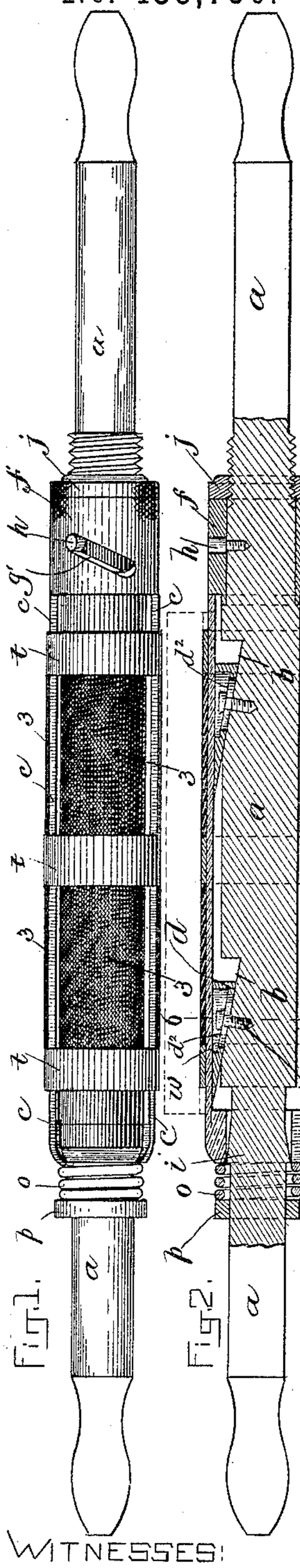
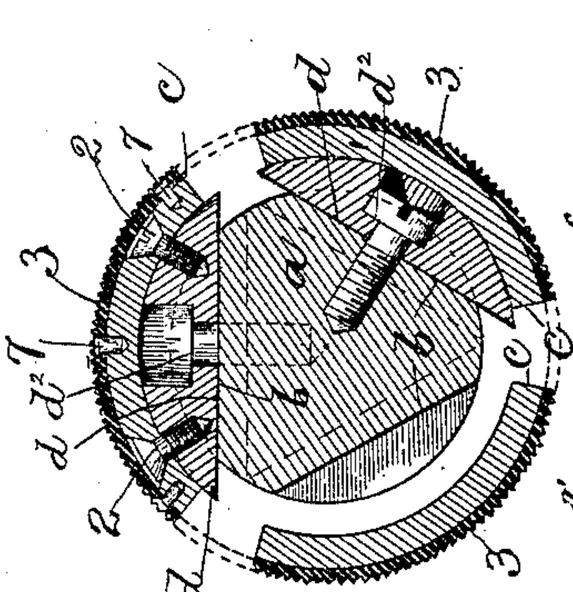
(No Model.) 2 Sheets—Sheet 1.

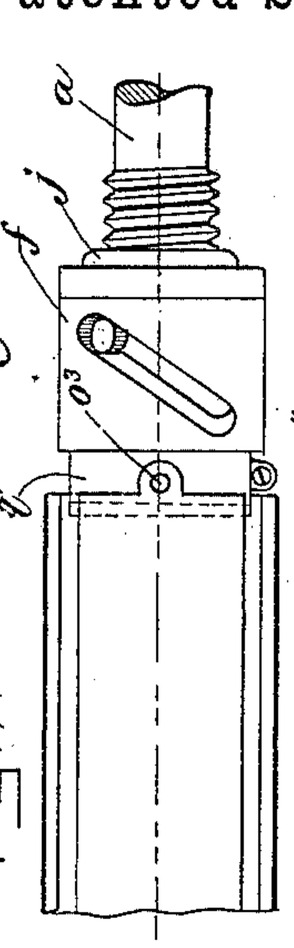
T. J. LEAHY.

