

Jan 6, 1931.

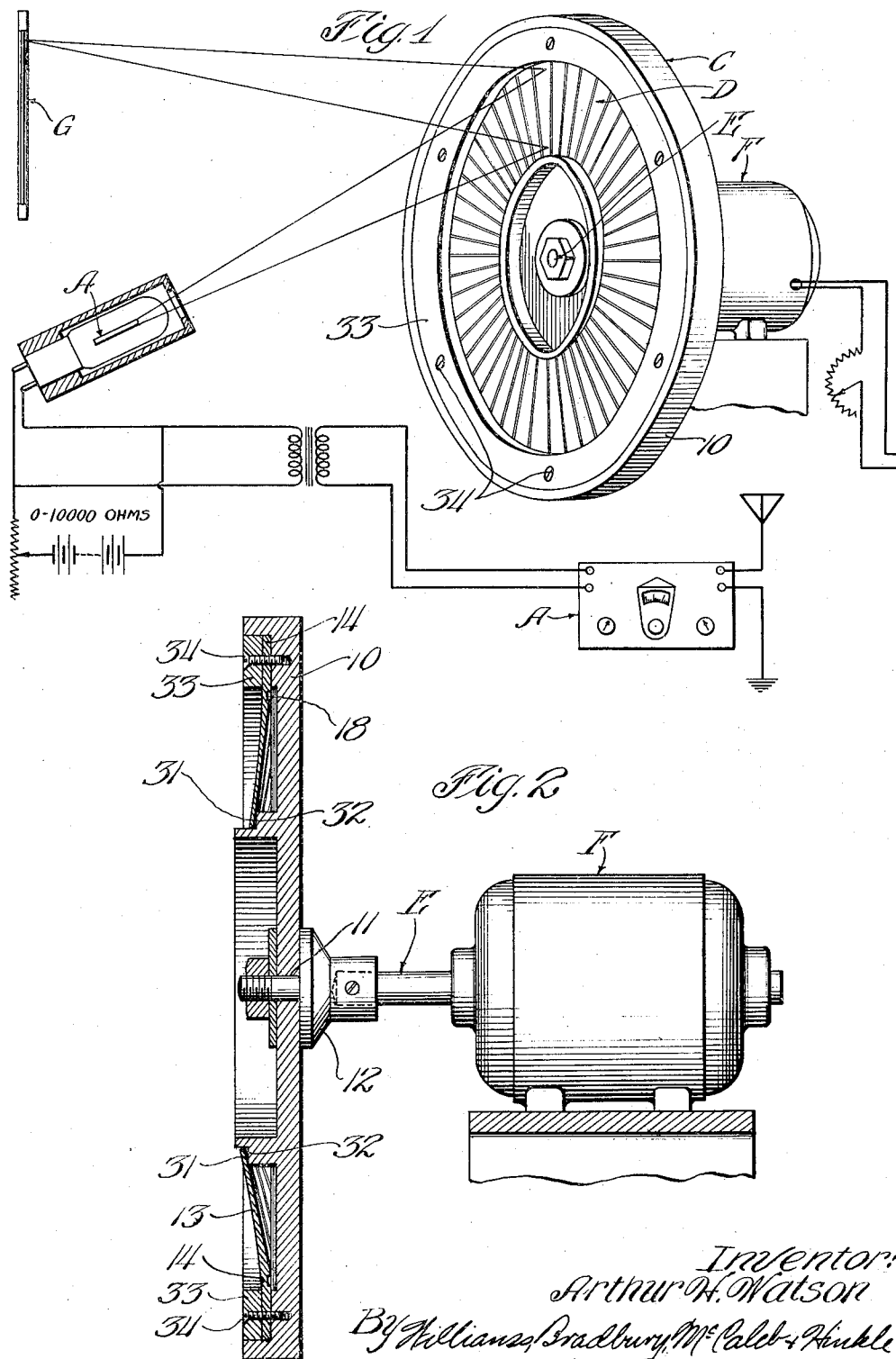
A. H. WATSON

1,787,920

TELEVISION APPARATUS

Filed March 7, 1929

5 Sheets-Sheet 1



Inventor:
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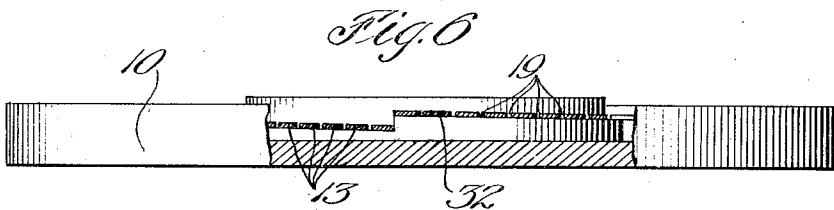
