O. LINDER.

OZONIZER.

APPLICATION FILED JUNE 18, 1910.

969,547. Patented Sept. 6, 1910.

2 SHEETS—SHEET 1.

Fig. 1

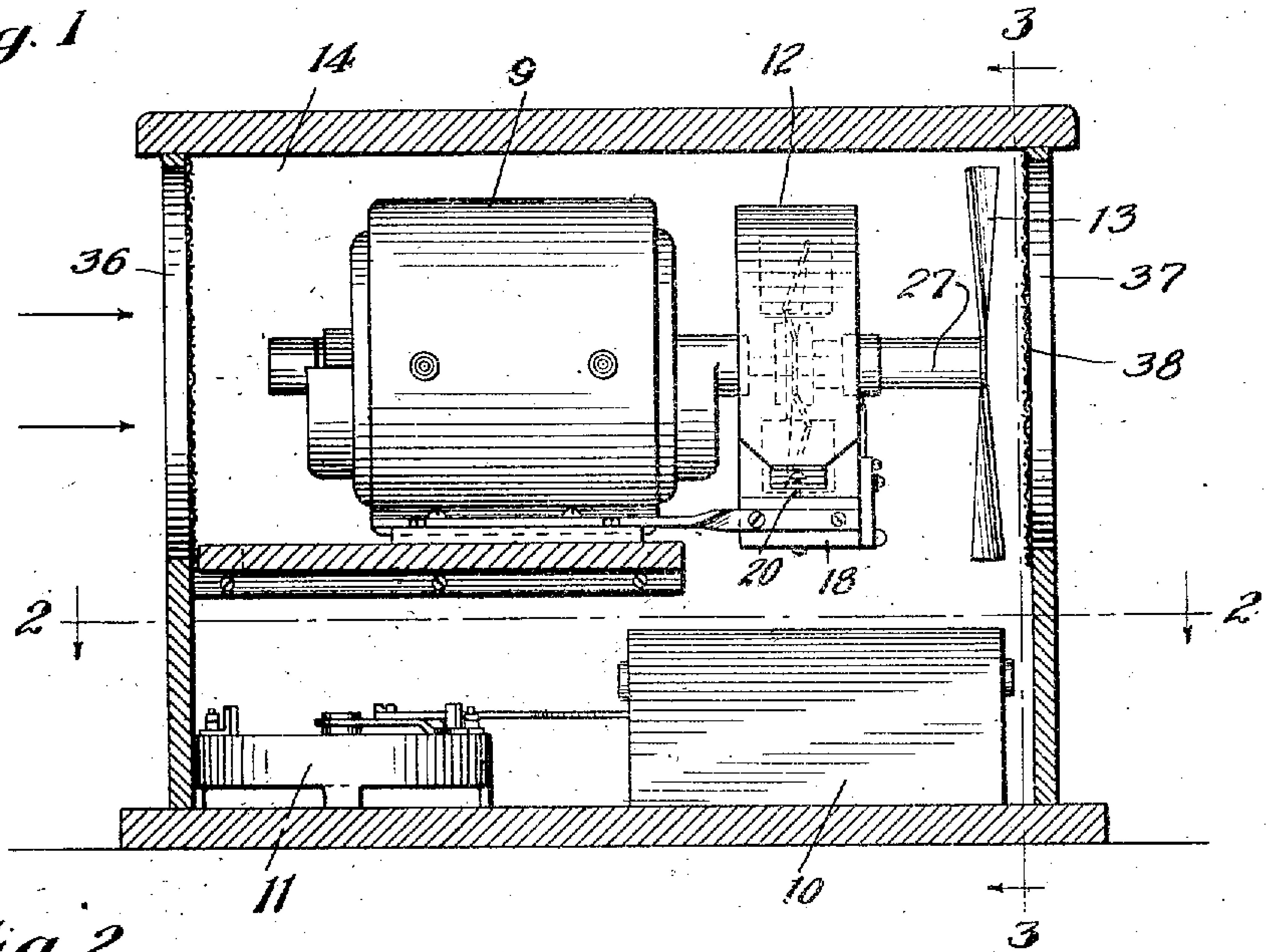
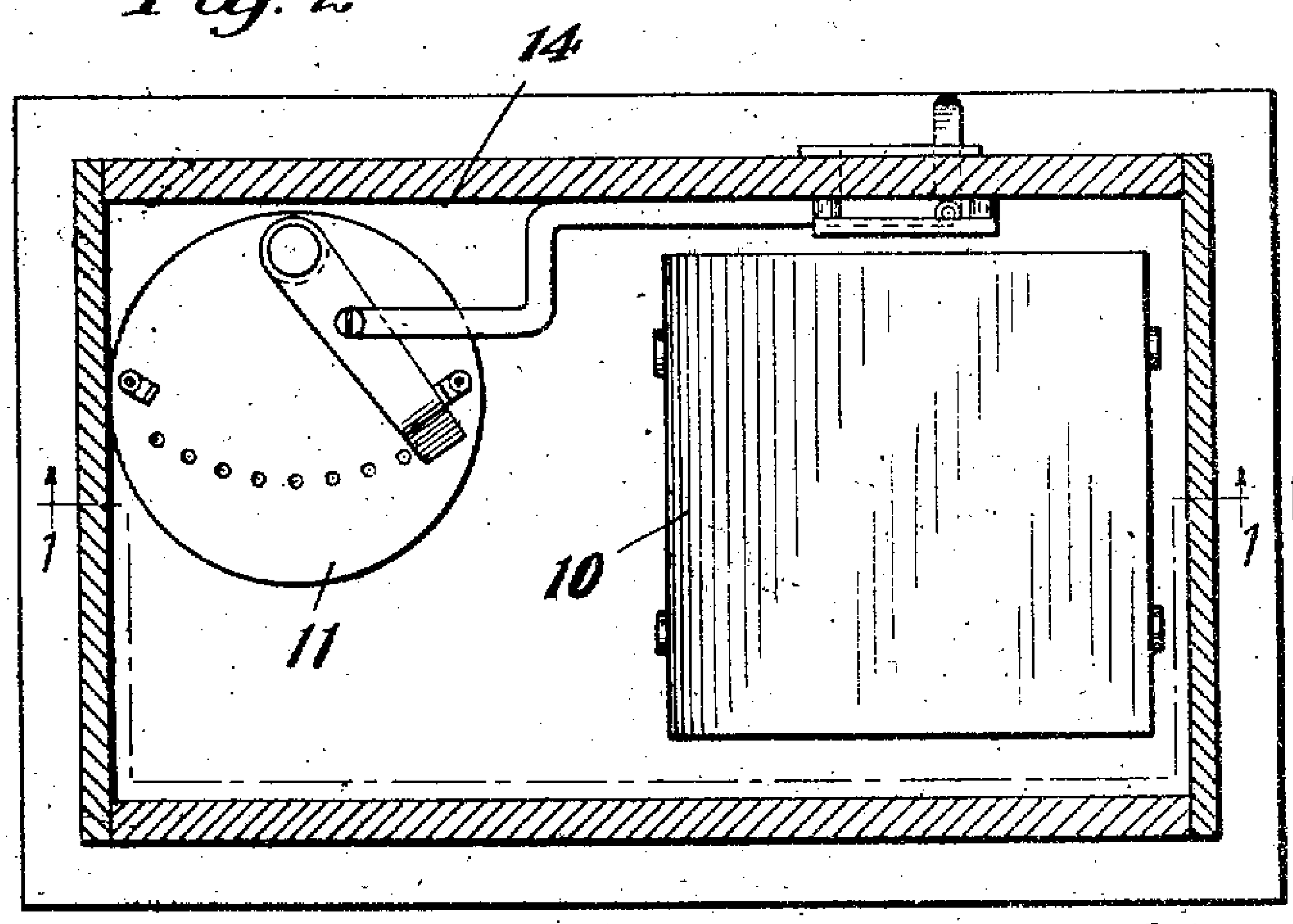


