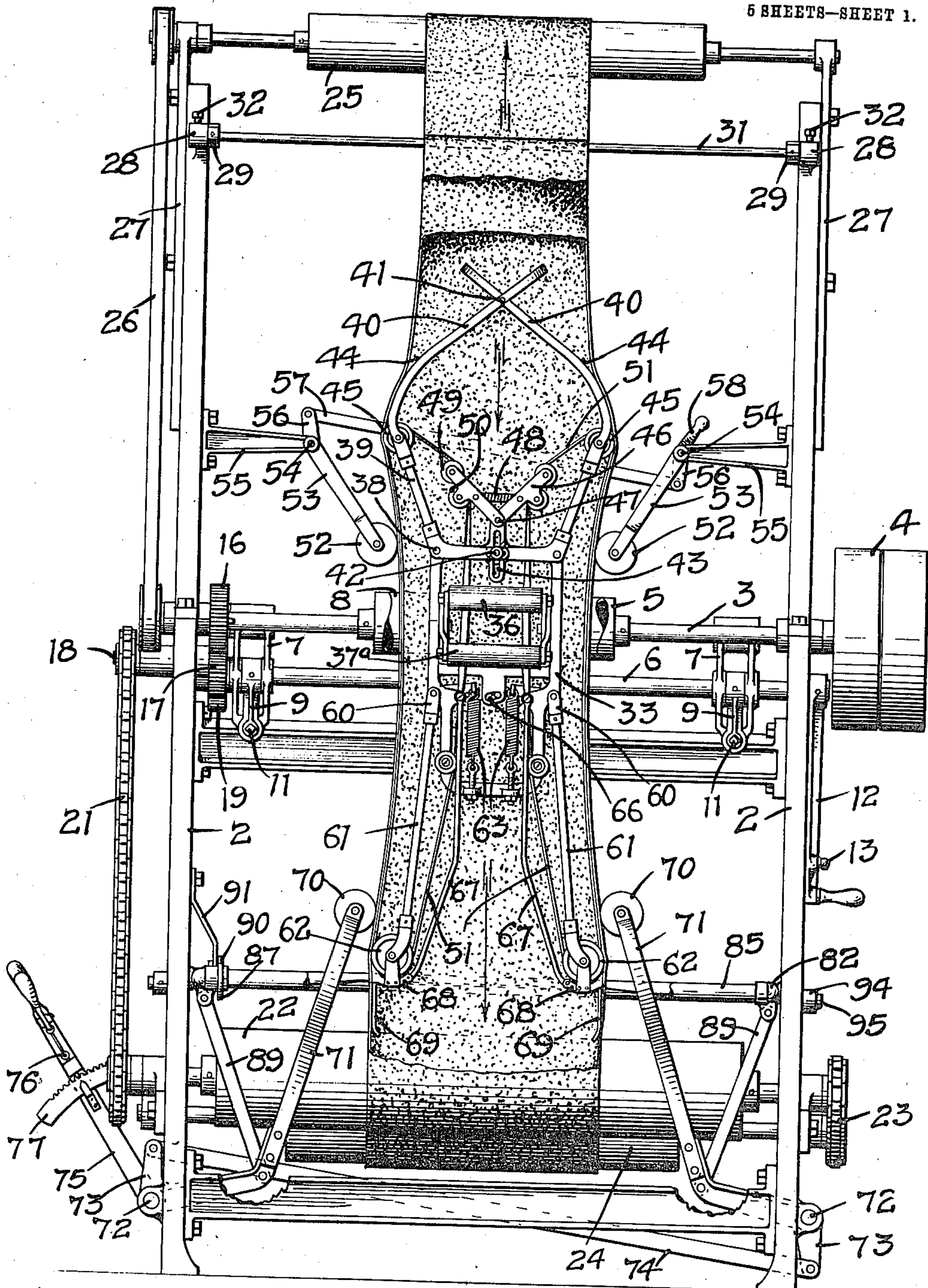


964,088.

F. CHATFIELD.  
FABRIC STRETCHING MACHINE.  
APPLICATION FILED DEC. 18, 1909.

Patented July 12, 1910.

5 SHEETS—SHEET 1.



WITNESSES  
*M. Wabstrom*  
*L. C. Brown*

Fig. 1.

