

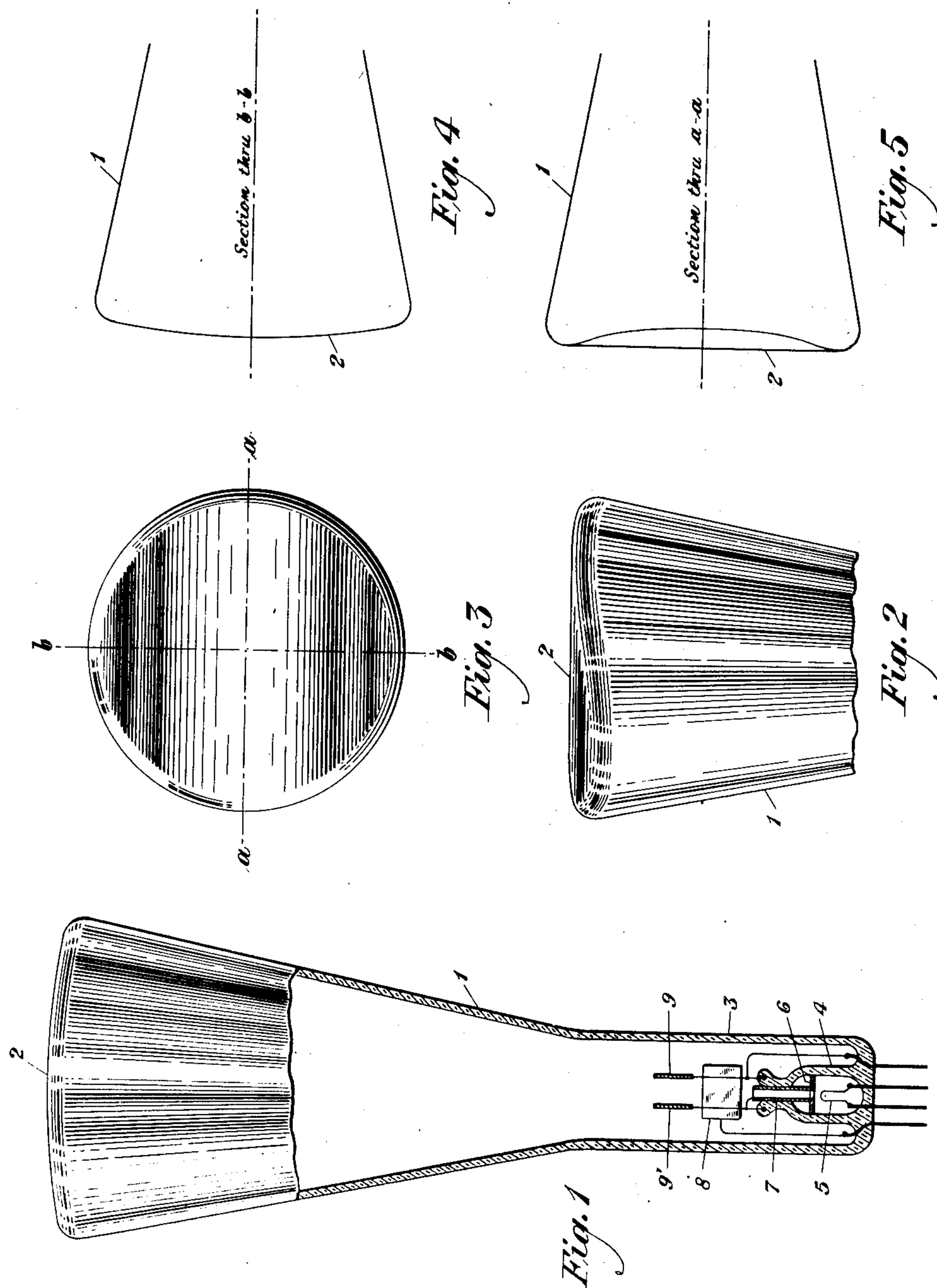
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R. BOWN

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CATHODE RAY OSCILLOGRAPH

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INVENTOR
R. Bown
BY *gr. f. h.*
ATTORNEY

UNITED STATES PATENT OFFICE

RALPH BOWN, OF MAPLEWOOD, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE
AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

CATHODE-RAY OSCILLOGRAPH

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This invention relates to cathode ray oscillographs, and more particularly to the form of the tube used in such devices.

