

No. 777,884.

PATENTED DEC. 20, 1904.

E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 1.

Fig. 1.

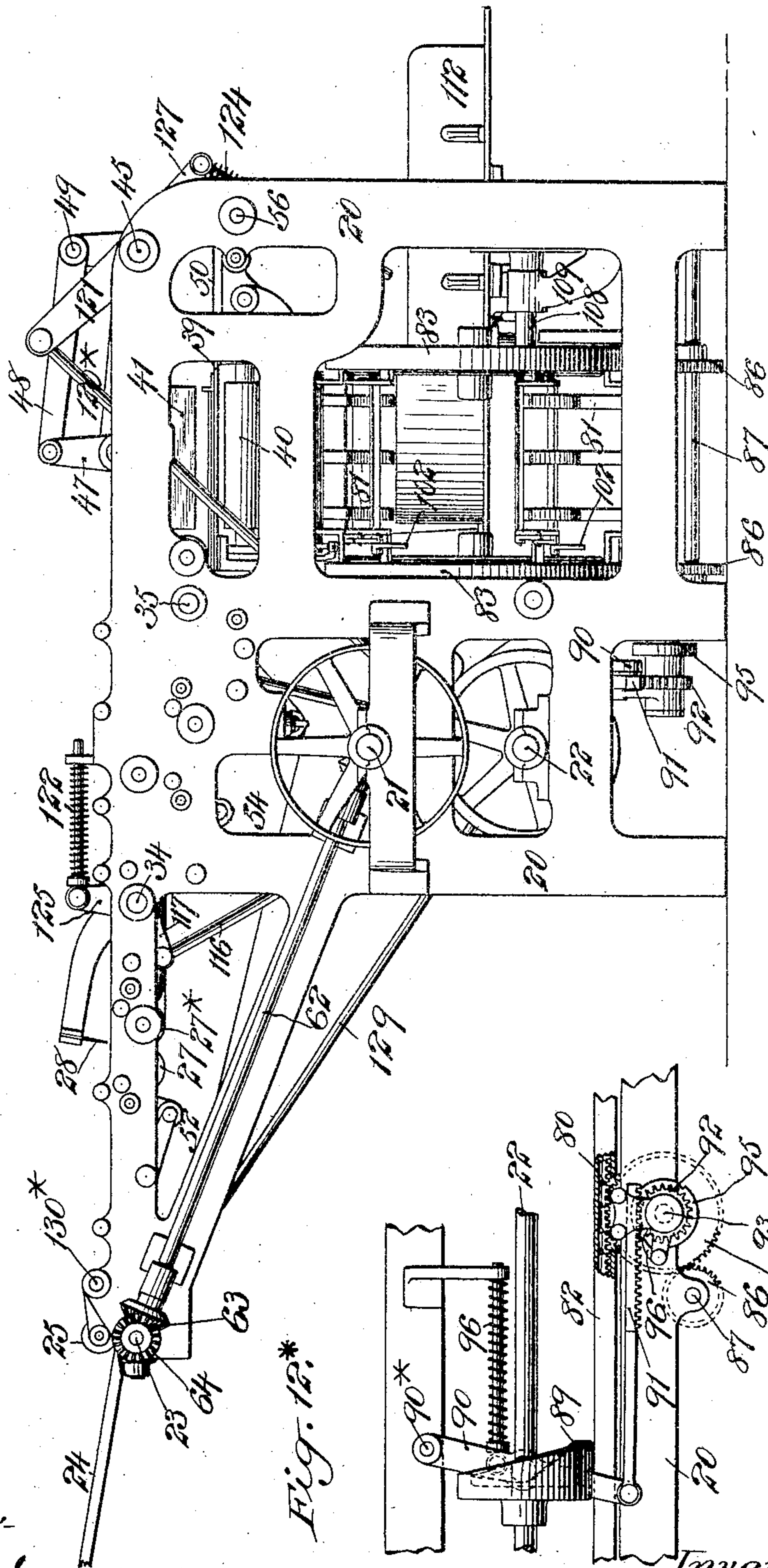
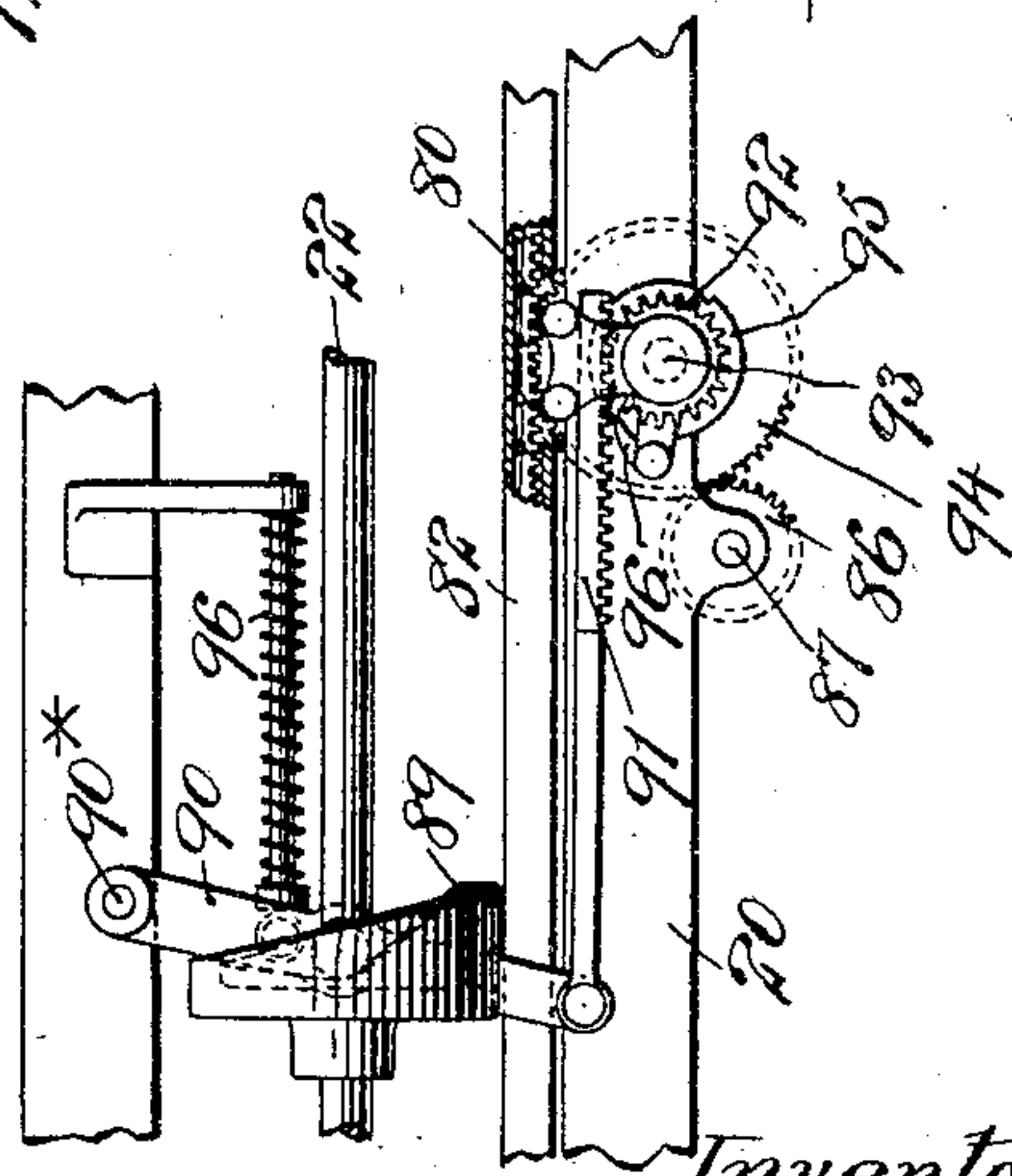


Fig. 12.*



Witnesses:
George Barry
Henry Thiele

Inventor:
Edgar H. Cottrell
by attorneys
Ramsdell & Howard

No. 777,884.

PATENTED DEC. 20, 1904.