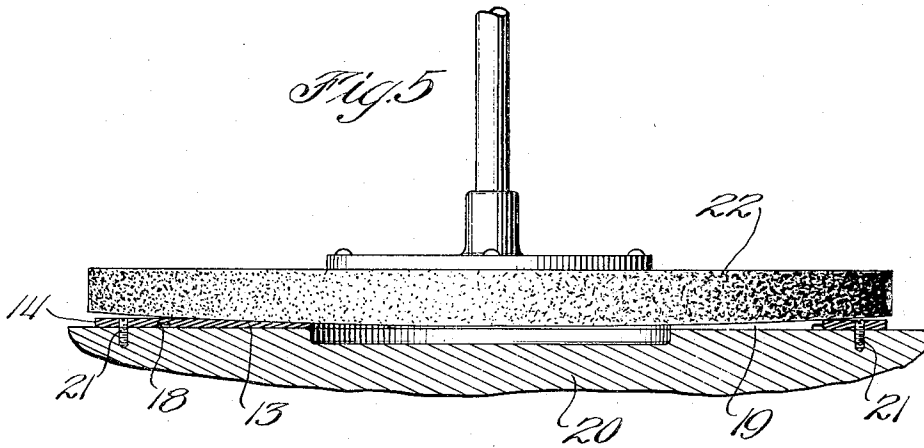
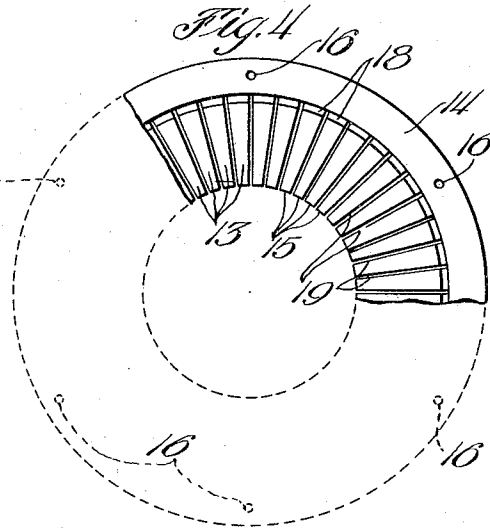
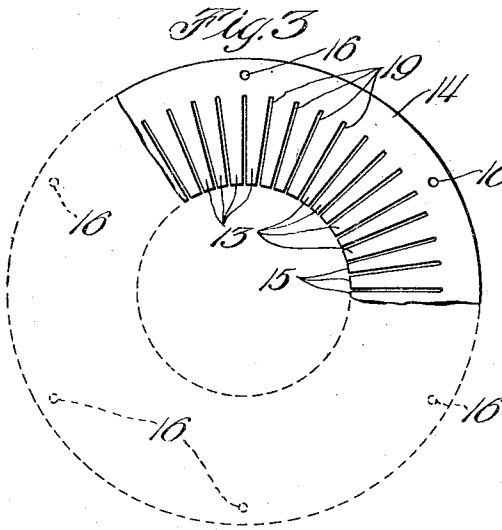
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5 Sheets-Sheet 2



