O. H. DOWELL.

SUCTION ROLL.

APPLICATION FILED APR. 6, 1909. RENEWED SEPT. 21, 1911.

1,008,407.

Patented Nov. 14, 1911.

3 SHEETS—SHEET 1.

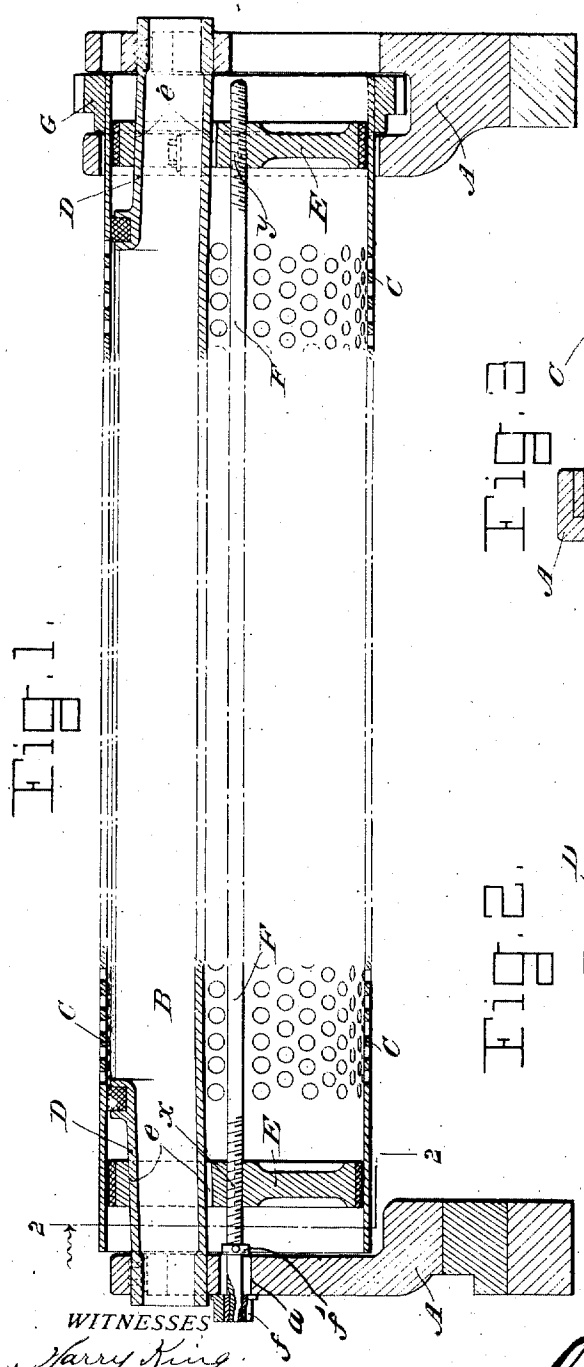

Fig. 1.

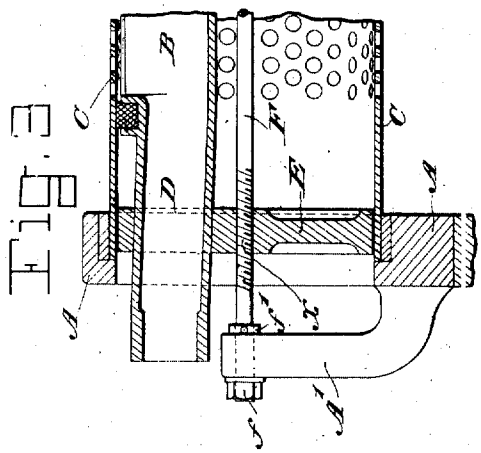

Fig. 3.

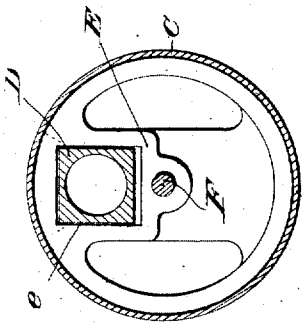

Fig. 2.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 4.