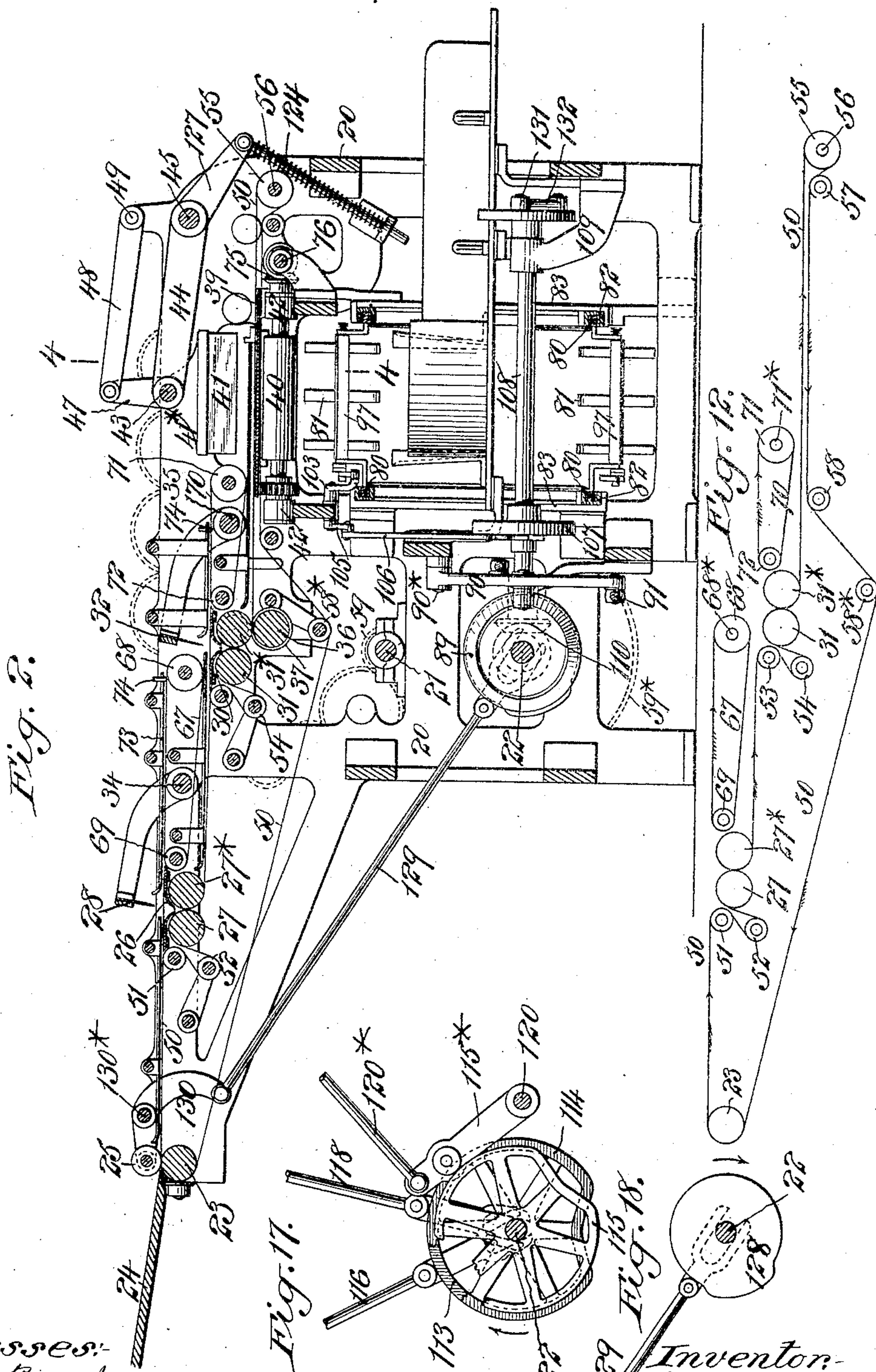
E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 2.



Witnesses:
George Barry
Henry Thorne

Inventor:
Edgar H. Cottrell
By Attorneys
Brown & Bond

No. 777,884.

PATENTED DEC. 20, 1904.

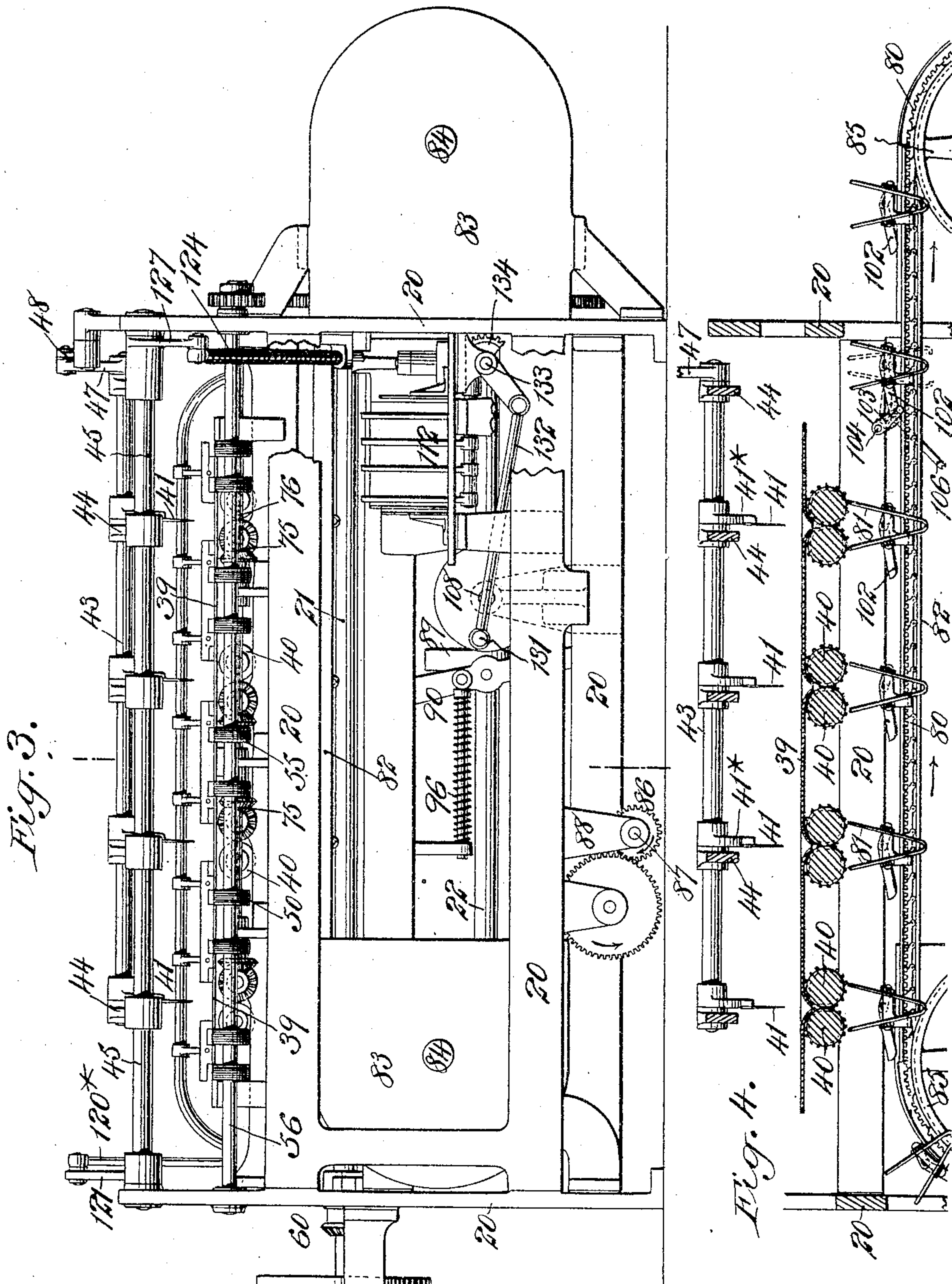
E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 3.



Witnesses:
George Barry
Henry Thorne

Inventor:
Edgar H. Cottrell
by attorneys
Brown & Seward

No. 777,884.

PATENTED DEC. 20, 1904.

E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 4.

