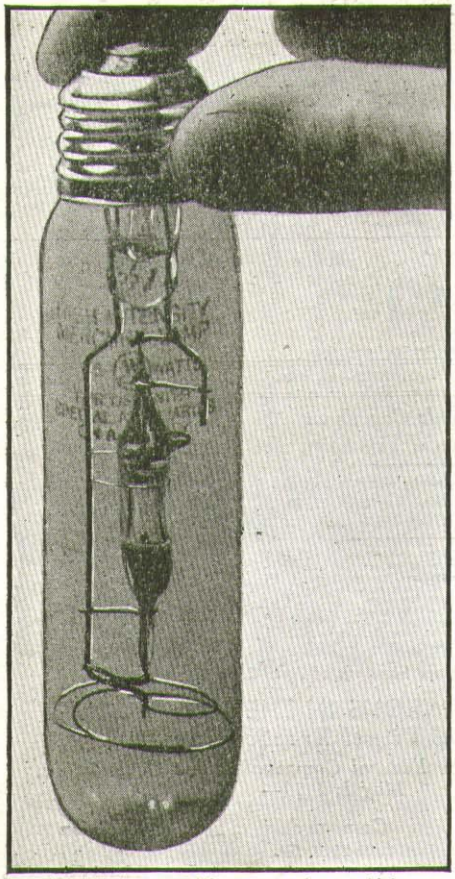

New Westinghouse 85-W. mercury lamp which produces as much light as a conventional 200-W. incandescent lamp (released June 1st, 1936) the newest contribution to television. (Special to Radio-Craft.)

HIGH INTENSITY ILLUMINANTS IN TELEVISION

Exclusive description (by the "Father of Radio") on new lamps; one is shown here for the first time in any magazine.

DR. LEE DE FOREST

ASSUMING that actual television will be brought into the *home* not by means of the cathode-beam tube as we now know it but by means of one or more mechanical scanning methods, **one of the main problems becomes that of a suitable high-intensity light source.**

There are two classes of such, one where the light source itself is modulated at television frequencies and the other where the light source is of fixed intensity and modulated by a Kerr cell or other practical inertialess light valve. From the first division, the arc lamp may be excluded on account of its inconstancy. High-intensity tungsten point lights of the incandescent-filament type may be developed but because of the extreme brilliancy at which it is necessary to burn such filaments their life is apt to be too brief to meet the requirements of home television.

Much was expected from the tungsten ball "point-o-lite" arc as made by the Ediswan Co. of London and possibly if this source could be placed in a sufficiently small bulb to meet obvious optical requirements, such a light source might prove satisfactory.

Most promising in its division now appears to be the high-intensity, high-pressure quartz capillary mercury vapor lamp on which Philips Company of Holland has been at work for some years. In this country the General Electric and Westinghouse Cos. are each developing this type of high-pressure mercury vapor lamp with every promise that this

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HIGH INTENSITY ILLUMINANTS IN TELEVISION

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source shortly will be available for television purposes. (The newest Westinghouse type, released June 1, 1936, and illustrated in the heading, is here shown for the first time in any magazine!—*Editor*)

CANDLEPOWER THAT RIVALS THE SUN!

In the air-cooled variety the intensity of the capillary vapor stream is approximately that of the electric arc crater or 85,000 candlepower per sq. in. But where the capillary is water-cooled by being encased in an outer glass tube through which a rapid stream of cold water is maintained flowing, high mercury pressures (20 atmospheres) are obtained; and a light intensity value *equal to that of the sun's disc*, or some 250,000 candlepower per sq. in.!

(The lamp in the heading illustration measures about 5⅝ x 1¼ ins. overall, the actual light element being only 1½ x ½-in. in dia. It is operated from a transformer which delivers around 250 V. at the secondary, and the mercury arc is approximately ½-ins. long, a striking contrast with the usual mercury- (or Hg-) vapor lamps in which the arc is of varying lengths from 5 ins., up. Thus the ideal "point source" is approached more closely than ever before in this type, which fact makes its use in television of the greatest interest. As with other lamps of the mercury-vapor type, the starting time is 3 to 4 minutes, before full brilliance is attained. Many other, larger sizes are made, that shown being the smallest at present.—EDITOR).

Indirect Modulation. Whereas a water-cooled device of this nature would scarcely be practical in a home, the less brilliant, air-cooled high-pressure mercury-vapor source appears to give sufficient brilliancy even after the light passes through 2 polaroids (Nicol prisms, or equivalent) and a Kerr cell, and necessary lenses, etc., to illuminate with acceptable brilliancy a screen area of at least 4 sq. ft.

Direct Modulation. While the most obvious use of this new mercury vapor lamp would be as a fixed source with light valve modulation, it is not at all uncertain that the brilliancy of this source can not be directly modulated at television frequencies by means of a suitable power amplifier. If so, this latter arrangement will afford many advantages over the fixed source with Kerr cell and polarizing devices.

There seem to be as yet untried possibilities in the future development of the so-called *crater lamp source*. The ultimate in a high-intensity, long-life crater lamp, either with a hot or a cold cathode, *has not yet been reached*. However, and although several investigators and manufacturers are still at work on the problem, it is doubtful whether any crater lamp will equal in intrinsic brilliancy that of the capillary quartz mercury- (Hg-) vapor source above described.

ULTRA-HIGH INTENSITY CATHODE-RAY BEAM

Akin to the crater lamp is the fixed-beam cathode of a source using a long, cylindrical, cathode beam tube containing sufficient gas to aid in focusing the beam to a very small spot and directing this fixed beam either upon a fluorescent coating upon a quartz window at the end of the tube which will successfully withstand the highly intense bombardment, or directing the beam at a 45 deg. angle upon a fluorescent, coated metal plate and viewing the spot through the side of the tube. In either construction it is obvious that the fluorescent surface must have no appreciable time lag, nor can the quartz or metal surface on which it is deposited become heat luminous. It is not difficult to construct air-cooled tubes of this nature which remain sufficiently cool to avoid redness of the bombarded surface.

The small number of milliamperes involved in this cathode-beam light source and the ease with which the beam can be modulated at television frequencies are arguments in favor of this type of light source for home television. (See the artcle, in this issue of *Radio-Craft* by Dr. Stager.—*Editor*)

The ensuing year's development should pretty well determine which of the above-described sources of high-intensity illuminants will be the most practical for television in the home.