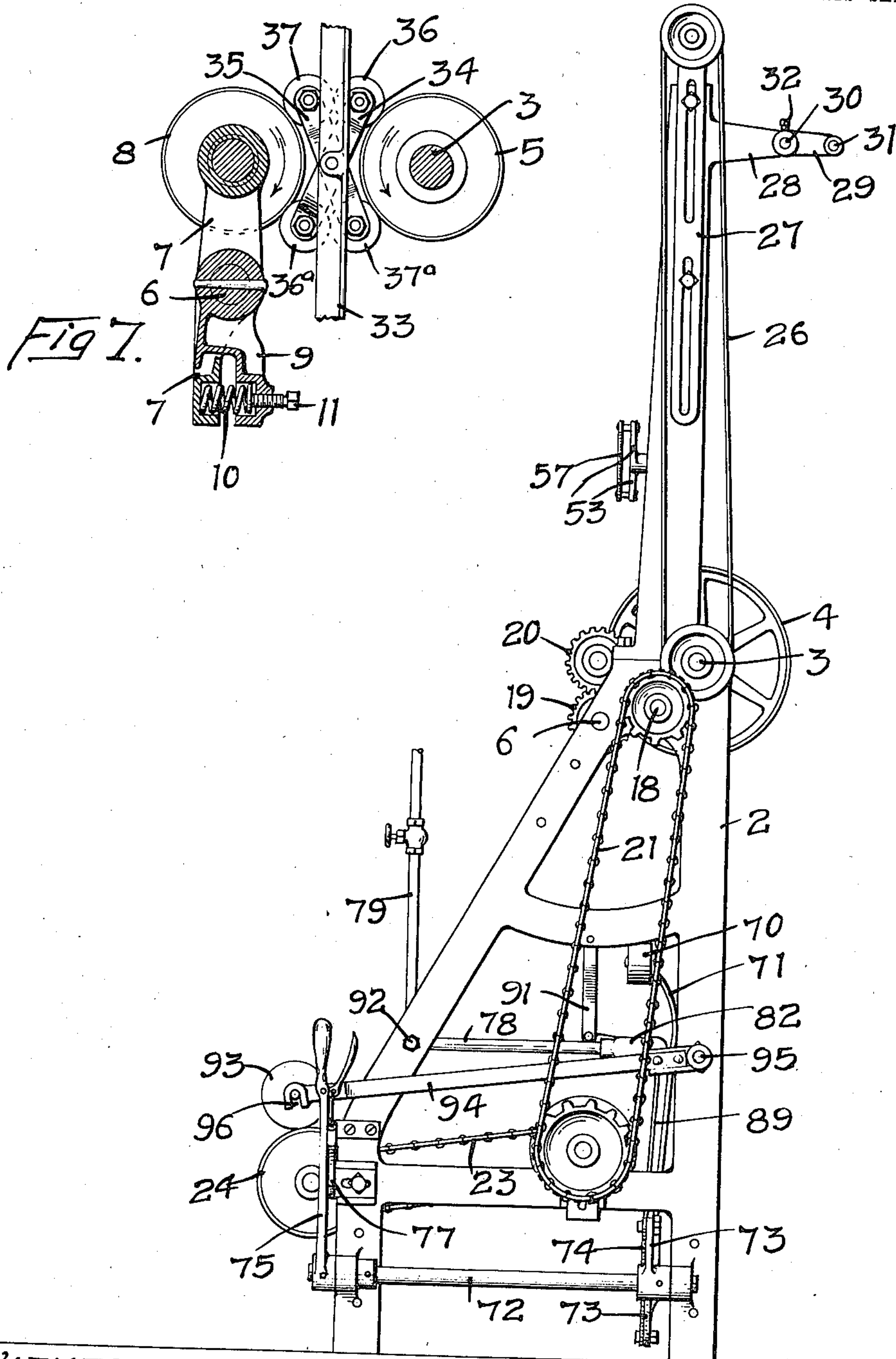
INVENTOR  
FRANKLIN CHATFIELD  
BY *Paul & Paul*  
ATTORNEYS

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Patented July 12, 1910.

6 SHEETS—SHEET 2.



WITNESSES  
*M. Walstrom*  
*L. C. Brown*

Fig 2.

INVENTOR  
FRANKLIN CHATFIELD  
BY *Paul & Paul*  
ATTORNEYS



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6 SHEETS—SHEET 3.

