

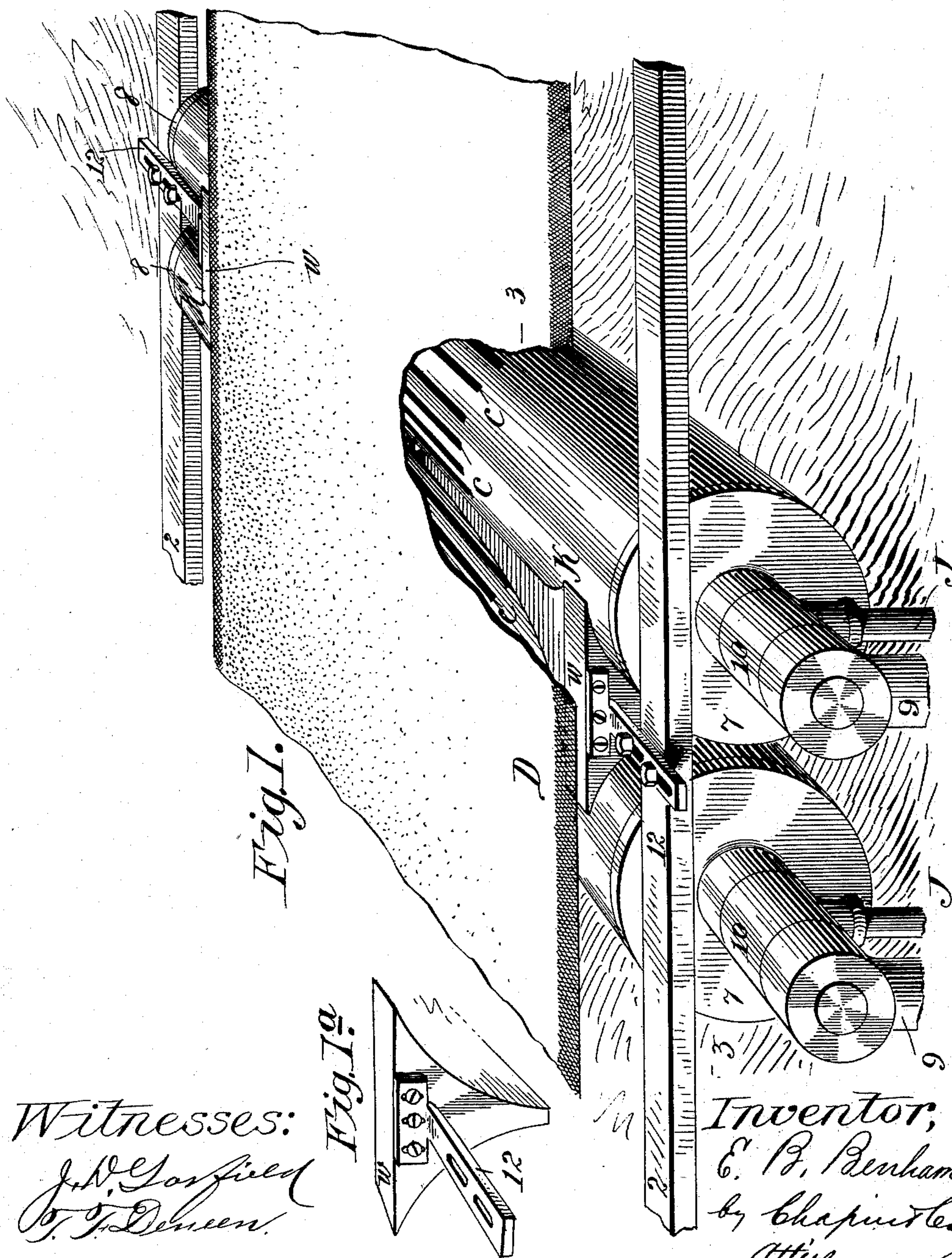
(No Model.)

3 Sheets—Sheet 1.

E. B. BENHAM.
SUCTION ROLL FOR PAPER MACHINES.

No. 483,340.

Patented Sept. 27, 1892.



Witnesses:
J. D. Garfield
J. T. Deane.

Fig. 1a.

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(No Model.)

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Fig. 2.

