

(No Model.)

3 Sheets—Sheet 2.

C. A. BELL.
TELEPHONE TRANSMITTER.

No. 336,083.

Patented Feb. 16, 1886.

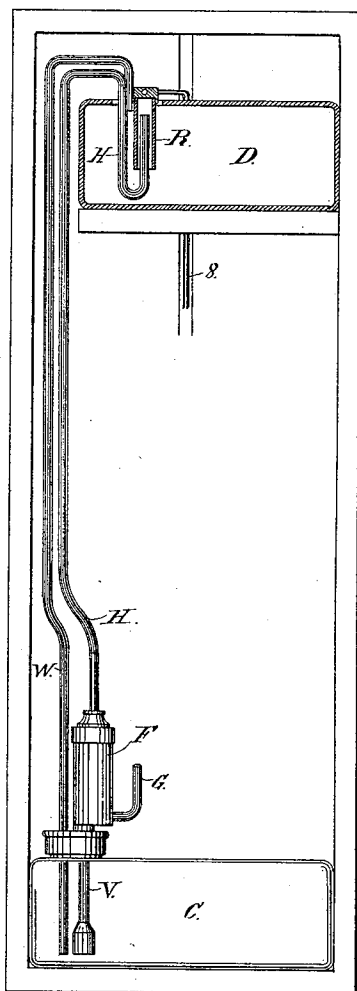


Fig. 11

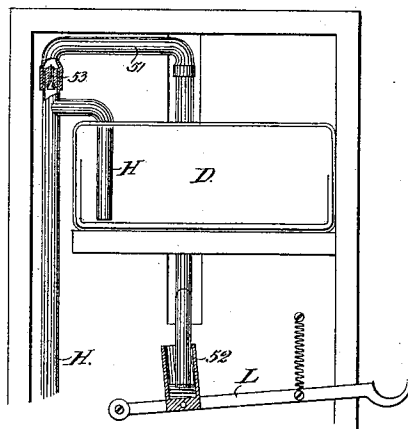


Fig. 12

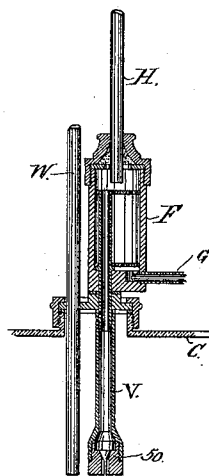


Fig. 13

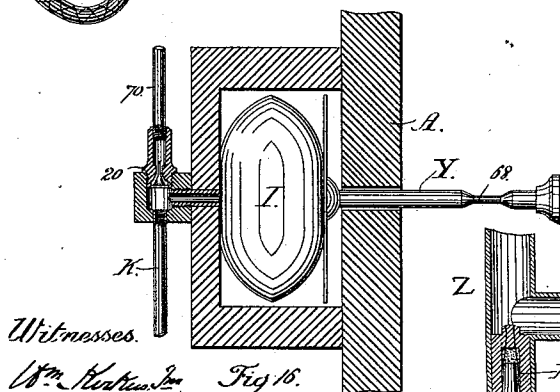
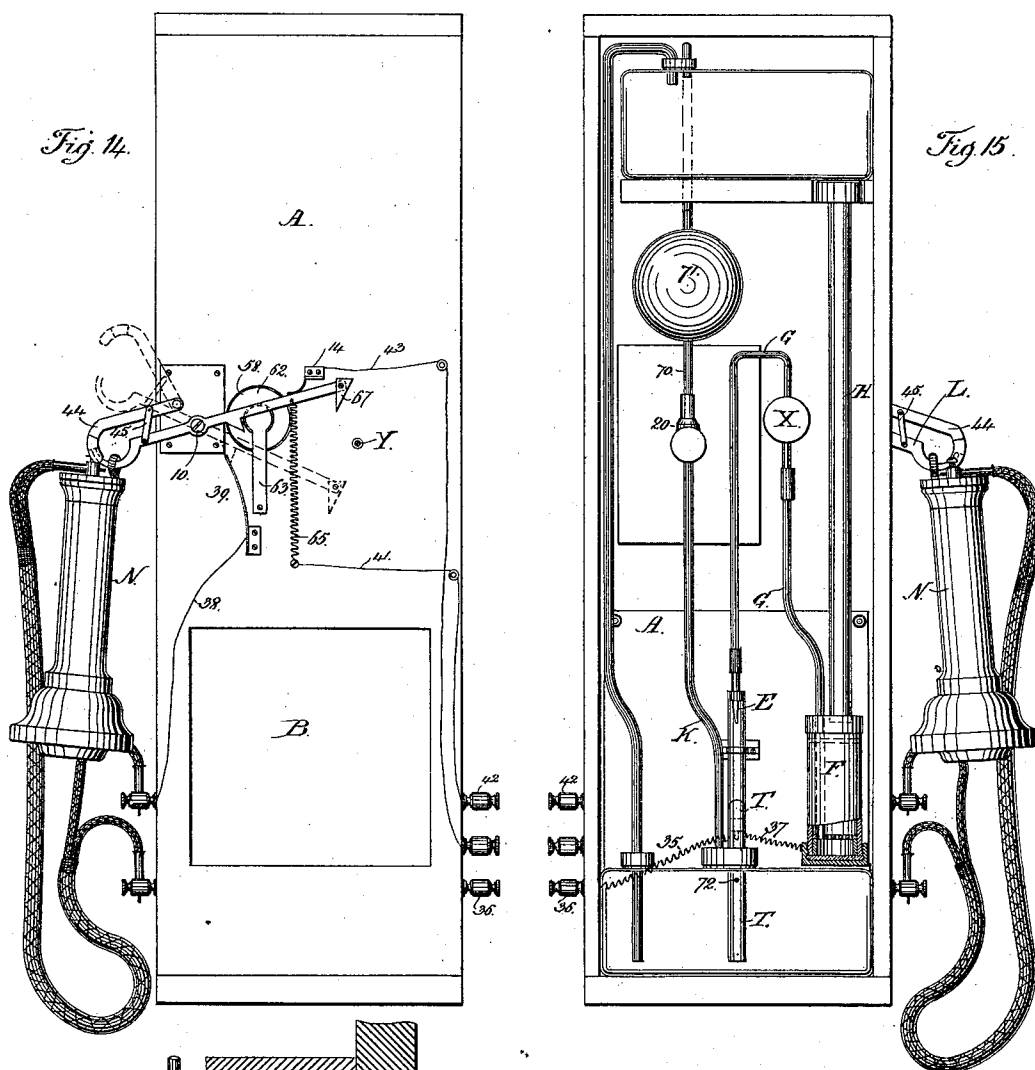
Witnesses.
Chas. H. H. H. H.
C. J. Hedrick

Inventor.
Chester A. Bell by
A. Pollok
his attorney.

C. A. BELL.
TELEPHONE TRANSMITTER.

No. 336,083.

Patented Feb. 16, 1886.



Witnesses.
Wm. Kesteven
C. J. Hedrick

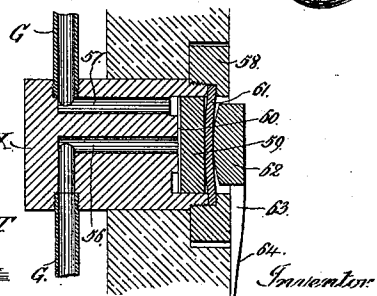
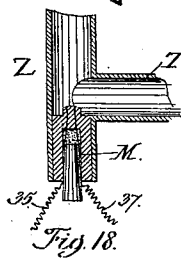


Fig. 17.
Chichester A. Bell
by A. Pollok
his attorney.

UNITED STATES PATENT OFFICE.

CHICHESTER A. BELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 336,083, dated February 16, 1886.

Application filed April 7, 1885. Serial No. 161,460. (No model.)

To all whom it may concern:

Be it known that I, CHICHESTER A. BELL, of Washington, in the District of Columbia, have invented a new and useful Improvement in Telephone-Transmitters, which improvement is fully set forth in the following specification.