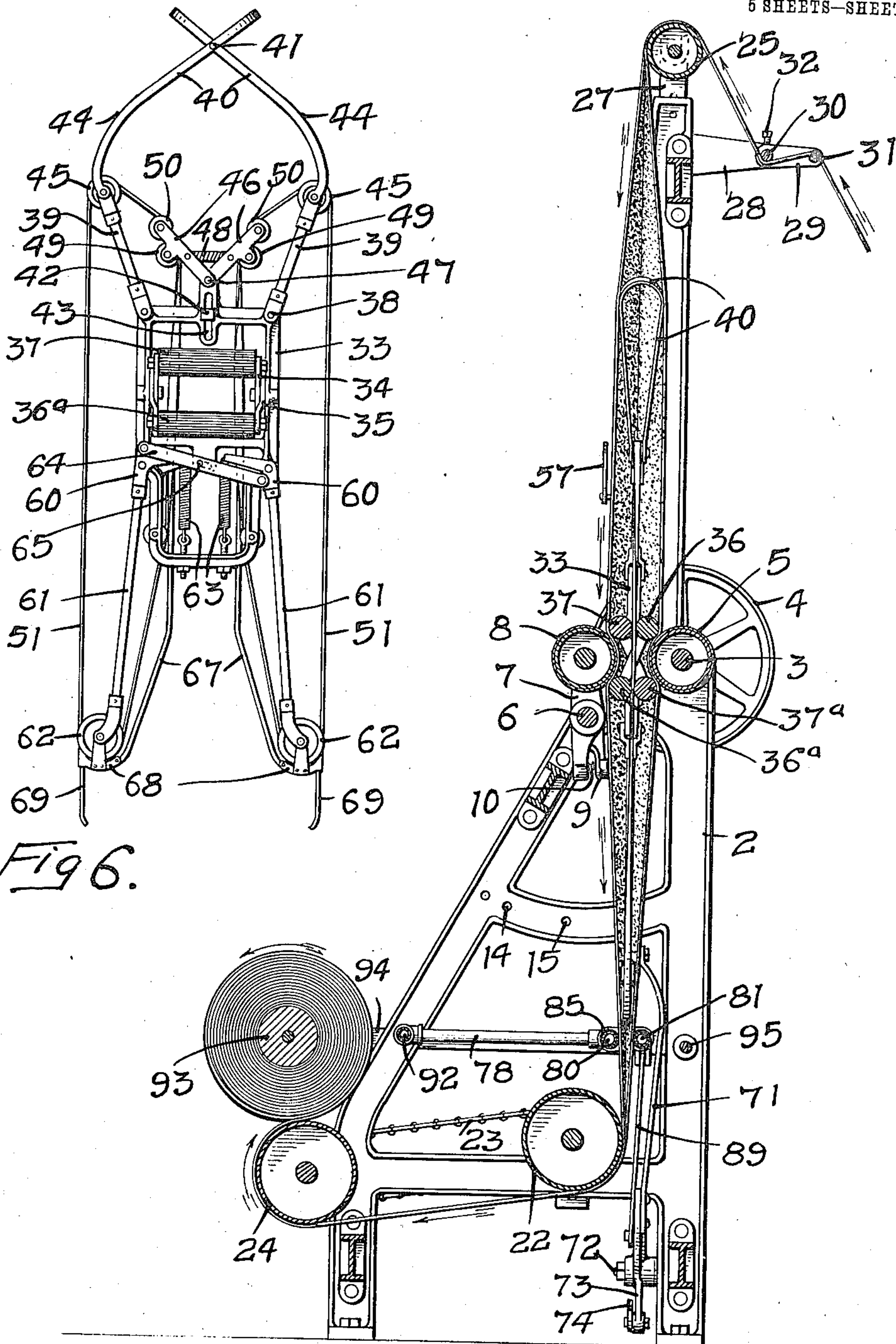


Fig 6.

FIG 3.

WITNESSES  
*M. H. Johnson*  
*L. C. Brown*

INVENTOR  
FRANKLIN CHATFIELD

BY *Paul & Paul*  
ATTORNEYS

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5 SHEETS—SHEET 4.

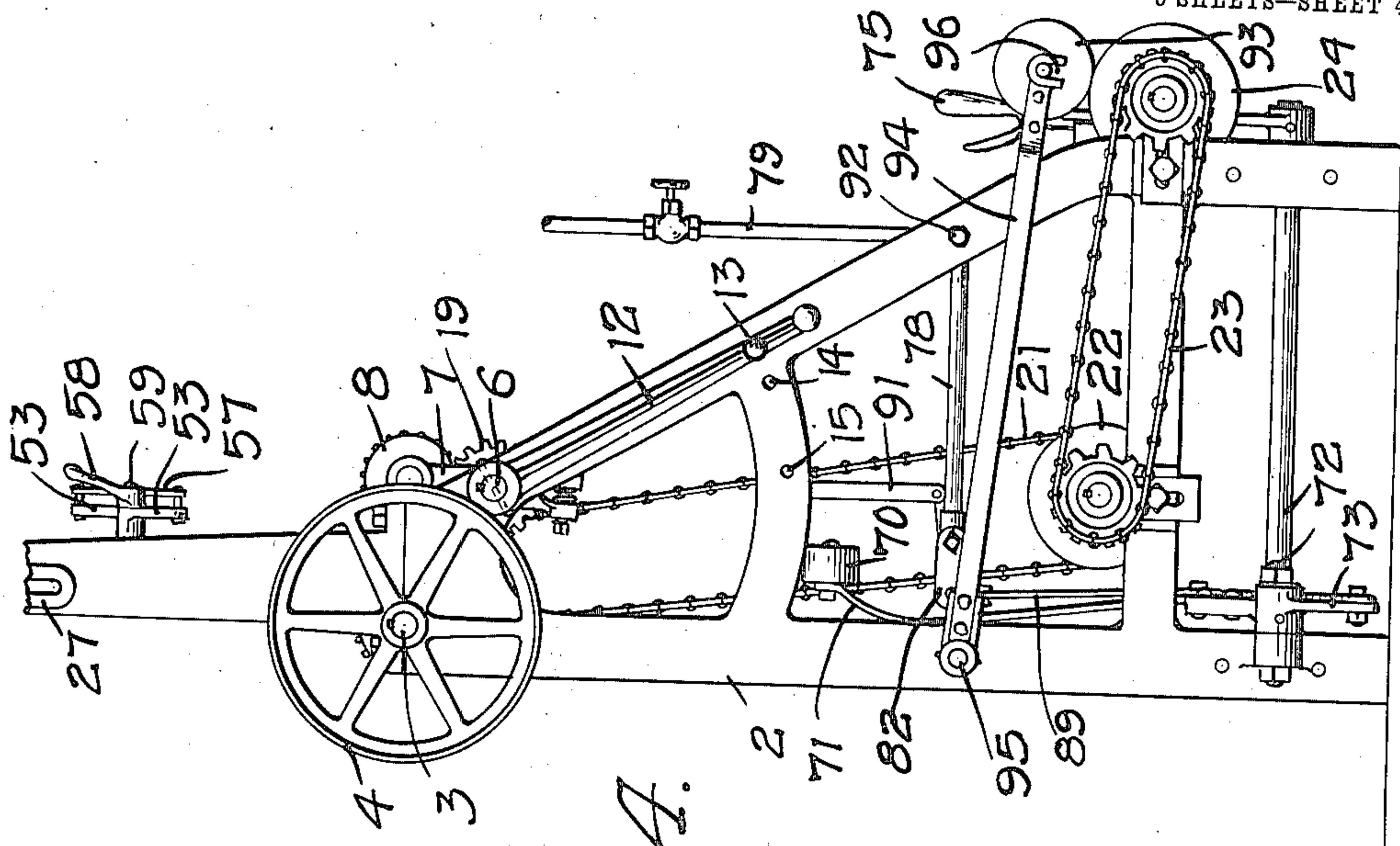


Fig. 4.