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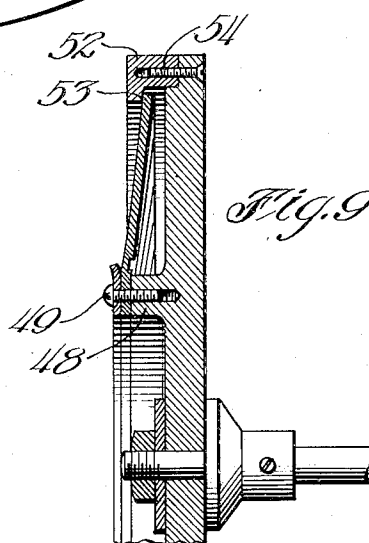
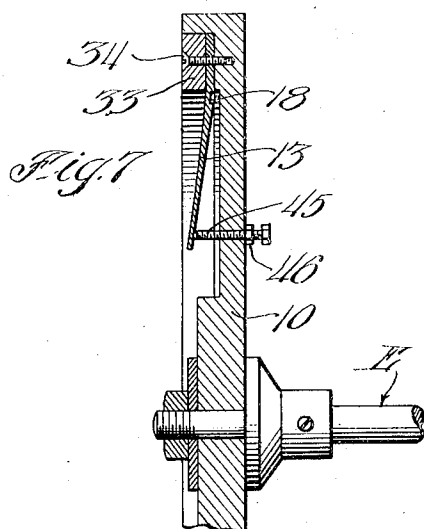
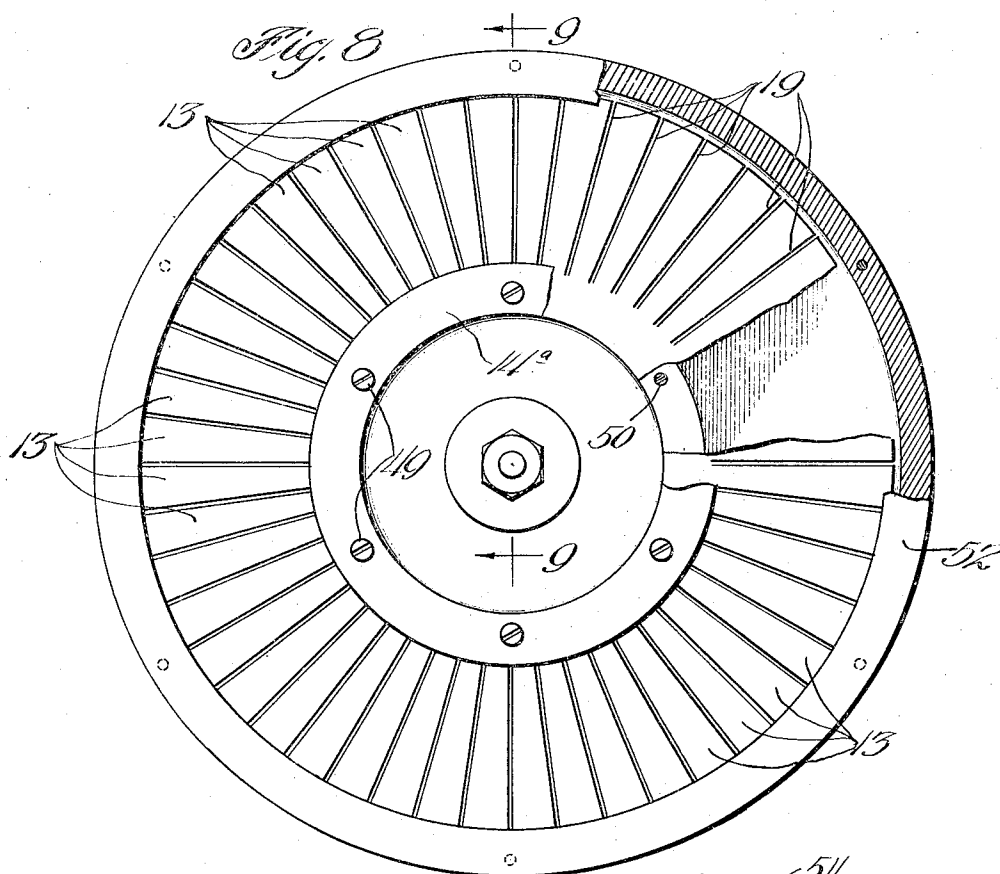
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TELEVISION APPARATUS