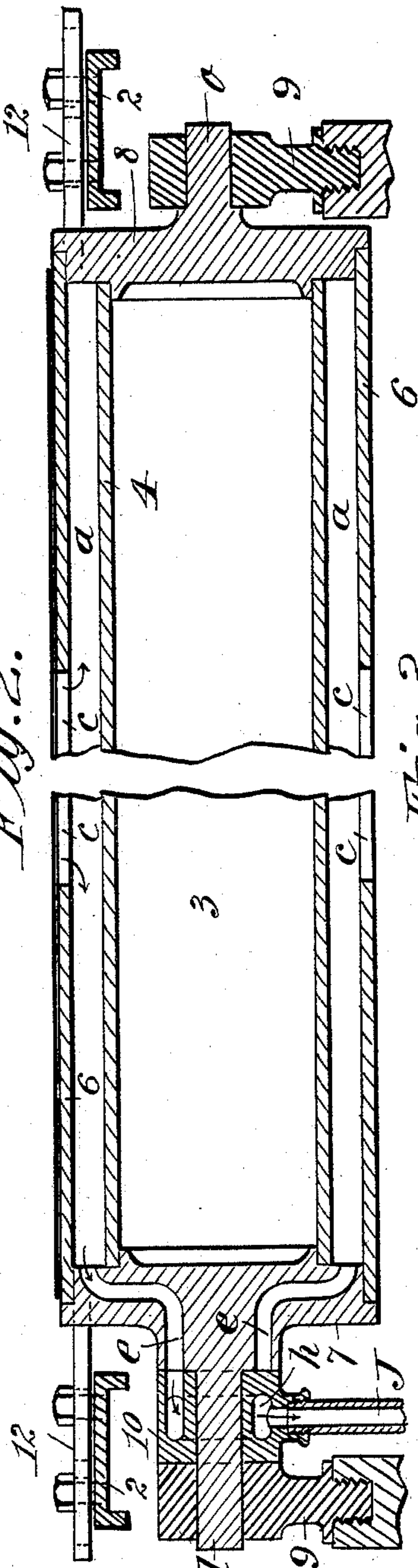


Fig. 3.

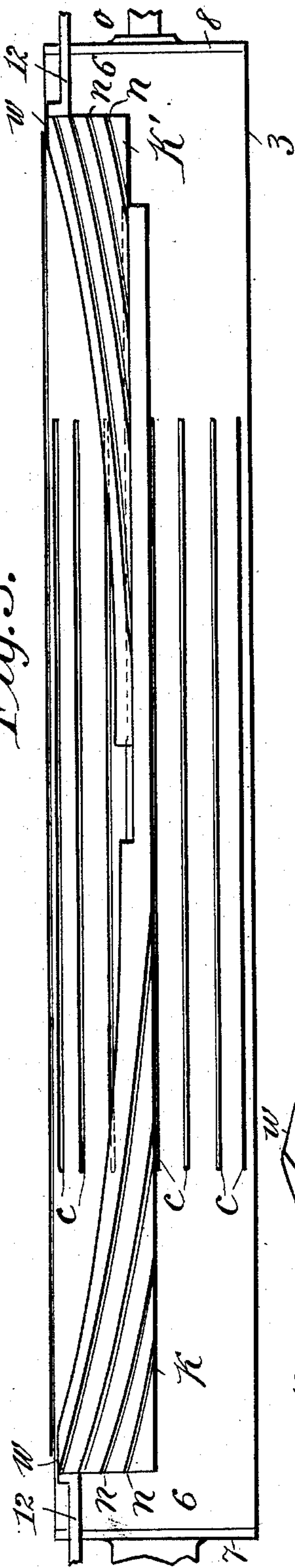
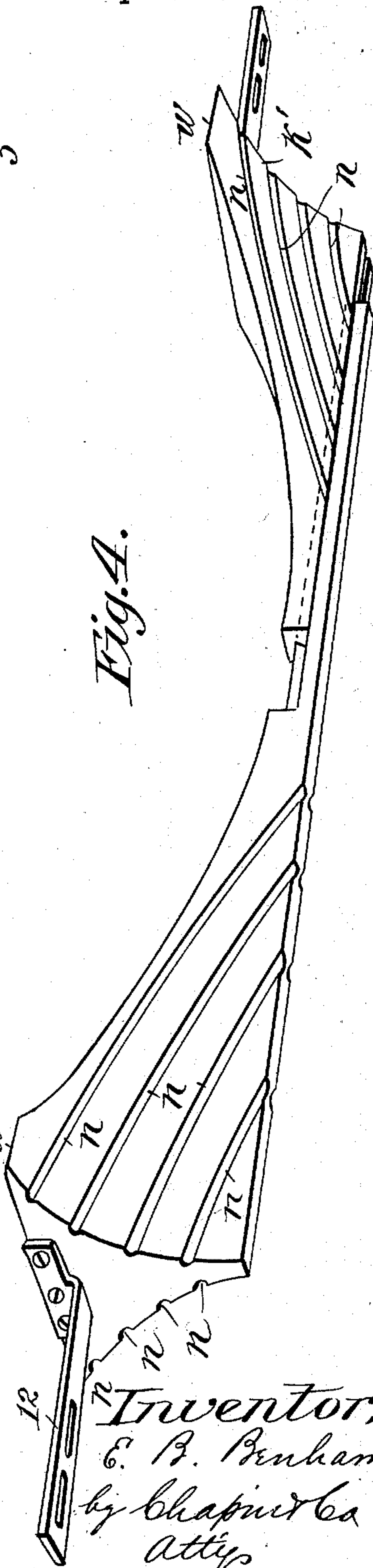


Fig. 4.



