No. 789,786. PATENTED MAY 16, 1905.

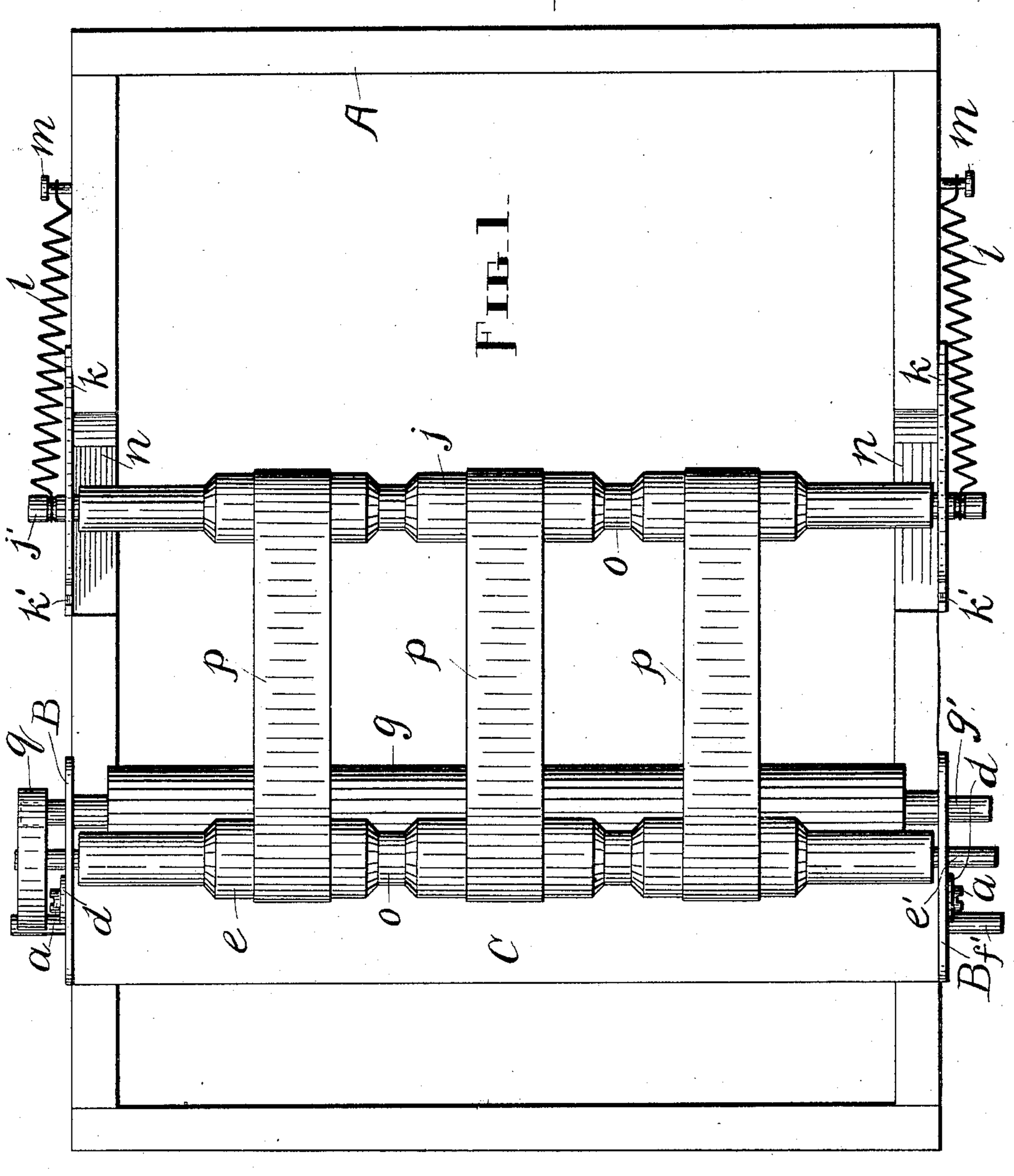
C. J. BELLAMY.

WINDING AND FEEDING MECHANISM.

APPLICATION FILED OCT. 28, 1903.

4 SHEETS—SHEET 1.

FIG. 1



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4 SHEETS—SHEET 2.

FIG. 2.

