

May 18, 1937.

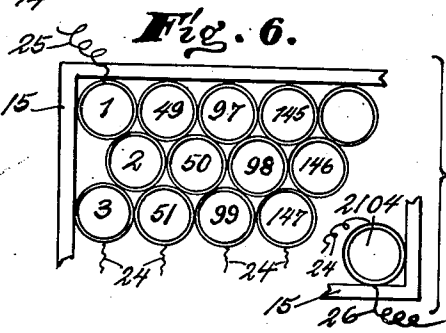
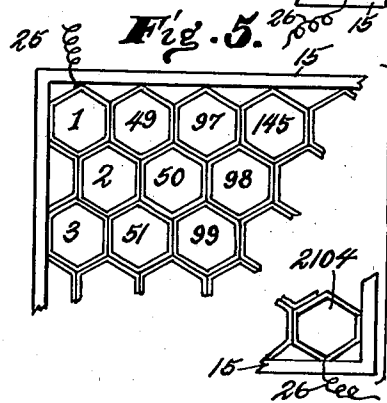
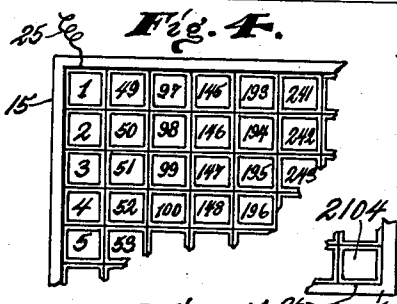
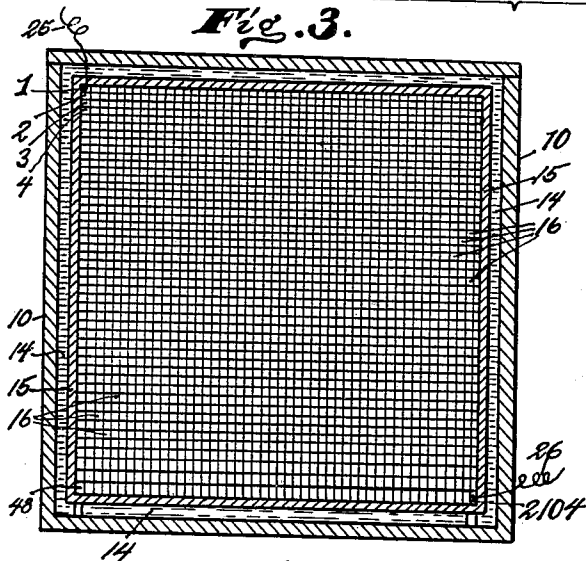
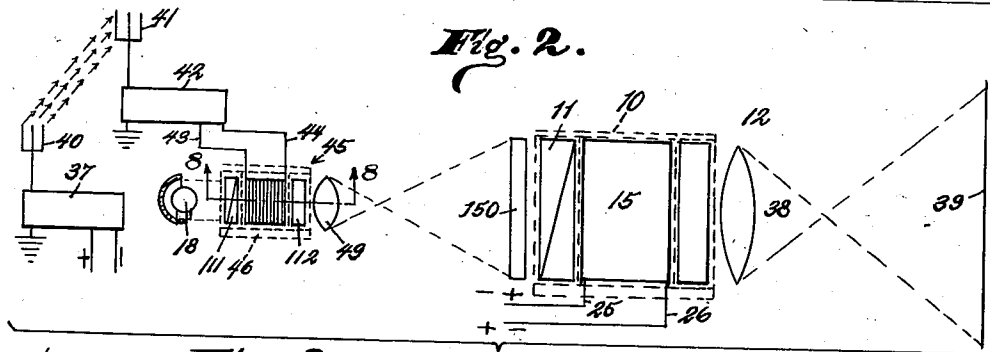
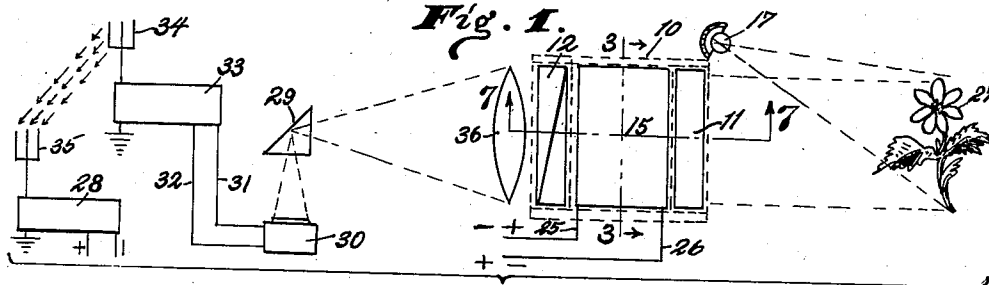
C. F. JOERS