Fig. 2



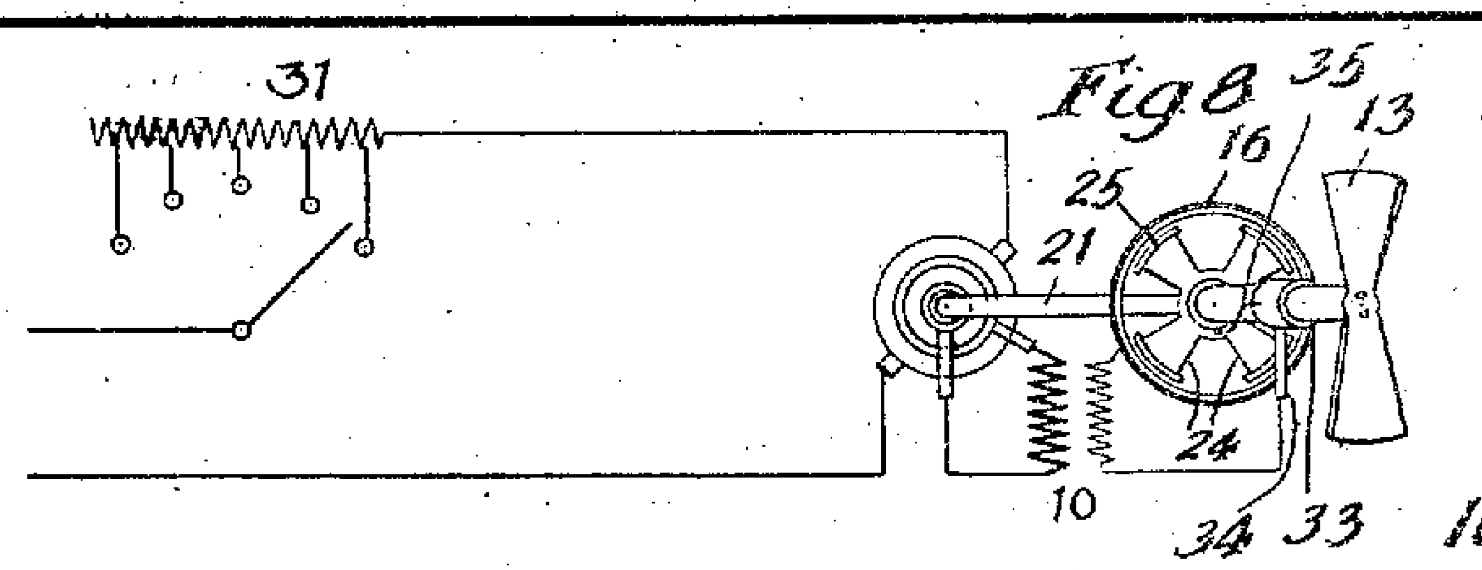
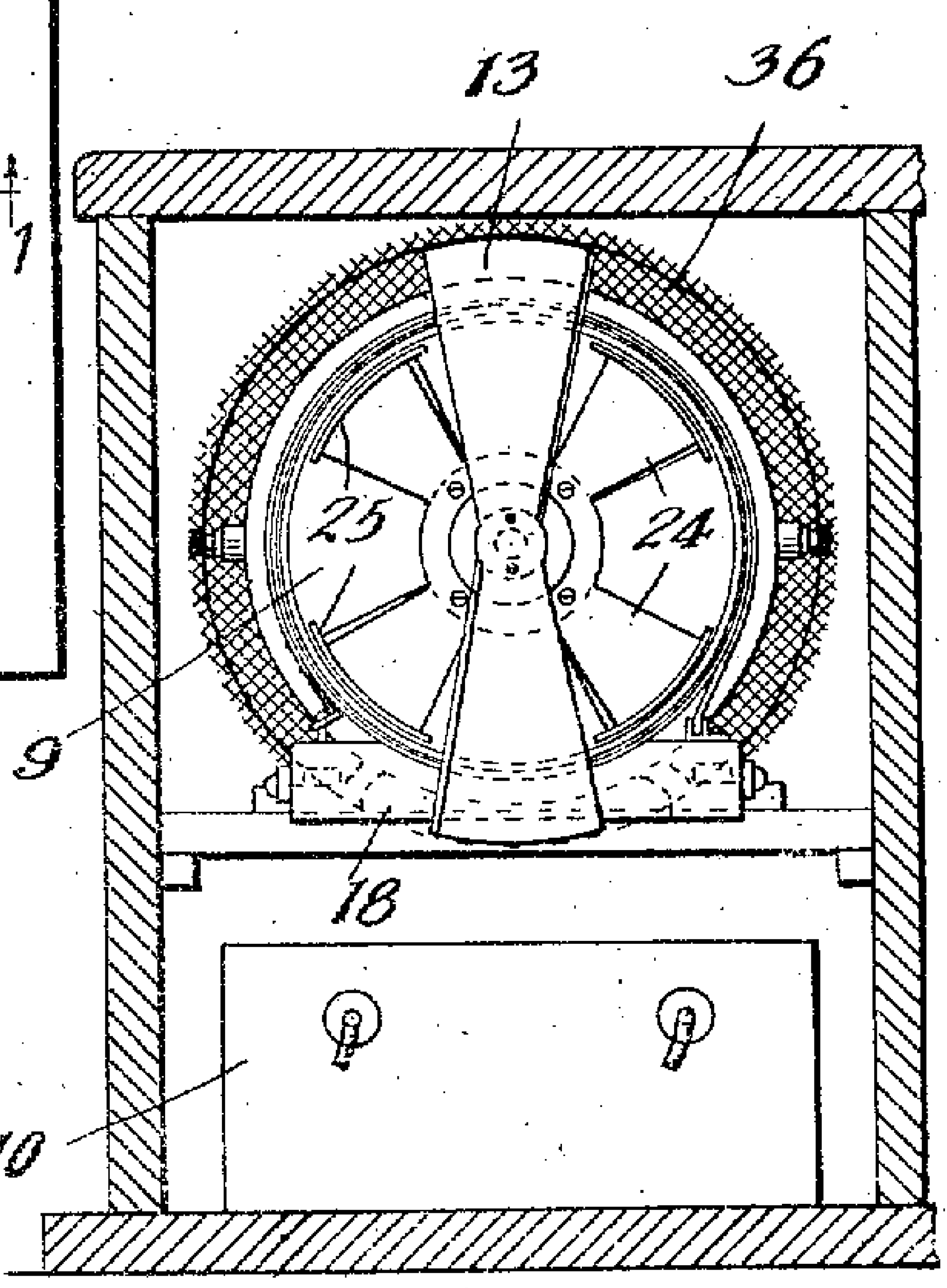


Fig. 3



Witnesses:

Wm. Geiger

R D Small

Inventor

Oscar Linder

By Banning & Banning

Attorneys

O. LINDER.

OZONIZER.

APPLICATION FILED JUNE 18, 1910.

969,547.