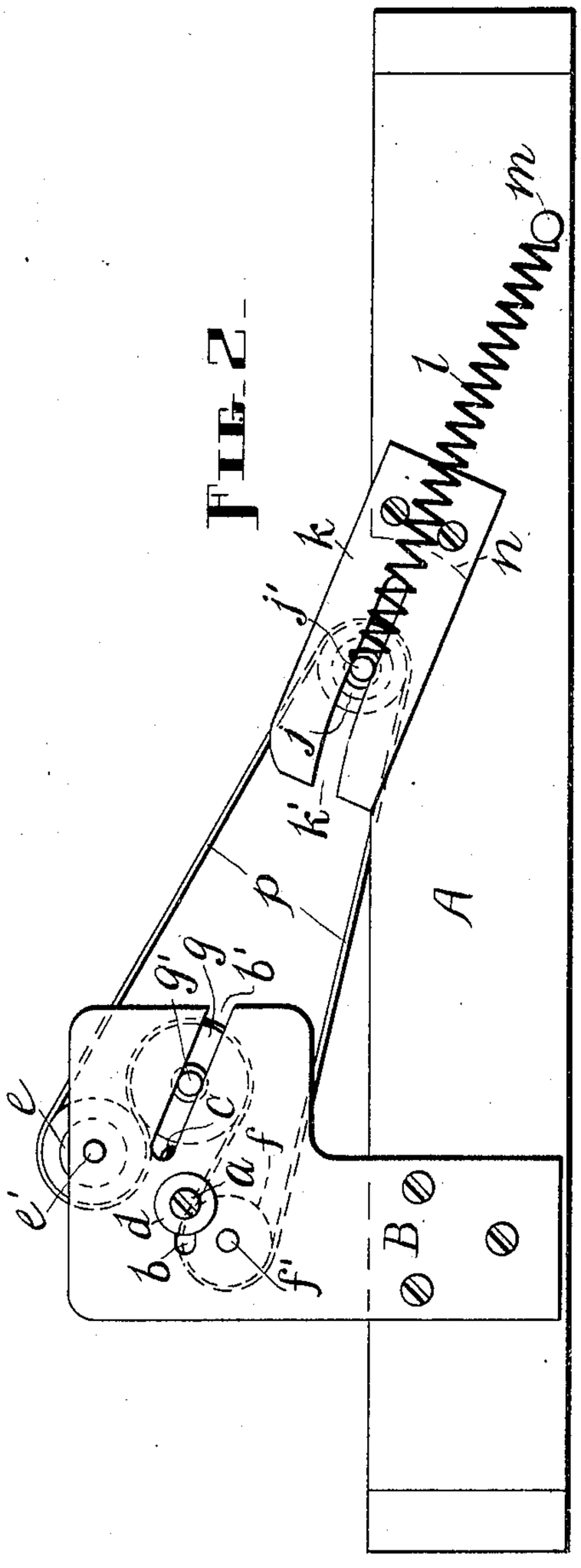
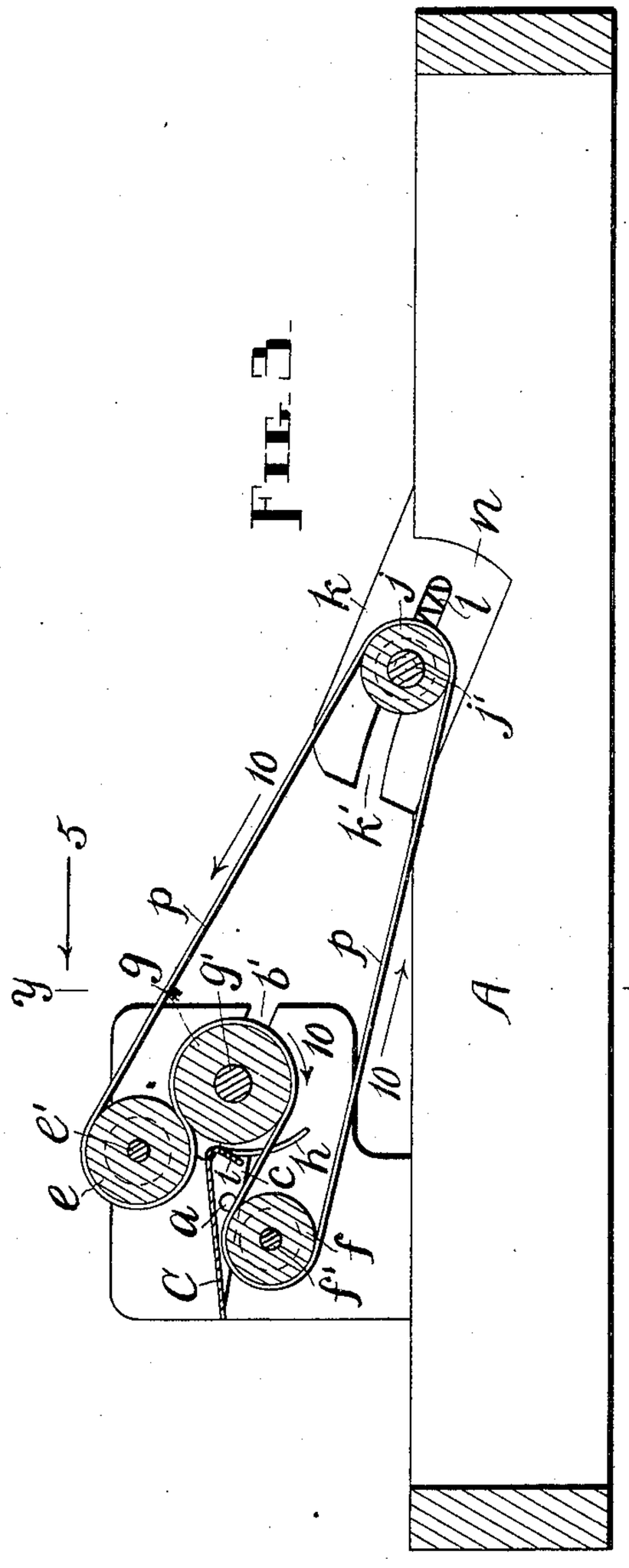


FIG. 3.



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4 SHEETS—SHEET 3.

FIG. 4.