2,080,942

APPARATUS FOR USE IN TELEVISION

Filed June 1, 1931

2 Sheets-Sheet 1



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May 18, 1937.

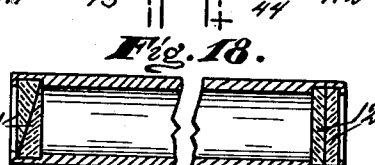
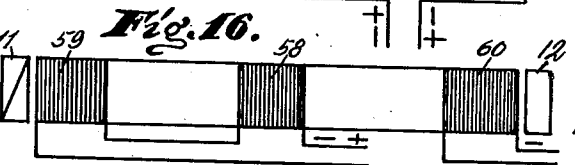
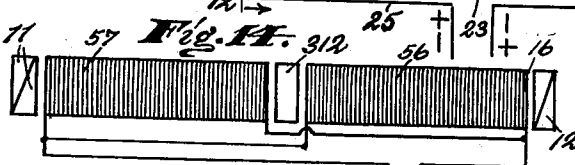
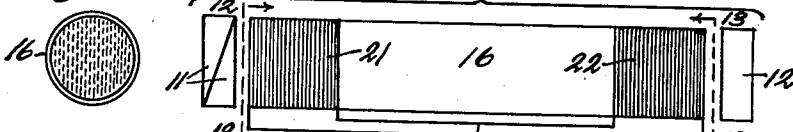
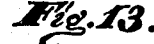
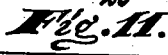
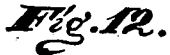
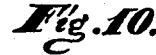
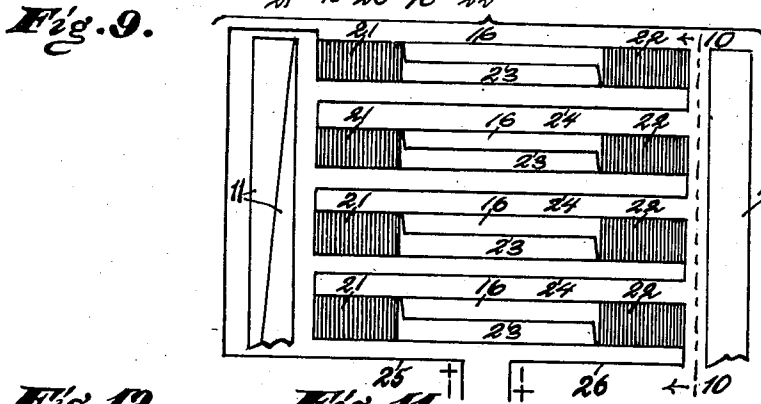
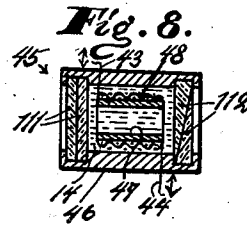
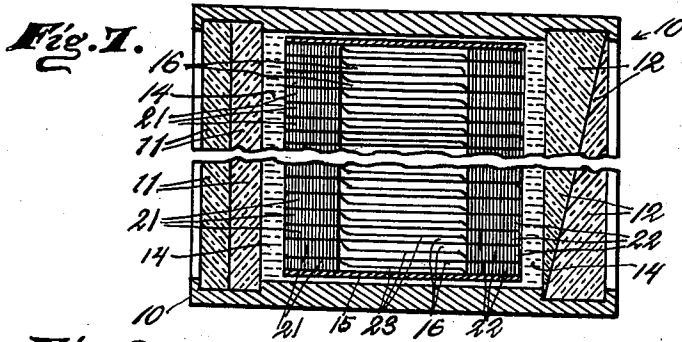
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2,080,942

APPARATUS FOR USE IN TELEVISION

Filed June 1, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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APPARATUS FOR USE IN TELEVISION

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4 Claims. (Cl. 178—6)

This invention relates to sending and receiving pictures by wireless and the principal object is to provide a simple apparatus that can be used for such purposes that is adapted to be operated without rotary mechanical parts. In other words the only moving elements in the picture sending and receiving apparatus are light and electricity with the parts for controlling them fixed relative to motion so that when once assembled in proper position they need never be changed or adjusted.

