ENGINEERING

Electric Light Without Bulbs

Walls and ceilings of rooms can glow with newly developed electroluminescence which is an advance beyond familiar fluorescent tubes.

By WATSON DAVIS

➤ A NEW kind of electric lighting has just come out of the laboratory. It will be available in flat panels of glass instead of in the usual bulbs or tubes.

You will see its first commercial application in the glowing faces of new self-lighting electric clocks. Later, luminous panels will convert the walls and ceilings of rooms into sources of diffuse, soft light. Even earlier there will be obvious but secret military applications.

The new method of producing light is called electroluminescence. It is as different from the familiar fluorescent tube as the incandescent lamp was from the fish-tail gas burner or from the candle-flame.

It is a relatively "cold light," producing less heat than conventional electric lighting.

It took several years of working on an almost "impossible" problem given to Sylvania Electric Products chemist to get a method that promises another electric lighting revolution. The chemist was Dr. Elmer C. Payne, who up to a decade ago was working on the problems of insecticides and other chemicals rather far removed from luminescent materials.

A French scientist, Dr. G. Destriau, had earlier reported that some luminescence appeared to be obtained when a chemical powder consisting chiefly of zinc oxide was mixed with castor oil, spread on mica and a current conducted to it through a layer of salt sea water. The luminescence at low voltages was apparently so weak that some scientists regarded the existence of the phenomenon as not having been fully established. But the company with which Dr. Payne is associated took one of the frequent "long shots" of research, which in this case hit the target.

The result was a new lamp in which a special phosphor or light-emitting powder is mixed with a plastic that does not conduct electricity and spread over the surface of a new kind of glass that does conduct electricity. A thin metal layer, like foil, is then applied over the phosphor and plastic, and the terminals of the house lighting circuit applied to the foil and to the conducting glass. Actually this is what is known electrically as a condenser, and so the device could be called a luminous condenser, in the same way that an incandescent lamp could be called a luminous resistor.

The current fed into the lamp must be varying or alternating, because light is produced only while the current is changing. If direct current is connected to the lamp, there is only a brief flash of light when the voltage is applied and another when the device is discharged, no light at all being emitted while the d.c. merely remains connected to the lamp.

Ordinary house current of 60 cycles per second a.c. will work satisfactorily, especially on the luminescent panels used as clock faces. But since the light is produced only while the voltage is changing, the larger number of alternations produced per second by high frequency power sources excite the lamp to even higher brightness. High voltages also increase the light output, and can easily be provided by a small transformer.

In the houses, offices and displays of tomorrow lighted by electroluminescence there will probably be simple transformers to take the standard 60 cycles current and step it up in frequency, but this will be no more complicated than much of the other new electrical equipment going into modern homes, offices and factories.

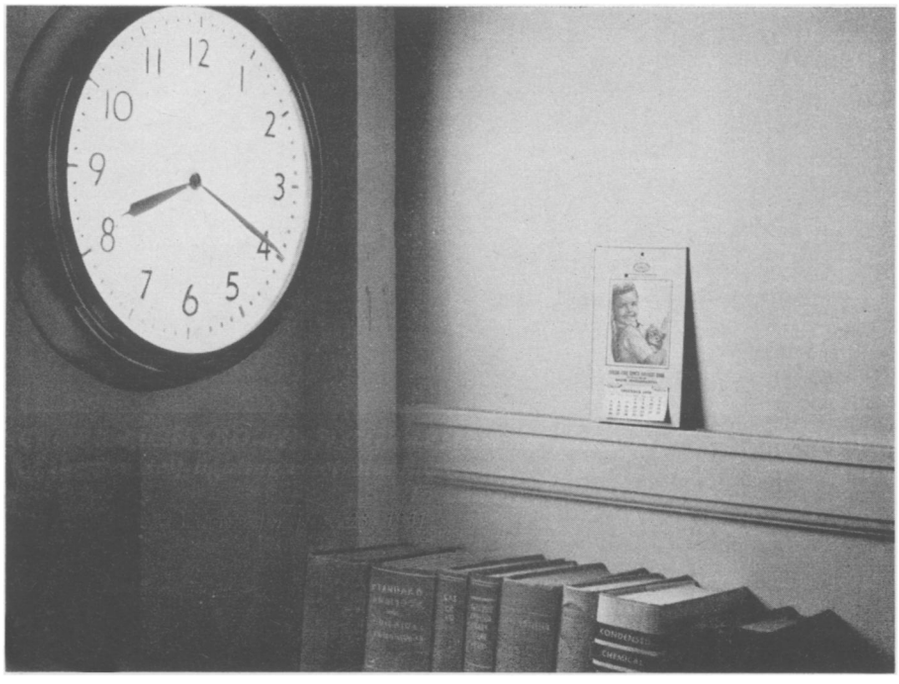
Success came to Dr. Payne's research efforts through his development of several substances that have the ability to convert electrical power into light by means of this new method. Such substances are called phosphors, but they require different properties than those of the phosphors used in fluorescent lamps or television picture tubes. Some of the necessary substances are fluorescent under ultraviolet radiation (as in fluorescent lamps) or under cathode rays (as in TV tubes) and others are not. A new set of conditions has to be met.

Laboratories other than Sylvania are known to be working on this new phenomenon but the first commercial application seems likely to come from the Sylvania development.

