My invention relates to air conditioning and deals more particularly with the combustion of odoriferous substances, disease germs, and harmful gases such as carbon monoxide that are carried by the air; with the purification of said air by the action of ultra-violet radiation; and with the treatment of said air with ozone for purification and for physiological benefits. Air conditioning is particularly useful in motor coaches wherein passengers are frequently crowded in close quarters and the resultant breath and body odors, at best, are unpleasant; and if, for example, one of the passengers has recently eaten garlic, they become intolerable.

Also in motor coaches, the air is usually contaminated by unburned fuel and lubricating oil from the motor thereof which, in gaseous form, filters into the passengers' compartment thru the floor, and thru cracks around doors and windows. These exhaust gases always contain carbon monoxide, which is objectionable even when present in quantities too minute to cause death. On the highway, motor coaches are continually passing thru air laden with fumes and gases from other motor vehicles so that any air admitted to the passengers' compartment from the outside is in need of purification. Dust, and sometimes pollen, are carried in large quantities by the air along highways.

The usefulness of my invention is not limited to the rendering of air more pleasant to breathe; its action is a positive aid in the prevention of sickness. Destruction of pollen is, of course, a great boon to sufferers from hay-fever and asthma. To the extent that diseases are spread by air borne germs, said diseases are combated by my invention wherein three well known germicides are effectively used, namely, heat, ozone, and ultra-violet radiation. Some people, when riding in motor coaches, are subject to a form of nausea akin to seasickness. Although the primary cause of this sickness is probably the swaying motion, it is greatly aggravated by gasoline fumes and other odors. Removal of said fumes and odors is therefore a matter of importance to the people affected.

One of the principal objects of my invention is to provide a recirculating system in which a portion of the air is subjected to intense heat each time it passes thru heat producing, ozone generating apparatus, thereby ultimately subjecting all of said air to intense heat and ozone. This destroys foreign matter that is otherwise indestructible, such as pollen. Material even partially heated is rendered more susceptible to the action of ozone. I have found that the kind of electric spark hereafter described can be used efficiently in this manner if the air is passed thru said spark at high velocity; it is not necessary for the air to be in contact with the intense heat of the spark for very long time in order to ignite most combustible organic substances, or to destroy bacteria, in the presence of ozone.

A further object of my invention is to generate ozone for immediate use in purifying air by means of a spark gap quenched by a jet of said air, which spark gap provides a multiplicity of areas which are constantly formed and broken at high frequency over a wide area. The conversion of atmospheric oxygen to ozone requires voltage sufficiently high to ionize and break down the air. This tends to form an arc, which wastes energy by radiating heat and rapidly burns up electrodes. An arc is inherently a low voltage, high current device; but it requires a high voltage to start it, and, after it has started, the extra voltage must be dissipated elsewhere—usually in the high voltage winding of a transformer—thus also wasting energy in the transformer.

With my method of placing the spark gap in a high-velocity air stream, voltages well above the break-down point of air are used, thus assuring the efficient formation of ozone; but the arc is quenched, thus limiting the current and effectively minimizing the consumption of energy and preventing the burning of electrodes or the formation of oxides thereon. Ozone thus produced is quickly removed from the spark to prevent its decomposition and is thoroughly mixed with the air, thus to prevent the ozone from forming pools or strata in which the odor of ozone would be too strong. Heretofore, it has been the custom to generate ozone in an apparatus having a solid dielectric to prevent sparking. I have found that, in the apparatus hereafter described, sparking is advantageous of itself and that it assures the efficient formation of ozone, since the requisite high voltage is assured at the formation of each spark. Furthermore, all of the voltage is applied to the air rather than to glass or some other solid dielectric; therefore the voltage required is lower and can be supplied by less expensive electrical equipment, and there is no energy lost in the solid dielectric.

A further object of my invention is to provide air conditioning apparatus in which nascent oxygen is formed in the air to be purified. This
2 nascent oxygen is extremely active chemically and so is useful in purifying air. However, it is so unstable as to exist only for an instant and must be used where it is formed.

