Nov. 14, 1933. R. C. JACQUELET ET AL 1,935,294

THERAPEUTIC LAMP

Filed Dec. 3, 1928

Fig. 1.

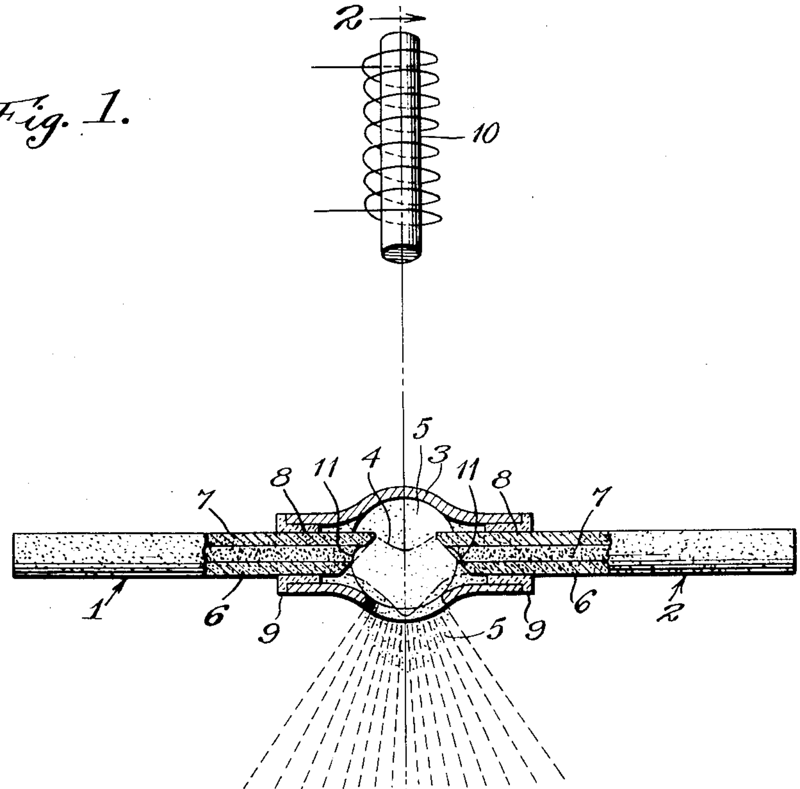
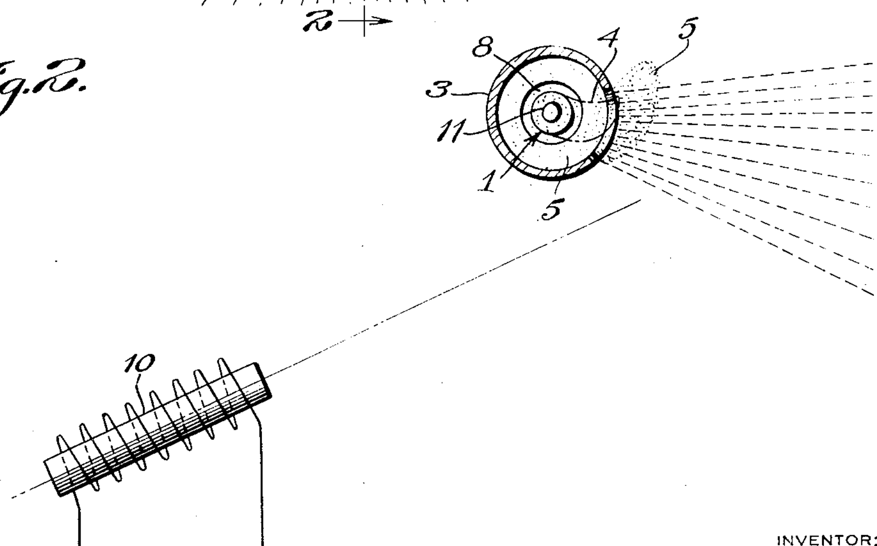


Fig. 2.



INVENTORS

Robert C. Jacquelet

BY John G. H. Siebel

Wood & Wood ATTORNEYS

Patented Nov. 14, 1933 1,935,294

UNITED STATES PATENT OFFICE

1,935,294

THERAPEUTIC LAMP

Robert C. Jacquelet and John G. H. Liebel, Cincinnati, Ohio, assignors to The Liebel-Flarsheim Company, Cincinnati, Ohio, a corporation of Ohio

Application December 3, 1928. Serial No. 323,413

6 Claims. (Cl. 176—117)

This invention relates to an instrumentality adapted to provide a beam of radiation of therapeutic value such as visible light, ultra-violet and infra-red radiation and also to a method of developing such a beam of radiation in useful quantities practicably, conveniently and economically.

