(No Model.) 9 Sheets—Sheet 1.

C. KAUFMAN.

CLOTH CUTTING MACHINE.

No. 487,840. Patented Dec. 13, 1892.

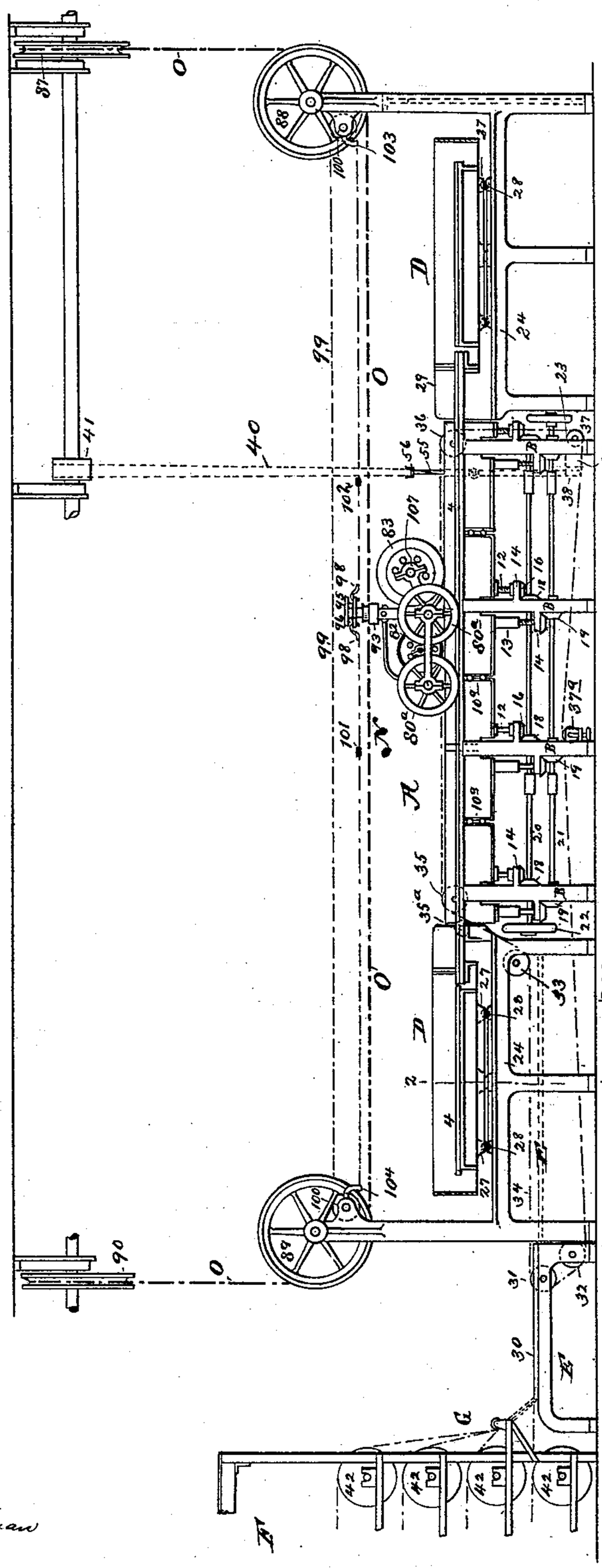

Fig. 1.

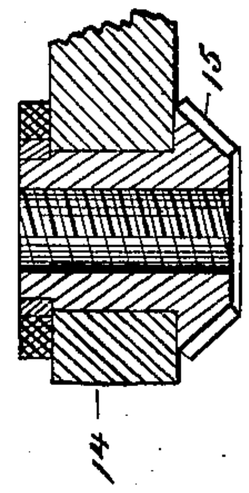

Fig. 25.

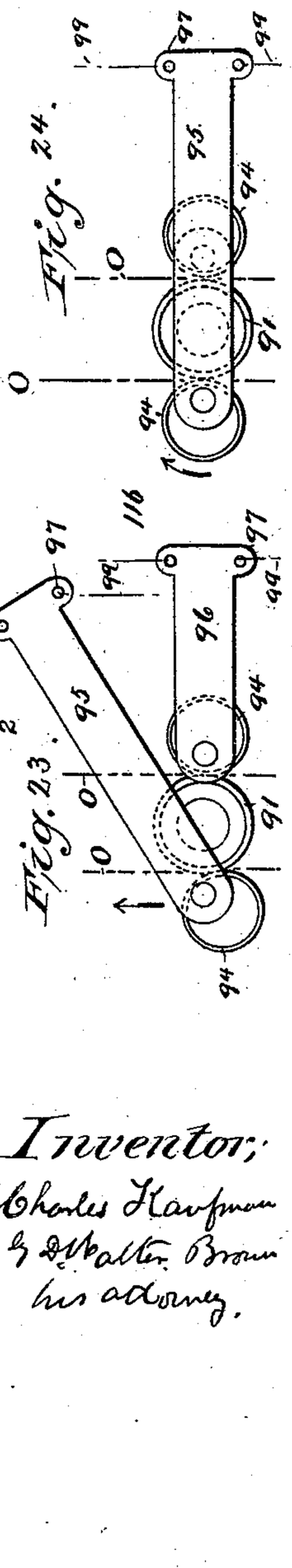

Fig. 24.

Fig. 23.

Attest;

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Amelia E. Christman

Inventor;

Charles Kaufman

by D. Walter Brown

his attorney.

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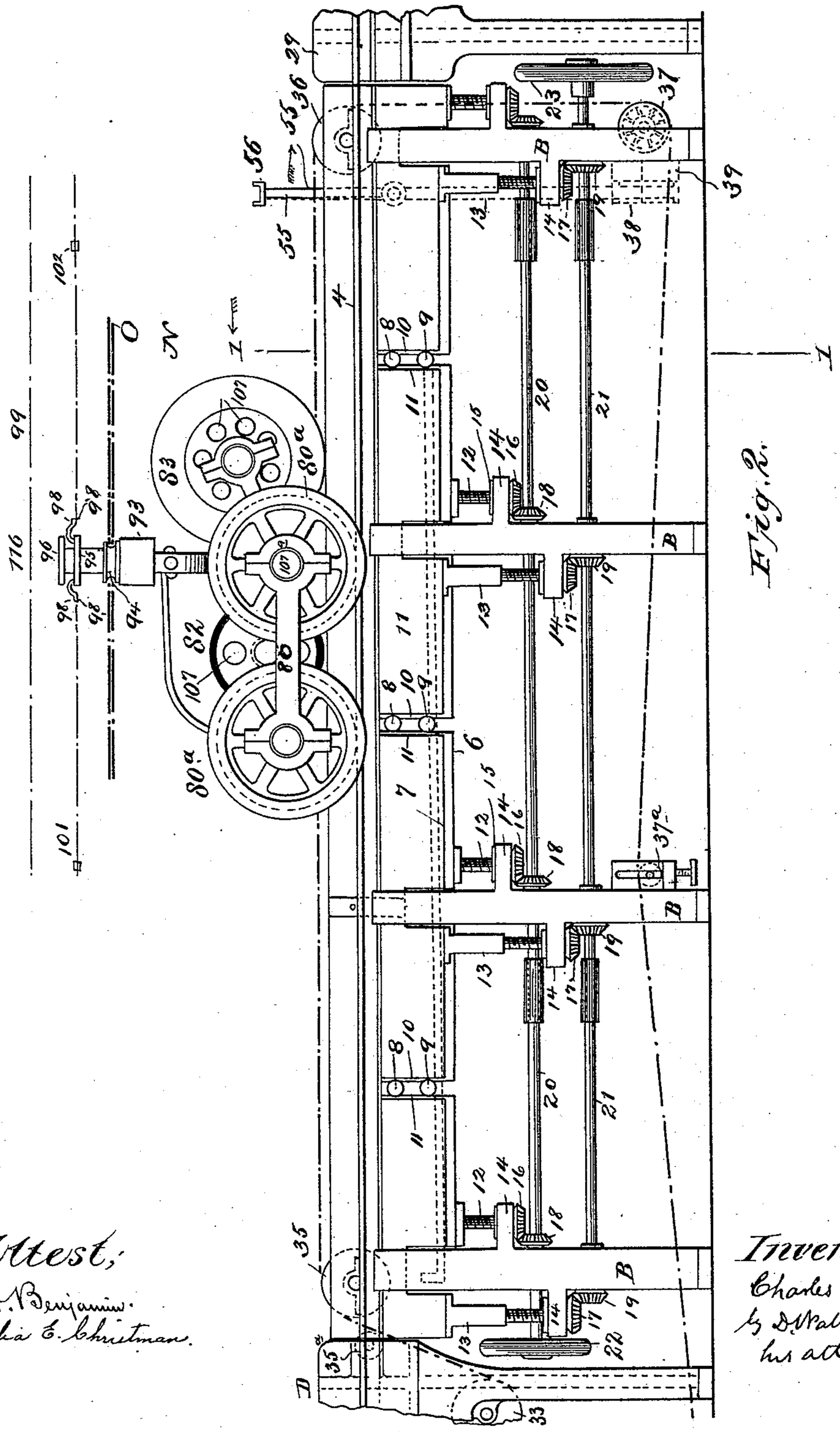

Fig. 2.

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CLOTH CUTTING MACHINE.