This invention relates more particularly to transmitters for telephone-lines in which the current-regulator or variable resistance is a sensitive jet of conducting-liquid; but it is also applicable, at least in part, to jet-translating apparatus in general. By this latter term is to be understood an apparatus for translating or transferring sonorous vibrations from one medium to another through the medium of a sensitive jet. Such apparatus forms the subject-matter of my applications for Letters Patent filed May 1, 1884, and officially numbered 129,946, 129,947, and 129,948, respectively.

In the practical use of jet-translating apparatus operating by means of a liquid it is desirable to have some means of readily producing, whenever desired, a supply of the liquid under the requisite degree of pressure, and of reusing the liquid again and again. For this purpose, according to the present invention, upper and lower reservoirs are provided, and they are connected by pipes, so that pressure upon the liquid in the lower reservoir can force it into the upper one, and are further combined with an air-compressor for producing sufficient pressure in the lower reservoir to lift a proper quantity of liquid the required height. Suitable valves are provided for confining the compressed air, and for insuring that the pressure of the same will force the liquid through the proper pipes.

The advantages of using an air-compressor to raise the liquid are, first, that air acts as a power-storing appliance, and can be sufficiently compressed by a single quick movement, so as in expanding to force the liquid into the proper reservoir; and, secondly, that the compressor is removed from contact with the liquid, which, especially if acidified, (as it would be in an electric transmitter, for the purpose of rendering it more conductive,) would be apt to corrode the material of the compressor and impair its operation. The air-compressor preferred is a bellows with a

collapsible bag of rubber and a check-valve outside of said bag. To prevent the upper reservoir from being filled above a suitable height, an overflow is provided for returning the excess to the lower reservoir. Preferably the arrangement is such that the liquid is expelled from and returns to the lower reservoir through the same pipe.

In jet apparatus it is further desirable to stop the jet when the apparatus is not in use. In my former applications I have shown an automatic cock for the purpose, it being closed to stop the flow of liquid to the jet-tube by the weight of the hand telephone when this is replaced on its support. In the present invention the jet-tube is arranged to be supplied through a siphon, which is provided with a movable part, which can be operated to unseal the siphon and stop the flow. This part may be the short leg of the siphon or a valve controlling the inlet of air into the upper part or bend of the siphon. It is connected with the telephone-support, so as to be operated in one direction by the weight of the hand telephone and in the other by a retractile spring or weight, or it may be by the weight of the parts themselves.

In order to insure the proper working of the apparatus, the telephone-support or device for stopping the flow of the liquid is combined with a movable stop, which prevents the movement of the same until the compressor has been operated. The act of compressing the air removes the stop. In the case of a siphon, which is unsealed by placing the hand-telephone on its support, it is necessary that it should be resealed while the liquid is raised in the tubes by the pressure of the air in the lower reservoir. Inasmuch as this pressure is relieved when the compressor expands, it is important to reseat the siphon before the compressor is released. By taking the hand-telephone from its support at this time, when the stop is out of the way, the spring shifts the telephone-support, and with it the movable part of the siphon, so as to seal the siphon while full of liquid. If, however, the hand-telephone be removed before the compressor is operated, or after it is released, the stop prevents the movement of the telephone-support until the compressor is operated, whereupon, so soon as the stop is out of

the way, the spring moves the telephone-support and reseals the siphon. This part of the invention includes more than the combination of the movable stop with a siphon, since it can also be usefully employed in other connections—as, for example, in apparatus in which an automatic stop-cock is employed to control the flow of liquid. When the hand-telephone is removed at improper times, the failure of the apparatus to operate will show that something is wrong, and the position of the telephone-support will also indicate this. An automatic lock may, however, be provided to prevent the removal of the hand-telephone from its support, except when the compressor has been properly operated. Such a lock forms part of the invention.

Among other improvements or modifications which form part of the invention, is a special arrangement of devices for adjusting the positions of the jet-tube and the electrodes. The jet-tube is carried by a flanged holder, which can be adjusted sidewise to a limited extent and clamped by a screw-cap in the position to which it may be adjusted. The electrodes are fixed in a plug which is adjustable transversely to the jet. The end of this plug is beveled. The electrodes pass through a hollow in the plug, which is filled with cement and closed by a stopper.

