No. 750,513. PATENTED JAN. 26, 1904.

G. H. WINSLOW & C. W. DENNETT.

PROCESS OF PRINTING WARPS.

APPLICATION FILED MAR. 4, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

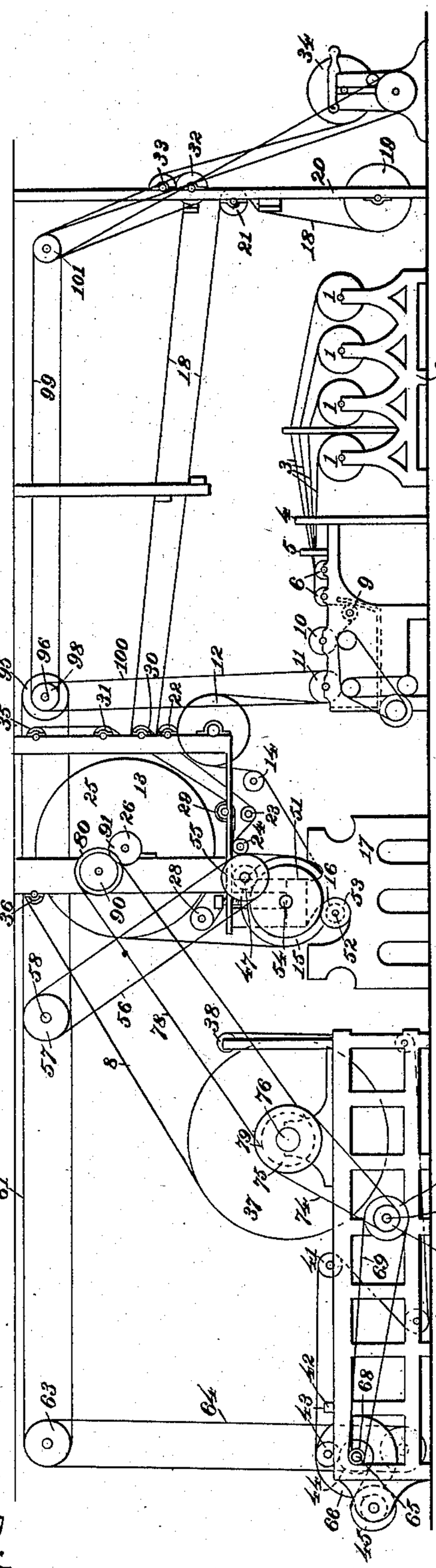

Fig. I.

Witnesses

H. S. Austin

Karl Daniel.

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NO MODEL. 4 SHEETS—SHEET 2.

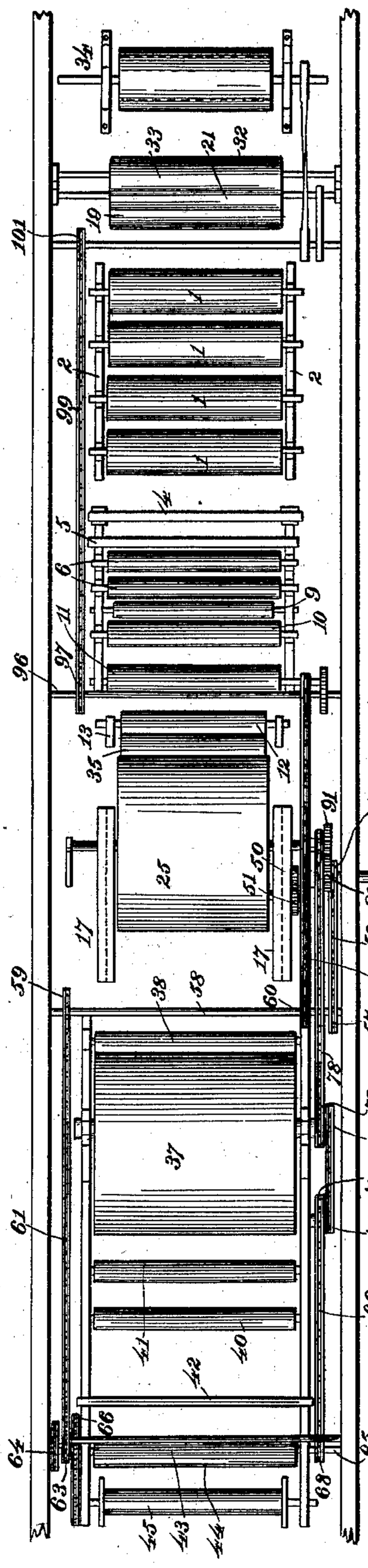

Fig. II.