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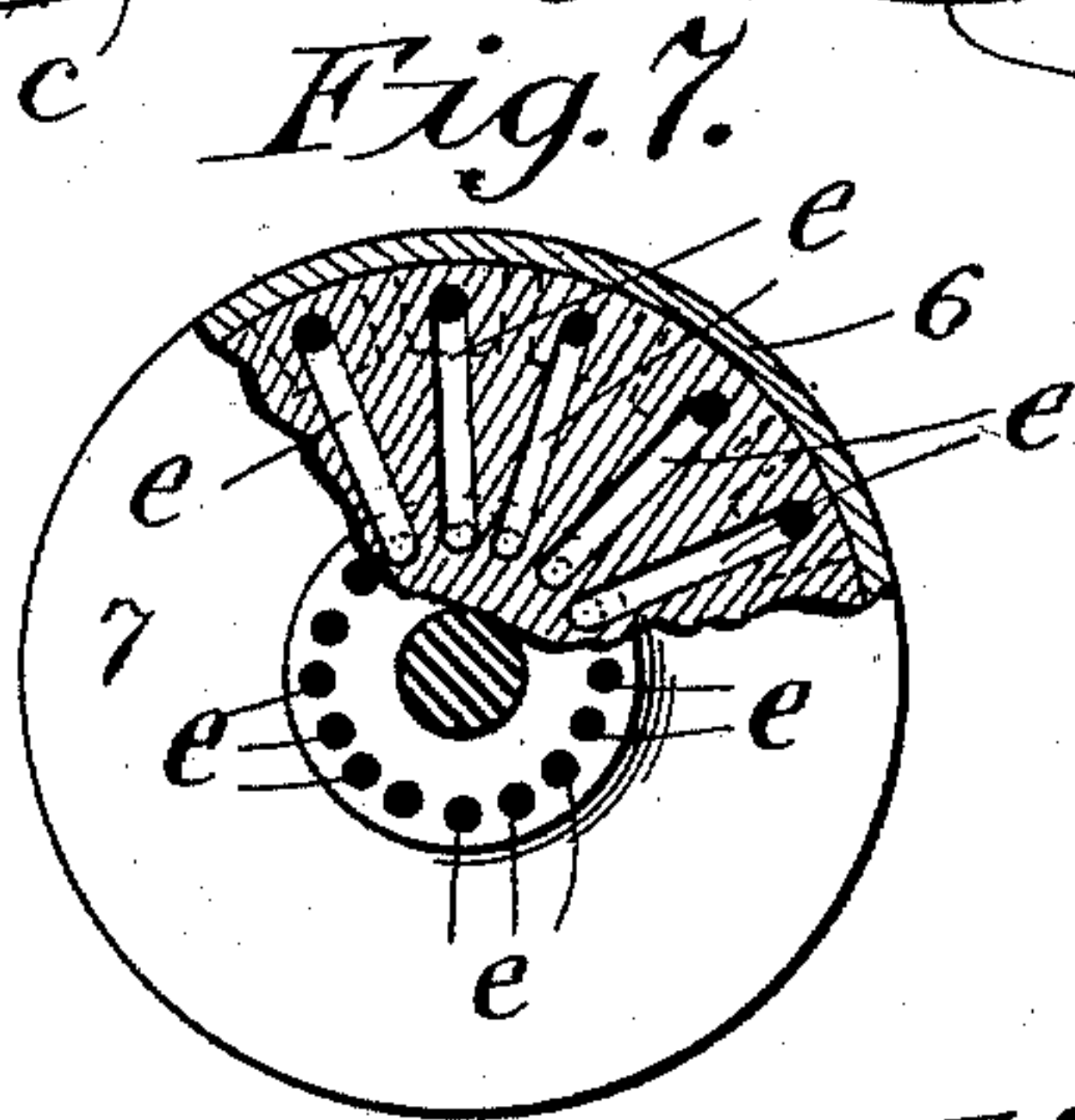