Having now explained the principle of the invention, what is considered, on the whole, the best mode of applying the same will be described, and also some other useful modes which I have devised.

Referring to the accompanying drawings, Figures 1, 2, and 3 are respectively a front elevation, back elevation, and vertical section in a plane at right angles to those of Figs. 1 and 2 of a telephone-station apparatus embodying the invention. Figs. 4 to 10 are detail views of the same; Fig. 11, a partial view, in back elevation, partly in vertical section, of an apparatus embodying the invention or a part thereof in a modified form; Fig. 12, a detail view of the same; Fig. 13, a back view, partly in section, illustrating a third form of the invention; Figs. 14 and 15, front and back views of a station apparatus embodying the invention, or a part thereof, in still another form; and Figs. 16 to 18, details of the same. All the apparatus shown are of my own invention.

Like letters indicate like parts on all the figures.

A is the case or box; B, the vibratory plate or diaphragm; C, the lower reservoir; D, the upper reservoir; E, the jet-tube; F, the filter; G, the pipe between the filter and the jet-tube; H, the supply-pipe between the filter and the upper reservoir; I, the compressor or rubber bag forming part of the compressor; K, the air-pipe; L, the telephone-support; M, the plug in which the electrodes of the jet-transmitter are fixed, and N the ordinary hand-telephone.

Referring to Figs. 1 to 10, the lower reser-

voir, C, communicates with the upper reservoir, D, directly by the pipe P and indirectly through said pipe P, the pipe Q, the filter F, and the pipe H. The pipe P reaches nearly to the bottom of the lower reservoir, passes through a hermetically-sealed joint in the top, and enters the upper reservoir by a lateral branch, 1, which terminates at the highest level to which it is desired that the liquid stand in the upper reservoir. The pipe Q extends into the top of the pipe P. (See Fig. 10.) It is slightly smaller exteriorly than the bore of pipe P, and descends below the point where the branch 1 joins the main pipe, so that the communication with the branch outlet is through the contracted space around the pipe Q. A section of soft-rubber tube, 2, fits over the ends and makes a close joint between the two pipes, so that they form practically one pipe in the form of a siphon, with a contracted outlet into the upper reservoir from the upper part or bend of the siphon. The pipes H and Q enter and terminate at the upper part of the filter F, while the pipe G communicates with the lower part of the same. The filter is preferably made of a rubber cylinder, (see Fig. 6,) bored out so as to leave one end in one piece with the sides, and closed at the other end by a screw-cap, 3, a soft-rubber disk, 4, being placed inside the same in order to make a close joint. Inside the cylinder are two perforated disks, 5, of hard rubber, the lower one resting upon the ring 6, of hard rubber. The space between the disks is filled with cotton wool, or other suitable filtering material. The pipes are sealed into the upper part of the cylinder by surrounding them with cement. The pipe H is bent over at the top, so as to enter the upper reservoir. It is closed at the end by the movable cap R, which fits loosely over the oblique end of the pipe H, and is free to turn thereon. The object of bringing the pipes P H in at the top of the reservoir is simply to avoid making joints in the sides or bottom, which are expensive to make, and, besides, are apt to leak. The object of carrying the pipe H nearly to the bottom of the reservoir is to seal the end of the cap R by the liquid in the upper reservoir, and thus avoid the necessity of making a close joint between it and the pipe H. The object of the cap R is to convert the pipe H into a siphon, which can be sealed and unsealed by moving said cap. The pipe H, with its downward and upward bends, which are not essential to an operative apparatus, but are very desirable, for the reasons stated, forms the descending leg of the siphon. The tube 7, projecting laterally from the cap R, forms the short or ascending leg of the same. When the cap is turned so as to raise the tube 7 out of the liquid, as shown in Figs. 2 and 3, the siphon is unsealed, and no liquid will flow into the pipe H. When, however, it is turned so as to bring the tube 7 into the position indicated in dotted lines, the liquid is siphoned into the pipe H, provided, of course, air is not trapped in the

cap R or the upper bend of the pipe H. The tube 7 is connected with the telephone-support L by the rod 8, which slides in and is guided by a groove in the wall of case A.