The particular type lamp to which this invention is directed is an arc lamp of the type wherein the electrodes usually contain requisite cores of material adapted to be vaporized by the intense heat of the arc to excite the desired spectra. The electrodes usually comprise carbon tubes filled with earth oxides or similar materials.

In an arc of this sort the amount of ultra-violet radiation produced increases with the temperature, so that a great amount of heat is incidental to the arc suitable for most therapeutic treatments. This heat causes the carbon electrodes to be oxidized and consumed very rapidly, producing a cloud of fumes.

The ordinary open arc will not burn over five or six minutes unless mechanical means are provided for feeding the electrodes forwardly to compensate for the consumption of the electrodes. Moreover, the current passing between the electrodes decreases rapidly over even this short period, so that after three or four minutes operation the arc is not providing nearly as much ultra-violet radiation as it did when started. The fumes incidental to the usual operation are highly objectionable and the attempts to dissipate them have been many and varied. The nuisance of both the continual mechanical manipulation and the fumes of the conventional therapeutic arc lamp have greatly inhibited its utility.

Attempts have also been made to enclose the arcs of therapeutic lamps but these attempts have been failures. The problems are manifold because of the high temperature, the fumes or vapors incidental to the arc, and proneness of ultra-violet radiation to be absorbed both by ordinary transparencies and by films or coatings on special transparencies.

One object of the invention is to provide a method of projecting a beam of radiation of therapeutic value.

Another object of the invention is to provide a method of minimizing the consumption of the electrodes of an arc lamp producing radiation suitable for therapeutic treatments.

Another object of this invention is to provide a housing adapted to protect from oxygen the electrodes of an arc lamp producing ultra-violet radiation.

Another object of this invention is to provide means for sealing an aperture in a housing about an arc producing ultra-violet radiation so that no substantial amount of oxygen can reach the electrodes while the lamp is in operation.

Another object of the invention is to provide a treatment lamp adapted to provide visible light, infra-red and ultra-violet radiation in quantities and proportions most appropriate for treatments conducive to health and vitality.

Another object of the invention is to provide instrumentalities adapted to be safely operated by the layman for projecting a beam of radiation of therapeutic value.

Another object of the invention is to provide an arc lamp for therapeutic treatments characterized by a greater useful radiation of ultra-violet per unit of power than arc lamps previously used.

Other objects and certain advantages will be more fully set forth in the description of the accompanying drawing forming a part of this specification, in which:

Figure 1 is a plan view partly in section, and

Figure 2 is a sectional view taken on line 2—2, of Figure 1.

This method of retarding electrode consumption and reducing fume formation in arc-light ultra-violet ray generation consists in positively excluding air from the major zone of the arc and confining the emanations to a minor zone of the arc constituting an emanation outlet sealed by the position of the arc against the ingress of air.

The method of producing radiation of therapeutic value of this invention comprises passing an electric current between two spaced electrodes containing material vaporizable in the arc while said electrodes are surrounded by a housing apertured to emit a beam but smaller in volume than the luminous flame surrounding the arc. The arc preferably is disposed nearer to the opening in the housing than to the remainder of the inner wall of the housing.

The method also includes (when desirable) dissipating the heat from the arc by using a housing of metal, which is a good conductor of heat, and also deflecting the flame toward the opening by means of a magnet.

The lamp of this invention comprises means for producing an arc within an apertured or ported housing with the arc disposed adjacent to the aperture in order to seal the same and provide a beam of radiation.

More specifically, two electrodes 1, 2, are slidably mounted in a housing 3 preferably in opposing relationship (as disclosed) on the same longitudinal axis with their ends spaced to provide a gap centrally disposed within the housing. Wires (not shown) are secured to these electrodes to supply them with current appropriate to provide an arc 4 productive of ultra-violet radiation. The arc is surrounded by a luminous flame 5.

As disclosed, each electrode comprises a carbon tube 6 and a core 7 of material such as earth oxides, vaporizable in the arc.

The housing comprises a body surrounding the spaced electrodes closely and is provided with an aperture or port adapted to emit the radiation.

