

No. 712,664.

Patented Nov. 4. 1902.

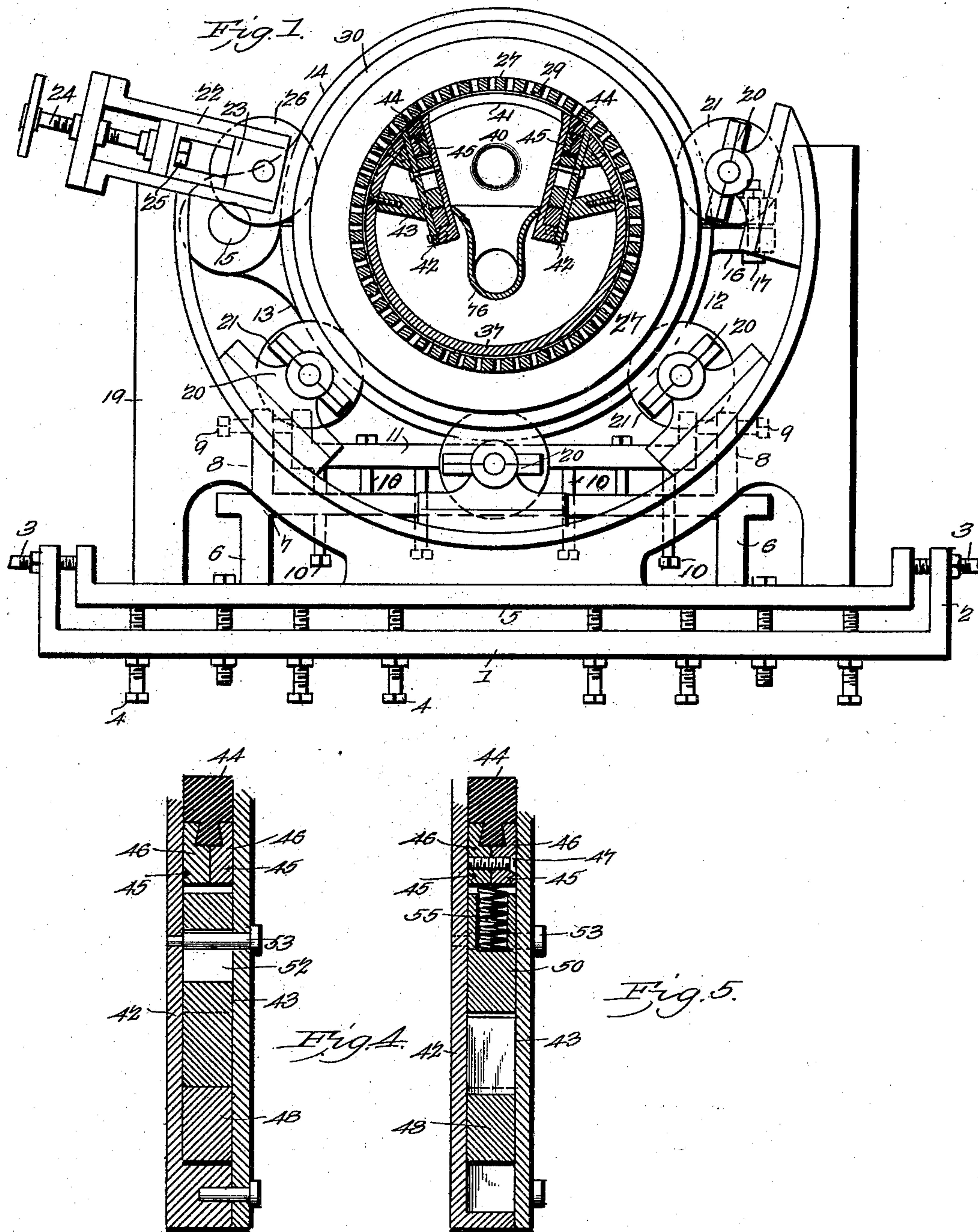
W. H. GAGE.

SUCTION BOX FOR PAPER MAKING MACHINES.