Filed March 7, 1929

5 Sheets-Sheet 3



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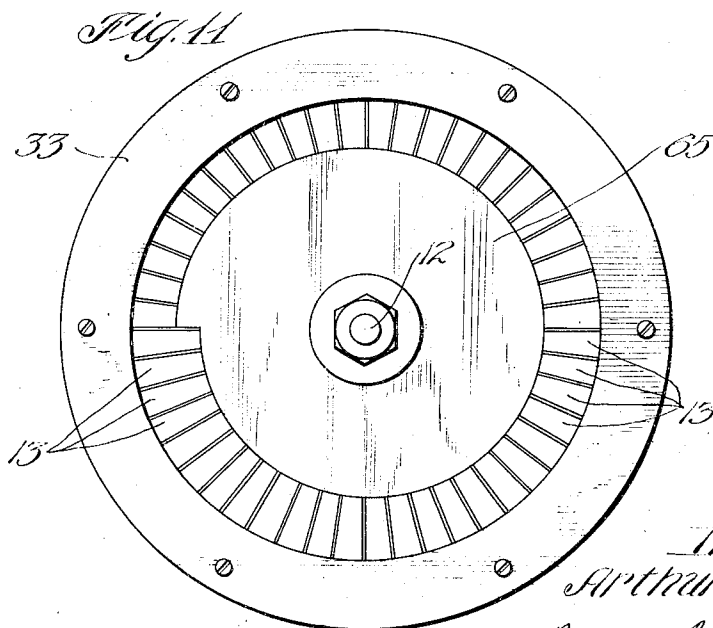
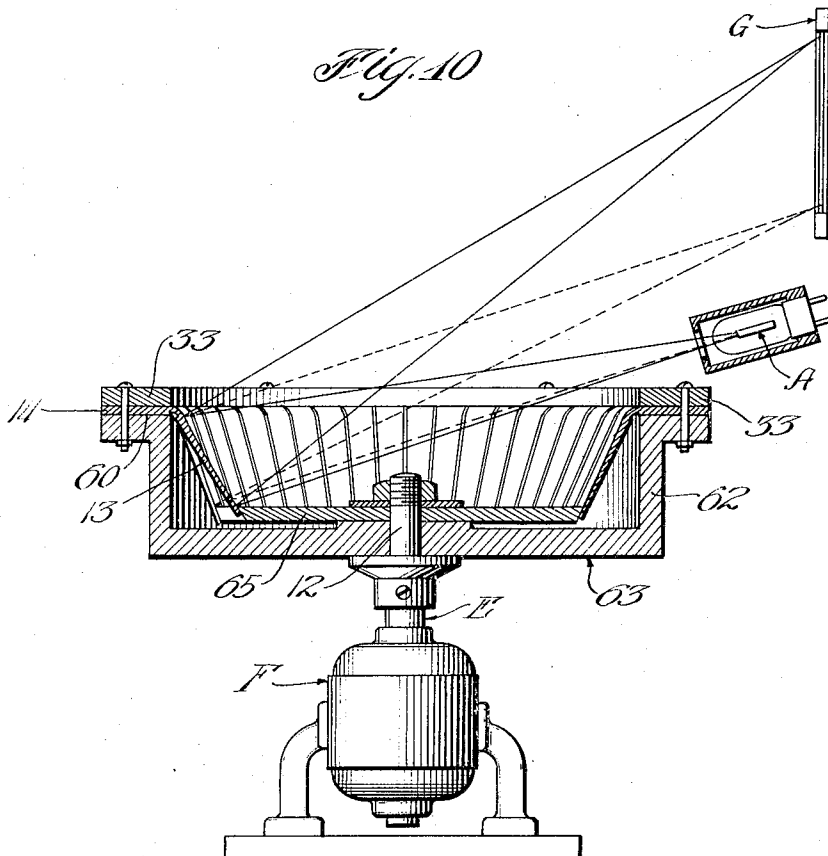
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5 Sheets-Sheet 4