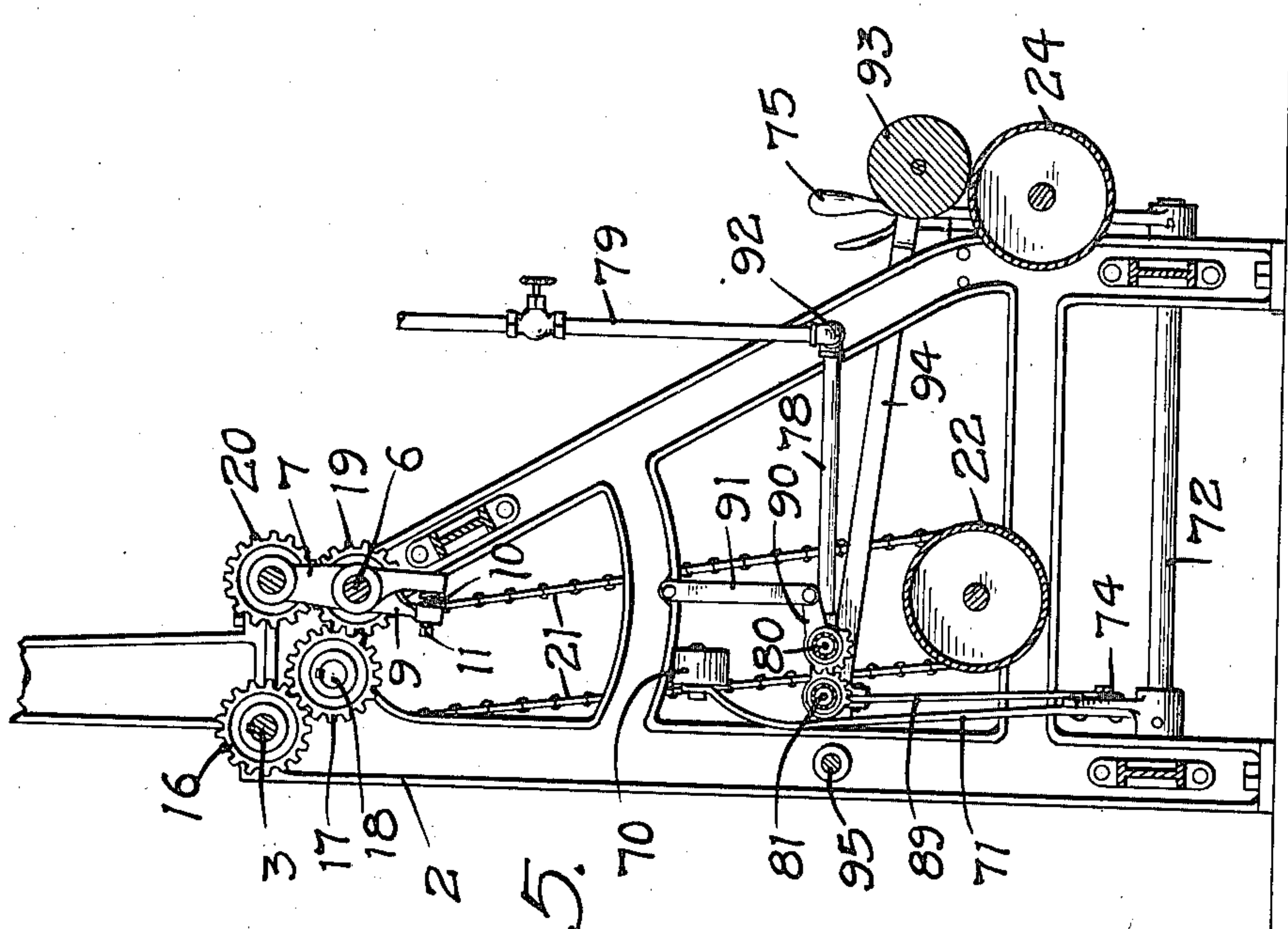


Fig. 5.