(Application filed Aug. 14, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses
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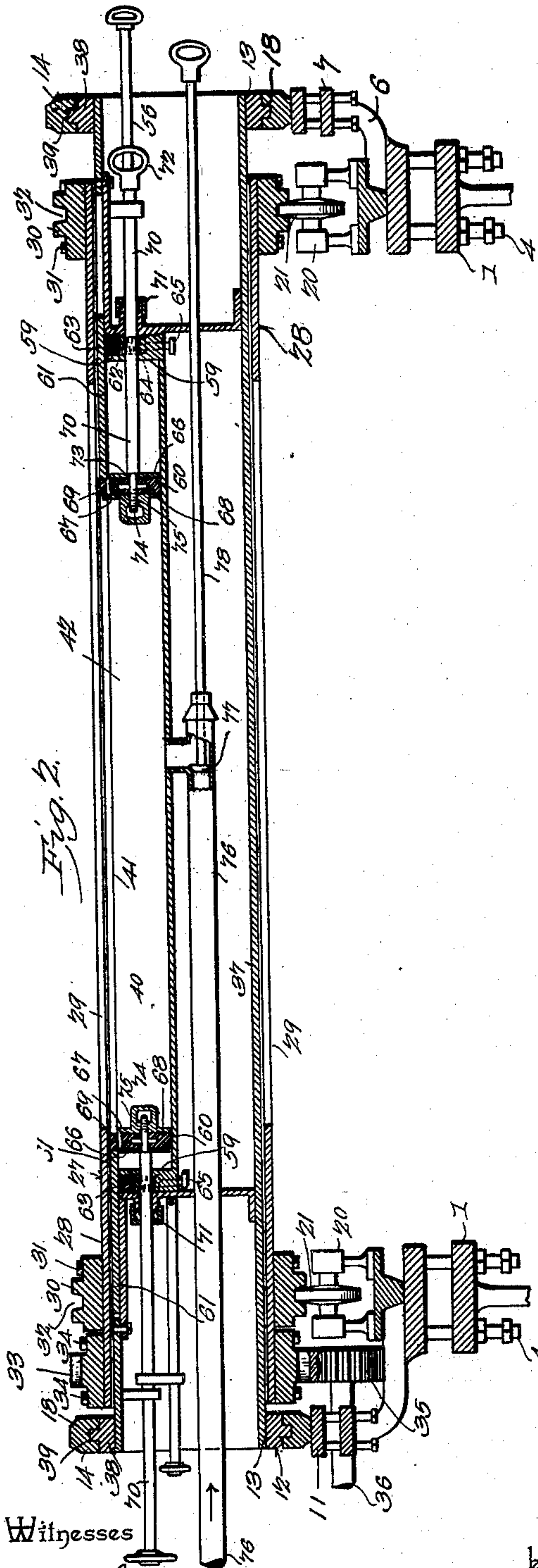


Fig. 2.

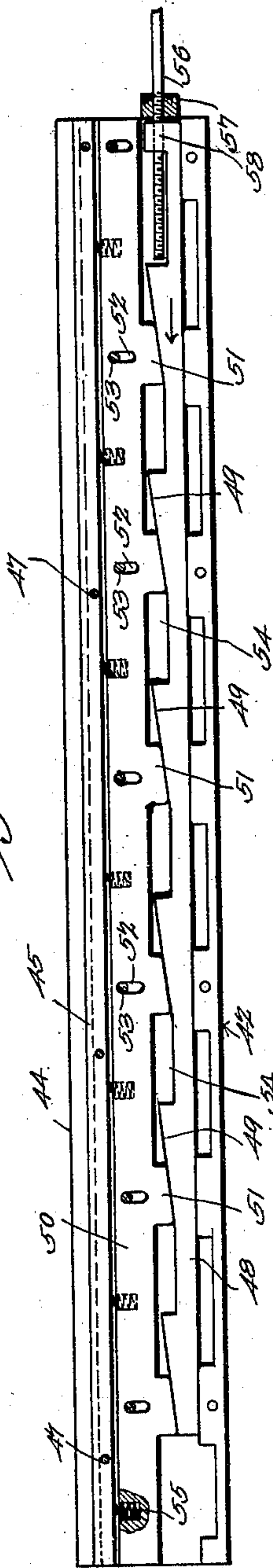


Fig. 3.