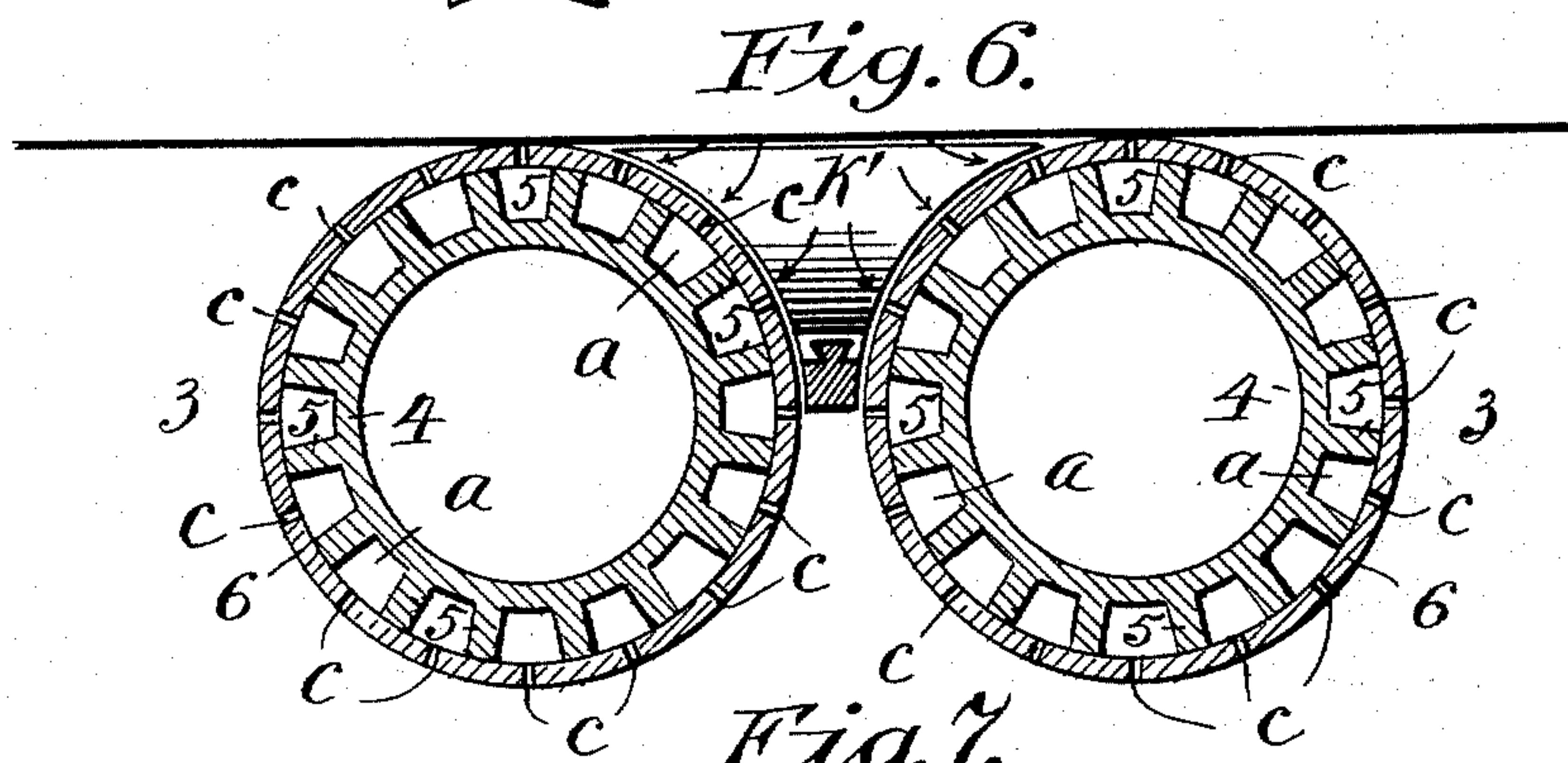
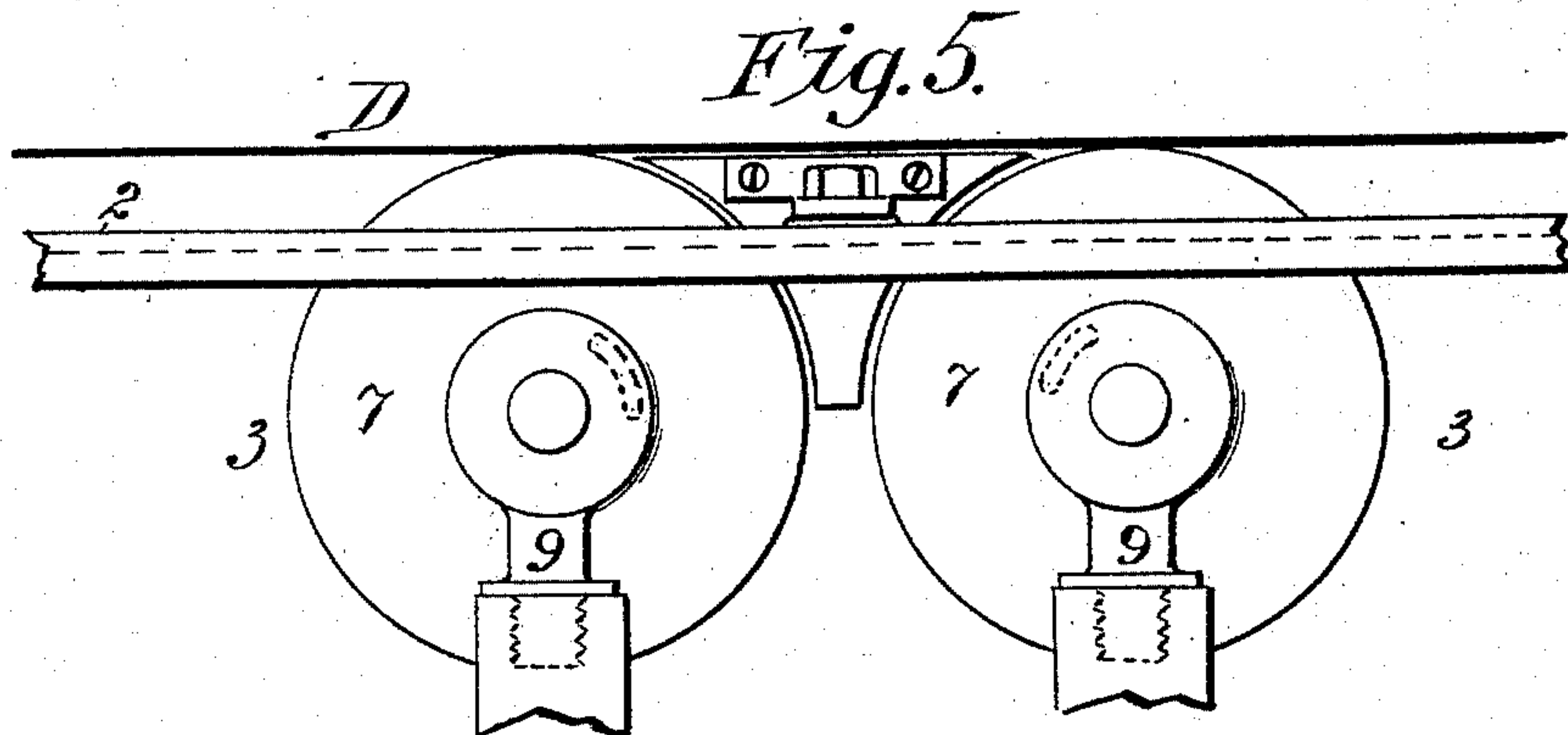


