F. E. COLE.

COMPENSATING SPOOL.

APPLICATION FILED FEB. 10, 1908.

936,306.

Patented Oct. 12, 1909.

2 SHEETS—SHEET 1.

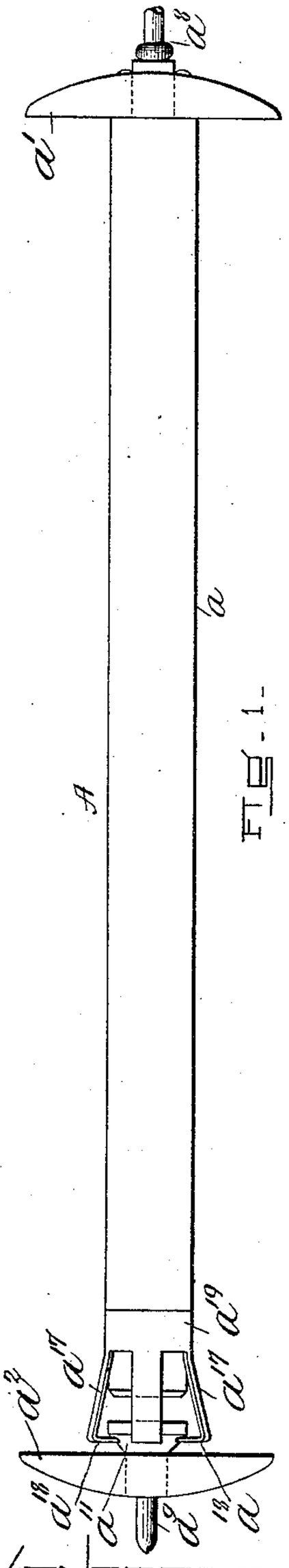

FIG. 1.

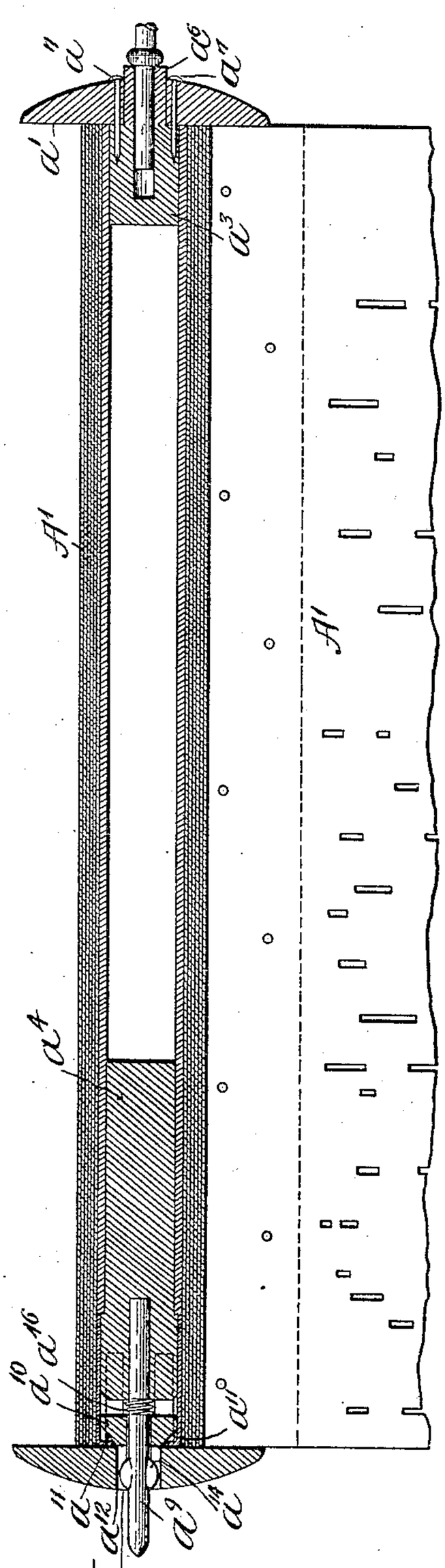

FIG. 2.