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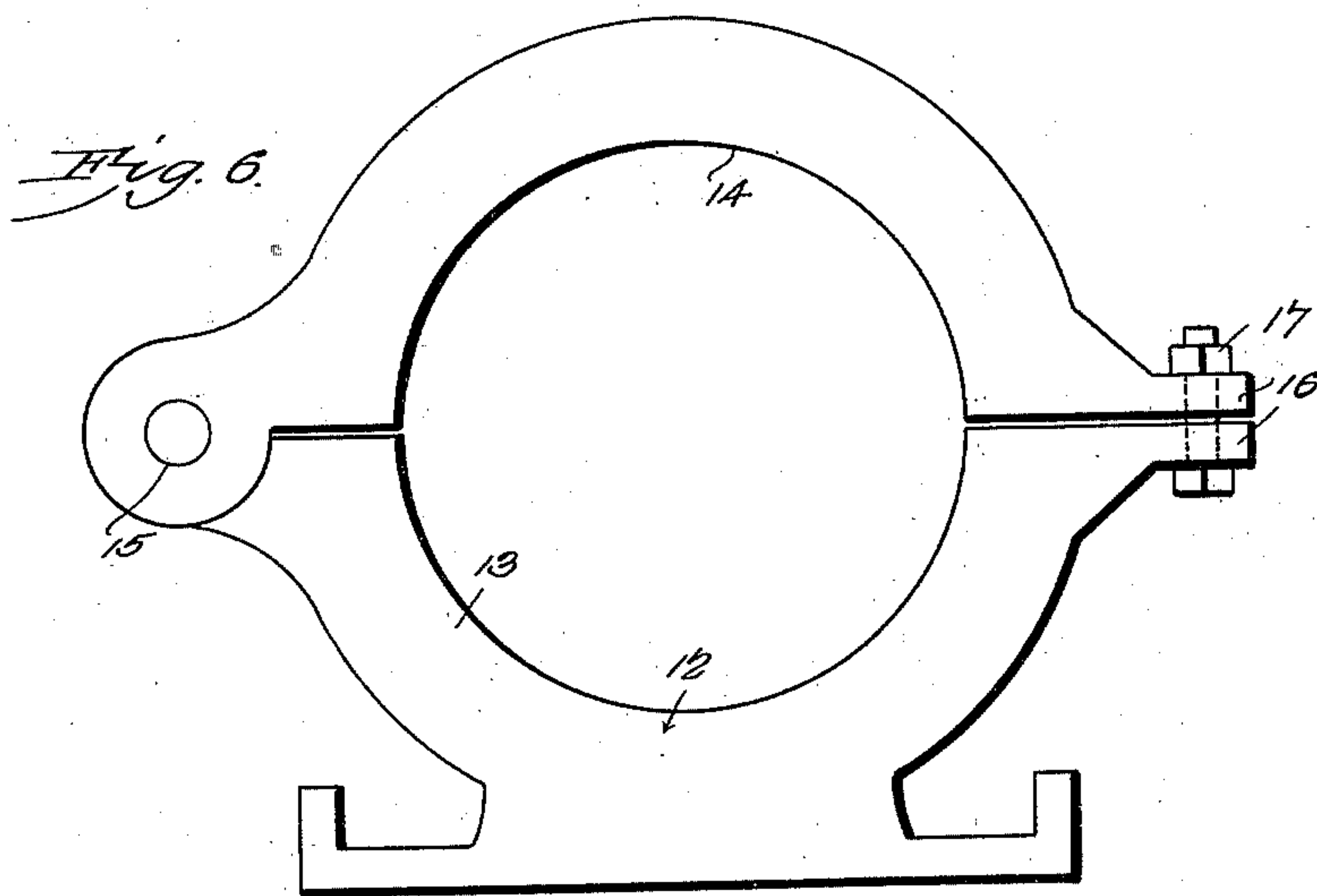
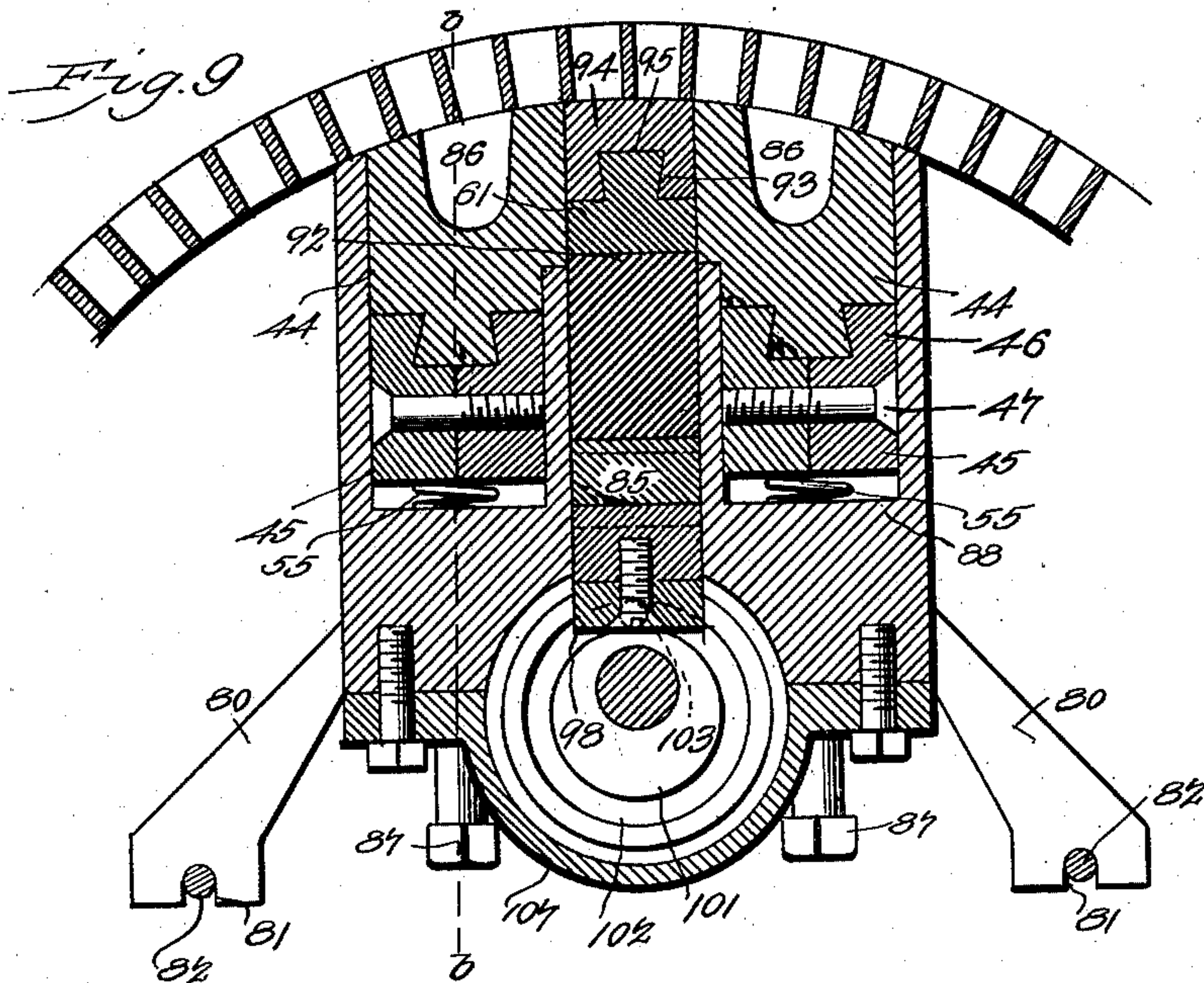