Heretofore cathode ray oscillograph tubes have been commonly constructed with the end of the tube which comprises the fluorescent screen so shaped as to form approximately a section of a sphere, thereby obtaining a thin section of glass with sufficient strength, due to the arched formation, to withstand the external air pressure. In order to obtain a photographic record of the oscillograph trace with a short exposure, it has been customary to make contact prints by applying the sensitive film or other sensitized surface directly to the end of the tube. It has, however, been very difficult to obtain a sufficiently close contact between the flat film and the spherical end section of the tube to avoid a loss of definition.

To avoid this difficulty, it has been proposed to construct the tubes with flat ends. In order to obtain the necessary strength for the flat screen or end to withstand the external air pressure, it is necessary to make this part thicker than the walls of the vessel. As it is impossible to blow the tube with the flat end thicker than the side walls, it has therefore been necessary to build up the tube by fastening a thickened end plate or screen to the side walls, thus rendering the manufacture much more difficult. Furthermore, even with the tube thus built up the plate must be so thick in order to withstand the air pressure as a flat slab that, while the film makes perfect contact with the surface of the glass, definition is lost due to the thickness of the plate.

In accordance with the present invention, it is proposed to overcome these difficulties by constructing the screen in the form of a curved surface of such character that a film or paper may be wrapped upon it to give substantially perfect contact without wrinkling or stretching. Specifically, it is considered desirable to construct the end wall or screen in the form of the curved surface resulting from the intersection of the side walls of the tube with the surface of a cylinder whose axis is at right angles to the axis of

the tube, the axis of the cylinder preferably passing near the source of cathode rays. This cylindrical shape of the screen preserves the strength due to the arched construction and renders the entire tube with the screen capable of being blown in a mold. The end section or screen need not, therefore, be materially thicker than the case of a spherical end, and at the same time it permits a flat film to be bent around the cylindrical surface in perfect contact with the end of the tube. It is also possible, with this type of construction, to arrange a roll of film to be moved continuously or intermittently across the end of the tube by automatic means for continuous recording of the oscillograph movements.

The invention will now be more fully understood from the following detailed description when read in connection with the accompanying drawing of which Figure 1 is an elevation of the cathode ray oscillograph tube of the present invention with the tube partly broken away to show the interior mechanism; Fig. 2 is a broken elevation of the tube as it would appear shifted upon its axis 45° from the position of Fig. 1; Fig. 3 is an end view of the tube looking toward the end wall or screen; and Figs. 4 and 5 are schematic representations of two sections of the tube taken through the axis thereof in planes at right angles to each other.

Referring to Fig. 1, the usual flaring side walls of the oscillograph tube are shown at 1, the fluorescent screen being formed by a suitable deposit on the interior of the end wall 2, to be described more fully later. At the other end of the tube the walls terminate in a neck 3 in which the electrodes of the tube are mounted. In order to mount the electrodes a press 4, of glass, is built into the bottom end of the tube. The cathode comprises a filament 5 which, when heated, constitutes a source of cathode rays. Just above the filament a metal shield 6 is mounted, this shield having a central hole through which the cathode rays pass. The anode comprises a small hollow cylinder 7 mounted within the press and preferably in electric contact with the shield 6. The deflector elements comprise pairs of plates 8—8' and 9—9'. 100