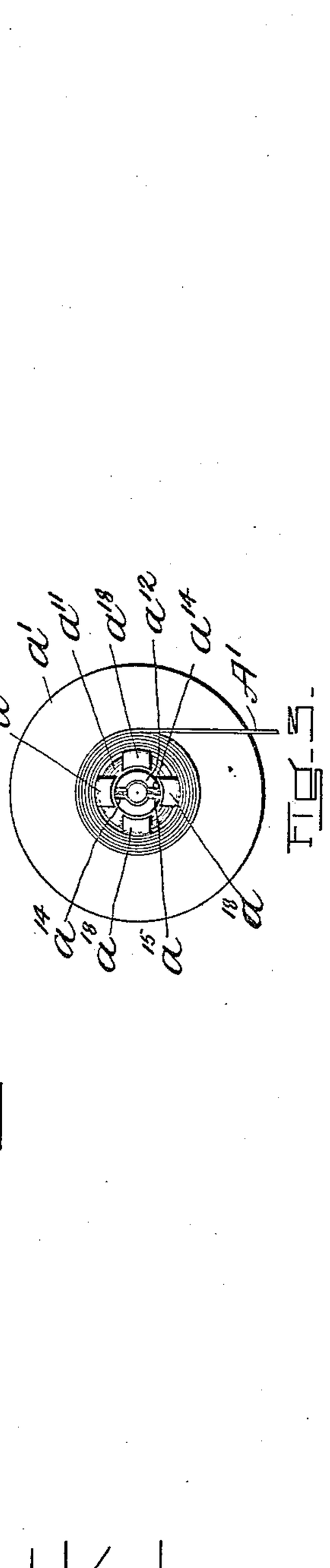

FIG. 3.

WITNESSES

M. E. Flaherty.

D. F. Phillips Jr.

INVENTOR

Frank E. Cole

by his attys

Clarke Raymond & Collins

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

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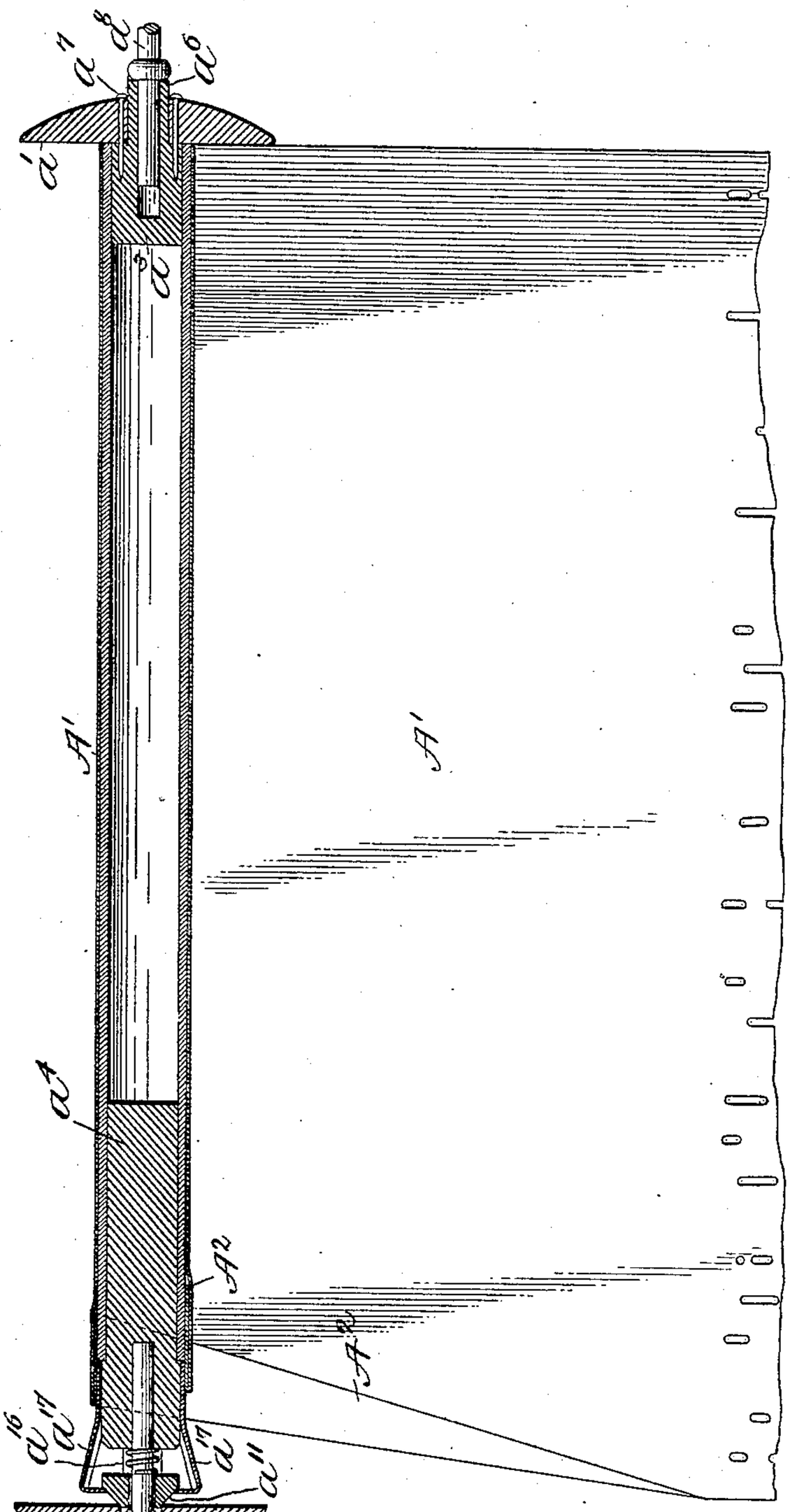