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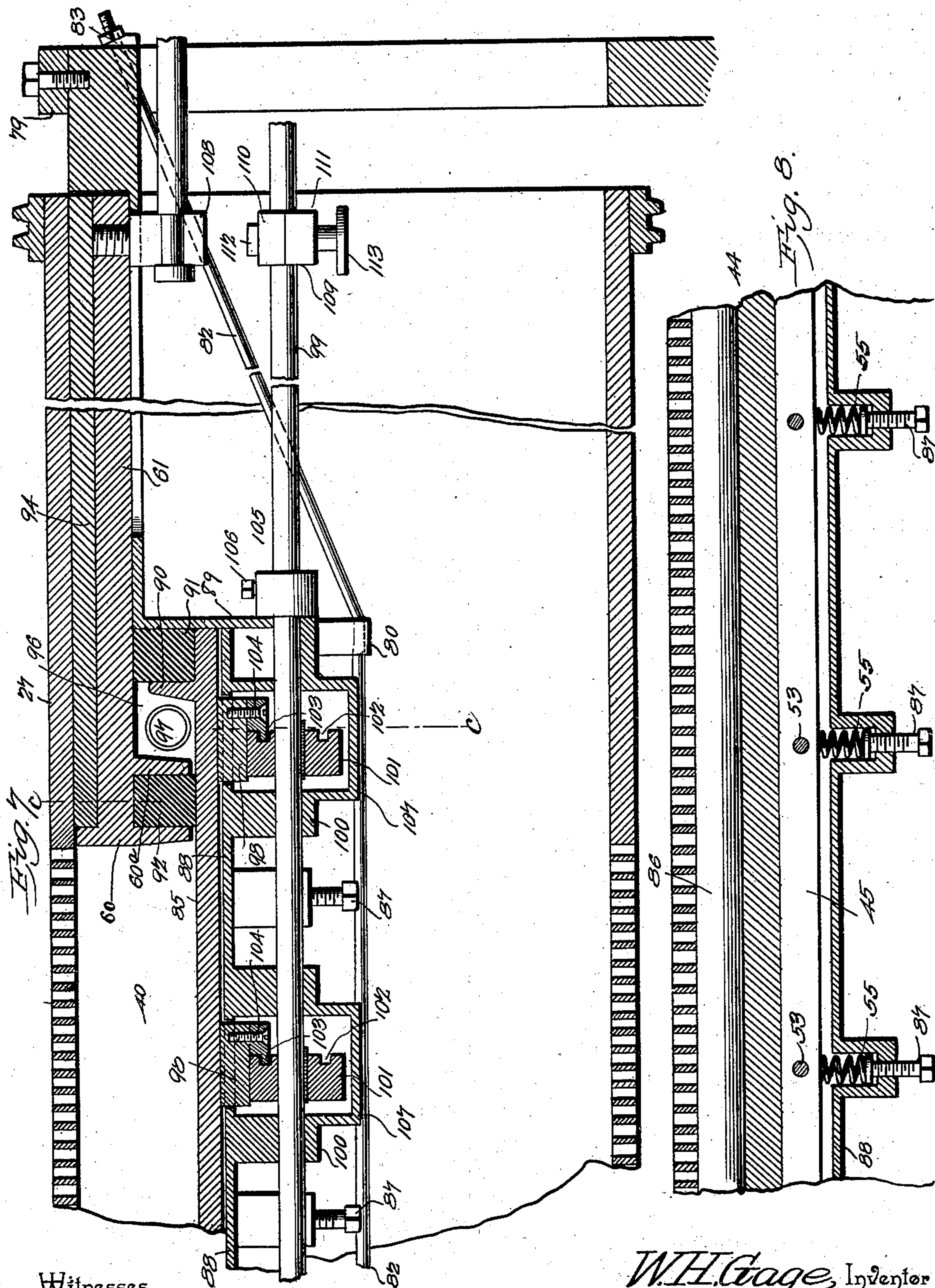
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UNITED STATES PATENT OFFICE.