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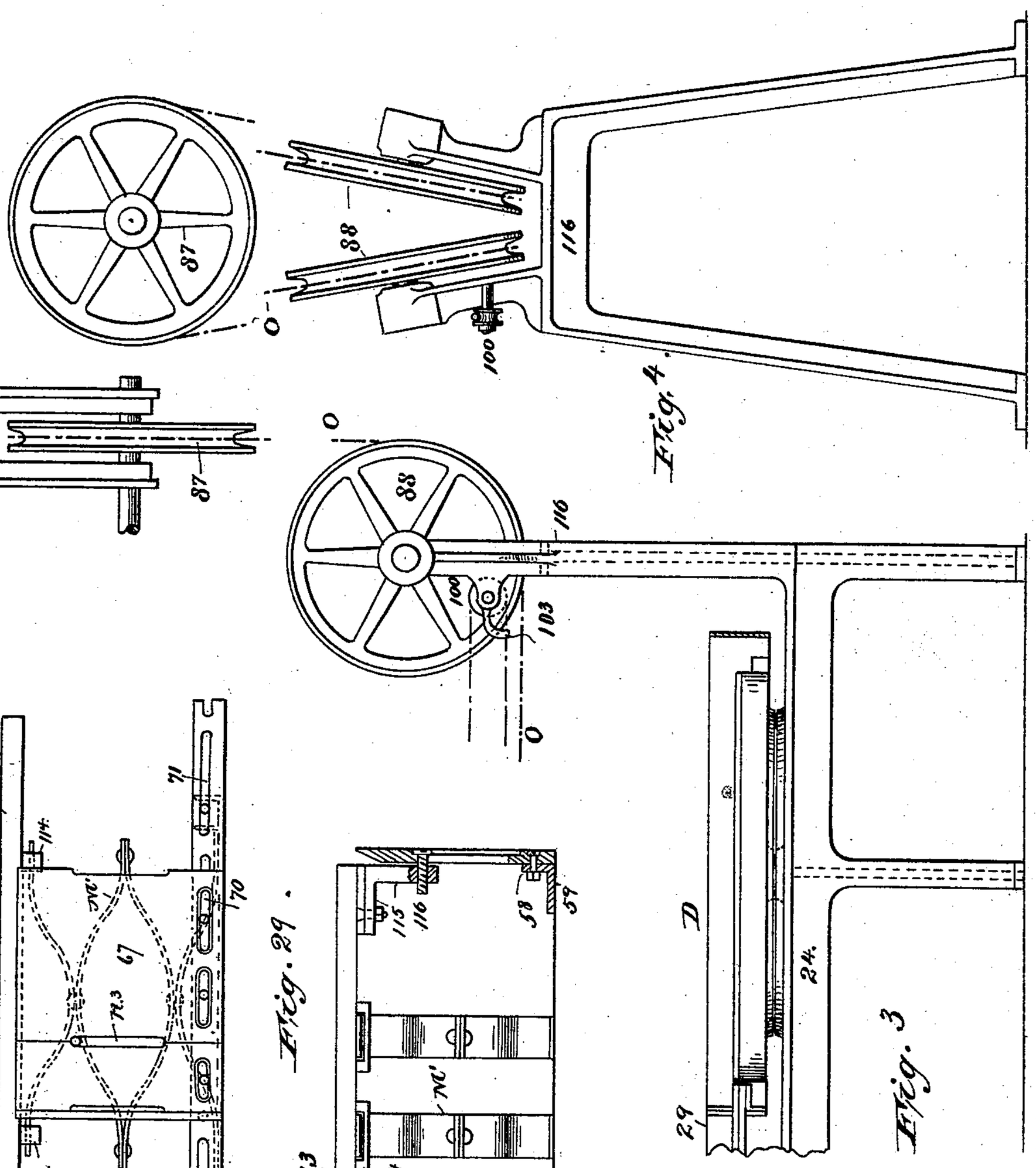

Fig. 4.

Fig. 3

Fig. 28.

Fig. 29.

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C. KAUFMAN.

CLOTH CUTTING MACHINE.

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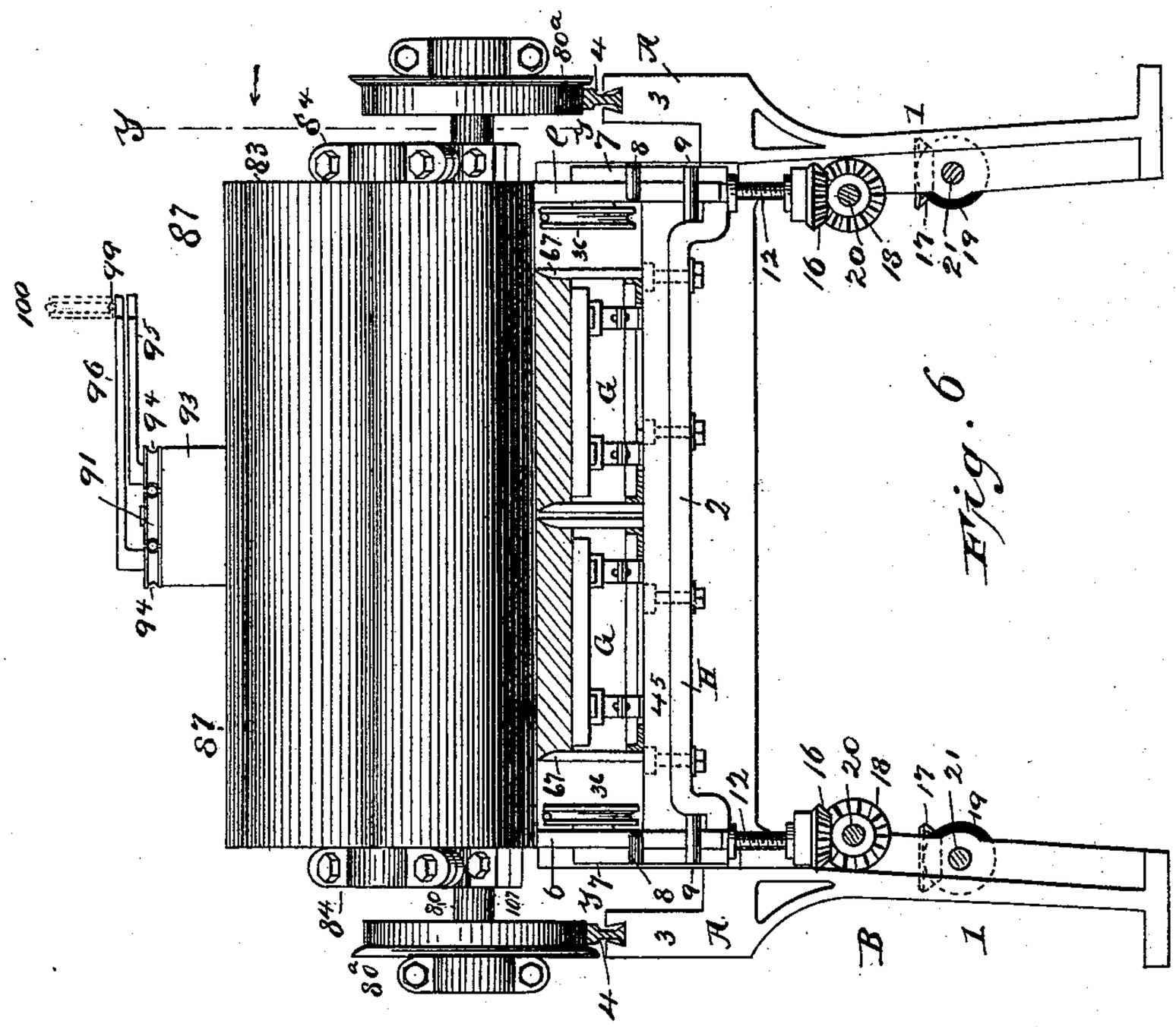

Fig. 6.

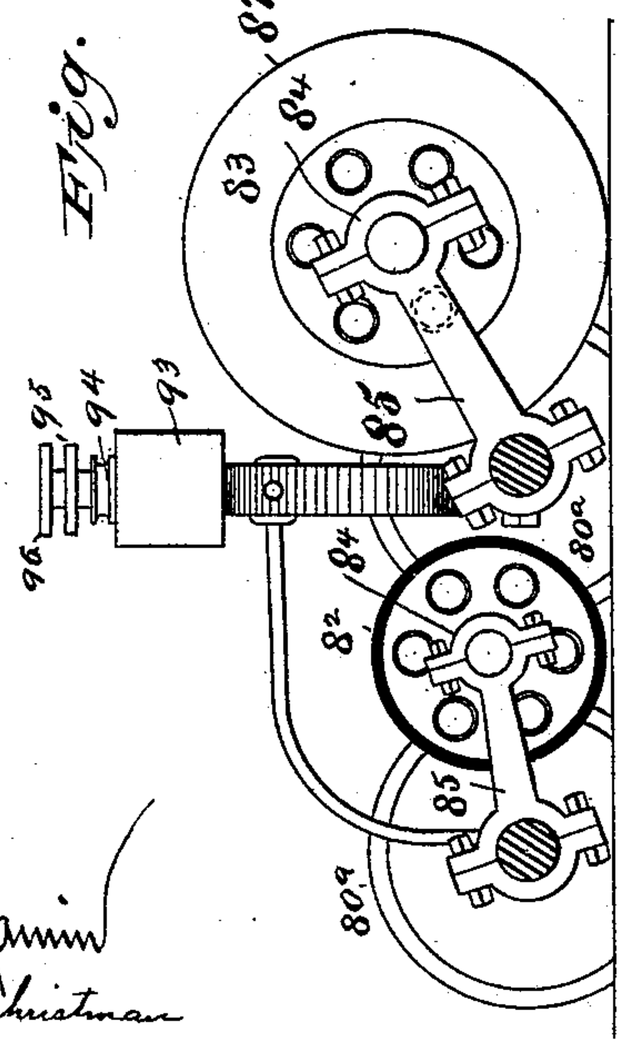

Fig. 7

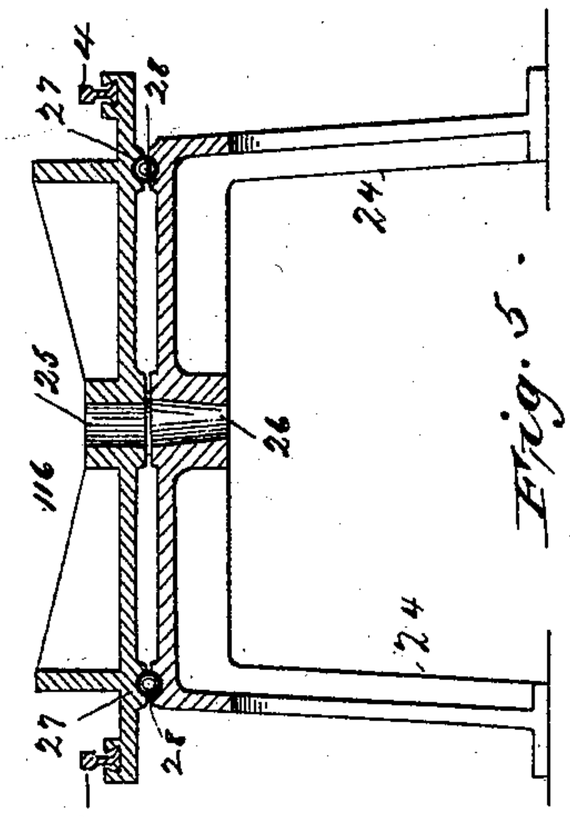

Fig. 5.

Attest
C. M. Benjamin
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Inventor:
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(No Model.) 9 Sheets—Sheet 5.

