

No. 652,445.

Patented June 26, 1900.

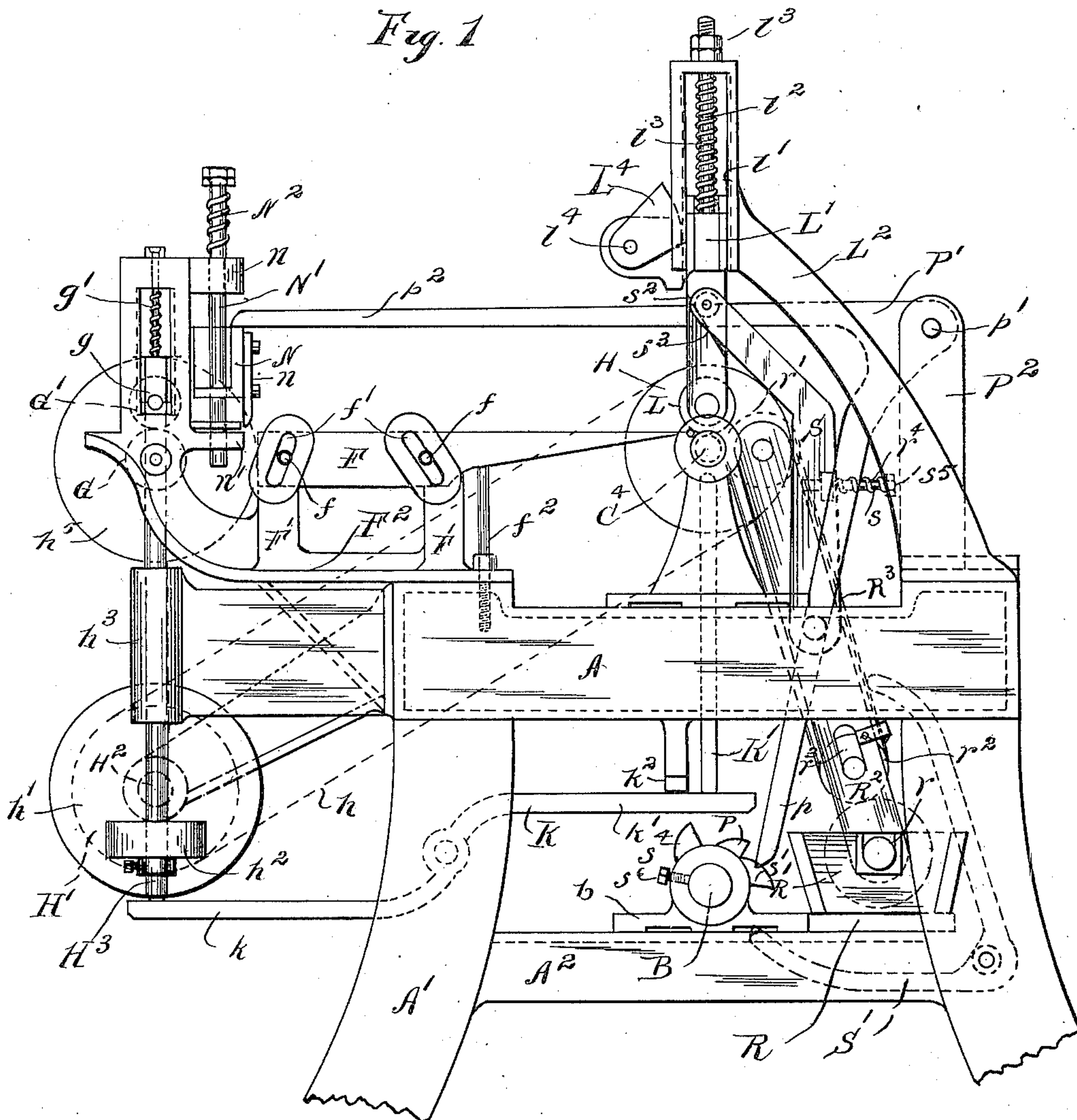
A. SKOFSRUD.
PAPER REELING MACHINE.

(Application filed Dec. 11, 1899.)

(No Model.)

6 Sheets—Sheet 1.

Fig. 1



Witnesses:

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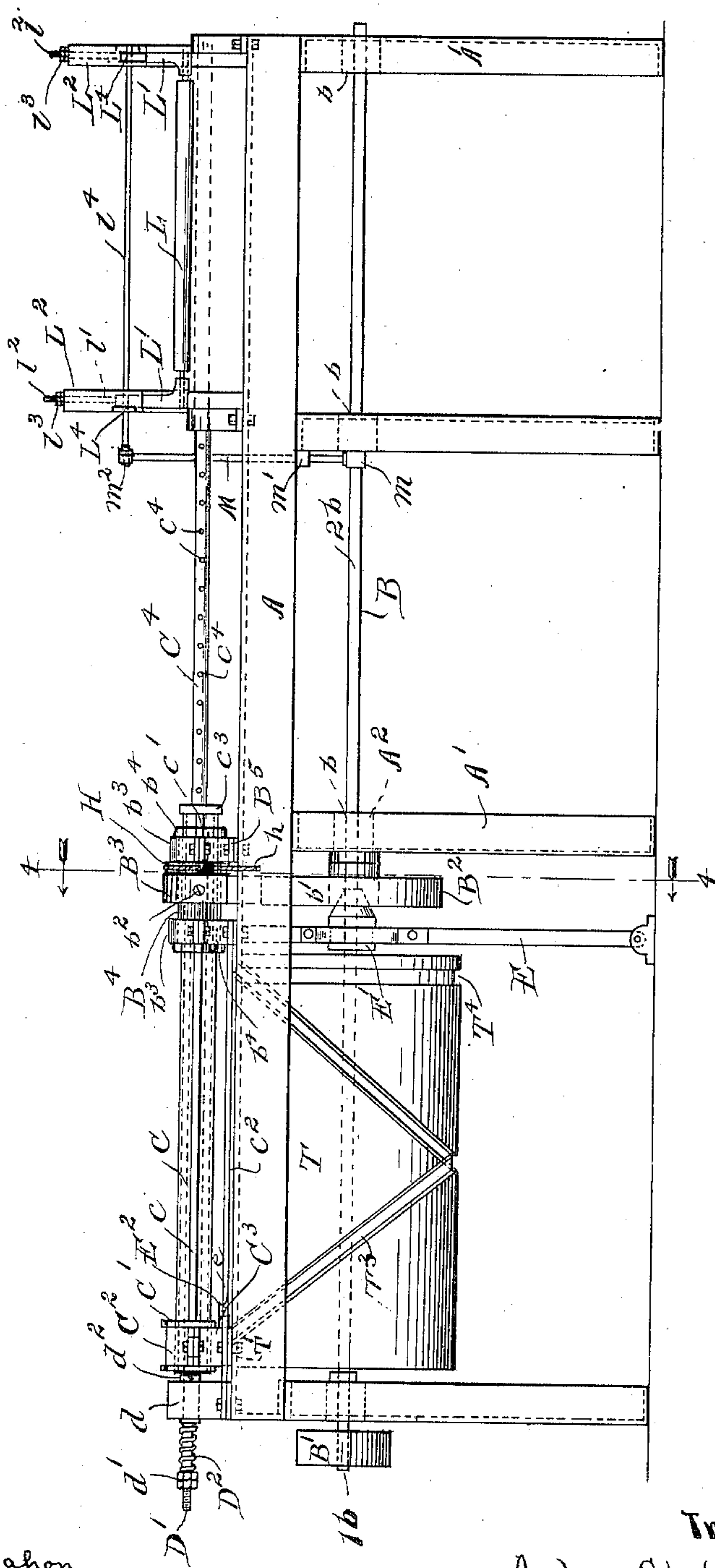
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(No Model.)