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TELEVISION APPARATUS

1,787,920

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5 Sheets-Sheet 5

Fig. 12

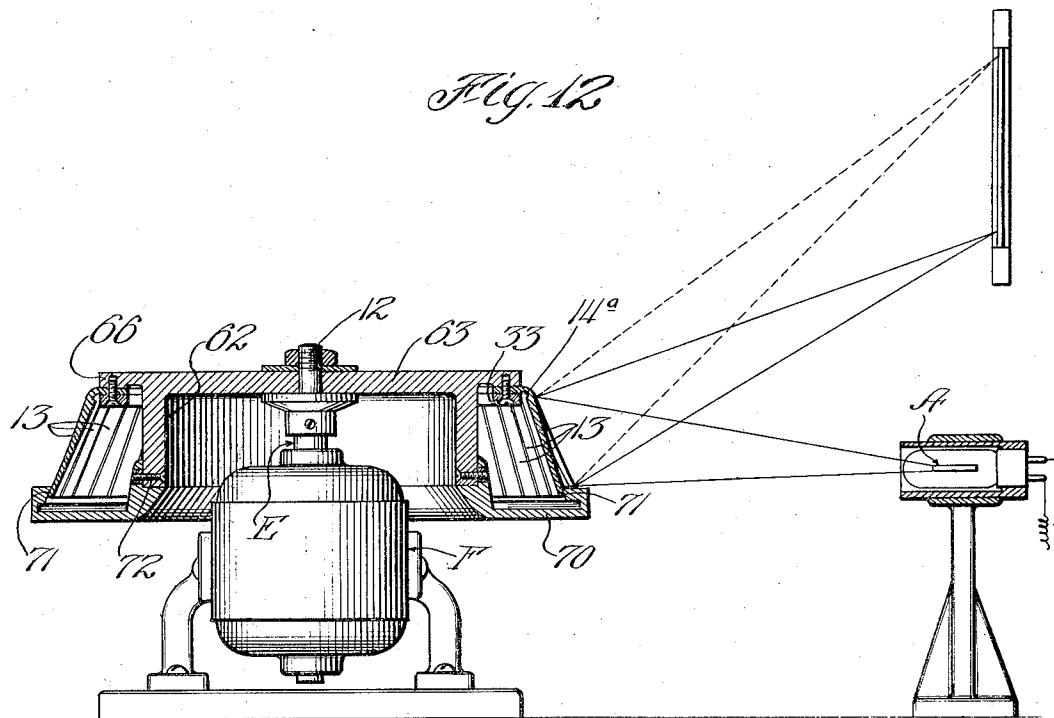
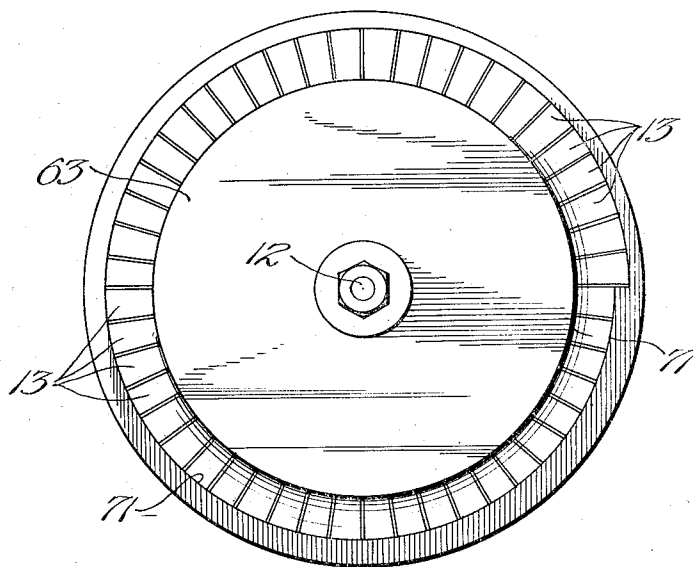


Fig. 13



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UNITED STATES PATENT OFFICE

ARTHUR H. WATSON, OF EVANSTON, ILLINOIS

TELEVISION APPARATUS

Application filed March 7, 1929. Serial No. 345,005.

This invention relates to improvements in television apparatus, particularly that type of apparatus employed in the transmission and reproduction of visible pictures through electrical conductors or ether waves.

The present invention is an improvement over that type of apparatus disclosed in co-pending application of Harry C. Duft and Arthur H. Watson for television apparatus filed November 19, 1928, and bearing Serial No. 320,252, wherein a scanning mechanism embodying a plurality of concave reflectors arranged upon and concentric to the axis of a revolving plate was disclosed and described as applicable for both the transmission and reception of visible pictures. The subject matter of the present application has to do chiefly with the structural aspects of the plate or disk bearing the concave reflectors.

An object of the invention is to provide a scanning mechanism for television apparatus which may be manufactured at an extremely low cost and with relatively few manufacturing operations, thus reducing materially the labor expenditure in the connection with the building and assembling of the mechanism.

Another object is to provide scanning mechanism for television apparatus in which the optical elements are automatically adjusted in operative position as the several parts of the mechanism are assembled.

The further object is to provide scanning mechanism for television apparatus wherein a high degree of accuracy in the production of the optical elements is attained.

Another object is to provide scanning mechanism for television apparatus which is applicable for the reproduction of television pictures comprising either straight or arcuate parallel lines. This feature I consider of great importance as the mechanism may be adapted for use in receiving apparatus for television pictures which is responsive to television broadcasting apparatus employing as a scanning element either a drum scanner or the conventional scanning disk with spirally arranged apertures or lenses or other like optical components.

My invention is illustrated in the accompanying drawings forming a part of this application wherein:

Fig. 1 is a perspective view of a television receiving apparatus embodying improved scanning mechanism;

Fig. 2 is a vertical sectional view of the scanning mechanism;

Figs. 3 and 4 represent the front and rear view of an element of the scanning mechanism;

Fig. 5 is a side elevation, partially in section, illustrating the process employed in the treatment of the element illustrated in Figs. 3 and 4 prior to assembling;

Fig. 6 is a side elevation of the scanning mechanism with the part thereof broken away;

Fig. 7 is a vertical sectional view in a modified form of the mechanism illustrating Fig. 2;

Figs. 8 and 9 are a fragmentary front elevation and a vertical sectional view, respectively, of another modified form of a mechanism illustrating Fig. 2;

Fig. 10 is a sectional view, a further modification of the mechanism illustrated in Fig. 2;

Fig. 11 is a top plan view of the mechanism illustrated in Fig. 10;

Fig. 12 is a side elevation of a further modification of mechanism illustrated in Fig. 2; and

Fig. 13 is a top plan view of the mechanism illustrated in Fig. 12.