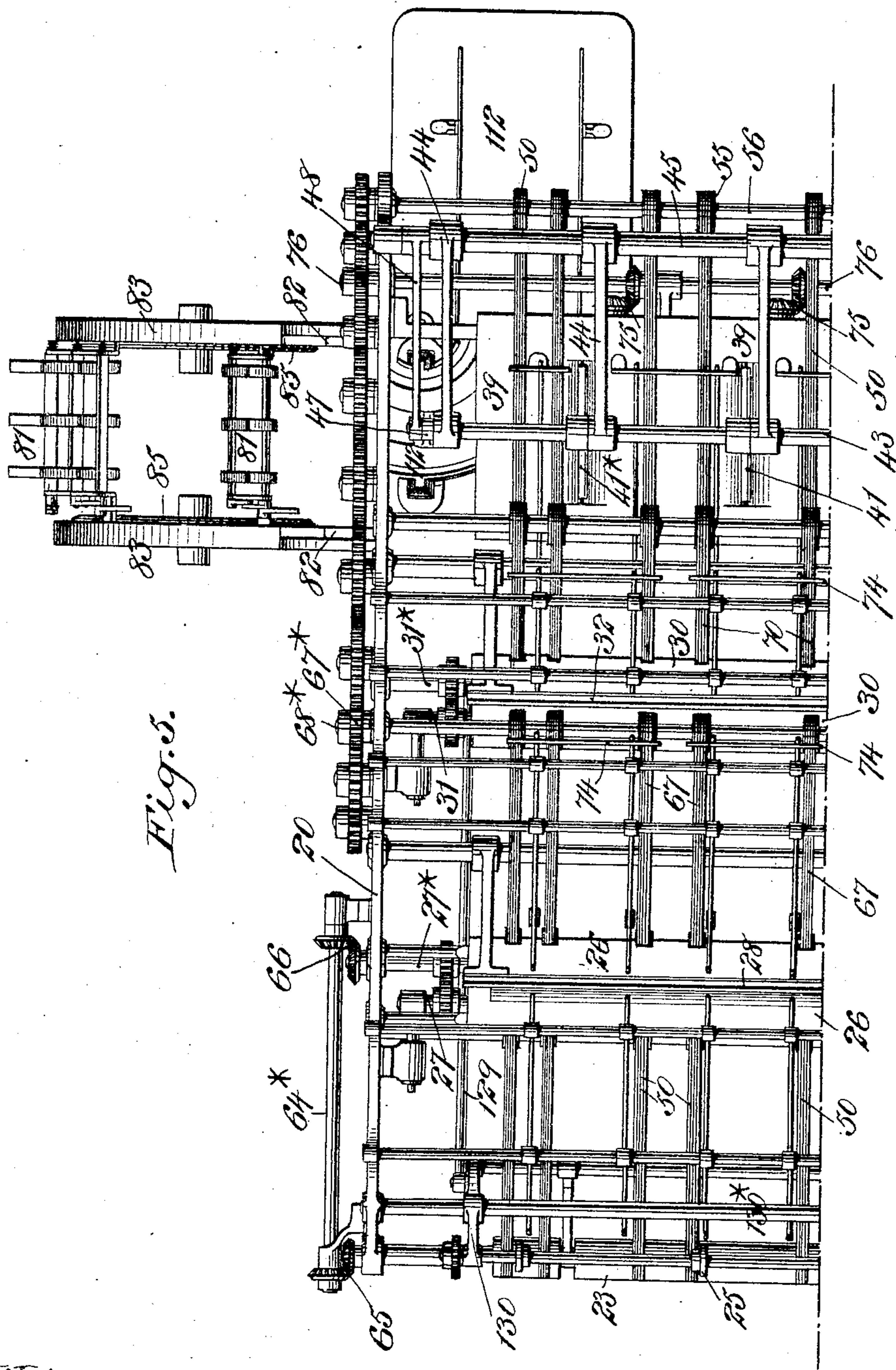


Fig. 5.

Witnesses:-

George Barry Jr.

Henry Thine

Inventor:

Edgar H. Cottrell
by attorneys

Edward Howard

No. 777,884.

PATENTED DEC. 20, 1904.

E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 5.

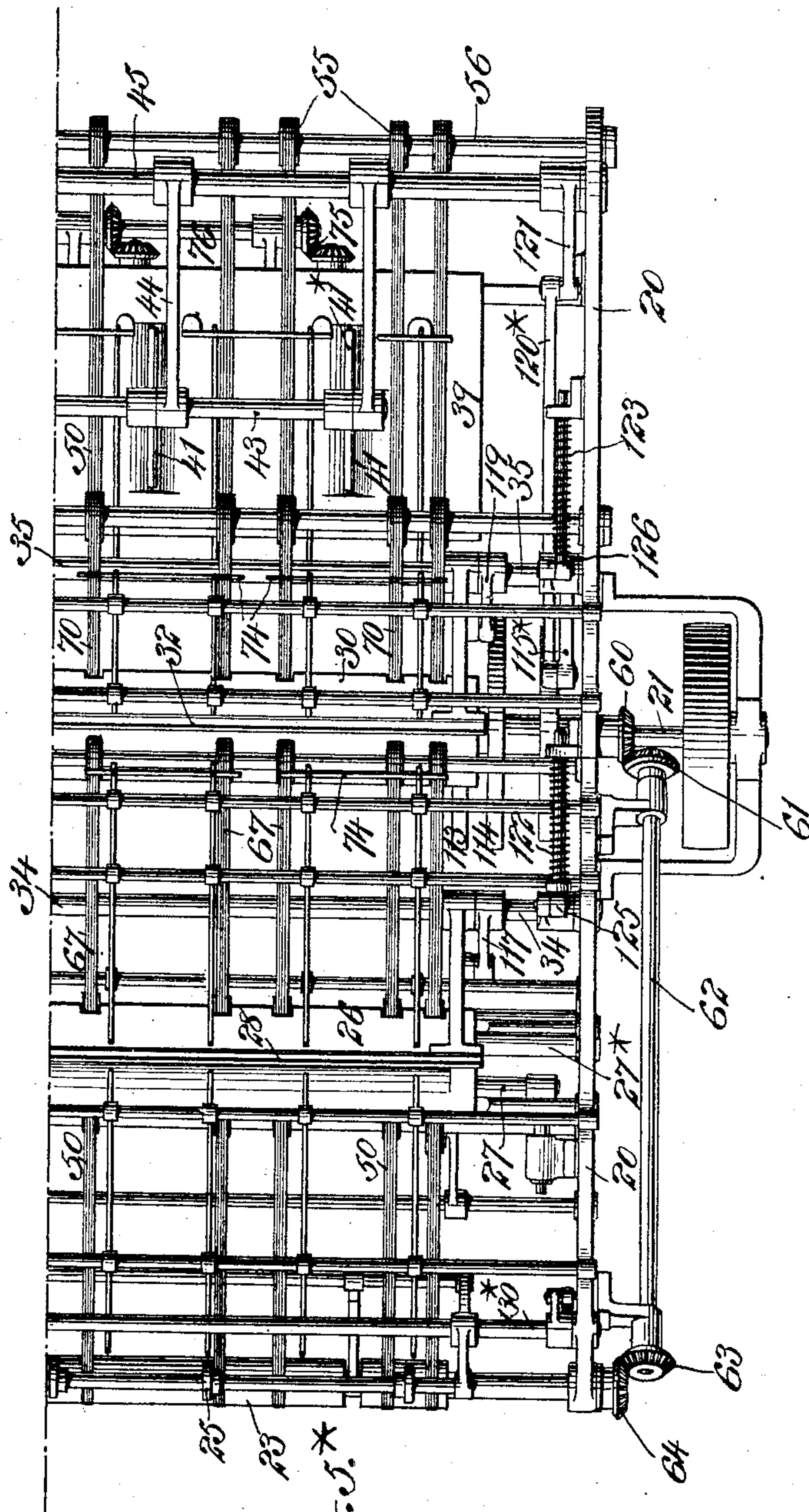


Fig. 5.*

Witnesses:

George Barry
Henry Shume

Inventor:

Edgar H. Cottrell
by attorneys
Brown & Howard

No. 777,884.