WITNESSES  
*M. W. Watson*  
*L. C. Brown*

INVENTOR  
FRANKLIN CHATFIELD  
BY *Paul & Paul*  
ATTORNEYS

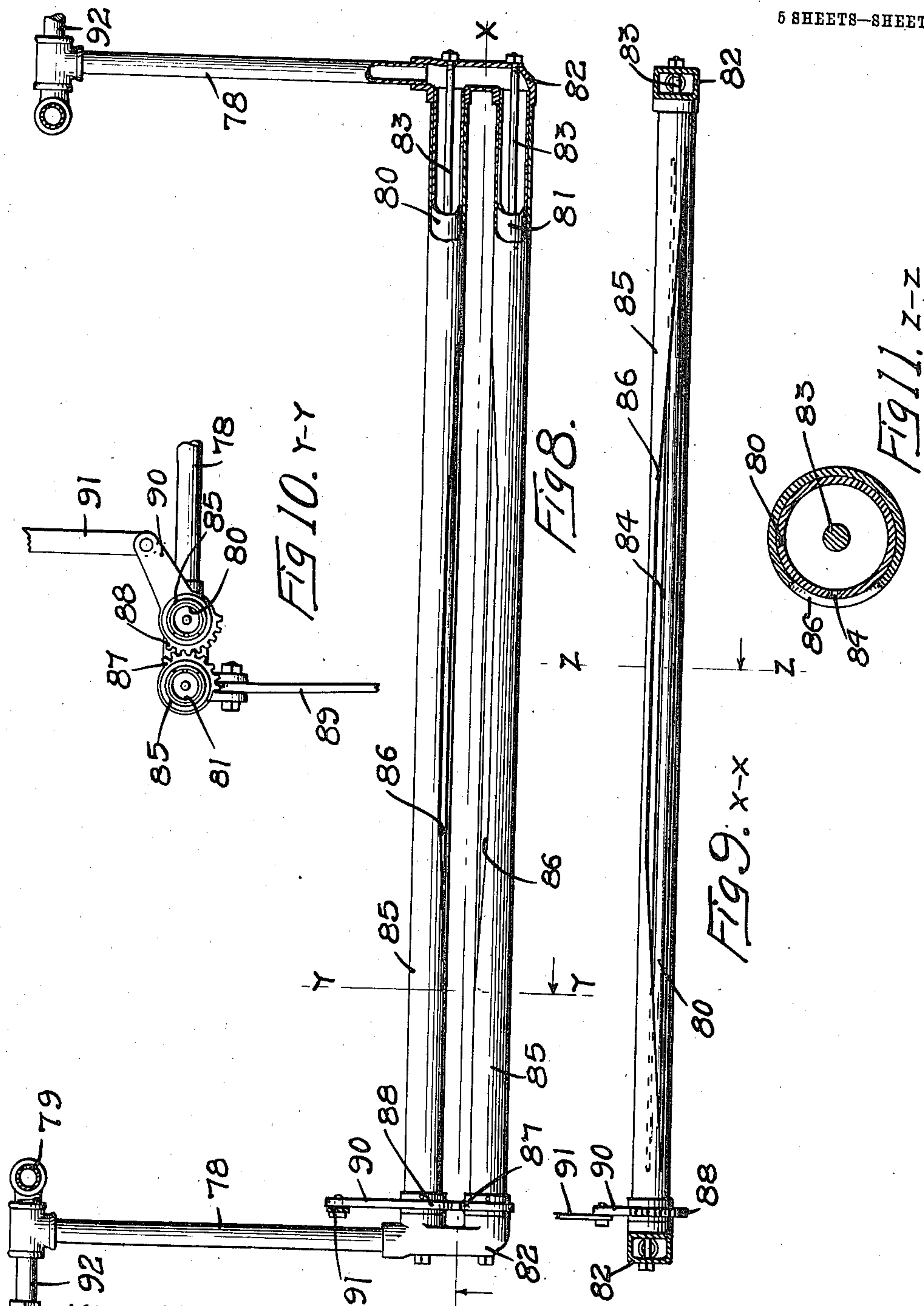


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6 SHEETS—SHEET 5.



WITNESSES  
*M. H. Johnson*  
*L. C. Brown*

INVENTOR  
FRANKLIN CHATFIELD  
BY *Paul & Paul*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

FRANKLIN CHATFIELD, OF MINNEAPOLIS, MINNESOTA.

## FABRIC-STRETCHING MACHINE.

964,088.

Specification of Letters Patent. Patented July 12, 1910.

Application filed December 18, 1909. Serial No. 533,975.

*To all whom it may concern:*

Be it known that I, FRANKLIN CHATFIELD, of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful  
5 Improvements in Fabric-Stretching Machines, of which the following is a specification.

In the manufacture of knit underwear the fabric tubes, after leaving the knitting machines, are subjected to a washing, bleaching, drying and shrinking operation and are then stretched and rolled up preparatory to being formed into garments.

In stretching machines as usually constructed, the middle portion of the fabric tube and the sides and edges thereof are not stretched uniformly, the fabric being pulled or dragged out of shape at the bends or folds where it comes in contact with the  
10 edges of the spreader. This results in rows of stitches running irregularly up or down around the fabric or from side to side of the flattened tube, instead of in a straight line across it. Obviously when the rows of  
15 stitches do not run in a straight line across the tube considerable trouble will be experienced in cutting out the garments.

The primary object of my invention, therefore, is to provide a stretching machine in which the middle portion, as well as the edges or sides of the flattened tube, will be subjected to a uniform stretching or widening pressure.

A further object is to provide a machine of comparatively simple construction and one which can be easily operated.

Other objects of the invention will appear from the following detailed description.

40 The invention consists generally in means for subjecting a tubular fabric to a uniform stretching.

Further the invention consists in means for automatically applying a moistening agent to the fabric.

Further the invention consists in various constructions and combinations, all as hereinafter described and particularly pointed out in the claims.

50 In the accompanying drawings forming part of this specification, Figure 1 is a front elevation of a fabric tube stretching machine embodying my invention, Fig. 2 is a side elevation of the same, Fig. 3 is a vertical sectional view through the middle portion of the machine, Fig. 4 is a side eleva-

tion of the lower portion of the machine looking at the opposite side from the view in Fig. 2, Fig. 5 is a vertical sectional view illustrating the detail construction of the machine, Fig. 6 is a plan view of the tube  
60 stretcher proper, which is capable of removal from the machine through which the tube passes, Fig. 7 is a detail view illustrating the arrangement of the driving rolls  
65 and the means for holding one of these rolls yieldingly toward the rolls of the stretcher, Fig. 8 is a detail view, partially in section, illustrating the means by which the moistening or steaming of the fabric is effected,  
70 Fig. 9 is a sectional view on the line  $x-x$  of Fig. 8, Fig. 10 is a sectional view on the line  $y-y$  of Fig. 8, Fig. 11 is a sectional view on the line  $z-z$  of Fig. 9.