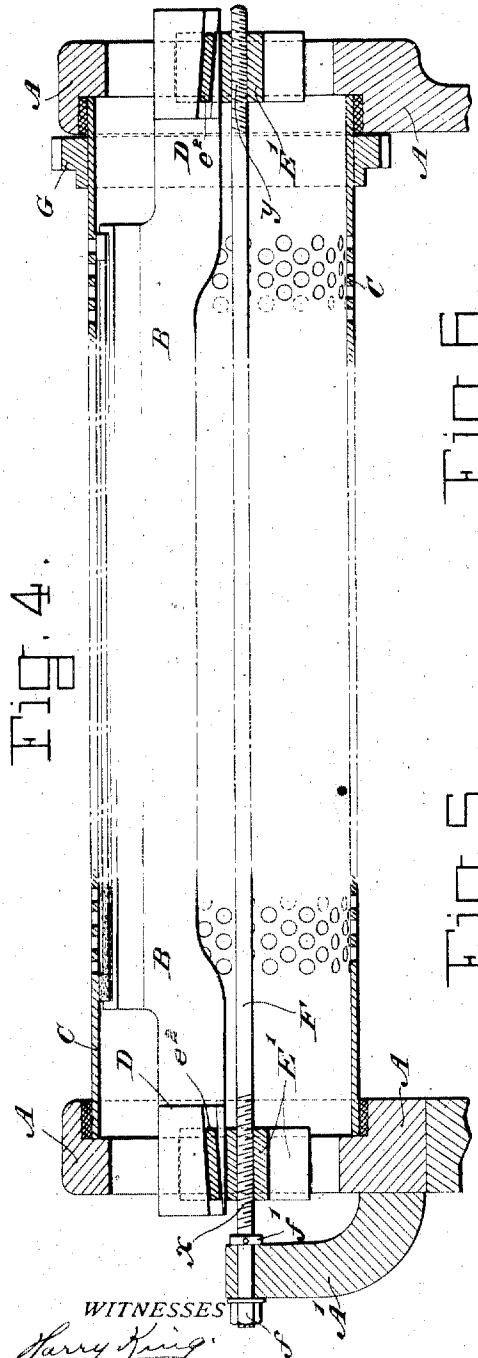


Fig. 6.

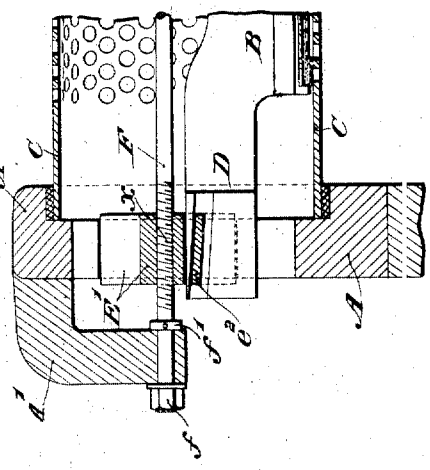
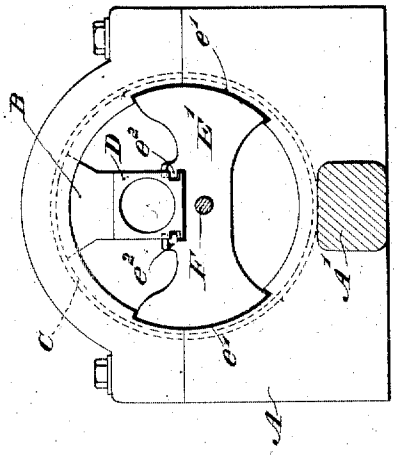


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 7.