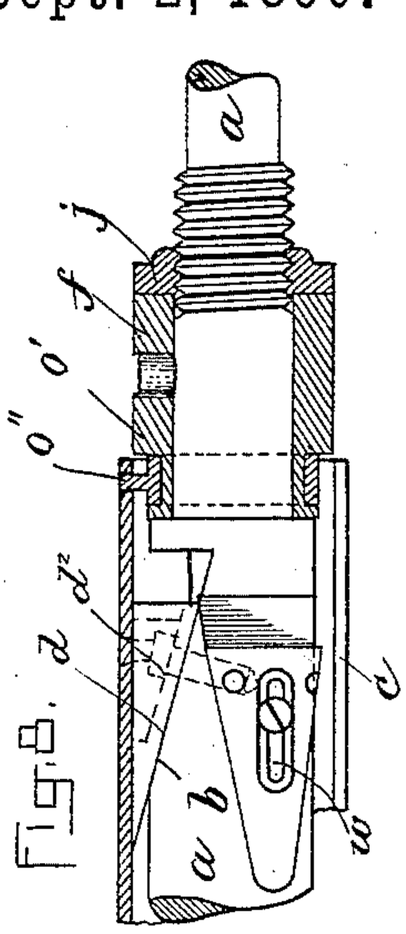
EXPANDING CORE OR MANDREL.

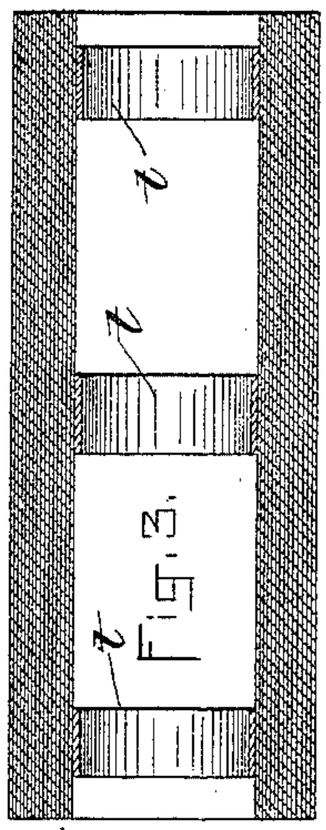
No. 435,756. Patented Sept. 2, 1890.

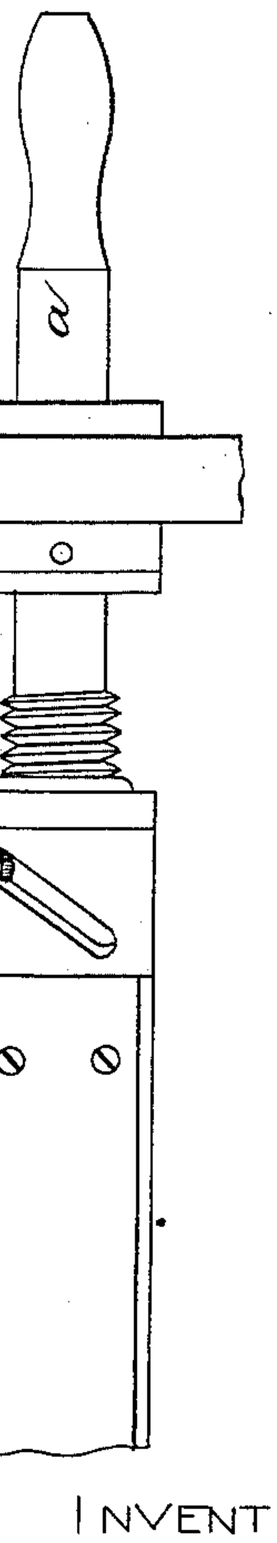


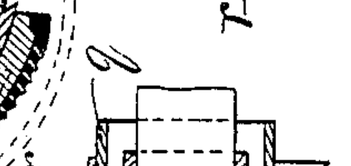












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(No Model.) 2 Sheets—Sheet 2.

T. J. LEAHY.

EXPANDING CORE OR MANDREL.