A further object of my invention is to provide air conditioning apparatus which produces, by means of a quenched spark gap, a maximum of ultra-violet radiation of those extremely short wave lengths which produce ozone, and a minimum of long wave length ultra-violet radiation which decomposes ozone. Quenching not only increases the production of short wave radiation, but allows said radiation to penetrate further into the air instead of being absorbed by the high temperature envelope surrounding an unquenched arc. Quenched sparks tend to scatter, thus making it unnecessary for the ultra-violet radiation to travel far to reach all particles in an air stream thru which said sparks pass transversely.

A further object of my invention is to provide an ozone generator utilizing precooled air. Air is heated by compression. Heated air is not as effective in producing ozone or in quenching the gap as is cooler air. Furthermore, the therapeutical value of the treated air is enhanced by precooling. If desired, said air may be cooled in a chamber which also serves as a muffler, or a separate muffler may be provided.

A further object of my invention is to provide air conditioning apparatus in which water can be vaporized and mixed with the air. This water vapor is useful not only in increasing the humidity of the air but also seemingly makes both ozone and ultra-violet radiation more effective in destroying bacteria. It has also been found that the odor of ozone is much less noticeable in moist air than in dry air.

A further object of my invention is to provide means for introducing water into the air in small quantities, said means not having orifices so small as to be easily clogged. This is accomplished by forcing water under pressure thru an orifice into a chamber of substantially quiescent air that is also under pressure. Thus, water is forced thru said orifice by a differential pressure which, being relatively low, requires a relatively large orifice; the water is so thoroughly atomized as to insure vaporization; and the amount of water used can be very accurately controlled.

A further object of my invention is to provide air conditioning apparatus which can be built cheaply and which is sufficiently portable to be especially adapted for use in motor vehicles, trains, airplanes, and the like. In permanent installations, power for the spark gap can be supplied cheaply and conveniently thru a transformer from a power line. In portable installations, power for the spark gap can be best supplied by a spark coil operated from a battery. A well-quenched gap is desirable for portability since it requires so little power.

A further object of my invention is to provide air conditioning equipment utilizing a quenched spark gap in which the electrical system is designed and arranged to produce frequencies of such character as not to produce radio interference. I am able to do this with the natural characteristics of the circuit, in some instances without the use of special coils and condensers, and in other instances, I provide additional inducance and capacity by appropriate agencies. I have noted that a high frequency spark generated from a quenched gap persists even in the presence of air blowing between the electrodes at high velocity. Said sparks tend to follow a straight line, and their paths are not distended as far as would be a continuous arc.

A further object of my invention is to provide air conditioning apparatus suitable for use with any circulating system for air provided with temperature and humidity controls and cleaning or washing devices.

Further and other details of my invention are hereinafter described with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic section of a motor coach showing a typical installation in which my invention is used in conjunction with an electrical heating device;

Fig. 2 is a diagrammatic illustration of a nozzle directed towards electrodes illustrating the manner in which the air jet distends the path of the sparks;

Fig. 3 is a transverse section taken on the line 3—3 in Fig. 2, and illustrates the manner in which the quenched sparks are to extend substantially the entire jet, even after it has diverged substantially after leaving the nozzle tip;

Fig. 4 is a diagrammatic illustration of an modification of my invention in which the nozzle is broken away to disclose a siphon-and-wick means for introducing liquids into the air stream;

Fig. 5 is a diagrammatic illustration of another modification of my invention in which the electrodes are shaped advantageously to distribute the electrostatic field to facilitate effective sparking;

Fig. 6 is an elevation illustrating the manner in which the structures are arranged to attain the purposes of my invention;

Fig. 7 is an enlarged detail view of the nozzle and fragments of the air and water supply means, with portions thereof shown broken away to disclose the internal construction;

Fig. 8 is a diagrammatic illustration of the electrical circuit embodying my invention; and

Fig. 9 is a diagrammatic illustration of a modification of my invention in which a thermostatic control is shown mounted on the cooling tank and, connected to said control, a switch arranged in a branch of the circuit with the "off" position of said switch being shown in dotted lines.