5 The lower end of the rod 8 is bent outward and passed through a hole in the inner end of the telephone support. The tube 7 is attached by a wire, 9, or other suitable connection, to a horizontal arm at the top of rod 8. When

10 the hand-telephone N is suspended from the outer end of the support L, the latter is in the position shown in full lines, Fig. 2, its inner end bearing against the fixed stop 14, and the tube 7 is lifted out of the liquid. When it is

15 removed, the support turns on its center 10 into the position shown in dotted lines, Fig. 2, and the tube 7 drops into the liquid, as shown in dotted lines, Fig. 3, provided the stop 11 is out of the way, as shown in dotted lines, Fig.

20 2. This movable stop 11 is formed of a bent lever pivoted to the case, and is normally retained in the position shown in full lines, Fig. 2, by the spiral tension spring 12, the short arm of the lever resting against the fixed stop

25 13. The stop 11 is removed out of the path of the telephone-support by depressing the lever S, which movement compresses the bag I. The rod 15, whose lower end is bent outward and passed through a hole in lever S, has a horizontal

30 arm, 16, at the upper end, which strikes the short arm of stop 11 when drawn down. The bag I, of flexible or soft rubber, rests upon the shelf 17, and has a hole in the bottom, through which the pipe K enters. Otherwise it is im-

35 perforate. This pipe has an exterior flange at the top inside the bag, and is provided on the outside with a screw-thread, which is engaged by the nut 18. This nut bears against the under side of shelf 17, and serves to clamp

40 the material of the bag between said flange and the upper surface of the shelf, or, as is preferable, between said flange and a disk inserted between the bottom of the bag and the upper surface of the shelf. A tight joint

45 around the air-pipe is thus made. Inside the bag is a spiral compression-spring for expanding it when released. Above it is a flat plate or follower connected by rods 15 and 19 with the lever S. As shown, the rods are screw-threaded

50 and provided with nuts, which engage the follower. As shown, also, the rod 19 has at the bottom a loop, which fits over the projecting end of rod 15, which end is threaded and provided with a nut for retaining the parts in

55 place. Of course, these are details which are entirely immaterial, and can be changed at will. On a branch of the pipe K is supported the air-inlet valve 20. It is a simple check-valve closing upward. It is shown in detail

60 in Fig. 4. It is made, preferably, of hard rubber. The lower end of the air-pipe K enters the lower reservoir by a close joint. The pipe T, for returning the liquid to the reservoir C after it has passed the jet-tube and electrodes,

65 also enters the reservoir by a close joint, and is provided at the bottom with a hard-rubber check-valve, 21, closing upward.

The mode of making a tight joint between the tubes and the glass reservoir is preferably as follows: The pipes K T (see Fig. 9) are ce- 70 mented into the disk 22, or they may partly be made in one piece therewith. The reservoir is cast with a screw-threaded neck, 23, which is engaged by the screw cap 24, which clamps the disk in place. A soft-rubber 75 washer, 25, is interposed between a flange on the disk 22 and the top of the neck 23. The pipe P is or may be cemented into a similar disk held in place by a screw-cap and sealed by a rubber washer. 80