WALTER HOWARD GAGE, OF FITCHBURG, MASSACHUSETTS, ASSIGNOR OF
ONE-HALF TO GEORGE H. CROCKER, OF FITCHBURG, MASSACHUSETTS.

SUCTION-BOX FOR PAPER-MAKING MACHINES.

SPECIFICATION forming part of Letters Patent No. 712,664, dated November 4, 1902.

Application filed August 14, 1901. Serial No. 72,067. (No model.)

To all whom it may concern:

Be it known that I, WALTER HOWARD GAGE, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented a new and useful Suction-Box for Paper-Making Machines, of which the following is a specification.

My invention is an improved suction-box for paper-making machines, and comprises a relatively fixed suction-box in combination with a revoluble perforated cylinder over which the wire and the felt passes, the said cylinder traveling at the same rate as the wire and felt to avoid friction between the same, and hence avoid wearing the wire or tearing the felt.

One object of my invention is to effect an improvement in the construction of the suction-box whereby the heads forming the ends of the same may be adjusted to increase or decrease the effective length of the box, and hence enable the same to be used in connection with the perforated revoluble cylinder in the making of paper of varying widths.

A further object of my invention is to effect improvements in the means to adjust the suction-box with relation to the revoluble perforated cylinder in which it is disposed.

A further object of my invention is to provide improved means for packing the joints between the suction-box and the revoluble perforated cylinder to enable an efficient vacuum to be maintained in the suction-box.

With these and other objects in view my invention consists in the peculiar construction and combination of devices hereinafter fully set forth and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view taken transversely through the perforated cylinder and the suction-box, showing the latter and the inner non-revoluble cylinder in operative relation to the perforated cylinder and showing the supports for the latter which adapt the same to be rotated and reduce friction. Fig. 2 is a vertical longitudinal sectional view of the same. Fig. 3 is a detail sectional elevation through one side of the suction-box. Fig. 4 is a detail transverse sectional view of the same on a larger scale. Fig. 5 is a similar

view taken on a different plane. Fig. 6 is an end elevation showing one of the clamping-collars in which the ends of the non-revoluble inner cylinder are secured. Fig. 7 is a detail vertical longitudinal sectional view of a modified form of my improved suction-box in which the inner non-revoluble cylinder is dispensed with. Fig. 8 is a vertical longitudinal sectional view taken on a plane indicated by the line *b b* of Fig. 9. Fig. 9 is a transverse section taken on a plane indicated by the line *c c* of Fig. 7.

The floor-frame 1 is provided at its sides with vertical flanges 2, having horizontal transverse threaded openings therein, in which openings operate adjusting-screws 3. The said floor-frame is further provided with vertically-disposed adjusting and supporting screws 4. On the latter is supported a laterally and vertically adjustable frame 5, the sides of which are engaged by the inner ends of the screws 3. The adjustable frame 5 is provided on its outer side with outwardly-projecting arms 6, the outer ends of which are upturned and connected together by a base-plate 7, which is formed integrally therewith and with the frame 5 and is provided at its ends with vertical flanges 8. Horizontally-disposed inwardly-projecting adjusting-screws 9 operate in threaded openings in the said flanges 8. Vertically-disposed adjusting and supporting screws 10 also operate in threaded openings in said base-plate 7. A plate 11 is supported on the upper ends of the screws 10, is clamped between the horizontally-disposed screws 9, and by means of the latter may be adjusted laterally. A clamping-collar 12 has its lower section formed integrally with the adjustable plate 11. The said clamping-collar comprises the lower semi-circular section 13 and the upper semi-circular section 14, which is hinged to said section 13 at one side, as at 15. The said sections of the said clamping-collar are formed with outwardly-projecting lugs 16 on the sides thereof opposite the hinge connection 15, and a clamping-bolt 16 connects the said lugs together and adapts the upper section 14 of the collar to be adjusted toward or from the lower section 15 thereof. The said clamping-collar is provided on its inner side with an an-

nular groove 18. The said adjustable frame 5 is provided on its upper side with a standard 19, the same being provided with a series of bearings 20 for antifriction-rollers 21, which rollers are disposed in a semicircular line. The said standard is further provided at its upper sides, at a point substantially opposite the upper roller 21, with a radially-disposed guide 22, in which is an adjustable bearing 23. The said guide 22 has an adjusting-screw 24, the inner end of which is swiveled to the said bearing 23, as at 25, and by means of which the said bearing may be adjusted radially. In the said bearing 23 is mounted an antifriction-roller 26. The said rollers 21 and 23 are disposed in the same vertical plane.

In practice two of the frames 15, constructed as hereinbefore described, will be employed, and the same may be disposed at a suitable distance from each other.