C. KAUFMAN.

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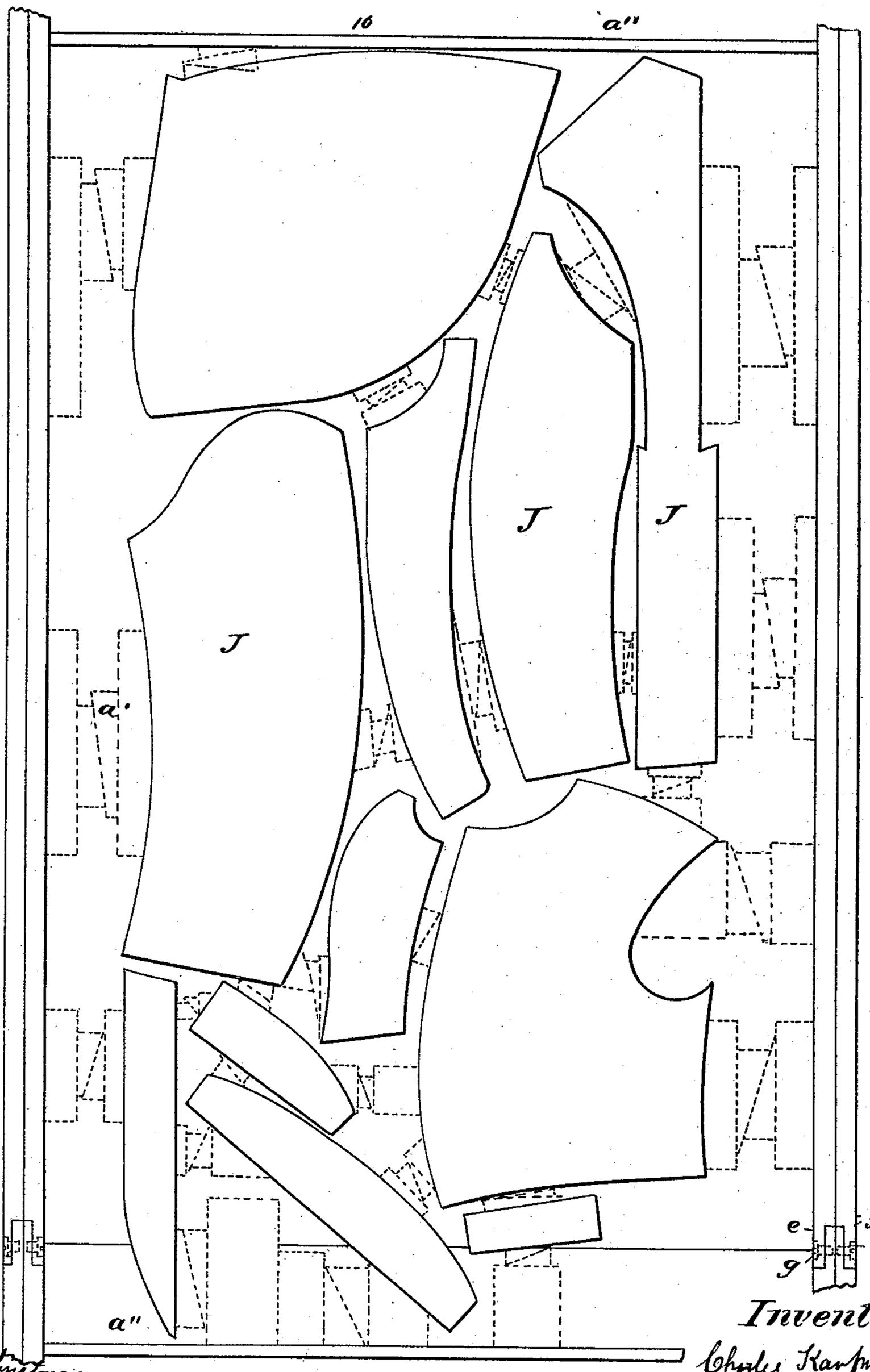

Fig. 6a.

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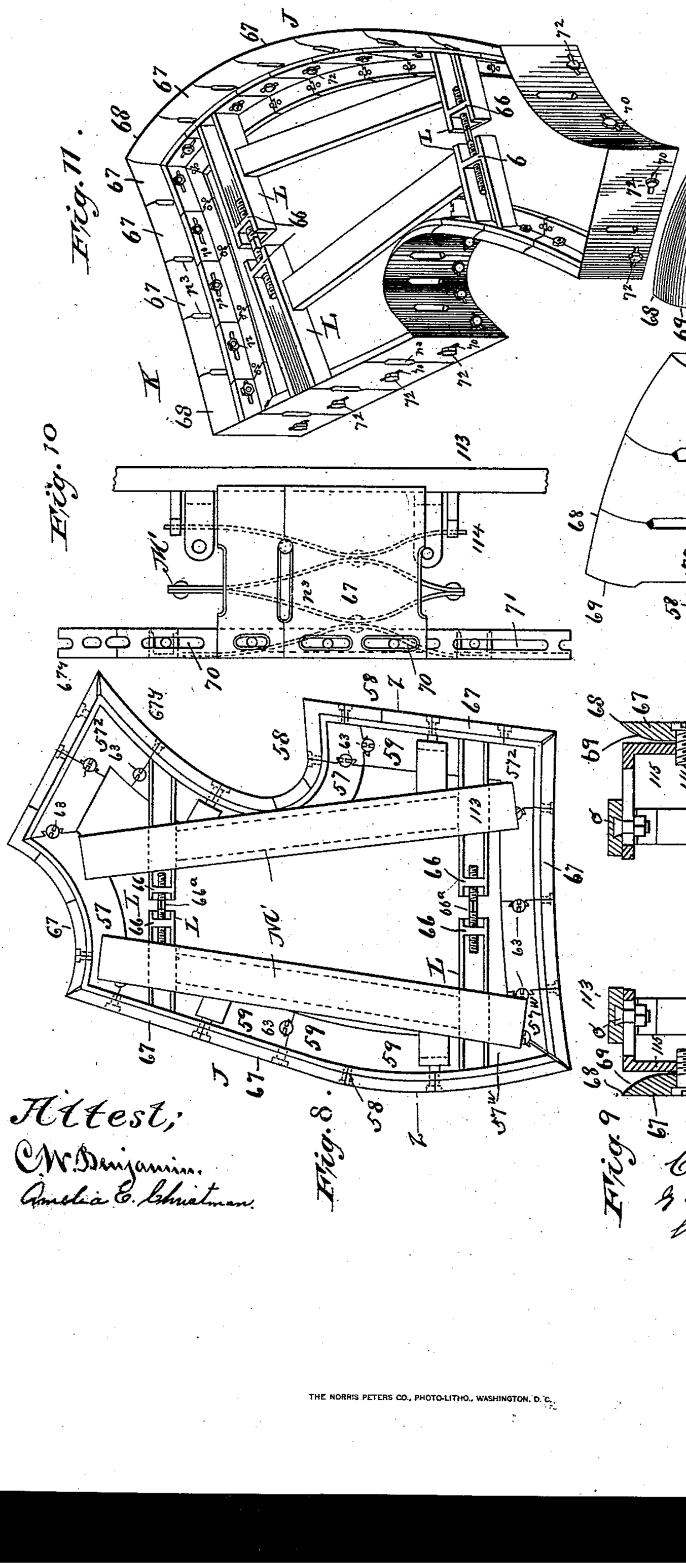

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(No Model.) 9 Sheets—Sheet 7.

C. KAUFMAN.

CLOTH CUTTING MACHINE.

No. 487,840. Patented Dec. 13, 1892.

Fig. 22.

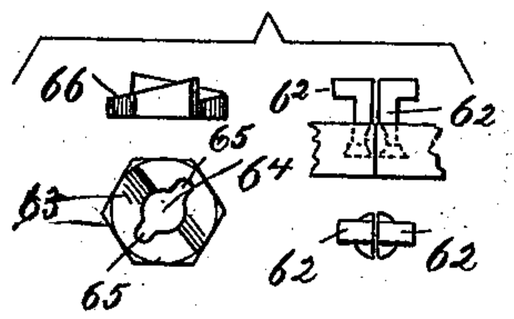

Fig. 14.

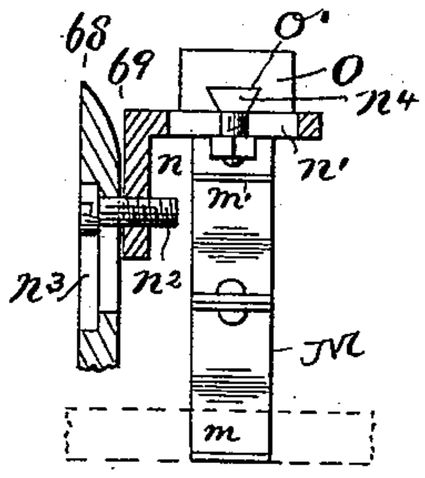

Fig. 16.

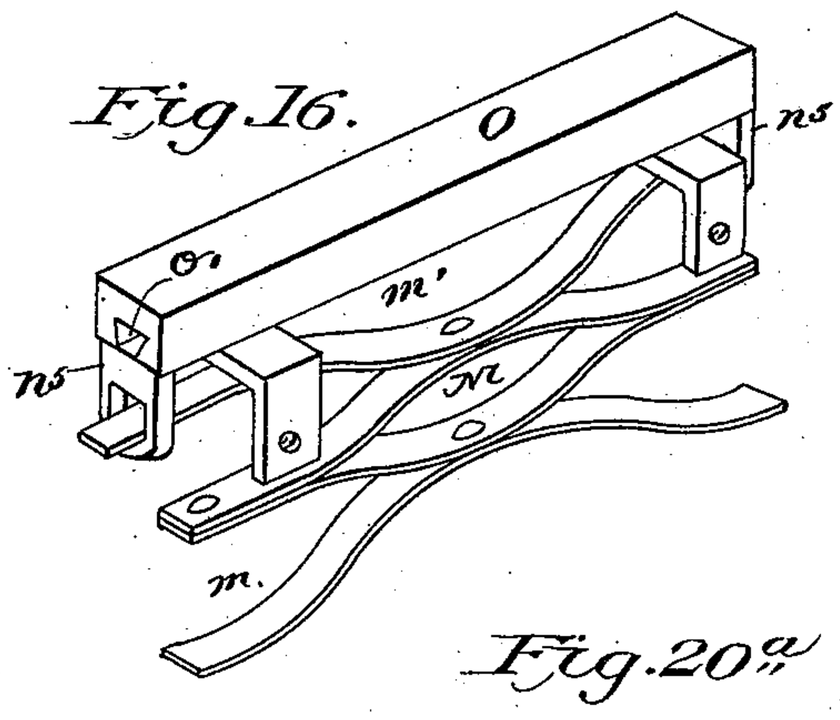

Fig. 15

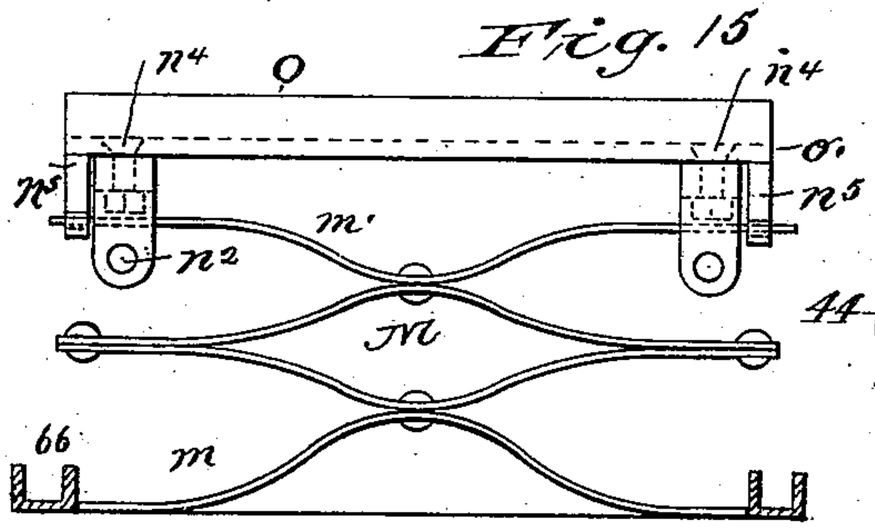

Fig. 20a

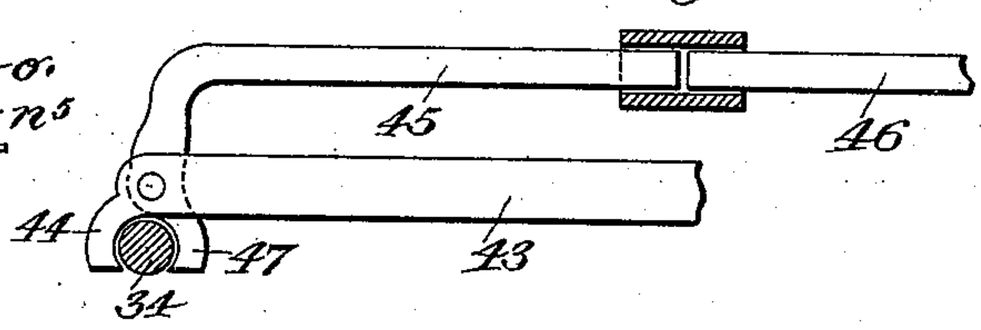

Fig. 20.