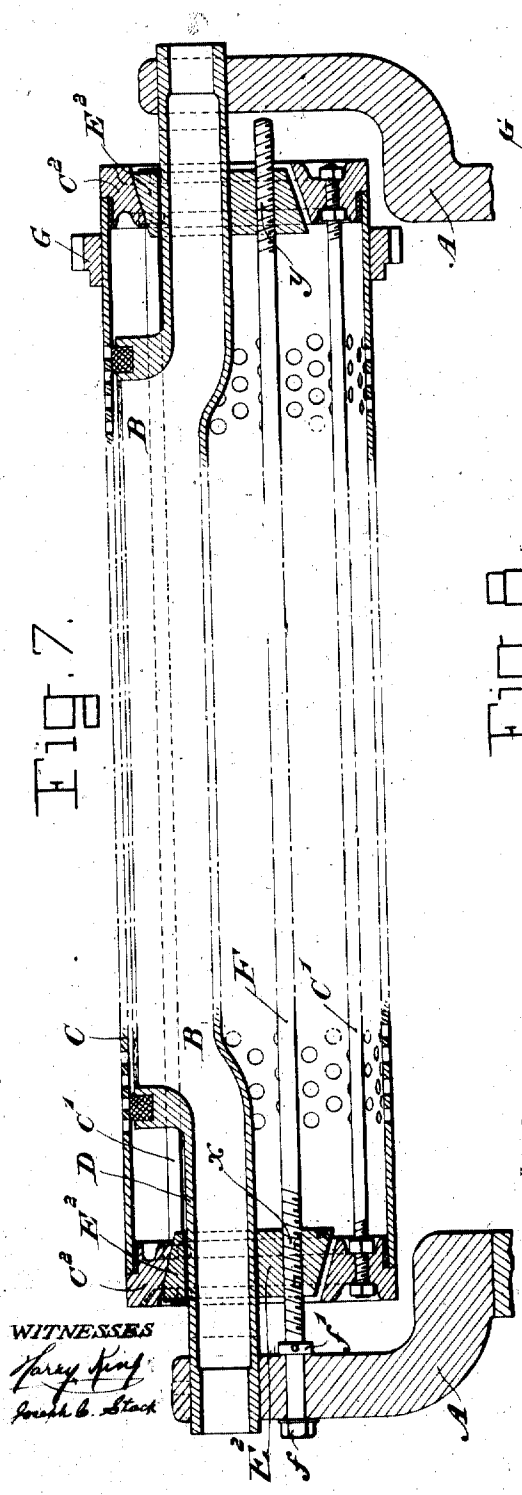
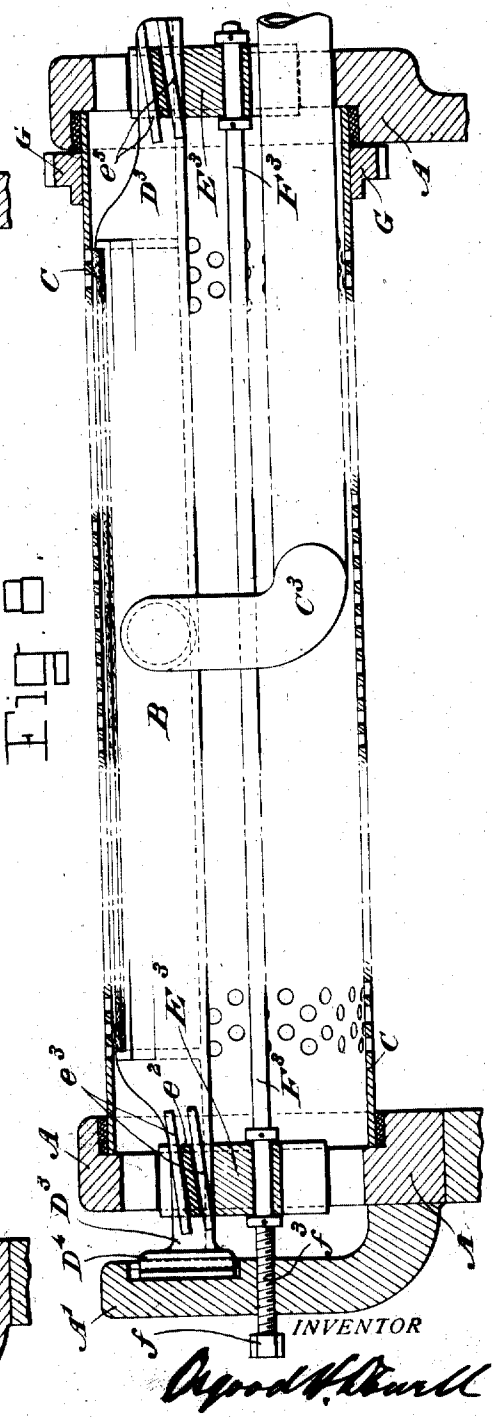


Fig. 8.



