N. W. DAVIS.

MACHINE FOR SUBJECTING AIR TO VIOLET AND ULTRA-VIOLET RAYS.

APPLICATION FILED JAN. 11, 1916.

1,209,132. Patented Dec. 19, 1916.

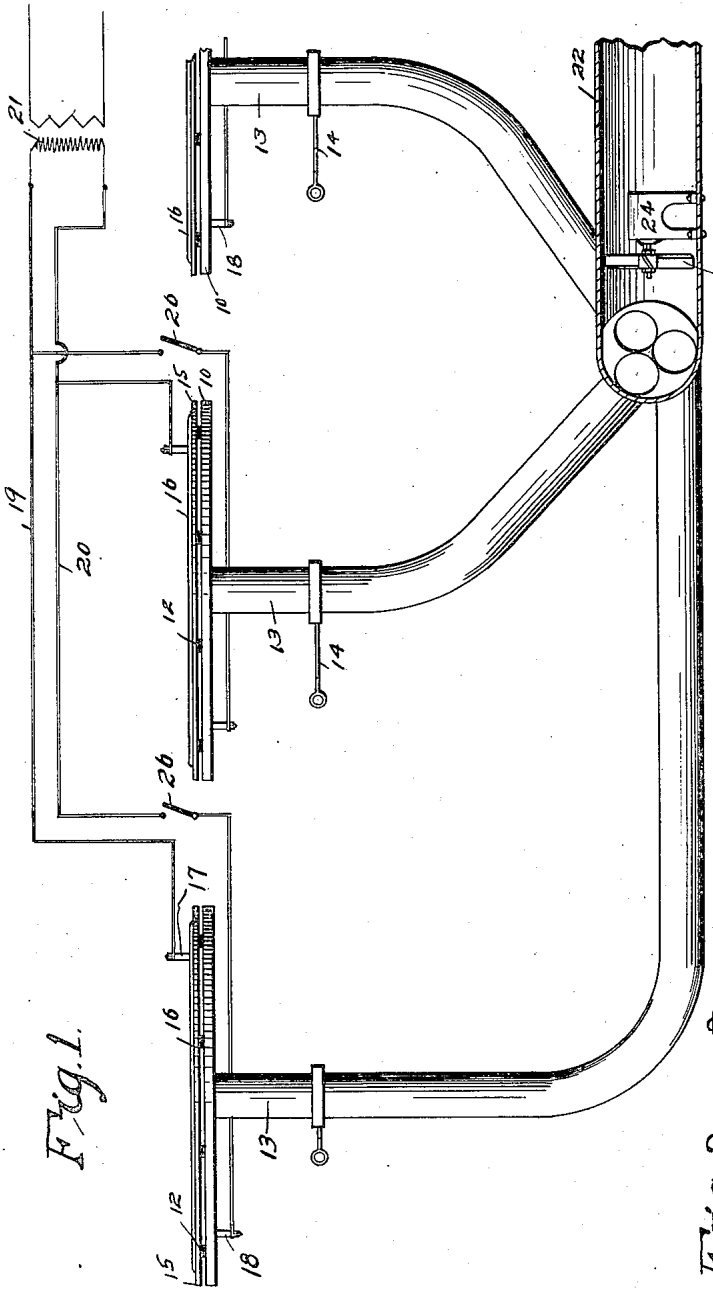

Fig. 1.

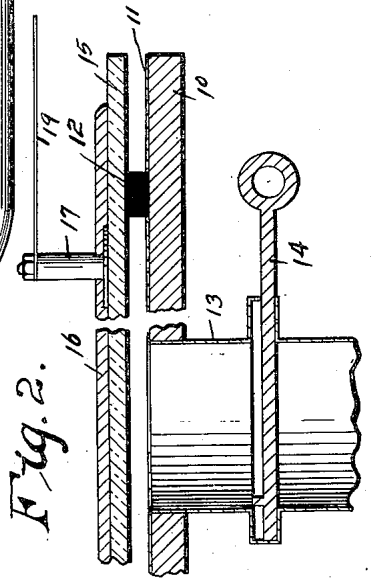

Fig. 2.

Witness
L. A. Paley

Inventor
Noah W. Davis
by Dwight Bair Atty's

UNITED STATES PATENT OFFICE.

NOAH W. DAVIS, OF DES MOINES, IOWA, ASSIGNOR OF ONE-HALF TO EDWIN M. MARKEL, OF DES MOINES, IOWA.

MACHINE FOR SUBJECTING AIR TO VIOLET AND ULTRA-VIOLET RAYS.

1,209,132. Specification of Letters Patent. Patented Dec. 19, 1916.

Application filed January 11, 1916. Serial No. 71,501.

To all whom it may concern:

Be it known that I, NOAH W. DAVIS, a citizen of the United States, and resident of Des Moines, in the county of Polk and State of Iowa, have invented a certain new and useful Machine for Subjecting Air to Violet and Ultra-Violet Rays.