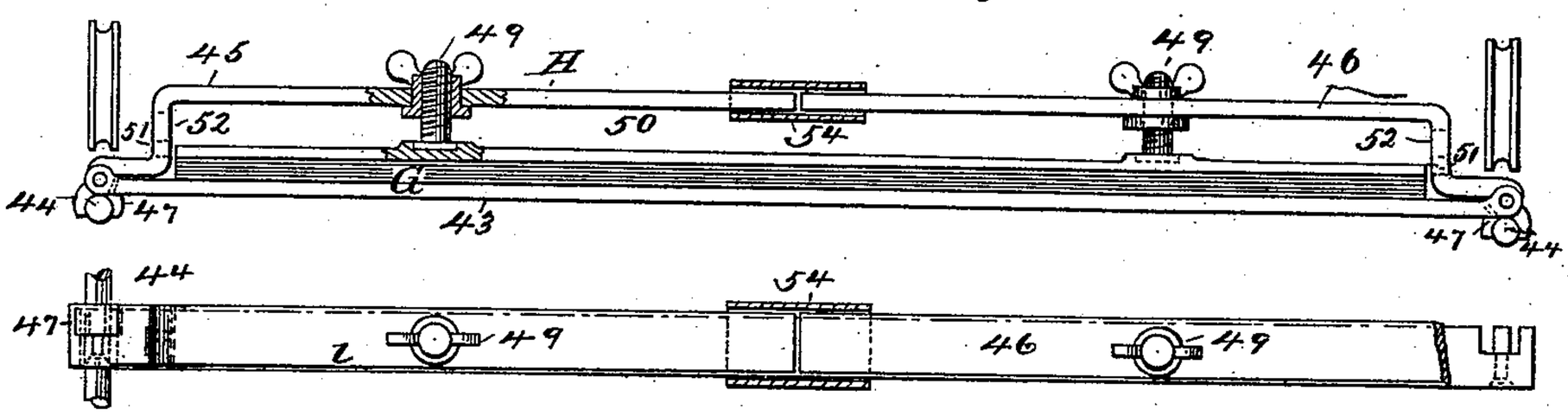

Fig. 21.

Attest;
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(No Model.) 9 Sheets—Sheet 8.

C. KAUFMAN.

CLOTH CUTTING MACHINE.

No. 487,840. Patented Dec. 13, 1892.

Fig. 17.

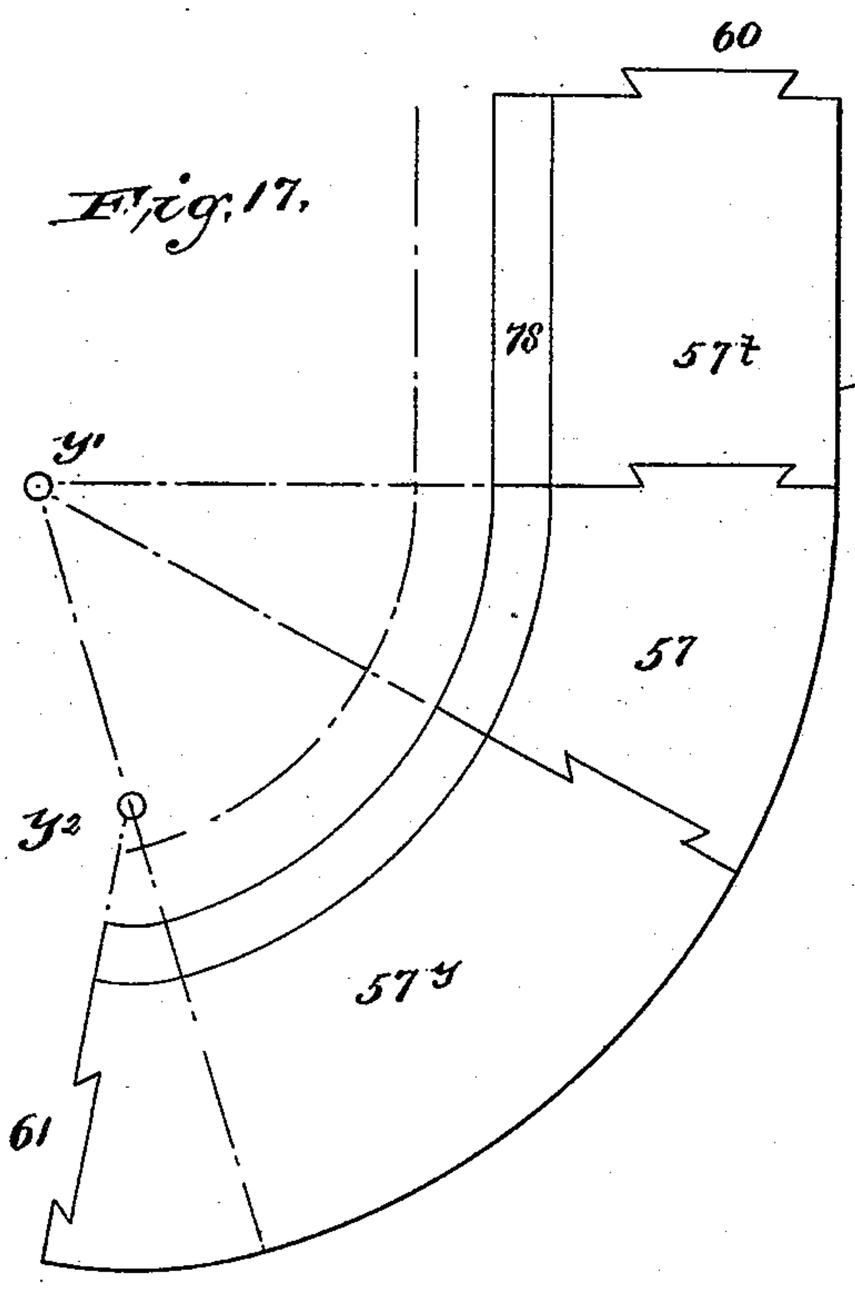


Fig. 18.