UNITED STATES PATENT OFFICE.

OSGOOD H. DOWELL, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE SANDUSKY FOUNDRY AND MACHINE COMPANY, OF SANDUSKY, OHIO, A CORPORATION OF OHIO.

SUCTION-ROLL.

1,008,407. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed April 6, 1909, Serial No. 488,205. Renewed September 21, 1911. Serial No. 650,346.

To all whom it may concern.

Be it known that I, OSGOOD H. DOWELL, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Suction-Rolls; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to revolving suction-rolls for use in paper and pulp mills or elsewhere where such apparatus may be needed, being commonly employed for extracting water and moisture from pulp while it is forming into a sheet on the wire or felt of a paper-making machine.

The object of the invention is to provide a suction-roll which shall be efficient in operation either with light or heavy suction; one wherein the adjustment is convenient; and the construction of which is simple and practical for manufacture.

My invention embodies the basic principle disclosed in Mr. William H. Millspaugh's U. S. Patent No. 895,283, of maintaining air tight contact between the suction-box and interior surface of the revolving shell or cylinder at a limited degree of pressure, so as to prevent the box from becoming locked to the cylinder under influence of the suction; which has greatly improved the efficiency of suction-rolls and made it possible to operate safely with heavy suction or substantial vacuum.

In a suction-roll embodying my invention, the pressure of contact between the box and cylinder is determined by relative radial adjustment, but can be regulated by a single adjusting instrumentality adapted to be manipulated at one end of the suction-roll, preferably at the front end for convenience of the operator. This is accomplished by supporting one member, either the cylinder or the box, by adjustable elements controlling the relative radial position of the box in the cylinder and adapted to be simultaneously operated by the said adjusting instrumentality, the latter being longitudinally arranged and connected mediately or immediately to the relative fixed member. In a preferred embodiment, the said adjustable elements constitute the cylinder-bearings and they are slidably mounted on projecting end portions of the box to move oppositely inward or outward on opposite slants or inclines to the axis of the cylinder, whereby the pressure of contact between the box and interior surface of the cylinder is increased or diminished as the distance between the cylinder-bearings is varied. In said embodiment, the cylinder rests upon the box except in so far as it is partially sustained by its bearings adjustable on the inclined end portions of the box; and the weight of the cylinder and the cylinder-bearings thus supplies the force for maintaining the pressure of contact, the same being limited by the adjustment of the heads or cylinder-bearings in a direction to release the weight.

The invention will now be more fully described with reference to the accompanying drawings, which are to be taken as a part of this specification, and then more particularly pointed out in the appended claims.

In said drawings, Figure 1 is a longitudinal vertical section of a suction-roll embodying my invention, in what I now consider a preferred form. Fig. 2 is a cross section of line 2—2 of Fig. 1. Fig. 3 is a vertical longitudinal section through one end of the roll showing a modification of Fig. 1. Fig. 4 is a longitudinal vertical section of another form of suction-roll embodying my invention. Fig. 5 is a front end elevation thereof. Fig. 6 is a longitudinal vertical section of a modification of Fig. 3, and in which the suction-box rests on the bottom of the interior surface of the cylinder and bears thereupon of its own weight. Figs. 7 and 8 are longitudinal vertical sections of other embodiments of my invention.

A denotes the roll-supports or standards; B the suction-box and C the revolving foraminous shell or cylinder.

It is understood that the open face of the box is provided with suitable packing for contact with the interior surface of the cylinder, and is in communication in any suitable manner with a suction-pump or exhaust apparatus. In the illustration, the box is shown having tubular extensions or end portions D adapted for coupling with the pipe-connections.