Patented Sept. 6, 1910

2 SHEETS—SHEET 2.

Fig. 4

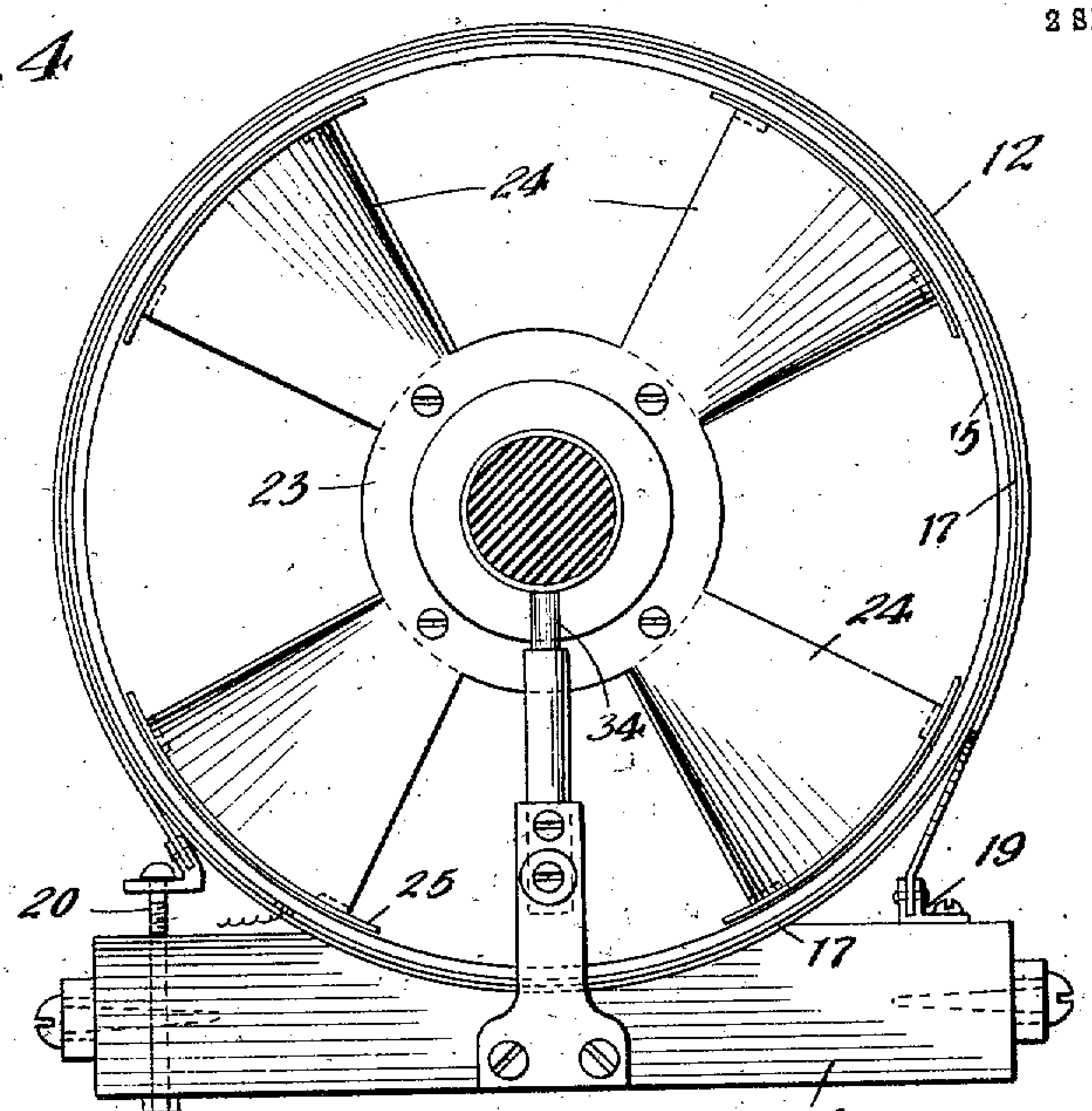


Fig. 5