In the embodiment of my invention I provide a revoluble cylinder 27, in which the suction-box is disposed. The said cylinder 27 has an imperforate section 28 at each end and a perforated intermediate section 29, the width of which perforated intermediate section is equal to that of the widest paper made by the machine in connection with which my improved suction-box is employed. The perforations in the said cylinder 27 extend entirely around the same. At or near the ends of the revoluble cylinder 27 are collars 30, in which the said cylinder is placed, the said collars being secured on the said cylinder by means of bolts 31 or other suitable devices. The said collars are provided with peripheral annular grooves or treadways 32, in which the rollers 21 23 operate, the said rollers serving to support the said cylinder and adapting the latter to be rotated, as will be understood. The said rollers form antifriction-bearings for the said cylinder. The latter is provided at one end with a ring-gear 33, which is secured thereon by bolts 34 or other suitable means, and the said ring-gear is engaged by a pinion 35 on a power-shaft 36. The bearings for the latter are not here shown; but it will be understood that suitable bearings must be provided therefor. From the foregoing it will be understood that power may be communicated to the roller 27 and the same rotated when the paper-making machine is in operation.

In the form of my invention shown in Figs. 1 and 2 of the drawings I employ an inner non-revoluble cylinder 37, which is disposed within and extends longitudinally through the revoluble perforated cylinder 27. Said inner cylinder 37 is provided at its ends, which project beyond the ends of the cylinder 27, with rings 38, which are fast thereon and are provided with peripheral annular flanges 39, that operate in the grooves 18 with which the clamping-collars 12 are provided. The suction-box 40 is disposed in the upper side of said cylinder 37 at a point midway between the ends of the latter, and that portion of the

said cylinder 37 which is over the said suction-box is cut away, as at 41, to form the open outer side of said suction-box. In Fig. 1 of the drawings the said opening 41 is shown as directly in the upper side of the inner cylinder 37; but in practice the said opening will be on one side of the upper portion of said cylinder 37. Owing to the fact that inner cylinder 37 is supported by the clamping-collars 12 the same may be adjusted to dispose the suction-box at any desired point within the outer cylinder, and when so adjusted may be firmly clamped in position by means of the bolts 17 and the hinged upper sections of the clamping-collars. By adjusting the plates 11 by means of the adjusting-screws 9 10 the inner cylinder may be adjusted within the outer cylinder as may be required, and hence the open side of the suction-box may be at all times maintained in close engagement with the inner side of the outer revoluble perforated cylinder.

In the form of my invention shown in Fig. 1 the sides 42 of the suction-box diverge outwardly toward the outer cylinder, and the same are provided with recesses 43, the outer sides of which are open. In the recessed sides of the suction-box are packing-strips 44, which are preferably made of Babbitt metal and which bear against the inner side of the revoluble perforated cylinder 27 to pack the joints between the same and the sides of the suction-box. The said packing-strips are dovetailed to bars 45, which are composed of separable sections 46, connected together by screws 47. In the lower side of each recessed side of the suction-box is disposed a longitudinally-movable bar 48, on the upper side of which are wedge-shaped keys 49. A bar 50 is disposed between each bar 48 and bar 45 and is provided on its lower side with wedge-shaped keys 51, which are engaged by the keys 49. Said bar 50 is provided with adjusting slots or guides 52, in which operate pins 53, which pass transversely through the sides of the suction-box. Said pins and slots coact as guides for the bars 50 to adapt the latter to be adjusted in planes at right angles to their axes. The said bars 50 are recessed in their sides which are opposed to the bars 45, as at 54, and in the said recesses are seated springs 55, which bear against the said bars 45 and press the packing-strips outwardly against the perforated cylinder. It will be understood that by adjusting the key-bars 48 longitudinally the tension of the said springs 55 may be varied to increase or decrease the friction between the perforated cylinder and the packing-strips 44 at will. Hence tight joints may be maintained between the sides of the suction-box and the revoluble perforated cylinder without creating undue friction. Any suitable means may within the scope of my invention be employed for adjusting the key-bars 48. I show adjusting-screws 56 for this purpose, which are swiveled in glands 57 at

the ends of the sides of the suction-box, the said adjusting-screws engaging threaded openings 58, with which the said key-bars 48 are provided.

5 At each end of the suction-box is a head 59. The said suction-box is further provided with sliding heads 60. Each sliding head is provided on its outer side with a slide 61, which is adapted to cover the sides of the perforated
10 section of cylinder 27 to any desired extent, according to the width of the paper that is being made on the machine and accordingly as the width of the space between the deckle-straps is narrowed or widened. It will be
15 understood that the said slide 61 partially covers the ends of the suction-box, in effect enabling the length of the vacuum portion thereof to be varied. The heads 59 of the suction-box are recessed, as at 62, to receive
20 packings 63, which bear against the under sides of the slides 61. Said packings are supported and compressed by springs 64, and the tension of the latter may be varied at will by means of adjusting-screws 65, with which the
25 heads of the suction-box are provided. Each of the sliding heads 60 comprises an outer section 66 and an inner section 67. Between the said sections is a spring 68, which is preferably a solid block of rubber, and also dis-
30 posed between the said sections of each sliding head in the side thereof opposite the inner side of the revoluble perforated cylinder is a packing 69, which packings 69 are arc-shaped on their outer sides to adapt them to
35 fit snugly against the inner side of the revoluble perforated cylinder. The width of the said packings 69 must be something less than the thickness of the rubber spring-blocks 68, so that the latter may be compressed be-
40 tween the sections 66 67 to keep the packings 69 closely in engagement with the revoluble perforated cylinder. The said sliding heads 60 are movable longitudinally in the suction-box by means of rods 70, which pass
45 through suitable stuffing-boxes 71 in the ends of the suction-box and are provided at their outer ends with suitable handles 72, by which they may be either moved longitudinally or rotated. The said rods 70 are adapted to
50 turn in openings in the sections 66 of the sliding heads, as at 73, and the inner ends thereof are screw-threaded, as at 74, and engaged with threaded openings 75, with which the sections 67 of said sliding heads are pro-
55 vided. Hence by means of said rods 70 said sliding heads may be moved longitudinally toward and from the ends of the suction-box to correspond with the width of the space between the deckle-straps. By turning said
60 rods 70 the compression of the sections 66 67 of said sliding heads 60 on said rubber spring-blocks 68 may be varied to vary the friction between the packings 69 and the inner side of the revoluble perforated cylinder as may
65 be required. The usual suction-pipe 76 leads from the suction-box and is provided with a valve 77, which is operated by a rod 78.