In Figs. 1 and 2, the box is fixed, its tubular extensions or end portions D being rigidly mounted on the standards A. Said end portions may be considered as arms sup-

porting the box proper. The cylinder C has its bearings on circular elements or heads E, which are axially movable within the cylinder and are slidably mounted upon the end portions or arms D, the latter being oppositely inclined. As shown more clearly in Fig. 2, the heads are provided with correspondingly inclined guide openings *e*, slidably fitted on the inclined arms; in lieu of which there may be other forms of inclined guides between the head and arms. The arms D are shown inclining downward, though they might incline upward. An adjusting rod F, preferably centrally arranged, held against longitudinal movement, but capable of being rotated, rigidly connects the heads E and is threaded in one with a right hand screw and in the other with a left hand screw, as indicated at *x* and *y*. To hold the rod, its forward end is or may be swiveled in the front standard A, or it might be swiveled in a lug on the bottom of the box or the arm D. The swivel-connection, as represented, allows the rod to rise and fall with the heads E and the cylinder journaled thereon; *a* being a short vertical slot between the bolt-head *f* and a collar f^1 affixed on the rod at opposite sides of the slot. Instead of the bolt-head *f*, for adjusting the rod by means of a wrench, the rod may be operated by any other suitable manipulating device. It is noted that the heads E are held in fixed relation and prevented from axial displacement by the adjusting rod, and are prevented from rotation by the end portions or arms D of the box. By turning the rod F, the heads E will be simultaneously moved in opposite directions, riding up or down on the oppositely inclined arms D of the suction-box, and thereby lifting or lowering the cylinder therewith, according to the direction of axial movement of the heads. The bearing-pressure of the cylinder upon the box may thus be regulated to the exact degree desired.

The shell or cylinder C may be held against endwise movement by any suitable means. For example, thrust-collars may be placed at opposite sides of the drive-gear G, as shown in Fig. 1, where the rear standard is bifurcated to provide said thrust-collars, the gear being secured on the cylinder between the two members of the standards. Other suitable arrangements would be to have the opposite thrusts of the cylinder sustained by the opposite standards, or thrust-collars may be revolubly fitted to the ends of the cylinder and arranged for radial or up and down movement on the arms D of the suction-box.

As shown in Fig. 2, the vertical dimensions of the guide-openings *e* in the heads E are greater than the vertical dimensions of the guides or arms D of the suction-box, leaving a space or clearance, as shown, in each head; so that the heads or cylinder-bearings, together with the cylinder, are capable of independent up and down movement, and the cylinder rests upon the suction-box except in so far as its weight is relieved by the adjustment of the heads on the arms D. I consider this a preferred construction for the reason that the box is maintained in contact with the cylinder under yieldable pressure, that is, the cylinder being free to rise bears yieldingly upon the box. I do not confine myself, however, to an arrangement wherein the pressure of contact is yielding, for it is obvious that the guide-ways *e* may be formed to fit the guides or arms D so as to avoid independent radial movement, in which case the radial adjustment of the cylinder, either inward or outward, would be positively effected by and depend upon the sliding contact between the guides and guideways for both directions of axial adjustment of the heads or cylinder-bearings By radial adjustment of the cylinder or cylinder bearings, I mean adjustment thereof which results in relative adjustment of the suction box radially of the cylinder.

Fig. 3 shows a modification of Fig. 1, in which the cylinder-bearings are fixed and the suction-box is the movable member. The cylinder has its bearings in the standards A, and the heads E, axially movable in the the cylinder-bearings, or in the cylinder, slidably support the box for positive adjustment thereof up and down or inward or outward as the heads are axially adjusted, the construction being otherwise substantially similar to that shown in Fig. 1. In this view, however, I show the guides or arms D inclined upward, and the right hand and left hand screws of the adjusting rod F transposed. The swivel-connection of the adjusting rod is to a bracket or arm projecting from the front standard or bearing.

