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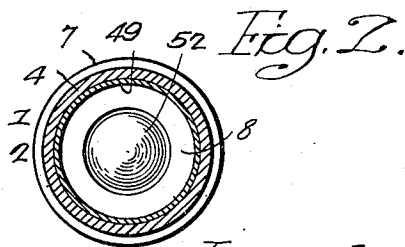
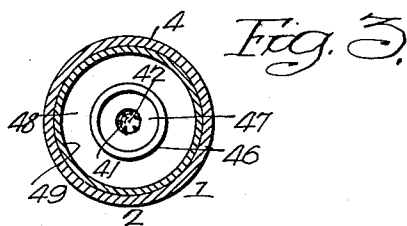
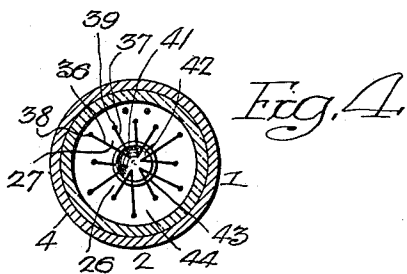
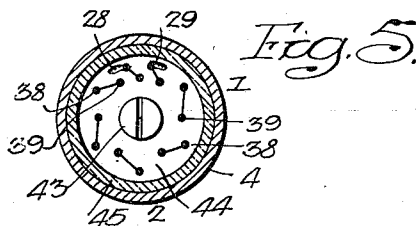
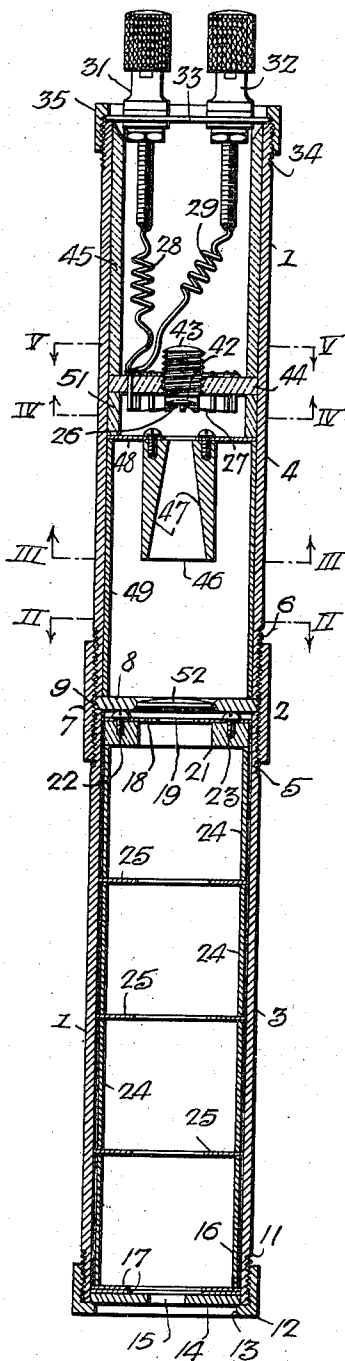
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1,734,837

PYROMETER

Filed Sept. 3, 1925

Fig. 1.



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PYROMETER

Application filed September 3, 1925. Serial No. 54,316.

My invention relates to pyrometers, and it has particular relation to radiation pyrometers.

One object of my invention is to provide a radiation pyrometer, of the general character described in my prior Patent No. 919,399, patented April 27, 1909, that shall be characterized by the relatively small angle of view of the pyrometer, permitting readings on very small objects, and by the increased concentration of the radiation at the detector.

Another object of my invention is to provide a device of the class described of compact and rugged design, suitable for inexpensive quantity production and comprising parts which may be easily made and may be readily assembled with a minimum expenditure of time and of money.