6 Sheets—Sheet 2.

Fig. 2.



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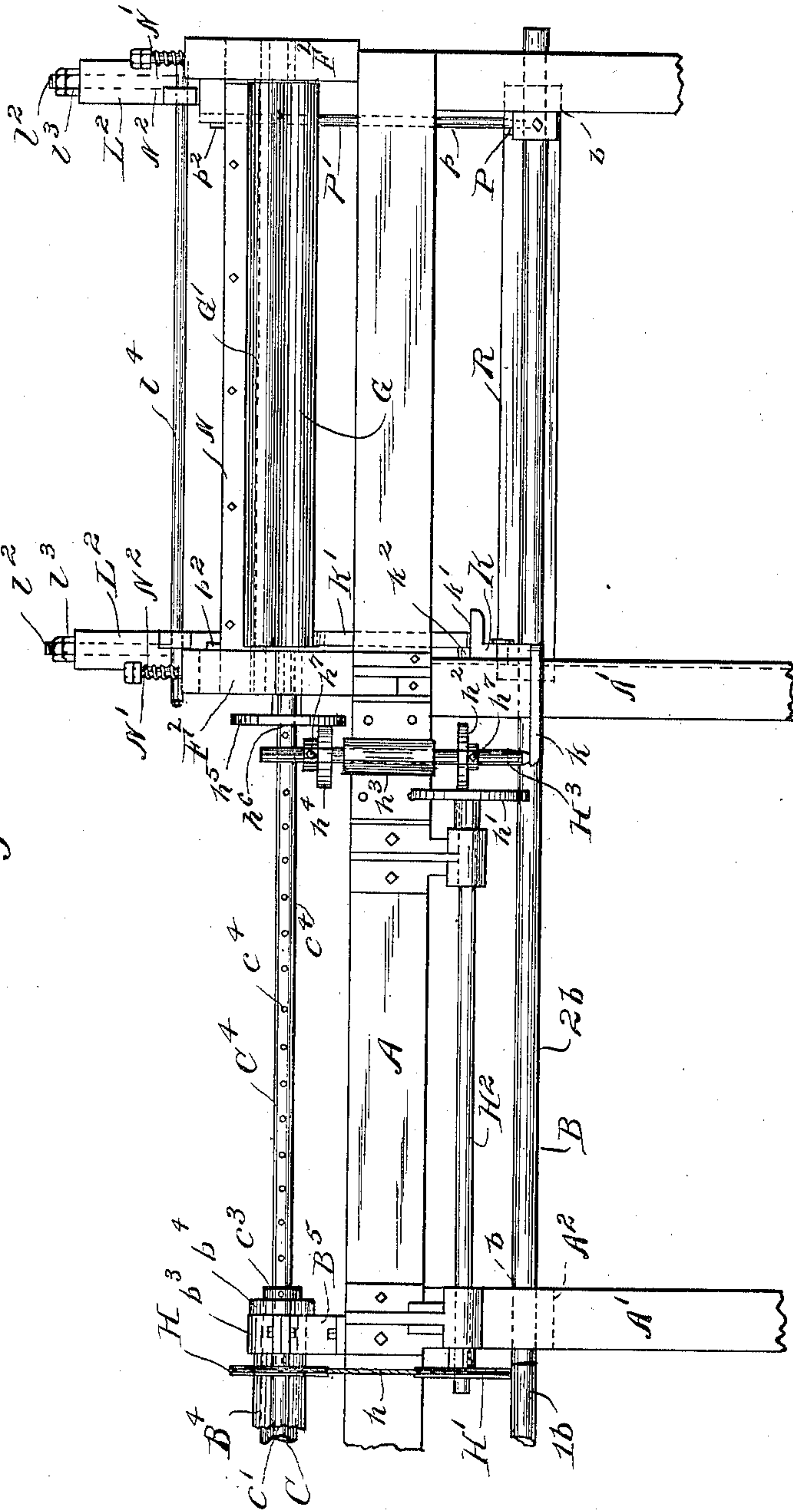
A. SKOFSRUD.
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(No Model.)