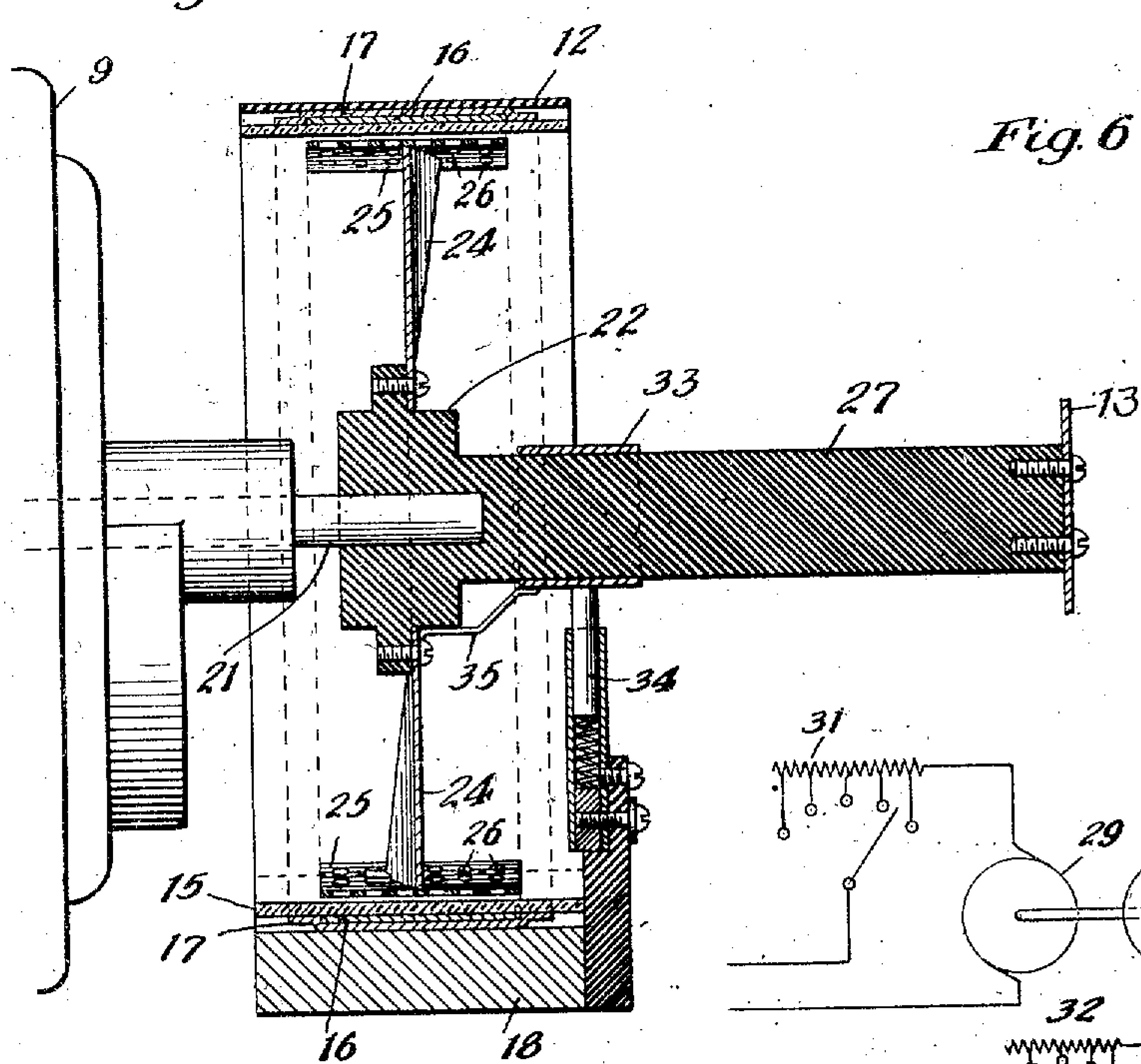


Fig. 6

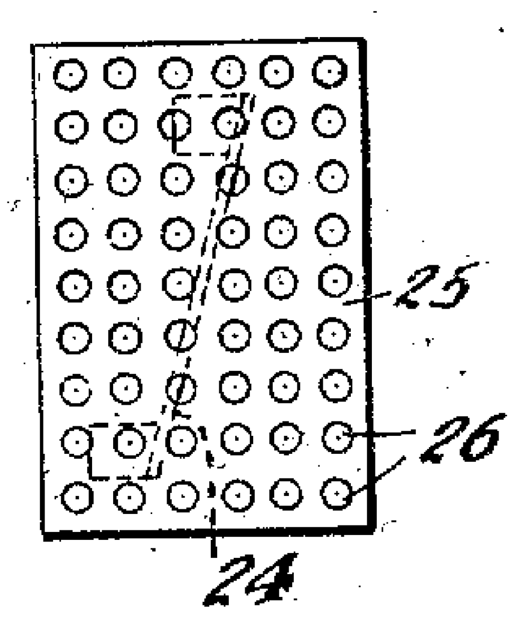
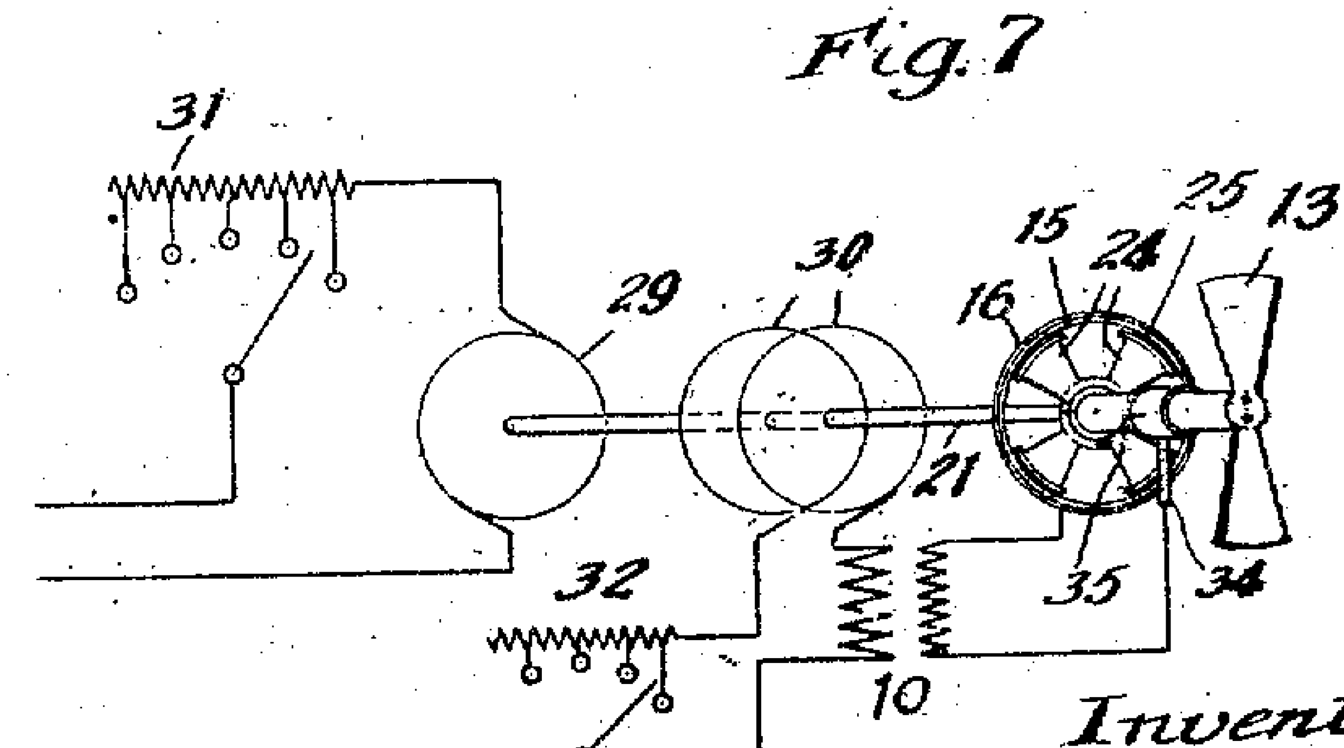