As disclosed, the aperture is substantially circular and is in area about ten to fifteen percent of that of a sphere having a radius equal to the distance between the center between the electrodes and the inside of the housing. The exact size of this aperture is of course variable, but it is regarded as important that the size be such in relation to the arc and luminous flame surrounding the arc that no swirl is created, the aperture being sufficient to permit vapors to escape from the arc but not large enough to permit oxygen to enter at the same time.

Generally speaking the aperture approximates the electrodes spacing, it being somewhat larger than the gap when the lamp is started and somewhat smaller after a run of about twenty minutes or half an hour using the usual carbon electrodes. The housing preferably has a volume less than the volume of the luminous flame surrounding the arc and there is consequently no room for oxygen on the inside of the housing.

As disclosed, the housing, somewhat oval in shape, is shell-like as distinguished from a recessed block in order to radiate and dissipate the heat more rapidly. The aperture is disposed facing laterally and slight downwardly so as to direct a beam of light upon a patient lying slightly below and somewhat to one side of the lamp.

This arrangement of arc, housing and aperture projects a beam upon the patient, said beam including radiation from the arc itself, from the luminous flame surrounding the arc and also from the very hot interior of the housing.

More specifically, the housing comprises a metallic body somewhat oval in shape and has two insulating refractory sleeves or bushings 8, one mounted in each end. Through each sleeve an electrode is slidably disposed so that the requisite arc can be developed in the center of the housing. The sleeves provide bearing surface for the electrodes and center therein relative to each other and to the housing. Each sleeve is provided with an outer flange 9 adapted to lessen the likelihood of the atmosphere entering the housing between the sleeves and the metallic portion.

The metal portion of the housing should be characterized by three properties: (1) a high melting point; (2) good conductivity of heat; (3) good radiation of heat. While the temperature of the arc is high the total amount of heat produced is not great and the housing should have sufficient radiation surface to dissipate this heat. Metals are therefore considered better as a class than refractory materials such as fire clay for enclosing an arc of this nature. While the fire clay has a higher melting point it is a poor conductor and radiator of heat. Moreover, it is difficult if not impossible to make a refractory housing of the proper mass, strength or durability which can withstand the sudden heatings and coolings incidental to the everyday use of the lamp.

In this respect it is to be noted that the metallic portion of the housing contacting a major area of the refractory parts tends to keep said refractory parts at relatively even temperatures, thus minimizing cracking and breakage due to stresses attending uneven temperature. The metallic housing also tends to balance or stabilize the temperature of the refractory parts so that the change of temperature is not as rapid as it would be if more refractory and less metallic material were used.

A magnetic field is created about the arc and housing for the purpose of deflecting the arc from its normal position within the housing in the direction and into the proximity of the aperture in the housing. Preferably this magnetic field is of sufficient strength to dispose a substantial portion of the flame surrounding the arc on the outside of the housing so that the aperture is sealed and the oxygen of the atmosphere cannot reach the electrodes.

As disclosed, an electro magnet 10 is placed slightly below the housing and on the other side of it from the side in which the aperture is located. This magnet is at right angles to the long axes of the electrodes or, otherwise expressed, is at right angles to the gap between the electrodes.

With the aperture laterally disposed in the housing there is a tendency for the arc to rise within the housing and this location of the magnet disposes the arc directly in the aperture. This provides greater radiation, seals the aperture and protects the top of the housing from the high heat to which it would otherwise be subjected. When this magnet is used as is recommended, the metal of the housing must be such as not to interfere with the magnetic field to a harmful degree.

In operation, the current is conducted through the electrodes and through the magnet simultaneously and in phase. Preferably the arc and magnet are connected in series. The electrodes are contacted and then separated the distance necessary for an arc of the desired intensity. The flame then seals the aperture so that oxygen cannot pass through it to the electrodes within the housing.

This substantially prevents formation of fumes and prolongs greatly the life of the electrodes. Moreover, this construction provides an arc which will operate for thirty minutes or more without being reset and without having the electrodes fed mechanically.

Also, the amperage does not fall off so rapidly as it would were the electrodes to be operated without protection, and the production of radiation is consequently more constant.

The electrodes themselves are consumed unevenly, and after a short time each electrode end is configurated to include a surface 11 partially facing the other electrode and partially facing the aperture so as to direct a beam of light toward the patient. This configuration of the electrode ends therefore directs a larger proportion of the ultra-violet radiation on the patient than would be the case were the ends shaped otherwise. No light is intercepted by the electrodes so that an intense radiation is thrown over a relatively large angle and over an extent of the patient greater than if the electrode ends faced each other squarely.