In the drawing, 2 represents an upright  
75 frame in which the operating mechanism for stretching and moistening the fabric tube is arranged.

3 is a driving shaft having a pulley 4 and a driven roll 5 mounted on the shaft. The  
80 shaft 3 is journaled in the frame 2. A shaft 6 is journaled in the machine frame parallel with the shaft 3, and arms 7 are loosely mounted on the shaft 6 at each end thereof, (see Fig. 1) and support at their upper ends  
85 a roll 8. The arms 7 depend below the shaft 6 and arms 9 are secured on said shaft and depend below the same, and springs 10 are interposed between the depending ends of the arms 7 and 9, the tension of said springs  
90 being regulated by set screws 11. These springs tend to hold the depending ends of the arms apart and press the roll 8 toward the roll 5 with a yielding pressure. The shaft 6 is capable of rocking in its bearings and a  
95 crank 12 is secured thereon and has a limited oscillating movement and is locked by means of a pin 13 fitting within holes in the machine frame. Fig. 4 illustrates this crank adjusted to bring the rolls into an operative  
100 position. When the crank is moved to allow the pin to enter the hole 14 the rolls 8 and 5 will be separated and when moved to the hole 15 the rolls will be moved apart to such an extent that the tube stretching device,  
105 hereinafter described, can be taken out of the machine. A gear 16 is secured on the shaft 3 and meshes with a gear 17 on a stub shaft 18 journaled in one side of the frame and said gear 17 meshes with an idle gear 19 on the  
110 shaft 6, through which the roll 8 is driven by a gear 20. (See Figs. 1 and 5.) The



shaft 18 projects through the frame of the machine and has a driving connection 21 with a shaft of a roll 22 which is journaled in the lower portion of the machine frame and has a drive 23 connecting it with a roll 24. The fabric tube passes under these rolls 22 and 24, as will hereinafter appear. A roll 25, journaled in the top of the frame, is driven from the drive shaft 3 through a belt 26. This roll 25 is preferably supported on brackets 27 which have slotted connections with the main frame and may be adjusted vertically to raise or lower the said roll.

I prefer to provide a fabric tightening device in the upper portion of the frame consisting of brackets 28, links 29 pivoted on a rod 30 and carrying a rod 31, over which the fabric is passed. Set screws 32 allow the oscillation of the links 29 and permit the tension on the fabric to be increased or decreased at will.

The rolls 5 and 8 are covered with a yielding substance and between these rolls the fabric tube is fed. The stretching device, which forms an essential feature of my invention, is also arranged between these rolls and I will now proceed to describe it in detail.

33 is a frame, substantially rectangular in form, on each side of which bars 34 and 35 are centrally pivoted. (See Figs. 6 and 7.) These bars carry rolls arranged in pairs with corrugated surfaces, the upper rolls being designated by numerals 36 and 37 and the lower rolls by the numerals 36<sup>a</sup> and 37<sup>a</sup>. (See Fig. 7.) The fabric tube passes between the rolls 5 and 36 and 37<sup>a</sup> on one side and the roll 8 and the rolls 37 and 36<sup>a</sup> on the other side, the fabric being held in contact with the corrugated surfaces of the rolls 36, 37, 36<sup>a</sup> and 37<sup>a</sup> by the pressure of the roll 8, such pressure being regulated by the tension of the spring 10 and the adjustment of the crank 12.

Pivoted at 38 on the frame 33 are bell crank levers 39 which carry pivoted tube opening loops 40, the upper ends of which cross one another, as indicated in Fig. 1, and are fastened together at 41. These loops present curved or rounded upper ends and serve to spread or separate the walls of the tube preparatory to its entering the stretching mechanism. The opposite arms of the bell crank levers 39 have an adjustable connection by means of a bolt 42 in a vertical slot 43 which permits the oscillation of the levers toward and from one another to adapt them for the size of the tube or the degree of width desired. The arms 40 have curved surfaces 44, which contact with the walls of the tube as it enters the stretcher proper. Near these curved surfaces pulleys 45 are mounted on the levers 39 and are movable back and forth therewith. Bars 46 are pivoted at 47 on the frame of the

stretcher and a spring 48 normally tends to draw the said bars together. Said bars carry wheels 49 and 50 which contact with belts 51 and serve as tighteners therefor. These belts pass around the pulleys 45 and contact with the edges of the flattened fabric tube, causing the same to feed with the same speed as the middle portion of the tube which passes between the feed rolls. The belts 51 pass between the corrugated rolls 36 and 36<sup>a</sup> and 37 and 37<sup>a</sup> and are operated thereby. The stretcher is centered in the machine by means of wheels 52 carried by arms 53 which are pivoted at 54 on brackets 55. The belts 51 constitute the essential feature of my present invention. They may be used in various ways and various means may be devised for supporting them and bringing their surfaces into contact with the bends at the edges of the tube. I do not wish to be confined, therefore, to the apparatus herein shown for supporting and operating these belts.