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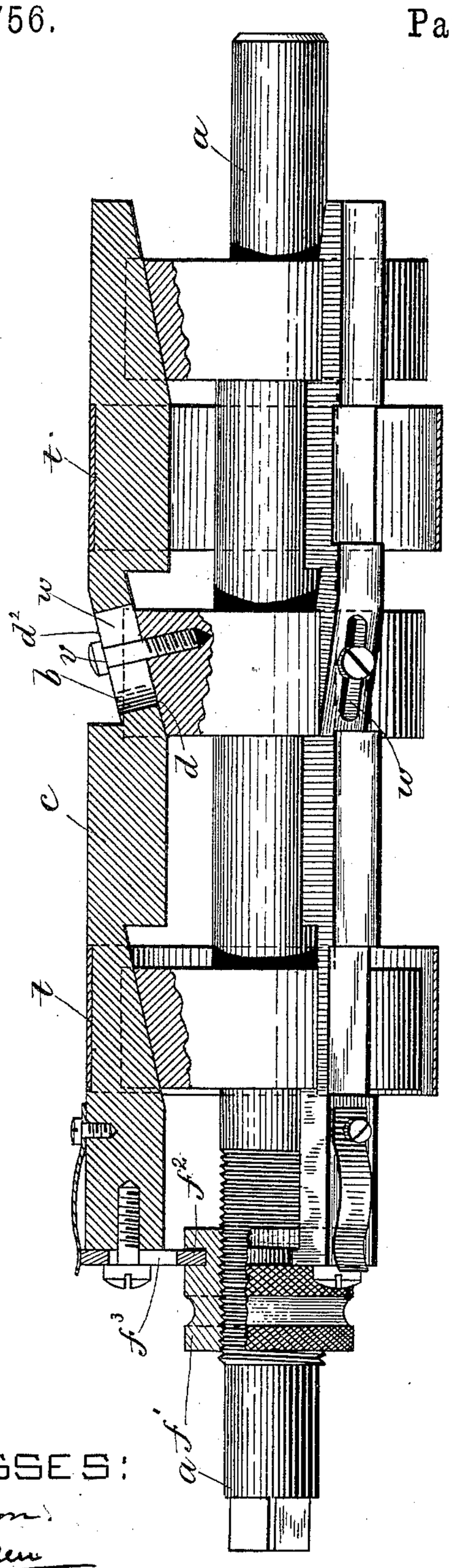
Fig. 2.



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UNITED STATES PATENT OFFICE.

TIMOTHY J. LEAHY, OF NORTH ANDOVER, MASSACHUSETTS.

EXPANDING CORE OR MANDREL.

SPECIFICATION forming part of Letters Patent No. 435,756, dated September 2, 1890.

Application filed February 6, 1890. Serial No. 339,484. (No model.)

To all whom it may concern:

Be it known that I, TIMOTHY J. LEAHY, of North Andover, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Expanding Cores or Mandrels, of which the following is a specification.

This invention has for its object to provide a simple and durable core or mandrel to support a web of paper or other like material while it is being rolled and unrolled and adapted to be readily contracted for removal from the web which has been rolled upon it and as readily expanded to hold the web which is to be unrolled.

The invention consists, first, in the combination, with an expanding core or mandrel having a series of radially-movable bars, of a series of loose rings having their internal surfaces formed to bear on said bars when the mandrel is expanded, whereby said rings may be engaged with the mandrel by its expansion and supported while a roll of paper is being wound upon them and disengaged from the mandrel by its contraction, so that the mandlel may be withdrawn from the rings, leaving them in the roll.

The invention also consists in certain details of construction and combinations of parts, all of which I will now proceed to describe and claim.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a core or mandrel embodying my invention, the bars thereof being expanded or forced outwardly and engaged with the short tube sections or rings. Fig. 2 represents a longitudinal section of the same. Fig. 3 represents the longitudinal section of a roll of paper supported by the tube sections or rings and removed from the mandrel. Fig. 4 represents a longitudinal section of the core or mandrel in a contracted condition and prepared for removal from the rings and the web of paper rolled thereon. Fig. 5 represents the section on line 5 5, Fig. 4. Fig. 6 represents the section on line 6 6, Fig. 2. Fig. 7 represents a side view, and Fig. 8 a sectional view, of a modification. Fig. 9 represents an end view of the core or mandrel, showing a pulley applied thereto and a brake co-operating with said pulley to retard the rotation of the mandrel when the web is being unwound. Fig. 10 represents the section on line 10 10 of Fig. 9. Fig. 11 represents a side elevation of the mandrel with the pulley and brake shown in Fig. 9. Fig. 12 represents a side elevation and partial section of another modification.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents the central shaft, which is provided with a series of inclined seats *b*, preferably formed by cutting away portions of the periphery of the shaft.

