Oct. 8, 1929. T. L. CROOM 1,730,808

INFRA RED RAY GENERATOR

Filed April 30, 1927

Fig. 1.

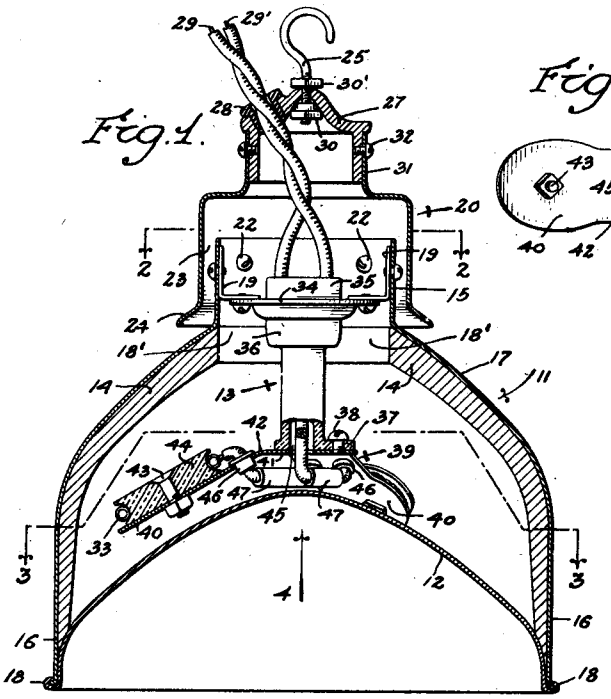


Fig. 4.

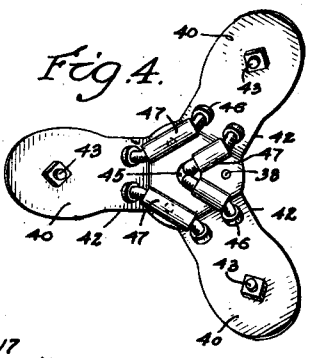


Fig. 2.

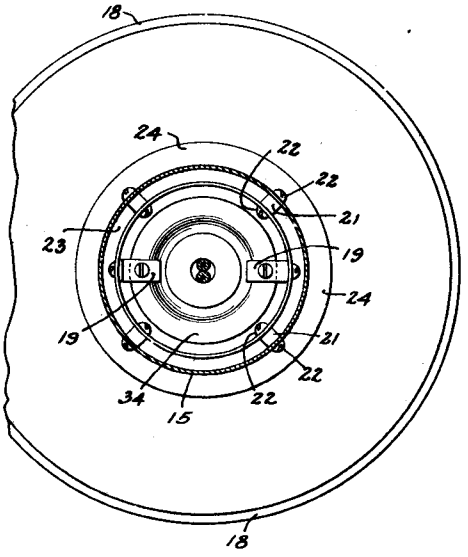
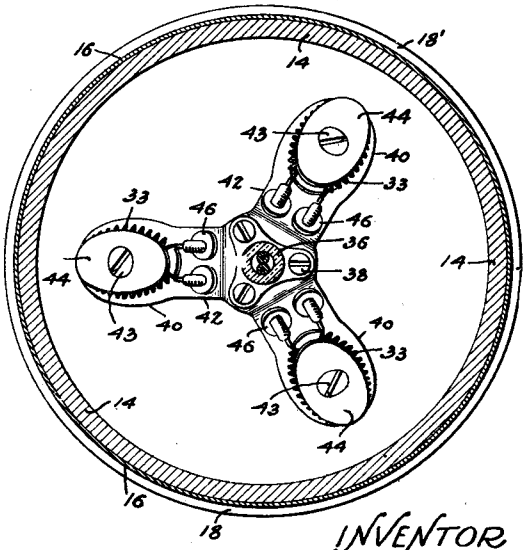


Fig. 3.



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UNITED STATES PATENT OFFICE

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INFRA-RED RAY GENERATOR

Application filed April 30, 1927. Serial No. 187,714.