The object of my invention is to provide a machine for subjecting the air to violet and ultra-violet rays, by the passage through the air of a brush electrical discharge generated therein, which machine is of comparatively simple, durable and inexpensive construction.

A further object is to provide a machine of the class mentioned employing the combination of elements best adapted for producing ultra-violet rays of light by the action of the electricity.

A further object is to provide in such a machine means for subjecting a moving current of air to violet and ultra-violet rays, which machine can be readily and easily adapted for varying the amount of air subjected to the action of the light rays, and for varying the speed of the air, whereby the machine may be employed for producing ozone and may be readily and easily regulated for varying the relative amount of ozone produced in the given quantity of air.

Still a further object is to provide in such a machine a glass plate or the like so mounted that the plate may be readily and easily removed for cleaning, replacing or repairing it.

Still a further object is to provide such a machine in which all the air passing through the machine is subjected to the action of the violet and ultra-violet light rays.

Still a further object is to provide such a machine in which the air is subjected to the light rays in such a way as to destroy the bacteria therein, while at the same time the machine may be regulated for varying the relative amount of ozone produced in the given amount of air.

My invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows a side elevation of a machine embodying my invention, part of the air conduct pipe being shown in section. Fig. 2 shows a vertical, sectional view partly broken away of part of one of the units of the machine.

My machine is preferably made up of a plurality of units, each unit being capable of accomplishing a large number of objects above set forth, and other objects and results which may appear hereafter, or may not even be mentioned in my specification.

Each unit of my improved device comprises an annular disk which is indicated in the form of my invention shown in the accompanying drawings by the reference numeral 10. This disk is preferably made of soft iron. The disk may be covered as in the form shown in Fig. 2 with a thin layer of silicon 11. Resting upon the disk 10 is a plurality of spacing blocks 12 of some suitable insulating material.

At the center of each disk 10 and silicon layer 11 is an opening communicating with an air pipe 13. In each air pipe 13 is a suitable controlling valve 14. Resting upon the spacing blocks 12 is a glass disk 15, which is slightly spaced from the iron disk and the silicon 11 by the blocks 12. The upper surface of the glass disk 15 is covered by a layer 16 of carbon.

Mounted on the carbon 16 is a binding post 17. Operatively connected with the members 10 and 11 is a binding post 18. The plurality of units just described are connected in a series by means of wires 19 and 20 with a suitable source of electrical power by means of an induction coil 21. The pipes 13 are connected with a single discharge conducting pipe 22 shown in Fig. 1. In the pipe 22 is mounted a suction fan 23 which may be operated by a motor 24.

In the operation of my improved machine for subjecting air to violet and ultra-violet rays, the air is drawn between the spaced disks and through the pipes 13 into the pipe 22 by means of the fan 23. Switches 26 are provided for selectively closing a circuit through each of the units. Assuming that the switches of all the units are closed, then the action of the electricity will cause violet and ultra-violet rays between the spaced disks.

I have performed a large number of experiments and have found that the materials here set forth are the best for producing

violet and ultra-violet rays. I preferably use soft iron or silicon for one disk, and glass, bakelite or other suitable plates adapted to diffuse the current to prevent the creation of an arc for the other disk. Iron is one of the best metals to use, and better results are obtained the softer it is.

The silicon is probably the best material to use with glass to produce violet and ultra-violet rays, but silicon is expensive and is also brittle. While it can be used alone, I preferably reinforce it with the iron disk 10.

The materials shown herein will produce a complete blanket of violet and ultra-violet rays between the spacing disks.

When air is drawn between the disks by means of the fan 23 all of the air so drawn between the disks and into the pipes 13 will be subjected to the action of the rays of light between the disks.

I believe that I have the only machine yet made which will thus subject all of the air to the action of the violet and ultra-violet rays. Other machines are so constructed that only part of the air may be drawn through a fan discharge pipe, which is the equivalent in other machines to the pipe 22, and be subjected to the action of the light rays.

The subjecting of the air to violet and ultra-violet rays changes a portion of the oxygen in the air to the form of ozone. This change is well known and will not be herein more particularly referred to. I will not herein go into any detailed explanation of the advantages or uses of ozone, other than to state that there are a variety of uses to which the oxygen in the air, changed to the form of ozone, may be put.

The subjection of the air to violet and ultra-violet rays also results in the destruction of dangerous bacteria, as is well known. It is a fact that ultra-violet rays are more destructive to bacterial life than are violet rays. I therefore prefer the use of silicon to that of any other metal, for the reason that the use of silicon results in the production of more ultra-violet rays than the use of any other metal known to me.

I find it is desirable, in a machine of this kind, to use an alternating current, for the reason that the use of such a current does not tend to carry particles of metal or the like to the under surface of the glass plate or the like, whereby an arc might be finally created.