Witnesses

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. III.

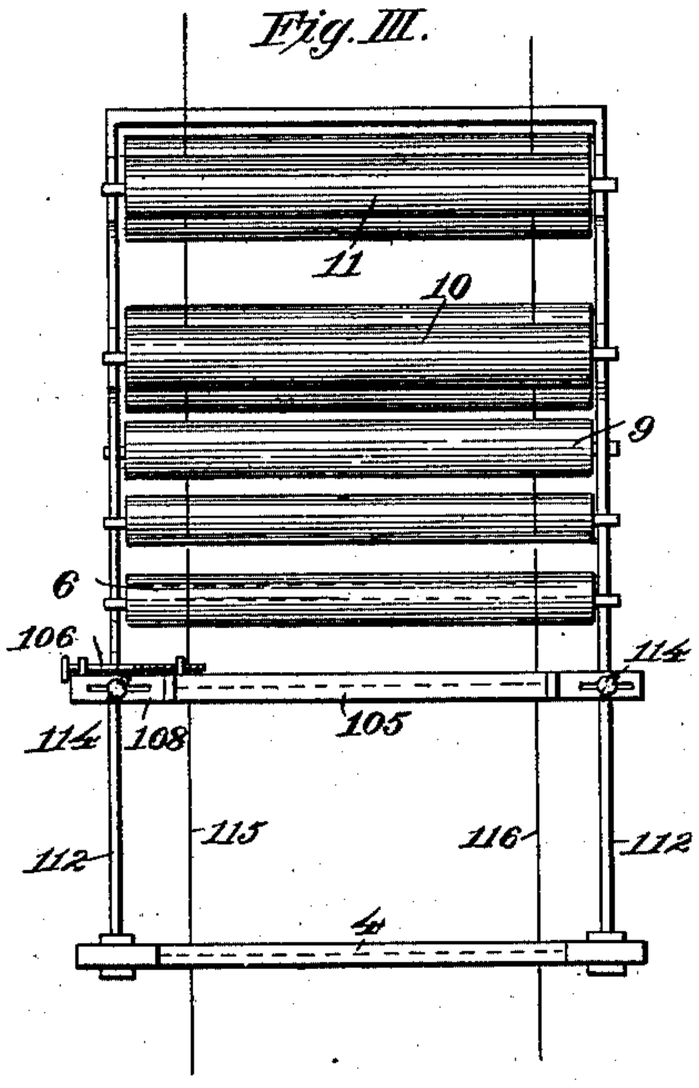

Fig. IV.