FIG. 4.

WITNESSES:

M. E. Flaherty.

P. F. Phillips Jr.

INVENTOR:

Frank E. Cole

by Wm Allyn

Clarke Raymond & Cowen

ANDREW, B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C

UNITED STATES PATENT OFFICE.

FRANK E. COLE, OF BOSTON, MASSACHUSETTS.

COMPENSATING-SPOOL.

936,306. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed February 10, 1908. Serial No. 415,079.

To all whom it may concern:

Be it known that I, FRANK E. COLE, of Boston, in the county of Suffolk and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Compensating-Spools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

My invention relates to an improvement in compensating spools, and especially to a spool on which is wound a perforated sheet used in musical or other instruments pneumatically actuated. According to its usual mode of operation in these instruments the perforated sheet is borne by one spool, off from which it unrolls to pass over the end of a tracker-board, so called, or other member having wind-channels, and thence onward to be wound upon another or take-up spool. In the normal running of the machine the sheet is retained in such manner that its perforations will properly coincide or track right with respect to the channels of the tracker-board, and such retention is obtained by the flanges of the spools laterally engaging with the sides of the sheet. Owing to uncontrollable inaccuracies in the size of the perforated sheet or to difficulties naturally resulting from its manner of retention the sheet is very likely to become laterally displaced from its normally true position relatively to the tracker-board when its perforations will not track right with respect to the ways or wind-channels in the tracker-board, and the entire instrument accordingly fail to operate properly. This is especially true because the paper comprising the perforated sheet is extremely sensitive to atmospheric conditions, either swelling or contracting from its normal size and proportions, when it will either bear against the flanges of the spool and be displaced thereby when the paper is swollen, or upon contraction of the paper the spool-flanges will become practically inoperative in laterally retaining the sheet to track properly over the channels in the tracker-board. With a perforated sheet thus liable to displacement it was found necessary that some provision be made for adjustably widening the spool between its flanges or, in other words, for adjusting one or both flanges of the spool by which compensation might be made for any inaccuracy or abnormal variation in the paper or sheet and the flanges continue to retain and guide the perforated sheet instead of displacing it from its correct position with respect to the channels in the tracker-board. It is accordingly to an improved means for obtaining an adjustable variation in the distance separating the flanges of the spool that my invention essentially pertains.

The object of my invention is to provide means that may be influenced by the force of pressure obtained by the tightening of the sheet upon the spool for controlling either one or both of its flanges. The advantages to be obtained from providing a spool with such means can best be seen and understood by describing it in detail.

In the drawings:—Figure 1 shows the spool in side elevation. Fig. 2 shows in longitudinal vertical section the spool with a sheet wound thereon. Fig. 3 shows in elevation one end of the spool. Fig. 4 shows in plan a preferred construction of sheet to be used in connection with my improved form of spool.

Referring to the drawings:—A represents the spool having the spindle a and at either end thereof the flanges a^1, a^2.