Another advantage of using the alternating current, arises from the fact that it causes impurities in the air to be collected upon the adjacent surfaces of the disks of each unit. For instance, if tobacco smoke is blown into the air being drawn between the disks, it will be noted that no tobacco smoke appears in the air drawn into the pipe 22. In the course of time, however, the surfaces of the spaced disks of each unit will become coated with impure matter. One object of my invention is to so mount the upper disk upon the lower spaced disk that the upper disk may be quickly and easily removed for the purpose of cleaning it. With the construction here shown, the upper disk can simply be lifted up and its under surface wiped off with a cloth or the like.

I will now explain somewhat the object of arranging my machine in a series of units which may be disconnected by means of the switches 26 and the valves 14, instead of making one large sized machine. In a preliminary way, it may be stated that the arrangement here shown is for purposes of illustration only, and that the units may be arranged in a great variety of ways to accomplish my purpose. When all of the units in the series are connected, it will be seen that a certain volume of air is drawn through the pipe 22 and is subjected to the action of the violet and ultra-violet rays. By closing off all the valves 14, except one, or by closing part of said valves, a large volume of air is drawn through the unit, the valve of which is open. The volume of air drawn through the pipe 22 is substantially the same, but the air is drawn more rapidly through the unit in operation.

The machine is built so that when the machine is working at full capacity with all the units in operation a maximum of ozone is produced by each unit. When part of the units are disconnected by closing the valves 14, the air passes much more rapidly through the units not thus disconnected. It is well known that the effect of such an operation would be to reduce the relative amount of ozone produced by the active unit or units. In other words after a certain velocity has been reached, the air passing through the violet rays at a higher velocity, causes a relatively less amount of ozone to be produced, than would be the case if the air would pass through the unit at a less velocity. Under some circumstances it is desirable to have more, and under other circumstances to have less ozone in the air. By shutting off some of the units by means of the valve 14, the air is drawn through the remaining units and a relative amount of ozone is produced. I believe I have the only machine capable of accomplishing this purpose. At the same time all of the air drawn to the machine is at all times subjected to the action of the ultra-violet rays, and whether all of the units are used or only part of them, or even only one unit is employed, dangerous bacteria in the air are destroyed by the action of the light rays, even though the amount of ozone produced is less in one case than in another.

It is possible with a machine such as

herein described, also to dilute the air which has been treated with untreated air, if such dilution should be deemed advisable. In other words the treated air may be drawn through one unit of the machine and by opening the switch of another unit and opening the valve thereof a quantity of the untreated air may be drawn into the pipe 22 together with the treated air and mingled with the treated air.

I preferably use one of my disks or plates made of some such material as iron, because such material is a good conductor of heat and serves to carry off the heat which may be generated between the disks or plates of each unit, and thereby prevent any undue heating of the air passing through the machine. I use the disks substantially 18 inches in diameter and spaced approximately 1/12 of an inch apart, and use from four thousand to eight thousand volts of electricity. If too strong a current is used compared with the area of the disk, there is a tendency to form an arc instead of a spray or brush discharge. If on the other hand, too weak a current is used, the brush discharge becomes too weak to thoroughly treat all of the air passing through. I have found that the proportions just mentioned are satisfactory for using the type of machine here described. It will of course be understood that there can be considerable variation in the area of the disks and the voltage and that reasonably satisfactory results can still be obtained. The proportions set forth above, however, allow me to secure the variation of results when a plurality of units is used as hereinbefore set forth.

My machine may be made in a great variety of forms, and I realize that many changes may be made in the construction and arrangement of the parts, and it is my intention to cover by this application any such changes which may be included within the scope of my claims.

I claim as my invention.

1. In a machine of the class described, a glass disk, a silicon disk parallel therewith and spaced therefrom, one of said disks having a central opening, a covering of conducting material for said glass disk, an air conducting tube communicating with said opening, spacing blocks between said glass and silicon disks of non-conducting material, said glass and silicon disks being included in an electric circuit, whereby air passed between said disks may be subjected to violet and ultra-violet rays due to the subjection of the air to brush discharge generated therein.

2. In a machine of the class described, a plurality of units, each comprising a disk of silicon, a spaced glass disk, a backing for said glass disk of non-conducting material, a tube communicating with the central space between the silicon and glass disks of each unit, a common receiving tube communicating with all of the first tubes, means for drawing air through said common receiving tubes, a valve in each of said first tubes, an electric circuit for each of said units including in each instance the glass and silicon disks of a unit, each circuit including a switch, said parts being so arranged that in any certain predetermined period a given quantity of air may, by adjustment of the valves, be drawn through one or more of the units for subjecting said air to violet and ultra-violet rays, when the electric circuits of the various units are closed, whereby ozone may be produced in different degrees of concentration in the air passed through the units.

Des Moines, Iowa, January 5, 1916.

NOAH W. DAVIS.