Oct. 17, 1939. A. W. KRAUSE 2,176,673

METERING DEVICE

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Fig. 1

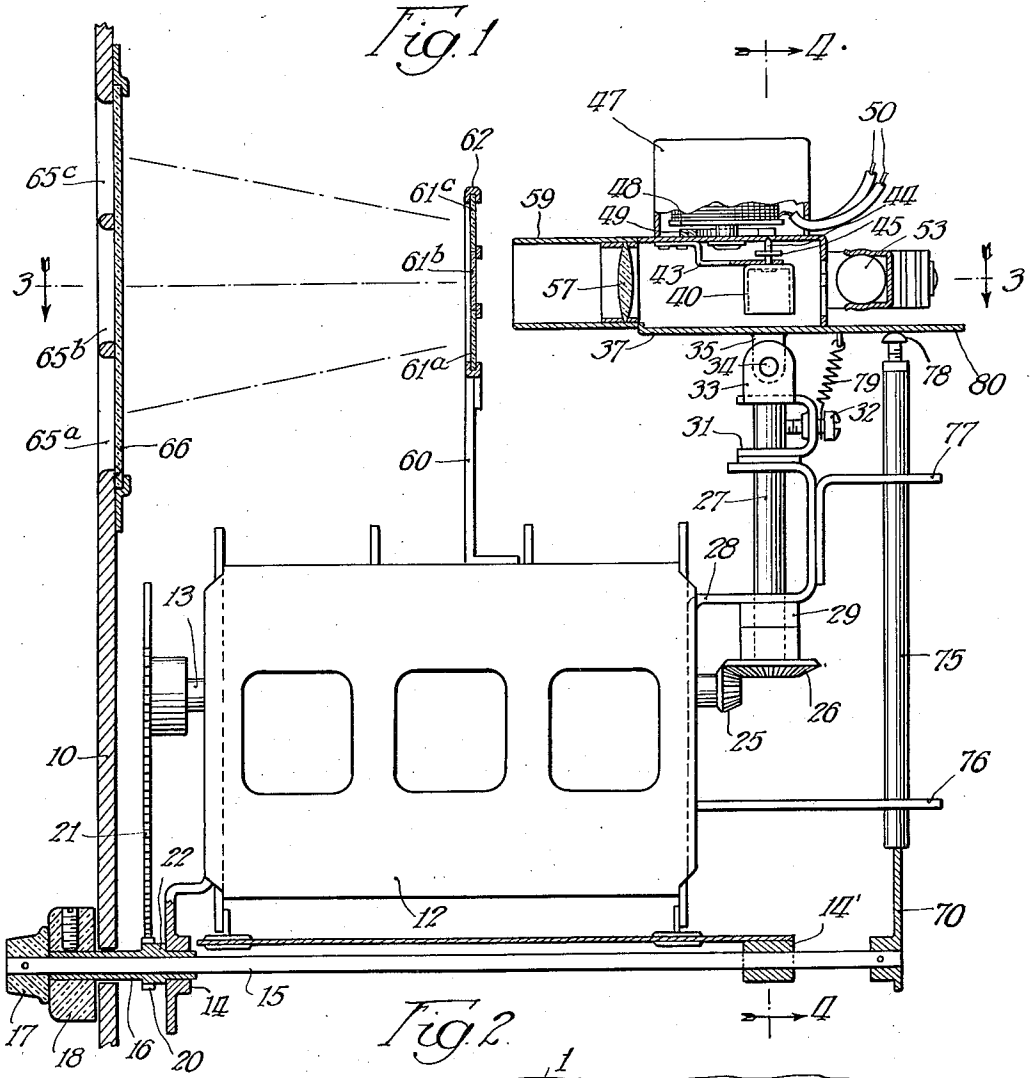
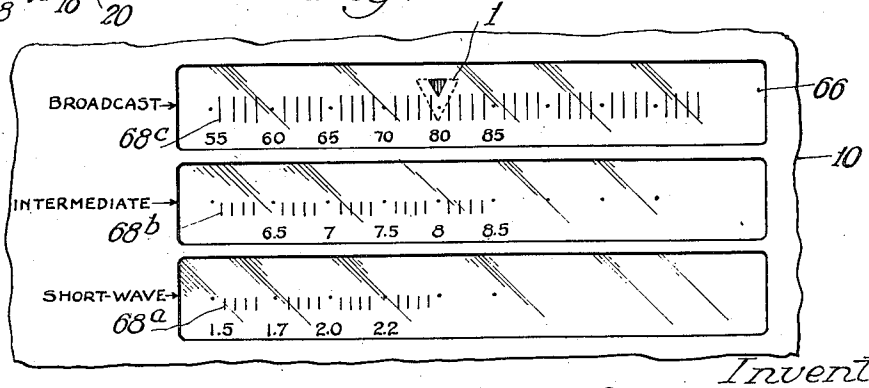


Fig. 2



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Fig. 3.