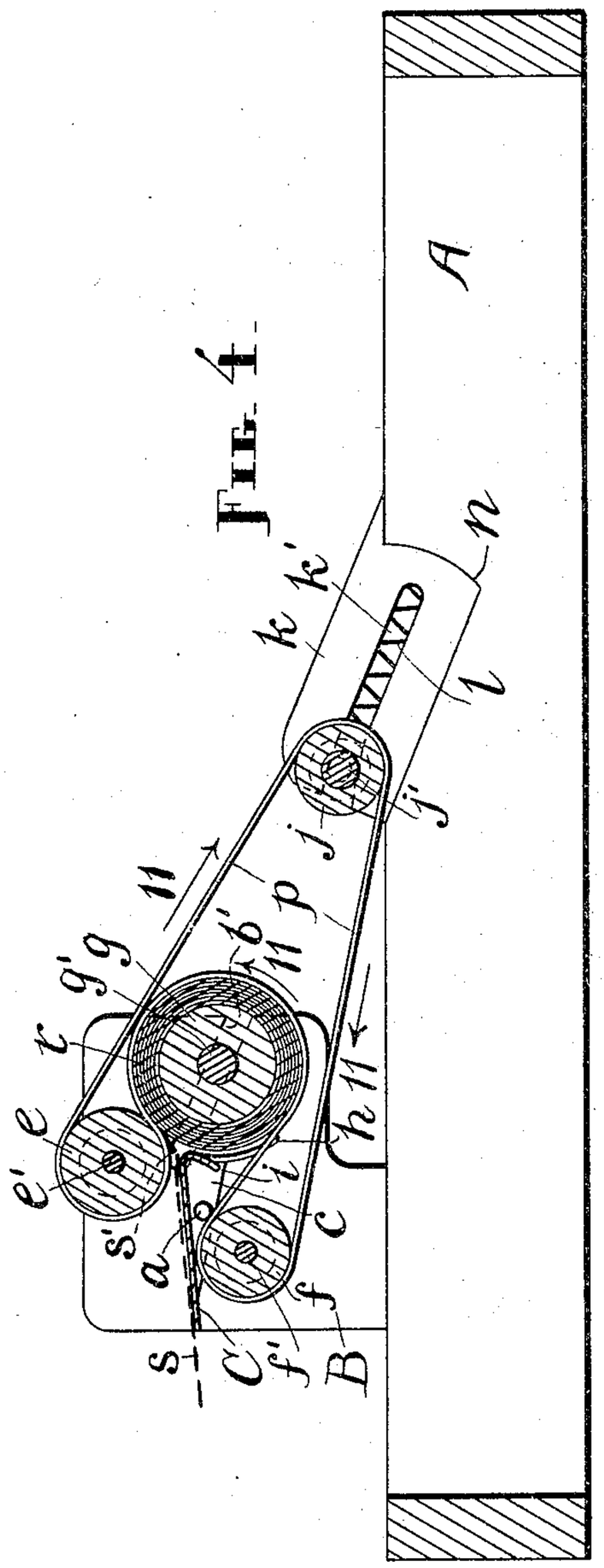
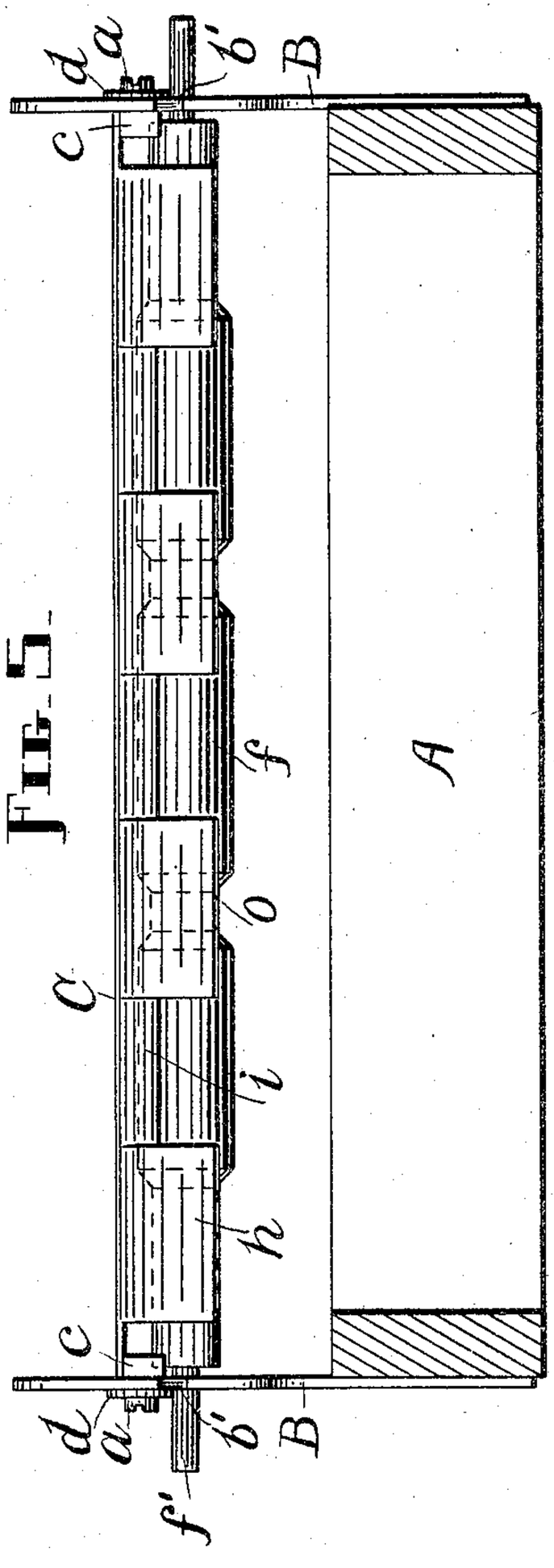


FIG. 5.



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4 SHEETS—SHEET 4.

FIG. 6.