Another object of the invention is to provide an apparatus for use in television that is adapted to be placed in synchronization with other stations by electrically tuning it into the same electrical frequency in use by the remote station to which a picture is to be sent or from which one is to be received. In other words the adjustment for a proper electrical frequency to be used with my apparatus is accomplished in a sending and receiving set associated with my apparatus.

Sending and receiving sets for radio and their adjustments for proper electrical frequency are well understood in the art and for that reason are shown only diagrammatically as associated with my apparatus.

Features of invention are shown in the construction, combination and arrangement of the parts of my apparatus whereby it operates automatically to both send and receive pictures so long as it is supplied with light and electricity and focused on a scene or object. That is, as the alternating current passes in one direction a picture can be sent to a receiving set, and when it passes in the opposite direction a picture can be received by a receiving set, only the peak voltage of the frequency being used.

A feature of invention is shown in providing the apparatus with a frame of multiple tubes each adapted to be magnetized in its proper time and prearranged order by the same electrical frequency, and through which light can reversely travel to receive a picture when the light is moving in one direction and to send it when traveling reversely.

A feature of invention is shown in the means for controlling the light as it enters, travels through and leaves each tube.

Another feature of invention is shown in providing an apparatus in which pictures are received and sent through the same set of light tubes magnetized to the same intensity by the same frequency of an alternating current in a timed predetermined order.

Other objects, advantages and features of in-

vention may appear from the accompanying drawings, the subjoined detail description and the appended claims.

The accompanying drawings illustrate the invention:

Figure 1 is a diagrammatic side view of an apparatus for use in television constructed in accordance with this invention showing it arranged to transmit a picture of a flower by wireless from a local to a distant receiving station.

Fig. 2 is a view analogous to Fig. 1 with parts of the local station arranged to receive by wireless a picture from a distant sending station.

Fig. 3 is an enlarged cross section on line 3—3, Fig. 1, diagrammatically indicating a frame of multiple light tubes submerged in a tank of nitro-benzol, the tubes being shown square in cross section.

Fig. 4 is an enlarged fragmental view of the upper left hand corner of the frame shown in Fig. 3, showing an end view of a number of multiple light tubes about four times their actual size.

Fig. 5 is a view analogous to Fig. 4, showing a honeycomb arrangement of the multiple light tubes.

Fig. 6 is also a view analogous to Fig. 4, showing a group of multiple light tubes that are round.

Fig. 7 is a fragmental semi-diagrammatic longitudinal section on line 7—7, Fig. 1, showing a layer of multiple light tubes submerged in a nitro-benzol liquid tank with the ends of the tank closed by reversely arranged prisms; and also diagrammatically showing the preferred form for electrically winding the tubes.

Fig. 8 is a semi-diagrammatic longitudinal section on line 8—8, Fig. 2, showing a single light conveying tube electrically wound and submerged in a nitro-benzol tank.

Fig. 9 is an enlarged fragmental diagrammatic view of the multiple light tubes between reversely arranged prisms showing the tubes wound and connected by a fine wire and also showing the tubes separated a considerable distance to more clearly indicate their electrical connection and also showing the tubes wound substantially alike with timing lengths of wire connecting the coils of each tube and also timing length of wires connecting the tubes.

Fig. 10 is an end view of the tubes and windings as seen from line 10—10, Fig. 9, with portions of the wire between the tubes offset to more clearly show their connection.

Fig. 11 is a diagrammatic view of a single tube

and its associated prisms on a very large scale.

Fig. 12 is a diagrammatic end view of the light tube as seen from the line 12—12, Fig. 11, indicating by dotted lines that the light passing through the prism at the left hand end of the tube has been polarized into a vertical plane.

Fig. 13 is a view analogous to Fig. 12 as viewed from line 13—13 indicating that the light in the tube has been turned ninety degrees by the magnetic field therein so it lies in a horizontal instead of a vertical plane or in a position to pass through the prism at the right end of the tube.