It is also to be noted that the temperature at the electrodes is higher than it would be were they unenclosed, inasmuch as this partial closure diminishes the radiation of heat. This higher temperature provides correspondingly greater ultra-violet radiation and this radiation per unit of power is consequently higher than in an unenclosed arc lamp.

The housing is preferably fabricated of a chromium, nickel alloy including iron where casting is desirable, though other materials and other methods of manufacture may be used. This particular alloy is not appreciably attacked by the flame of the arc and has the requisite thermal and magnetic properties. In use it turns black and is therefore an ideal radiator of heat.

If the conventional amorphous carbon electrodes are used the lamp will burn without adjustment for a period equal to any advisable treatment, yet it will not burn so long as to be dangerous should the user fall asleep before the lamp, not an infrequent occurrence.

The ultra-violet, infra-red and visible radiation produced by this lamp, all have therapeutic value. By substituting electrodes with different core materials, such as are generally used in the art, it is possible to produce radiation characterized by widely differing spectra, each of which has its own therapeutic applications. Some cores, for instance, provide a preponderance of infra-red and comparatively little ultra-violet, others a preponderance of middle wave length ultra-violet, in the region 1800 to 3000 Angstrom units, and still others produce substantially the same quality and spectral distribution of radiation as sunlight in a clear atmosphere at high altitudes.

While this lamp is suitable to be used extensively by the medical profession, in the treatment of various diseases, it is particularly adapted for a different field, namely, to keep the well man well. It is a widely recognized fact that there is such a thing as light starvation, and that exposure of the body to sunlight or its equivalent is essential to prevent the individual acquiring certain diseases and to keep the organisms functioning at maximum efficiency. This lamp has, therefore, been structurally planned to be safe in the hands of the layman and particularly to provide the sun-like radiation adapted to maintain normally healthy people in that state throughout those periods of the year during which there is a great deficiency of sunlight.

The lamp is also, of course, adapted to be used for other purposes requiring ultra-violet or special spectra such as treating foodstuffs, weathering materials, photography, testing color fastness, and the like.

Specific claims on the housing are reserved for separate applications.

Having described our invention, we claim:

1. A treatment lamp, comprising, instrumentalities adapted to produce an arc radiating ultra-violet light, and a housing of metal possessed of high heat radiating properties surrounding said arc so closely that it is elevated thereby to a temperature providing infra-red radiation of therapeutic value.

2. The method of producing radiation suitable for therapeutic treatments, which comprises passing an electric current between spaced electrodes containing vaporizable material while said spaced electrodes are surrounded by a housing having an opening therein adapted to emit radiation, said housing being smaller in volume than the luminous flame normally surrounding the arc, and deflecting said arc in the direction of the opening adapted to emit light in order to seal the opening against oxygen.

3. The method of providing radiation of therapeutic value which comprises the developing of an arc between two electrodes containing material adapted to provide ultra-violet radiation and confining said arc in a heat dissipating metallic housing disposed about said arc so closely that a portion of the luminous flame surrounding the arc protrudes through an aperture in said housing positioned to direct a beam of light upon the patient.

4. A treatment lamp, comprising, a metallic heat dissipating housing provided with a laterally disposed aperture, horizontal sleeves of insulating material mounted opposingly and horizontally in said housing, electrodes slidably disposed in said sleeves, and a magnet connected in phase with the electrodes and located to deflect the arc between the electrodes into sealing relationship with the aperture in the housing to protect the electrodes from the atmosphere.

5. A treatment lamp, comprising, two cored carbon electrodes disposed with their ends adapted to abut, a housing fabricated of metal possessed of a high melting point closely surrounding said electrode ends and adapted to be raised in temperature by the arc established between them to an incandescence productive of infra-red radiation of therapeutic value, an oval port in said housing, and a blow magnet disposed to blow the arc between the electrodes toward the port in order to maintain the arc between the port and the line between the electrode centers.

6. A treatment lamp, comprising, two cored carbon electrodes disposed with their ends adapted to abut, a housing fabricated from a heat dissipating metal possessed of a high melting point closely surrounding said electrode ends, a port in said housing, and a magnet adapted to blow the arc into the metallic annulus comprising the port.

ROBERT C. JACQUELET.
JOHN G. H. LIEBEL.