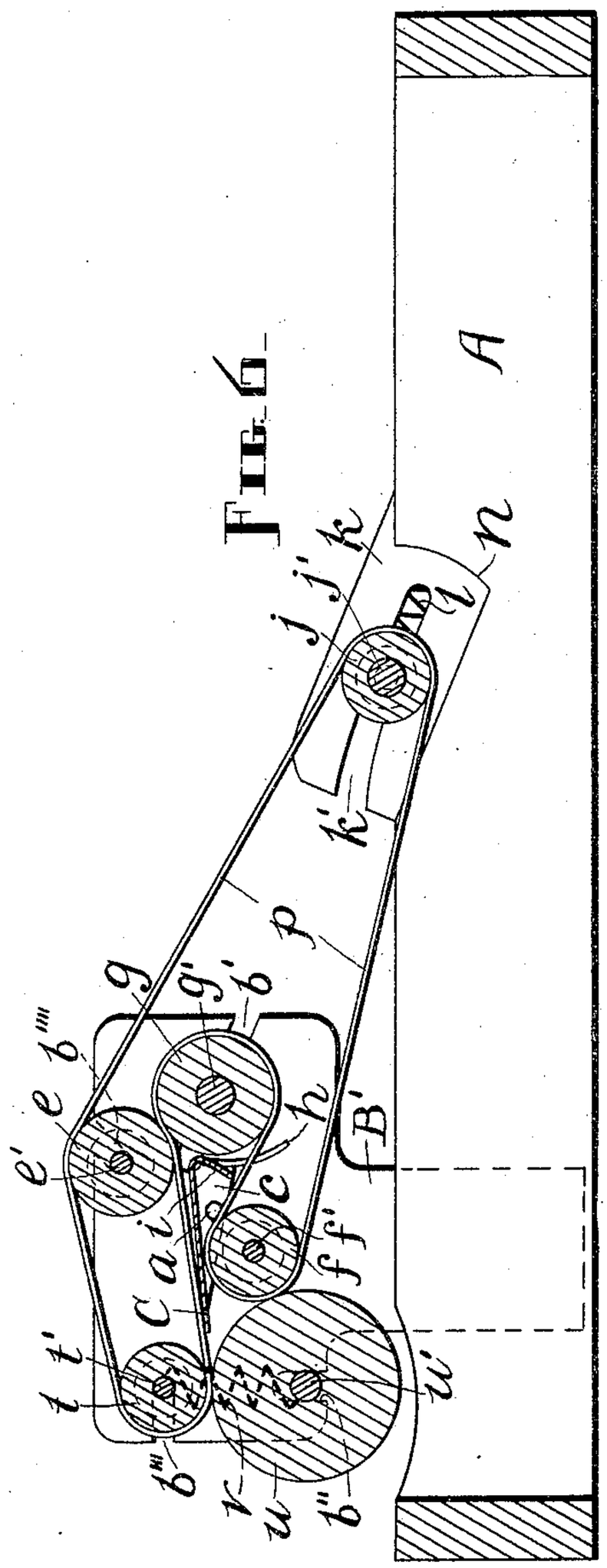


FIG. 8.

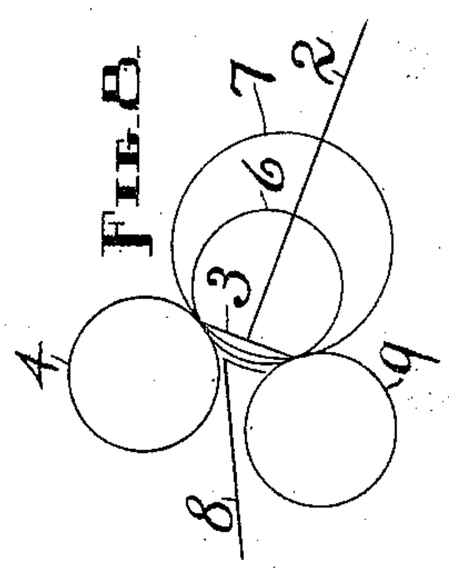
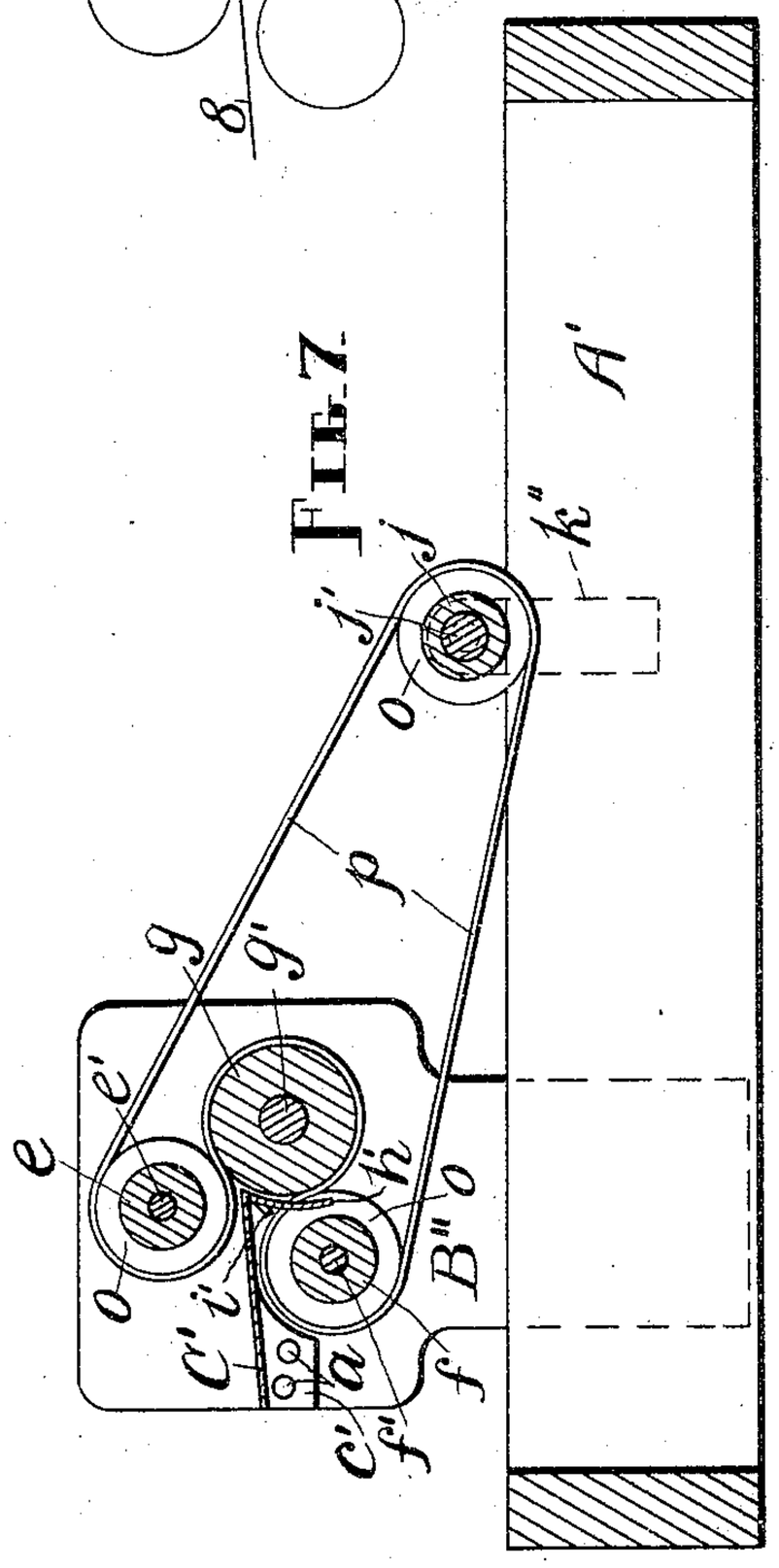