The arms 53 have hubs provided with lugs 56 connected across the machine by a link 57, said link insuring uniform travel of the arms 53 and the wheels 52. The arms 53 are held and caused to move uniformly with respect to one another by means of a screw clamp device 58, mounted on one end of a bolt 59 which forms a pivot for one of the arms 53. (See Figs. 1 and 4.) By loosening this clamp the arms may be freely oscillated and adjusted with respect to the belts and fabric. The connection between the arms insures a uniform relative movement. The lower portion of the frame 33 has bell crank levers 60 pivoted thereon carrying rods 61 in which pressure wheels 62 are mounted. Coil springs 63 are attached to one arm of said bell cranks and to the lower portion of the frame 33 and the tension of said springs normally tends to swing the arms 61 outwardly and press the feed belts, which pass down under the wheels 62, into engagement with the wall of the fabric. A uniform relative movement of the rods 61 and the wheels thereon is obtained by means of a link 64 pivoted on the bell crank 60 eccentrically with respect thereto and having a pin 65 that is slidable in a slot 66 in the frame 33. Rods 67 are pivoted on the frame 33 and depend beside the rod 61 and carry shoes 68 which are pivotally connected with the pivots of the wheels 62. Fingers 69 are carried by these shoes and through the connections of the rods 67 with the rods 61 and the stretcher frame, are always held in a vertical position during the lateral adjustment of the rods 61.

On each side of the stretcher width controlling wheels 70 are arranged, carried by arms 71 which are mounted on shafts 72. These shafts have cranks 73 thereon, which are connected across the machine by a bar



74. A lever 75 is mounted on one of said shafts and has a latch 76 to engage the teeth of a quadrant 77. By the operation of this lever the position of the arms and the pressure wheels carried thereby can be easily and quickly regulated.

For the purpose of steaming and moistening the fabric as it leaves the stretcher I provide tubular arms 78 having a pipe connection 79 with a source of steam supply and carrying tubes 80 and 81 having heads 82 connected by rods 83. The heads 82 are connected at each end of the tubes by links 89 with the arms 71. The tubes have longitudinal slots 84 therein and sleeves 85 inclose said tubes and are rotatable thereon, said sleeves having diagonally cut openings 86 therein which, when the sleeves are revolved, gradually expose the slots in the tubes and permit the escape of the steam therein. These sleeves are rotated by any suitable means, preferably by mutilated gears 87 and 88. The gears 87 and 88 are in mesh with one another and the latter has a crank arm 90 thereon, pivotally connected by a link 91 with the frame of the machine. (See Figs. 1 and 10.) The arms 78 are capable of vertical oscillation on the bearings 92 and when the arms 71 are moved to operate the links 89, the said arms 78 and the tubes carried thereby will be oscillated and through such oscillation the crank 90 will be moved to rotate the sleeves and expose or close the steam slots covered thereby. In this way an automatic opening and closing of the steam slots is permitted through the adjustment of the arms 71 and their pressure wheels. The jets of steam, flowing out through the slots in the tubes 80, will heat and moisten the walls of the fabric tube and cause them to lie flat on the rolls and be rolled smoothly and evenly on a reel 93. This reel rests upon the roll 24 and is held in place by arms 94 mounted on a shaft 95 and having recessed ends 96 to receive the axis of the reel. The reel will revolve with the revolution of the roll 24 and gradually wind the fabric thereon.

The stretcher frame proper, illustrated in Fig. 6, is placed in an upright position in the machine with its corrugated rolls arranged as shown in Fig. 3 and the fabric tube is drawn over this stretcher, the walls being separated by the spreader and the tube being fed between the corrugated rolls and the rolls 5 and 8. The revolution of these rolls will feed the tube downward and the feed belts driven by the pressure wheels and cooperating therewith, will move the edges of the flattened tube downward at a uniform speed with the middle portion, thereby insuring the same travel for the sides and the middle of the tube, preventing the rows of stitches from sagging and curving up or down from edge to edge of the

fabric. The required degree of stretching will be obtained by the passage of the tube over the stretcher, so that when the fabric is wound on the reel it will be stretched and shaped and ready to be formed into garments. Whenever desired, the rolls 5 and 8 may be separated and the removal of the entire stretcher frame from the machine permitted.

I do not wish in this application to be confined to the details of construction herein set forth for effecting a uniform stretching of the fabric, as I am aware that various changes may be made in the machine and substantially the same results obtained, my invention essentially residing in a mechanism by means of which the tube is stretched with rows of stitches running evenly across the flattened tube.

I claim as my invention:

1. A fabric tube stretching device comprising means for feeding the middle portion of the tube and means for feeding the sides or edges of the tube at the same relative speed as the middle portion, whereby the rows of stitches will be maintained straight across the fabric.

2. A knit fabric tube stretching device, comprising means disposed within the tube for feeding the middle portion and means also disposed within the tube for feeding the sides thereof at the same relative speed as the middle portion.

3. A knit fabric tube stretching device, comprising means for feeding the middle portion and means for feeding the sides of the tube uniformly with respect to the middle portion and simultaneously stretching the tube.

4. A knit fabric tube stretching device comprising means disposed within the tube for feeding the middle portion, means also disposed within the tube for feeding the sides thereof uniformly with respect to the middle portion, said side feeding means effecting a stretching or widening of the tube.

5. A fabric tube stretching device, including belts and means for driving the same, said belts contacting with the inner wall of a tube, for the purpose specified.

6. A knit fabric tube stretching device, including belts disposed within the tube and a driving means therefor, said belts contacting with the edges of the flattened tube, for the purpose specified.

7. A knit fabric tube stretching device comprising means for feeding the edges of the flattened tube and means for feeding the middle portion thereof, said middle portion feeding means driving said side portion feeding means.