As may be inferred from the above title, this invention relates particularly to a therapeutic device suitable for use in the production and convergent projection of special invisible rays,—such as the invisible rays which slightly exceed in length the red rays of the visible spectrum.

It being known that ultra violet rays and infra-red rays are capable of various therapeutic uses, although different in their penetrative power and physiological effects, it is an object of my invention to provide convenient means to produce and to project those comparatively safe but deeply penetrating rays which intervene, in point of wave length, between ordinary heat rays and ordinary light rays.

It is an object of my invention to provide a comparatively simple, rugged and durable means for the production and projection of infra-red rays; and my preferred device for this purpose is not only comparatively inexpensive but fool-proof,—being, in fact both highly efficient and suitable to be entrusted to the patient himself, without danger of detrimental effects either by the derangement of parts by excessive use.

It is, of course, true that an ordinary electric heater whose exposed heating element is brought to a glowing temperature, in producing both ordinary heat rays and ordinary light rays, gives off infra-red rays; but it is an object of my invention to provide an infra-red ray generator in which an incandescent conductive element is so housed that practically no energy is wasted in visible rays, and by which the infra-red rays may be so projected as to assure a satisfactory penetration thereof,—without undue exposure of the body of a patient to either the shorter rays or to the still longer but less valuable heat rays which may be unavoidably emitted from said incandescent body.

Other objects of my invention, including the use of a concave projecting element favorably disposed relatively to an internal heating means (said heating means preferably comprising what I may term an integrating dome, formed of a refractory, heat-insulating material disposed within a suitable housing and exposed to direct radiation from an electrical heating element, and said heating element being preferably comprised in a removable unit which includes spatulate shields so disposed as to obviate excessive local heating of said projecting element by said heating elements) may be best appreciated from the following description of an illustrated embodiment of my invention, taken in connection with the appended claims and the accompanying drawings, in which

Fig. 1 may be referred to as a substantially median vertical section through an embodiment of my invention which is adapted to be supported, in a dependent relationship, above a surface or body to be irradiated with infra-red rays.

Fig. 2 may then be referred to as a horizontal section taken substantially as indicated by the line 2—2 of Fig. 1.

Fig. 3 is an additional section, taken substantially as indicated by the line 3—3 of Fig. 1.

Fig. 4 is a bottom plan detail view, taken from the general direction indicated by the arrow 4 of Fig. 1 but with an intervening concave projecting element and other parts eliminated.

Referring to the details of that specific embodiment of my invention chosen for purposes of illustration, 11 is a main housing which serves not only for the support of a concave projecting element 12 (and optionally also for the support of an interior electrical heating unit 13) but also for the retention and protection of an insulating lining 14, formed of a refratory material and adapted to serve as a heat integrating dome,—downwardly and inwardly reflecting heat and light rays to impart a desired temperature to the concave projecting element 12, or its equivalent.

Although parabolic concave elements are commonly employed for the projection of substantially parallel light or heat waves originating in or near an external focal point, it should be understood that my concave projecting element 12, even when substantially parabolic in curvature (as shown), is intended to be heated by conduc-

tion consequent upon radiation and/or reflection of rays from an interior source,—the curvature of said projecting element being advantageous especially in producing a concentration or convergence of emitted infra-red rays, and advantageous also in substantially obviating danger of burning, by accidental contact with the flesh of a patient, as also in avoiding a waste of heat by upward convection currents.

The housing 11 is shown as comprising a comparatively small cylindrical portion 15, at the upper end thereof, a larger cylindrical portion 16, at the lower end thereof, and a tapered intermediate portion 17,—shown as curved in two directions and as in direct or approximate contact with the insulating and reflecting lining 14. This lining may advantageously be molded in place, before or subsequently to the uniting of the projecting housing 11 and the element 12 by an edge roll 18; and it may advantageously consist largely of "celite" or another diatomaceous earth compound (say, 75–85%) asbestos (say, 5–10%) and plaster of Paris (say, 5–10%), and may be initially mixed with sufficient water to produce a plastic consistency and optionally provided with an external glaze by an application of sodium silicate (water glass) in solution or suspension.