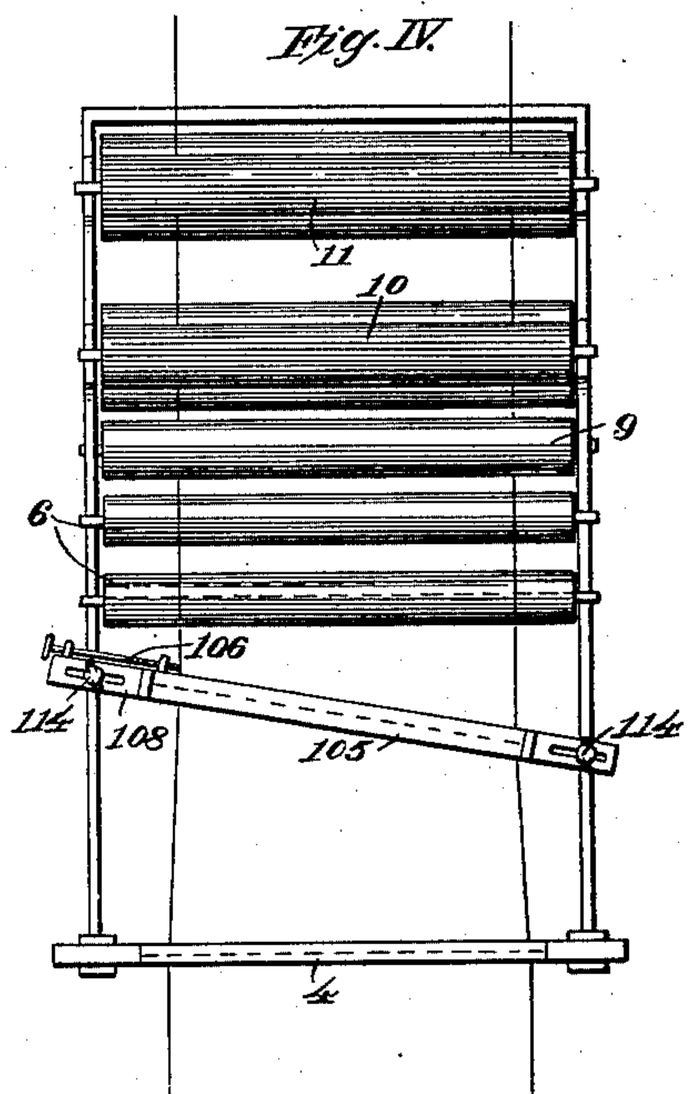

Fig. V.

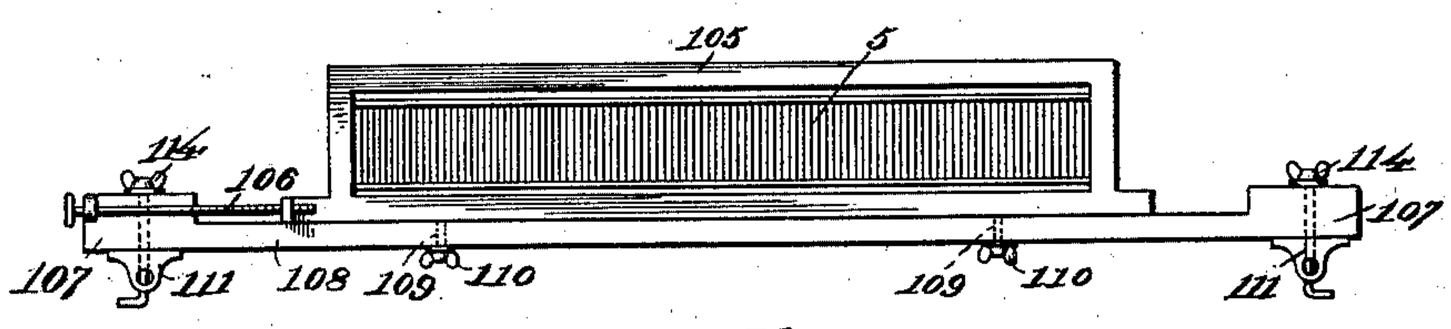

Fig. VI.