FIG. 7.



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No. 789,786. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

CHARLES J. BELLAMY, OF SPRINGFIELD, MASSACHUSETTS.

WINDING AND FEEDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 789,786, dated May 16, 1905.

Application filed October 28, 1903. Serial No. 178,814.

To all whom it may concern:

Be it known that I, CHARLES J. BELLAMY, a citizen of the United States of America, residing at Springfield, in the county of Hampden and Commonwealth of Massachusetts, have invented a new and useful Winding and Feeding Mechanism, of which the following is a specification.

My invention relates to improvements in mechanism for winding and feeding paper, cloth, and other kinds of fabric in which are employed a core upon which the fabric is adapted to be wound and from which the same fabric is adapted to be afterward fed, a plurality of tape-supporting members and the tape supported thereby, with certain other parts and members, all as hereinafter set forth; and the objects of my improvement are to provide mechanism both for winding paper, cloth, and other varieties of fabric upon a core and for feeding the same from the core as desired. Such mechanism as this is adapted to successfully and conveniently handle paper, cloth, and other varieties of fabric either in web or short lengths, either in sheets or strips in sequence, or can be satisfactorily employed to handle short lengths in conjunction with a continuous web or short lengths in double thickness or two webs. Heretofore in particular much difficulty has been experienced in attempting to roll together separate or independent sheets of paper so that they could be properly unrolled in sequence. With my mechanism I am able not only to wind up the separate sheets in sequence, but to deliver them thereafter in like manner. In winding, the sheet or strip is pushed into the bite formed by the actuating-roller or the tape supported thereby and another coacting member by which said sheet or strip is drawn into the device. Feeding is done either by directly actuating the tape-supporting members, the action of which is reversed from what it is in winding, or by pulling upon the exposed end of the last sheet or strip wound on the core. The preferred method of feeding depends upon the use to which the sheets are to be put and the nature of the force available for actuating them.

A further object of my invention is to provide practicable, efficient, and comparatively simple mechanism which is capable of accomplishing the above-noted results.

I attain these objects by the means illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a preferred form of my mechanism free from such attachments or connections as might be adapted to facilitate the intake and delivery under certain conditions and for certain uses; Fig. 2, a side view of the same; Fig. 3, a longitudinal vertical section on lines *x x*, Fig. 1, looking in the direction of the arrow; Fig. 4, a similar sectional view showing a core with paper wound thereon and the course of the paper-sheets to or from said core; Fig. 5, a transverse section on lines *y y*, Fig. 3, looking in the direction of the arrow 5, all of the rollers with one exception being omitted; Fig. 6, a longitudinal vertical section showing an adaptation of the device by setting an actuating-roller away from the mechanism shown in the preceding views in conjunction with an idler for use in connection with certain other machines; Fig. 7, a longitudinal vertical section showing a modification of the device in which axial bearings for the core are dispensed with and certain other changes made; and Fig. 8, a diagram illustrating the method of locating the path of the axis of the core, either with or without fabric thereon, in its movable bearings.

Similar letters refer to similar parts throughout the several views.

The end of the device into which paper is taken or at which paper is delivered is herein termed the "working" or "front" end, the same being the left-hand end of Figs. 1, 2, 3, 4, 6, and 7, and this is to be kept in view in the following description, so that no confusion may arise as to the relative position or location of certain of the members.

As a convenient support for the rotary and other parts which enter intimately into the new construction a frame A or A′ may be provided from the sides of which near one end rise side pieces or upright supports B, B′, or B″. A guide C or C′ extends between the supports, to which it is securely fastened by

screws *a*. A slot *b*, Fig. 2, is cut in each support B or B′ to receive one of the screws *a*, which passes through said slot into threaded engagement with an ear *c*, depending from the adjacent end of the guide C, one such ear being provided at each end of said guide, and by this means the guide may be properly adjusted. Washers *d* are introduced between the heads of the screws *a* and the sides of the supports. The guide C′ may be attached by its ears *c*′ to each support B″ in a similar manner to that just described.

