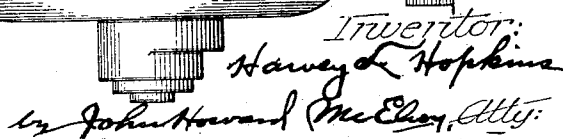


1,364,501.

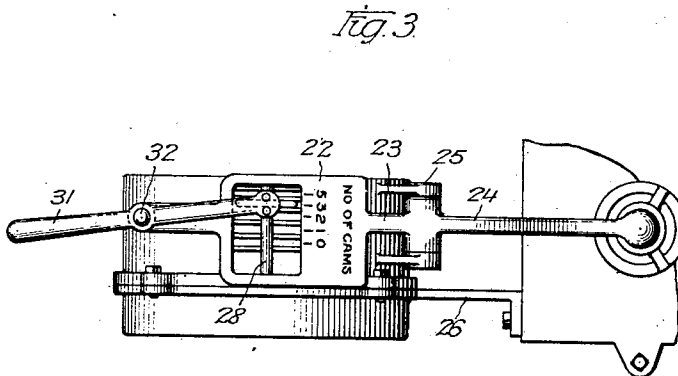
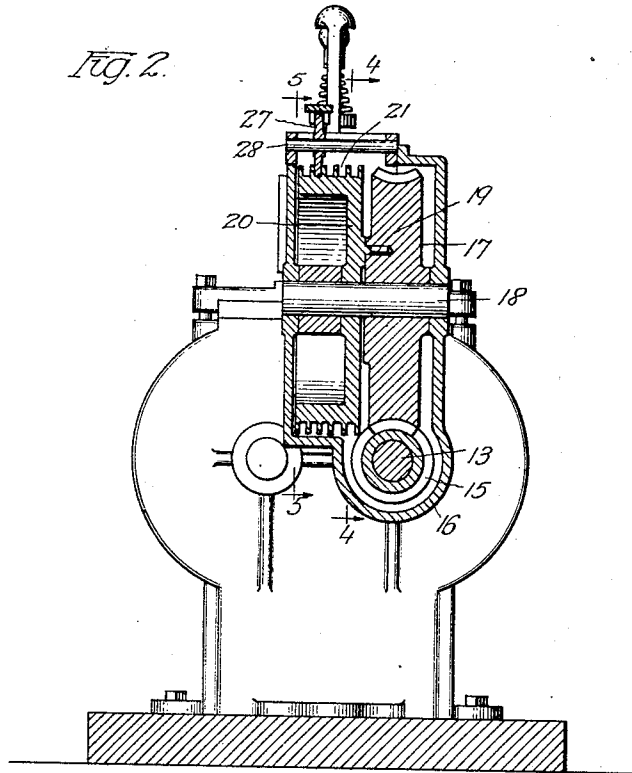
3 SHEETS--SHEET 1.



H. L. HOPKINS.
HYPEREMIA APPARATUS.
APPLICATION FILED JAN. 24, 1920.

1,364,501.

Patented Jan. 4, 1921.
3 SHEETS—SHEET 2.



Inventor:
Harvey L. Hopkins,
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Patented Jan. 4, 1921.
3 SHEETS—SHEET 3.

Fig. 4.

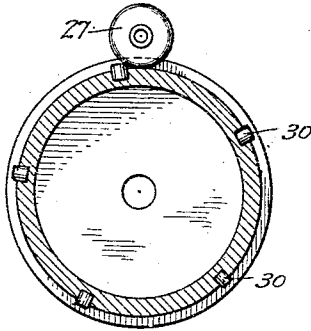


Fig. 5.

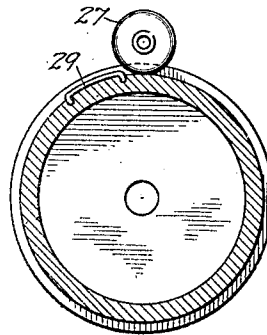


Fig. 6.