The television apparatus selected for illustration herein, particularly in Figs. 1 to 6, in general comprises a neon or glowlamp A responsive to the output current from a radio receiver B to cause the intensity of its illumination to vary in proportion to the strength of the radio output current. A scanning mechanism C including a plurality of concave reflectors D arranged concentrically with respect to the axis of shaft E of an electrical motor F, each of the reflectors being adjusted so as to cause light reflected therefrom from the lamp A to fall upon successive vertical portions of a translucent screen G. In operation, a visible picture is reproduced upon the

screen G comprising a plurality of parallel arcuate lines, one for each of the reflectors D, each line varying in intensity of illumination as to its sub-portions in a degree directly proportional to the current output of the radio receiver B.

As heretofore explained, the invention relates particularly to the scanning mechanism C which in its preferred form is best illustrated in Figs. 2 to 6 inclusive. This mechanism comprises a molded die-cast bakelite disk 10 having an opening 11 therethrough upon its axis by means of which the disk is mounted by a suitable bushing 12 upon the shaft E of the electric motor F.

The concave reflectors D comprise segments 13 of an annular hard brass plate 14 formed by slotting the plate radially from the inner edge 15 to the peripheral portion of the plate.

In manufacture the plate is first constructed as shown in Fig. 3 at which time all of the segments 13 lie in a common plane. A plurality of spaced apart holes 16 are formed adjacent the periphery of the plate. The rear face of the plate has a concentrically grooved portion 18 registering with the inner ends of the slots 19 before mentioned. The purpose of groove 18 is to render the segments 13 flexible at their inner ends so that each segment may be moved out of the plane of the plate without warpage or distortion of the segment.

The plate as thus constructed is placed upon a flat bed 20 and secured against rotation and lateral movement by pins 21 held by the bed 20 which extend upwardly partially through the openings 16. The plate is thus centered with respect to the bed. The bed 20 forms a part of an optical lens grinding machine another element of which comprises a grinding shoe 22. I prefer to employ a grinding shoe having a convex curvature of 24" radius. It is important that the plate be placed upon the bed 20 with the rear face, i. e. that face bearing the groove 18 downwardly.

The grinding shoe 22 is then operated to grind a 24" radius concave surface simultaneously upon the front face of all the segments 13. The grinding shoe 22 may then be removed if desired and the surface polished with rouge, but I prefer first to dispose a plating of chromium upon the concave surface thus formed and then subject the plate to a further like grinding and subsequent polishing by a grinding and polishing the shoe similar to shoe 22. I thus provide a plurality of highly polished concave reflectors formed by the segments 13 all of which have their focal point in common.

The next step in the construction of the scanning mechanism consists in placing the plate upon the disk 10 with its peripheral region bearing upon an annular shoulder 30 concentric with and adjacent to

outer edge of the disk, the grooved portion 18 of the plate being disposed at the rear as shown in Fig. 2. The inner edges 31 of the segmental portions 13 are permitted to bear upon a spiral shoulder 32 which is best illustrated in Fig. 6. This shoulder is integral with disk 10. The peripheral region of the plate is then clamped tightly against the shoulder 30 by clamping ring 33 and screws 34 extending through the ring, the apertures 16 of the plate and threaded into the disk 10. As the clamping ring 33 is tightened the peripheral region of the plate will move toward the rear causing the segmental portions 13 to flex at the groove 18 and each segmental portion constituting in itself a separate concave reflector will be brought to a different focal point determined by the pitch of the spiral shoulder 32.

The scanning disk thus constructed is mounted upon the shaft E of the motor F as described, and the apparatus A, B and G arranged substantially as illustrated in Fig. 1.

In operation, television signals from a broadcasting television station are received and translated by the radio receiver B into current varying in power in proportion to the transmitted television signals so that the lamp A is caused to rise and fall in brilliancy in illumination and the light reflected by each of the reflectors comprising the segment 13 of the plate builds up a picture comprising 48 parallel arcuate lines on the screen G.

One of the outstanding and important advantages of this type of scanning mechanism, as differentiated from the spiral scanning disk, now well known in the art of television is that a large percentage of the light from the neon or glow lamp A is projected upon the screen G at any one moment whereas the apertured scanning disk or apertured scanning drum referred to and comprising what is known in art as the direct vision scanning apparatus employs but an extremely small quantity of the light at any one moment. In the case of the 48 line picture less than 1/2000 part of the light is utilized at any one moment.