A^1 represents a perforated sheet wound on the spindle. The spindle is preferably made of paper or pasteboard having the form of a hollow tube and the flanges are supported in the following manner: In the ends of the hollow spindle are inserted plugs a^3, a^4. Projecting outwardly from the plug a^3 is a hub a^6 and upon this hub is mounted the flange a^1 to rest flush up against the end of the hollow spindle. This flange I prefer to be a fixed or stationary flange in distinction from an adjustable one. Accordingly the flange is held fixedly in place by means of nails a^7 extending through the flange and fastening into the end of the plug a^3 on the hub of which the flange is mounted. From the end of the plug a^3 there extends beyond the flange outwardly a pin a^8 and this forms one of the pins by which the spool is mounted in the instrument in which it is adapted to operate. On the other side of the spool, projecting from the end of the plug a^4, there extends a pin a^9 providing a mounting for this end of the spool. The flange a^2 is longitudinally adjustable upon this pin and the pin is made sufficiently long both for the flange to be longitudinally adjustable upon it and also to provide for the reception of a

means for controlling and retaining the flange, as will now be explained. This means comprises a member a^{10} attached to the flange and located to be adjustable upon the pin a^9 between the flange a^2 and the end of the spindle or rather plug a^4 contained in the end thereof. This member is preferably made annular in shape and is provided with a beveled edge a^{11} inclined toward the flange a^2. The member a^{10} may be connected with the flange in any suitable manner. I prefer to form the member with a hub a^{12} through which the pin a^8 extends and upon which the flange a^2 is mounted. In order that both the flange a^2 and member a^{10} may be adjustable upon the pin and still be incapable of rotating thereon, the hub a^{12} fits loosely upon the pin so as to be longitudinally adjustable thereon, while the pin is provided with wings a^{14} contained in internal longitudinal slots a^{15} formed in the hub, which wings prevent the hub and flange from turning upon the pin, but permit a longitudinal adjustment thereof.

Inserted between the member a^{10} and the end of the plug a^4 is a spring a^{16} coiled around the pin a^8 and adapted to exert a constant pressure to force the flange a^2 outwardly from the end of the spindle or plug a^4. Connecting with the spindle or rather with the plug a^4, which as may be seen preferably extends beyond the end of the spindle, are a series of yielding fingers a^{17} having turned ends a^{18} normally engaging with the member a^{10} and adapted to bear upon or against the inclined or beveled edge thereof when the fingers are forced inwardly from their normal position by the binding stress exerted by the sheet when tightly wound around them. In this connection it will be understood that these yielding fingers form practically a continuation of the body of the spindle and that the sheet is wound around these fingers as well as around the spindle proper. Inasmuch as the fingers are attached to the plug contained in the end of the fingers, and as these fingers have preferably the same thickness as the shell of the spindle itself the fingers accordingly when compressed by the binding stress of the sheet lie practically flush with the surface of the spindle, as may be seen in Fig. 2, and cause no elevation in the winding of the sheet at this point. The fingers a^{17} may be secured to the plug a^4 by mounting them upon a collar a^{19} fitting around the plug.

As was above explained, the turned ends of the fingers a^{17} normally engage with the member a^{10}, or in other words, when the fingers are in a position springing outwardly and uninfluenced by the binding stress of the sheet, as may be seen in Fig. 1. They act accordingly as stops, holding the member a^{10} and flange a^2 in an outwardly adjusted position, maintained as before explained by the spring a^{16} pressing against them. When the yielding fingers a^{17} are depressed by the binding stress of the sheet wound around the same, their turned edge will engage, as before explained, with the beveled edge of the member a^{10} and bearing upon this edge the fingers will act to draw the member a^{10} and with it the flange a^2 inwardly in the direction of the end of the spindle, a sufficient space being left interposed between the normal outer position of the flange and the ends of the fingers.

The operation of the device is as follows:—When the sheet is wound upon the spindle and extending fingers the binding stress of the sheet when wound tightly will act to depress the fingers inwardly so that they will bear upon the cam-forming or inclined edge of the member a^{10} and draw the flange of the spool tight up against the edge of the sheet. After the sheet has become unwound from the spindle and extending fingers these fingers will become relieved of the binding stress of the sheet bearing against them and accordingly will release the adjustable flange whereby it will be forced outwardly by the interposed spring or with such limit of outward adjustment as is determined by the yielding fingers when in their normal position. Accordingly when the sheet is rewound upon the spindle and fingers there will be ample space between the flanges of the spool in which the sheet may be wound, so that if the sheet has become swollen the danger of its wrinkling against the flanges of the spool is eliminated and the rewinding of the sheet may be easily obtained. After the sheet has been rewound the spool may be removed from the instrument. Then the operator taking the spool and holding tightly the wound sheet in one hand and turning either one of the flanges of the spool with the other hand he may wind the sheet more tightly upon the spindle and fingers or with sufficient tightness that the binding stress of the sheet will act to draw the flange tight up against the edges of the sheet when it will be in condition to be again unwound. As the flange is drawn up by the binding stress of the sheet it will tend to even the edges thereof should there be a tendency to unevenness. Should the sheet tend to contract when wound upon the spool, its very contraction in a spool fitted with a device like mine, will tend to automatically draw the flange laterally to follow such contraction of the sheet and provide a proper lateral retention for it, or vice versa, in case the paper swells the retaining flange will automatically become released whereby a longer space may separate the flanges of the spool and the sheet have proper lateral guidance and still wind and unwind without danger of crumpling.