Witnesses
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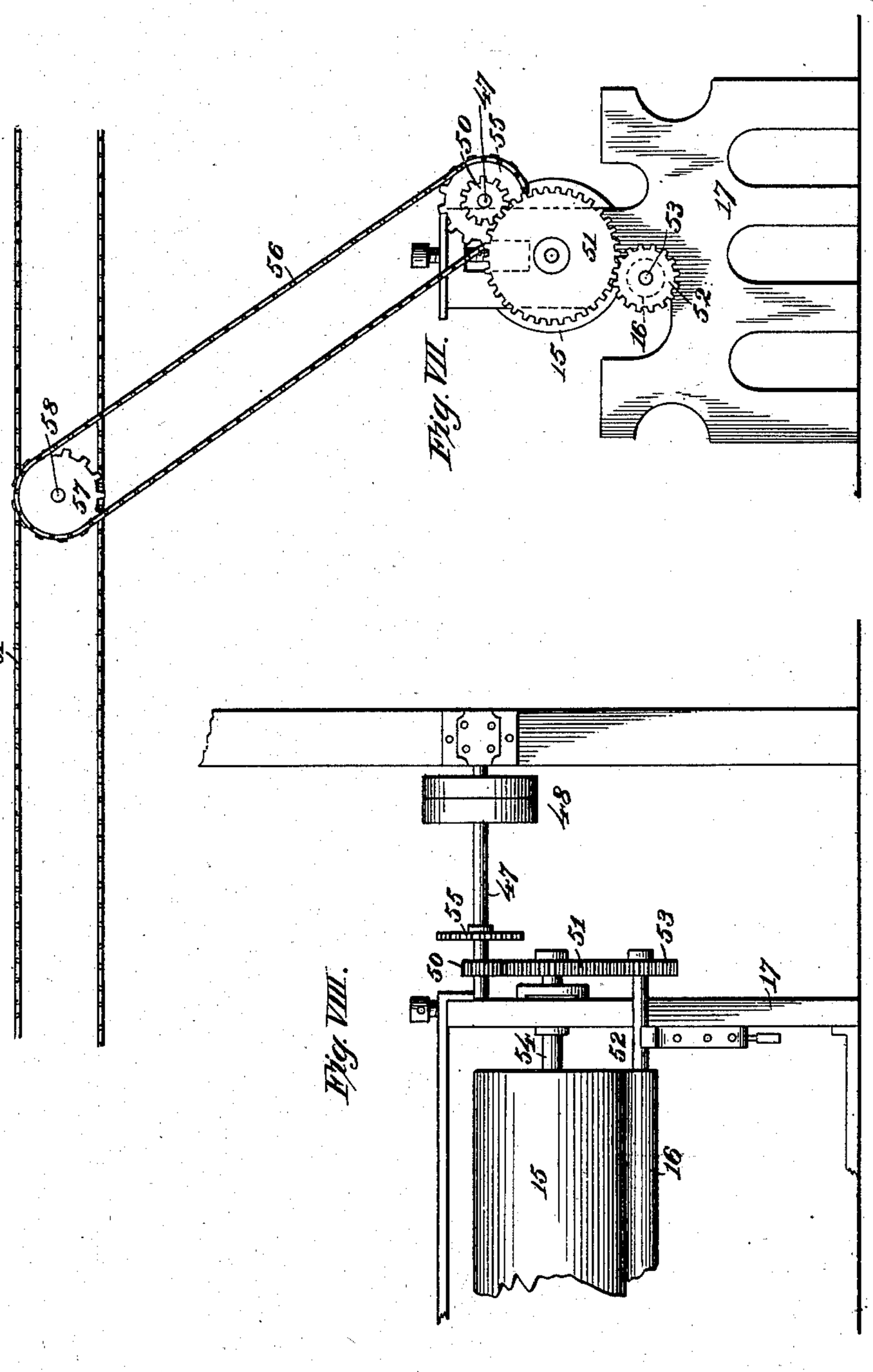
NO MODEL. 4 SHEETS—SHEET 4.



Witnesses
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Attorney.

No. 750,513. Patented January 26, 1904.

UNITED STATES PATENT OFFICE.

GEORGE H. WINSLOW AND CHARLES W. DENNETT, OF NORTH ADAMS, MASSACHUSETTS.

PROCESS OF PRINTING WARPS.

SPECIFICATION forming part of Letters Patent No. 750,513, dated January 26, 1904.

Application filed March 4, 1902. Serial No. 96,641. (No specimens.)

To all whom it may concern:

Be it known that we, GEORGE H. WINSLOW and CHARLES W. DENNETT, of North Adams, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Processes of Printing Warps, of which the following is a complete specification, reference being had to the accompanying drawings.

The object of our invention is to produce an improved process or method of printing color-designs upon warps preparatory to weaving the threads of such warps into figured fabrics in which the figure referred to is in whole or in part derived from the printing of the warp.

The process is especially applicable to the manufacture of cotton fabrics or may be applied to the treatment of warps of other materials—such, for instance, as silk, mohair, ramie, and others unnecessary to be enumerated.

In the application of our process to the manufacture of any kind of warp our invention comprehends, generally speaking, the passing of all the threads which collectively constitute a warp, with a uniform tension and by a synchronous movement throughout from start to finish, through a series of steps during which the threads are unwound from the beam upon which they are originally wound and are transferred to the warp-beam upon which the printed warp is finally wound ready for the loom.

The several steps of the process will be hereinafter more fully and at large described; but for the purposes of this general statement it may be specified that they comprehend the wetting or moistening of the warp, regulating the degree of moisture preparatory to the step of printing, then printing, afterward properly drying the printed warp, and finally combing or separating and spacing the threads of the warp previous to their being wound upon the beam ready for the loom.

It is essential in the printing of all warps by our process that at every point at which the color is applied to the threads of the warp it shall pass through and through the thread or saturate it so that the color of the design printed upon the warp may show in uniform tone upon both sides of the fabric into which the warp is subsequently woven. To accomplish this object, it is not only necessary to moisten the warp, but also to accurately regulate the degree of moisture therein, because if there be excessive moisture in the warp preparatory to printing the color will tend to flow along the threads of the warp, and thereby to distort the figure or design of the print. A very slight excess of moisture in the warp preparatory to printing will be sufficient to deface and commercially condemn the fabric. On the other hand, an insufficiency of moisture in the warp will prevent the proper saturation of the threads with color, which will be equally deleterious to the fabric, but for another reason. It will therefore appear that the step in our process of moistening the warp to a nicely-regulated degree preparatory to printing is of the utmost importance, as it is one which has required careful consideration in the development of our process.