Fig. 8.

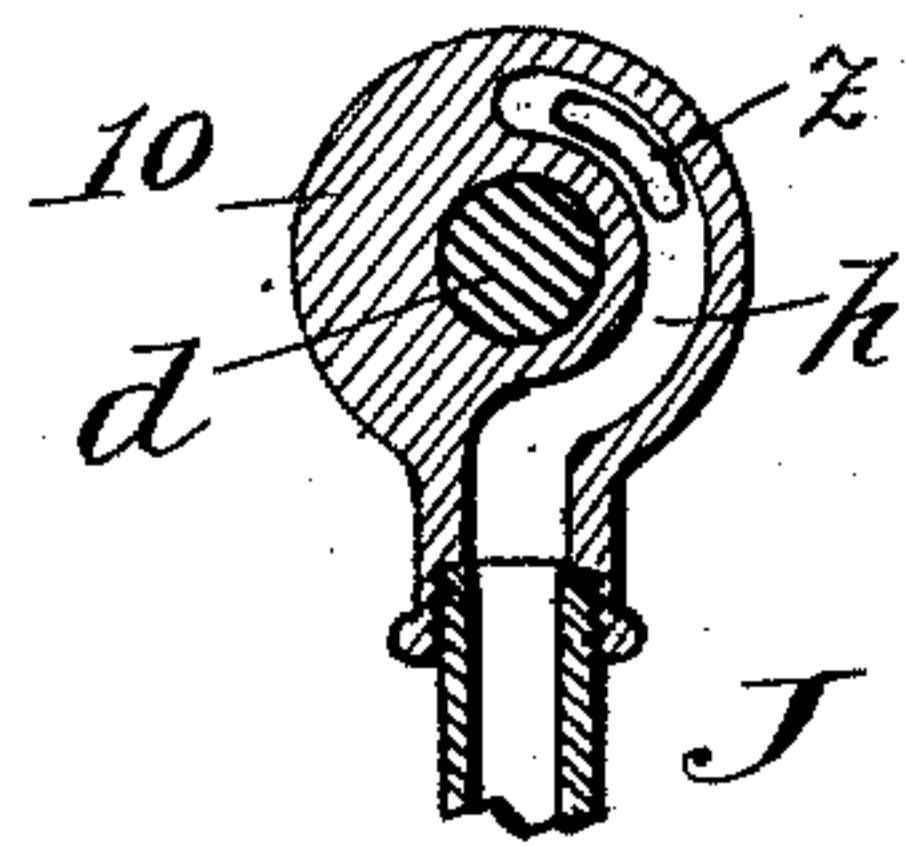
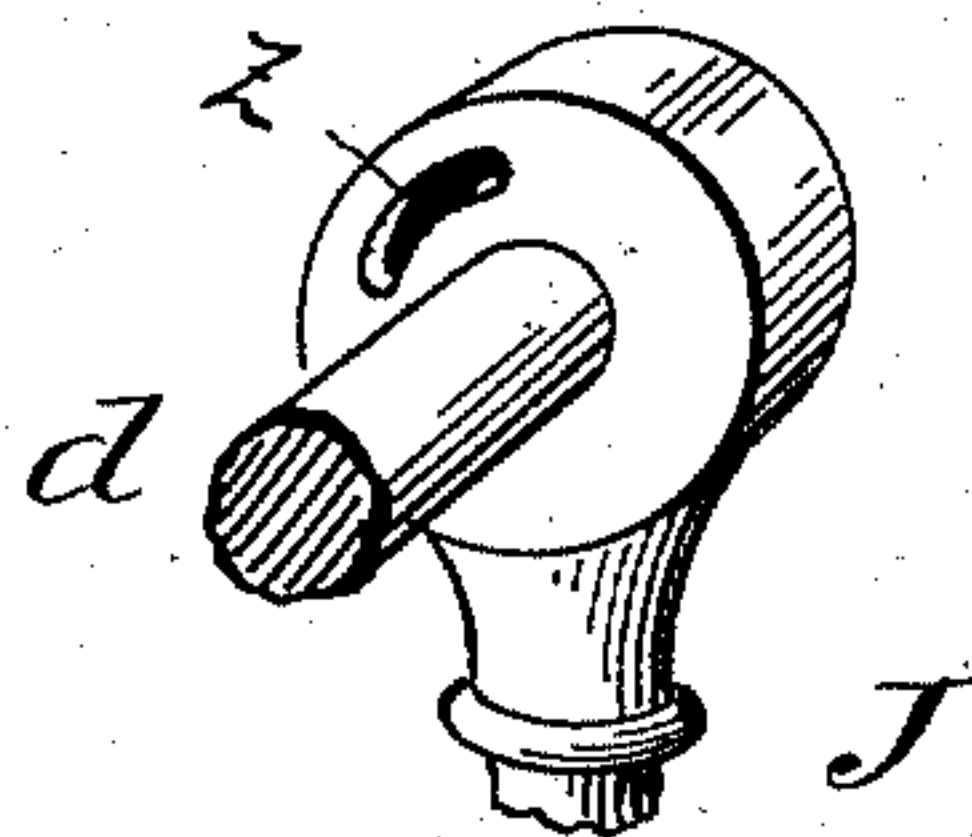