Up to the present time scanning apparatus of the type illustrated herein and such as disclosed in the co-pending application of Harry C. Duft and Arthur H. Watson, has presented large difficulty to experimenters, and manufacturers contemplating the construction of such apparatus because of the high cost in manufacturing and producing a relatively large number of accurately arranged optically correct reflectors.

My present invention entirely eliminates this serious problem heretofore considered as a stumbling block in the successful commercial exploitation of the concave reflector type of scanning mechanism.

In Fig. 7 I have illustrated a modified form of the scanning mechanism wherein the spiral shoulder 32 is dispensed with and employ instead a plurality of adjustment screws 45, one for each of the segmental portions 13. These screws are threaded through the disk at points in registration with the inner ends of the segmental portions 13 so that the continuant turning of the screws will cause the segmental portions to be flexed at the grooved part 18 outwardly away from the disk, as shown in Fig. 7. It is thus possible to individually adjust each reflector and thus establish proper or desired distance between the parallel arcuate lines traced upon the screen G during operation. To facilitate permanent adjustment, each of the screws 45 has a lock nut 46 by means of which the screw may be locked in its adjusted position. The operation of this form of the scanning mechanism is identical to that described in connection with the preferred form.

In Figs. 8 and 9 I have illustrated a further modification of the scanning mechanism. The structure illustrated therein differs chiefly from that structure heretofore described in the arrangement of the segmental separated reflector elements 18. Instead of slotting the plate 14 from its inner edge toward the peripheral region, I provided radial slots in the plate extending from the outer periphery toward the inner edge of the annulus. It may be well to state at this time in connection with this modification and those described in the preceding paragraphs, that a slot $\frac{1}{2}$ " in width is sufficient to prevent cramping of the segments as they are flexed out of their normal plane.

The plate thus formed designated by the reference numeral 14a is clamped by means of a clamping ring 33a to a forwardly extending annular projection 48 integral with the disk 10a by screws 49 extending through openings 50 provided in the plate 14a adjacent to its inner edge. A ring 52 having a shoulder 53 fashioned in the form of a spiral is secured to the outer face of the disk 10a at its periphery by screws 54 which when drawn tight pull the segmental portions 13 of the plate 14a rearwardly toward the disk, flexing of the plate taking place at the groove 18.

The shoulder 53 engages at all times with the outer end of the segmental portions. The groove 18 in this form of the scanning mechanism is disposed at the inner ends of the slots 19.

The structure thus described comprises a scanning disk which operates precisely in the same manner as that described as the preferred form of the invention but possesses the additional advantage of making possible an extremely compact disk of lesser diameter than that illustrated in Fig. 2 or in Fig. 7, as that portion of the plate 14—14a which

does not comprise the optical elements extend toward the axis of the disk and does not necessarily lie at the outer edge of the disk. Another advantage of importance obtained by this structure is the assurance of the flexing of the segmental portion at the groove 18 made possible by the fact that the segmental portion 13 (see Fig. 8) is of lesser width at that point in registration with the groove 18 than at any other part, and also that the thickness of the plate is less at that point than toward its outer edge. The grinding and polishing of the plate 14a is accomplished in precisely the same manner as that illustrated in Fig. 5, except that the shoe 22 is sufficiently large to extend to the outer edge of the plate and hence the thickness of the stock used must be slightly greater.

In Figs. 10 and 11 I have illustrated a further modification of the scanning mechanism which is intended for use with broadcast pictures comprising parallel straight lines as distinguished from parallel arcuate lines such as contemplated in connection with the preceding embodiments of the invention described.

In this form the plate 14 is secured between the clamping ring 33 and a surface 60 transverse to the outer peripheral wall 62 of a drum 63. The drum 63 is mounted upon a bushing 12 which in turn is secured to the shaft E of the motor F.

In this form of the invention the motor F is mounted with its axis extending vertically and hence the rotation of the drum 63 is upon a vertical axis and in a horizontal plane. The segmental portions 13 are drawn inwardly toward the bushing 12 by an eccentric plane 65 in such a manner as to cause each segmental portion or reflector so formed to reflect the light from a neon lamp A disposed above the drum 63 upon screen G to form a plurality of parallel straight lines.

In this modification of the invention the disposition of the reflectors or segmental portion 13 within the drum 63 makes possible the compact assembly of the entire television inasmuch as a portion of the optical distance between the lamp A and the reflectors includes the entire inner diameter of the drum, the rays being reflected back across the drum to a screen mounted above the lamp.

