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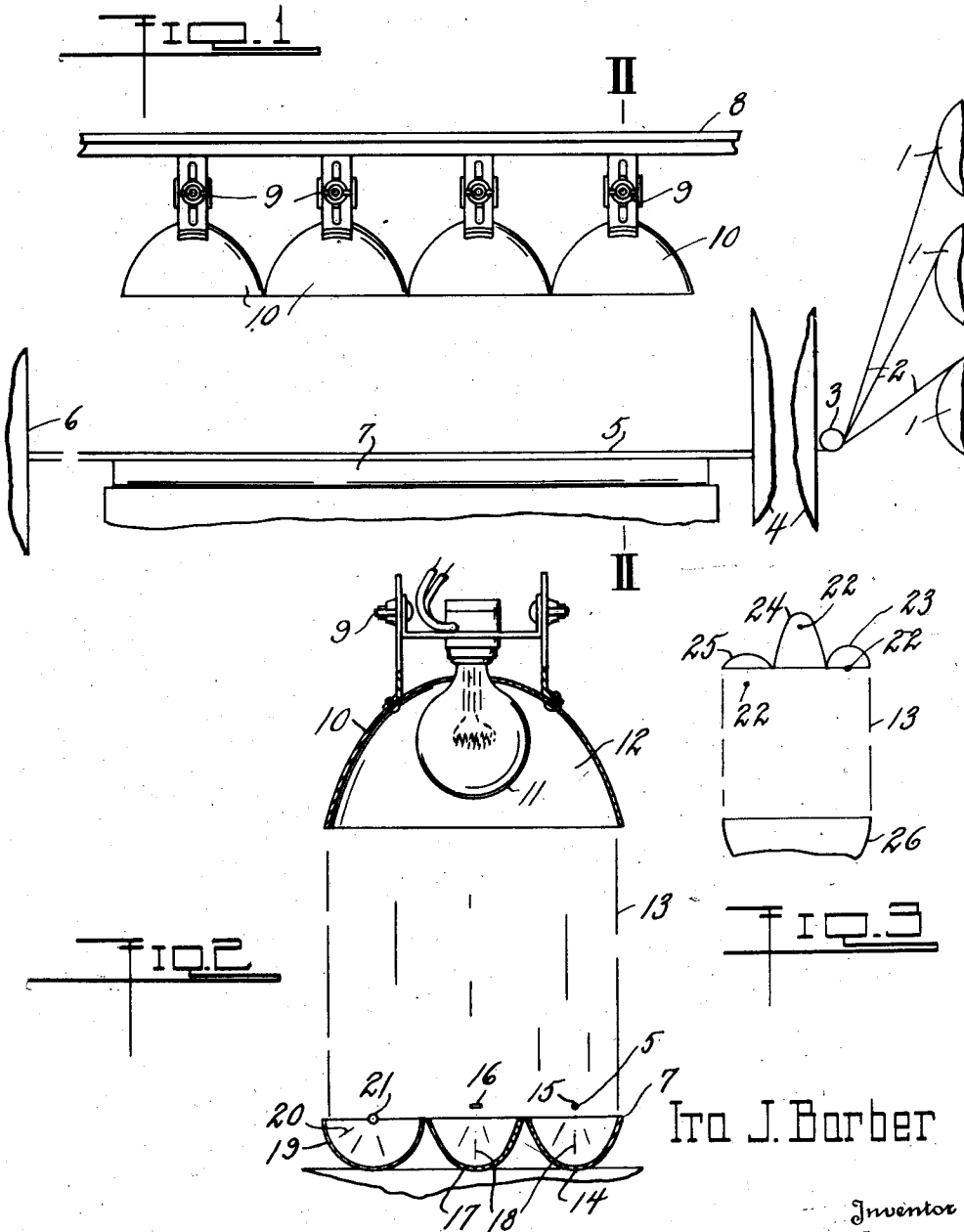
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RADIANT HEAT TREATING AND APPARATUS THEREFOR