6 Sheets—Sheet 3.

Fig. 3



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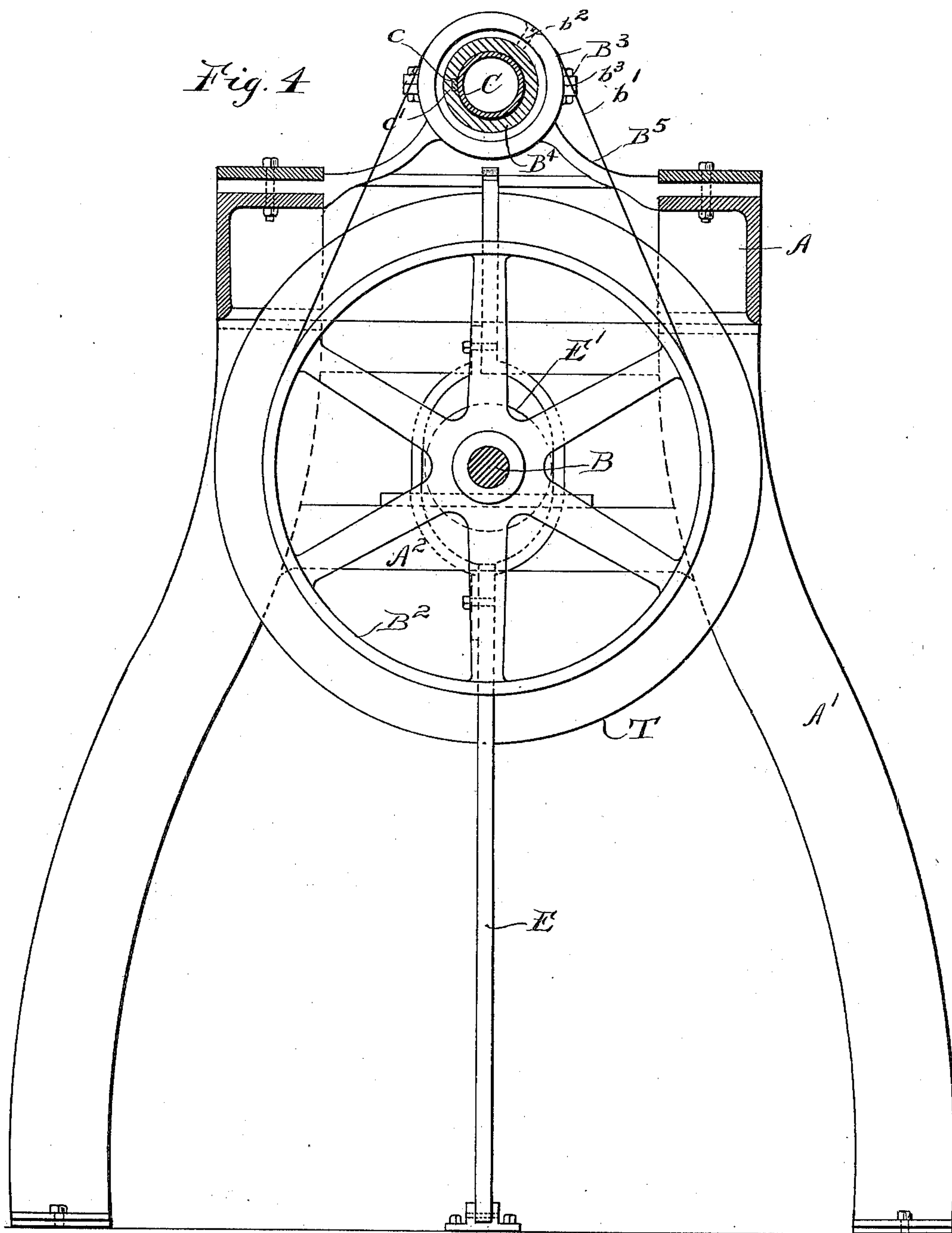
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6 Sheets—Sheet 4.



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(No Model.)

