E. NOPPEL.

FORCE AND SUCTION DEVICE.

APPLICATION FILED APR. 29, 1914.

1,304,196. Patented May 20, 1919.

Fig. 1.

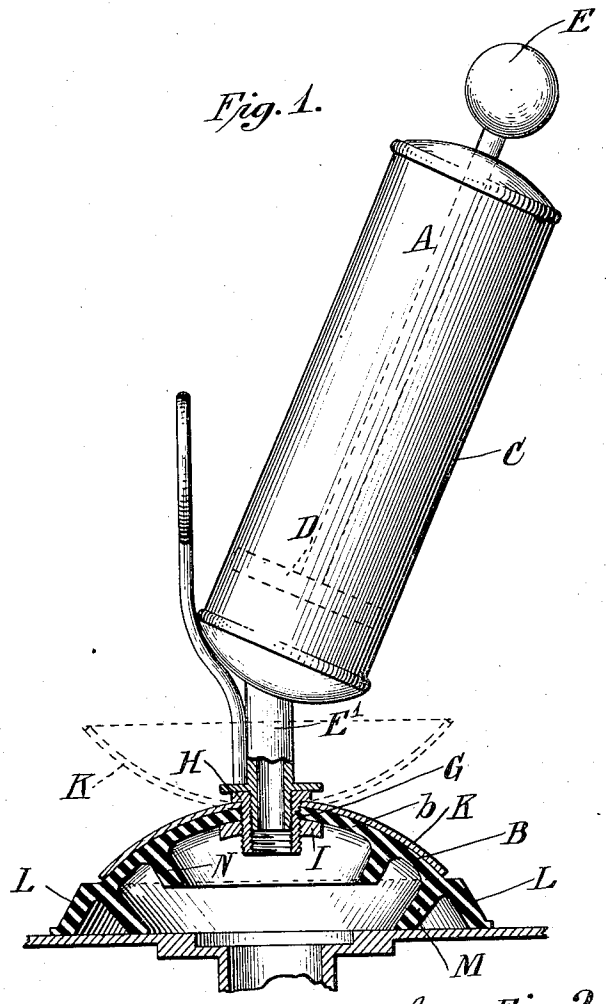
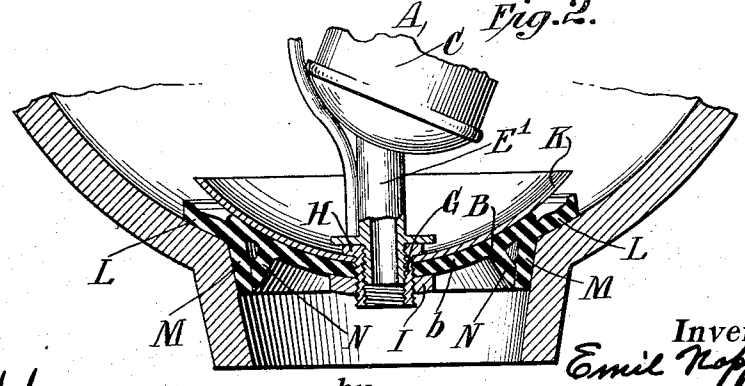



Fig. 2.




Attest:

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by

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# UNITED STATES PATENT OFFICE.

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## FORCE AND SUCTION DEVICE.

1,304,196. Specification of Letters Patent. Patented May 20, 1919.

Application filed April 29, 1914. Serial No. 835,123.

*To all whom it may concern:*

Be it known that I, EMIL NOPPEL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Force and Suction Devices, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to combined force and suction devices for dislodging obstructions in pipes, drains, etc. In Letters Patent of the United States Nos. 646,455 and 646,668 granted to me on the 3rd day of April, 1900, a device of this character is disclosed consisting of a pumping device and a connected cup, the latter being adapted to be applied over the pipe or passage to be cleared and being so formed as to effectually seal the joint between the cup and the surface to which it is applied, both when the pump is operated to compress the air and when it is operated to create suction. In the patented devices the cup is of flexible or elastic material and is reinforced by a stiff cap, leaving the flexible edge of the cup exposed, which edge is formed with diverging angularly related inner and outer sealing lips, the outer lip acting as a seal when the pump is operated to create suction, and the inner lip acting as a seal when the pump is operated to compress the air in the cup. The devices of the patents were designed for use more particularly in situations where the pipe or drain was surrounded by a substantially flat or slightly inclined surface leading thereto, such for instance as exists in sinks, wash basins and the like, and in the use of the patented devices it was found that where the drain or pipe was surrounded by a surface having a decided inclination, as for instance in many forms of closet bowls, the lips on the cup would fail to seat properly, and consequently the device would not operate effectively.