Filed May 14, 1941

2 Sheets-Sheet 1



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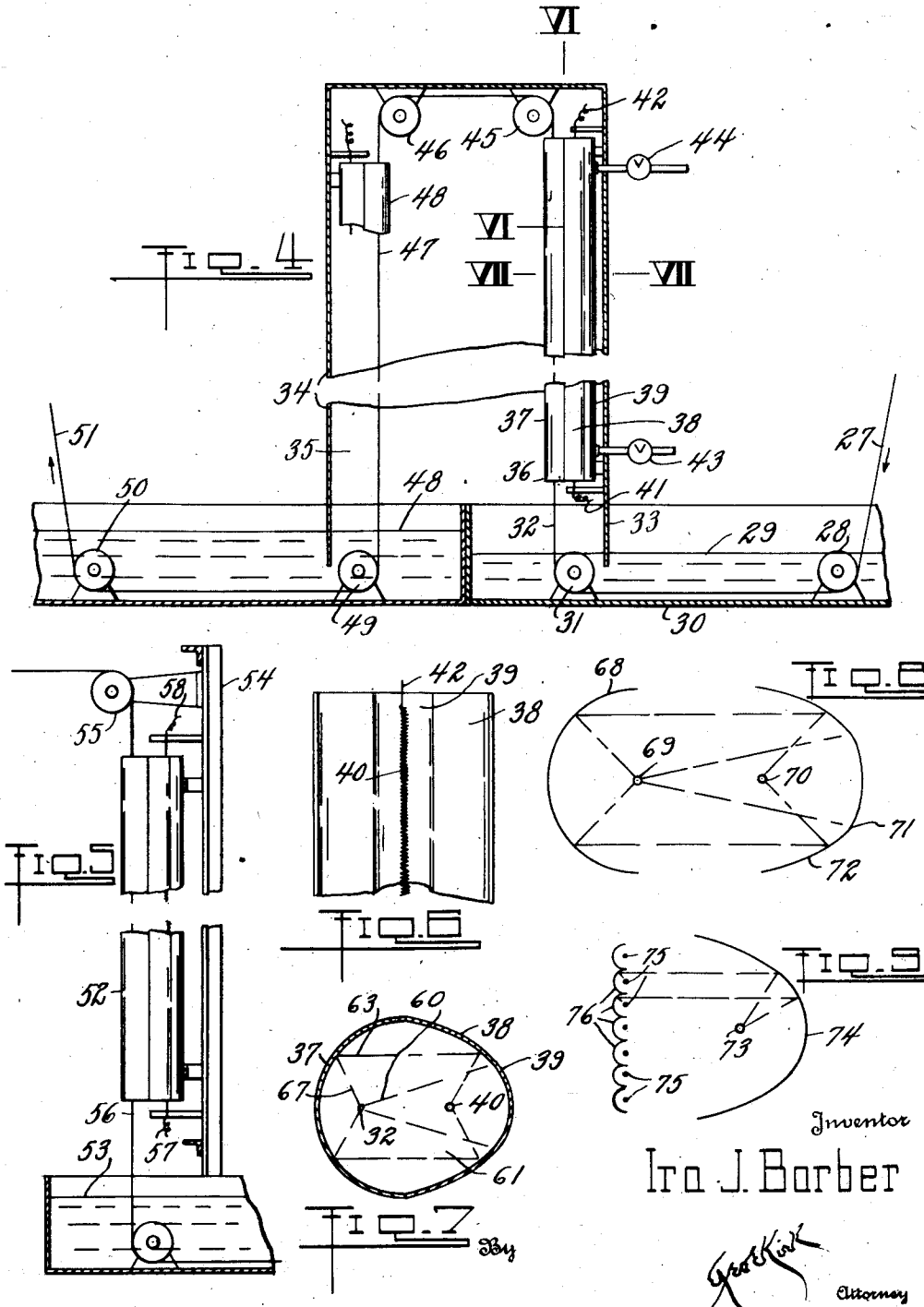
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UNITED STATES PATENT OFFICE

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RADIANT HEAT TREATING AND APPARATUS THEREFOR

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Application May 14, 1941, Serial No. 393,362

1 Claim. (Cl. 219—34)

This invention relates to object-enveloping rays from a radiant energy source.

This invention has utility when incorporated in the treatment of suspended articles or series of articles, more particularly articles approximating symmetrical cross-section in lineal reaches thereof, as rods, tubes, ribbons, tapes, wire, and the like, even to annealing metal objects, coating, or other treatment.

Referring to the drawings:

Fig. 1 is a side elevation, with parts broken away, of an embodiment of the invention, wherein the lineally extending series of objects in parallel receives direct rays and, as passing along troughs, have such rays supplemented with the reflected rays;

Fig. 2 is a section on the line II—II, Fig. 1, showing the energy source and the troughs;

Fig. 3 is a diagrammatic view in which the variety of sources for the energy are opposed to the object-carrying trough;

Fig. 4 is a partial diagrammatic showing of an embodiment of the invention in connection with atmosphere control as in a pneumatic trough isolated chamber which may be to the extent of annealing, hardening, normalizing, or carburizing wire;

Fig. 5 is a fragmentary view of a vertical type of treating device wherein the energy source, instead of being of the bulb type as in Fig. 2, may be of the continuous or rod resistance type;

Fig. 6 is a detail view of the energy source rod and its reflecting trough portion on the line VI—VI, Fig. 4;

Fig. 7 is a section on the line VII—VII, Fig. 4, showing the closed type of chamber as a source for rays in an enveloping tube;

Fig. 8 is a diagrammatic showing of relation between the energy source and the work or object treated; and

Fig. 9 is an additional diagrammatic showing how the energy source may act upon a plurality of reaches of elongated objects in transit.