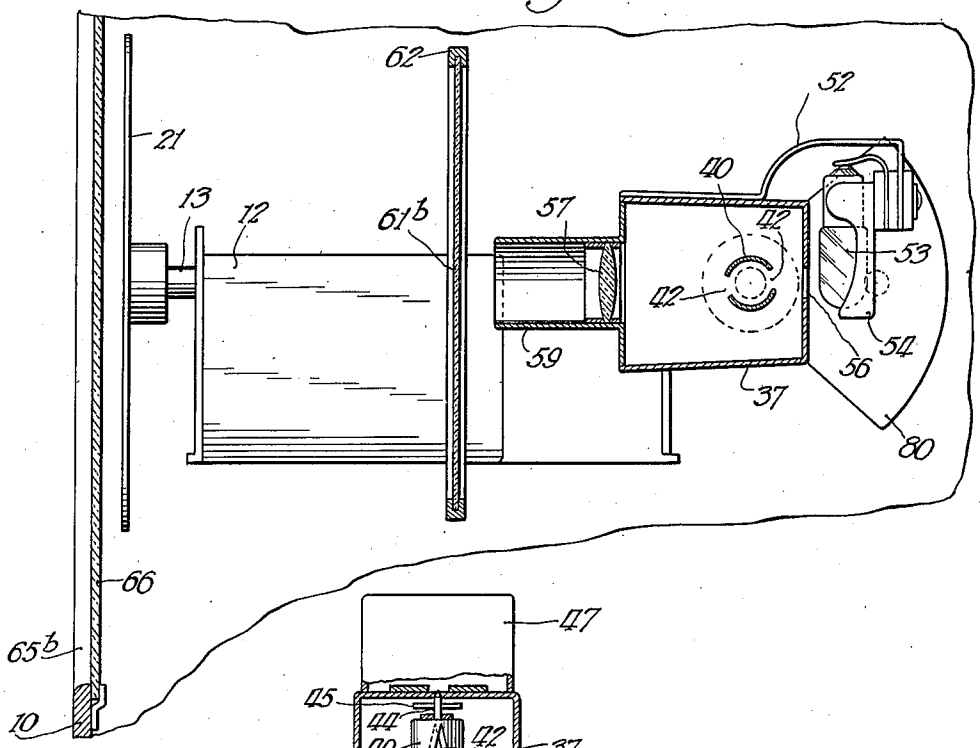


Fig. 4

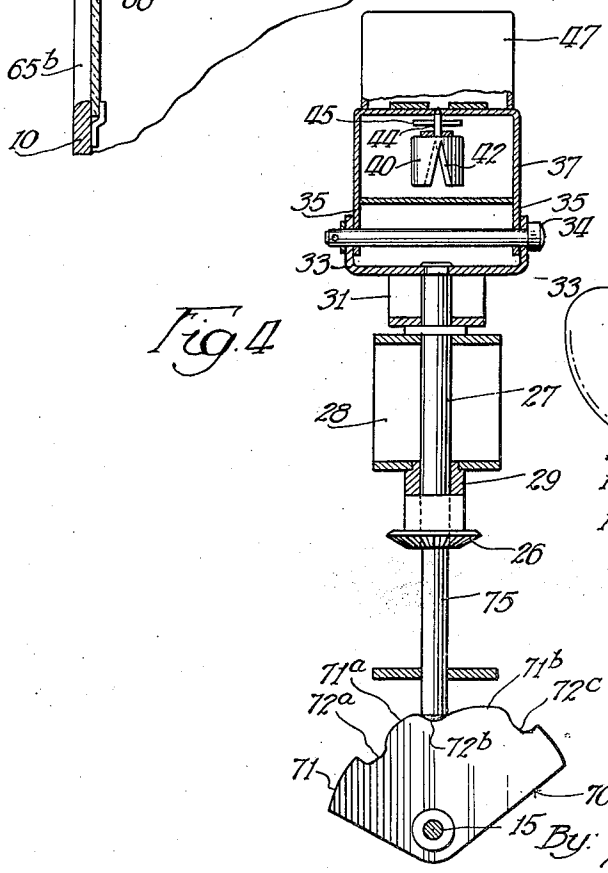
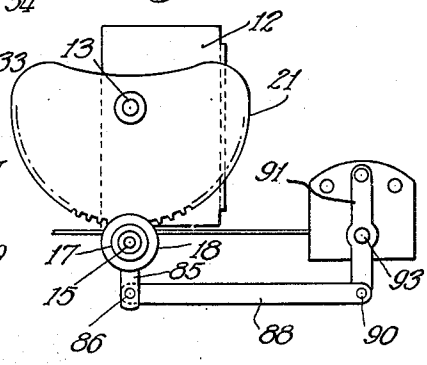