In operation the revoluble perforated cylinder containing the suction-box, as described, is placed outside of the couch-roll of
70 a cylinder paper-making machine and on one side of the vat, the felt passing around the said cylinder. The sliding covers 61 keep the water from the felt beyond the sides of the sheet of paper formed on the felt, and, in
75 connection with the packings hereinbefore described, exclude air from the suction-box, hence enabling an effective vacuum to be maintained therein. The adjustable frames
80 5 enable the cylinder to be adjusted and maintained in perfect adjustment with relation to the other elements of the paper-making machine.

In Figs. 7, 8, and 9 I show a modified form of my invention, in which the inner cylinder
85 27 is dispensed with and the suction-box has its ends connected to and directly supported by the rings 38, as at 79. In this form of my invention the suction-box is provided on its under side at its ends with outwardly and
90 downwardly projecting lugs 80, which have notches 81 in their lower sides. Truss-rods 82 are disposed longitudinally under the suction-box, are engaged in the said notches 81, and the ends thereof are secured to the ends of the
95 suction-box, as at 83. It will be understood that said truss-rods brace and strengthen the suction-box to enable the same to withstand the stress to which it is subjected. In this form of my invention the sides of the suction-
100 box are parallel, the space between them being relatively narrow, and the suction-box is provided with a movable false bottom 85. The packing-strips 44, which are constructed of Babbitt metal, are channeled in their upper
105 sides, as at 86 to form chambers for the reception of water, which forms a packing or sealing medium between the packing-strips and the upper inner side of the perforated revoluble cylinder 27. In this form of my invention
110 the packing-strips 44 in the sides of the suction-box are dovetailed to supporting-bars 45, which comprise the separable sections 46, connected together by screws 47, to enable the packing-strips when they become worn
115 to be readily detached from the bar 45 and replaced by new ones. The springs 55, which support and compress the packing-strips 44, bear upon adjusting-screws 87, which operate in threaded openings in the bottom of
120 the suction-box near the sides thereof, and by means of which adjusting-screws the tension of the said springs 55 may be varied as may be required. Formed with or securely
125 attached to the bottom 88 and sides of the suction-box at the ends thereof are heads 89. The movable false bottom 85 of the suction-box is slightly shorter than the space between the fixed heads 89, that form the ends of the
130 suction-box, and the said movable false bottom is provided on its upper side, near its ends, with transversely-disposed heads 90. Between the same and the approximate fixed heads 89 are disposed rubber or other suit-

able packing-blocks 91, which are compressed between the said heads 89 90. The sliding heads 60 are formed on their under sides with depending flanges or heads 60^a, each of the said sliding heads having a pair of said depending flanges, and between the latter are rubber or other suitable packing-blocks 92, which bear upon the movable false bottom 85 and effectually pack the joints between the same and said sliding heads. The slides 61 of the latter are provided on their upper sides with longitudinal dovetail tongues 93, and I provide each of the said slides with a packing-strip 94, which is made of Babbitt metal and is provided on its under side with a dovetail groove 95 to receive the dovetail tongue of one of the said slides. Hence the said packing-strips are secured on the said slides and bear against the under side of the upper portion of the perforated revoluble cylinder. It will be observed by reference to Fig. 8 that chambers 96 are formed in the ends of the suction-box between the packing-blocks 91 92, which chambers may be supplied with water through the pipes 97 to more effectually exclude air from the box through the ends thereof.