Fig. 9.



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UNITED STATES PATENT OFFICE.

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SUCTION-ROLL FOR PAPER-MACHINES.

SPECIFICATION forming part of Letters Patent No. 483,340, dated September 27, 1892.

Application filed September 9, 1891. Serial No. 405,159. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH B. BENHAM, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Suction-Rolls for Paper-Machines, of which the following is a specification.

This invention relates to paper-making machinery, the object being to provide for paper-machines improved suction-rolls for use in said machines in place of the suction-boxes heretofore employed for extracting water or moisture from the paper-stock as it is carried along by the wire web or apron; and the invention consists in the construction and arrangement of said suction-rolls and devices co-operating therewith, all as hereinafter fully described, and more particularly referred to in the claims.

In the drawings forming part of this specification, Figure 1 is a perspective view of a pair of suction-rolls for a paper-machine embodying my improvements, said figure showing portions of the side rails of the frame of such a machine, air-cut-off blocks attached to said rails, a portion of the wire-cloth apron of a paper-machine partly broken away over said rolls, and other devices hereinafter fully described. Fig. 1^a is a perspective view of the outer end of one of said cut-off blocks and its supporting-bracket. Fig. 2 is a longitudinal section of one of said suction-rolls and sectional views of other parts hereinbelow described. Fig. 3 is a side elevation of the air-cut-off blocks of a roll and of one of said rolls beyond said blocks. Fig. 4 is a perspective view of said cut-off blocks and their supporting devices. Fig. 5 is an end elevation of said rolls and a side view of one of said rail parts and an edge view of the wire apron. Fig. 6 is a cross-section of said rolls and of one of said cut-off blocks about midway between the ends thereof and showing an edge view of said apron, the other of said blocks being shown between the rolls. Fig. 7 is an end elevation of one of said rolls, showing a portion thereof broken away and having indicated thereon in dotted lines other parts of the roll, as below described. Fig. 8 is a sectional and Fig. 9 a perspective view of the air-valve of a roll.

The essential object of this invention is to provide a pair of rolls peculiarly constructed for a paper-machine, each one of which is substantially a rotating suction-box, for extracting moisture from the paper-stock which is carried along over said rolls by the usual wire-cloth or apron. The engagement of said apron with the surfaces of said rolls serves to rotate them, thus obviating the employment of the usual suction-box and the frictional and wearing effect which is produced when said apron is drawn across said box, all as below set forth.

In the drawings, 2 indicates parts of the side rails of the frame of a paper-machine.

The suction-rolls above referred to are indicated by 3, and each of said rolls is constructed as follows: A tubular center piece 4, preferably of sheet-brass, is provided, having a series of longitudinal ribs 5 thereon, extending from end to end, thereby forming a series of grooves or chambers *a* between said ribs. A tubular exterior covering 6, also preferably of sheet-brass, is provided and tightly fixed on said ribbed center piece to constitute the outer shell of the roll and has therein a series of longitudinal or other suitably-formed perforations *c*. Said perforations *c* are so arranged and located in said shell 6 that they are found in those parts thereof which constitute the outer walls of the chambers, which are thus formed between the said ribs 5 on the center piece 4, and said perforations constitute passages through which water and air may enter said chambers, induced by the exhaustive effect of a suitable air-exhausting pump which may be connected to said roll, as below described. A metallic head 7, having air conduits or channels *e* therein, communicating with each of said chambers *a* of the roll, is firmly bolted or otherwise secured to one end thereof, the air-conduits in which extend, as shown in Fig. 2, from the outer end of the hub of said head to the inner face thereof, and one of said conduits terminates opposite one end of each one of said chambers *a*. The opposite end of the roll is tightly closed by a metallic head 8, having a suitable journal or hub *o* thereon, which is bolted or otherwise suitably secured to the roll. The said channeled roll-head is provided with a long jour-