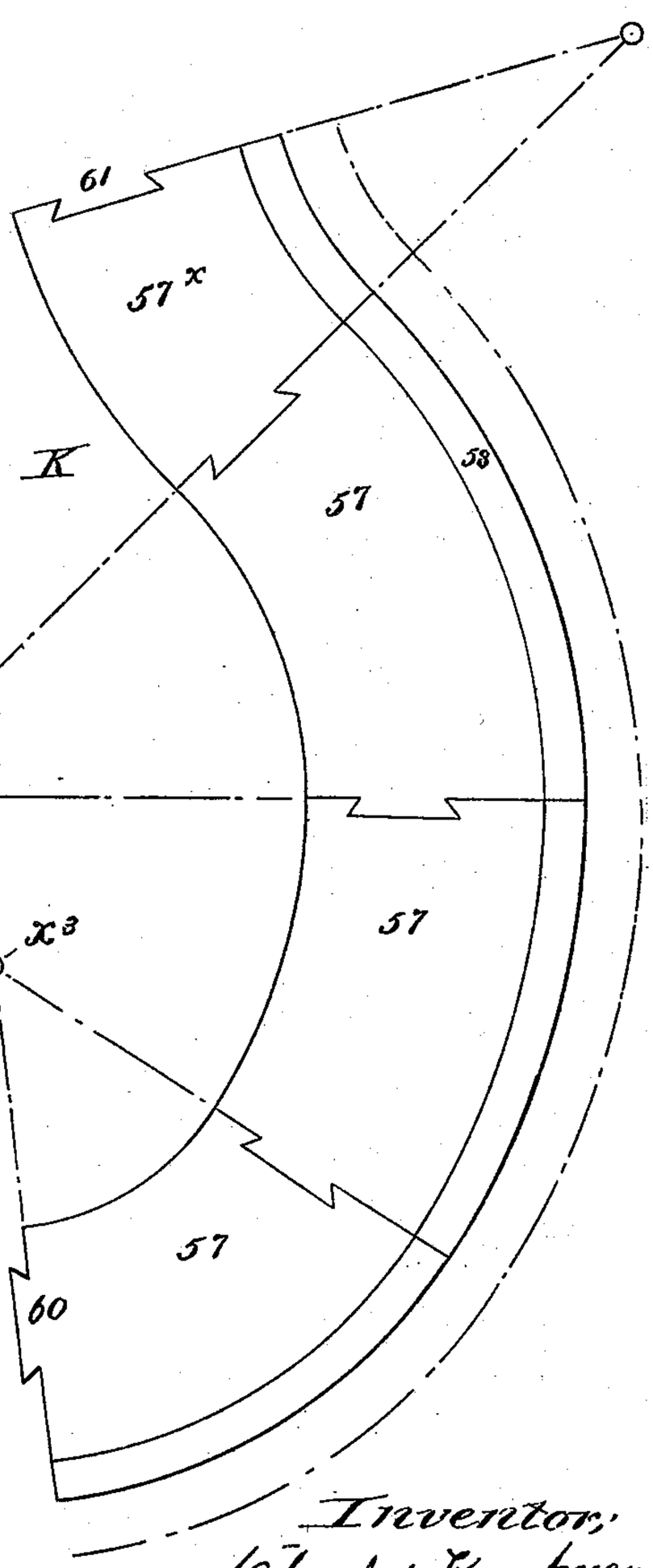
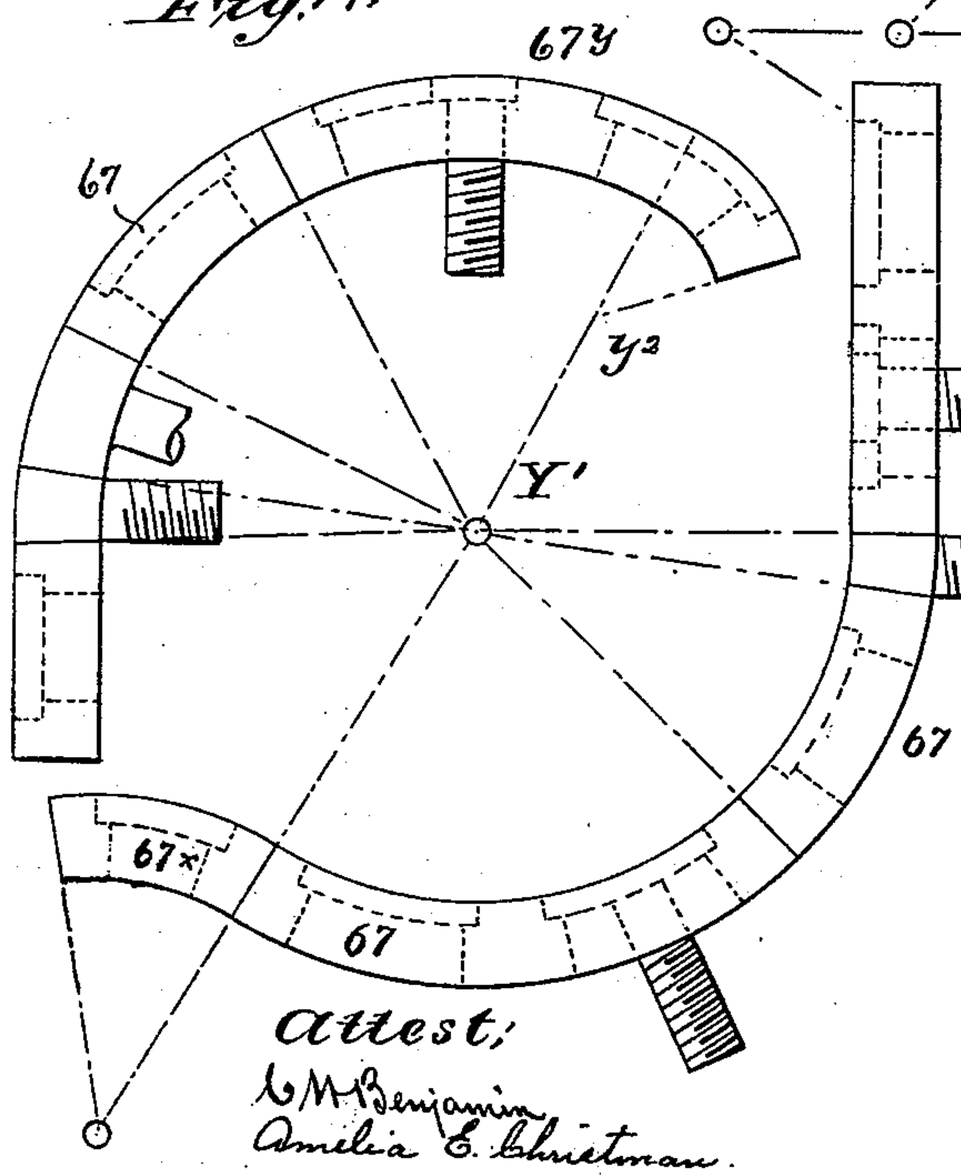


Fig. 19.



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C. KAUFMAN.

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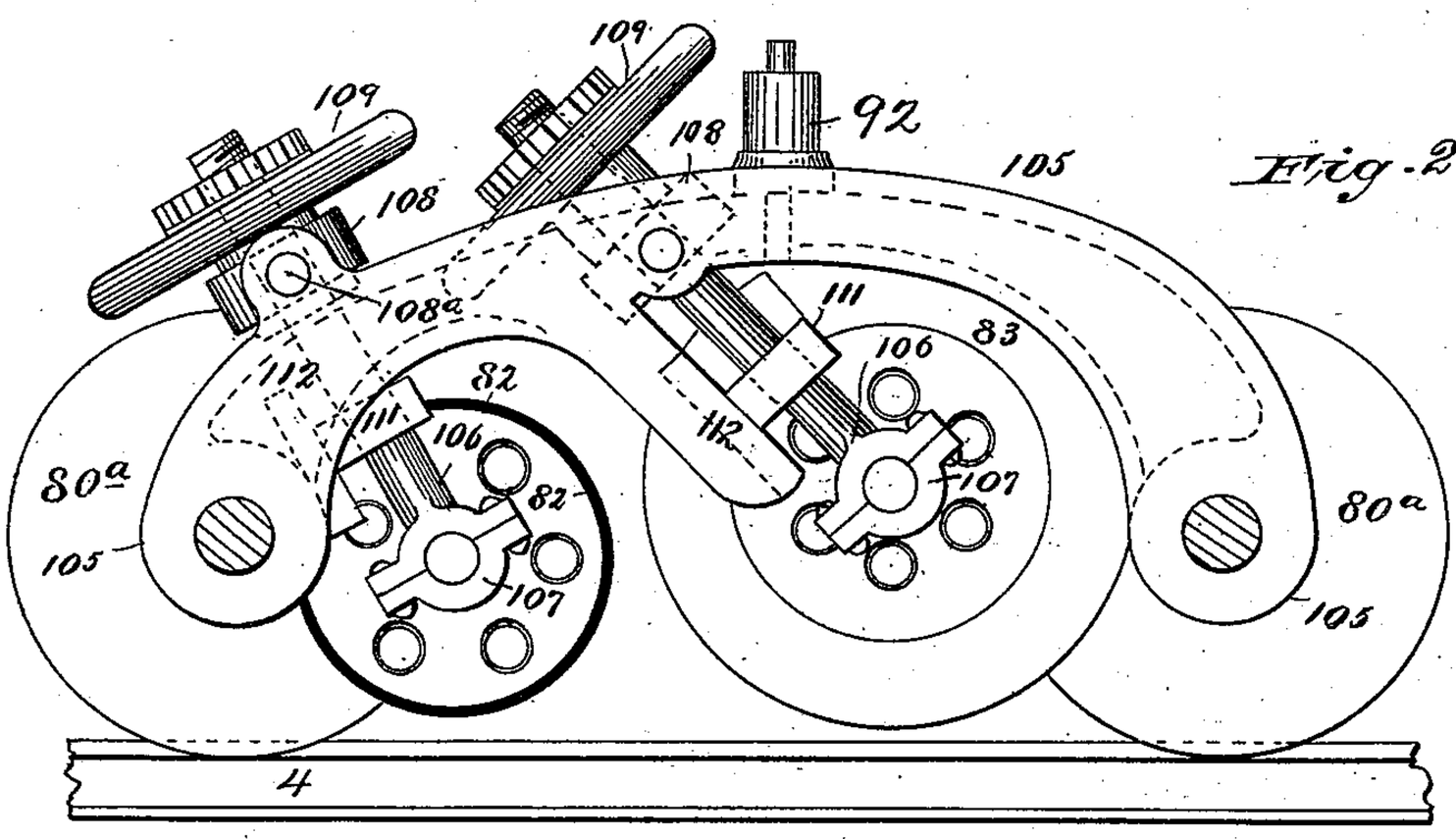

Fig. 26.

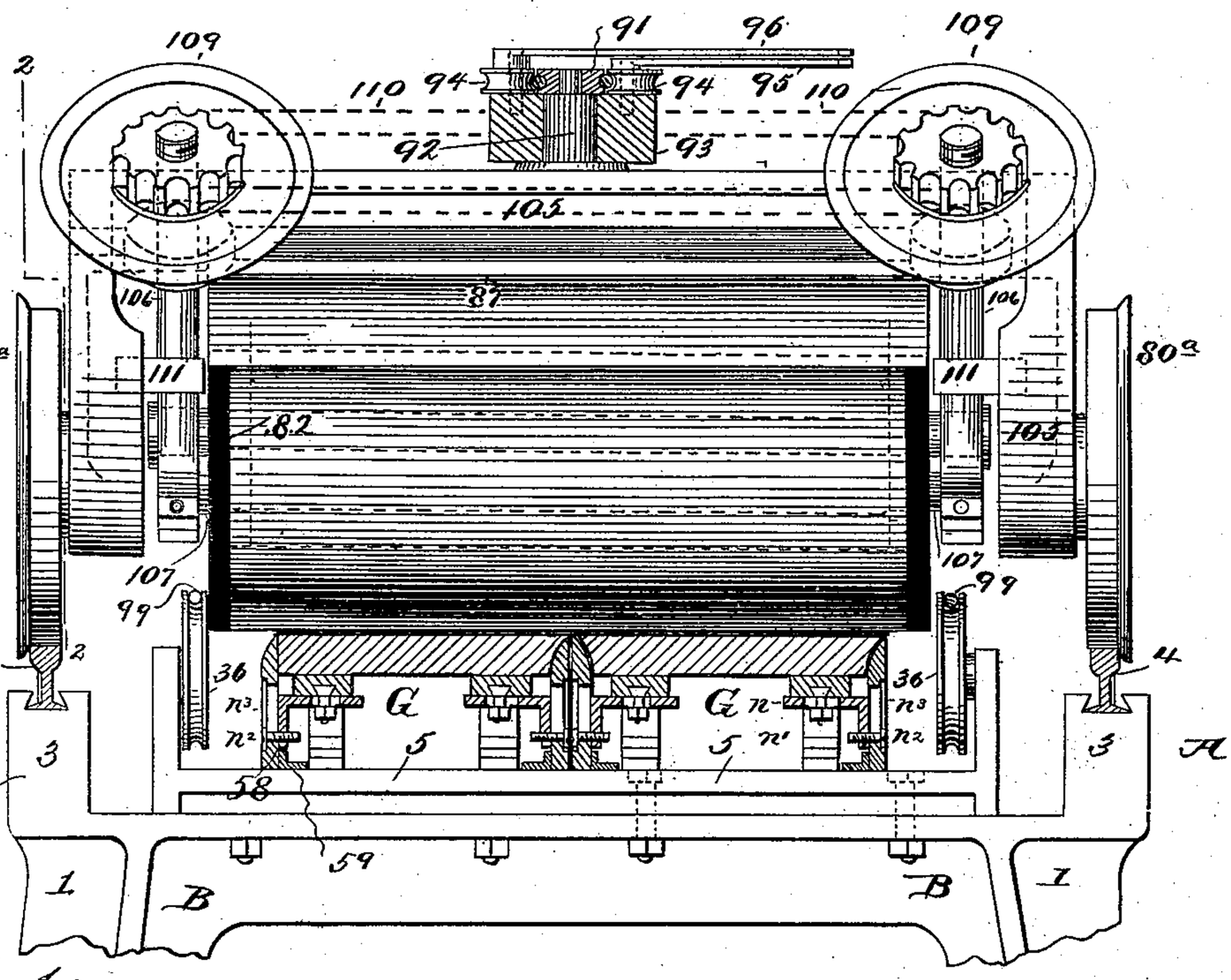

Fig. 27.