8. A knit fabric tube stretching device, including feed rolls between which the middle portion of the fabric is fed, and means for feeding the edges of the flattened tube



at the same relative speed as said middle portion.

9. A knit fabric tube stretching device comprising feed rolls between which the middle portion of the fabric passes, and feed belts arranged to contact with the edges of the flattened fabric.

10. A knit fabric tube stretching device comprising feed rolls between which the middle portion of the fabric passes, feed belts arranged to contact with the sides or edges of the flattened tube and engaged and driven by said feed rolls.

11. A knit fabric tube stretching device including feed rolls engaging the middle portion of the fabric, feed belts contacting with the edges or side walls of the tube and driven by said feed rolls, and said feed rolls and belts being disposed within said tube.

12. A fabric tube stretching device including feed rolls between which the middle portion of the fabric is fed, means for feeding the edges of the fabric, said feed rolls being capable of relative adjustment to render them operative or inoperative.

13. A fabric tube stretcher including feed rolls between which the middle portion of the fabric is fed, and means for feeding the edges of the fabric, one of said rolls being yieldingly held with respect to the others.

14. A fabric tube stretcher comprising feed rolls having yielding surfaces, corrugated rolls arranged in pairs between said first named rolls, the walls of the fabric passing between said yielding surfaced rolls and said corrugated surfaced rolls, and feeding the middle portion of the fabric, and means for feeding the edges thereof simultaneously.

15. A fabric tube stretcher comprising a driving roll, a similar roll driven from said first named roll and having an oscillating movement toward and from said first named roll, rolls having roughened surfaces between which and said driving roll and said driven roll the wall of the fabric passes, and means for increasing or decreasing the pressure of said driven roll on the fabric.

16. A fabric tube stretcher comprising rolls having yielding surfaces, corrugated rolls between which and said yielding surfaced rolls the fabric passes, belts passing between said corrugated rolls and driven thereby and said belts contacting with the edges of the tube.

17. A fabric tube stretcher comprising a frame, means for feeding the middle portion of the tube, means for feeding the edges of the tube uniformly with respect to the middle portion, and means for centering said feeding means.

18. The combination, with feed rolls, of a fabric tube stretcher including rolls and feed belts, said belts engaging the edges of the fabric and means for centering said

stretcher with respect to said first named rolls.

19. A fabric tube stretcher including means for feeding the middle portion of the tube, means for feeding the edges thereof uniformly with respect to the middle portion, said edge feeding means being capable of lateral adjustment to increase or decrease the width of the tube.

20. A fabric tube stretcher comprising a frame, means for feeding the middle portion of the tube, means for feeding the edges thereof, and a spreader disposed within the tube and separating the edges thereof.

21. A fabric tube stretcher comprising a frame, means for feeding the middle portion of the tube, means for feeding the edges thereof, and yieldingly held spreader arms operating to press apart or separate the opposite edges of the tube.

22. A fabric tube stretcher comprising means for feeding the tube, and relatively movable stretcher belts disposed within and engaging the side walls of the tube.

23. A fabric tube stretcher including spring pressed arms disposed within the tube and contacting with the side walls thereof and pivotally connected for relative movement, pulleys carried by said arms and feed belts passing around said pulleys.

24. A fabric tube stretcher comprising pivoted tube stretching arms and feed belts carried thereby, and width controlling wheels between which and said belts the edges or sides of the fabric pass.

25. A fabric tube stretcher including feed belts and tube width controlling arms co-operating therewith, and a heating and moistening device.

26. The combination, with a fabric tube stretcher, of a heating and moistening device and means for automatically regulating the discharge of the heating and moistening agent.

27. The combination, with a fabric tube stretcher, of a steam heating and moistening tube having means for discharging steam against the fabric tube and means for automatically regulating the discharge of the steam from said tube.

28. The combination, with a fabric tube stretcher, of a slotted steam delivering tube, a sleeve therefor having a diagonal slot, the exposure of the slot in said steam tube increasing with the rotation of said sleeve and means controlling the movement of said sleeve.

29. The combination, with a fabric tube stretcher including width controlling arms and feed belts, wheels between which and said belts the fabric moves, supports for said wheels, and a heating and moistening device connected with said supports.

30. The combination, with an upright machine, of means for feeding a fabric tube



vertically therethrough, said means comprising a part for operating the middle portion of the tube and a part for operating the sides and edges thereof uniformly and simultaneously with respect to the middle portion.

31. The combination, with a frame, of rolls mounted therein between which a knit fabric tube is fed and means adapted to fit within the tube between said rolls and comprising means for feeding the middle portion of said tube and means for feeding the sides thereof simultaneously and uniformly.

32. The combination, with a machine frame, of rolls mounted therein between which a knit fabric tube is adapted to be fed, a stretcher frame adapted to be placed within the tube between said rolls, rolls mounted in said stretcher frame and be-

tween which and said first named rolls the middle portion of the tube is held and fed, and belts driven by said stretcher frame rolls and engaging the sides of the tube to feed the same uniformly with respect to the middle portion thereof.

33. A knit fabric tube stretching device including belts disposed within the tube and a driving means therefor, said belts contacting with the edges of the flattened tube, and a tube opening means disposed in advance of said belts.

In witness whereof, I have hereunto set my hand this 27th day of November 1909.

FRANKLIN CHATFIELD.

Witnesses:

RICHARD PAUL,  
L. C. CRONEN.