Referring now more particularly to the first five figures, it will be observed that two rollers *e* and *f* and a third roller or core *g* for the paper or other fabric have their trunnions or the ends of their shafts *e*′, *f*′, and *g*′, respectively, journaled in the supports B, the shaft *g*′ being received in slots *b*′ in said supports, while the shafts *e*′ and *f*′ have stationary bearings therein. The slots *b*′ extend forward and upward from the rear edges of the supports B. The roller *f* is located directly below the guide C.

The rear edge of the guide C is close to the core *g*, back of which fingers *h* and *i* depend from said edge, the fingers *h* being longer than the fingers *i*. The fingers *h* after curving slightly forward have a general inclination to the rear, while the direction of the fingers *i* is forward. The object of this peculiarly-constructed guide will be fully set forth hereinafter.

A tension-roller *j* has its trunnions or the ends of its shaft *j*″ journaled in brackets *k k*, securely attached to the sides of the frame A back of the supports, each of said brackets having a slot *k*′ therein for said shaft *j*″. Springs *l l* extend between the outer ends of the shaft *j*″ and pins *m m*, driven into the sides of the frame. The front ends of the springs *l* comprise the principal bearings for the shaft *j*″, while the brackets *k* serve more in the capacity of guides. The sides of the frame A are cut away, as shown at *n*, to accommodate the tension-roller *j*.

The rollers *e*, *f*, and *j* by preference have a plurality of annular grooves *o* to divide each into as many annular ridges as there are tapes *p*, which are adapted to run on said ridges. This construction not only renders the rollers lighter, but enhances the ease and smoothness with which the device works, because there is less liability of the fabric being wound or fed to catch upon the rollers.

I have shown three endless tapes *p*, although the number may be greater or less, arranged side by side on their supporting-rollers, said tapes passing between the fingers *h*, where they intersect the plane of the tapes. These tapes are supported on the raised portions of the rollers *e*, *f*, and *j*, as hereinbefore stated, which they encompass, and are so arranged that in passing from the roller *e* to the roller *f* they partially embrace the core *g* or the material thereon. In other words, the aforesaid rollers support and are encircled by a series of parallel tapes, the rollers *e* and *f* forming approximately the base of a triangle and the roller *j* the apex thereof, while the core *g* or the material wound thereon is pushed into the slack between said rollers *e* and *f* and held there. Then owing to the influence of the springs *l* on the roller *j* or because the tapes *p* tighten on account of their own elasticity said tapes must always hold the core and the material thereon, if any, in a partial but effective embrace, controlling the varying periphery thereof as long as limits are fixed beyond which said periphery cannot be forced. This arrangement of tape-supporting rollers accomplishes two purposes: First, it secures simultaneous movement of all rollers, and, second, it furnishes the means for successfully manipulating the core and various thicknesses of fabric thereon, the latter being an absolutely essential feature in a device of this kind.

The slot *b*′ represents the path of the axis of the core, the method of fixing which is one of the most essential features of my invention. While it is not necessary that the slot should be employed for movable bearings, nor yet essential that the core should have any axial bearings whatsoever, as will presently appear, it is to be observed that the path of said movable bearings, if such be employed, or of the imaginary axis of the core in any case, must be definitely fixed if the best results are to be obtained. The proposition is a geometrical one and is explained below.

In order that the tape shall always be tight in its partial embrace of the core or fabric wound thereon, the periphery of said core, with or without its fabric, must not only have a line of contact on the roller *e* or the tape supported thereby, but must find resistance on some other line parallel to that, such as is afforded by the lower roller or the tape supported thereby in the arrangement shown in Figs. 7 and 8 or such as is established by the bearings provided by the slots *b*′, Fig. 3. In either and in any case the rule by which the relation of the path of the axis and the lines of resistance referred to is established as follows: The plane of said path represented by the line 2 in Fig. 8 should be perpendicular to the plane represented by the line 3, connecting the two aforesaid parallel lines of resistance and equidistant from said lines.

Returning now to a consideration of the operation of the mechanism, which can be best understood by the study of Fig. 3, and assuming that it is desired to form a roll of independent sheets of paper, the operation is as follows: Actuate the mechanism by means of a hand-wheel or pulley *q* on one end of the shaft *e*′ so that the tapes *p* travel in the direction of the arrows 10, Fig. 3, and insert

the end of a sheet of paper in the bite formed by said tapes and the core *g*. The sheet is immediately wound onto the core *g* by the tapes *p*. Before the sheet has entirely disappeared between the roller *e* and core *g* the head or top of a second sheet is inserted between such roller and core or the paper already wound upon the latter above the foot or lower margin of its predecessor. I find it is only by thus lapping the bottom and top margins when winding that unvarying and satisfactory sequence in feed of separate sheets without accompanying web on the inside can be obtained. If butted or if lapped on the inner surface of the leading sheet or strip in process of winding, I attain no sure and constant sequence in feeding, the following sheet or strip being likely to accompany the sheet or strip which should be its predecessor, either coinciding full length therewith or with a varying portion thereof, according to the length of the sheets and the size of the periphery.. By lapping, as explained, I also insure in feeding the succeeding sheets following with just the same amount of lap which they had in winding; but to return to the specific description of the mechanical operation, the second sheet follows the first, a third follows the second, and as many more as are required to make up the roll. As the paper accumulates on the core *g* said core is pushed away from the roller *e*, the shaft *g'* moving rearwardly in the slots *b'*, and more of the back reaches of the tapes *p* is required and used to confine the accumulation of paper, thereby shortening the length of the laps behind the paper-holding core, the tension-roller *j* being drawn forward against the resiliency of the springs *l*. In Fig. 4 the changed positions due to the presence of a substantially full paper-roll *r* of the core *g* and the roller *j* are shown. In passing around the core *g* the head of the sheet after leaving the tapes encounters the long guide-fingers *h* and is thereby directed upward between another portion of the paper and the core again or the paper already wound thereon. The short guide-fingers *i* are adapted to prevent portions of the head of a sheet in its circuitous course from catching on the guide, as it would be very liable to do in the absence of said fingers, and to otherwise direct the course of the paper.