The movable false bottom of the suction-box is provided on its lower side with bearing-studs 98. A shaft 99 extends longitudinally under the bottom of the suction-box and is disposed in bearings 100, which depend from the bottom of the suction-box. Keyed on the said shaft are a series of eccentric cams 101, which bear under the bearing-studs 98 and are each provided in one side with an eccentric annular groove 102, which is engaged by a detent 103, with which each of the said bearing-studs is provided. In practice the said detents are separable from the said bearing-studs and are here shown as detachably connected thereto by bolts or screws 104. The grooves 102, while eccentrically disposed, are concentric with the perimeters of the said cams. It will be understood from the foregoing that by turning the shaft 99 the cams 101 may be caused to raise the movable false bottom of the suction-box to compress the packing-blocks 91 92, and also to compress the heads 60 and the slide 61 closely against the revoluble perforated cylinder. By moving the shaft 99 endwise in one direction a slight distance the cams 101 may be simultaneously disengaged from the detents 104 to release the connection between the said shaft and the movable false bottom of the suction-box to facilitate the disassembling of the parts of the latter. A collar 105 is secured on the said shaft 99, as by a screw 106, and bears against one end of the suction-box to lock the said shaft against longitudinal movement when the detents 103 are engaged with the grooves 102 of the eccentric cams. I provide the bottom of the suction-box with casings 107 to inclose the eccentric cams, the bearing-lugs, and the detents, as

shown in Fig. 9. The slide-rods 70, which operate the slides in this form of my invention, are detachably connected to the slides, as at 108, whereby when the slides have been adjusted the said rods may be removed to prevent them from projecting outwardly beyond the ends of the revoluble perforated cylinder, where they would be in the way. The suction-box is further provided at a suitable distance from one end of the said revoluble perforated cylinder with a clamp 109, which is here shown as a bearing having a fixed jaw 110 and a movable jaw 111 to engage the shaft 99 and a bolt 112 to clamp said jaws on said shaft, the said bolt having a winged nut 113, which is adapted to be readily turned by hand. When the shaft 99 has been turned to cause the sliding heads and the packed slides thereof to engage the inner side of the revoluble perforated cylinder to effect air-tight joints therewith, the said shaft may be secured at said adjustment by tightening the nut 113, as will be readily understood. Other modifications may be made without departing from the spirit of my invention, and I do not therefore limit myself to the precise construction and combination of devices herein shown and described.

Having thus described my invention, I claim—

1. The combination of a revoluble perforated cylinder, concentrically-disposed bearing-rollers supporting the same, relatively fixed bearings for said rollers, and bearing-rollers, in movable bearings, engaging one side of the cylinder above the axis thereof, whereby said cylinder may be unshipped from said bearing-rollers, and means to set said movable bearings, with a suction-box in said cylinder, substantially as described.

2. The combination of vertically and laterally adjustable frames, a revoluble perforated cylinder having its bearings on said frame, whereby either end of said cylinder may be adjusted vertically and laterally, vertically and laterally adjustable supports, and a suction-box in and extending through said cylinder, said suction-box being non-revoluble and carried by said vertically and laterally adjustable supports, substantially as described.

3. In combination with a revoluble perforated cylinder, a relatively fixed suction-box within the same and having adjustable heads to widen or narrow the effective perforated portion of the cylinder, said heads having slides extending outwardly therefrom and bearing against the inner side of the perforated revoluble cylinder, to keep the water from the felt beyond the sides of the sheet of paper formed on the felt, substantially as described.

4. In combination with a revoluble perforated cylinder, a relatively fixed suction-box, movable packings to close the joints between said cylinder and suction-box, springs to com-

press said packings, and means to vary the tension of said springs, substantially as described.

5 5. In combination with a revoluble perforated cylinder, a relatively fixed suction-box, bearing against the same, said suction-box having fluid-packing chambers on the side thereof opposed to said cylinder, substantially as described.

10 6. In combination with a revoluble perforated cylinder, independently - adjustable bearings for the respective ends thereof, a relatively fixed suction-box to bear against one side of the cylinder, and independently-
15 adjustable supports for the respective ends of said suction-box, substantially as described.

20 7. In combination with a revoluble perforated cylinder, bearings therefor, a relatively fixed suction-box to bear against one side thereof, annular bearings to support said suction-box and means to adjust said annular supporting-bearings, substantially as described.

25 8. In combination with a revoluble cylinder, having non-perforate end sections and a perforated intermediate portion, a relatively fixed suction-box to bear against one side of said cylinder, adjustable heads disposed within the ends of said suction-box, said heads
30 having outwardly-extending slides to bear

against one side of said cylinder, compression-springs to support said heads, means to vary the tension of said springs, and means to adjust the suction-box and hence the heads, 35 radially toward one side of the cylinder, substantially as described.

9. In combination with a revoluble perforated cylinder, a relatively fixed suction-box to bear against one side thereof, adjustable 40 heads within the ends of said suction-box, to bear against said cylinder, and fluid packings between said heads and the ends of said box, substantially as described.

10. The combination of vertically and laterally adjustable frames, having concentrically-disposed bearing-rollers, a revoluble perforated cylinder, supported on said bearing-rollers, said cylinder having a ring-gear thereon, a power-shaft having a pinion engaging 50 said ring-gear, a non-revoluble suction-box in and extending through said cylinder, and vertically and laterally adjustable supports for said suction-box, substantially as described. 55

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WALTER HOWARD GAGE.

Witnesses:

LEWIS B. CLAPP,
WILLIAM N. GAGE.