In Fig. 4 I have shown a slight improvement in the sheet wound upon the spool and which is especially applicable to the present construction. It sometimes happens that when the sheet is unwound from the spool it is not entirely unwound, in which case the flange-adjusting fingers would not be released by the sheet so that the flange would be sprung outward. I accordingly make that portion of the sheet beyond the playing portion thereof narrower than the main width of the sheet so that after the playing portion of the sheet has become unwound from the spool then the flange-adjusting fingers will become released before the entire sheet has become unwound. I prefer to turn the edge of the sheet instead of cutting it for the reason that the turned in part A^2 acts as a reinforcement to the edge of the sheet preventing it from becoming broken or stretched by bearing against the flange-adjusting fingers as the sheet is wound upon the spindle as might be the case were it not strengthened.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States:—

1. A spool of the character specified having in combination a spindle, a movable flange for the lateral retention of a sheet wound on said spindle, and means whereby the position of said flange may automatically be changed by the binding stress of the sheet around said spindle.

2. A spool of the character specified having in combination a spindle, a longitudinally adjustable flange for the lateral retention of a sheet wound on said spindle, a mounting for said flange on which it is longitudinally adjustable, and means whereby said flange may be controlled by the binding stress of the sheet around said spindle.

3. A spool of the character specified having in combination a spindle, a longitudinally adjustable flange for the lateral retention of a sheet wound on said spindle, a mounting for said flange on which it is longitudinally adjustable, and means whereby said flange may be drawn in the direction of the edge of said sheet by the binding stress thereof around said spindle.

4. A spool of the character specified having in combination a spindle, a longitudinally adjustable flange, a mounting for said flange, a member for maintaining said flange in a normally outward position away from the end of said spindle, and means whereby said flange may be moved toward the end of said spindle by the binding stress of a sheet around the spindle.

5. A spool of the character specified having in combination a spindle, a longitudinally adjustable flange, a mounting for said flange, a member connecting with said flange having an inclined edge, and means connecting with said spindle and adapted and arranged whereby it may be actuated by the binding stress of a sheet around said spindle to engage said inclined edge and change the position of said flange.

6. A spool of the character specified having in combination a spindle, a longitudinally adjustable flange, a mounting for said flange, a part connecting with said flange having an inclined edge, means for yieldingly maintaining said flange in a normally outward position away from the end of said spindle, and means connecting with said spindle and arranged and adapted whereby it when influenced by the binding stress of a sheet wound around said spindle, may bear upon the inclined edge of said part and draw said flange in the direction of the end of said spindle.

7. A spool of the character specified having in combination a spindle, a movable flange, a part connecting with said flange presenting an inclined edge, and a series of yielding fingers connecting with said spindle and adapted and arranged to coöperate with said inclined edge for moving said flange when said fingers are actuated by the binding stress of a sheet around said spindle.

8. A spool of the character specified having in combination a spindle, a pin projecting from the end of said spindle, a flange mounted on said pin and longitudinally adjustable along the same, means interposed between said flange and the end of said spindle for maintaining said flange in a normally outward adjusted position, a part connecting with said flange having an inclined edge, and a series of yielding fingers normally engaging said edge for maintaining said flange in its outwardly adjusted position and bearing upon said inclined edge when said fingers are actuated by the binding stress of a sheet around said spindle.

9. A spool of the character specified having in combination a spindle, a sheet wound thereon, a longitudinally adjustable flange for the lateral retention of said sheet, a mounting for said flange, and means adapted and arranged whereby it may be actuated by the binding stress of said sheet around said spindle for moving said flange inwardly toward the end of said spindle, said sheet being formed narrower at the end beyond the playing portion thereof whereby said means may be released from the binding influence of said sheet before the sheet has become entirely unwound from the spindle.

FRANK E. COLE.

In the presence of—
WILLIAM A. COLE,
M. E. FLAHERTY.