Fig. 7



Witnesses:

Wm. Geiger

R D Small

Inventor

Oscar Linder

By Banning & Banning

Attorneys

UNITED STATES PATENT OFFICE.

OSCAR LINDER, OF CHICAGO, ILLINOIS, ASSIGNOR TO STANDARD ELECTRO-UTILITIES COMPANY, A CORPORATION OF ARIZONA TERRITORY.

OZONIZER.

969,547. Specification of Letters Patent. Patented Sept. 6, 1910.

Application filed June 18, 1910. Serial No. 567,656.

To all whom it may concern:

Be it known that I, OSCAR LINDER, a citizen of the Republic of Switzerland, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Ozonizers, of which the following is a specification.

This invention relates to ozonizers or mechanisms for producing ozone, of the general type shown and described in Letters Patent of the United States, No. 951,443, granted to me on the 8th day of March, 1910.

Objects of this invention are, to secure a better distribution of the electrical discharge over the discharge surface, to prevent heating of the discharge surfaces, and to prevent the formation of undesirable gases, as, for example, nitrous oxid, by providing an adequate area from which the discharge may take place; to provide means for securing a better flow of air around and past the discharge surfaces, thus insuring that the ozonized air will be removed evenly and continuously from the discharge zone, and thus avoiding the forming, from time to time, of pockets containing highly ozonized air, which would detract from the proper and best operation of the mechanism and facilitate the formation of undesirable gases; to provide additional means for insuring the movement of air through the device, separate and distinct from the ozonizing blades, and at the same time to give added security against the possibility of injuring people by dangerous electrical shocks; to arrange the parts in such manner as to secure the most perfect and advantageous circulation of air through the device; to provide novel and accurate means for regulating the rate of generation of ozone, and at the same time regulating the rate of flow of air through the device in such a way that the amount of ozone carried off by each cubic unit of air will be practically the same, whether the rate of air flow is large or small.

Other objects will appear from a detailed description of the invention, which consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings—Figure 1 shows a sectional elevation of the device taken on the line 1—1 of Fig. 2, looking in the direction of the arrows; Fig. 2 shows a sectional plan taken on the line 2—2 of Fig. 1, looking in the direction of the arrows; Fig. 3 shows a cross-section taken on the line 3—3 of Fig. 1, looking in the direction of the arrows; Fig. 4 shows a detail front elevation of the rotating and stationary electrodes, the projecting shaft carrying the supplemental fan being cut off; Fig. 5 is a sectional detail of the rotating and stationary electrodes, the supplemental fan being cut away; Fig. 6 is a detail of my improved rotating electrode shoe; Fig. 7 is an electrical diagram showing one arrangement of connections for securing a variable amount of electrical discharge approximately proportionate to the rate of rotation of the air fan, use being made of a motor generator; and Fig. 8 shows an electrical diagram similar to Fig. 7, use being made, however, of a rotary converter.

It will be understood that in the embodiment of my invention I provide a stationary electrode and a rotating electrode spaced a suitable distance from the former and insulated therefrom in any suitable manner, so that an electrical discharge will occur between the electrodes but so that arcing will be prevented by means of the insulating material.