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UNITED STATES PATENT OFFICE.

CHARLES KAUFMAN, OF NEW YORK, N. Y.

CLOTH-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 487,840, dated December 13, 1892.

Application filed November 28, 1891. Serial No. 413,453. (No model.)

To all whom it may concern:

Be it known that I, CHARLES KAUFMAN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Machines for Cutting Cloth, &c., of which the following is a specification.

My invention relates to improvements in cutting-machines of that type which is adapted to the cutting of cloth and other fabrics into any desired shape, size, and pattern by pressing the cloth or other fabric on the knives of the machine. In my machine a number of knives are set side by side with the cutting-edges upward and are held in proper position by being secured to frames which have the desired shape, and said knives and frames together form the "cutting-forms."

My invention, in the first place, especially relates to the shaping and construction of the said knives so that a limited number of the knives can be used in a great (practically unlimited) number of cutting-forms.

In order that a machine of the kind referred to shall be practicable, it is necessary that it be capable of cutting any size, shape, or pattern; but heretofore all such machines, so far as I am aware, have used cutting-forms composed principally of shaped knives, and there has been no system by which the knives could be always combined into any shape or size of cutting-form. Thus there has been heretofore necessitated the use of as many distinct shaped knives as there are forms and patterns to be cut, and the expense of providing the necessary and great numbers of such knives is so great as to be impracticable; but I overcome this difficulty by forming the knives in separate pieces, and each piece is a section of a hollow cylinder, the vertical edges whereof lie in planes radiating from the longitudinal axis of the cylinder, and the top (or cutting edge) and the bottom edges of each piece lie in parallel planes, which are at right angles to the longitudinal axis of said cylinder. Of course I can also make the knives in separate pieces, each of which is a section of some other body than a hollow cylinder—as, for instance, a section of a hollow body whose cross-section is an ellipse. In this latter case the cutting-edge of the knife would be an arc of the ellipse and the vertical edges of the knife would be planes that are each normal to the ellipse at their point of intersection therewith. I also may combine straight knives with either of said kind of curved knives, the vertical edges of such straight knives being each plane surfaces at right angles to the straight cutting-edge. Evidently from the properties of curves and their radii and normals any two of such curved knives or such a curved and a straight knife can be set closely side by side and their cutting-edges will form an absolutely continuous and fair line; also, evidently a small number of such knives can be combined in a very great (practically unlimited) number of cutting-forms, each having an absolutely-continuous cutting-edge of any desired pattern, so as to cut the cloth clean and without waste. My said knives are secured on frames which have the shape of the desired pattern, and the frames may be made in separate pieces, each of which is a section of a hollow cylinder or other body, as hereinbefore described, for the knives, or the frames may be made in one solid piece of the desired shape.

In the second place, my invention relates to the roller-frame, and I employ in the same a plurality of rollers for pressing the cloth or fabric upon the knives of the cutting-forms, and also devices to prevent the heaviest roller, which begins the cut, from touching the knife-edges. The lighter roller is permitted to descend clear to the knives, since its weight is not great enough to injure the knife-edges. Moreover, I arrange each roller in the frame so that it has a capacity for vertical motion, and I employ devices similar to those first named to regulate the distance to which each of the rollers can descend toward the cutting-forms. I prefer to obtain this capacity of adjustment of the rollers by supporting them at the lower ends of rods that are pivoted on the frame, and on the rods I place nuts that regulate the distance which the rods, and of course also the rollers, can descend toward the cutting-forms. I may, however, also use side boards on the tables which support the cutting-forms, as will be hereinafter explained, and have the rollers travel on said side boards.

Then by making the side boards adjustable the distance to which the rollers can descend can also be regulated.

My invention further consists, finally, in the details of the constructions, as will be hereinafter explained.

Referring now to the drawings which accompany the specification to aid the description, Figure 1 is a side elevation of the complete machine. Fig. 2 is a side elevation, enlarged, of the middle part of the machine, showing the means for raising and lowering the side boards on which rest the rollers of the roller-frame. Fig. 3 is an enlarged side elevation of one end of the machine, showing one of the turn-tables and sets of cable-pulleys. The arrangement of the other end of the machine is similar to that shown in this figure. Fig. 4 is an end elevation of the machine, and showing the relation of the cable-pulleys to each other. Fig. 5 is a vertical section through the pivot of one turn-table and frame, showing the glass balls on which the turn-table rests. Fig. 6 is a cross-section and elevation of the machine on the line 1 1 of Fig. 2. The roller-frame is shown in elevation and as pressing the cloth on the knives of two cutting-forms. Fig. 6ª is a plan view of a table, showing the cloth-patterns after the same are cut, and the quoins (indicated by dotted lines) by which the cutting-forms are locked in place on the table. Fig. 7 is a section of the roller-frame on the line *y y* of Fig. 6, showing how the pressure-rollers are hung on the axles of the wheels. Fig. 8 is a plan view, and Fig. 9 a cross-section, of a single cutting-form complete, showing the sectional frames of the cutting-form, the sectional knives of the same, the springs for holding up the cloth, and guides for the springs. Fig. 10 is an elevation, partly broken, showing two sectional knives and several sections of the frame and indicating how the knives are secured to the frames. Fig. 11 is a perspective view of a single cutting-form. Fig. 12 is an enlarged perspective of three sectional knives and sections of frames and showing how the knives are secured on the frames. Fig. 13 is a perspective view of a single knife-section, showing the various slots. Fig. 14 is a detail of a single spring and cap-piece and knife, showing the manner of uniting the cap-pieces to the springs and of guiding the springs in the slots in the knives, which knives are not shown in this figure. Fig. 15 is a side elevation of the same parts as are shown in Fig. 14. Fig. 16 is a perspective view of the same. Figs. 17 and 18 are enlarged plan views of sections of the frames, showing how the same are formed by radii of curves. The knife-edges are indicated by dotted lines. Fig. 19 is a plan view of sections of the knives, showing how the same are formed by radii, and also showing the bolts for attaching the knives to the sections of the frames. Figs. 20 and 21 are respectively side elevation and plan of the clamp for securing the cloth to the cables by which the cloth is drawn over the cutting-forms. In Fig. 20 the cloth is indicated by heavy shading. Fig. 20ª is a broken longitudinal section and elevation of the said clamp, indicating the manner in which the jaws which grip the cable are operated by the movement of the short arms of the clamp. Fig. 22 show details of the buttons and pins by which the sections of the cutting-frame are fastened together. Figs. 23 and 24 are enlarged plan views of the eccentrics for gripping the main cable and their levers. In Fig. 23 the eccentrics grip the cable. In Fig. 24 they do not. Fig. 25 is an enlarged section of one of the nuts with its bevel-gear for raising and lowering the side boards of the main tables. Figs. 26 and 27 show the construction of the preferred form of the roller-frame. Figs. 28 and 29 show in detail a modification of the means for supporting the material operated on. The plane of Fig. 29 is perpendicular to the plane of Fig. 28.

I will now describe first the main table and its attachments and the means for propelling the materials to the cutting-forms.

My cutting-forms are secured on tables A, in the manner hereinafter explained, and said tables A consist of frames or supports B and metal top pieces 5, and said frames B are of metal and preferably cast with the legs 1 1, cross-pieces 2, and side supports 3 3, for the roller-frame truck-rails 4, all in one piece. Thus the said tables A are composed of sections, each consisting of a top 5 and as many frames B and pairs of legs as may be necessary to support the tops. Each of said sections of table is made a moderate length, as, say, about ten feet, and when I need to lengthen the tables I simply place several such sections end to end until I have made a table of the desired length. Thus I can at will produce a very long table which will support a great number of cutting-forms, and will thus permit many patterns to be cut at a single operation. My said table-tops 5 are made with true plane upper surfaces, and I may secure along each side of the tables two side boards 6 7, which are preferably made of sheet metal with true plane upper edges, which serve as guides for the roller-frame, as will be hereinafter explained. The said side boards 6 and 7 are secured to the table-frames by the bevel-headed bolts 8 and 9, which pass through vertical guide-slots 10 11 in the said side boards, so that said side boards can move up and down for the purpose of regulating the depth of the cuts in the fabrics operated on, as will be hereinafter explained. The upward and downward motion of the side boards is effected by the screws 12 and 13, which are threaded through nuts 15, that revolve in the brackets 14 on the frames of the table, and said nuts have beveled gears 16 17 on their lower ends. These said beveled gears 16 and 17 are engaged by beveled gears 18 and 19 on shafts 20 21, and on these shafts are hand-wheels 22

23. Thus by turning hand-wheel 22 the side board 6 will be raised on one side of the table and by turning wheel 23 the side board 7 on the same side of the table will be raised. There are similar sets of screws, shafts, and hand-wheels for the other side of the table, and by gages the corresponding side boards of both sides can be raised to exactly the same height.

In order to permit of the proper connections of the shafts 19 and 20 when the table is lengthened, the end of the shaft of each table is provided with a coupling, and thus when the tables are put together these couplings fit each other, so that the motion of the hand-wheels will rotate the continuous length of shafting under all the tables; also, the said side boards 6 and 7 each have rabbets *e f* in their ends, and when the tables A are lengthened, as described, the ends of the side boards of one section of the table fit the ends of the side boards of the next section of the table, and the ends are then firmly fastened by screws *g h*, as shown in Fig. 6ª.

At either end of my said table A′, when the same is completed, is set the turn-table D for the roller-frame. This said turn-table D is supported on the frame 24 and has a central orifice 25, which fits easily on the pivot 26, that is fixed in the frame 24. Said turn-table D has in its under side a circular groove 27, semi-spherical in cross-section, which groove rests on glass balls 28, that are supported in a corresponding circular groove in the frame 24, and said turn-table D also carries tracks 4 for the roller-frame. It will of course be understood that the raised end 29 of the frame 24 has a passage-way to admit the roller-frame to the turn-table.

Adjacent to one of the turn-tables D is the cloth-table E, which is somewhat lower and narrower than the turn-table D and the permanent table A, so that said cloth-table E can be slid under the turn-table, and said cloth-table E is usually just long enough to reach under the turn-table nearly to the one end of the main table A. On the top of said cloth-table E are guides 30, which are adjustable in any known manner to the width of the cloth. Said cloth-table E has pulleys 31 32 33 at each side, over which pulleys are stretched wire cables 34 for the purpose of carrying the cloth G from the rack F over the cutting-forms, as will be hereinafter explained. One branch of said cable 34 passes up from pulley 33 over pulley 35 at the end of the permanent table A, and thence is stretched parallel along over one side of the said table A, and sufficiently above the same to permit the cutting-forms to be set on said table A below the cloth as it is carried along by the cable. On the said turn-table D is a spring-actuated pulley or roll 35ª, which presses the cloth against the pulley 35 and prevents its slipping back after it has been cut. Thence said cable 34 passes over the pulley 36 and down under the pulley 37, which is driven by bevel-gears on the shaft of the belt-pulleys 33 39. One of these said pulleys 38 39 is loose and the other fixed in the ordinary manner, and power is communicated by the belt 40 from the driving-pulley 41. From the said pulley 37 the cable 34 returns to its starting-point at the cloth-table E.