c c c represent the bars, which are provided on their inner sides with inclined flat faces *d*. Said faces are preferably the inner sides of wedge-shaped blocks, bearing the seats *b* and having segmental outer surfaces, which when said blocks are in the position shown in Figs. 4 and 5, are continuations of the periphery of the shaft *a*. The faces *d d* are adapted to slide upon the seats *b b* lengthwise of the shaft *a*, and are held in engagement with said shaft by means of studs or screws *v*, which pass through longitudinal slots *w* in the faces *d*, as shown in Figs. 2, 4, 5, and 6. Enlarged cavities are formed in the outer surfaces of the faces *d* to receive the heads of the screws *v*. The bars are provided with inclined outer faces d^2, which are parallel with the faces *d*. The heads of the studs or screws *v* bear on the outer faces d^2 and prevent the separation of the bars from the shaft.

f represents a collar, which is adapted to rotate upon the cylindrical portion of the shaft *a* at one end of the portion of said shaft in which the seats *b b* are formed. Said ring has a spiral groove, which receives the stud or screw *h* affixed to the shaft *a*. When the ring *f* is rotated, the engagement of the stud *h* with its spiral slot causes the ring to move endwise upon the shaft *a*. The inner end of the ring *f* bears upon the ends of the bars *c*, and when said ring is moved in the direction indicated by arrow in Fig. 2 it moves said bars in the same direction and causes the faces *d*, riding on the seat *b*, to force the bars outwardly from the position shown in Fig. 5 to that shown in Fig. 6, thus expanding or enlarging the supporting-periphery formed by the outer surfaces of said bars.

i represents an inclined or tapering shoulder formed on the shaft *a* and arranged to support the ends of the bars *c* opposite those ends which are in contact with the collar *f*, the bars being offset, as shown in Figs. 2 and 4, so as to bear upon the collar *i*. Said collar has the same inclination as the seats *b b*, so that the ends of the bars bearing on the collar are firmly supported in any position to which they may be moved outwardly from the center of the shaft *a*. The collar *f* is confined upon the shaft *a* by means of a nut *j*, screwed upon the threaded portion of the shaft and bearing against the outer end of the collar *f*.

The bars *c* are provided with recesses in their outer surfaces, formed to engage and prevent endwise movement of a series of rings *t*, which are adapted to be placed upon the core or mandrel when the same is contracted, the rings being then loose upon the mandrel. When the mandrel is expanded, the bars *c* are closely pressed against the inner surfaces of the rings *t*, the thickness of said rings being such that their outer surfaces are flush with the outer surfaces of the bars *c*, as shown in Figs. 1 and 2. The rings being in place upon the expanded mandrel and firmly held thereby, the mandrel is placed in suitable bearings and rotated to wind the web of paper in a roll upon it. I prefer to provide the outer surfaces of the bars *c* between the rings *t* with corrugated coverings 3, which may be of rubber or other yielding material, or of rigid material, such as any suitable metal. The corrugations on said coverings are preferably shaped like the corrugations on the sole of a rubber boot or shoe, and they act to maintain the frictional hold between the paper and the mandrel, so that the rotation of the mandrel will wind the paper upon it without the necessity of gluing the paper to the rings, a practice which would be required if the corrugated coverings 3 were not employed. Said coverings may be detachably secured to the bars *c* by screws 7 or otherwise, and they may be adjusted lengthwise upon the bars so as to permit the rings *t* to be placed in any desired positions, the spaces between the ends of said coverings constituting the grooves which receive the rings *t* and prevent said rings from slipping endwise upon the bars. The number of the coverings 3 may be varied, so as to permit the use of any desired number of rings *t*. After the roll of paper has been formed upon the core or mandrel the latter may be contracted by moving the bars *c* in the opposite direction to that in which they were moved to expand the mandrel. The contracting movement of the bars may be produced by means of a spring *o*, interposed between a collar *p*, affixed to the shaft *a* and the ends of the bars *c*, as shown in Figs. 1 and 2, said spring forcing the bars *c* endwise when the ring or collar *f* is moved outwardly or backwardly. The contracted mandrel is now disengaged from the rings *t*, as shown in Fig. 4, so that it may be withdrawn from the rings, leaving the latter in the rolled web of paper, as shown in Fig. 3.