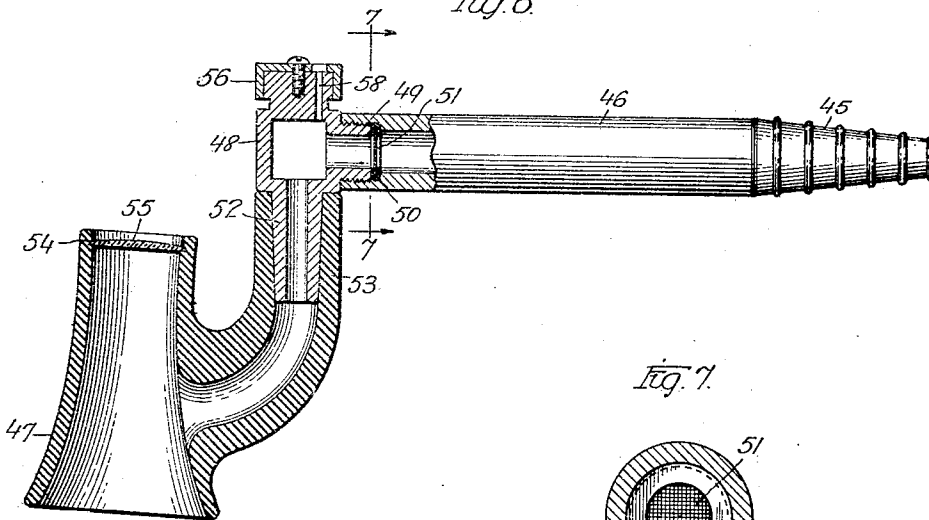


Fig. 7.

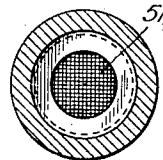
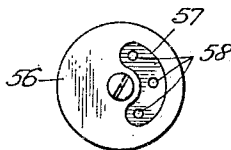


Fig. 8.



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UNITED STATES PATENT OFFICE.

HARVEY L. HOPKINS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO GUSTAVUS A. SMITH, OF MARSHALLTOWN, IOWA, AND ONE-THIRD TO GEORGE E. GIBEAULT, OF CHICAGO, ILLINOIS.

HYPEREMIA APPARATUS.

1,364,501.

Specification of Letters Patent.

Patented Jan. 4, 1921.

Application filed January 24, 1920. Serial No. 353,863.

To all whom it may concern:

Be it known that I, HARVEY L. HOPKINS, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hyperemia Apparatus, of which the following is a full, clear, and exact specification.

My invention is concerned with certain new and useful improvements in power operated hyperemia apparatus, and is designed to produce an apparatus of the class described, operated by power, which shall have all the capacity and effectiveness that are inherent in hand operated devices, such for instance as that shown in my Patent No. 1,217,886, dated February 27, 1917, yet which shall not necessitate the laborious hand manipulation inherent in the hand operated devices.

In such power operated apparatus heretofore used or proposed, with which I am familiar, a vacuum has ordinarily been produced by a reciprocating piston pump driven continuously with the result that the duration of the vacuum pull was always limited by the length of time consumed by the motor in moving the piston in one direction, as the vacuum was necessarily released at each reciprocation. Furthermore, it took a very considerable portion of the suction stroke to produce the vacuum, so that the effective pull of the vacuum was necessarily very short and always intermittent. Furthermore, so far as the production of the vacuum is concerned, half of the time (that during which the piston moves back) is wasted.

In my novel apparatus, I employ a rotary pump and arrange to release the constant and continuous vacuum produced thereby by a mechanism which preferably automatically opens the valve and releases the vacuum at desired intervals, irrespective of the degree of the vacuum obtained. This mechanism is preferably adjusted so that the vacuum can be released say every second, or held as long as say fifteen seconds, which I consider the longest time that is desirable to hold it without release, as a longer period tends to bruise the tissues and discolor the skin, although I have arranged it so it may be held indefinitely, if desired. It is further arranged so that if the vacuum has

been held for a considerable interval, the interval before it is again applied is longer, so that the affected tissues which are more distorted by a vacuum held for a long interval than a short one will have ample time to return to their normal position before the suction is again applied.

My invention is further concerned with a novel cup adapted to be employed with such apparatus irrespective of the character of the apparatus for producing the suction.

It is further concerned with such an apparatus provided with a fine strainer to prevent hairs from the patient's skin being drawn into the apparatus and interfering with its efficiency.

To illustrate my invention, I annex hereto three sheets of drawings in which the same reference characters are used to designate identical parts in all the figures, of which—

Figure 1 is a side elevation of an apparatus employing my invention with portions thereof in section to show the construction;

Fig. 2 is an elevation in section on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of a portion of the apparatus seen at the right of Fig. 1;

Figs. 4 and 5 are enlarged details in vertical section as seen on the lines 4—4 and 5—5 of Fig. 2 but with the operating holder in different adjustments from that shown in said Fig. 2;

Fig. 6 is a central longitudinal section through my novel cup;

Fig. 7 is a detail in section on the line 7—7 of Fig. 6, on a larger scale; and

Fig. 8 is a top plan view on a larger scale showing the hand manipulated valve in connection with the cup.