6 Sheets—Sheet 6.

Fig. 10

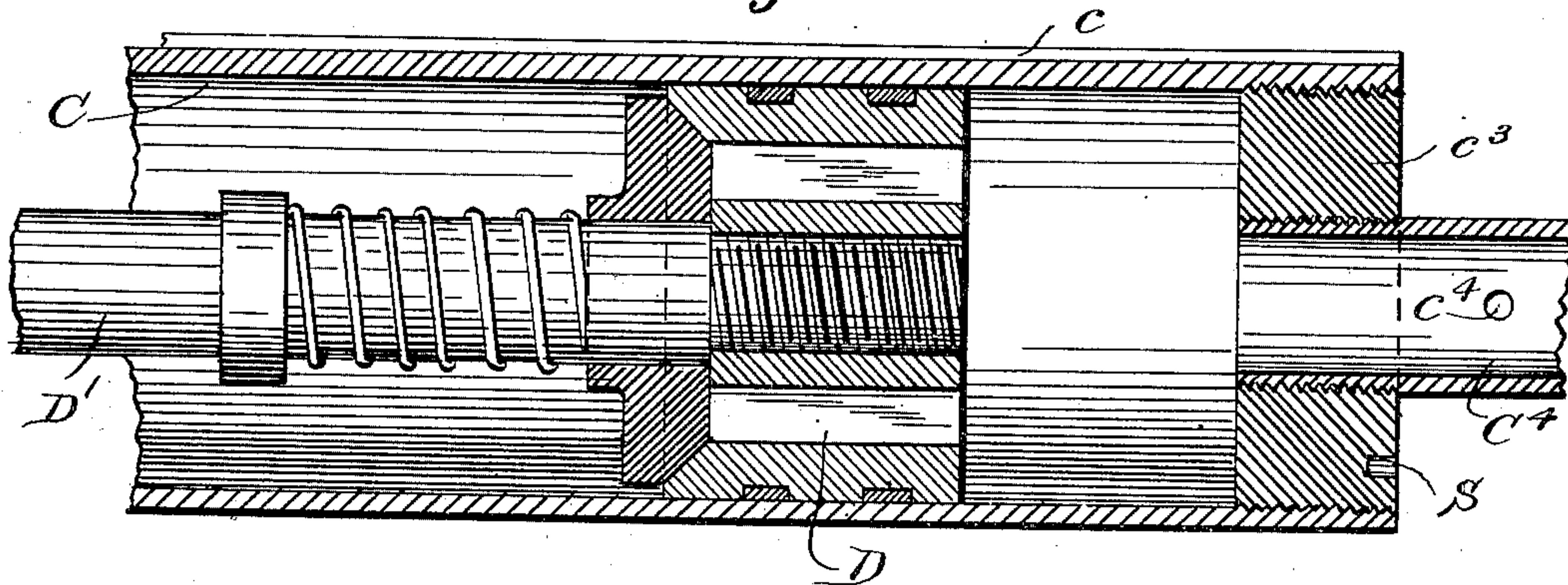


Fig. 11

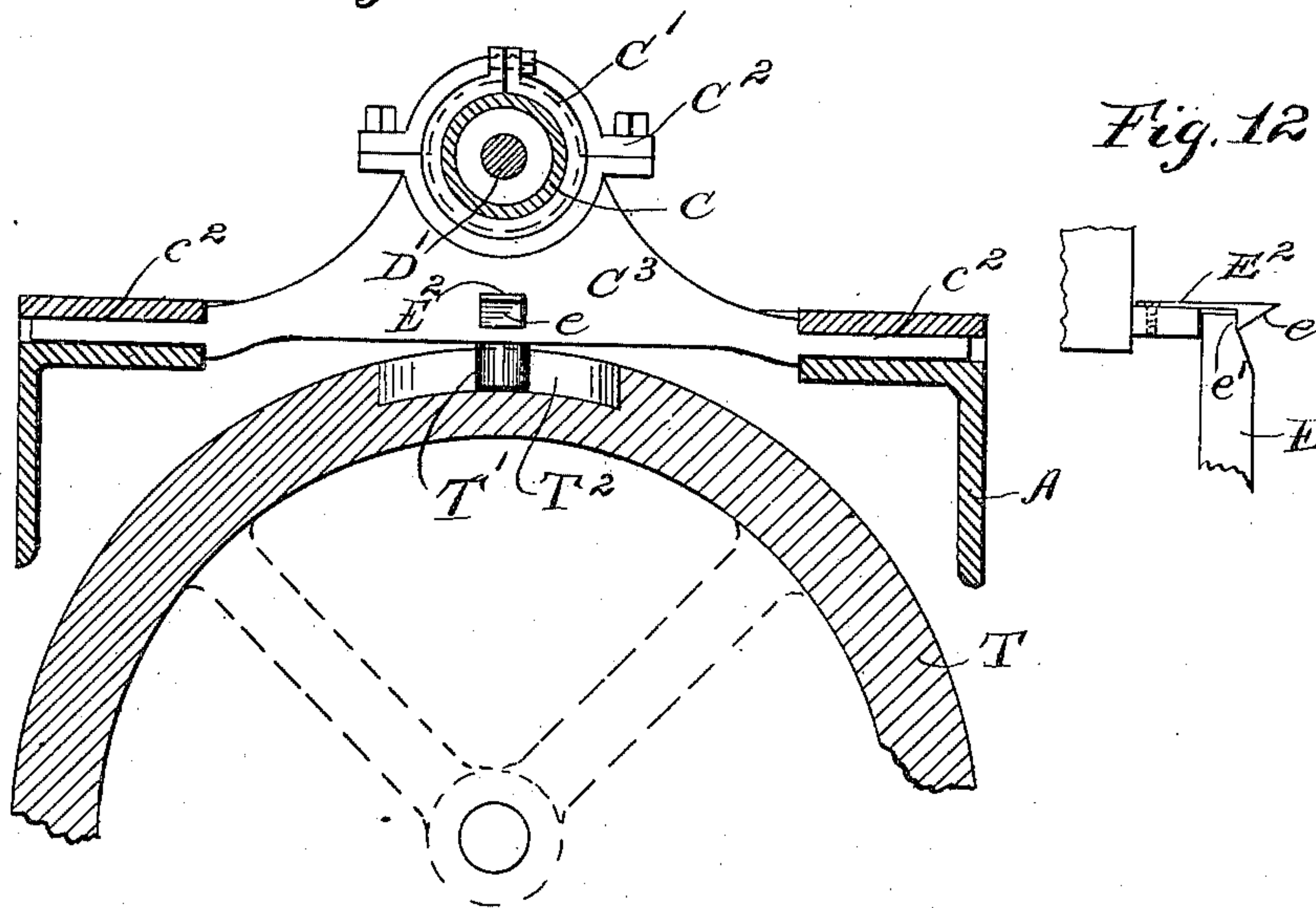
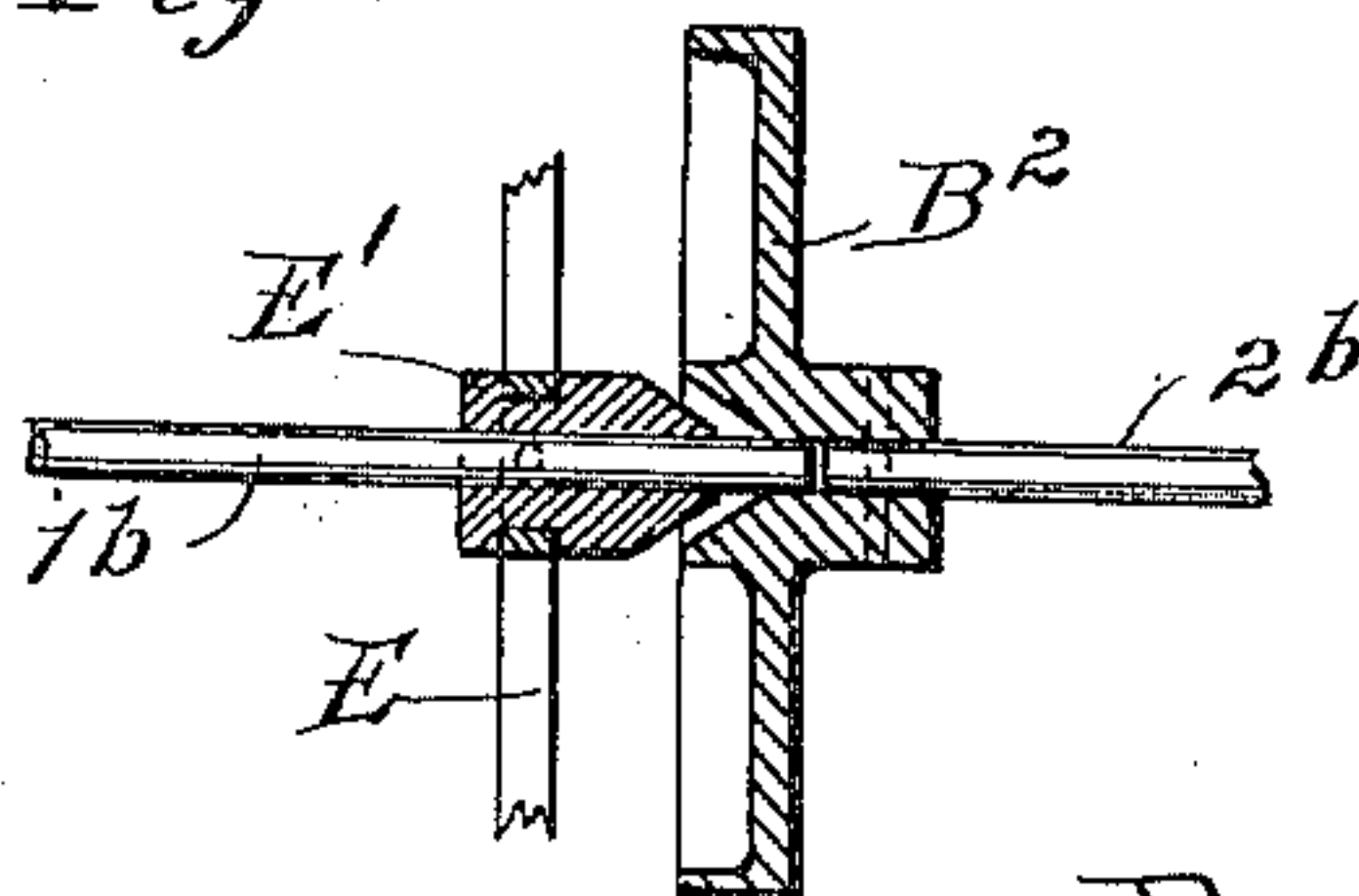


Fig. 13



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UNITED STATES PATENT OFFICE.