Fig. 5



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Patented Oct. 17, 1939 2,176,673

UNITED STATES PATENT OFFICE

2,176,673

METERING DEVICE

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Application August 27, 1936, Serial No. 98,138

5 Claims. (Cl. 250—40)

My invention relates to electrical metering devices and has particular application to tuning devices for radio receivers, although it is applicable to other electrical instruments.

In the tuning of radio receivers, difficulty is frequently experienced in adjusting the tuning to the maximum strength of the signal which it is desired to receive. Tuning along a scale can only be approximately accurate, due to slight variations which occur from time to time in the wave length of a certain station, and persons with an inaccurate or defective sense of tone find difficulty in tuning by ear.

An object of my invention, therefore, is to provide means for metering an electrical device, and especially for tuning a radio receiver, by means of visual indicia which will vary according to the strength of the impulse being metered, so that the maximum strength of said impulse can be optically determined with the greatest accuracy.

A further object of my invention is to provide a device of the type referred to wherein the visual indicia will be represented by a light beam projected upon a translucent scale, which beam will vary in size according to the sharpness of the electrical impulse being metered.

A further object is to provide a device of the type referred to wherein the indicia will be in the form of an illuminated triangle a vertex of which points toward a tuning scale, which triangle, as the impulse increases in strength, becomes smaller in area, approaching as a limit a point of light.

Another object is to provide, in a device of the type referred to, a plurality of scales of different color, for tuning respective groups of wave lengths, with means for optionally projecting an illuminated tuning indicia onto such scales.

Still another object of my invention is to provide in a metering device, a semi-transparent mirror bearing a calibrated scale, with means for projecting a beam of light upon the rear of said mirror, so that said device, when not in operation, will have a non-mechanical appearance, rendering the same especially attractive as an article of furniture.

Various other objects and advantages will become apparent as the description proceeds.

Referring now to the drawings forming a part of this specification and illustrating a preferred embodiment of my invention,

Figure 1 is a side elevation, partly in section, representing a radio receiver embodying my invention,

Figure 2 is a fragmentary elevational view of the front panel of the receiver, showing a tuning scale embodying my invention,

Figure 3 is a sectional view taken substantially along the line 3—3 of Figure 1,

Figure 4 is a sectional view taken substantially along the line 4—4 of Figure 1, and

Figure 5 is a front elevational view, with the front panel removed, showing certain features of the tuning mechanism.

The numeral 10 represents the front panel of a cabinet housing a radio receiving set having certain operative elements which need not be herein discussed, except to say that it includes a variable condenser 12 having a shaft 13. Journaled in the panel 10 is a shaft 15, retained by bearings 14 and 14'; said shaft having a sleeve 16 rotatably mounted thereon. Keyed to the front end of the shaft 15 is a manipulating knob 17 and independently keyed to the sleeve 16 is a manipulating knob 18. The sleeve 16 carries a spur gear 20 which meshes with a gear 21 keyed to the condenser shaft 13, whereby said condenser may be controlled by manipulation of the knob 18.

The condenser shaft 13 carries at its end opposite to the gear 21 a bevel gear 25 which meshes with a similar gear 26 secured to a shaft 27. Said shaft 27 extends through a bracket 28 fixed to the outside of the condenser housing 12, a suitable journal 29 being provided between the gear 26 and the bracket 28. Another bracket 31 is fixed to the shaft 27 by means of a set screw 32. The bracket 31 carries a pair of spaced perforated ears 33, 33, which serve as bearings for a pintle 34. Said pintle serves as a hinge for a pair of spaced ears 35, 35 carried by a housing 37.