As has been stated, the step in the process of reducing the warp to a regulated degree of moisture is essential to the successful application of our process to all warps; but in the manufacture of certain warps, and particularly cotton warps, to which, as has been stated, our invention is especially applicable, it is necessary to size the warps before they are finally wound upon the beam ready for the loom. It is in practice important, in order to avoid unequal stretching or shrinkage of the threads of a warp, to avoid the application of moisture to the warp after it is printed—in other words, that the final drying of the warp should immediately and uninterruptedly follow the printing step of the process. For that reason it is practically essential in the application of our process to the printing of cotton and other warps which require sizing that the warp should pass through the size before it is printed. Therefore in the practice of our invention as applied to cotton and similar warps the sizing of the warp becomes that step in our process by which the necessary moisture pre-

paratory to the step of printing is imparted to the warp.

Another important step comprehended by our process and not heretofore alluded to is that step by which the spaces between the threads of the warp may be readily varied or the warp expanded or condensed at will. The use of a condenser in the manufacture of warps is not new; but what we regard in this connection as novel in our invention is the employment of means by which the condensing operation may be readily varied at will by the employment and proper manipulation of a single reed. This feature of the invention is important, because it enables an operator to determine at will the number of threads of the warp which shall be brought into contact with a given space upon the printing-roll or with only a portion thereof. By this means provision is made for the introduction of stripes or other variations of design into a fabric made from a printed warp harmoniously with the design printed upon the warp. It is believed that the foregoing general statement will be perfectly clear to one skilled in the art without greater elaboration herein of details by which the object specified is accomplished.

In the foregoing specification it should be noted that a clear distinction is drawn between the terms "warp" and "warp-threads." By the term "warp" we designate all of the threads collectively wound upon a single beam which extends lengthwise in a loom in the operation of weaving a width of fabric, and by the term "warp-threads" we designate the individual threads of such a warp.

Now it is common practice in the art to color warp-threads; but this, it should be observed, is essentially different from the printing of warps to which our invention relates. It is also old to unite a warp in a sort of skeleton weave by the employment of a temporary weft, so that the warp may be handled without disturbing the relations of the threads and then printing the warp; but this method is expensive and is impracticable except in very costly fabrics.

In the accompanying drawings, Figure I is a side elevation of complete apparatus for carrying out our process, the illustration being mainly diagrammatic in character. Fig. II is a similar top plan view of the subject-matter of Fig. I. Fig. III is a top plan view illustrating the condensing-reed and showing the same at right angles to its frame. Fig. IV is a view similar to Fig. III, illustrating the reed set obliquely to its frame for the purpose of condensing a warp. Fig. V is a side elevation of the subject-matter of Fig. III. Fig. VI is a side elevation of the reed and its supporting members detached from their frame. Fig. VII is an enlarged view of a portion of the subject-matter of Fig. I, illustrating details of the printing-roller-driving mechanism. Fig. VIII is a view of a portion of the subject-matter of Fig. VII, taken at right angles thereto.

Referring to the numerals on the drawings, 1 indicates each of a series of ordinary beams, of which four are illustrated and which are revolubly mounted, as in a suitable frame 2. Upon the beams 1 are wound warp-threads 3, from which they are led, as through an ordinary base-reed 4 and through a condensing-reed 5, over rollers 6 of a sizing-machine 7 of any ordinary or suitable description. Such mechanism being clearly understood in the art, it is sufficient here to specify that the warp 8, which receives form in passing through the reed 5, is carried into the sizing-vat by passing under a depressed roller 9, whence, passing between two pairs of suitably-driven rollers 10 and 11, it has a portion of the sizing liquid squeezed out of it. From the second pair of rollers 11 the warp 8 is conducted over a moisture-regulating drum 12, which is revolubly mounted in suitable bearings upon a pendent frame 13. The drum or cylinder 12 is heated, as by the internal application of steam. Means for regulating the heat, as well as the size of the drum and the extent of the area of contact between it and the warp 8, afford means of nicely regulating the degree of moisture in the warp 8. 14 indicates a guide-roller, by means of which the warp is properly bent over the drum 12 and directed at a proper angle over a presser-roller 15, which is adjustably suspended from the frame 13. The roller 15 is adapted to bear against a printing-roller 16, suitably mounted in a frame 17, which carries the ordinary color-boxes, feed-rollers, and other appurtenances with which printing mechanism of this description is usually provided. The printing-roller is mechanically driven in a way which will hereinafter be specified; but the presser-roller 15 derives its motion from peripheral contact with the printing-roller 16. The warp 8 in passing between the rollers 15 and 16 receives the imprint of the design from the printing-roller. It is unnecessary to further specify the details of the printing mechanism, since it may be of any suitable construction well known in the art.