It is the aim of the present invention to produce a combined force and suction device which will operate with effectiveness under the conditions mentioned, and the invention consists in providing the edge of the cup with inner and outer sealing lips, so formed and related that when the cup is applied to a pipe having a surrounding surface possessing a decided slope or inclination, the inner lip will extend into the pipe and seat against and seal the inner surface of the same and the outer lip will seat against and seal the inclined surface leading to the pipe. As a convenient means of carrying the invention into effect, the constructions of the patents mentioned may be adopted, in combination with means for so adjusting the cup from its normal condition of use, that it may be employed both in cases where the pipe is surrounded by a flat or slightly inclined surface, and also where the surface leading to the pipe possesses considerable inclination or slope.

In the accompanying drawings:

Figure 1 is a side elevation partly in section of my improved device as it appears when employed in connection with pipes or drains surrounded by a flat or substantially flat surface.

Fig. 2 is a similar view showing the cup adjusted to adapt the same to be employed in connection with pipes or drains surrounded by an inclined or sloping surface.

Referring to the drawings:

A represents a pumping device and B an inverted cup connected therewith. The pumping device is of the familiar well known form, consisting of a cylinder C containing a piston D provided with a handle E, which when drawn outwardly will create suction beneath the piston, and when forced inwardly will compress the air beneath the piston. The cup B is of flexible material, preferably rubber, and in its normal condition as shown in Fig. 1 it is curved upwardly at its center in the form of a dome *b*, having an opening therethrough communicating with the interior of the pump cylinder through the nipple E′ on the latter. In the form of the device shown, the cup is detachably connected with the nipple by means of a sleeve G provided with inner and outer screw threads and having a head H on its end. The sleeve extends through the opening in the cup, which latter is tightly clamped thereto by means of a confining nut I screwed on the inner end of the sleeve and binding the cup against the head H. The end of the nipple is threaded and screwed tightly into the sleeve, thereby forming an operative detachable connection between the pump and cup. K represents a reinforcing or stiffening cap for the cup which is preferably of metal and fits over

the dome of the same leaving the lower edge of the cup free and exposed. This cap is detachably held in place by being provided with a central opening which surrounds the sleeve G and is clamped firmly in position between the cup and head H of the sleeve, by means of the confining nut I before alluded to. By means of the construction described the cap may be readily detached from the cup and connected parts, and again connected in place in reversed position, as indicated by dotted lines in Fig. 1 for the purpose presently to be described.

The exposed free edge of the cup is bifurcated as shown forming two sealing lips, an outer lip L and an inner lip M which diverge from each other at relative angles. The edges of these lips are adapted to seat on the surface surrounding the pipe or drain to be cleared as shown in Fig. 1, and their form and relations are such that when the pump is operated to create suction within the cup and consequently within the pipe, the atmospheric pressure on the outer lip will act to force the same tightly down and cause it to act as a seal against the ingress of air between it and the surface to which it is applied, thereby enabling a vacuum to be created in the cup and pipe. When however the pump is actuated to create pressure in the cup and pipe, the air pressure will react on the inner lip, forcing the same tightly down on the supporting surface and causing the lip to act as a seat against the escape of air at this point, thereby enabling pressure to be maintained in the cup and pipe.

The construction so far described is substantially the same as that set forth in my said Letters Patent above mentioned, and the details thereof form no part of the present invention except in so far as they cooperate with the novel features of the invention as will now be described.

The present invention, in the particular example and embodiment shown, contemplates such an adjustment or change in the form of the cup that the sealing lips thereon may be made to coöperate with pipes or other outlets where the surrounding surface leading thereto is deeply inclined or possess a decided slope as shown in Fig. 2. The adjustment of the cup for this purpose is effected by reversing the curvature of the dome of the same, so that it will curve downwardly at its center as shown in Fig. 2, instead of upwardly as shown in Fig. 1, and this is effected by reversing the position of the reinforcing cap as shown by dotted lines in Fig. 1. The reversal of the cap is effected by first removing the confining nut I then drawing the cup and cap from the nipple, then removing and reversing the position of the cap, and finally reassembling the parts and securing them fixedly in operative relations as before, but with the cap reversed.

If now the cap is applied to a surface of the form shown in Fig. 2, the inner lip will enter within the pipe, and when the pump is forced downwardly, the cup will be collapsed at its center and the curvature of the dome will be reversed and will conform to the convex surface of the inverted cap, the inner lip being pressed against the inner surface of the pipe, and the outer lip being caused to set flatly against the sloping surface surrounding the same. This position of the parts is clearly indicated in Fig. 2, and when the pump is operated to create suction, the side of the outer lip will act as a seal in connection with the sloping surface leading to the pipe, and will effectually prevent the ingress of air at this point; and when the pump is operated to create pressure, the side of the inner lip will coöperate with the inner surface of the pipe and act as a seal to prevent the escape of air at this point.