Face-Lighted Bedside Alarm

A bedside alarm clock that lights its own face by electroluminescence is the first application planned. This will add self-illumination to pacing the time electrically. The same alternating current so essential to the new kind of lighting is responsible for the ability of the electric clock to keep time, the well-known accuracy of the electric clock being due to the precise regulation of the cyclage of the electric current by the central station. While the accuracy of the 60 cycle frequency is not necessary to the new lighting, the alternating current is essential.

For those who like a little light in the room at night while they sleep, the new self-lighting clock will be night light and timepiece combined. Thus the clock takes



CLOCK-LIGHTED PHOTOGRAPH—This photograph taken by the light of the new self-lighting electroluminescent clock is a forecast of novel lighting to come.

on one more task, additional to its main function of marking the minutes and the hours. No clock will be complete unless it is self-lighting, in addition to ringing bells and turning on the radio and the coffee maker at an appointed time.

Those who have been steering the new development, particularly O. H. Biggs, chief engineer, and Dr. E. F. Lowry, engineering laboratory manager at Sylvania, believe that the new lighting will be ideal for decorative lighting and for many jobs that can not be done well by other types of lighting. Eric Mager has been instrumental in working out some of these developments.

Museums would like to bathe their displayed treasures in light from a broad soft source. They have been especially eager to test the new method.

The dinner table or the boudoir dressing alcove could be built with principal surfaces that give light. Great halls and theaters will be designed so that their enclosures will give off light much as the sky is luminous.

Luminous Ceilings Foreseen

Luminous ceilings might be sufficient in many cases, as the brightness can be considerable. Such a ceiling would be mounted like acoustic tile.

While the most obvious form of the new lighting is a flat plate, essentially a condenser or capacitor, it can be used to make other forms of lamps. The engineers have made a wire-wound tubular lamp of this sort. A pair of enameled copper wires were wound side by side in close physical contact in a glass tube. Then the phosphor suspended in an insulating substance was brushed over the wire wound tube. When the current was applied to the wires, luminescence was produced and the tube glowed with light.

This kind of lighting is so new that it has not been christened with a simple name. Electroluminescence might be shortened to "electrolume."

Electroluminescence is a third practical method of converting energy into light for illumination purposes.

A candle flame, an old-fashioned gas burner, or the flickering flame of the open fire gives off light because bits of carbon are heated to incandescence. These are essentially point sources of light. So, too, the incandescent electric lamp depends upon the electricity heating the filament until it gives off light. It is the same general method of turning heat energy into light radiation.

The second electrical method of producing light is by the use of gaseous discharges, with or without the addition of fluorescent materials. These give light sources that can be used as lines of light.

The new electroluminescence lighting operates in still another way, a third way, with a voltage change exciting light from the particular kind of phosphors that are used. It is area lighting in a very practical sense.

Still very new, electroluminescence seems to have a glowing future.

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● RADIO

Saturday, June 30, 1951, 3:15-3:30 p.m. EDT

"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. Kirtley F. Mather, professor of geology at Harvard University, and Dr. Howard A. Meyerhoff, administrative secretary, American Association for the Advancement of Science, will discuss "Mineral Resources and International Understanding."

MEDICINE

Milk Gel for Burns

Special gauze dressing with gel produced from milk has been used successfully for burn treatment. Acetic acid gel also developed.

➤ IF YOU are badly burned and have to go to a hospital, you may get a gel produced from milk put on your burns with a special gauze dressing over them. Or you may get a gel containing acetic acid, the vinegar acid, put on them. Or the burned surfaces may merely be cleaned and left exposed to the air without any covering. But you probably will not get any ACTH, in spite of a dramatic report of one burn victim whose recovery was attributed to treatment by this famous arthritis remedy.

Reports on all these methods were given at the meeting of the American Medical Association in Atlantic City, N. J. The milk gel treatment, announced by Drs. Raymond M. Curtis, John H. Brewer and Ira W. Rose of Baltimore, has been given by them to 434 patients so far. Dr. Walter E. Fleischer, also of Baltimore, reported using it for 303 burn victims in steel mills.

Greater relief of pain is one of the advantages stressed by both groups. Another is the simplicity of the method. A third advantage is that it reduces to a minimum the loss of important proteins from the tissues. It eliminates the need for bulk pressure dressings. This is particularly useful in burns of the face and hands. Finally, it speeds recovery so that needed skin grafts can be put on as early as the ninth day in some cases.

The milk gel is made from the casein of milk combined with sodium lactate, also from milk and sodium lauryl acetate. This molasses-thick gel is spread over the burns to a depth of about one-sixteenth of an inch. Strips of gauze impregnated with zinc acetate are bandaged over this. The gel rises into the gauze and combines with the zinc acetate to form a semi-porous film. This film prevents leakage of blood serum protein from the burn but lets water evaporate slowly from the wound.

The gel and bandages are so easy to put on that lay persons can be trained to apply them. This great advantage in cases of mass disaster was stressed by all the doctors who have tried it.

The warning against use of ACTH in burn cases was given by Dr. Herbert Conway of New York. Three deaths in New York of burn patients from side effects of ACTH were reported. Two patients died of perforated stomach ulcers after 30 days of ACTH for their burns. One patient died from failure of the adrenal gland when ACTH had to be stopped because of acute abdominal pain.

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