Before proceeding farther it will be well to describe the operation of the apparatus explained. When it is desired to use the telephone, the lever S is first depressed. This movement compresses the bag I and forces 85 the air (which is prevented from escaping by the closing of the check-valve 20) into the upper part of reservoir C. The pressure of this confined air forces the liquid through the pipe P. A part of this liquid passes through 90 the branch pipe 1 into the upper reservoir; but the larger part passes on through the tube Q into the filter F, which it fills, and thence through the pipe H and cap R into the upper reservoir. A small part of the liquid from 95 the filter is also delivered through the pipe G to the jet-tube E. The liquid in the lower reservoir, C, is prevented from passing up the waste-pipe T by the check-valve 21 at its lower end. While the lever S is held down, 100 and while in consequence the pipes P Q H, filter F, and cap R are all full of liquid, and while also the stop 11 is out of the way, the hand-telephone N is removed from its support L, which immediately turns and allows 105 the tube 7 to drop into the liquid. The siphon between the upper reservoir, D, and the filter F by way of the pipe H is now complete, and the liquid will run out of the upper reservoir as fast as necessary to supply the jet. After 110 the siphon has been sealed by the dropping of the tube 7 it is no longer necessary to hold down the lever S. On releasing it the bag I expands, the air-pressure in the reservoir is relieved, and air also enters through the valve 20. The 115 relief of the air-compression in the lower reservoir allows the liquid which has collected in the pipe T to run out into the reservoir. It also allows the liquid in pipe P to descend. If so much liquid has been forced into the up- 120 per reservoir that its limit is above the end of the branch pipe, the excess is sucked back into the lower reservoir. The pipe P thus acts as an overflow. The ingress of air through the branch after the liquid-level in the upper 125 reservoir has been lowered sufficiently, prevents the pipes P Q acting as a siphon and returning the liquid into the lower reservoir. On replacing the hand-telephone on its support the weight thereof lifts the tube 7 out of 130 the liquid in the upper reservoir and stops the flow of liquid to the jet-tube. The jet-tube E is slipped into a flanged carrier, 27, which it fits tightly enough to be retained in position

by friction. This carrier is confined by a screw-cap, 28, which clamps the flange. The parts are arranged (see Fig. 7) so as to allow a small sidewise adjustment to the carrier. A glass tube, 29, surrounds the jet-tube. It is cemented to the cap 30 at the top and the cup 31 at the bottom of the same, and is fastened by the metal band 32 to the diaphragm B. The plug M is tapped into the side wall of the cup, and is adjustable across the jet by turning it. The inner end of the plug is beveled. The electrodes are formed by wires which are fixed in small holes in the end of the plug and terminate on the beveled surface. They pass through the hollow of the plug, which is filled with cement, 33, and then closed by the stopper 34. The outlet or waste pipe T communicates with the bottom of the cup 31. One electrode is connected by wire 35 with the binding-post 36, to which one line-wire is led. The other electrode is connected through the wire 37, hand-telephone N, and wire 38 with the contact-spring 39. The telephone-support L is made of conducting material, and operates as a switch, being permanently connected through the spring 40 and wire 41 with the binding-post 42, to which the other line-wire is led. The fixed stop 14 is or may be connected by the wire 43 with a binding-post, (not shown in Figs. 1 and 2, but represented in Figs. 14 and 15,) to which the branch containing the call-bell and other signaling apparatus is led.

The arrangement of contacts and circuit-connections, it may be observed, is a common one, and of course may be changed without affecting in any way the present invention.

To prevent removal of the telephone from its support, except when the lever S is depressed so as to allow the telephone-support to turn, a locking-lever, 44, is pivoted to the case and connected with the telephone-support by a link, 45, so arranged that the locking-lever is turned at a greater angular velocity than the telephone-support. When, therefore, the parts are in the position shown in dotted lines, the telephone can easily be removed; but so long as the stop 11 is interposed to prevent the telephone-support from turning the hand-telephone cannot be removed.

In operation the jet strikes the beveled end of the plug M and the liquid spreads over the same in a thin film and completes the circuit between the electrodes. The vibrations impressed upon the jet by talking to the diaphragm B (or otherwise) produce corresponding vibrations in the resistance of the circuit through the electrodes, and consequently throw the battery-current in said circuit into corresponding undulations. As shown, the transmitter and receiver (or hand telephone) are both included in the main circuit, and this arrangement is preferred, because the internal resistance of the transmitter is very great. Distilled water acidulated with pure sulphuric acid, to render it conductive, (say a solution containing one volume of acid to three hun-

dred volumes of water,) is preferably used as the jet-liquid.

Instead of having the cap R turn upon the inclined end of the pipe H, the cap could slide lengthwise of the same. In this case it would be unnecessary to have the side tube, the cap itself constituting the short ascending leg of the siphon. This construction is shown in Fig. 11, the end of the pipe H being vertical, and the cap R being attached directly to the rod 8, so that it is lifted to unseal the siphon and stop the flow whenever the hand-telephone is placed on its support.