In passing between the rollers 15 and 16 the warp is provided with a backing-cloth which should move at an equal rate of speed with the warp in order to prevent disturbance of the threads thereof until after the print is dry, and we therefore provide in our apparatus mechanism for accomplishing that result.

The backing-cloth 18 is carried in a roll 19, journaled as between upright frame-pieces 20. 21 indicates a guide-roller over which the backing-cloth 18 is directed to a second guide-roller 22. Additional guide-rollers 23 and 24 serve to present the backing-cloth 18 at a proper angle to the roller 15, in passing over

which the warp is laid upon the backing-cloth.

In passing between the rollers 15 and 16 the backing-cloth 18, with the warp 8 upon it, (indicated by numerals 8 18,) passes to a large drying-cylinder 25, journaled, as indicated at 26, in the frame 13. 28 indicates a guide-roller, which is preferably located for economy of dimensions near the cylinder 25, at such a point as will compel contact between the warp 8 and cloth 18 throughout the great portion of the periphery of the cylinder 25. From the roller 28 the warp and cloth pass over a guide-roller 29 and thence to rollers 30 and 31, respectively. The peripheries of the rollers 30 and 31 are properly substantially tangential to a common plane, so that the warp 8 and cloth 18 proceed together to the roller 30, where they separate, the cloth 18 going over a pair of tension-rollers 32 and 33 to a take-up roll 34. The rollers 32 and 33 and the roll 34 are driven at a proper rate of speed to keep the cloth 18 taut and moving at a rate uniform with that at which the warp 8 moves.

In the apparatus illustrated it is important to provide means that will insure sufficient dryness in the warp 8 when it leaves the backing-cloth 18, which will prevent unequal stretching or shrinkage of the warp-thread or running of the color of the print. For that reason the dimensions and heating capacity of the cylinder 25 and the extent of contact between the periphery of that cylinder and the warp and backing-cloth must be carefully considered and calculated to the character of work required of the apparatus. Such details of the construction and manipulation must necessarily be left to the judgment of the constructor and operator and can only be pointed out generally as hereinbefore set forth in a general description of the character of this specification. After leaving the roller 31 the warp 8, passing over guide-rollers 35 and 36, which enable it to clear the roller 25, is brought into contact with a final drying-cylinder 37, from which, as by guide-rollers 38, 39, 40, and 41, it is conducted after passing through a comb 42 over guide-rollers 43 and 44 to a loom-beam 45, upon which it is finally wound ready for the loom.

It should be observed that the same care to preserve uniformity of movement of the warp is essential after it leaves its backing-cloth as at any former stage of the process and that accurate timing of the movements of the driving or drying operations of the apparatus must be preserved up to and including the driving of the beam 45, upon which the warp is finally wound.

The driving mechanism of our apparatus has been heretofore alluded to in general terms, and we will now proceed to describe the same more in detail. Referring, accordingly, to Fig. VIII, in view of Figs. I, II, and VII, as showing a practical and preferred form of driving mechanism, 47 indicates a main driving-shaft of the apparatus, to which power may be applied as required, as through a split pulley 48. It is of course assumed that where shafts or wheels are mentioned they are suitably mounted in the usual manner upon some part of the frame of the apparatus or other supports available in the building where the apparatus is erected; but detailed description of journal-bearings and similar implied members will be omitted, except where it appears to be specially required.

The shaft 47 carries a fixed pinion 50, which meshes with a stud-supported gear 51, that communicates motion to the shaft 52 of the printing-roller 16, as through a pinion 53, fixed to the shaft 52. The roller 15, suspended by its axle 54, derives motion, as has been specified, through peripheral pressure against the printing-roller 16, actual contact between the rollers 15 and 16 being prevented by the intervention of the warp and backing-cloth.