Referring to the drawings which form a part of this specification, 1 is an air pump, shown more clearly in Fig. 6, 2 is an electric motor operatively connected to said air pump by means of a shaft 3 which shaft carries fixedly secured near its outer end a pulley wheel 4 and the idler pulley wheel 5 adjacent thereto. Said motor and said air pump may be supported by any convenient means (not shown), and said motor may be supplied by any suitable source of power.

An air intake pipe 6 is adapted to receive air to be purified and to conduct the same to said air pump. Said air is compressed and forced from said air pump thru pipe 7 to the cooling chamber 8 which may be secured within the framework of the motor vehicle or located in any suitable extension. The compressed air from the motor driven pump may be directed into a refrigerant coil 9, and may be further conditioned in a storage tank 10. The refrigerant valve 11 is suitably located in either a water or oil piping system. Said motor driven pump may pressurize a refrigerant into said refrigerant coil 9 and said refrigerant expanding through said expansion valve will then absorb heat from the brine in the
Air release valve 14 is operatively connected to said cooling chamber 8 by means of the pipe 15. Air is conducted from said cooling chamber by pipe 16 to a T-member 17, thence thru pipe 18 to nozzle 19, which may be threaded on the pipe 18.

A belt 20 operatively connects either pulley wheel 4 or pulley wheel 21 to pulley wheel 22, which is fixedly secured to discharge 22 of water pump 23. It will be understood that, when said belt connects pulley wheel 4 to pulley wheel 21, both will be rotated, but, when said belt connects pulley wheel 5 to pulley 21, neither will rotate.

The pump 23 is referred to for convenience as a water pump, but it should be understood that other liquids may be used therein if desired. Said water pump is adapted to draw water from tank 24 thru pipe 25 and to discharge said water thru discharge 26. Pipe 25 to a needle valve 27. As is shown more particularly in Fig. 7, said needle valve comprises a member 28 into which is threaded said discharge pipe 25 at one side thereof.

Opposite to said discharge pipe in member 28 is threaded overflow pipe 29 which carries surplus water back to tank 24. Also threaded into said member 28 is a bushing 30 and cap member 31 into which is threaded a needle 32. Between said cap member and said bushing, packing means 33 may be inserted. Said needle is adapted to seat in the seating member 34 threaded into member 28 to which is connected pipe 35 which is adapted to conduct water thru one side of said T-member 17 to the interior of pipe 18 thence to the nozzle 19. Said pipe 35 may be supported in said T-member by the threaded bushing 36 engaging packing means 37. Said packing means is adapted to prevent leakage of air around said pipe 35.

Said pipe 35 is supported near the end thereof by a disc 38 which may be press-fitted into said member 28. Said disc 38 has a plurality of holes 39 arranged near its periphery, said holes being adapted to permit passage of air into the compression chamber 40. The end of the pipe 35 is partially closed by the disc 41 in the central portion of which is an orifice 42. Said orifice is adapted to admit water or other liquid to the compression chamber 40. Said disc 41 may, if desired, be soldered to the end of pipe 35. Said nozzle 19 may be firmly pressed into a hole in the insulating member 43.

A plurality of orifices 44 may also be press-fitted in said insulating member 43, said orifices being positioned to form a spark gap 45 in front of said nozzle 19. Said nozzle 19 is provided, at its outer end, with an orifice 46 adapted to direct a jet of air 47 thru said spark gap 45. Said electrodes 44 may be made of any suitable material. I have found Monel metal to be satisfactory. For the purpose of forming a spark gap, said electrodes 44 are directed substantially toward each other and are spaced apart a distance depending on the electrical characteristics of the circuit hereafter described. I have found a space of one half inch to be satisfactory, although it can be more or less.