The object of the arrangement of pipes P Q H in Figs. 1, 2, and 3 is to avoid the use of a check-valve to prevent the return of the liquid to the lower reservoir. By the use of such a valve a less number of pipes can be used. For example, the pipe V, provided at the bottom with a downwardly-closing check-valve, 50, delivers the liquid into the upper part of the filter F, (see Figs. 11 and 12,) and said liquid is then forced into the upper reservoir, D, through the pipe H. An overflow-pipe, W, is provided for returning any excess of liquid to the lower reservoir.

Instead of having the ascending leg of the siphon movable for the purpose of sealing and unsealing the siphon when desired, a valve can be provided for admitting or excluding air from the bend of the siphon for the same purpose.

As shown in Fig. 13, the branch pipe 51 communicates with the bend in the pipe H and terminates within the cup 52, mounted on the telephone-support, and containing sufficient mercury in the bottom to seal the end of the tube when the telephone-support is in its highest position, as shown. When the telephone-support is drawn down by the weight of the hand-telephone, the end of the branch pipe 51 is exposed, and air can enter the bend and stop the siphonage.

At 53 is a check-valve, closing upward, to prevent the liquid from being forced over into the mercury-cup.

In the apparatus of Figs. 14 to 18 the telephone-support controls a valve, which is shown in detail in Fig. 17. It is placed in the jet-supply pipe G, the two parts of which are screwed into the hard-rubber block X, provided with an inlet-passage, 56, and an outlet-passage, 57, and set in the front wall of the telephone-case, being retained in place by the screw-ring 58. A disk, 59, of hard rubber, faced with soft rubber, 60, fits in the end of the block and closes the end of inlet-passage 56 whenever it is forced inward. A disk, 61, of soft rubber, is screwed over the end of the block X, being clamped firmly at the edges by the screw-ring 58. A follower, 62, bears on the outside of disk 61. It is carried by a spring-arm, 63, fastened at the lower end to the case A, and provided with an incline, 64, on the outside, so that when the hand-telephone is placed on its support the latter,

being carried over said incline, forces the fol-
lower inward and closes the valve. When
the hand-telephone is removed, the retractile
spring 65 turns the telephone-support and re-
leases the valve, so that the liquid can flow
through pipe G to the jet-tube. It is neces-
sary, however, to compress the bag I by push-
ing in the rod Y before the telephone-support
can turn sufficiently to release the valve, be-
cause the triangular piece 67, pivoted to the
inner end of the telephone-support, strikes
the said rod Y, except when the latter is
pushed in so as to bring the contracted part
68 in the plane of its movement. The rod
Y affords no hinderance to the movement
of the telephone-support in the opposite di-
rection, because when the triangular piece
strikes the rod in moving upward it will turn
on its pivot in order to pass. The filter-sup-
ply pipe enters the upper reservoir through
the bottom. The check-valve 20 is placed at
the bottom of a pipe, 70, which communicates
with the upper part of the reservoir D. In
this pipe is an air-chamber, 71, in the form of
a flexible rubber-cloth bag. In this apparatus
there is no communication with the outer air,
all the joints being hermetically sealed, and
consequently all evaporation and liability of
dust to enter are avoided. The jet-tube is
fixed in the upper end of the tube Z by cement.
The plug M is cemented into the lower end of
said tube, the waste-pipe T entering the side
of the same at the top of the plug. In the
waste-pipe T a small hole is made at 72, to let
the gases set free by the electrolysis escape
into the upper part of the reservoir C.

It is obvious that various other modifica-
tions could be made in details without depart-
ing from the spirit of the invention, and parts
of the invention can be used separately.

I do not confine myself to the proportions,
dimensions, and materials herein indicated,
which are given simply by way of example.

Having now fully described my said inven-
tion, what I claim is—

1. The combination, with the jet-tube, the
upper and lower reservoirs, and the air and
liquid pipes, of the compressor for forcing the
liquid from the lower into the upper reservoir,
the hydrostatic column between the reservoirs
giving the pressure required to force the liquid
through said jet-tube, substantially as de-
scribed.