In order to assure the desired strength, to produce a relatively thick insulating layer in an upper region and/or to give to the interior surface of the refractory lining 14, a curvature somewhat similar to that of the concave projecting element 12, or its equivalent, said lining may be upwardly thickened, although preferably so terminated as to provide a central opening 18′, substantially corresponding in internal diameter to the upper and narrower cylindrical portion 15 of the housing 11,—in order to permit a convenient insertion or removal of a suitable heating unit 13 therethrough. Said unit, whatever its specific character, may advantageously be supported by means such as brackets 19, disposed interiorly of said housing and/or interiorly of a suitably spaced closure element 20,—shown as separate from the upper cylindrical portion 15 of the housing 11, and as so secured, by means of spacers 21 and screws 22, as to provide a ventilating space 23, inwardly communicating with the mentioned central opening 18′.

Being downwardly terminated in a flange 24, and upwardly terminating in a handle or hook 25, the suspension or closure element 20 may be referred to as a bell or cap; and it may advantageously comprise, in addition to a thin-walled lower section, a terminal casting 27 provided with an eccentric opening for an insulating button 28, for suitably insulated conductive wires 29, 29′,—the hook or handle 25 being shown as retained by nuts 30, 30′ and the cast element 27 being shown as interfitted within a constricted portion 31 of said bell and as retained therein by screws 32.

Regarding it as desirable to obtain a substantially uniform heating of the concave projecting element 12 to a temperature but slightly below that required to produce a luminous glow—I prefer to impart heat thereto mainly by a reflection of rays from a concave member such as the insulating lining 14,—this being adapted to serve as an integrating dome for the reflection of rays, emitted by the incandescent coils 33, or the like, or by similar heating elements comprised in the heating unit 13.

An apertured plate 34 being shown as carried by the mentioned brackets 19 and as engaged by hollow insulating members 35 and 36, the latter insulating member may downwardly terminate in radiating projections 37, apertured to receive screws 38,—shown as threaded into a sheet metal rosette or "clover leaf" 39, comprising spatulate sections 40. These spatulate sections are shown as connected with a centrally apertured section 41 by resilient constricted portions 42 and as respectively carrying, by means of bolts 43, rounded or discoid insulating bodies 44, suitable for the support of the mentioned elements 33; and said heating elements may be connected in any suitable way with the mentioned wires 29, 29′, shown as carried downward through the insulating elements 35 and 36 and through a central opening 45 in the "clover leaf" 39. The perforating of the mentioned constricted portion 42 to provide for the insertion of insulating buttons 46 may incidentally increase the flexibility of the same; unduly exposed portions of the wires 29, 29′ may be provided with porcelain or similar guards 47; and it is an important merit of the described construction that the spatulate elements 40, being positioned beneath the discoid insulating elements 44 carrying heating elements 33, are adapted to serve not only in the support of said elements but as equalizing shields, interposed between the mentioned parts and protecting the concave projecting elements 13 against undue local heating, by direct radiation from the elements 33. The downward radiation from the shields 40 being about equal to the reflected radiation which said shields obstruct, the heating of 12 is substantially uniform.

It should be understood that, during insertion or withdrawal of a heating unit 13, or its equivalent, the spatulate elements 40 may be sprung inwardly sufficiently to permit the same, and parts supported thereby, to pass through the opening 18, or its equivalent,—said spatulate elements then automatically springing outward into substantial parallelism with the opposite areas of the convex inner surface of the projecting element 12; and it will be understood not only that heat or

light rays from the incandescent elements 33 may be repeatedly reflected, from point to point of the concave inner surface of the integrating lining, but also that a very large percentage of the energy emitted from said heating elements is ultimately projected in the form of infra-red rays, suitably concentrated for deep penetration,—and mainly at right angles to the elements of the concave surface or otherwise as convergent or substantially parallel rays.