Other objects and applications of my invention, as well as details of construction and operation, will be apparent more fully hereinafter, when taken in connection with the accompanying drawing, wherein

Fig. 1 is a longitudinal sectional view of a pyrometer embodying my invention;

Fig. 2 is a transverse sectional view illustrating the convex lens, the sectional plane being taken on the line II—II of Fig. 1;

Figs. 3 and 4 are similar views taken on the lines III—III and IV—IV, respectively, of Fig. 1, but illustrating the detector; and

Fig. 5 is a view similar to Figs. 3 and 4 along the line V—V of Fig. 1, but showing the opposite side of the detector support.

In the drawings, a pyrometer 1 comprises an elongated tube 2, front and rear sections 3 and 4 of which have adjacent ends 5 and 6 threaded for the reception of a coupling sleeve 7. A ring 8 is provided with a threaded periphery 9 and it is positioned intermediate the adjacent ends 5 and 6.

A front end 11 of the section 3 is threaded for the reception of a cap 12 having an inwardly extending flange 13 adapted to clamp a diaphragm 14, which is provided with a central opening 15, against a sleeve 16. A pair of rings 17, 17 may be positioned intermediate the sleeve and the diaphragm 14.

A second diaphragm 18 having a central opening 19 is mounted on a ring 21 adapted to

fit within the front tube section 3. The heads of screws 22 and 23, which serve to secure the diaphragm 18 on the ring 21, may abut against the side of the central ring 8. A plurality of additional sleeves 24 are positioned intermediate the sleeve 16 and the supporting ring 21 and are spaced by washers 25 similar to the washer 17. The sleeves 16 and 24 and the washers 17 and 25 and the supporting ring 21, constituting the inner elements of the radiation tube section 3, are coated with a black material. The construction as above defined, permits radiant energy to pass unobstructedly through the apertures 15 and 19 of the diaphragms 14 and 18, respectively, into the concentrating and detector tube section 4.

The section 4 has positioned therein a detector 26 which is shown in the form of a thermo-electric device, wherein a plurality of thermocouples 27 are connected in series-circuit relation and associated with external circuits (not shown) by means of a pair of conductors 28 and 29. The latter are respectively connected to binding posts 31 and 32 supported on a plate 33 clamped to a rear end 34 of the tube section 4 by means of a threaded cap 35 corresponding to the aforesaid cap 12.

Each thermocouple may comprise a pair of elements 36 and 37, which extend inwardly from supporting posts 38 and 39, respectively, to a common junction point 41. The junction point 41 of the several thermocouples are closely spaced and are positioned at the principal focus of a concave reflector 42 mounted on a threaded adjusting member 43 supported by a plate 44 which also serves to support the posts 38 and 39. The member 44 closely fits within the tube section 4 and it may be spaced from the rear end 34 by means of a sleeve 45.

Radiant energy entering the tube section 4 through the diaphragm 18 may be concentrated upon the thermocouples 27 by means of a member 46 having an inner, highly polished, conical reflecting surface 47. The member 46 is so mounted on a brass ring 48 that the smaller end of the funnel-shaped reflecting surface 47 is in proximity to the thermocouples 27 and the large end is in proximity to the diaphragm 18.

The supporting ring 48 may be positioned at the proper distance with respect to the thermocouples 27 by means of a pair of sleeves 49 and 51, the first of which extends between the ring 48 and the central ring 8. The second spacing sleeve 51 is positioned between the ring 48 and the thermocouple supporting plate 44. The spacing sleeves 45, 51 and 49 and the supporting members 8 and 44 are coated with a black substance as is the case with the inner members of the front tube section 3. Thus, the radiant energy entering the tube section 4 is concentrated by the conical reflector surface 47 on the thermocouples 27. Such radiant energy as passes beyond is reflected back upon said thermocouples by the concave reflector 42.

Another important feature of the present invention is the use of additional means 52 for initially concentrating the radiant energy before it is reflected by the conical reflector 47, which has been shown in the form of a convex lens supported by the intermediate ring 8 directly to the rear of the second diaphragm 18. Practical operation has shown that such construction has many advantages. For example, it makes possible the temperature measurement of smaller objects than has been heretofore possible, and in addition, causes a greater concentration of the radiant energy at the thermocouples 27.