Said electrodes 44 may be connected to a transformer 49 by wires 50 which may, if desired, carry insulating material 48. Said transformer 49 carries binding posts 51 adapted for connection to a source of electrical power. Surrounding said nozzle and said electrodes a protective tube 52 is positioned. Said protective tube may be made of any convenient material such as wood fiber.

An alternative structure adapted for use with a battery 53 as a source of power is schematically shown in Fig. 6. When the switch 54 is closed, current from said battery will cause the primary winding 55 of said transformer 49 and thru the magnetic interrupter 56 thence back to battery 53. Said interrupter is adapted to repeatedly make and break said primary circuit by means of contact members 57. If desired, said interrupter 56 and said transformer 49 may be integrally constructed in the form of the well-known spark coil. Said transformer 49 is provided with an iron core 58. Between said primary winding 55 and secondary winding 56 may be placed a metal shield 61 which may, if desired, be connected to ground by the wire 59.

As hereinafter described, it is desirable to use a substantial amount of inductance and capacity in conjunction with said spark gap 45. I prefer to use a transformer which supplies capacity by means of the distributed capacity of its secondary winding and to so arrange the loop 64 as to provide sufficient inductance therein. However, if desired, additional inductance may be supplied as by a coil 65. I have found that said loop has sufficient inductance if its area is approximately 100 square inches. Similarly, if the distributed capacity of the secondary winding of the transformer is unusually low, or if the resistance of said winding is too high, it may be desirable to add capacity to the circuit and this may be done by arranging a condenser 62 as shown in Fig. 8. I have used a capacity of about 10 microfarads as condenser 63.

The resistance of said secondary winding is represented at 62.

As shown in Fig. 9, as an alternative structure, if desired, a thermostatic member 65 may be fixedly secured to cooling chamber 8 by rivets 66. Said thermostatic member is adapted to engage lever 68 which is operatively connected to lever 69 of snap switch 70. As shown by dotted lines, when said thermostatic member is heated by heat from said cooling chamber 8, it moves said lever 69 to the "off" position. Said snap switch 70 may be connected to the primary of the electrical circuit in such a way as to interrupt the current therein when in its "off" position.

As is shown in Fig. 4, an alternative means for introducing water or other liquid into the air stream comprises a bushing 71 threaded into T-member 12 which together with nozzle member 19 is adapted to replace nozzle 18. Threaded into said bushing 71 is a reservoir 74 provided with a tube 75 leading to the bore of T-member 12. Said tube is provided with an opening 76 near its lower end. If desired, a wick 77 may be inserted in said tube in such a way that its lower end is immersed in liquid 78 contained by said reservoir 74, the upper end of which may extend into the bore of T-member 12.

A preferred shape of the end portion of electrodes 44 is shown diagrammatically at 44A in Fig. 5.

My invention has been described and illustrated for use with the room 88. A typical installation embodying my invention is shown in Fig. 1 wherein the purified air from the nozzle...
is conducted thru pipe 79 to a heating element 80 and is then discharged into the interior of a motor coach 81. Said air, after circulating throughout said interior of said motor coach, is drawn thru the inlet member 82 back into the air pump 1. Said motor coach is provided with a gasoline motor 83 which is cooled by fan 84. The exhaust gases from said motor are discharged thru pipe 85 and muffler 86 and pipe 87 into the air.

The foreign matter which ordinarily befools the air within a motor coach is of a composite nature. Some of it is readily neutralized by ozone, whereas other constituents, such as unburned fuel and tobacco or other smoke, can be rendered innocuous only by heating them to a high temperature, preferably in the presence of ozone or nascent oxygen. Other foreign material, such as some dusts, will not be chemically changed by a brief contact with electric sparks, but it will be sterilized thereby.

In my invention, molecular oxygen and other elements are dissociated by the heat of the sparks or the electrostatic field associated therewith. The nascent atoms of nascent oxygen are very active chemically and are, therefore, very useful in purifying air. However, they exist for only a brief period of time and must be utilized promptly, within a short distance from the place where they are formed, otherwise they will revert back to some molecular form useless, or they will form less active molecules such as ozone. Although less active than nascent oxygen, ozone is useful because it is carried out into the air of the motor coach and there destroys bacteria and odors.