To feed the paper from the device or unwind it from the roll *r* on the core *g*, actuate the mechanism so that the tapes *p* shall travel in the direction indicated by the arrows 11, Fig. 4, or draw out one sheet after another by pulling upon an exposed end. The broken lines *s* and *s'* in Fig. 4 represent adjacent and lapped ends of two sheets, by which it will be observed that before one sheet is clear of the roll *r* and the roller *e* or of the portions of the tapes *p* which pass beneath said roller the end of another sheet becomes exposed or brought into position where it can be readily seized with the fingers and thumb of the operator, since the sheets always feed with the same lap given them in winding. As the size of the roll *r* diminishes the core *g* and roller *j* move away from each other, because the springs *l* always keep the tapes tight.

From the foregoing the complete operation of the mechanism will be understood, and it will be seen, furthermore, that continuous strips either singly or in plurality may be handled, as well as a line of independent sheets, or such a line of sheets together with a continuous strip. In short, various combinations of sheets or strips or sheets and strips may be successfully manipulated by my mechanism. Renewed attention is called to the fact that although I have described the mechanism as being used in winding or feeding paper it is applicable as well to many other kinds of fabric for which, as in the case of paper, it will be found useful both for webs and short lengths or for the two together, one over the other, to be wound upon or fed from the same core.

In Fig. 6 the support B' by preference is provided with three other slots in addition to the inclined slot *b'* and one for the screw *a*, which is similar to what is shown at *b* in Fig. 2, such additional slots being designated and located as follows: *b''*, extending vertically upward from the bottom edge of a forward projection of the support; *b'''*, extending horizontally rearward from the front edge of the support near the top, and *b''''*, extending downward and forward from the upper edge for the shaft *e'*. In addition to the rollers *e* and *f* and the core *g* there is a roller *t*, which has a trunnion on the end of its shaft *t'*, received into the support-slot *b'''*, and a roller *u*, which has a trunnion on the end of its shaft *u'*, received into the support-slot *b''*. The roller *u*, which receives its rotary motion by frictional contact with the roller *t* (said roller *t* in this case becoming the actuating-roller) and with the roller *f* or with the tapes *p* thereon and acts directly on the fabric when it enters or leaves the device, is tensioned toward said rollers *t* and *f* by a spring *v*, extending between the ends of the shafts *t'* and *u'* outside of the support B', (one such spring being provided at each side of the device,) or tension may be applied to said roller *u* in any other convenient manner. The slot *b''* permits vertical play on the part of the roller *u*, which latter is in reality an idler for the purpose just stated, and said slot also admits of the convenient removal of the shaft *u'* from the support B'. The tapes *p* include, as before intimated, the actuating-roller *t* in their circuit and normally hold said roller, with its shaft *t'*, against the rear end of each slot *b'''*. The slot *b'''* enables the roller *t* to be easily removed or replaced. The guide C is used as before, its front edge coming quite close

to the idler *u*. The tension-roller *j* and associated parts are also duplicated in the present instance.

The operation of the Fig. 6 construction is very similar to that already described in connection with the preceding views, except that the paper is first led between the tapes on the roller *t* and the idler *u*, from whence it passes between the guide C and adjacent reach of the tapes *p* to the core *g* in winding or takes a reverse direction in feeding. The overlapping of adjacent ends is done in front of the roller *t* and idler *u* instead of in front of the roller *e* and core *g* when the fabric is being wound, and the first-named rotary members assist in actuating the fabric into the grip of the last-mentioned rotary members, or, conversely, in feeding the new actuating-roller and idler finally deliver the fabric.

Referring now to Fig. 7, it will be noticed that a shorter frame A′ is used and a slightly different support B″. Rollers *e* and *f* have their shafts permanently journaled at each end in a support B″, two of such supports being provided, of course, in this and the preceding construction, as in the one first described. The roller *j* has its shaft *j″* permanently journaled at each end in a bracket *k″*. Here the core *g* has no axial bearings, but is slung between the supports in loops or bends of the tapes *p*, the course of which latter, however, is very similar to that best shown in Fig. 3. In this application of my invention the roller *f* is so located as to enable the core *g* or fabric wound thereon to be drawn by the tapes *p* into contiguity with said roller, as well as with the roller *e*—that is, said core or the fabric bears against both rollers, only the tapes *p* being interposed between. Heretofore the tapes have been of unyielding material; but owing to the fixed position of the roller *j* said tapes must be made of some elastic or partly-elastic material, so as to yield as the diameter of the core *g* is increased by the fabric wound thereon and to contact as said diameter decreases during the feeding process, both winding and feeding being performed in practically the same manner as hereinbefore fully explained. The imaginary axis of the core *g* moves in a plane in all respects similar to the plane of the shaft *g′*, owing to the peculiar arrangement of the parts and the geometrical laws governing the same, as hereinbefore pointed out. The guide C′ has long fingers *h′*, which intersect the tapes as before, said fingers extending into the grooves *o* in the roller *f*, and short fingers *i″* are also employed as before, both these and the fingers *h′* serving the same purposes as the fingers *h* and *i*.