The roll of paper is supported by the rings *t* sufficiently to permit its transportation to the place where it is to be used. When the paper is to be unwound, another mandrel, constructed as above described, may be inserted in and engaged with the rings *t* and mounted in suitable bearings, so that it may be rotated for the unwinding of the paper. The last-named mandrel may be provided with a pulley *q*, on the periphery of which bears the band *r*, one end of which is attached at *r'* to a fixed support, while the other end has a weight *r''*. Said band acts as a brake to prevent the too free rotation of the mandrel in the unwinding operation. As the pulley *q* becomes worn in time by the friction of the band *r* on it, I prefer to make the periphery of said pulley in a separate piece from the hub *q'* thereof, as shown in Fig. 10, said periphery being attached to said hub by screws or bolts, so that it can be readily removed and replaced by a new one.

My invention is not limited to the collar *f*, with its cam-groove *g'* and the stud *h* co-operating therewith as the means for imparting the expanding movement to the bars *c*, as said movement may be imparted by any other suitable means—for example, a nut *f'*, engaged with the threaded portion of the shaft *a* and having a groove *f''*, receiving lugs f^3, attached to the ends of the bars, as shown in the modification represented in Fig. 12.

Instead of the spring *o* as the means for giving the bars their contracting movement, the said spring may be dispensed with, and the bars may be connected with a loose ring *o'*, fitted with a groove on the collar *f*, and provided with outwardly-projecting studs *o''*, which enter holes in lugs o^3 on the bars *c*, as shown in Figs. 7 and 8. The ring *o'* moves endwise with the collar *f*, but is prevented by its engagement with the bar *c* through the studs or pins *o''* from rotating with said collar. Said studs or pins enable the collar *f* to draw the bars *c* backwardly with it, as will be readily seen. The rings *t t* may be made of strips of metal, each adapted to be detachably connected at its ends, so as to convert it into a ring and disconnected so that the strips may be straightened out and shipped back to the paper-mill in more compact form than would be possible if they retained their ring shape.

It will be seen that by forming a roll of paper upon a series of rings instead of upon a continuous tubular core or mandrel, as heretofore, I not only reduce the weight of the roll, but also decrease the cost of transportation of the parts that internally support the roll when said parts are returned to the paper-mill. It will be seen that the nut *j* may be screwed up against the collar *f* to hold the latter at any position to which it may be moved upon the shaft, and thus rigidly sup-

port the bars in their expanded positions, so that the mandrel cannot be contracted until the nut *j* is turned backwardly.

I do not limit myself to the particular construction of the bars *c* here shown—that is to say, instead of making the faces *d* on said bars in separate pieces secured to the bars by screws, said faces may be formed on integral parts or projections cast or otherwise formed with the bars.

It is obvious that various other changes may be made in the details of construction without departing from the spirit of my invention.

I claim as my invention—

1. The combination, with an expanding core or mandrel having a series of radially-movable bars, of a series of loose rings having their internal surfaces formed to bear on said bars when the mandrel is expanded, whereby said rings may be engaged with the mandrel by its expansion and supported while a roll of paper is being wound upon them and disengaged from the mandrel by its contraction so that the mandrel may be withdrawn from the rings, leaving them in the roll, as set forth.

2. The combination, with an expanding core or mandrel, including a series of radially-movable bars having ring-retaining shoulders on their outer faces, of a series of loose rings each formed to enter the recesses between two of the shoulders of the bars, said rings being of such internal diameter that their inner surfaces bear on all the bars when the mandrel is expanded and are made loose upon said bars when the mandrel is contracted, as set forth.

3. The combination of the central shaft having the inclined seats *b*, the longitudinally-movable bars *c*, having the inclined faces *d*, bearing on said seats, and the coverings 3, applied to the outer surfaces of said bars, the ends of said coverings constituting shoulders adapted to retain loose rings *t*, placed upon the bars, as set forth.

4. The combination of a shaft *a*, having the inclined seats *b* and the peripheral collar *i*, with the bars *c*, having inclined faces *d* bearing on said seats *b*, and offset ends bearing on the collar *i*, as set forth.

5. The combination of the shaft *a*, having the seats *b*, the longitudinally-movable bars *c*, having the inclined faces *d*, means for moving said bars in one direction to expand the mandrel, a fixed shoulder *p* on the shaft at one end of the series of bars, and a spring interposed between said fixed shoulder and the outer ends of said bars and adapted to move the bars longitudinally in the opposite direction to contract the mandrel, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 23d day of January, A. D. 1890.

TIMOTHY J. LEAHY.

Witnesses:

WILLIAM F. KELLEY,

WILBUR E. ROWELL.