PATENTED DEC. 20, 1904.

E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 6.

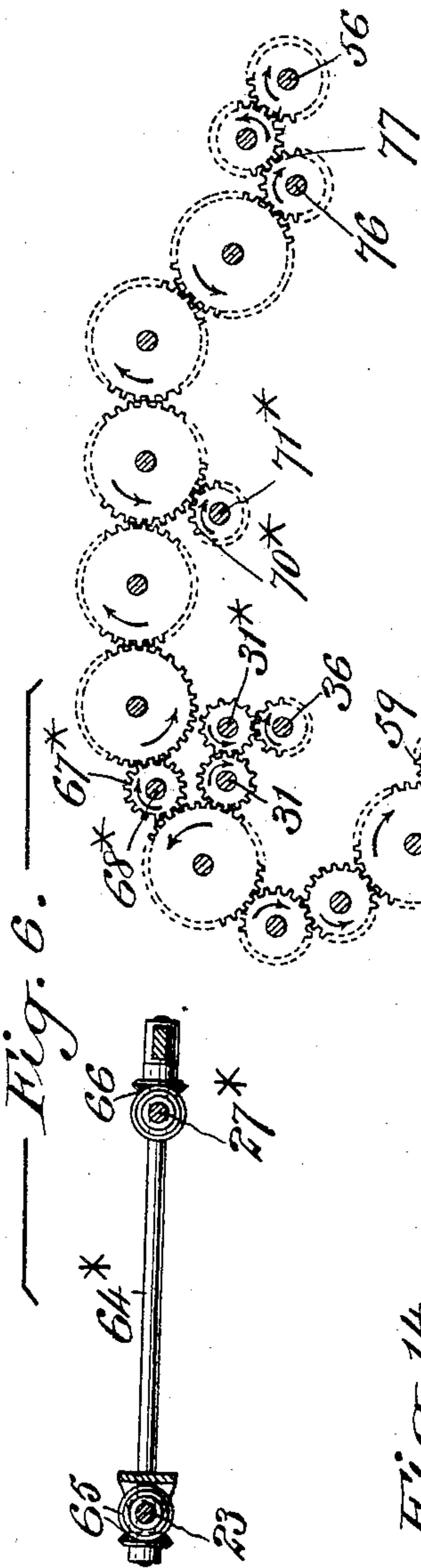


Fig. 14.

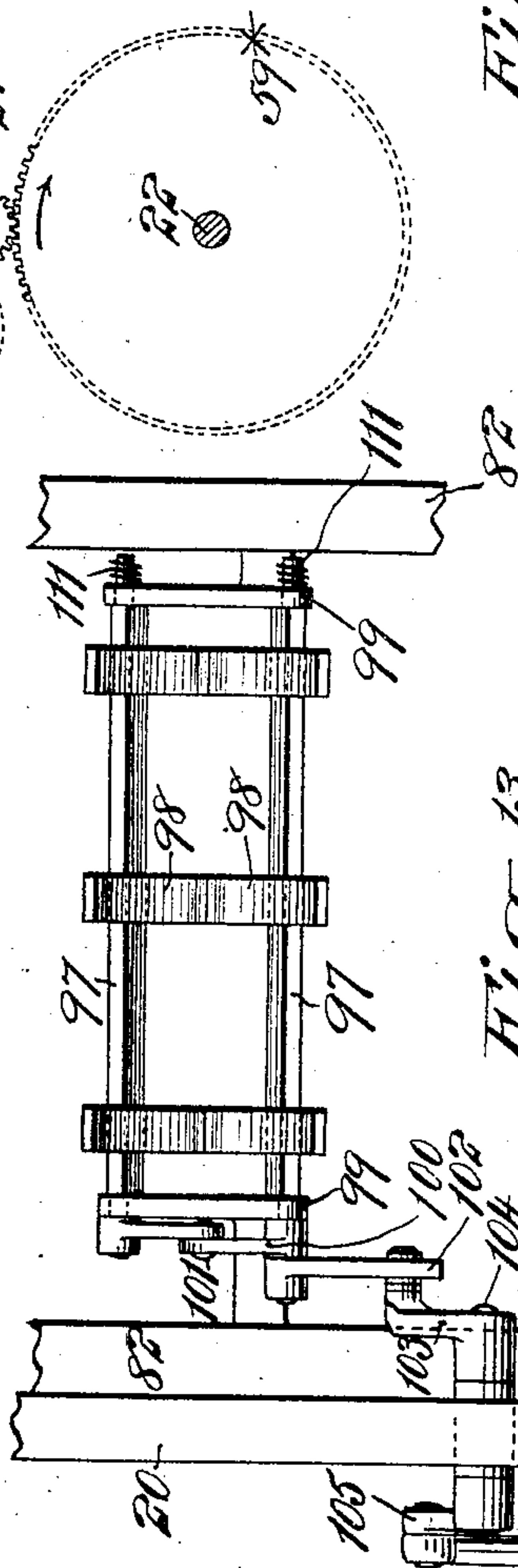


Fig. 13.

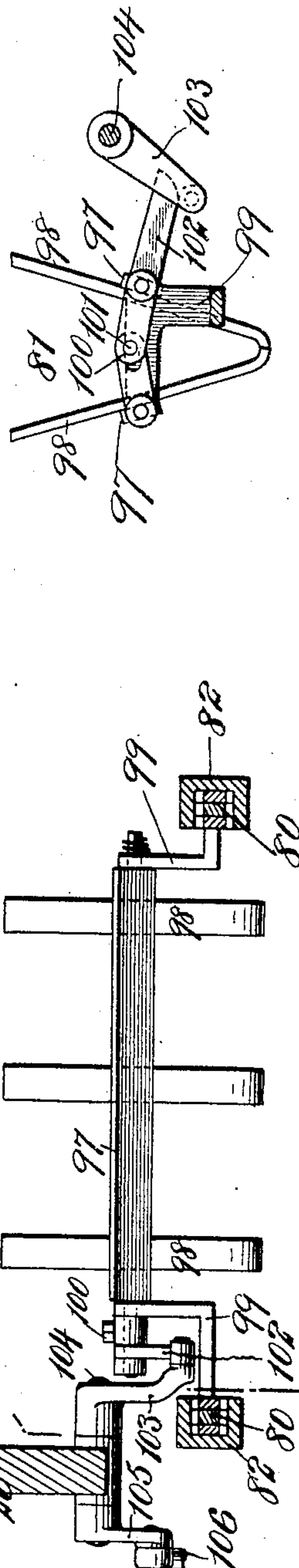


Fig. 15.

Witnesses:
George Barry
Henry Thiele

Inventor: Edgar H. Cottrell
By Attorney: Brown & Howard

No. 777,884.

PATENTED DEC. 20, 1904.

E. H. COTTRELL.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

APPLICATION FILED NOV. 20, 1903. RENEWED OCT 14, 1904.

NO MODEL.

7 SHEETS—SHEET 7.

Fig. 10.

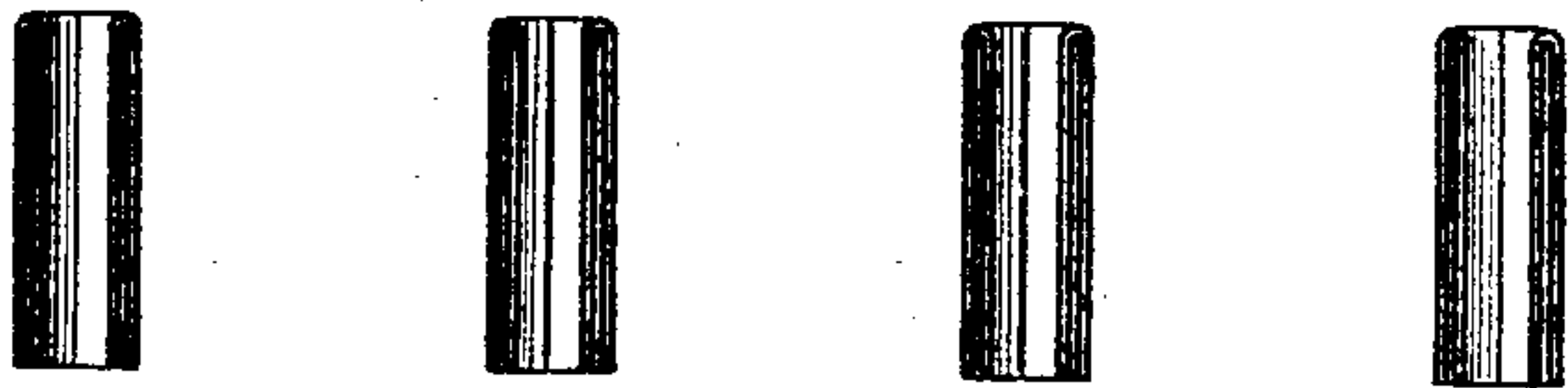


Fig. 9.