Figs. 4 and 5 show another construction in which the cylinder has fixed bearings in the standards A, and the suction-box is the movable member. In this case, the adjustable elements which support the box are indicated by the symbol E^1, and they are in the form of cross-bars, as shown in Fig. 5, and arranged in guide-ways e^1 in the standards just beyond the bush-linings of the cylinder-bearings. When the heads E^1 are adjusted inwardly, they may pass within the ends of the cylinder. The end portions or arms D of the cylinder are in this instance shown straight instead of inclined, and the heads E^1 are provided with guide-flanges or gibs e^2 working in lateral ways or grooves in the end portions of the box; the guides at the two ends of the machine being oppositely inclined. The heads E are connected by the adjusting rod F in the manner here-

inbefore explained for controlling the relative radial adjustment between the box and cylinder by the axial adjustment of the heads.

Fig. 6 shows a modification of Figs. 4 and 5 wherein the suction-box is inverted and bears upon the bottom of the shell or cylinder, as in cases where the wire or felt, or the sheet of paper, passes under the suction-roll. Otherwise, the construction is substantially the same as in Fig. 4, except that the guide-grooves in the sides of the arms D are wider than the gibs or guide-flanges e^2, so as to give clearance and allow the suction-box to bear of its own weight upon the interior surface of the cylinder, save as the weight is relieved by the adjustment of the heads E^1 in a direction to raise the box from said surface.

It will be observed that in Fig. 1 the axially-adjustable elements support the cylinder and ride upon inclined bearings on the box, or rather the arms D of the box, which thus support said elements; while, in Figs. 3, 4 and 6, the axially-adjustable elements support the box and provide inclined bearings therefor. In these latter figures, however, the axially-adjustable elements are slidably fitted to both members of the suction-roll, that is, the cylinder and the box, being actually so arranged in Fig. 3 and substantially so in Figs. 4 and 6, considering the cylinder-bearings as a necessary complement of the cylinder.

In contradistinction from the preceding figures, I show in Fig. 7 an embodiment of my invention wherein the axially-adjustable elements, being slidably fitted to the box, support and also provide inclined bearings for the cylinder. In this construction, the axially-adjustable elements consist of heads or blocks E^2 having inclined tops and bottoms, and working in correspondingly-shaped openings or slide-ways in annular cylinder-bearings C^2, the latter being supported on said heads. The said heads E^2 are also provided with slide-ways or openings slidably fitted on the end portions or arms D of the suction-box for movement parallel with the axis of the cylinder, the said arms D being straight in this instance, and mounted on the standards A. The heads E^2 and their slide-ways in the cylinder-bearings C^2 are oppositely arranged at the two ends of the cylinder, and said heads E^2 are connected by an adjusting rod F in the same manner as in the other constructions, for moving said heads simultaneously in opposite directions. It will be seen that the cylinder rests upon the box by its own weight and the added weight of the cylinder-bearings, except in so far as the weight is relieved by the heads E^2, which can be adjusted as desired to raise or lower the cylinder and limit its bearing-pressure upon the box to any degree desired. The heads E^2 may occupy the full space of their slide-ways in the cylinder-bearings, but preferably clearance is provided between the bottom inclines of the heads and the bottoms of said slide-ways, in order to allow an independent lifting of the cylinder and thus have its bearing-pressure upon the box yieldable. Fig. 7 may, therefore, be considered as a modification of Fig. 1. The cylinder-bearings C^2 take the end thrust of the cylinder, and said bearings are connected by suitable tie-rods C^1.