The plates 8—8' are arranged parallel to each other on either side of the path of the cathode rays and just above the anode, the plate 8' not being shown in Fig. 1 because it is cut away by the section taken through the walls of the vessel. Similarly, the plates 9—9' are arranged above the plates 8—8' and parallel to each other but in planes at right angles to the planes of the plates 8—8'. By means of suitable electric connections a cathode ray stream is caused to pass from the filament through the tubular anode 7 to impinge upon the inner surface of the end wall or screen 2 of the vessel, and by means of potentials applied to the plates 8—8' and 9—9' this stream may be deflected. The operation of this type of instrument is fully described in an article by J. B. Johnson, entitled "A low voltage cathode ray oscillograph," published in the Journal of the Optical Society and Review of Scientific Instruments, Volume VI, No. 7, September, 1922.

The novel feature of the present invention resides in the form of the end wall or screen 2. As has been previously stated, it has heretofore been the practice to make the end wall or screen in the general form of a section of a sphere, as shown in Fig. 1 of the Johnson article above cited. In accordance with the present invention, however, the shape of this end wall or screen is modified so that it is of the general shape of the section of a cylinder formed by the intersection of the side walls of the vessel with the outer surface of a cylinder whose axis is at right angles to the axis of the vessel. With the end wall formed in the manner stated, a section taken through the end wall along the line *b—b* of Fig. 3, for example, would result in a curved section of the end wall or screen, as shown at 2 in Fig. 4. A section taken along the line *a—a* by a plane in the axis of the vessel at right angles to the plane *b—b* will lie in a straight line, as shown at 2 in Fig. 5. While it is preferred that the cylindrical section forming the end wall be of such radius that its axis passes through the axis of the vessel approximately at the location of the cathode ray source and at right angles to the axis of the vessel, the principal advantages of the invention may be attained without adhering to this feature. In fact, the curved surface of the end wall need not be a cylindrical surface at all, but may be a surface of any desired curvature so long as sections formed by planes parallel to the axis of the tube and at right angles to the line *b—b* all lie in straight lines.

It will be clear from a consideration of Figs. 1 and 2 that a flat film or other sensitized element may be bent around the surface of the end wall 2 in such a manner as to contact therewith at all points. It will also be clear that, due to the arched construction of the end wall, it need be no thicker than the side walls, so that the tube may be blown in a mold

in the usual manner. Furthermore, the mold may be drawn without difficulty if the parts are split along the plane *a—a*.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. A cathode ray oscillograph tube provided with a screen at one end having a curved surface whose curvature is such that at least one plane intersection thereof will lie in a straight line.

2. A cathode ray oscillograph tube provided with a screen at one end having a curved surface whose curvature is such that its intersection with one plane will be a curved line and its intersection with a plane at right angles thereto will lie on a straight line.

3. A cathode ray oscillograph tube provided with a screen at one end having a curved surface whose curvature is such that its intersection with one plane will be substantially an arc of a circle and its intersection with a plane at right angles thereto will lie on a straight line.

4. A cathode ray oscillograph tube provided with a screen at one end having a curved surface whose curvature is such that its intersections with one plane will be substantially an arc of a circle whose center lies approximately at the cathode ray source and its intersections with a plane at right angles thereto will lie on a straight line.

5. A cathode ray oscillograph tube provided with a screen at one end having a curved surface whose curvature is such that its intersection with one plane through the axis of the tube will be a curved line and its intersections with planes at right angles to said first plane and parallel to said axis will lie in straight lines.

6. A cathode ray oscillograph tube provided with a screen at one end having a curved surface formed by the intersection of the walls of the tube with the surface of a cylinder whose axis is at right angles to the axis of the tube.

7. A cathode ray oscillograph tube provided with a screen at one end having a curved surface formed by the intersection of the walls of the tube with the surface of a cylinder whose axis is at right angles to the axis of the tube and passes substantially through the source of cathode rays.

In testimony whereof, I have signed my name to this specification this 21st day of March, 1928.

RALPH BOWN.