

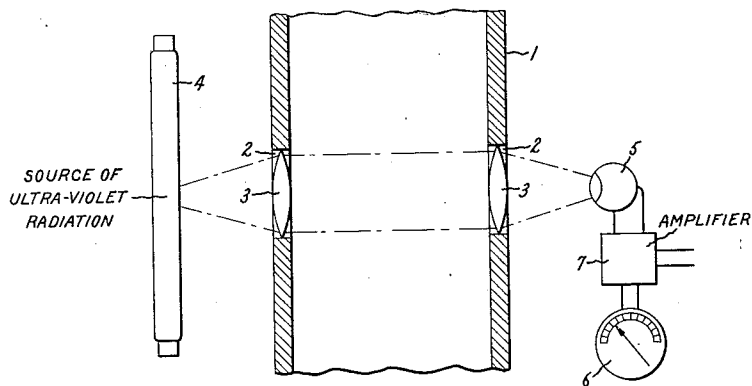
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SMOKE DETECTOR

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SMOKE DETECTOR

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3 Claims. (Cl. 250—83.3)

My invention relates to apparatus for detecting smoke and it has for its object the production of an improved form of such apparatus. Smoke detectors as commonly constructed in the past for operating an indicating or other device when the density of the smoke, as for example that issuing from a chimney of a power plant, reached a predetermined value have employed a source of visible light such as an incandescent lamp and a photoelectric device which was sensitive to such light.

In certain kinds of apparatus, as for example in air conditioning systems, a small fire starting at some point of the system may, if not immediately subdued, be quickly fanned to uncontrollable proportions by reason of the forced circulation; hence it becomes highly desirable to detect such a fire at the earliest possible stage thereof when the smoke may be scarcely discernible. I have found that where the smoke to be detected is composed of very minute particles whose size is comparable with the wave length of ultraviolet radiation a detector having a sensitiveness greater than that heretofore obtained may be produced by employing ultraviolet radiation instead of visible light in combination with a photoelectric device which is sensitive to such light.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the single figure of the drawing 1 represents a duct of an air conditioning system, the air in the duct being normally free or substantially free from smoke but which in the early stages of a fire somewhere in the system may contain a small amount of smoke. In opposite sides of the duct are the openings 2 in which are shown the condensing lenses 3 which may be of quartz. Opposite one lens 3 is a source of ultraviolet radiation represented, for example, as the low pressure mercury vapor lamp 4 such as that known to the trade as a germicidal lamp which lamp is a source of strong radiation of the 2537 angstrom line. Opposite the other lens 3 and positioned to receive the ultraviolet after passing through the duct is the photoelectric device 5. This device is highly sensitive to ultraviolet radiation and may, for example, be one known to the trade as phototube FJ-405 which has a high response to ultraviolet of wave lengths between 2000 and 4000 angstrom units. The photoelectric device may be connected to control any desired apparatus for giving an indication or an alarm in response to the presence of a predetermined amount of smoke in the duct. As representative of such apparatus I have shown the indicating device 6 which is connected through the amplifier 7 with the photoelectric device.

Ultraviolet radiation from a portion of the lamp 4 is caught by the adjacent lens 3, directed across the duct and then into the window of the photoelectric device 5. While minute particles in a gaseous medium cause a certain amount of attenuation of radiation in the visible range because of scattering and absorption the attenuation rapidly increases as the radiation wave length decreases reaching a high value when the wave length is very short and the size of the particles is of the same order as the wave length. Hence, if there is smoke present in an appreciable quantity in the air carried by the duct, which smoke is made up of particles whose size is comparable with the wave length of ultraviolet radiation, those particles cause a pronounced attenuation of the ultraviolet whereby a corresponding reduction occurs in the amount of the radiation which reaches the photoelectric device.

I have found that with apparatus such as I have described above one may effect an increase in sensitivity in smoke detection of sixty per cent over apparatus such as formerly employed using light of the visible spectrum and a photoelectric device sensitive thereto.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. Apparatus for detecting in a gaseous medium suspended solid particles whose size is comparable with the wave length of ultraviolet radiation comprising a photoelectric device constructed to respond to said radiation, a source of said radiation arranged to direct a beam thereof through said medium on said device, and an electro-responsive device connected with said device.

2. In an air conditioning system including a duct through which air is passed, apparatus for detecting a small quantity of smoke in said air comprising a source of ultra-violet radiation, means for directing a beam thereof across said duct, a photoelectric device sensitive to said radiation arranged to receive said beam after passing through said air, and a device connected to be responsive to the output of said device.

3. Apparatus responsive to the presence of smoke in air comprising the combination of a duct, ultraviolet-transmitting lenses located in the walls of said duct opposite one another, an ultraviolet-generating low pressure mercury vapor lamp located adjacent one of said lenses whereby a beam of ultraviolet of 2537 A. wave length may be projected through air passing through said duct, a photoelectric device sensitive to variations of said beam caused by the presence of smoke in said air positioned to receive said beam of ultraviolet and means for indicating such variations.

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