It is obvious that the tapes in the last construction may be made of unyielding material and suitable tension means employed, as in the other cases. So, too, may the tension means last alluded to be omitted and the tapes made of yielding material. Generally, however, it is thought that unyielding tapes and mechanical means for keeping them taut will produce the best results.

I do not wish to be confined or restricted to the exact construction and arrangement herein shown and described, as minor changes therein may be made without departing from the nature of my invention. It is plainly to be seen that the sizes of the different members and shapes of some of them will vary under different circumstances, both actual and relative, and that they may be differently mounted. Especially will numerous forms of resilient or yielding bearings for the back roller readily occur to those skilled in the art, so that I do not wish to be limited to the particular form shown. Moreover, the rotary members may be actuated by applying power elsewhere than to the rollers *e* and *t*. For instance, in all of the cases illustrated there is no reason why the roller *f* should not become the actuating medium, if desired. Different forms of guide may be used, or sometimes the guide may be dispensed with, or perhaps the fingers will be found to be unnecessary, especially where the mechanism shall be used only for feeding, and there would often be no harm done under many conditions if the rear edge of the guide lightly touched the periphery of the fabric-roll. Again, where used only for winding, as at a paper or fabric factory, the guide need not be so close to the face of the core or fabric thereon as when feeding is also to be done from the same mechanism. Occasionally more tape-supporting members than I have shown may be required to keep the highest and lowest reaches of tape from rubbing on intermediate parts of the tape where they pass over and under the fabric-roll; but it will be readily seen how these additional members can be easily supplied. It should also be added that while I believe the position of the mechanism with the so-called "actuating-roller" above the guide is better for winding fabric on the core, since the proper lapping of the top and bottom margins of the fabric is thus more conveniently done, I think it will be very advantageous to adopt an inverted position of the entire device when the mechanism is used chiefly for feeding, because then the fed sheet can be bent down over the actuating-roller, thus taking out much or all of the curl which it has perhaps acquired by being wound on the core, especially if a small core be employed. When a large core is used, the curl will be perhaps quite unobjectionable.

Certain of the tape-supporting members which are herein shown and described as rollers having rotary motion need not always have such motion nor be of roller formation, but may consist of stationary parts of some other suitable formation.

Instead of extending the long guide-fingers

from the edge of a guide they may be separate and distinct from the latter and projected upward from below into proper position or otherwise located, and the guide itself may even be omitted in such case.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In fabric winding and feeding mechanism the combination of a plurality of tape-supporting members, two of which are in fixed bearings and one of which is in movable bearings, and the last-named spring tensioned away from the other said members, means to so tension said member in shifting bearings, a member of varying diameter in movable bearings, and partially embraced by the tape in the reach between two said supporting members in fixed bearings.

2. In fabric winding and feeding mechanism, the combination with a member of varying diameter, of a plurality of tape-supporting members and tape adapted to be supported thereby, said tape-supporting members being so arranged that in passing from one to another said tape partially embraces said member of varying diameter, and a guide having one edge adjacent the exposed portion of said member of varying diameter.

3. In fabric winding and feeding mechanism, the combination with a member of varying diameter, of a plurality of tape-supporting members and tape adapted to be supported thereby, said tape-supporting members being so arranged that in passing from one to another said tape partially embraces said member of varying diameter, and fingers adjacent the member of varying diameter and intersecting one of the planes of the tape.

4. In fabric winding and feeding mechanism, the combination with a member of varying diameter, of a plurality of tape-supporting members and tape adapted to be supported thereby, said tape-supporting members being so arranged that in passing from one to another said tape partially embraces said member of varying diameter, a guide having one edge adjacent the exposed portion of said member of varying diameter, and fingers adjacent the member of varying diameter and intersecting one of the planes of the tape.

5. In fabric winding and feeding mechanism, the combination with a plurality of tape-supporting members and the tape supported thereby, and a member of varying diameter partially embraced by said tape, of a guide having an edge adjacent the arc of said member of varying diameter not embraced by the tape, fingers extending adjacent such arc and curved approximately thereto and intersecting the course of the tape between said member of varying diameter and a supporting member, and other fingers located between the first-mentioned fingers.

6. In fabric winding and feeding mechanism the combination of a plurality of tape-supporting members, two of which are in fixed bearings, and the tape supported thereby, and a member of varying diameter, in movable bearings and partially embraced by the tape in the reach between two supporting members in fixed bearings, which said member of varying diameter contacts with one only of the said fixed members or the intervening tape.

7. In fabric supporting and feeding mechanism the combination of a plurality of tape-supporting members and the tape supported thereby, and a core with fabric thereon in separate detachments, a portion of each preceding detachment, in order of feeding, lapping upon the exterior surface of the next succeeding detachment, said tape-supporting members being so arranged that in passing from one supporting member to another the tape partially embraces said fabric in separate detachments upon said core.

8. In fabric winding and feeding mechanism the combination of tape-supporting members at least four in number, three of which are in fixed bearings, and the tape supported thereby, another member of varying diameter in movable bearings and partially embraced by the tape in the reach between two of said fixed tape-supporting members, and a shiftingly-journaled rotary member outside the tape-circuit but tensioned against one of said fixed tape-supporting members or the intervening tape.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES J. BELLAMY.

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STEPHEN S. TAFT, Jr.