nal d , which projects from the central portion of its hub, as shown in Fig. 2. Each of said rolls 3 is supported on two pillar-blocks 9 or other similar suitable devices, in which are bearings or boxes for said journals d and o , and said pillar-blocks are provided with suitable bases, as shown. An air-valve 10 is placed loosely on the journal d between the hub of said roll-head 7 and said pillar-block 9, having therein an air-chamber h , (see Figs. 2, 8, and 9,) which is connected with an exhaust-pipe J, and a curved slot or port z through the side of said valve adjoining the end of the hub of said head 7 communicates successively with certain of the open ends of said channels in said head when the rolls 3 are rotated. The said pipe J is connected to any suitable air-exhausting device. The operative relations of said air-valve 10, together with the position of its said port z , are such that the open ends of the air-conduits e of the roll-head 7 are all closed against the said air-exhausting or vacuum action above referred to, excepting such number thereof as are opposite said port, and those may be three or four, more or less, according to the arrangement and dimension of the said vacuum-chambers a in the roll with which said conduits communicate. The said vacuum-chambers of the roll or rolls 3 with which said valve 10 permits said air-exhaust communication are those, as shown in Fig. 6 and as indicated by the arrows thereon, which as the rolls rotate are brought to positions opposite each other and above the axes of the rolls and under that portion of the wire-cloth web D which overlies said last-named chambers and which has contact with the suction-rolls, as shown in said Fig. 6, to the end that the thin mass of wet paper stock or pulp which is carried over said rolls on the wire-cloth shall have the water extracted therefrom. During said water-extracting action of the rolls 3 more or less air, with water and moisture from said paper-stock, enters the chambers a of the roll through said perforations c in the outer roll-shell 6, but is discharged therefrom through the same perforations as the chambers move around under the axis of the roll and are cut off from the air-exhaust connections above described.

In order to maintain a proper vacuum in said space between the suction-rolls above their axes and beneath the wire-cloth apron D, which overlies said space, the air-cut-off blocks K K', made, preferably, of sheet-brass, are supported adjustably between said rolls, as shown in Figs. 1 and 6. The form of said blocks is clearly shown in Fig. 1, 1^a, 3, 4, 5, and 6, and exteriorly the sides thereof are concavely curved to permit them to be adjusted to positions as close as practicable to the surfaces of the rolls, whereby they shall serve to cut off and prevent the entrance of air upwardly between the rolls into said vacuum-space under the wire-cloth apron. Said blocks are constructed to have their inner extremities overlies each other, as shown in Figs. 3

and 4, and said extremities are preferably united by a dovetail or similar interlocking engagement, as shown, whereby their adjoining parts toward those parts of the rolls centrally between the ends of the latter shall be sustained against sagging or deflection. Said blocks are also constructed, preferably, with shallow grooves or channels n , extending spirally within those portions of their surfaces which lie next to the surfaces of the rolls from the ends of the blocks to their lower edges, as clearly shown in Fig. 4. The purpose of said channels n is to gather more or less water therein from the surface of the roll and assist in retaining a certain quantity therebetween to serve as a water packing between the roll and the block to prevent air from passing, and thereby preserve a better vacuum, as and for the purpose stated. The said cut-off blocks are, as shown, each constructed with a plane upper surface w , which is normally maintained in a line with the upper sides of the rolls and serves as a bearing for the borders of the wire-cloth apron D, as shown in Fig. 1. The heads or outer extremities of said blocks fill the space, as shown, between the border of said apron and the surfaces of the rolls directly beneath it, and thus cut off the entrance of air under said apron at that point.

In order to facilitate the escape of water that may drip onto the upper sides of the cut-off blocks or that may be thrown thereon from one of the rolls, the said upper sides are preferably deflected or made with surfaces downwardly inclined from the inner edges of said plane faces w toward a central point therebetween. Any water which tends to collect on the blocks between the rolls enters the chambers a through the perforations c in said rolls, and is discharged therefrom by centrifugal force while the rolls revolve. The said cut-off blocks are supported in their proper positions, as described, by a stiff bracket 12, which is bolted or otherwise rigidly attached, as shown, to the side rail 2 of the paper-machine or to other suitable fixed part thereof. The bolt-holes of the arm of said bracket are elongated to permit of the adjustment of the cut-off block to positions more or less removed from the border of the wire-cloth apron D, according to the width of the paper-stock mass which is carried thereon, so that the inner edge of the plane surface w of the block shall be brought slightly under the border of said mass and properly act to cut off any passage of air through the wire-cloth into the said vacuum-space thereunder. It will be observed that when the ends of the blocks K K' are adjusted inwardly or outwardly, as described, the central interlocking parts thereof slide within or upon each other, and that no opening is made between said ends whereby air may be admitted to the vacuum-chamber over the blocks.