The way in which the sparks of the quenched gap in my invention are scattered throughout the air jet is shown in an enlarged view in Fig. 2 and Fig. 3, wherein the sparks are indicated by the numeral 88. These rapidly recurring sparks constantly shift their paths so that the air jet is thoroughly sprayed with them. Thus the nascent atoms are utilized to purify the air in the immediate vicinity of their formation, and substantially all particles of said air are subjected briefly to the heat of said sparks. Inasmuch as the air in the motor coach recirculates thru my device, if any foreign matter should escape the action of the sparks and cannot be eliminated before its first trip through, it will be again subjected to said action.

While my invention is shown as being used in conjunction with the heating member 80, it is to be understood that it might similarly be used with any other form of air cooling, cleansing, or dehumidifying means, and a blower, not shown, for circulating said air may, if desired, be included as a part of said means.

The operation of my invention is as follows: The transformer 45 and the motor 2 are simultaneously connected to a source of power. An arc immediately forms across the spark gap 45. This is a continuous, flaming arc and, if long continued, it would rapidly consume the electrodes. Also, said continuous arc is produced by a low voltage which does not ionize the air to produce ozone. A continuous arc converts carbon to molecular oxygen. Furthermore, the ultra-violet radiation from such a continuous arc is of a kind which brings about the decomposition of ozone.

However, in my invention, this continuous arc exists for only a brief period of time. When the jet of air from the air pump attains its full velocity, it quenches said arc so that thereafter only a series of intermittent sparks is emitted from the electrodes or from the electrodes to the surrounding ionized air. These high frequency sparks are caused by rapidly oscillating electrical charges in the circuit that includes the spark gap; when the arc is moved or broken by the air jet, the resultant electrical phenomena cause recurring sparks at frequencies determined by the electrical characteristics of said circuit.

Whether power is supplied to the transformer from an alternating source, or whether a battery and interrupter is used in the primary, the voltage in the secondary will be pulsating. The intermittent sparks herein described are produced by said pulsating voltage but they are ordinarily of much higher frequency than said pulsations. I have found it advantageous to use a circuit in connection with said spark gap having such inductance and capacity that said sparks recur as frequently as 25 million times or more per second, although it is not necessary that such a high frequency be used. I have found that less interference with radio receivers is caused thereby than when said frequency is lower.

These high frequency sparks may be referred to as quenched arcs or quenched sparks, and the process of quenching the continuous arc to produce said sparks is known as "quenching the gap.”

It will be understood that said intermittent sparks will not all recur at the same frequency; several frequencies may be produced. This is due to the fact that the current that flows thru the spark gap may follow any of several alternative paths, for example, thru the capacity of the windings, thru the capacity between wires, or thru coupled circuits; that is, the circuit usually has more than one degree of freedom. I deem this to be advantageous in that it causes the sparks to spread out more; the higher frequency sparks passing directly across the spark gap, the lower frequency sparks being more disturbed by the air jet.

If the velocity of the air thru the gap is sufficiently high, said gap will be almost completely quenched—only high frequency sparks will be formed. If the velocity of said air is lower, a continuous arc will be formed and distended away from said gap, while high frequency sparks will pass more directly across said gap. Thus, as applied to a spark gap, quenching is a relative term; a gap may be well quenched or only partially quenched.

In my invention, I prefer to have the gap well quenched, since there are then more of the beneficial results with less energy consumption, and there is no noticeable pitting or oxidation of the electrodes. More energy in the air between electrodes accompanies said high frequency sparks than with low frequency sparks or a continuous arc; therefore, my purposes are accomplished with little current and consequent elimination of pitting of the electrodes.