In order to secure a proper electrical discharge, it is necessary to use a high potential current, which can best be obtained through the use of alternating current of moderate potential stepped up in a transformer. In case the source of electrical supply is an alternating current, the device may be arranged to use this current directly in the transformer for stepping up to secure the high potential discharge current, and also to use another portion of this current for running the motor which drives the rotating electrode and fan. In case the source of electrical supply is a direct current, means must be provided for changing a portion into alternating current for use in the transformer, while at the same time means must be provided for rotating the electrode and fan. Obviously, a motor generator may be used to accomplish both purposes, the rotating electrode and fan being placed on the same shaft with the generator and motor and the alternating current being secured from the generator. In this case, the speed of rotation will be approximately proportional to the potential on the direct current leads, but the potential of the alternating current will not necessarily vary in the same ratio. Therefore, when varying the potential of the direct current in order to vary the speed of the rotating electrode, and also the generator, the potential of the discharge will not necessarily be proportional to the speed of rotation of the electrode and of the fan. Since the amount of ozone generated is approximately proportional to the potential of the discharge, it is seen that the amount of ozone generated for each revolution of the electrode will not necessarily be the same for all speeds of rotation when using a motor generator. However, a rotary converter, being a machine in which the alternating current slip rings are directly connected to the direct current commutator, is a machine in which the alternating current potential is exactly proportional to the direct current potential. Therefore, when using a rotary converter the speed of rotation and the alternating current potential will both be proportional to the direct current voltage, and therefore the potential of the discharge will rise at the same time that the speed of the rotating element is increased. Thus the total amount of ozone generated will increase with the speed of the rotating electrode and of the fan, and therefore the amount of ozone generated for each revolution will be practically constant. In other words, by providing means for varying the alternating current potential in the proper ratio with respect to the speed of rotation, the amount of ozone generated per revolution may be kept constant for all speeds, and thus the ozone density of air delivered may be the same when using the machine at high speeds as at low speeds.

It will be understood that in order to secure the most perfect results the ozonized air must be promptly carried away from the electrical field, as any lingering of this air in the field promotes the decomposition of the newly formed ozone and the heat of the field conduces to the formation of nitrogenous compounds. In other words, the circulation of air through the electrical field and away from the electrodes must be rapid and perfect to secure the best results. One of the objects of my invention is to form the shoe electrodes in such way as to provide a circulation of air which will carry the gases immediately away from the electrical field.

Referring now to the figures, 9 represents a motor generator or rotary converter of suitable type and size; 10 is an alternating current transformer; 11 is a rheostat of proper design and size; 12 is the outer casing covering the stationary electrode; 13 is a supplemental fan, and 14 is an inclosing box or case.

As in the previous construction, the ozonizer proper comprises a stationary circular electrode and a rotating electrode within the former, the two electrodes being separated by an insulating annulus of proper thickness, width and composition. Referring particularly to Figs. 4 and 5, the insulating annulus is shown at 15, surrounded by a strip of metal foil 16 of a width preferably less than the annulus, so that an insulating tape or protector 17 may inclose the strip 16 and be bent down at its edges against the annulus so as to entirely inclose the electrode, thus protecting it and preventing an electrical discharge taking place from it over the edge of the annulus.

In order to securely hold the annulus and stationary contact in place, I provide a block 18, of wood or other insulating material, having cut into its upper face a segmental groove to receive the lower portion of the annulus, electrode and tape. I then pass the strap or casing 12, of insulating material, around the upper portion of the annulus and electrode, fastening said strap to the block 18 at 19 and drawing it tight at the other end, as by means of a bolt 20 passed through the block 18.

The shaft of the motor or converter is shown at 21 in Fig. 5, projecting beyond the bearing an amount sufficient to receive an insulating hub 22. This hub carries the rotating electrode, which is in the form of a central ring portion 23 and provided with a plurality of blades 24, of proper form to cause a movement of air through the device. Each of these blades is provided with a shoe 25, preferably perforated over its entire face, as will be explained. As this electrode rotates, a discharge will take place from these shoes, which are in close proximity to the annulus, to and through the latter to the stationary electrode 16 surrounding the outside of the annulus. This discharge will occur approximately equally over the entire surface of each shoe, so that the amount of ozone thus generated will increase with the total area of all of the shoes. As the electrode rotates, a current of air will be thrown outwardly by reason of the shape of the blades, and this current of air will carry off the ozone uniformly, thus insuring a uniform density of ozone in the air which leaves the device. However, in order to facilitate the movement of air immediately around the rotating electrodes and to insure that there will be formed no pockets of air adjacent these electrodes, I provide the holes (26) in each shoe. These will permit air to pass through the shoes as they rotate, thus carrying off the newly formed ozone and bringing in fresh air to be acted upon.

The insulating hub 22 is extended outward a considerable distance in the form of a shaft 27, which carries on its end a supplemental fan 13. This supplemental fan will aid the blades of the electrode in creating a draft of air, and will thus insure a proper removal of the ozone as fast as generated. Furthermore, inasmuch as this supplemental fan is insulated from all electrical parts by means of the insulating shaft 27, it is seen that insurance is provided against dangerous electrical shocks which might otherwise be obtained by holding a wire or pin against the rotating fan.

Referring now to Fig. 7, I show the preferred arrangement of electrical connections when using a motor generator to supply alternating current from a source of direct current. The direct current commutator is shown at 29, and the alternating current slip rings at 30. As above explained, the potential across the electrodes will not necessarily vary in proportion to the speed of rotation when using the motor generator. In order to vary the speed of rotation of the motor generator, I provide a rheostat 31 and proper connections in series with the direct current motor, and in order to vary the potential across the electrodes in the proper manner I provide an additional rheostat or resistance 32 in the alternating current leads. It will be understood that in practice these rheostats can be adjusted separately or in unison according to requirements.