ANTON SKOFSRUD, OF CHICAGO, ILLINOIS.

PAPER-REELING MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,445, dated June 26, 1900.

Application filed December 11, 1899. Serial No. 739,913. (No model.)

To all whom it may concern:

Be it known that I, ANTON SKOFSRUD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper-Reeling Machines, of which the following is a specification.

This invention relates to mechanism for automatically forming sheets of paper into rolls, tubes, or rigid cylinders; and it consists in combining with means for feeding a continuous sheet of paper a lengthwise-reciprocating tubular spindle having lateral suction-perforations, means for causing suction therein while it is stopped over the path of said sheet to pick up the edge thereof, and means for concurrently actuating the feeding mechanism and rotating said spindle; in combining with said apparatus means for applying paste to the surface of the sheet as it is wound upon the spindle; in combining with said apparatus paste-applying mechanism acting momentarily immediately after the edge of the sheet is picked up and again as the roll approaches completion, and shearing mechanism acting immediately preceding the final action of the paste-applying mechanism; in improved means for regulating the speed of the feeding mechanism in accordance with the size of the roll, and in various other features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is an elevation of apparatus embodying my invention viewed from the reeling end of the machine. Fig. 2 is a longitudinal elevation with parts omitted from the front side of the machine, showing, among other things, the double cam-drum for projecting, staying, and retracting the suction-spindle and the clutching mechanism for engaging the paper-feeding and spindle-rotating devices with the main driving-shaft. Fig. 3 is an enlarged fractional elevation of reeling part of the machine, showing paper feed and cutting knife; Fig. 4, an enlarged transverse section on the line 4 4 of Fig. 2, seen in the direction of the arrows; Fig. 5, an enlarged plan view of the double cam-drum detached, showing the gate and switches therein; Fig. 6, a transverse section through said drum on the line 6 6 of Fig. 5; Figs. 7, 8, and 9, enlarged details of the gates and switches

appertaining to said drum; Fig. 10, a fractional longitudinal section through the vacuum-cylinder and valve-piston therein, showing also a portion of the suction-spindle; Fig. 11, an enlarged detail, partly in transverse section, of the double cam-drum, the traveler operated thereby, and the vacuum-cylinder carried by said traveler; Fig. 12, a detail of the clutch-shipping lever and its engaging catch, and Fig. 13 a sectional detail showing clutch and pulley at the junction of the sections of the main shaft.

A designates a strong rectangular bench-frame mounted upon suitable legs A^1 , with transverse bars A^2 tying said legs therebeneath and serving as supports for various bearings mentioned in the ensuing description. For convenience in identification the location and direction of movement of groups and elements of the apparatus will hereinafter be defined as right or left or front or rear with reference to the position of this frame, as indicated in Fig. 2 of the drawings.

B is a main driving-shaft in two sections 1^b and 2^b , running longitudinally of the frame and turning in bearings b , secured to the aforesaid tie-bars, and B^1 is a driving-pulley fixed to the left-hand section of said shaft and constantly driven from any suitable source. Rigidly affixed to the right-hand section of shaft B, at the point where it abuts against the rear section, is a second pulley B^2 , connected by belt b^1 with a smaller overhead pulley B^3 , which is suitably pinned, as by screw B^2 , to elongated bushing B^4 , resting and revolving in bearings b^3 , supported by brackets B^5 from the bench and stayed against endwise movement by annular end flanges b^4 , snugged against the outer faces of said bearings.

C is the vacuum-cylinder, sliding lengthwise through said bushing B^4 and turned therewith and thereby through engagement of its longitudinal spline c with groove c^1 , cut lengthwise of the bushing. At its rear end the cylinder is fixedly held in clamping-bushing C^1 , journaled in bearing C^2 upon the traveler C^3 , which reciprocates lengthwise of the bench in ways c^2 to a distance advisably somewhat exceeding the width of the sheet to be reeled. The right-hand end of the cylinder is stopped by a plug c^3 , into which is

axially tapped the suction-spindle C^4 , having lateral perforations c^4 and closed at its farther end. The plug is adapted, as by key-sockets c^5 , to be readily removed and replaced by others carrying spindles of different diameters, according to the nature of the work.

In the vacuum-cylinder is a piston D , secured to a rod D' of such length that when the cylinder is at the extreme left-hand limit of its reciprocation the valve is closely adjacent to the aforesaid plug and which extends through the open rear or left-hand end of said cylinder and through a bearing d on the frame and at its extreme free end is screw-threaded to receive adjusting and jam nuts d' , which confine an encircling coiled expansion-spring D^2 against said bearing, whereby the piston-rod is normally retracted to the full limit permitted by a collar d^2 , pinned thereto on the other side of the bearing. With this arrangement it is evident that since the piston is held back yieldingly against accompanying the cylinder in its advancing movement by its spring-seated rod a vacuum will be formed in said cylinder during each traverse to the right, creating a strong suction through the perforations of the spindle, and that the drag of the vacuum upon the piston itself will overcome the resistance of the spring D^2 to such an extent that the piston will be carried along some distance in the same direction with the cylinder until the longitudinal movement of the latter stops at the extreme of the traverse to give space for the rotary or winding movement, when the expansion of the spring will retract the piston, and thus continue the lateral suction through the spindle for an appreciable time, so that it may pick up the edge of the sheet fed above it.