To provide for any desired slight adjustment of said blocks vertically or toward or

from the surface of the rolls, the part of the bracket 12 which is attached to the end of the block is bolted thereto by screws likewise passing through elongated holes, as shown in Fig. 1^a.

In practice the usual wire-cloth apron D, upon which the paper-stock is delivered from the stuff-chest of the paper-machine, moves, with its overlying wet stock, and bears upon said suction-rolls, and its impinging force thereon is essentially augmented by reason of the above-described vacuum under that part thereof which extends over the rolls, and consequently the latter are caused to rotate with a speed coinciding with the longitudinal movement of said apron.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A suction-roller for paper-machines, consisting of a tubular center having a series of longitudinal ribs on its exterior surface, a tubular shell covering said ribs, thereby forming a series of exhaust-chambers therebetween having an opening therethrough opposite each of said chambers, a head for one end of said roll, having air-conduits therein corresponding in number to that of said chambers, extending from its outer side to its inner face and communicating with said chambers, a suitable head for the opposite end of said roll, and suitable journals and bearings for each head, combined with an air-valve, substantially as described, co-operating with said conduit-containing head and permitting air communication between a limited number of said exhaust-chambers and conduits during the rotation of said roll, air-cut-off blocks, substantially as described, located between said rolls, and a suitable air-exhaust device connected to said valve, substantially as set forth.

2. In a suction apparatus for paper-machines, a cylinder mounted for rotation and adapted to be peripherally borne upon by the passing apron and provided with a series of separated chambers which terminate in passages having their orifices at different places around the periphery of the cylinder, a common conduit arranged for suction communication with all of said separated chambers, and valve mechanism arranged between and relative to the said common conduit and said separated cylinder-passages, whereby as the cylinder rotates there will be established suction communication through such of said separated peripherally-terminating chambers as are adjacent the passing apron and a cut-off of the suction communication through such of the said chambers as are not adjacent to said apron, substantially as described.

3. The combination, with two chambered suction-rolls for paper-machines, substantially as described, having rotary movements near each other, of two air-cut-off blocks supported between said rolls, having grooves within those portions of their surfaces which adjoin said rolls, said grooves extending from

the ends of said blocks to their lower edges, substantially as set forth.

4. The combination, with two parallel separated chambered suction-rolls for paper-machines, provided with series of suction-passages which terminate at different peripheral portions of the roll and which have rotary movements near each other, of two air-cut-off blocks located and ranging longitudinally between and having bearings at their opposite sides lengthwise upon the sides of both of said rolls and having longitudinal sliding engagements the one with the other, said blocks having their portions which are adjacent the ends of the roll in the plane coincident with the upper peripheral portions of the rolls, their upper surfaces intermediate of the so-coinciding end surfaces being below said plane of coincidence, and adjustable supporting devices therefor, whereby said blocks may be moved for adjustment parallel with the axes of the suction-rolls to accord with the width of the paper-stock which may be passing over the rolls, substantially as set forth.

5. The combination, with two chambered suction-rolls for paper-machines, provided with series of suction-passages which terminate at different peripheral portions of the roll and having rotary motions near each other, of two cut-off blocks located between said rolls and having sidewise bearings peripherally thereon, and one thereof having a longitudinal dovetailed way and the other the longitudinal dovetailed rib for engagement therein, and each also having longitudinally-adjustable end supports, substantially as described.

6. The combination, with two chambered suction-rolls for paper-machines, substantially as described, having rotary movements near each other, of two air-cut-off blocks supported between said rolls and preventing air from entering therebetween from beneath and between their ends, each of said blocks having an upper surface near the ends of said rolls substantially in a plane with the upper sides thereof and being downwardly inclined from the inner border of said upper surface to a central point between the outer ends of said blocks, substantially as set forth.

7. The combination, in a paper-machine, of the apron and a parallel pair of suction-rolls having separated air-passages therein which terminate at different portions peripherally thereof, and a suction-conduit and valve mechanism for each roll, coacting with said separated passages, whereby a suction may be established as the rolls rotate through such of the said passages as have their orifices toward the upper portion of the roll, and a block or part constituting a longitudinal partition in bearing upon and between the adjacent sides of the rolls, the same having its end portions in a plane substantially coincident with the tops of the rolls, but having its intermediate surface depressed, substantially as described.

8. The combination, with a suction-roll for
a paper-machine, consisting of a tubular cy-
lindrical shell having a series of longitudinal
ribs with intervening longitudinal chambers
5 *a* and a surrounding cylindrical shell 6, having
longitudinal slots or perforations *c*, a closing-
head at one end, and a head at the other, which
is provided with a series of passages *e*, that
terminate in ports having a circular arrange-
10 ment, substantially as described, of a suction-

pipe mounted relative to the roll and adapted
to have at a given instant during the rotation
of the roll an air communication with one or
more of the said ports, substantially as and
for the purpose described.

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