In carrying out my invention in its preferred form, I mount on the base 10 a small electric motor 11, the armature shaft 12 of which is positively connected to or made integral with the shaft 13 of the rotary pump 14, which may be of any desired construction adapted to produce a substantially continuous vacuum by the rotation of its shaft 13. The shaft 13 has secured thereon the worm 15, preferably in a casing 16, which casing also includes the worm wheel 17 driven by the worm and journaled upon the shaft 18 mounted in the aforesaid casing 16.

Secured to the worm wheel 17 so as to rotate therewith, as by the pins 19 pro-

jecting therefrom into recesses in said wheel, is a cam wheel 20 which is provided with a plurality, five as illustrated, of channels 21. and one of these channels, marked "0" in the scale 22, seen in Fig. 3 associated with the power arm 23 of the lever 24 fulcrumed in the bearings 25 supported from the casing 16, which in turn is supported by the arm 26 fastened to the pump casing, has no cam therein so that it has no action on the lever 24 when the wheel 27 journaled on the shaft 28 supported in the power arm of the lever 23 is in said channel. The adjacent channel marked "1" on the scale 22, as seen in Fig. 5, has one cam lug 29 thereon so that the lever 24 will be moved once during each rotation of the cam wheel 20. The next channel marked "2" on the scale 22 has two equidistant cams (not shown), which are say half as long as the cam 29. The channel marked "3" (not shown) has three equidistant cams, which are a third as long as the cam 29; and finally the channel marked "5", as seen in Fig. 4, on the scale 22 has five equidistant cams 30. The position of the wheel 27 in the various channels is controlled by the supplemental lever 31 fulcrumed at 32 on the end of the power arm 23 of the main lever and having at its inner end the pair of downwardly projecting pins 33 which engage the two sides of the wheel 27 to control its position.

The other end of the lever 24 engages the preferably ball-like top 34 of the valve stem 35 which is mounted to slide in the bearing 36 formed on the top of the valve supporting cup 37 which is screwed into the top of the casing of the pump 14. A passage 38 extends down into the top of the pump casing which is provided on its interior with the conical valve seat 39 adapted to be closed by the valve 40 secured on the lower end of the stem 35. A coiled expanding spring 41 interposed between the bearing 36 and the shoulder 42 associated with the top 34 of the valve stem holds the valve 40 closed against any suction that the pump is capable of producing. Screwed into the top of the pump casing is a nipple 43 on which is secured a flexible tube 44, which will be of sufficient length to extend to the point where the patient is being treated, and has its other end secured on the nipple 45, preferably constructed as shown in Fig. 6, which forms a part of the handle 46 by which the vacuum cup 47 is manipulated. This handle 46 consists of a hollow tube and has screwed into the other end thereof the valve casing 48, which has the threaded cylindrical extension 49, as shown. Interposed between the end of the extension 49 and the shoulder 50 formed in the end of the handle 46 is a fine screen 51, which I find to be vital in order to keep the fine hairs which are frequently detached from

the skin of the patient from being drawn into the pump and interfering with its operation. By unscrewing the valve body 48 at suitable intervals, I can remove the hairs which have accumulated on the screen 51 and prevent its being clogged up.

The valve body 48 is also provided with the nipple 52, which is of the proper size and shape to be firmly held in the hollow arm 53 which extends from the side of the vacuum cup 47. This arm and the cup are preferably composed of soft rubber which, however, has sufficient rigidity and body so that it is not distorted by the vacuum to which it is subjected. In order that the operator may observe the action of the suction on the patient, I preferably form in the top of the cup the annular channel 54 into which a thin glass disk 55, similar to a watch crystal, may be slipped. Obviously the vacuum will not tend to displace the glass, but merely to hold it more firmly in position.

In order to control the degree of the vacuum, and to substantially release it entirely without stopping the machine, I provide the valve cap 56, seen in Figs. 6 and 8, which is mounted to turn on the head of the valve casing 48, and is provided with the slot 57 therein which is adapted to be moved by hand entirely out of register with any of the plurality of apertures 58 extending through the top of the valve casing, or it can be moved into register with one, two or all of the apertures. Obviously when it is out of register with any of the apertures the vacuum is at its strongest. When it is moved to register with one of the apertures 58, the degree of the vacuum is perceptibly reduced, and when moved in register with two of them, it is still weaker, and when moved in register with all of them, it is substantially destroyed.