2. The combination, with the jet-tube and
the upper and lower reservoirs, of the liquid-
pipes connecting the upper and lower reser-
voirs, and the compressor and air-pipe, one of
said liquid-pipes being arranged to act as an
overflow to return any excess of liquid to the
lower reservoir when the pressure is relieved,
substantially as described.

3. The combination, with the jet-tube and
the upper reservoir, of a jet-supply pipe in the
form of a siphon, and a movable cap or its
specified equivalent for sealing and unsealing
said siphon to control the flow to the jet, sub-
stantially as described.

4. The combination, with the upper and
lower reservoirs, the liquid-pipe leading from
the lower reservoir, the compressor, the jet-
tube, and the siphon-pipe for supplying liquid
to said jet-tube, of the movable cap or its
specified equivalent for sealing and unsealing
said siphon, and the stop removable in the act
of operating said compressor, substantially as
described.

5. The combination, with the reservoirs, the
connecting pipe or pipes for conveying the
liquid from the lower to the upper reservoir,
the compressor, the jet-tube, and the device
for controlling the flow to said jet-tube, of the
stop for preventing the movement of said de-
vice, removable in the act of operating said
compressor, substantially as described.

6. The combination, with the upper and
lower reservoirs, the compressor, the pipes,
and the jet-tube, of the device for controlling
the flow of liquid to said jet-tube, and the
movable telephone-support connected with
said device for operating the same automatic-
ally, substantially as described.

7. The combination of the upper and lower
reservoirs, the pipes, the compressor, the jet-
tube, the device for controlling the flow to the
jet-tube, the movable telephone-support, and
the removable stop, substantially as described.

8. The combination, with the movable tele-
phone-support, the compressor, and the re-
movable stop, of the lock for preventing the
removal of the hand-telephone from its sup-
port until the latter has been shifted, substan-
tially as described.

9. The combination, with the reservoirs,
pipes, compressor, and jet-tube, of the de-
vice for stopping the flow to the jet-tube, the
telephone-support, the removable stop, and
the lock for retaining the telephone on its
support, substantially as described.

10. The combination, with the jet-tube and
the upper and lower reservoirs, of the com-
pressor, the upright pipe leading from the
lower reservoir and communicating with the
upper reservoir through a contracted opening,
and the siphon forming a continuation of said
upright tube and serving to supply the liquid
to the jet-tube, substantially as described.

11. The combination, with the jet-tube and
the upper and lower reservoirs and the com-
pressor, of the siphon for supplying the liquid
to the jet-tube, and the pipe leading from the
lower reservoir and communicating with the
descending leg of said siphon, substantially as
described.

12. The filter composed of an upright cyl-
inder filled with filtering material, in combi-
nation with the upper reservoir, the pipe de-
scending therefrom and opening into the filter,
the jet-tube, and the pipe between the jet-tube
and the filter, said pipes being sealed into the
top of said cylinder and opening into said
filter, one at the top and the other, after pass-
ing through the filtering material in the cyl-
inder, opening into the bottom thereof, sub-
stantially as described.

13. The combination, with the jet-tube, the upper and lower reservoirs, and the pipes, of the compressor formed of a compressible bag, and provided with a check-valve in a branch
5 of the air-pipe outside of said bag, substantially as described.

14. The combination, with the jet-tube and its flanged carrier, of the screw-cap for retaining the jet-tube in place by clamping said
10 flange, substantially as described.

15. The combination, with the jet-tube, of a plug having electrodes set therein and adjustable at right angles to the tube, substantially as described.

16. The screw-plug having the electrodes set therein, substantially as described.

17. The plug having the electrodes set there-

in, said electrodes passing through a hollow in the plug which is filled with cement, substantially as described.

18. The combination, with the upper reservoir, the jet-tube, and the siphon-pipe for supplying liquid to said tube, of the cap free to turn on the end of said pipe and provided with a lateral pipe which forms the ascending leg of the siphon, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHICHESTER A. BELL.

Witnesses:

PHILIP MAURO,
C. J. HEDRICK.