Supply rolls 1 (Fig. 1) may supply strands 2 to pass about guide roll 3 into treating chamber 4, say for receiving a coating and thence extend by reaches 5 to receiving chamber 6 where such may be spooled, cut into lengths, or otherwise given attention. In this transit region of the reaches 5, troughs are provided. Opposing trough 7 as mounted by bracket 8 and adjustable means 9, are reflectors 10 for energy sources 11, herein shown as infra-red-ray type with reflectors when the treatment is to be of a heating nature. The equipment comprises sources 10, 11, having rays

projected therefrom and herein referred to as "primary." The ray projection as entering the trough reflector or re-reflector 7 and re-projected therefrom is herein referred to as "secondary." The energy source 11 acts upon the reflectors 10. The reflectors 10 are coated with gold plating 12 for projecting rays 13 toward the trough 7. The troughs may be of appropriate configuration for even distribution of the direct rays 13 about the objects 5. The rays 13 may be of intensity and of duration to bring about the extent of treatment sought. In this treatment where there is a parabolic reflector, trough 14 may have the work at focus 15. The particular parabola may be according to the character of work being handled, such as ribbon 16 for parabola 17. For instance, reflective rays 18 as concentrating at focus 15 for ribbon 16, may answer one set of conditions. Suitable concave reflector 19 may be adopted for rays 20 toward lineally extending object 21.

In further carrying out this invention, energy sources 22 (Fig. 3) may be in different types of projectors 23, 24, 25, of the spheric zone, parabolic, or arc types, with the direct rays 13 therefrom to complementary or opposing reflector 26.

More specifically, say in the annealing of wire, strand or strands 27 (Fig. 4) may pass over roller 28 in bath 29 of a liquid in vessel 30, thence about roller 31, to have a reach 32 enclosed by legs 33 of housing 34 in providing chamber 35. In this chamber 35 there may be upwardly extending ducts 36 providing reflective trough 37 in which the reach 32 may extend in its ascent for receiving direct rays as toward the trough 37, and indirect rays as impinging on the object as concentrated by the trough. This trough portion 37 is connected by elliptical or other portion 38 with complementary trough portion 39 in which is located energy source 40 having electric lead 41 and lead 42 therefrom. This energy source if of the heat type may be a resistance such as "Calrod" or "Globar." These energy source heat resistances may have contribution to their efficiency herein by further controlling the atmosphere or vapor for enveloping the reach 32 as undergoing the ray treatment. In such instance valves 43, 44 may control the ingress and egress of vapor, or operate for maintenance of vapor uniformity according to the annealing or other treatment sought, whether such vapor be steam or ammonia, carbon dioxide, hydrogen, or other elected gas, or even inert medium.

The treatment may be completed in this ascent, or the reach 32 may pass about roller 45 in the

housing 34, thence about roller 46 to down reach 47 in tubular treating chamber 48 for further treatment, and thence to a bath 48 in exit from the chamber about rollers 49, 50, to take-off portion 51 as assembled therefrom in lengths or on spools, or in any manner for shipment or storage.

A tube 52 (Fig. 5) rises from bath 53. A rack 54 carries roller 55. An upward reach 56 in the tube 52 is parallel to ray energy source which has entrance terminal 57 and exit terminal 58.

The energy source 40 (Fig. 7) may have rays 60 effective through region 61 to concentrate on work region 32. Additionally rays 63 to reflective portion 38 may pass to region 37 to be reflected back as rays 67 to concentrate upon the work 32 on the remote or opposite portion therefrom acted upon by the direct or projected rays 60.

The reflective rays may be in proportion to be uniform upon the opposite side of the object being treated. The uniform enveloping temperature achieved with "Calrod" has been as high as 1800° F. with the object 18 to 24 inches away from the energy source and traveling at say 3 feet per second. With the "Globar" resistance, temperatures up to 3000° F. have been obtained.

A spheric zone reflector 68 (Fig. 8) may concentrate on work 69. Energy source 70 may have reflective region 71 to focus on the work 69, and reflective portion 72. An energy source 73 (Fig. 9) may project to reflector 74 for work 75 in the focus regions of troughs 76.

What is claimed and it is desired to secure by Letters Patent is:

Apparatus for heat-treating elongated objects comprising: a plurality of trough-shaped reflectors positioned substantially in side-by-side relationship, so as to form a bank of reflectors, and facing in the same general direction; radiant-heater means opposite the open faces of the trough-shaped reflectors; reflector means associated with said radiant-heater means and constructed and arranged to distribute substantially evenly, and to direct generally perpendicularly, to all portions of said bank, the radiations from said radiant-heater means, and means for supporting the elongated objects to be heated to lie along and in the zones to which the radiations are focussed by said trough-shaped reflectors.

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