Within the housing 37 is a shutter 40, said shutter being in the form of a cylindrical member having a pair of V-shaped slits or perforations 42 arranged in diametrically opposed relation. Said cylindrical shutter is rotatably carried by a bracket 43 which, in turn, is secured to the upper portion of the housing 37. The shutter is provided with a shaft 44 and fixed to said shaft is a permanent magnet 45. Arranged over the housing 37 is a casing 47 housing an electrical armature 48 and an electromagnet 49 actuated thereby, said armature 48 being electrically connected by means of conduits 50 with an operative element of the receiver, as, for example, in the plate circuit of the detector tube or the intermediate amplifier tubes, whereby the armature coil will be energized in accordance with the tuning of the set to the signals received.

It will be readily apparent that the armature and shutter operate on the principle of a d'Arson-

val galvanometer, the position of the shutter about its axis, as represented by the shaft **44**, varying according to the strength of the received signal.

A bracket **52** (Figure 3) is secured to the housing **37** and this bracket carries an electrical lamp **53** housed in a reflector casing **54**. An aperture **56** is provided in the rear of the housing **37** for the passage of a light beam from the lamp **53** and a double convex lens **57** is provided in a lens tube **59** for focusing the light which is projected from the lamp **53** and through the shutter **40**.

Arranged on the upper wall of the condenser housing **12** is a bracket **60** carrying a plurality of filters indicated at **61***a*, **61***b*, and **61***c*, said filters being mounted in a suitable frame **62**. Said filters are formed of any suitable translucent or transparent material, such as glass or other plastic, and are differently colored, as, for example, green, red, and yellow, respectively, for a purpose hereinafter described.

There is also provided in the front wall **10** of the cabinet a plurality of windows **65***a*, **65***b*, and **65***c*, behind which is arranged a translucent screen **66**. As shown best in Figure 2, the screen **66** is etched or engraved or otherwise provided with indicia **68***a*, **68***b*, and **68***c*, representing three groups of wave bands, such as ordinary broadcast, intermediate, and short wave bands, respectively. The screen **66** may, of course, be formed of any suitable translucent material, but I have found it very effective to use for this purpose a semi-transparent mirror. Semi-transparent mirrors have been used before for other purposes and, hence, the method of their manufacture is well known. I find it highly advantageous to use such a device in a radio, since the present tendency is to produce radio cabinets in such form that they will look as much like an article of furniture and as little like a mechanical device as possible. The use of a semi-transparent mirror in lieu of the types of metering scales heretofore employed imparts to a radio receiver an improved ornamental appearance and, when the device is not in use, gives it the aspect of an attractive article of furniture.

The spindle **15** has keyed to its rear end a cam **70** which is best seen in elevation in Figure 4, said cam having a discontinuous eccentric surface **71**, **71***a*, **71***b* and notches **72***a*, **72***b*, and **72***c*. Said cam is adapted to engage the lower end of a post **75**, said post being slidably retained by bracket **76** carried by the condenser housing and a bracket **77** secured to the bracket **28**. Said post has at the upper portion thereof a bearing member **78** adapted to engage a member **80** extending rearwardly from the housing **37**. A helical tension spring **79** normally urges said member **80** into engagement with bearing member **78**.

Also fixed to the shaft **15** is a lever **85** to which is pivoted as at **86** a rock arm **88**, the other end of said rock arm being pivoted as at **90** to a lever **91**. Said lever is pivotally mounted at **93** and serves as a three-way switch element, said switch element being so connected electrically that when said cam is adjusted in a plurality of different positions the radio receiver will be adjusted for the reception of different wave bands. These electrical features of the device are not shown, inasmuch as the same are entirely familiar to those skilled in the art.

In the operation of the receiver, the knob **18** is used to control the condenser and hence is used as the station selector. As the knob **18** is rotated, the shaft **27** is turned about its axis, by means of the bevel gears **25** and **26**, carrying with it the shutter **40**, armature **48**, lamp **53**, and associated parts. The lamp **53**, being illuminated as soon as the switch actuating the receiver is turned on, will project a beam of light through the shutter **40**, the light being focused by the lens **57** and passing through one of the filters and falling upon the screen **66** in the form of a V-shaped or triangular image I, as seen in Figure 2. Said beam, of course, will be clearly visible from the front of the translucent or semi-transparent screen **66**. Since the shutter will normally be in a position with the diametrical slits **42** in alignment with the light beam, the image I will be of maximum size until a broadcase wave is picked up. The current will then flow through the armature **48** and the shutter **40**, acting in accordance with the well known principles of a galvanometer, will be rotated. As the broadcast wave is more accurately tuned, the strength of the current passing through the armature will increase and the deviation of the shutter **40** from its normal position will accordingly increase, thus reducing the size of the light triangle, as shown in Figure 2. It will be readily apparent that accurate tuning by visual means will thus be very simple, since the illuminated triangle will gradually approach a point as a limit, said point representing the maximum accuracy of tuning.