37ª is a tension device, consisting of a pulley in a bearing which is set on one end of a screw, as shown, so that the pulley can tighten or slacken the cable.

It will be understood that there is a similar cable at each side of the machine, both cables being driven by pulleys 37, actuated in the manner described. Now the cloth G is wound on rollers 42 42, which revolve in bearings in the rack F. As many layers of cloth as are desired are drawn from said rollers 42 down to the guides 30 of the cloth-table E, and then the ends of the layers of cloth are clamped together in the clamp H. Said clamp H consists of a cross-bar 43, which has on its under side at each end a concave projection 44, which forms one member of a cable-grip, and at either end of said cross-bar 43 is pivoted a short arm 45 46, each of which has on its under side a concave projection 47, that forms the other member of the cable-grip. Said arms 45 46 each have set-screws 49, that enter shallow sockets in a flat bar 50, that has a tongue 51 at each end which enters a slot 52 52 in each of the arms 45 46. Thus the bar 50 is adjustable in the slots 52 52, so that different thicknesses of cloth can be received and held in the clamp. Now said short arms 45 46 are lifted, the bar 50 being also raised, and the ends of the cloth are placed over the cross-bar 43 and under the bar 50, and the whole is then placed on the cables 34, so that the said cables 34 will be between the grip parts 44 and 47. Then the flat bar 50 is lowered upon the cloth and the short arms 45 46 are brought down horizontal, whereby the aforesaid grip parts 44 47 close upon the cable in the manner of shears, firmly gripping the cable 34. The ends of the arms 45 46 are held down by the ring 54, which ring 54, when the arms 45 46 are open, is slipped back on one of them, and when the said arms 45 46 are closed is slid over the ends of both. Finally the set-screws 49 are screwed down, clamping the cloth firmly between the bar 50 and the cross-bar 43. Now the cloth G is firmly attached to the cables 34 and will evidently be drawn along over the table A when the cables are started. At the other end of the said table A and near the pulley 36 I pivot a lever 55, which carries a belt-shifting finger 56, and said lever 55 is so placed as to be struck by the cloth-clamp H H, so that the belt 40 will be shifted to the loose pulley and the cable 34 will stop automatically. Then the clamp H will be taken off the cloth and the roller-frame will pass over the cloth, as will be hereinafter described.

The cutting-forms.—Now, as before said, the cloth G is drawn over the cutting-forms J, which are placed on the main table A immediately below the cloth. Said cutting-forms

J are constructed as follows: First are the frames K. Evidently the shape of the said cutting-forms must be of great variety, so that it is generally not advisable to have the frames in one piece; but said frames are preferably built up of segments, and those segments are capable of indefinite combinations. I effect these results by the following construction: The frames K are each preferably composed of many parts 57 57, and each of those parts 57 is a section of a hollow cylinder, and the sides of each part are true planes radiating from the center of the cylinder. Thus in Figs. 17 and 18 each of the parts 57 of the frame K is a section of a hollow cylinder, whose center is at y' y^2 and x' x^2 x^3, and the sides of each of said sections are planes radiating from said centers. These said sections 57 may all be of different widths, some being narrow, others wide, and also they may be of different radial lengths, some sections being surfaces of small, others surfaces of large, radii; also, the outer surfaces of said sections may be concave as well as convex. Thus the section $57^{\times}$ in Fig. 18 is concave; but in all these cases the sides of the sections are radial planes. Moreover, I may form a single section with different curves, and in that case one side of the section will be a plane radial to the curve on that side and the other side of the section will be a plane radial to the curve on that side. This is made clear by 57^{y} in Fig. 17. Moreover, as was hereinbefore explained, I may form the pieces 57 as sections of other hollow bodies than cylinders, and their curves will be other than arcs of cylinders, as ellipses of hyperbolas or parabolas; but in that case the sides of the sections will be normals to the curved surface. Now from the known properties of curves and normals evidently each section, as above described, will always fit tightly side by side, and the curve of the outer surface will always be a fair continuous curve, no matter how suddenly the curvature may rise; also, I can use along with the curved sections other sections with flat surfaces and sides perpendicular to the flat surface, and evidently, mathematically considered, such flat pieces are sections of cylinders of infinite radius. Now I prefer to make each of said sections 57 as an angle-iron, with the vertical part 58 and the horizontal flange 59. The said vertical parts 58 are shaped as sections of curved bodies, as hereinbefore described, and the flanges 59 will be sections of the same plane curves. For corners I either form an angle-segment of a single piece, as 57^{z} in Fig. 8, and then shape each side of such angle-section as a normal plane of its respective curve, or I make miter-pieces, as 57^{w}, the bevel of each said miter-pieces being such that the miter-edges will not fit, but will leave an angular open space between them. Thus such miter-pieces can be adapted to various angles, according as the space between the miters is more or less open. Now said sections are united in the following manner: Each section has on one side a tongue 60 and on the other side a dovetail groove 61, and thus the tongue of one section being slid down into the groove of the other the two will be united. The outer face of the tongues and the inner face of the grooves must be parallel to the sides of their respective sections, as shown in the drawings. Also on the top face and at each side of the sections is fixed a pin 62, bent horizontally at its top, as shown. Over these pins 62 is put a button 63, which has a central orifice 64 just large enough to inclose the pins 62, but not large enough to slip over the bent ends, and at opposite sides of the orifice 64 is the slot 65. The top of the button is also formed with inclined planes 66. Now slipping the slot 65 over the pins 62 and giving the button a quarter-turn the sections will be firmly bound together. Now the sections 57 having been put together, as described, into the proper form, as Figs. 8 and 11, braces L are used to keep the sections in shape. These braces L are each made in two **U**-bars, and the inner ends of each bar are closed by a flange 66, and the flange of one rod has a right-hand and the other rod a left-hand female-threaded hole, in which is threaded a right and left handed bolt B. Turning the bolt by a wrench the braces are lengthened, so as to press outward the frame to its proper shape.

Fig. 8 shows only cross-braces; but evidently there may be similar braces extending from the cross-braces shown to the ends of the frame, so as to stretch out the frames lengthwise, if necessary.

Now the frames having been shaped as described, the knives are fastened to the frames in the following manner: Each knife 67 is formed of sheet metal and as a section of a hollow cylinder, and the sides of each knife are the radial planes of that cylinder. In like manner as described for the frames, the knives are either wide or narrow sections, and they are formed of cylinders of varying radii and are both convex and concave, and of course there may be flat knife-sections with parallel sides. Thus, as was explained in connection with the frames, knives of varying curvature will fit closely side by side and will form fair curves, notwithstanding the varying curvature, also, I can form one knife-section of two curves, and then each side of the section will be a plane radial to the curvature of that side. Thus with a limited number of knives a very great number of cutting-forms can be constructed, and this formation of the knives as sections of hollow cylinders and with radial sides is of great practical utility and an essential part of my invention. Indeed, I could form my frames as single-shaped frames and yet use with them my sectional knives, and in some cases I will do this; but generally I prefer to make both my frames and knives in sections. Generally the inner surface of the knives will be formed of the same radius as the other surface of the frame, and the inner surface of the knives will also be the same width

as the frames, so that some one knife will always fit nicely on the frames. The knives are each sufficiently long to stand some distance above the frames, and their cutting-edges 68, which are formed by bevels 69, will be truly horizontal and parallel with the top of the table A. In some knives the said bevel 69 will be outward, in others inward, and the knives which are at the edge of the fabric to be cut will have this said inward bevel, since this form will prevent the edge of the fabric from turning down inside the edges of the knives.

In each of the knife-sections except the narrowest size, and near the lower edge thereof, are horizontal slots 70, and there are corresponding horizontal slots 71 in the vertical part of the frames 57. A bolt is put through these slots, and a nut 73, turned up on its inner end, secures the knife to the frames. By reason of the slots 71 and 72 a knife can be moved sidewise on the frame to its proper position. The narrow knife-sections have the bolt 72 secured to them, and this bolt is fastened to the frames, as just described; also, since the slots 71 and 72 are made a little wider than the body of the bolt, there is permitted a slight upward and downward movement of the knives, so that their cutting-edges can be brought into exactly the same horizontal plane. Thus when the frames and knives are united there will be produced cutting-forms J, having knife-edges in the exact shape of the desired pattern.

To hold the fabrics clear of the knife-edges while they are being drawn along by the cable 34, as hereinbefore described, I use what I term "leaved springs" M, Figs. 14, 15, and 16, which are set upright and lengthwise of the cutting-forms between the braces L, Fig. 7. The ends of the uppermost leaf M′ slide through slots in lugs n^5, fixed on the under side of cap-pieces o, and said cap-pieces o have a dovetailed groove o' on the under side which slides over beveled-headed bolts n^4, which bolts n^4 pass through slots n' in angle-guides n, and these guides n have bolts n^2, which pass through vertical slots n^3 in the knives 67. Said slots n^3 are formed by the meeting of two half-slots, one in each of two adjoining knife-sections, as shown in Figs. 10 and 12. Thus the cap-pieces o are adjustable both lengthwise and sidewise, and by the guides n hold the springs M upright and secure to said springs a true rectilinear motion. The tension of said springs M is such as to hold the cap-pieces o, on which the cloth G rests, somewhat above the knife-edges 68, even when weighted by the cloth; but also such as to yield when the roller-frame passes over the cap-pieces.

The leaved form of springs is very important, since it permits of the ends of the spring successively depressing under the frame-rollers.

Now the cutting-forms J with their knives, frames, braces, and springs having been constructed, as described, each such cutting-form is placed at any desired part of the table A, and there secured by quoins and wedges a', (indicated by dotted lines in Fig. 6ª,) in a manner similar to that in which printers lock their forms, and the better to effect this I place across the ends of the tables bars a'', which are bolted to the table or otherwise fixed in place, and I use these bars a'' to assist in wedging the cutting-forms, as shown in Fig. 6ª.

It will be evident from the foregoing description that my cutting-forms J, when once put together, are strong constructions which may be moved about as desired, and can be removed from the tables A and stored for future use, and this is a practically-important result of my method of construction.