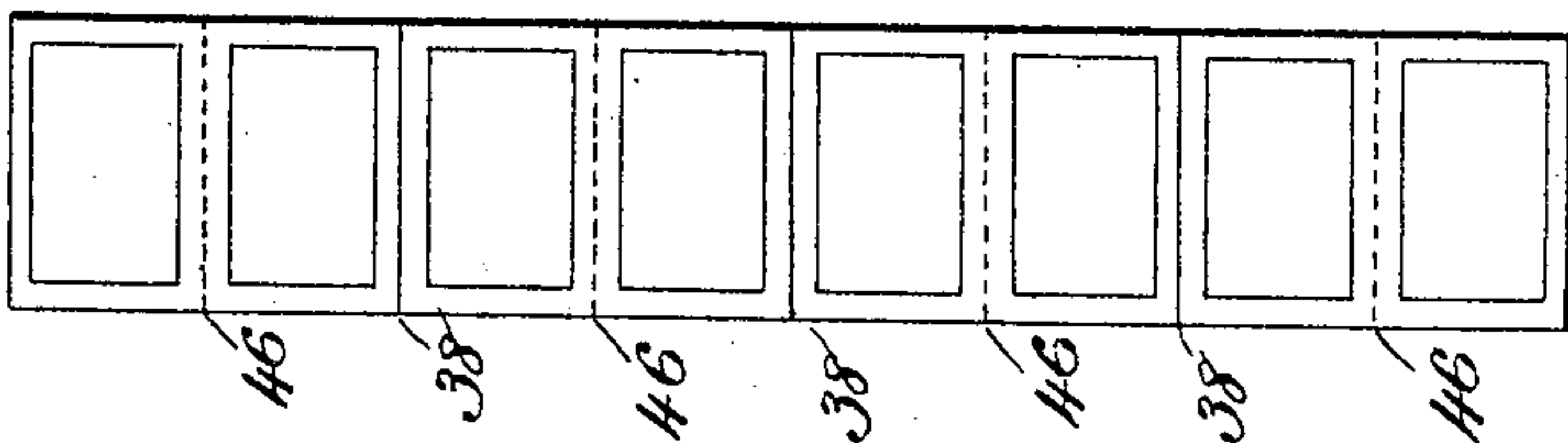


Fig. 8.

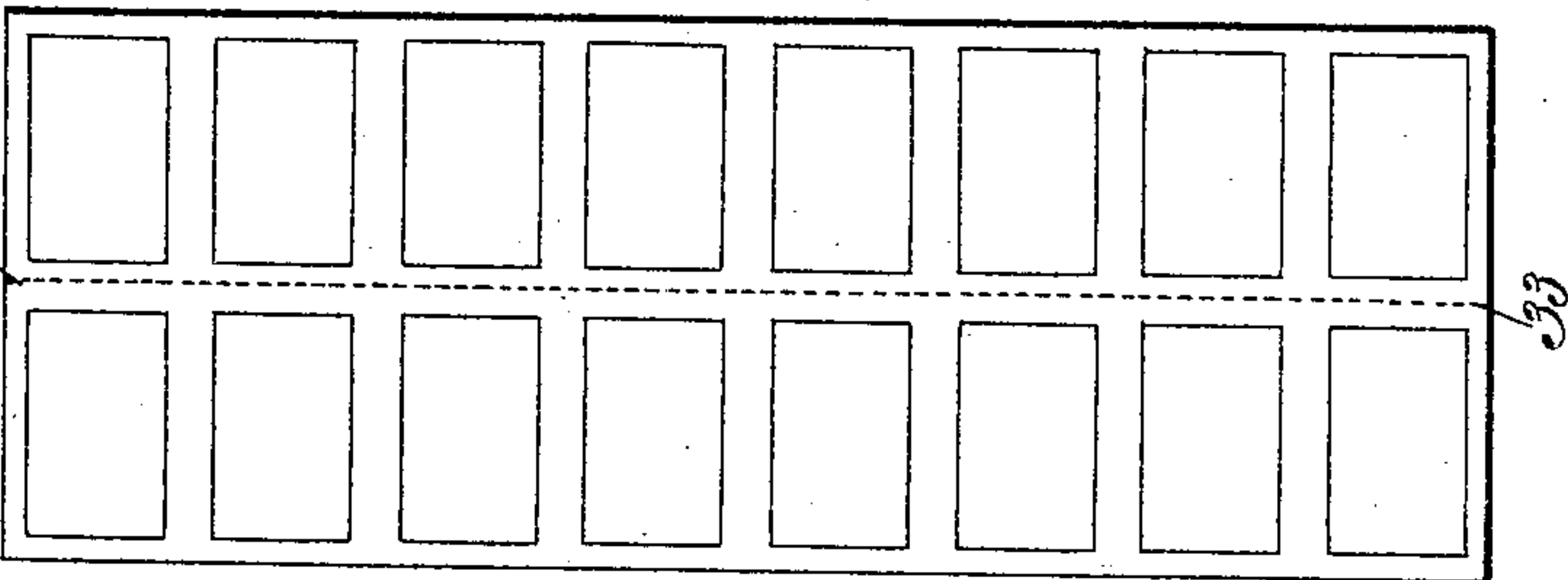


Fig. 7.