It will also be seen that the station may be quickly selected roughly, since the light beam projected on the screen is in the shape of a pointer directed toward the numerals of the scale. A further advantage accruing to my invention is that devices embodying the same may be operated in the dark with as much accuracy as in the light.

Tuning the receiver for signals of different wave bands is facilitated by means of the plurality of bands of indicia on the screen **66**, as shown in Figure 2. Selection of one of said bands is made by means of the knob **17**, controlling the electrical elements of the receiver through mechanism as shown in Figure 5, and simultaneously actuating the indicating mechanism by means of the cam **70** controlled through the shaft **15**. When the cam **70** is in such position that the post **75** rests in the lowermost notch **72***a*, the housing **37** will be tilted in such a manner that the light is projected through the uppermost filter **61***c* and passes through the window **65***c*. Rotation of the cam to the intermediate notch **72***b* elevates the post **75** and arranges the housing **37** in the position shown in Figure 1 so that the light is thrown through the filter **61***b* and through the window **65***b* of the front panel. Further rotation of the cam to a point where the post **75** rests in the uppermost notch **72***c* tips the housing **37** to a point where light is projected through the filter **61***a* and through the window **65***a*.

By providing filters of different colors for different wave bands, the operator can tell at a glance what band is being received.

I am aware that tuning a radio receiver by means of a light beam has been suggested in Smith U. S. Patent 1,997,702, granted April 16, 1935. However, so far as I am aware, I am the first to conceive of the use of a pointed beam of light which approaches a dot or point of light as a limit of tuning accuracy.

Various changes coming within the spirit of my invention will probably suggest themselves to those skilled in the art hence I do not wish to be limited to the specific form shown or uses mentioned, except to the extent indicated in the ap-

pended claims, which are to be interpreted as broadly as the state of the art will permit.

I claim:

1. In combination with metering means and means for projecting a beam of light on a graduated screen; a shutter adapted to be operatively connected with the metering means and having spaced walls with V-slots between the screen and the second means, said walls being oppositely movable transverse to the beam by said metering means, said slots being variously registerable relative to the second means to enable a V-shaped beam from the second means to be projected on the screen in similarly-shaped differently-sized V-areas having a common axis, whereby the apexes of the areas will indicate the same reading.

2. In combination with metering means, a graduated screen and means for projecting a beam of light toward said screen to be intercepted by the graduated portion thereof; a shutter having walls spaced apart longitudinally of said beam, said walls having slots aligned with said beam, an edge of one slot cooperating with an edge of the other slot to impart a V-shape to said beam, said slots being movable by said metering means toward and away from said beam to vary the cross-sectional area of said beam without shifting the apexes of the areas from a line substantially parallel to the adjacent screen graduation, whereby the apexes will indicate the same reading.

3. In combination with an electrical circuit adapted to be tuned to resonance, a translucent graduated screen and means for projecting a beam of light onto the graduations; a rotary shutter having a pair of diametrically opposed V-shaped apertures adapted to register with said beam and each other and extending in the same direction from their apexes and oppositely movable in response to the tuning of the circuit to resonance to register with each other in various degrees and thereby impart a V-shape to the light image projected on the screen through said shutter and vary the size of the image in accordance with the degree of resonance of the circuit, said apertures being arranged to be fully in register with each other and said beam when the circuit is in resonance.

4. In combination with an electrical circuit, a translucent graduated screen and means for projecting a beam of light onto the graduations; a rotary shutter having a pair of diametrically opposed V-shaped apertures through which said beam passes, to impart a V-shape to the light image projected on the screen through said shutter, means for tuning the circuit to resonance, and means cooperating with the tuning means and said shutter for rotating said shutter so as to vary the alinement of said apertures and thus vary the size of the image in accordance with the degree of resonance of the circuit.

5. In combination with a radio set having a graduated station selector scale illuminated by a lamp; means for tuning the set to resonance with a received signal, means responsive to the tuning of the set for restricting the area illuminated to a V-shape, and means responsive to said tuning means and operative upon said restricting means for reducing the area without substantially shifting the apex of the area transversely of the graduations, as resonance is approached.

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