Between the pinion 50 and the pulley 48 there is fixed to the shaft a sprocket-wheel 55, which, as by a sprocket-chain 56, communicates motion to a sprocket-wheel 57 upon a transverse shaft 58, which in turn, as by sprocket-wheels 59 and 60, communicates motion to sprocket-chains 61 and 62. The former drives a sprocket-wheel 63, (see Figs. I and II,) which is geared, as by a sprocket-chain 64 and suitable intermeshing wheels, to the shaft 65 of a feed-roller 66. 68 indicates a pinion upon the shaft 65, which, as by a chain 69, drives a wheel 70 upon a shaft 71, a pinion 72 on which communicates motion through a chain 74 to a sprocket 75 upon the shaft 76 of the drying-roller 37. A chain 78 communicates motion from a wheel 79 upon the shaft 76 to a wheel 80, that drives a gear 90, meshing with a gear 91 upon the shaft 26 of the drying-cylinder 25.

The sprocket-chain 62, meshing with a wheel 95 upon the shaft 96, communicates motion through a pair of sprocket-wheels 97 and 98 to chains 99 and 100, respectively. The chain 100 is operatively connected with the driving mechanism of the sizing-machine 7, as diagrammatically indicated. The chain 99 drives a shaft 101, which in turn through suitable belt and pulley connections drives the rollers 32 and 33 and the take-up roll 34 at the required uniform rate of speed.

The driving mechanism of the apparatus as above described has each of its several parts so timed as to communicate with every rotating member adapted to impart motion to the warp and backing-cloth when they are united and when they are separated from each other at a uniform rate of speed, so that there is nowhere exerted upon either the warp or the backing-cloth either an acceleration, weight, or drag which tends in the least to disturb the relations of the threads in the warp or of the

figures of the design after they are printed upon the warp.

The details of the condensing-reed 5 and its means of operation for effecting the condensing function are illustrated in detail in Figs. III to VI, inclusive, of the drawings. Referring thereto, the reed 5 is mounted in a frame 105, longitudinally movable, as by means of an endless screw 106, mounted in the head 107 of a supporting-bar 108. The frame 105 is secured, as by terminally-threaded studs 109, which, working in longitudinal slots provided for them, respectively, in the bar 108, are provided underneath the bar, respectively, with wing-nuts 110, by which when the position of the frame 105 is adjusted with repect to the bar through manipulation of the screw 106 the frame may be securely fixed in place.

The bar 108 is provided near its opposite extremities with swivel-eyelets 111, through which pass the respective side bars 112 of a supporting-frame. The side bars 112 being parallel and the eyelets 111 being free to turn, it is obvious that the reed in its frame 105 may be within certain limits brought to any required angle, as will appear upon comparison of Figs. III and IV. Each of the eyelets is secured to the supporting-bar 108, as by a stud-bolt 113, which carries upon its threaded extremity a wing-nut 114. By this means whenever the position of the reed is fixed it may be secured in that position by turning the nut 114 and drawing the eyelets 111 fixedly against the bottom of the bar 108. The operation of the reed 5 as a condenser is accomplished by setting it in a position oblique to the side bars 112. When the reed is at right angles to the side bars, the extreme lateral threads 115 and 116 of a warp are at their extreme limit of separation. If the reed be moved to an oblique position, the threads 115 and 116 will be drawn somewhat closer together and the spaces between all of the intermediate threads will be correspondingly and distributively lessened. It is obvious, therefore, that within the limits of adjustment of the reed the width of a warp passing through its dents may be varied at will and without interrupting the operation of the apparatus. By this means the number of warp-threads presented to a given surface of the printing-roll may be readily varied for the purpose specified.

The operation of the apparatus as a whole having been described in the specification of its functions and mechanical structure and the operation of the condensing-reed having been pointed out more in detail, further description of the operation to one skilled in the art appears to be unnecessary.

What we claim is—

The method of treating warps herein described, which consists in communicating to a warp motion at a uniform rate of speed from beam to beam, moistening, printing and drying the same, and in varying at will the presentation of the warp to the printing-roller, by condensing or expanding the spaces between the warp-threads comprising the warp.

In testimony of all which we have hereunto subscribed our names.

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CHARLES W. DENNETT.

Witnesses:
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