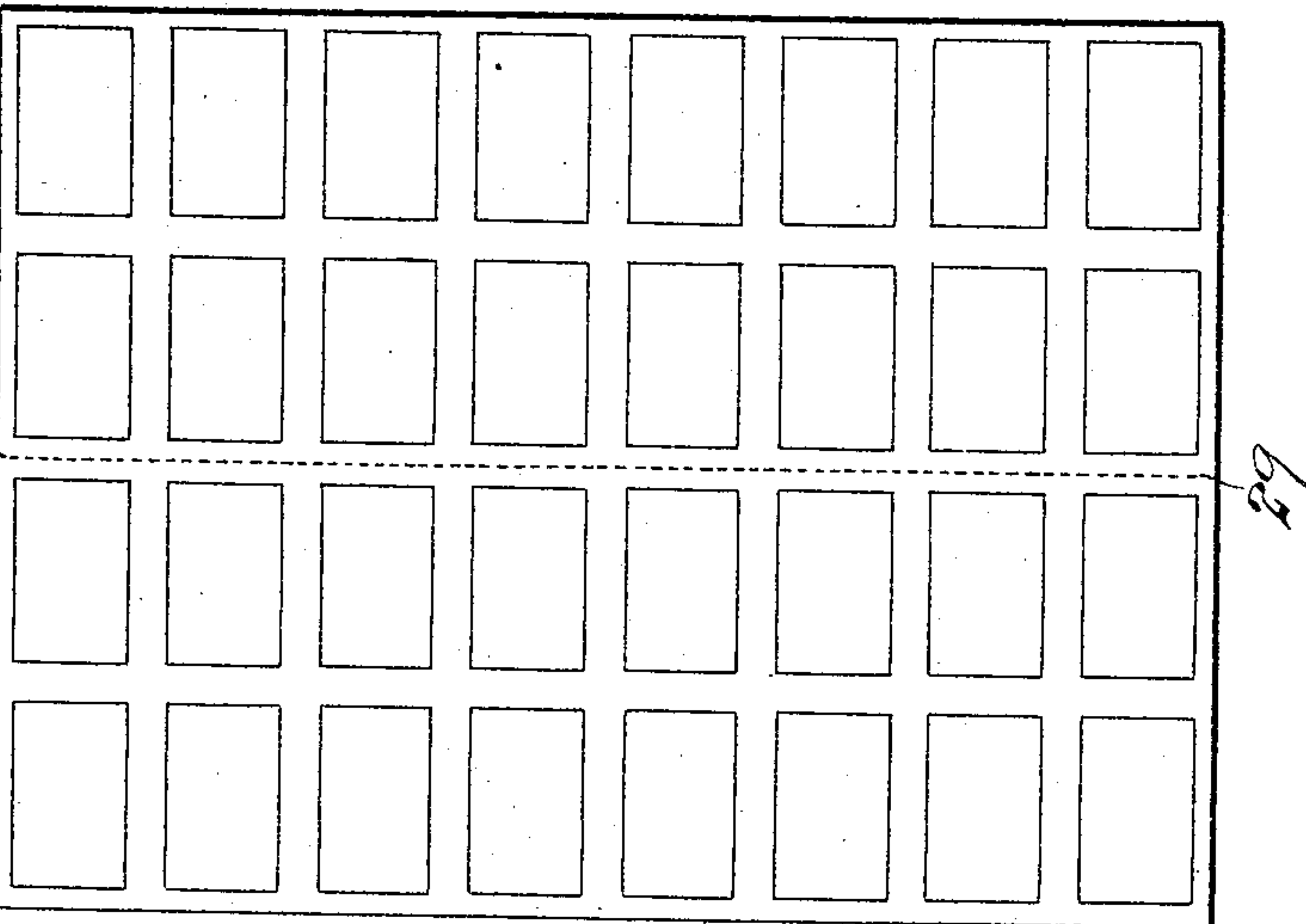
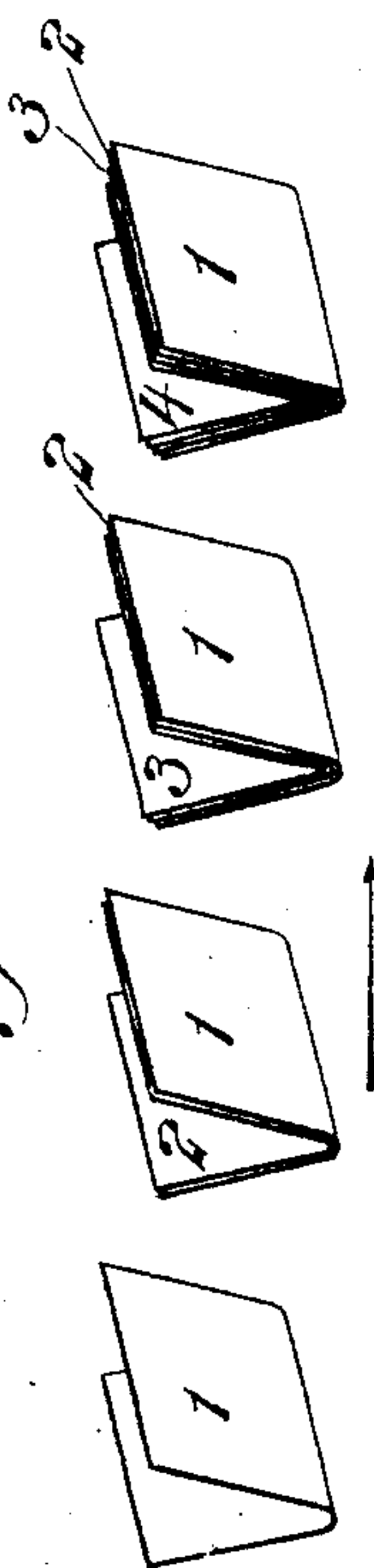


Fig. 11.



Witnesses:
George Barry Jr.
Henry Thorne

Inventor:
Edgar H. Cottrell
By attorney
F. M. Howard

UNITED STATES PATENT OFFICE.

EDGAR H. COTTRELL, OF STONINGTON, CONNECTICUT, ASSIGNOR TO C. B. COTTRELL & SONS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MACHINERY FOR CUTTING AND FOLDING PAPER OR OTHER FABRICS.

SPECIFICATION forming part of Letters Patent No. 777,884, dated December 20, 1904.

Application filed November 20, 1903. Renewed October 14, 1904. Serial No. 228,411.

To all whom it may concern:

Be it known that I, EDGAR H. COTTRELL, a citizen of the United States, and a resident of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Machinery for Cutting and Folding Paper or other Fabrics, of which the following is a specification.

A machine embodying this invention has for its principal object the production of signatures of sixty-four pages from printed sheets of the same number of pages. By the operation of the machine to produce such signatures such sheets following each other in regular succession are separately and successively made each into four sixteen-page signatures and such signatures obtained from each sheet have inset into them similar signatures obtained from the next sheet in the order of succession in such manner that collections of four of such sixteen-page signatures are made in the form of sixty-four-page signatures.

The invention consists in certain devices and combinations thereof, illustrated by the accompanying drawings and hereinafter described and claimed, whereby signatures containing a larger number of pages are produced by the formation and subsequent collection of a number of signatures each containing a smaller number of pages in the manner hereinabove mentioned.

Figure 1 of the drawings represents a side elevation of a machine for making sixty-four-page signatures; Fig. 2, a vertical longitudinal section parallel with Fig. 1, taken at about the middle of the width of the machine; Fig. 3, a view of the delivery end of the machine, which is the end at the right of Figs. 1 and 2; Fig. 4, a vertical section parallel with Fig. 3 in the line 4-4 of Fig. 2. Figs. 5 and 5* together represent a plan of the machine; Fig. 6, an inside face view of the gearing shown in the plan view, Fig. 5; Fig. 7, a plan of one of the sixty-four-page sheets from which the signatures are produced and showing the lines in which the folds and cuts are to be made; Fig. 8, a plan of the sheet once folded; Fig. 9, a plan of the sheet twice folded; Fig. 10, an

edge view of four sixteen-page signatures obtained by cutting the sheet shown in Fig. 9 transversely to the lines of its fold and folding parallel with the cuts. Fig. 11 illustrates in perspective the production of a complete signature by inseting as will be hereinafter described. Figs. 12, 12*, 13, 14, 15, 16, 17, 18 are detail views which will be hereinafter described.

20 designates the main framing, consisting of upright side frames, girths, and ties and containing the bearings for the driving-shaft 21, the cam-shaft 22, the lower feed-roll 23, and other shafts and rolls to be hereinafter described, the said feed-roll being arranged at the foot of the feed-table 24, over which the sheets are to be fed or presented to the feed-rolls 23 25 in any suitable manner. At a proper distance forward of the feed-rolls there are arranged (see Fig. 2) a folding-plate 26, folding-rolls 27 27*, and a folding-blade 28 of well-known construction for producing in the sheet the first fold, which is made across the sheet on the center thereof, as indicated by the line 29 in Fig. 7. At a proper distance forward of the plate 26, rolls 27 27*, and blade 28, but somewhat lower than them, are arranged the plate 30, rolls 31 31*, and blade 32 for making the second fold parallel with the first one midway between the latter and the edges of the sheet, the line for said second fold being designated by 33 in Fig. 8. The said folding-plates 26 30 are supported on suitable girths between the side frames. The journals of the folding-rolls 27 27* 31 31* and those of the rock-shafts 34 35 of the folding-blades 28 32 are supported in bearings in or on the side frames.

Under the foremost of the folding-rolls 31 31* there is arranged in suitable bearings in or on the side frames the shaft 36 of the rotary splitter carrying the three slitting-blades 37, only one of which is visible, for severing the folded sheet represented in Fig. 9 on the lines 38 shown in that figure, and thereby producing four quarter-sheets which may be termed "signature-sections," said lines 38 being transverse to previously-described folds and par-

allel with the direction of the run of the sheets through the machine. (Indicated by arrows in Figs. 7, 8, 9.) This rotary slitter is of well-known kind and needs no particular descriptions further than to say that its blades 37 run in grooves in the folding-roll 31* above.