When the front end 11 of the pyrometer 1 is pointed at a heated body, the radiant energy therefrom passes through the diaphragm openings 15 and 19 and is converged by the convex lens 52 on the conical surface 47. The conical surface 47 causes a complex reflection of the radiant energy, with the result that a maximum concentration occurs at the thermocouples 27. Such energy as passes beyond the thermocouples 27 is reflected backwardly on the same by the concave reflector 42, so that said thermocouples 27 are subjected to a maximum concentration

of energy. The resulting electro-motive forces developed by the thermocouples 27 establish currents when a galvanometer or other indicating instrument is operatively associated with the binding posts 31 and 32.

While I have shown only one form of embodiment of my invention, for the purpose of describing the same and illustrating its principles of construction and operation, it is apparent that various changes and modifications may be made therein without departing from the spirit of my invention, and I desire, therefore, that only such limitations shall be imposed thereon as are indicated on the appended claims or as are demanded by the prior art.

I claim:—

1. A pyrometer comprising a detector, a concave reflector on one side of said detector, and a converging lens on the other side thereof.

2. A pyrometer comprising a detector, means for reflecting the rays passing said detector, means for concentrating the rays on said detector, and means for initially concentrating the rays on said second-mentioned means.

3. A pyrometer comprising a thermocouple, a concave reflector on one side thereof, a funnel-shaped concentrating reflector on the other side thereof, and a converging lens in operative relation to said funnel-shaped reflector.

4. A pyrometer comprising a thermocouple, a concave mirror on one side, a concentrating reflector on the other side, and a lens for converging the rays on said concentrating reflector.

5. A pyrometer comprising a casing having an opening, a diaphragm for said opening, a detector, a lens positioned intermediate said detector and said diaphragm, and a concentrating reflector positioned intermediate said lens and said detector.

6. A pyrometer comprising a sectional tube provided with a coupling member, one section of said tube having an opening for radiant energy, the other section containing a detector, a lens positioned within said tube, and a reflector for concentrating the rays passing through said lens.

7. A pyrometer comprising a sectional tube, a ring positioned intermediate the adjacent ends of the sections, a coupling member for securing said sections in position, a lens carried by said ring, and a detector in operative relation to said lens.

8. A pyrometer comprising a tube having an opening, a diaphragm for said opening adapted to permit radiant energy to enter said tube, a detector positioned within said tube, a lens positioned intermediate said detector and said diaphragm, a second diaphragm in operative relation to said lens, and a reflector for concentrating the radiant energy passing through said lens on said detector.

9. A pyrometer comprising a tube having an opening, a diaphragm for said opening adapted to permit radiant energy to enter said tube, a detector positioned within said tube, a lens positioned intermediate said detector and said diaphragm, a second diaphragm in operative relation to said lens, a reflector for concentrating the radiant energy passing through said lens on said detector, and a second concentrating reflector adjacent to said detector.

10. A radiation pyrometer comprising a funnel-shaped reflector, a lens for converging the desired radiation on said reflector, heat responsive means operatively associated with the apex of said reflector, and means for preventing the incidence of undesired radiation on the said lens.

11. In a radiation pyrometer, a funnel-

shaped reflector, a lens for converging the desired radiation on said reflector, heat responsive means operatively associated with the apex of said reflector, means for directing the radiation in a beam on the said lens, and
5 for preventing the incidence of undesired radiation thereon.

12. In a radiation pyrometer, a tubular casing, a funnel-shaped concentrating reflector therein, a pyrometer adjacent the apex
10 of said reflector, and a lens arranged in said casing between the said reflector and the opening of the said casing at a distance from the said opening relatively great with respect to its distance from the said reflector,
15 whereby the incidence on the lens of substantially all the undesired radiation is prevented.

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