In order that when the curvature of the cup is thus reversed, the inner lip will be caused to seat with certainty and uniformity against the inner surface of the pipe, I provide the cup with an annular rib N which, when the cup is in the condition shown in Fig. 1, extends inwardly from the inner surface thereof, but when the cup is reversed in position as shown in Fig. 2, will extend outwardly therefrom. The position, form and size of the rib, relative to the inner sealing lip is such that when the cup is reversed, the free edge of the rib will abut and bear against the inner side of the lip at its lower end, and will in this manner force the same outwardly and cause it to seat closely and uniformly against the inner surface of the pipe. When in this position, the inner surface of the rib presents an outwardly and downwardly inclined face, which being acted on by the compressed air, will cause the lip to be pressed laterally and closely against the pipe.

It is to be noted that the changed condition of use of the cup, involves a change in the manner in which the lips effect their sealing action on the surfaces with which they coöperate. When employed in connection with a flat surface as shown in Fig. 1, it is the ends of the lips that contact with the surface and are active as seals, whereas when employed under the conditions illustrated in Fig. 2, it is the adjacent inner sides of the lips that contact with the surfaces and are active as seals.

It will be obvious to the skilled mechanic that various changes in the details of the construction may be made without departing from the limits of my invention. For instance the invention is not limited to the particular form of detachable connection of the parts to enable the reinforcing cap to be secured in reversed position, as other means

for accomplishing this object will suggest themselves to the skilled mechanic, and be embraced within the limits of my invention. It will be understood therefore that my invention is not limited to any particular form or embodiment of the parts except in so far as such limitations are specified in the claims.

Having thus described my invention, what I claim is:

1. In a combined force and suction device, the combination of a pump, a cup connected therewith and provided with flexible sealing lips normally diverging from each other toward their free ends and provided on their adjacent sides with sealing surfaces, said lips being of such length and construction that when spread apart the sealing surfaces may be made to coöperate with surfaces relatively inclined to each other to seal the same, and means acting on the cup and adapted by pressure thereon to deform the cup and spread the sealing lips apart.

2. In a combined force and suction device, the combination of a pump, a cup connected therewith and provided with two sealing lips having sealing surfaces on their ends and also on their adjacent sides, said lips being normally in position to render the end sealing surfaces operative, and said lips being of such length and construction that when spread apart the side sealing surfaces will be adapted to coöperate with surfaces relatively inclined to each other to seal the same, and means for adjusting the cup to spread said lips apart.

3. In a combined force and suction device, the combination of a pump, a flexible cup connected therewith and provided with a sealing lip, means for adjusting said cup to seat the sealing lip, and a projection on the cup adapted to engage the lip when the cup is adjusted.

4. In a combined force and suction device for clearing pipes, etc., the combination of a pump, a flexible concaved cup connected therewith and provided with inner and outer sealing lips adapted to coöperate at their ends with a flat or substantially flat surface, means for reversing the concavity of the cup to adapt the lips to coöperate with surfaces relatively inclined to each other, and a rib on the cup adapted to engage the inner lip and seat the same tightly when the concavity of the cup is reversed.

5. In a combined force and suction device, the combination of a pump, a flexible concave cup connected therewith and provided with sealing lips adapted to coöperate with a flat surface, said cup being adapted to be collapsed to spread the lips apart, said lips being of such length and construction that when spread apart they will be adapted to coöperate with surfaces relatively inclined to each other, and a concave reinforcing cap applied over the cup and reversible thereon to collapse the cup and spread the lips apart.

6. A cup for a combined force and suction device, said cup being formed with a dome, and being provided with inner and outer sealing lips having end sealing surfaces, said lips being of such length and construction that when the curvature of the dome is reversed, the sides of the lips may be made to contact respectively with surfaces relatively inclined to each other to seal the same.

7. A cup for a combined force and suction device, said cup being provided with inner and outer sealing lips, and having a rib adapted to engage the inner lip and hold the same sealed.

8. A cup for a combined force and suction device, said cup being provided with inner and outer sealing lips, and being deformable to seat the sealing lips respectively against the surfaces to be sealed, the said inner lip and adjacent portion of the cup being of such relative form that when the cup is deformed, said adjacent portion of the cup will positively engage the inner lip to force the same tightly against the surface.

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

EMIL NOPPEL.

Witnesses:
JOSEPH FREY,
GEORGE W. LEFFLER.