The roller-frame.—The cloth is cut by being pressed on the cutting-forms J, and to effect this I prefer to use a roller-frame N, which traverses over the cutting-forms, though evidently a screw-press or other means to exert downward pressure might be employed. My said roller-frame N consists of side bars 80, connected in any suitable manner by cross-ties, and has flanged wheels 80ª, traveling on the track 4 and which turn on axles fixed in the said side bars, and such axles may of course serve as the cross-ties of the frame. Said frame N carries pressure-rollers 82 83, which are hollow metal cylinders having holes in their heads, as shown, for the introduction of bars, so as to vary the weight of the said rollers at will. Each of said rollers 82 83 is pivoted in a bushing 84 on the end of inclined rods 85, one bushing and rod at each end of each roller, and the lower ends of said rods 85 are pivoted on the shafts of the wheels 80ª. Thus the rollers 82 83 are vertically adjustable through the raising and lowering of the side boards 6 and 7, so as to control the depth of the cut, as will be hereinafter described, and also that if the rollers meet any obstruction they can rise and pass over it. The ends of the front and heavier roller 82 travel on the outer side board 7, and said roller has a circumferential rabbet around each end, in which is a ring of vulcanized fiber to diminish the wear of the side boards 7. The larger rear roller 83 has a covering of vulcanized fiber or other suitable material 87, and this roller travels on the inner side board 6. The purpose of having two rollers 82 83 is that the heavier roller 82 may begin the cut, but may not descend to the knives 67, but that there shall always be some thickness of cloth between the knives and said roller, and that the lighter roller 83, which is covered with vulcanized fiber or other suitable material, may finish the cut and bear on the knives. Thus the great weight of the first roller will not injure the knives, and I may use more than two rollers, and in that case the several heavier rollers will successively deepen the cut; but none of them will descend to the knives, and only the lightest roller will finish the cut and bear on the knives. Evidently the depth of the cut which the several rollers 82 83 will make

is controlled by the side boards 6 and 7, which are set for any desired depth of cut by the aforesaid screws 12 and 13. The said roller-frame N is propelled by the endless cable O. Said cable O is driven by pulley 87, passes under two inclined pulleys 88, side by side, then along above the table A and around two inclined pulleys 89 at the other end of the machine and up around a pulley 90. One branch of said cable O passes by each side of a pulley 91, which turns on a pin 92, that is fixed in the roller-frame N. On said pin 92 turns a collar 93, on which is pivoted two eccentric cams 94 94, so placed that one cam can grip one branch of the cable O, and the other cam the other branch of said cable against the pulley 91. Each of said eccentrics 94 has an arm 95 96, with eyes 97 in their free ends, in which eyes may be hooked hooks 98, that are on a small endless cable 99, stretched along parallel to the cable O and over pulleys 100 at each end of the machine. On said cable 99 are fixed at proper positions lugs 101 102, which will strike against arms 104 104, fixed at either end of the machine, when the cable 99 moves sufficiently far in that direction. Now the eccentrics 94 are so set that when the levers 95 96 are in the middle position of Fig. 24 the eccentrics do not grip the cable O against the pulley 91 and the cable will move along without moving the roller from N; but when the lever-arms 95 or 96 are either inclined, as in Fig. 23, then the eccentric of that arm will grip the cable O against the pulley 91, so that the said frame N will be moved along in the direction of one or the other branches of the cable O which is so gripped. As the roller-frame N thus moves along it moves the small cable 99 until the lug 101 or 102 strikes the corresponding arm 103 or 104. Then the cable 99 stops; but the frame N still being moved by the cable O of course the small cable 99 moves that one of the lever-arms 95 or 96 which is hooked to the cable 99 to the middle position, so as to free the eccentric 94 from the cable O and stop the frame N. The position of said lugs 101 and 102 is so adjusted that the frame N will stop when it is properly on one of the turn-tables D, and not before; also, in case of accident the operator can pull the cable 99 and so stop the said frame N at any point.

Now the whole operates as follows: As many layers of cloth as are necessary are drawn from the rollers 42 in rack F, placed in the clamp H, and drawn by the cable 34 over the cutting-forms J, in the manner described. The cloth will be as yet held above and out of contact with the knives 67 by the springs M, and now the clamp H, having been taken off the cloth, the roller-frame will be started by the operator pulling the cable 99 and levers 95 96, in the manner described. As the roller-frame N passes along, the front heavier roller 82 will press the cloth down on the knives 67, the springs M yielding sufficiently therefor, and the knives 67 will cut partly, but not entirely, through the layers of cloth, the depth of the cut being regulated before hand by the position of the side boards 7. As the lighter rear roller 83 passes over the cloth G, it also presses the cloth down on the knives 67 and completes the cut, the side boards 6 being set to permit said roller 83 to descend clear to the knives 67, and said side boards 6 may evidently be so set as to let the roller 83 barely touch the knives. Thus the wear of the knife-edges is reduced to a minimum. The patterns which are thus cut by the rollers rest on the springs M, inside the cutting-frame J, and as the roller-frame N passes by the said springs M lift up the patterns, which are then removed by an attendant. At the end of its travel the roller-frame N passes onto the turn-table D and stops automatically, as described. Then the operator revolves the turn-table and reverses the roller-frame N, the collar 93 permitting this to be done. The clamp H is now again set on the cloth-cable 34 and filled with layers, as before. The cable 34 is started, the cloth drawn over the main table A, the clamp H removed, all as before described, and the roller-frame N is sent back to its starting-point over the cutting-frame J, again stopping on the other turn-table D, and thus the operation is repeated as often as desired.

In Figs. 26 and 27 I show my preferred form of roller-frame. In this form of roller-frame the side bars 105 are arched and support inclined rods 106, which have on their lower ends bushings 107, in which are pivoted the axles of the pressure-rollers 82 and 83. The construction of said rollers is similar to that hereinbefore described. There is one such inclined rods 106 at each end of each roller 82 and 83, and at their upper part said rods 106 pass with easy fit through swivel-blocks 108, which are fixed on shafts 108^a, that turn in bearings in the frame 105. The upper extremities of said rods 106 have screw-threads on which are nuts with hand-wheels 109, by turning which the rods 106 are raised or lowered, and the said nuts are formed as sprocket-wheels, which have chains extending around the nuts of the rod 106 at the other end of the same roller. Thus by turning either hand-wheel 109 the rods at both ends of the same roller are raised or lowered simultaneously. Said rods 106 106 each have a collar 111 near their lower ends, with rectangular faces, which collar slides on a guide 112, that is secured to the frame 105. Said roller-frame N is impelled by a cable O in the same manner as hereinbefore described, and when used the side boards 6 or 7 on the table A will be omitted, for the distance to which the rollers 82 and 83 can descend is now controlled by the rods 106, which are set at the proper position by the hand-wheels and nuts 109. The table A will then have a flange along the sides for the wedging of the quoins, as described.

In Figs. 28 and 29 I show a platform 113, resting on springs M′. Said platform 113 has

lugs 114, in which slides the upper leaf of the said spring M′, and the said platform 113 has angle-guides 115, with bolts which play in the guide-slots n^3 of the knives 67, as hereinbefore described.

Now, having described my improvement, I claim as my invention—

1. In cutting-machines, a knife formed as a section of a hollow cylinder, the vertical edges of which section lie in planes radiating from the longitudinal axis of said cylinder, and the top (or cutting) and the bottom edges of which section lie each in parallel planes that are at right angles to the longitudinal axis of said cylinder.

2. In cutting-machines, frames for cutting forms, consisting of curved and straight sections, as described, pins with bent heads set at the meeting faces of adjoining sections, and slotted and beveled buttons adapted to fit over and lock adjacent pins.

3. The combination, in cutting-machines, of knives, as described, and frames to support the knives, said frames being each composed of a plurality of pieces and certain of the pieces being sections of hollow cylinders and having vertical edges which are plane surfaces radiating from the longitudinal axis of said cylinder and having bottom edges that are plane surfaces at right angles to the longitudinal axis of said cylinder, long horizontal slots in said pieces, and bolts in said knives, adapted to pass through said slots and fix the knives at variable positions on said frames.

4. In cutting-machines and in combination with sectional cutting-forms, extension-braces consisting of a plurality of U-bars arranged end to end and each bar having the inner end closed by a flange 66, and right and left hand screws threading through the flanges of adjacent U-bars.

5. In cutting-machines, the combination, with cutting-forms, of roller-frames adapted to reciprocate over the cutting-forms and press fabrics thereon, and said roller-frames carrying pressure-rollers rotatably suspended on the lower ends of rods which are pivoted on the frame, and devices to limit the descent of said rollers toward said cutting-forms.

6. In cutting-machines, the combination of roller-frames adapted to traverse over cutting-forms, an endless traveling cable to reciprocate said roller-frames, eccentrics on said roller-frames to grip said cables, a second cable to engage said eccentrics, lugs on said second cable, and stops to engage said lugs, so as to stop said roller-frame.

7. In cutting-machines, the combination of a roller-frame, a main traveling cable to impel said roller-frame, a rotary collar on said roller-frame, eccentrics mounted on said collar and adapted to grip said cable, and a second cable adapted to connect with said eccentrics and release the same from said main cable or cause the same to grip said main cable.

8. In cutting-machines and in combination with a cloth-conveying cable, a cloth-clamp having a long bar curved at each end and shorter bars pivoted at each end of said longer bar and also having oppositely-curved ends which form with the curved ends of the said long bar a grip for said cable, and a swing adapted to cover the ends of said shorter bars and hold the same down on the long bar.

9. In cutting-machines and in combination with a cloth-conveying cable, a cloth-clamp having a cross-bar, arms pivoted on said cross-bar, and said cross-bar and said arms having oppositely-curved ends, which together form a grip for said cable, a pressure-bar parallel to said cross-bar and adjustable in slots in said arms, and screws in said arms for pressing said bar on the cloth.

10. In cutting-machines and in combination with cutting-forms, leaved springs independent of the support for said cutting-forms and adapted to be set in various positions within said cutting-forms, projections on said springs, and vertical guide-slots in said cutting-forms to guide said projections.

11. In cutting-machines and in combination with cutting-forms, main tables adapted to support the same, roller-frames, rails for said roller-frames on said main tables, and turn-tables having corresponding rails for said roller-frames and adapted to rotate by means of axial pivots, circumferential grooves in both said turn-tables and the supports thereof, and balls in said grooves.

12. In cutting-machines, the combination of a cloth-conveying cable, a cloth-clamp adapted to grip said cable between the curved ends, respectively, of a fixed cross-bar and of short arms pivoted thereon, and a belt-shipper adjacent to said cable and adapted to be engaged by said clamp for the purpose of arresting said cable.

13. In cutting-machines, a roller-frame for pressing fabrics on cutting-forms and having a plurality of pressure-rollers rotatably supported on the lower ends of rods which are pivoted in the frame, threads on said rods, and nuts to limit the motion of said rods through the pivotal supports thereof.

14. The combination, in cutting-machines, of cutting-forms, leaved springs independent of the support of said cutting-forms and adapted to be set at different positions within said forms, slotted cap-pieces adapted to slide lengthwise over said springs and carrying guides which move vertically in guide-slots in the cutting-forms.

Signed at New York, in the county of New York and State of New York, this 19th day of November, A. D. 1891.

CHARLES KAUFMAN.

Witnesses:
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