During the advancing movement of the vacuum-cylinder and until the suction-spindle closely approximates its winding position the pulley B^2 is disconnected from the rear or left-hand section of the main driving-shaft, so that vacuum-cylinder and suction-spindle are unaffected by the revolution of the latter; but as the traveler C^3 nears the limit of its forward traverse it strikes and moves the upper end of clutch-shifter lever E , and thereby causes the engagement of sliding clutch E' upon said rear section, which advisably is a conical friction-clutch, as shown, with said pulley, and locks the sections together, when the pulley instantly by means of belt b' communicates motion to overhead pulley B^3 and rotates cylinder and spindle at a greatly-multiplied speed over that of the main shaft. The instant the reverse traverse of the cylinder commences, which will be after a suitable interval to permit the winding of a roll of the desired size, the pulley B^2 must be disengaged from the driving-section of the main shaft to stop the rotation of the spindle, and lest the usual spring employed for such purpose in similar locations should not act

promptly enough to break the contact between the friction clutch-faces I preferably make the unclutching positive by means of a spring-catch E^2 on the forward face of the traveler-block beveled advancingly at e to ride over the shifter-lever in the right-hand traverse, but shouldered in rear, as at e' , to drop over and hold said lever in the left-hand traverse and carry therewith until the clutch is disengaged and the lever so inclined as to release said catch. When the suction-spindle reaches the end of its forward movement and begins to revolve, it is just in advance of and practically in flush contact with the adjacent knife-edge of the self-adjusting table F , arranged transversely to the length of the bench-frame at the right-hand end thereof and over which the sheet to be wound is fed. This table is supported by pins f in convergent guide-slots f' at the top of standards F' , which rise from an extension-bracket F^2 , bolted to the front of the bench-frame, and it is normally checked in a horizontal or inclined position, depending upon the diameter of the suction-spindle used, by an adjustable stop f^2 , which stays the knife-edge at the level of the upper surface of said spindle. The stop offers no resistance to any upward movement of the knife-edge. Therefore as the papersheet is wound upon the spindle and the diameter of the roll increases the knife-edge resting thereon gradually rises and the table tips in its guide-slots to direct the sheet constantly to the top of the roll.

The sheet is fed to the table and over it to the spindle by rollers G and G' , the first of which is driven and the other simply a pressure roll turning in yielding bearings g , pressed down by spring g' toward said driven roll. The feed-roll G is driven and its speed is automatically increased as demanded by the increasing diameter of the paper-roll being wound in the following manner, to wit: Alongside pulley B^3 on elongated bushing B^4 is keyed a second pulley H , which when the bushing, and consequently the spindle, is revolved drives back by belt h to pulley H' , fixed to the rear or left-hand end of counter-shaft H^2 , hereinafter termed the "feed-shaft." Upon the right-hand end of this feed-shaft is keyed a friction-disk h' , which engages with a friction-wheel h^2 upon the lower end of a vertical shaft H^3 , turning in long sleeve-bearing h^3 and bearing at its upper end a second friction-wheel h^4 , which in turn engages with a friction-disk h^5 on the extended gudgeon h^6 of the feed-roller. The friction-wheel h' engages with its driving-disk above the axis of the feed-shaft, and the friction-wheel h^4 engages with the disk which it drives below the axis of the gudgeon of the feed-roll. Therefore an ascending movement of their vertical carrying-shaft, hereinafter termed the "change-speed" shaft, will result in lengthening the driving-surface in contact with one for a single revolution of the feed-shaft and contracting the surface

which the latter must travel over to produce a single revolution of the feed-roll, thus speeding the latter, while a descending movement, on the contrary, will slow down the feed-roller. To regulate this change of speed, the friction-wheels may each be adjustable on its shaft by means of binding-screws h^7 , set in their hubs, as shown. To impart the rising movement to the vertical shaft, its lower end is stepped upon the subtending arm k of a lever K , pivoted to the frame, and by its opposite arm k' supporting a sliding bar K' in contact with the surface of the increasing paper-roll, so that with each additional revolution added thereto the arm k' is depressed and the arm k correspondingly raised, lifting shaft H^3 and its friction-wheels and accelerating the feed-roll. When the reeling is completed and the suction-spindle withdrawn, stripping off the paper-roll, the vertical change-speed shaft will fall by its own weight to normal slow-feed position and the lever K will be restored to starting position, where it will be stayed by contact with lug k^2 before the upper or contact end of sliding bar K' has risen where it will obstruct the ensuing advance of the suction-spindle, but will come in contact with the paper wound thereon as soon as any appreciable demand is made upon the feed.

Above and parallel with the suction-spindle when in its extreme advanced position is a smoothing and compacting roll L , mounted in bearings in the lower ends of sliding bars L' , which work in vertical ways l' in the overhanging brackets L^2 , upstanding from the rear of the bench-frame. These bars are extended with rods l^2 , screw-threaded at their ends to receive adjusting-nuts l^3 , whereby the limit of their downward play is determined, and encircled by coiled springs l^3 , which press the smoothing-roll into constant contact with the paper-roll as the latter is wound. As said paper-roll increases in diameter with the progress of the reeling the smoothing-roll, the object of which is to lay the convolutions uniformly and compactly together, is lifted, with its carrying-bars, against the force of the springs l^3 , until finally, with the completion of the reeling friction-dogs L^4 on a rock-shaft l^4 , engaging with each sliding bar, lock the roll against descent while the suction-spindle is being retracted and until it is again advanced and begins reeling. Then the cam m on the right-hand or intermittent section of the main shaft acts against the lower end of a rod M , guided in vertical sleeve m' , and at its upper end connected to a crank m^2 from the dogging-shaft l^4 , and lifts it, rocking said shaft and disengaging the dogs, when the smoothing-roll is immediately carried down toward and into contact with the accumulating paper-roll.

To sever the sheet when a roll of suitable size has been reeled on the suction-spindle, a knife or shear blade n is secured to the inner face of a block N , pinned to guide-rods N' ,

which play in ears n , projecting inwardly from the aforementioned extension-bracket F^2 , and also through a ledger-plate n' , over which the sheet is advanced by the feed devices and against which it is severed on the descent of the knife. The knife-block N is normally held elevated by springs N^2 ; but immediately before the rotation of the suction-spindle ceases a cam or tappet P on the intermittent section of the main shaft B strikes the pendent arm p of an elbow-lever P' , pivoted at p' to a standard P^2 from the bench-frame and forces down the overhanging arm p^2 of said lever, which normally rests in contact with said block, carrying the block down and causing the knife thereon to shear past the ledger-plate. This action takes place sufficiently in advance of the cessation of rotation of the spindle to permit the reeling in of all that part of the sheet extending along the table between spindle and shearing mechanism.