Forward of the slitter are suitably arranged (see Figs. 3 and 4) a folding-table 39, four pairs of folding-rolls 40, and four folding-blades 41, coöperating therewith through slots in said table, the said table and the bearings 42, Fig. 2, for said rolls being supported on two of the cross-girths of the framing and the stocks 41* of the said folding-blades being all rigidly placed on one bar 43, which is pivoted into the arms 44 of a rock-shaft 45. The said folding-rolls 40 and blade 41 are arranged transversely to the rolls 27 27* 31 31*, and blades 28 32 for producing the folds of the cut quarter-sheets or signature-sections on the lines 46, Fig. 9, parallel with the lines 38, on which they have been cut from the original sheet, and thereby producing from each quarter sheet or section a sixteen-page folded signature. For the purpose of preserving a parallel motion of the folding-blades 41 their carrying-bar 43 has affixed upon it an arm 47, which is connected by a radius-bar 48 with a fixed pivot 49 on the machine-framing.

For the purpose of first carrying the unfolded sheets from the feed-rolls 23 25 to the folding-plate 26, next carrying the once-folded sheets from the folding-rolls 27 27* to the folding-plate 30, and afterward carrying the twice-folded sheets to the slitters 37 and thence to the folding-table 39 a single carrier 50, consisting of a suitable number of cords or tapes, is employed. This carrier, though partly visible in Fig. 2, is more clearly represented in the corresponding diagram, Fig. 12, wherein its course is traced by arrows. Commencing at the lower feed-roll, said carrier runs therefrom over and under idler-pulleys 51 52, thence over the first and under the second of the folding-rolls 27 27*, thence over and under idler pulleys 53 54, over the first and under the second of the folding-rolls 31 31*, thence over the folding-table 39, returning round pulleys 55 on a rotary shaft 56, running in bearings in the side frames, thence under the table 39, over idler-pulleys 57 58, under idler-pulleys 58*, and thence to the feed-roll 23. This carrier runs continuously and may be driven in any suitable manner. It is represented as driven by the feed-roll 23 and also by the folding-rolls 27 27* 31 31* and by the shaft 56, all of which are driven positively by any suitable train or trains of gearing—such, for example, as the two trains shown in Figs. 5, 5*, 6. The driver of one of said trains is represented as a spur-gear 59, Fig. 6, on the driving-shaft 21, this train serving, as may be easily traced through Fig. 6, to drive the folding-rolls 31 31* and slitter-shaft 36 and the carrier-shaft 56. The driver of the other train

is a miter-gear 60, Fig. 5*, on the driving-shaft, which miter-gear meshes with a miter-gear 61 on a side shaft 62, Figs. 11 and 5*, another miter-gear, 63, on which meshes with and drives a miter-gear 64 on the feed-roll 23. This roll is geared, through another side shaft, 64*, Figs. 5 and 6, and the miter-gears 65 66, with the folding-rolls 27* for driving the folding-rolls 27 27*. The folding-rolls 40 are represented (see Figs. 5 and 5*) as driven by the same train of gearing which includes the gear 59, the said rolls all being geared by pairs of miter-gears 75 with a shaft 76, which is arranged in bearings in the side frames and which for driving it is furnished with the gear 77, as shown in Fig. 6.

Forward of the folding-rolls 27 27* there is arranged over the carrier 50, as shown in Figs. 2, 5, 5*, and 6, a supplementary carrier, consisting of tapes or cords 67 and carrying-pulleys 68 69 therefor for the support of the forward parts of the unfolded sheets during their presentation to the said folding-rolls and for the support of said parts during the first part of the first folding operation. Likewise forward of these second folding-rolls 31 31* there is arranged over the said carrier 50 a supplementary carrier consisting of tapes or cords 70 and carrying-pulleys 71 72 therefor for the support of the forward parts of the sheets which have been once folded during their presentation to the latter folding-rolls and during the first part of the second folding operation. For driving the supplementary carriers 67 70 the shafts 68* and 71* of their pulleys 68 71 are furnished with gears 67* and 70*, which are included in the train illustrated in Fig. 6, which includes the gear 59. Over the supplementary carriers 67 70 there are arranged stationary guard-rods 73 for preventing the turning up of the forward parts of the sheets on said carriers, and on these rods 73 are stops 74 for stopping the sheets in proper positions for folding by the rolls 27 27* and 31 31*, respectively.

For the purpose of receiving the folded sixteen-page signatures from the folding-rolls 40 and insetting together such signatures obtained from four successive sixty-four-page sheets, there is provided under the said rolls, as shown in Figs. 2 and 4, an intermittently-moving endless pocketed signature-carrier consisting of two parallel endless toothed racks or chains 80 and attached in pockets 81, the said racks being arranged to run horizontally in a direction transverse to that of the endless sheet-carrier 50 (indicated by an arrow in Fig. 4) in stationary ways 82, forming parts of frames 83, carried by the main framing, the said frames also containing or supporting the pivots 84 on which run the wheels 85, which carry the said racks. The two racks are geared together to run in unison by gearing 86 and 94, Figs. 1 and 3, on shafts 87 and 93, which runs in fixed bearings in or

on the framing. The necessary intermittent movements of the carrier are obtained one from every revolution of a cam 89 on the cam-shaft 22, the length of movement being equal to the width of the slit sections of the sheet or the distance between the contact-surfaces of the several pairs of folding-rolls 40, and the intermissions of the movement which take place while there is a pocket under each pair of folding-rolls 40, being of sufficient duration to permit the operation and withdrawal of the blades 41. The cam-shaft 22 derives constant rotary motion from the driving-shaft 21 through the gear 59, hereinbefore described, on the latter shaft, which meshes with the larger gear 59* on the cam-shaft. The means through which the said cam 89 drives the endless racks are illustrated in Fig. 12*, which represents a back view of a portion of the framing and portions of one of the ways 82 and racks 80 and shaft 22. This cam acts against a lever 90, which is pendent from a fixed fulcrum 90* on the framing, and the lower end of which has connected with it a rack-bar 91, which engages with a pinion 92, fitted loosely on a short shaft 93, which works in fixed bearings in or on the framing and which also has fast upon it a spur-gear 94, meshing with one of the racks 80. There is also fast on said shaft a ratchet-wheel 95, which is engaged by a pawl 96, carried by the pinion 92, so that by the movement of the rack-bar produced by the cam 89 in one direction the gear 94 produces a movement of the endless carrier-racks in the corresponding direction, but during the return movement of the rack-bar produced by the action of a spring 96* on the lever 90 no movement of the carrier-racks is produced.

The pockets of the signature-carrier, which are represented in Figs. 2 and 4, are, as shown in Fig. 4, at distances apart equal to the distances between the several folding-rolls 40, and their blades 41, and which are designated each as a whole by the numeral 81, are constructed to provide for the opening of their bottoms at proper times by movements of their sides in a direction parallel with the movement of the carrier and transverse to the faces of the leaves of the signatures deposited therein. This construction is fully illustrated in Figs. 13, 14, and 15, of which Fig. 13 represents a transverse vertical section of the upper run of the carrier, with a front view of a pocket and its opening mechanism, Fig. 14 a plan corresponding with Fig. 13, and Fig. 15 a side view of a pocket and parts of its opening mechanism. The pockets 81 are of skeleton form, each composed of two similar members, each member constituting one side of the pocket and consisting of a horizontal bar 97 and attached side pieces 98, firmly attached thereto, the said bars being pivoted into brackets 99, which are rigidly attached to opposite links of the two chains of the sig-