It is frequently desirable to introduce moisture into air; this is especially desirable when ozone is used because the odor of ozone is less objectionable in moist air. Also, both ozone and ultra-violet radiations are more effective in killing bacteria in the presence of water vapor. It is desirable to introduce water in such a way that it will be substantially all vaporized immediately, and it is also desirable to have said vapor uniformly distributed in the air. At the
same time, it is advantageous to introduce said water under pressure in order that it may be better controlled and to assure vaporization. However, to introduce a small quantity of water at high pressure requires an orifice so small that it is easily clogged.

I have found that if water under considerable pressure is forced thru the orifice 42 into air at slightly less pressure in the compression chamber 44, a comparatively large orifice can be used, because water flows thru it only because of the small differential pressure between said water and said air, and said water is thereby so thoroughly atomized and mixed with said air that it immediately vaporizes and can be accurately controlled by needle valve 27.

Ozone is more readily formed from cool air than from warm; cool air more thoroughly quenches a spark gap; and cooled air from my device has a pleasant, refreshing effect when breathed that is different from the effect of any other air I have observed. Said air appears to have important therapeutic value for beasts and birds, as well as humans. It is likely that said therapeutic value is due chiefly to ozone; but none of the common bad effects, are produced by air from my invention even when doses sufficiently large to produce marked beneficial results are used. Cooling the air also retards decomposition of ozone therein.

I have found that when the compressed air is passed consecutively thru two or three small cooling tanks, such as are shown in Fig. 8, it is better cooled and gives better results than when only one such tank is used. Accordingly, it is more advantageous to cool said cooling tank 8 thoroughly by immersing the same in a refrigerating brine tank, as is shown in Fig. 6. Said cooling tanks serve the further purpose of acting as a muffler to absorb pulsations in the air that would otherwise produce objectionable sound waves.

Quenched sparks which tend to follow the moving air particles remain in contact with said particles for sufficient time to bring about their combustion, and by recirculating said air, all particles thereof may be so heated. Also, they have said sparks scatter as much as possible in order that the shorter wave ultraviolet radiation, which does not penetrate very far into air, may reach all parts of the air stream.

To this end of causing the sparks to spread, I deem it desirable to shape my electrodes as shown in Fig. 3, although this shape is not necessary and ordinary pointed electrodes operate satisfactorily.

By the means and method described, I utilize ozone in a peculiarly effective way to purify air, and to remove odors from it; I further purify and deodorize said air by combustion and by ultraviolet radiation; and I accomplish this result by means that are cheap and unusually free from trouble, not being affected by dust or moisture, and that require very little power to operate.

My invention can be used in damp cellars and in refrigerators where odors are commonly found and where other ozone generators will not operate because of the moisture.

I claim:

1. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming are extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to return at high frequency.

2. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; means in connection with said jet producing means for the inspiration of moisture into said jet in predetermined quantities; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to return at high frequency.

3. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; means in connection with said jet producing means for the inspiration of moisture into said jet in predetermined quantities; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to return at high frequency.

4. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; means associated with said jet producing means for cooling the air in advance of said jet; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to return at high frequency.

5. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; means in connection with said jet producing means for the inspiration of moisture into said jet in predetermined quantities; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to return at high frequency.
said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; refrigerating means associated with said jet producing means for cooling the air in advance of said jet; means in connection with said jet producing means for the introduction of moisture into said jet in predetermined quantities; pressure inducing means for liquid for supplying said moisture and for said air, said means supplying said fluids to said jet producing means at more or less constant velocity and at predetermined relative pressures, the pressure of the liquid being higher than that of the air; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to reform at high frequency.

6. In air conditioning apparatus, means for treating the air in a chamber comprising air circulating and recirculating mechanism adapted to withdraw continuously a portion of the air in said chamber and reintroduce it; means for producing a jet of said air directed into said chamber; a pair of electrodes arranged adjacent but to the sides of the jet thus produced; an electric circuit connected to said electrodes; means for impressing across said electrodes an electrical potential sufficiently high to produce a continuous flaming arc extending across the path of said jet; and means for accelerating the air of said jet to such a velocity as to change said flaming arc to a quenched arc which is adapted to form, be extinguished, and to reform at high frequency, at a frequency in excess of two megacycles per second.

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