In Fig. 8 I show connections intended to be used in connection with rotary converter operation. In this case, as before stated, the density of ozone will be practically the same when operating at high speed as at low speed, and so in general but one rheostat will be needed, this being placed in the direct current leads, although, of course, it will be understood that I do not restrict myself to the use of only one rheostat, as obviously one might also be placed in the alternating current leads.

Referring again to the drawings, the preferred manner of delivering current to the rotating electrode is to provide a slip ring 33 on the shaft 27, a carbon or other brush 34 delivering current to this slip ring and the slip ring being connected to the rotating blades by means of a connection 35.

In order to induce the best flow of air through the device, I prefer to form an opening 36 in the rear wall of the casing and an opening 37 in its front wall, covering each of these openings with a suitable grating 38, the openings being in line with the motor generator or rotary converter, electrodes and supplemental fan. In this case fresh air will enter the device through the opening 36, as shown by the arrows, and after cooling the motor generator will pass by the rotating electrode and between the shoes 25 and annulus, and finally will be delivered by the fan 13 through the opening 37 to the exterior of the device. Thus the current of air will not only be thrown into contact with the electrodes in the most advantageous manner, but will also serve to cool the motor generator or converter, and also tend to remove particles of dust or dirt from the electrodes which might have collected thereon.

The use of shoes, such as 25, not only enables the securing of a large discharge area for each blade of the rotating member, but provides a construction in which the discharge surfaces may be replaced from time to time without seriously deranging any other portions of the device, and without wasting portions which have not been injured or worn.

It is found that the provision of the perforations in the discharge shoes permits a circulation of air around the electrodes such that the newly formed ozone is immediately carried off and the formation of undesirable gases is practically eliminated.

It will be understood that by the use of the shoes 25 the electrical discharge can be made to occur over the entire width of the stationary electrode 16, whatever this may be, and that by the provision of a large discharge area the density of discharge to produce a given amount of ozone per hour may be less than otherwise. Thus the tendency to produce objectionable gases may be lessened; the parts will not tend to heat so much as otherwise, and there will be less tendency to burn the rotating electrode discharge surfaces than otherwise. Obviously the shoes, 25, may be of any contour desired. In order to increase the effectiveness of the discharge surface of each shoe, said surface may be provided with corrugations, points, projections or other discharge members.

Although I have shown and described the supplemental fan as inclosed within the casing of the ozonizer, still it is evident that if desired this fan may be placed outside of the screen by extending the shaft or insulating hub through the screen, thus increasing the effectiveness of the draft of ozonized air delivered into the body of the room.

I claim:

1. In a device of the class described, a stationary circular electrode, a rotating electrode adjacent thereto, and means exterior the rotating electrode for producing an air draft past the rotating electrode whereby the ozonized air will be removed, substantially as described.

2. In a device of the class described, a stationary circular electrode, a rotating electrode adjacent the stationary electrode, the rotating electrode being in the form of a fan, and a supplemental fan in line with the rotating electrode, the electrode and supplemental fan adapted to create an air draft when running whereby the ozonized air will be removed, substantially as described.

3. In a device of the class described, a cir-

cular insulating annulus, a stationary electrode in the form of a band of conducting material surrounding the annulus on its exterior periphery, and a rotating electrode adjacent the annulus and spaced therefrom a distance to create an electrical discharge between the electrodes, the rotating electrode being provided with a plurality of discharge shoes of a width substantially the same as that of the stationary electrode band, substantially as described.

4. In a device of the class described, an insulating annulus, a stationary electrode surrounding the annulus and spaced therefrom a distance to create an electrical discharge between the electrodes, the rotating annulus being provided with a plurality of discharge shoes, each provided with a plurality of air holes whereby when the rotating electrode is in motion air draft will be created through said holes to remove the ozonized air from the electrodes, substantially as described.

5. In a device of the class described, a stationary electrode, a rotating electrode spaced therefrom a distance to create an electrical discharge between the electrodes, and an air fan adjacent the rotating electrode and insulated therefrom and adapted to create an air draft to remove the ozonized air, substantially as described.

6. In a device of the class described, two electrodes and a fan for creating an air draft to remove the ozonized air, a rotary converter and a transformer, the fan rotatively connected to the rotary converter and one circuit of the transformer electrically connected to the slip rings of the rotary converter and the other circuit of the transformer being suitably connected to the electrodes, and means for varying the potential of direct current supplied to the rotary converter whereby the speed of the rotary converter and the alternating current potential across its slip rings may be varied simultaneously, substantially as described.

7. In a device of the class described, a circular stationary electrode and a rotating electrode concentric with the stationary electrode and spaced therefrom a distance to create an electrical discharge, the rotating electrode comprising a plurality of air draft vanes each carrying on its periphery a discharge shoe, each discharge shoe being provided with a plurality of transverse holes whereby when the rotating electrode is in motion an air draft will be created around the electrodes and through the holes to remove the ozonized air, substantially as described.

OSCAR LINDER.

Witnesses:
R. D. SMALL,
THOMAS A. BANNING, Jr.