nature-carrier. The two bars 97 have each affixed to one end an arm 100, and the two arms are connected, as shown at 101 in Fig. 15, by a pin in one entering a slot in the other. One of the said bars 97 has affixed to it a rearwardly-projecting arm 102, which by the movements of the carrier in the direction shown by arrows in Fig. 4 is brought, as shown in Fig. 4 and in Figs. 13, 14, 15, over a roller on the end of the arm 103 of a short rock-shaft which is arranged in a fixed bearing in or on the framing 20 at a point (shown in Fig. 4) beyond or in advance of all the folders 40 41. The said rock-shaft has another arm, 105, which has connected with it a rod 106, actuated by a cam 107 on a shaft 108, which is arranged in fixed bearings in brackets 109, Fig. 2, at right angles to the cam-shaft 22. This shaft 108 is driven by the cam-shaft 22 through miter-gears 110. (Shown in dotted outline in Fig. 2.) The form of said cam 107 is shown in detail view, Fig. 16, which represents a section of said cam and its shaft 108 and shows the connection of the rod 106 with the cam. For the purpose of keeping the bottoms of the pockets closed at all times except when after each has received a sixteen-page signature from the four folders 40 41 in succession coil-springs 111 are applied, as shown in Figs. 13, 14, between their bars 97 and their supporting-brackets. After the four signatures have been received in a pocket the next movement of the carrier causes the arm 102, attached to one of the pivoted bars 97 of said pocket, to pass over the roller on the arm 103 of the rock-shaft 104, and at that time the cam 107 acts to throw up the said arm, and through it the pocket-arm 102, which acting through the connected arms 100 of the two members of the pocket throws the pocket open, as shown in dotted outline in Fig. 4, and so permits the signature therein to drop out therefrom into a packer or other suitable receptacle. A packer partly shown in the drawings is of well-known construction, and therefore needs no description; but in order to identify it in the drawings and avoid its confusion with the parts of the machinery comprised in my invention I have applied to several of its parts the reference-numeral 112. A crank 131 is shown in Figs. 2 and 3 on the pocket-opening shaft 108 for operating the packer through a rod 132, rock-shaft 133, and toothed sector 134, which are shown in Fig. 2.

The folding-blades 28, 32, and 41 may be actuated by any suitable means. For actuating them I have represented three cams 113 114 115 on the cam-shaft 22. These cams are represented in Fig. 17, which represents a transverse section of the shaft 22 and side views of the cams. The cams 113 114 for operating the blades 28 32 are both alike; but they are arranged upon the shaft in different positions to time the successive operations of their respective blades. The cam 113 operates for that

purpose through a rod 116 on an arm 117 of the rock-shaft 34, which carries the blade 28. The cam 114 operates for the same purpose through a rod 118 on the arm 119 (see Fig. 5*) of the rock-shaft 35, which carries the blade 32. The cam 115 operates through a lever 115*, having a fixed fulcrum 120 on a rod 120*, which connects said lever with an arm 121 on the rock-shaft 45, by the arms 44 of which is carried the bar 43, which carries the blades 41. The cams operate to raise the blades; but the downward movements of the blades by which the foldings are performed are produced by springs 122 123 124 under the control of said cams, as is common in such folding devices. The spring 122 for producing said movement of the blade 28 is represented in Figs. 1 and 5* as applied to an arm 125 of the rock-shaft 34. The spring 123 for producing the movement of the blade 32 is represented in Fig. 5* as applied to an arm 126 of the rock-shaft 35, and the spring 124 for producing said movement of the blades 41 is represented in Figs. 2 and 3 as applied to an arm 127 of the rock-shaft 45.

The cam-shaft 22 is represented (see Fig. 1 and also in the detail section, Fig. 18) as carrying besides its other cams a cam 128 for lifting the feed-roll 25 at proper times, the said cam operating on a yoke-rod 129, connected to the arm 130 of the rock-shaft 130*, which carries the said feed-roll.

Having now described the several parts which constitute the invention and their mutual relation, I will briefly recapitulate their operation in regular succession. The sixty-four-page sheets, such as are shown in Fig. 7, being successively fed by the rolls 23 25, are carried singly to the folder 27 27* 28, and each after having been thereby folded at the middle of its length on the lines 29 passes on to the folder 31 31* 32, whereby it is folded the second time. The twice-folded sheet passes thence over the slit to be thereby cut transversely to the folds into four sections, which passing to and through the folders 40 41 are folded into a set of four sixteen-page signatures, which is deposited into four pockets of the carrier. After the set of four signatures obtained from the first sheet has been so deposited one in each of four of the pockets 81 of the signature-carrier a movement of the said carrier takes place and a set of four signatures, obtained, as above described, from the next following sheet, is deposited into four of the pockets of the carrier, three of the latter or second set being thus inset into three of the first. In the succeeding operations three of the signatures of each set obtained from one sheet are inset into three of the set obtained from the preceding sheet. In this way it will be understood that at the first starting of the machine four sheets have to be folded and cut and their products of sixteen-page signatures have to be deposited in the pocketed carrier

to obtain the first sixty-four-page signatures. After that a sixty-four-page signature is on the opening of every pocket, as herein described, delivered for each sheet fed.

The formation of the sixty-four-page signatures as above described is illustrated in the perspective diagram Fig. 11. In this diagram to avoid confusion the sixteen-page signatures are each illustrated by a single line. The pockets (not shown) containing the signatures are supposed to be moving from left to right, as indicated by the arrow. In this figure the numeral 1 designates a sixteen-page signature obtained from the first of any four successive sheets presented to the machine; 2, a signature obtained from the second of the four inset into 1; 3, a signature from the third inset into 2, and 4 a signature from the fourth inserted into 3 and completing the sixty-four-page signature. After the first four operations of the machine any four pockets which are under the folders 40 41 and have received the signatures therefrom contain, respectively, one, two, three, and four sixteen-page signatures, and every delivery which is made by the opening of the most advanced of the four pockets consists of a sixty-four-page signature.

It will be readily understood by those skilled in the art how, in a machine such as that described, by the use of sheets three-fourths of the width of those represented and cutting into threes forty-eight-page signatures may be made from three of sixteen pages like those described, or by using sheets of half such width and cutting into twos thirty-two-page signatures may be made from two such sixteen-page signatures.

What I claim as my invention is—

1. In a folding-machine, the combination of mechanism for separately forming signatures from one sheet, means for presenting sheets one after another to said mechanism and means for insetting a separately-formed signature obtained from one of the so-presented sheets into a previously-formed signature obtained from another of the so-presented sheets.

2. In a folding-machine, the combination of means for separately folding one after another a plurality of sheets and cutting the so-folded sheets into signature-sections, and means for separately folding the said sections of each sheet into signatures and insetting signatures so obtained from one sheet into those previously obtained from another sheet.

3. In a folding-machine, the combination of mechanism for forming signatures from one sheet, means for presenting sheets one after another to said mechanism, and a carrier for the reception one within another from said mechanism of signatures formed each from one of several sheets successively presented to said mechanism.

4. In a folding-machine, the combination of mechanism for forming signatures from one

sheet, means for presenting sheets one after another to said mechanism, and an intermittently-moving carrier furnished with pockets for the reception, within each of several of which at one time, of one of the so-formed signatures.

5. In a folding-machine, the combination of a sheet-carrier, folding mechanism for twice folding a sheet in lines transverse to the movement of said carrier, a slitting device for cutting the so-folded sheets crosswise of the two folds into sections, folding mechanism for separately folding the so-cut sections in lines transverse to the first and second folds and thereby forming them into signatures, and a carrier moving in lines transverse to the lines of the last-mentioned fold for the reception simultaneously of several of the last-mentioned signatures.

6. In a folding-machine, the combination of folding mechanism for making two parallel folds in a sheet, a slitter for severing the so-folded sheet crosswise into several sections, a folder for folding said sections transversely to said parallel folds into signatures, a carrier for presenting sheets singly and successively to said folding mechanism and slitter, and a carrier furnished with pockets and moving transversely to the sheet-carrier for the collection in each of its pockets of several so-folded signatures obtained from as many single sheets.

7. In a machine for folding and delivering

signatures, a signature-carrier provided with pockets the bottoms of which open for the discharge of signatures by movements of their sides in directions parallel with the movements of the carrier and transverse to the faces of the leaves of the signatures deposited therein.

8. In a machine for folding and delivering signatures, a signature-carrier consisting of two endless racks, pockets composed each of side members pivoted to said racks, and means for opening the bottoms of said pockets by movements of their side members in directions parallel with the movements of the carrier and transverse to the faces of the leaves of the signatures deposited therein.

9. The combination in and with an endless signature-carrier, of two endless moving racks, pockets consisting each of two members separately pivoted to both racks, cam-actuated mechanism for operating on one of said members and connections between the two members whereby both are moved for opening the bottoms of the pockets.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 2d day of November, 1903.

EDGAR H. COTTRELL.

Witnesses:

FREDK. HAYNES,
ALIDA M. EGBERT.