One of the purposes for which this machine is designed is to form tubes for firework use. This requires that both the initial and the final edge of the paper-roll shall be pasted, and to that end a paste-trough R is located beneath the bench-frame to contain a supply-roll R' , having its gudgeons seated in open bearings r in the ends of said box and pivoted in the lower end of frame-bars R^2 , which at their upper ends, on the rear side of the advanced position of the suction-spindle, carry a roller r' , adapted to be swung into contact with said spindle or the paper-roll thereon. Over this roll r' and around a lower roll r^2 , mounted by its gudgeons in longitudinal slots r^3 in said frame-bars and adapted to bear by gravity against the supply-roll, is led an endless paste-apron R^3 , which is moved each time it comes in contact with the revolving paper-roll, and thereby moves the supply-roll. Normally the apron is kept away from the paper-roll by expansion-springs r^4 , seated against bent retraction-arms S , pivoted to said frame-bars and pressing outward against the heads of dowel-pins s , playing through said arms and connected to the bars; but immediately after the new edge of the sheet is picked up by the suction-spindle the lower arms of bent levers S' are struck by tappets s' on the intermittent section of the main shaft and the upper arms thereof are carried forward to strike the paste-frame bars and force them toward the spindle against the resistance of said springs r^4 , causing paste to be applied to the paper edge, the paste-frame being immediately retracted by the springs as the tappets pass off of the lever-arms. As the paper-roll increases in size some provision is necessary to keep the paste-apron at a suitable distance therefrom that paste may neither be applied where it is not wanted nor the operating devices changed in their relations. To this end the upper extremities of the bent retraction-arms are provided with antifriction-rolls s^2 , which rest on inclined tracks s^3 , cut in the sliding bars L' of the

smoothing-roll, so that as these bars rise with the lifting of said roll by the increase in size of the paper-roll said retraction-bars shall be forced out, carrying the paste-frame with them, away from the spindle. When the knife has been actuated and the reeling of the paper approaches its completion, a second set of tappets s^4 on said intermittent section of the main shaft strike the bent levers S' and again force the paste-frame inward that the apron may touch and prepare the roll for the pasting down of the terminal edge by the pressure of the smoothing-roll. Nuts s^5 on the dowel-pins enable the stress of springs r^4 to be adjusted so that the normal distance of the paste-frame may be determined nearer to or farther from the suction-spindle, and the tappets s' and s^4 may be set by means of screws s^6 passing through their hubs to advance or retard or omit altogether one or both of the pasting movements. The paste-frame, with its attached retraction-arms, being unconnected, except by contact with the paste-trough and with the inclined tracks s^3 , may be lifted bodily out of the machine in case it is intended to merely reel and not to paste the paper sheet. The suction-spindle in its advancing movement passes through and is guided by a bearing S^2 , located at the left-hand side of the passageway for the paper sheet, so that in reeling the adjacent end of the paper-roll is practically in contact with the right-hand side of said bearing. Therefore when the series of operations, heretofore described, terminating with the final severing and pasting of the sheet are finished and the suction-spindle begins its retreating traverse, followed immediately by the cessation of rotary movement, the paper-roll is stopped by this bearing and stripped from the spindle to drop through the open bench-frame into any suitable receptacle placed beneath.

It is evident that the movements and effective engagements of the various elements of the machine may be primarily induced and controlled in a great number of ways from the main shaft; but that which I have specially devised and prefer to use for the purpose consists in a reversely-cam-grooved drum T , Figs. 2 and 5, keyed to the rear or left-hand section of the main shaft, and by the revolution of which the traveler is alternately carried to the right from its rearmost position (indicated in Fig. 2) until it has engaged and operated the clutch-shifter, held stationary while the suction-spindle is being rotated, and finally withdrawn to its starting position to immediately resume its forward traverse. For the purpose of describing this drum and its mode of operation it will be conventionally assumed that the view thereof in Fig. 2 is a side elevation, and Fig. 5 a top plan. Then at the outset the pendent roller T' engages with the longitudinally-trending cam-grooves T^2 and T^3 of said drum at the

neutral point α , Fig. 5, and in the advancing movement, with the drum rotated as indicated by the arrow, it follows the groove T^2 and is in thrusting contact with the rear edge t thereof, ultimately returning by the groove T^3 and in contact with the front edge t' of said groove. The two grooves are described around the drum on opposite spirals, merging into each other with a slow or rounded sweep at the starting-point, crossing each other centrally beneath the drum, and meeting again on top at the return-point X' in an angle which opens into a circumferential groove T^4 , which is traversed by the roller T during an entire revolution of said drum before entering the return-groove, whereby the traveler is held stationary during the reeling operation.

In order that the traveler-roll may not take the wrong groove at the point where the grooves cross each other, each groove is provided upon its contact edge t and t' , respectively, with a spring-held hinged gate t^2 and t^3 , normally closing the entrance to the crossing and adapted when opened to make the contact edge of its respective groove continuous thereacross. This gate is struck by the traveler-roll in its approach to the crossing and pushed open to afford a bridge for its passage. After having left the gate t^2 in the advancing groove T^2 the traveler-roll approaches the return-angle, and here it is requisite that its entrance into return-groove T^3 should be temporarily barred, so that it may with certainty engage with the delay-groove T^4 and travel therearound its allotted period. To this end just before reaching said point it strikes and rides upon a yielding cam-block T^5 , closing the groove T^3 , depressing it, and thereby rocking a lever t^4 on fulcrum t^5 and raising a guard-block T^6 to close the entrance to the return-groove. Simultaneously with the depression of cam-block T^5 and elevation of guard-block T^6 a cam-block T^7 is raised in the delay-groove T^4 in advance of the return-point, and a switch-block T^8 , connected therewith by lever t^6 , fulcrumed at t^7 , and until then closing the entrance to the delay-groove, is retracted, opening a clear passage for the roller. This simultaneous action of the guard and switch blocks and their cams is induced by intercommunicating lever t^8 , and when once thrown the parts are maintained in position until again actuated by the traveler-roll by the frictional contact of spring-washers t^9 on their lever-fulcrums or other suitable means. The traveler-roll having entered the annular delay-groove journeys therearound until it strikes and depresses cam-block T^7 near the return-point, thus throwing up the switch-block T^8 and retracting the guard-block T^6 , closing the delay-groove to further advance and opening a track into the return-groove, which it follows to gate t^3 , and, bridging the crossing therewith, continues back to the starting-point, when it immediately com-

mences a fresh advance, of course carrying with it the traveler and its attachments in all these movements.

I do not limit myself to the specific mechanism herein described except as hereinafter definitely pointed out, considering that it may be greatly varied without departing from the spirit of my invention; but

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

1. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a suction-spindle for picking up and reeling the sheet, means for projecting said spindle across the feed-passage for said sheet and retracting it therefrom, means for inducing suction in said spindle while so projected, and means for concurrently rotating it to reel the sheet.

2. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a suction-spindle for picking up and reeling the sheet, means for projecting said spindle across the feed-passage for said sheet and withdrawing it therefrom, means for inducing suction in said spindle while so projected, means for concurrently rotating it to reel the sheet, and means for applying paste to the sheet as it is reeled.

3. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a spindle for reeling the sheet, means for picking up and binding the advancing edge of said sheet to the spindle, means for projecting said spindle across the feed-passage for said sheet and retracting it therefrom, means for revolving the spindle while so projected, and means for stripping the finished roll in said retracting movement.

4. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a spindle for reeling the sheet, means for picking up and binding the advancing edge of said sheet to the spindle, means for projecting said spindle across the feed-passage for said sheet and retracting it therefrom, means for revolving the spindle while so projected, pasting mechanism actuated to apply paste to the sheet immediately after it is picked up, and again as the roll approaches completion and means for stripping the roll from the spindle as the latter is retracted.

5. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a suction-spindle for reeling the sheet, means for projecting said spindle athwart the feed-passage for said sheet and withdrawing it therefrom, a bearing-block through which the spindle is retracted, constituting a stripper for the finished roll, means for inducing suction in said spindle while in its projected position, and means for concurrently imparting rotation thereto.

6. The combination in a machine for reeling paper, of mechanism for feeding and severing the sheet, a suction-spindle for reeling the sheet, means for projecting said spindle

athwart the feed-passage for said sheet and withdrawing it therefrom, means for inducing suction in said spindle while in its projected position, means for concurrently imparting rotation thereto, and pasting mechanism actuated to gum the sheet while being reeled.

7. The combination in a machine for reeling paper, of mechanism for feeding and severing the sheet, a suction-spindle for reeling the sheet, means for projecting said spindle athwart the feed-passage for said sheet and withdrawing it therefrom, means for inducing suction in said spindle while in its projected position, to pick up the sheet, means for concurrently imparting rotation thereto, pasting mechanism adapted to move toward and away from said spindle and means actuating said pasting mechanism to gum said sheet twice during the reeling thereof, once at the beginning and once at the end.

8. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a reeling-spindle and an automatically-tilting feed-table extending between said feeding mechanism and the reeling position of the spindle and arranged to be tilted by contact of its proximate edge with the accumulating roll being reeled.

9. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a reeling-spindle and an automatically-tilting feed-table arranged between said feeding mechanism and the reeling position of said spindle, and adapted to rest by its proximate edge on the accumulating roll, and a vertically-yielding presser-roll arranged above said position of the spindle, and between which roll and the table the sheet is drawn upon said spindle.

10. The combination, in a machine for reeling paper, of mechanism for feeding and severing the sheet, a reeling-spindle, change-speed gearing for varying the action of the feeding devices, a presser-bar arranged to contact with the surface of the accumulating roll, and a lever intermediate between said bar and the change-speed gear, whereby the latter is regulated according to the size of the roll.

11. The combination of the longitudinally-reciprocating reeling-spindle, the vertically-yielding presser-roll, the sliding bars in which it is mounted, the dogs arranged to lock said bars in elevated position when the spindle is withdrawn from beneath the presser-roll, and the cam whereby said dogs are disengaged when the spindle is again projected.

12. The combination of the reeling-spindle, the feed-rolls, the feed-regulating bar and the lever which it operates, the vertically-sliding speed-regulating shaft carrying friction-wheels and stepped on said lever, a disk on a driven shaft engaging one of said friction-wheels, and a disk on the gudgeon of the positive feed-wheel engaging the other of said friction-wheels.

13. The combination of the reeling-spindle

dle, the swinging paste-frame and its apron, the retraction-arms therefor, the springs holding the frame toward said arms, the vertically-yielding pressure-roll, its carrying-arms having inclined tracks with which the upper ends of the retraction-arms engage, and the actuating-lever, for the paste-frame.

14. The combination with the reeling-spindle and the swinging paste-frame, of the actuating-lever for said frame, and the adjustable cams for operating said lever.

15. The combination of the reeling-spindle, the presser-roll and its slide-bars with inclined ways, the paste-frame, the feed-rolls, the change-speed gear, its actuating bar and lever, the spring-borne knife-block and knife, the bent lever whereby said block is depressed, the bent lever for actuating the paste-frame, and the cams on the front section of the main shaft for operating the latter two levers.

16. The combination with the reeling-spindle and the feed-rolls, of the feed-table mounted in the convergingly-slotted standards, and the adjustable stop for the inner side of said feed-table.

17. The combination of the longitudinally-reciprocating reeling-spindle having lateral perforations, the vacuum-cylinder, the piston therein, the piston-rod spring held by a stationary part of the frame, and the valve in the piston.

18. The combination of the reciprocating reeling-spindle, the vacuum-cylinder, the traveler, and the actuating-drum, having reversed set lateral cam-grooves and circumferential delay-groove with suitable gates, guard and switch.

19. The combination of the reciprocating reeling-spindle, the vacuum-cylinder, the traveler, means for actuating said traveler, a pulley for transmitting rotary motion to the

reeling-spindle, a clutch, and a clutch-shifter actuated by the traveler toward the end of its forward traverse to engage said clutch with the pulley.

20. The combination of the reciprocating reeling-spindle, the vacuum-cylinder, the traveler carrying said cylinder, means for reciprocating said traveler, a pulley for transmitting rotary motion to the spindle, a clutch for engaging said pulley, a clutch-shifting lever closed by the push of the traveler in its forward traverse and a spring-catch on the traveler adapted to engage with said shifter-lever in said forward traverse and retract it positively in the retreating traverse.

21. The combination of the divided main shaft, the reversely-grooved cam-drum on the rear section thereof, the traveler engaging with said drum, the vacuum-cylinder and suction-spindle reciprocated by said traveler, a pulley on the forward section of the main shaft, a pulley slidingly connected with the vacuum-cylinder, a belt connecting the two pulleys, a clutch carried by the rear section of the main shaft to engage the pulley on the forward section, a clutch-shifting lever, and means carried by the traveler for positively actuating said shifter-lever.

22. The actuating-drum herein described, constructed with the reverse cam-grooves, the circumferential delay-groove, the spring-held swinging gates for opening and bridging the crossings of the cam-grooves, and the automatically-actuated guard and switch-blocks for connecting said cam-grooves with the delay-groove.

In testimony whereof I affix my signature in presence of two witnesses.

ANTON SKOFSRUD.

Witnesses:

O. D. McMAHON,
J. BUEHLER.