In Fig. 8, I show a construction wherein the slanting bearings or supporting surfaces between the axially adjustable elements and the radially movable member of the apparatus are inclined in the same direction instead of opposite directions at the two ends of the cylinder. In this construction, the suction-box is shown as the radially movable member, the cylinder being journaled in bearings in the standard A. The axially-adjustable elements consist of heads E^3 slidably mounted in the standards or cylinder-bearings in the same manner as in Figs. 4 and 5, and having inclined gibs or guide-flanges e^2 working in inclined flanges e^3 on the sides of the arms D^3 of the suction-box. The heads E^3 are connected by the adjusting rod F^3 which in this instance is longitudinally movable and has a screw f^3 threaded or tapped in an arm rising from the front standard A, and provided with a bolt-head f for screwing said rod to move it rearward and forward to adjust the heads and thereby adjust the box with relation to its bearing pressure against the interior surface of the cylinder. The rod F^3 is shown loosely inserted through the heads E^3 and provided with collars at opposite sides of the heads so that the latter will be positively adjusted with the endwise adjustment of the rod. To prevent longitudinal displacement of the suction-box, its front arm D^3 has a vertical sliding connection on the arm A^3 rising from the front standard, for example, a T-shaped guide working in guideways, as indicated at D^4; or, in lieu of this construction, the suction-box may be vertically guided at both ends of the apparatus. Instead of the tubular end-portions D of the box in the preceding figures, the box in Fig. 8 has closed ends, as indicated in dotted lines, and is in communication with the pump by a pipe C^3 connected medially with the box.

I have illustrated several constructional embodiments of my invention by way of example, from which it will appear that the specific arrangement and the details of construction may be modified in various ways, and hence I do not desire to be understood as limiting myself to the specific construction shown, or to any particular form of embodiment.

In the following claims, terms referring to connection or engagement between the axially-adjustable elements and the suction-box or the cylinder are to be construed to include either direct or medial connection or engagement. For example, the axially-adjustable elements have inclined sliding engagement directly with the box in Fig. 1 and medially through the cylinder-bearings with the cylinder in Fig. 7. The expression "inclined sliding engagement" and other expressions of similar import are to be understood as including any equivalent means, and the term "cylinder" is to be construed as including any form of shell that may be used in place of a true cylinder.

Having thus described my invention what I claim is:

1. A suction-roll in which the cylinder and suction-box are respectively supported for relative radial adjustment and are withheld from contact beyond a limited degree predetermined by such adjustment, in combination with a single adjusting instrumentality and means operated thereby for effecting such adjustment.

2. A suction-roll in which the cylinder and suction-box are respectively supported for relative radial adjustment and are withheld from contact beyond a limited degree predetermined by such adjustment, in combination with a longitudinal adjusting instrumentality and means operated thereby for effecting such adjustment.

3. A suction-roll wherein the suction-box and cylinder are arranged for relative radial adjustment and having devices controlling such adjustment and withholding the cylinder and suction-box from contact beyond a determined degree and a longitudinal operating instrumentality therefor.

4. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable elements for forcing the box and interior surface of the cylinder in contact and limiting the degree of such contact, and a single operating instrumentality for adjusting said elements.

5. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable elements operatively-connected with one of them for withholding the box and interior surface of the cylinder from contact beyond a predetermined degree, and means for simultaneously adjusting said elements.

6. In a suction-roll, the combination with the cylinder and suction-box therein, of axially adjustable elements having a fixed radial relation to one of them and operatively-connected with the other for radial adjustment, whereby the pressure of contact between the box and cylinder is regulated by adjustment of said elements.

7. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable elements having a fixed relation to the axis of the cylinder and slidably-connected to the box at a slant to said axis, whereby radial adjustment between the box and cylinder is effected by adjustment of said elements.

8. In a suction-roll, the combination with the cylinder and suction-box therein, of movable supports for one of them, the position of which supports determines and limits the pressure of contact between the box and cylinder, and adjusting means for moving said supports simultaneously.

9. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable supports for one of them, and a longitudinally-arranged instrumentality operatively-connected with and adapted for adjusting both supports.

10. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable supports for one of them, the position of which supports determines and limits the pressure of contact between the box and cylinder, and a longitudinal operating rod connected with and adapted for shifting said supports simultaneously.

11. In a suction-roll, the combination with the cylinder and suction-box therein, of adjustable supports for one of them controlling the radial position of the box relative to the cylinder, whereby they are withheld from contact beyond a degree permitted by said supports and a longitudinal adjusting rod therefor connecting said supports with the fixed member.

12. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supports for one of them having inclined bearings, whereby radial adjustment is effected by axial adjustment of said supports, said supports withholding the suction-box and cylinder from contact beyond a limited degree.

13. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supports for one of them having oppositely-inclined bearings, and operating means for adjusting said supports simultaneously in opposite directions, said supports withholding the suction-box and cylinder from contact beyond a limited degree.

14. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supports for one of them having inclined bearings, and operating means connected with said supports for adjusting them simultaneously, said supports withholding the suction-box and cylinder from contact beyond a limited degree.

15. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supporting means for

one of them, and means whereby radial adjustment between the box and cylinder is effected by adjusting said supporting means, said supporting means keeping the suction-box and cylinder from contact beyond a limited degree.

16. In a suction-roll, the combination with the cylinder and suction-box therein arranged for relative radial adjustment, of axially-adjustable supports for one of them having sliding engagement with one of them at inclines to the axis of the cylinder, such engagement withholding the suction-box and cylinder from contact beyond a determined degree.

17. In a suction-roll, the combination with the cylinder and suction-box therein arranged for relative radial adjustment, of oppositely-movable axially-adjustable supports for one of them having sliding engagement with one of them at oppositely-slanting inclines, such engagement withholding the suction-box and cylinder from contact beyond a determined degree.

18. In a suction-roll, the combination with the cylinder and suction-box therein arranged for relative radial adjustment, of oppositely-movable axially-adjustable supports for one of them having sliding engagement with one of them at oppositely-slanting inclines, and an adjusting rod connecting said supports and having a right-hand screw in one and a left-hand screw in the other.

19. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supports for one of said members slidably-fitted to both of them, there being inclined sliding engagement between said supports and one of said members, whereby they are restrained from contact beyond a limited degree.

20. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable supports for one of them having inclined sliding engagement with the box, whereby they are restrained from contact beyond a limited degree.

21. In a suction-roll, the combination with the cylinder and suction-box therein arranged for relative radial adjustment, of axially-adjustable elements slidably-fitted to the box for controlling such radial adjustment, and thereby limiting the contact between the suction-box and cylinder.

22. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable elements having inclined sliding engagement with one of them for limiting the pressure of contact between the box and interior surface of the cylinder, and a longitudinal adjusting rod connected with said elements.

23. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable contact-limiting elements simultaneously-movable in opposite directions and having sliding engagement with one of said members at opposite inclines.

24. In a suction-roll, the combination with the cylinder and suction-box therein, arranged for relative radial adjustment, of oppositely-movable axially-adjustable elements for regulating such radial adjustment, and an adjusting rod connecting said elements and having means for shortening or extending its length between them.

25. In a suction-roll, the combination with the cylinder and suction-box therein arranged for relative radial adjustment, of oppositely-movable axially-adjustable elements for regulating such radial adjustment, and an adjusting rod having right and left hand screw connections with the respective elements.

26. In a suction-roll, the combination with the cylinder and suction-box therein, of cylinder-bearings adjustable radially and axially and slidably mounted on inclines on the box, whereby the cylinder can be adjusted to rest upon the box or to have its weight relieved.

27. In a suction-roll, the combination with the cylinder and suction-box therein, of radially-adjustable cylinder-bearings, supports for said bearings, said supports and said bearings having inclined bearing surfaces in slidable contact, there being provision for relative axial adjustment between said supports and said bearings.

28. In a suction-roll, the combination with the cylinder and suction-box therein, of axially-adjustable elements supporting one of said members and adapted to lift the same radially by inclined plane action, whereby said member can be raised and lowered by adjustment of said elements so as to take its weight or allow it to rest upon the other member.

29. In a suction-roll, the combination with the cylinder and suction-box therein, one member being radially-movable and adapted to rest upon the other, and supports for the movable member having inclined sliding engagement therewith, there being provision for relative adjustment axially between said supports and said movable member.

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

OSGOOD H. DOWELL.

Witnesses:
JOSEPH C. STACK,
MARY A. CLARK.