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LOUIS BELL, DECEASED, LATE OF NEWTON, MASSACHUSETTS, BY SARAH G. BELL, ADMINISTRATRIX, OF NEWTON, MASSACHUSETTS, AND WALTER GEORGE WOLFE, OF GREENWOOD, MASSACHUSETTS; SAID SARAH G. BELL ASSIGNOR, BY MESNE ASSIGNMENTS, TO SARAH G. BELL, OF NEWTON, MASSACHUSETTS.

FLUID FILTER FOR THE ABSORPTION OF CERTAIN RADIATIONS.

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Our present application relates to ray filtering and particularly to the selective interception of certain rays with respect to their (so called) thermal values. Previous to our present invention it was supposed that the "thermally" active rays were largely confined to the red region of the spectrum. Our present invention is predicated on the discovery that the violet and ultra-violet rays also have a very considerable activity. As an aid in disclosing this discovery and by way of illustration of the present invention, an instance is selected involving the screening of "heat" in a projection apparatus such as a moving picture machine in which the film must be protected from the intense activity of the powerful light source employed.

In our prior application, Patent No. 1,657,776, granted January 31, 1928, we were concerned with the use of a somewhat similar medium but in that case the specific medium discussed dealt more particularly with the screening of the red or infra red rays, the screening of the violet being rather incidental to the neutralizing of the color of the medium employed to screen the red rays. We have reserved for separate consideration our more particular discovery and invention which is now presented with specific reference to the deliberate and definite screening of the violet and ultra-violet or even as generally as the entire end of the spectrum beyond the green or blue-green. We had found that as a matter of fact, by consistently screening this end of the spectrum, it was in many cases not necessary to screen the red rays at all. The invention is obviously one of considerable scope and in this presentation it is felt that every reservation as to scope should be considered as made by us for the full protection of the invention by this application or such divisions thereof as may be necessary.

For the purposes of the present application it is apparently necessary to try to establish the meaning of various terms because even though the specification be addressed to those skilled in the art, there is much divergence in theory even among our most distinguished scientists and there is such change of generally accepted laws from time to time that it is deemed advisable to discuss the practical application of the discovery and invention involved herein in terms somewhat other than those established heretofore under different theories.

The energy now discovered as having certain destructive, deleterious or otherwise undesirable characteristics and which lie beyond the violet and possibly as far back in as the blue-green of the spectrum, has characteristics or displays phenomena which are either similar or analogous to that of the energy from, say, the infra-red. Such energy is usually discussed in terms of "temperature" or "heat."

In order to avoid the unnecessary complication of considering such phenomena of temperature, heat or combustion, and in order to make more easy some basis of comparison between the energy of the infra-red and the energy of the ultra-violet, the present discussion will refer to the undesirable energy of the ultra-violet in this case simply as "energy." There may be other "energies" developed in this region but in the present instance we are primarily considering those forms of energy which have apparently tendencies similar to those showing resultant phenomena known as "temperature," "heat" and "combustion" and commonly ascribed to the red region of the spectrum.

For example, by way of analogy, the corresponding energy in the "X-ray" region produces on the human flesh results that have been commonly known as "burns." Such "burns" have not corresponded exactly with "burns" produced by energy of longer wave length, but it is perhaps fair to use this example as establishing the similarity of character of the energy now discovered to exist in the ultra-violet.

In the particular application of this discovery or invention as applied to the screening by absorption of the energy of a beam used for the purposes of illumination, the problem is to prevent or retard by absorption the usual destructive tendency on such an object as the film.

The apparent phenomena of the destruction of such a film has been simple combustion. This has been accounted for on the basis of the energy from the red rays.

Without being committed to any theory,

it is now pointed out that, based on the discovery and invention herein, the energy from the ultra-violet is a considerable factor in this destruction, either as contributory to the effects of the red ray energy or as somehow preparatory to it, as by disturbing excitation of the molecules of the celluloid of the film by which they are rendered more readily combustible. In other words, it may be that the resultant phenomena from this radiant energy in the ultra-violet may differ only in degree from that of the energy of the red or the phenomena may be of a different character altogether.

For the purposes of the present discussion, it is only necessary to understand that there is energy in the ultra-violet which, while not showing the ordinarily observed phenomena of temperature as it appears by any ordinary thermometric measurement, is nevertheless productive of kindred phenomena which are correspondingly destructive to certain media.

The problem of applying this principle for the protection of such an article as a moving picture film is therefore one of absorbing the energy under the peculiar conditions imposed by practical requirements.

As set forth in our previous application, the screening of the heat may be conveniently effected by interposing a cell containing a solution, the elements of which have the desired shut-off for certain rays and which may be combined chromatically to neutralize their original colors.

For the purposes of our present invention, the structure of such a cell need not be illustrated, as any type of cell may be used.

For the sake of brevity, however, the discussion of the fluid type will be continued.

A characteristic solution may be prepared as follows: Prepare (1) a 20% solution of ammonium ferrous sulphate; (2) a saturated solution of cupric sulphate; (3) a saturated solution of cobaltic sulphate.

Of the first solution take 9 parts, add to it 1 part of the second solution, and then add cobaltic sulphate to balance the color to neutral. When this is used in a cell it may be diluted with approximately its own bulk in water or a little more.

The cobaltic sulphate has a very strong shut-off in the violet and ultra-violet but is of a pinkish color. Cupric sulphate is of a blue color and also has supplemental absorption for the blue and violet rays. The ammonium ferrous sulphate is of a yellowish color and for the purposes of the present illustration may be considered essentially as a neutralizing agent, although it does absorb a certain amount of the red.

Such a balanced or neutralized solution will cool the beam of light of a colored motion picture or other film, and yet will not alter the colors of the film but will permit them to appear truly upon the screen The flesh tints, for instance, can be perfectly transmitted through our filter.

It will be understood however that the chromatic connection is not wholly controlling as in some cases the color factor is not necessary. The absorption feature may therefore be effected regardless of the matter of color neutralization.

It has been shown that the cobalt solution is of very high efficiency in cutting off the energy present at either end of the spectrum, and it is very desirable for such purposes as herein indicated. The elements of the solution may varied, although they do in themselves always combine very satisfactorily.

It will be understood that other substances besides cobaltic compounds may be used and balanced by elements other than the iron and copper compounds. Such combinations will readily occur to those skilled in the art and variations will readily be made for different uses and different colors of light, all without departing from the spirit of our invention as defined in the appended claims.

What we therefore claim and desire to secure by Letters Patent is:—

1. In a ray filter of the class described, a fluid medium including a solution of ammonium ferrous sulphate, and a solution of cupric sulphate with a solution of cobaltic sulphate in chromatic balance thereto.

2. In a ray filter of the class described, a substantially colorless fluid medium including a solution of cupric sulphate and cobaltic sulphate, the colors thereof being balanced by a neutralizing solution introduced therein.

SARAH G. BELL,
Administratrix of Estate of Louis Bell, Deceased.
WALTER GEORGE WOLFE.