The operation of the foregoing apparatus will be readily apparent. If for any reason the machine is desired to hold a continuous vacuum in the cup so that the same can be controlled entirely by manipulating the valve cap 56, the end of the lever 24 is lifted up against the pressure of the spring 41 to elevate the wheel 27 out of the channel in which it may be running, so that it can be placed in the channel "0" which has no cams and which consequently will never open the valve 40 to release the vacuum. If frequent and short suction are desired, the wheel 27 is placed in the "5" channel, where the vacuum will be released five times during each rotation of the wheel 20. As seen, the cams 30 are quite short so that the release is likewise short. If the vacuum is to be held as long as possible with the automatic operation, the wheel 27 is placed in the channel "1" where the long cam 29 opens the valve 40 once during each complete revolution.

lution of the wheel 20 and holds it open for some little time to allow the tissues to reach their normal form before applying the suction again.

5 While I have shown and described my invention as embodied in the form which I at present consider best adapted to carry out its purposes, it will be understood that it is capable of modifications, and that I do not
10 desire to be limited in the interpretation of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

15 1. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the cup with the
20 intake of the pump to produce quickly and hold a constant vacuum in the cup, and a release valve associated with said passage and operable independently of the degree
25 of pressure therein to open it to the atmosphere and thereby release the vacuum in the cup without interfering with the vacuum
producing action of the pump, said valve being automatically operated to release the
pressure for a small fraction of the time in which it is restored and held.

30 2. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the cup with the
35 intake of the pump to produce quickly and hold a constant vacuum in the cup, a release valve associated with said passage to open
it to the atmosphere and thereby release the vacuum in the cup, and an automatic mechanism to open the valve at desired intervals
40 independently of the pressure in the passage and without interfering with the vacuum producing action of the pump, said
mechanism operating to release the pressure for a small fraction of the time in which it
45 is restored and held.

3. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the cup with the
50 intake of the pump to produce quickly and hold a constant vacuum in the cup, a release valve associated with said passage to open it
to the atmosphere and thereby release the vacuum in the cup, said valve being automatically operated to release the pressure
55 for a small fraction of the time in which it is restored and held, and means for adjusting the mechanism to regulate the duration
of the intervals the vacuum is held.

60 4. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the intake of the
pump with the cup, a release valve associated

with said passage, and an automatic mechanism synchronizing with the pump to open the release valve instantly at intervals and hold it open a fractional period proportional to the time it had been closed.

5. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the intake of the
70 pump with the cup, a release valve associated with said passage, and an automatic mechanism synchronizing with the pump to open the release valve at intervals and hold it
75 open a period proportional to the time it had been closed, said mechanism being adjustable to regulate the length of the intervals.

6. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the intake of the
85 pump with the cup, a release valve associated with said passage, a rotary member having thereon a plurality of groups of cams, each group in an annular arrangement, and a
90 different number in each group, connections to rotate said member, and a lever associated with said release valve to open the same when it is moved by the cams.

7. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the intake of the
95 pump with the cup, a release valve associated with said passage, a wheel having thereon a plurality of parallel annular channels, a group of cams in said channels, a different
100 number in each channel, connections to rotate said member, and a lever associated with said release valve to open the same when it is moved by the cams.

8. In a hyperemia apparatus, the combination with a rotary pump adapted to be driven continuously in one direction, of a cup, a passage connecting the intake of the
110 pump with the cup, a release valve associated with said passage, a wheel having thereon a plurality of parallel annular channels, a group of cams in said channels, a different
115 number in each channel, connections to rotate said member, a lever associated with said release valve to open the same, an adjustable disk carried by the lever and riding
in one of the channels, and a supplemental lever cooperating with the disk to determine the channel in which it rests.

9. In a hyperemia apparatus, a cup, and a regulating valve associated therewith consisting of a cap movable over a plurality of apertures opening from the cup to the air.

10. In a hyperemia apparatus, the combination with an air pump, of a cup, a vacuum massage passage connecting the cup with the intake of the pump, means for re-

leasing the vacuum at short intervals, and a fine strainer in said passage for the purpose described.

11. In a hyperemia apparatus, a tubular
5 handle provided with a nipple at one end and an annular shoulder in the other end with internal threads outside of the shoulder, a connection threaded into said end, a screen disk held against said shoulder by
10 the connection, a plurality of apertures opening into said connection, a cap mounted to turn thereon so as to close one or more of said apertures, and a cup attached to the connection.
12. In a hyperemia apparatus, a tubular
15 handle provided with a nipple at one end and an annular shoulder in the other end

with internal threads outside of the shoulder, a connection threaded into said end, a screen disk held against said shoulder by
20 the connection, a plurality of apertures opening into said connection, a cap mounted to turn thereon so as to close one or more of said apertures, a nipple extending from said connection and a cup having an elastic ex-
25 tension therefrom cooperating with said nipple.

In witness whereof, I have hereunto set my hand and affixed my seal, this 22nd day of January, A. D. 1920.

HARVEY L. HOPKINS. [L. S.]

Witness:

JOHN HOWARD McELROY.