The projecting element 12 may advantageously be formed of a heat-conductive sheet material such as copper or iron or an alloy or compound thereof; and it will be understood that complete concentration of the projected rays at a focal point is neither practicable nor desirable. The entire organization described may be supported, by means such as the hook or handle 25, either above or in any desired relationship to a patient occupying a prostrate or sitting posture, or another posture suitable to any effect desired; the concave projecting element 12 may be brought to and kept at a distance favorable to the desired penetration or to a superficial concentration of the infra-red rays,—the manner and duration of this treatment being dependent upon the nature of the malady; and it is an important merit of the described organization that prolonged treatments are not only free from danger but are distinctly pleasurable,—the deep penetration being unaccompanied by any local and superficial over-heating such as must result from the use of an exposed incandescent heating element, or the like.

Infra-red rays are active where they are absorbed, producing increased oxidation, increased conductivity, relief of stasis, and inducing arterial blood hyperemia; in mild sedative doses they are analgesic; they are suitable for use not only in the correction of superficial disturbances (whether produced by excessive exposure, as illustrated by sun burn, or by local infection); and they are also suitable for use in the treatment of acute and chronic arthritis, nephritis, neuralgias, sciaticas, inflammation of pelvic organs, stiffness and tenderness following surgical operations, acute bronchitis, pleurisy, endocarditis, acute and chronic tonsilitis, urethritis. They are helpful also in the treatment of sprains, bruises, contusions, lumbago and painful spinal conditions; but it should be understood that no novelty is herein ascribed to the use of infra-red rays for a therapeutic effect,—my invention being directed explicitly to an improved means for the production and projection of such rays.

Although I have herein described a single complete embodiment of my invention, it should be understood not only that various features of my invention might be independently employed but also that numerous modifications thereof might be devised, by workers skilled in the arts to which this case relates, without the slightest departure from the spirit and scope of my invention, as the same is indicated above and in the following claims.

I claim as my invention:

1. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner convex surface thereof, for conduction to and radiation from said outer concave surface.

2. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner convex surface thereof, for conduction to and radiation from said outer concave surface,—said concave surface being substantially parabolic.

3. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner convex surface thereof, for conduction to and radiation from said outer concave surface,—said heat-applying means comprising a heat integrating dome.

4. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner surface thereof, for conduction to and radiation from said concave surface,—said heat-applying means comprising an integating dome formed of a refractory material.

5. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner surface thereof, for conduction to and radiation from said concave surface,—said outer heat applying means comprising an electrical resistance having a shield interposed between said resistance and said inner surface.

6. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner surface thereof, for conduction to and radiation from said concave surface,—said outer heat applying means comprising an electrical resistance having a shield interposed between said resistance and said inner surface and a heat integrating dome thereabove.

7. For a therapeutic use: a projecting element having a concave outer surface; and means for applying a substantially uniform heat to an inner surface thereof, for conduction to and radiation from said concave surface,—said heat applying means comprising an electrical resistance having a shield interposed between said resistance and said inner surface and a heat integrating dome thereabove, and both said resistance and said dome being confined within a housing to which said dome conforms.

8. An organization for generating infra-red light rays embodying: an outer shell which is larger at one end than at its opposite end, said larger end being provided with a closed concave projector having a convex inner surface within said shell, said shell being provided with means for supporting an electric heater element; and an electric heater element mounted on said support and enclosed between said shell and said projector element.

9. For use in an infra-red ray generator: a heating unit which comprises plates carrying insulating elements respectively surrounded by heating coils, said plates serving also as equalizing shields interposed between a projecting element and an inner reflector.

10. For use in an infra-red ray generator: a heating unit which comprises plates carrying insulating elements respectively surrounded by heating coils, said plates serving also as equalizing shields interposed between a projecting element and an inner reflector and said shields being spatulate and radially disposed and provided with flexible connecting webs.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 25th day of April, 1927.

THOMAS L. CROOM.