In Figs. 12 and 13 I have illustrated a still further modification of the scanning mechanism wherein the segmental portions 13 or concave reflectors so formed are disposed at the outer face of a revolving drum. In this modification I have employed the disk 14a such as described in connection with the scanning mechanism shown in Figs. 8 and 9, the disk being secured between clamping ring 33 and an outwardly extending flange 66 formed on the drum 63.

The outer ends of the segment portion 13 are drawn downwardly and toward the face

62 of the drum and are secured by an annular adjustment ring 70 having a shoulder 71 in the form of a spiral against which the outer ends of the segmental portions 13 engage.

5 This ring is secured to the drum by screws 72. In this form of the invention as well as that described in Figs. 10 and 11, the slot 19 extending from the outer edge of the disk 14a toward the inner edge must be slightly greater in width than the slot 19 described in connection with the preferred form of the invention to allow for the greater movement of the segmental portion 13 out of their normal plane and to prevent congestion. It is suggested that the slots 19 be made in the form of a V having that part of greatest width adjacent the outer edge of the plate.

10 In operation this embodiment of the invention operates precisely in the same manner as that described with the mechanism shown in Figs. 10 and 11, but the entire "light throw" from the lamp A to the concave reflectors formed of the segmental portions 13 must be extraneous of the drum (see Fig. 12).

25 The fundamental feature of the invention herein described may be summarized as a structure comprising a scanning disk presenting a plurality of separate concave reflectors, each constituting a separate optical element which constitutes a single plate ground with uniform concave curvature throughout and sub-portions thereof moved out of their normal planes to comprise an operative scanning disk.

What I claim and desire to cover in the United States patent is as follows:

1. In a television apparatus, a rotatable support, a plurality of reflecting surfaces mounted thereon, said surfaces representing a portion of a single sphere, and means for shifting the surfaces out of said sphere whereby each surface will be disposed at a different angle from the other surfaces.

45 2. A method of producing reflecting surfaces for a television apparatus which consists of radially slotting an annular plate, supporting said plate upon a rigid support and abrading said plate with a member having a spherical surface to form concave reflecting surfaces.

3. A method of producing reflecting surfaces for a television apparatus which consists of providing an annular plate, radially slotting said plate, supporting said plate against a plane surface, and abrading one surface of said plate with a spherical surface to form concave reflecting surfaces.

55 4. A method of producing reflecting surfaces for a television apparatus which comprises providing a plate with radial slots, abrading one side of said plate with a spherical surface to form reflecting surfaces, and forming a circular slot along the ends of the

slots to permit bending of the surfaces at this point.

5. A method of producing a rotatable member for a television apparatus which consists of providing an annular plate with radial slots, supporting the plate against a plane surface, abrading one side of the plate to concave reflecting surfaces, mounting said annular plate upon a rotatable support and securing the free ends of the reflecting surfaces in different planes of rotation upon the rotatable member.

6. A method of producing a rotatable member for a television apparatus which consists of providing a plate with radial slots, abrading one side of said plate to form a spherical surface, mounting the plate upon a rotatable member, and securing the sectors between the radial slots to the rotatable member at different angles.

7. A method of producing a rotatable member for a television apparatus which consists of providing a plate with radial slots to form a plurality of surfaces, simultaneously abrading all of said surfaces to render them concave, supporting said plate upon a rigid rotatable member, and securing the surfaces thereto at different angles.

8. A method for producing a rotatable member for a television apparatus which consists of providing a plate with radial slots to form a plurality of surfaces, simultaneously abrading all of said surfaces to render them concave, forming an annular groove in the plate along the ends of said slots, mounting said plate upon a rotatable member and securing the surfaces thereto each at a different angle.

9. In a television apparatus, a scanning device comprising a rotatable support, a plurality of reflecting surfaces mounted thereupon, said surfaces representing sectors of the surface of a common sphere and each disposed at a predetermined angle with respect to the remainder and the axis of rotation of the rotatable support.

10. A method of producing reflecting surfaces for a television scanning device which consists of simultaneously forming concave surfaces upon a plurality of reflecting elements each comprising a sector of an annular portion of a spherical surface and in subsequently moving said elements to positions of varying angles from one another.

11. A method of producing reflecting surfaces for a television scanning device which consists of simultaneously forming concave surfaces upon a plurality of reflecting elements each comprising a sector of an annular portion of a spherical surface.

In witness whereof, I hereunto subscribe my name this 28th day of February, 1929.

ARTHUR H. WATSON.