Fig. 14 shows a light tube formed of coiled wire in two parts arranged with inner ends adjacent an intermediate prism and with the parts in circuit, and with one part adapted to act slightly in advance of the other.

Fig. 15 shows a light tube formed of coiled wire.

Fig. 16 shows a light tube with separate windings at opposite ends with each winding in a separate circuit.

Fig. 17 is a fragmental longitudinal section through a multiple tube tank semidiagrammatically showing its ends closed by glass screens and the tubes provided with individual polarizing and analyzer prisms in their ends.

Fig. 18 is an enlarged fragmental longitudinal section through one of the multiple tubes shown in Fig. 19, showing reversely arranged prisms secured in its ends.

My apparatus for sending and receiving pictures by television includes a tank 10 that has its top, sides and bottom formed of opaque material and the ends are closed by prisms 11 and 12 so it can be filled with nitro-benzol 14 in which the tube frame 15 with its multiple light tubes 16 can be submerged.

If desired the ends of the tank 10 can be closed with the glass screens 13 with the prisms 11 and 12 interposed between the ends of the frame 15 and screens as semi-diagrammatically shown in Figs. 17 and 18.

The frame 15 is arranged within the tank so that the open ends of the multiple tubes are adjacent the prisms 11 and 12 so that light entering the apparatus through the prisms can pass through the tubes in a predetermined order that will be explained later.

The prisms are arranged transversely or at right angles to one another so that light entering the tank 10 through one or the other prisms 11, 12 is polarized so it can not pass out of the tank through the opposite prisms until the plane of polarized light is turned ninety degrees. In other words, the prism through which the light enters the tank is the polarizer and the other the analyzer of the light, and the parts are constructed and arranged so that in both sending and receiving pictures the prism alternately functions as both polarizer and analyzer of the light. That is, when the light enters from one end of the tank the prism through which it enters functions as the polarizer, but when the direction in which the light travels is reversed it will function as the analyzer.

As previously indicated, the tubes 16 are arranged in the tank so that light either directly or reflected from the lamps 17 or 18 will pass through them; and in this connection I provide a simple means for controlling the light so it is flashed from the tubes singly and in a consecutive order to scan a scene for sending a picture or receiving the picture of a scene scanned and broadcast by another station.

This means includes a winding for each tube

with the windings connected so that an alternating electrical current of a predetermined frequency can be passed through the coils to establish magnetic fields of the same intensity in each tube separately and in a consecutive order with the current of sufficient voltage to establish magnetic fields of sufficient intensity to turn in a successive order the plane of light in each tube ninety degrees so it can pass out of the tank through the prism opposite to the one through which the light entered. When the light is thus successively passed from the tubes in one direction and order a scene can be scanned by them to send the picture to a distant receiving station and when passed in the other direction a picture can be received from a sending station and projected to a visualizing picture screen. In other words, if an alternating electric current of a predetermined frequency is passed through the coils of tube 1 shown in Fig. 3, and in through the intermediate tubes to tube 2104, each in succession will be magnetized to pass its portion of the light in one direction on the first phase of the impulse, and on the second phase the impulse will pass reversely through the coils of the tubes from the tube 2104 to tube 1.

The multiple tubes 16 are preferably wound as shown in Figs. 7 and 9; and as seen therein opposite end portions of each tube are wrapped with the same number of turns of fine copper wire so that the lengths of the wire in the coils 21 are equal to that in the coils 22 and the coils are connected by intermediate wires 23 the purpose of which is to cause gaps of time to elapse between the energizing of the tube coils.

Also there are gap time wire connections 24 that connect the extreme ends of the coils 22 with the starting ends of the coils 21 arranged to progress from tube to tube until all are in circuit with one another so that electrical current entering the coil 21 of the first tube will pass through link wire 23 to coil 22 and then through the gap wire 24 to the coils of the next or second tube and so on through the coils of all of the tubes in a successive order.

An alternating electrical current of any suitable frequency can be supplied to the coils of the tubes in any suitable way through the wires 25 and 26 it being understood that the same frequency is used for each tube, and that any suitable frequency can be used. The source of energy is not shown as it is well understood in the art.

The frame 15 is preferably supplied with a larger number of tubes than are diagrammatically indicated, as is used in Figs. 3 to 6 inclusive, for as the number of tubes in use increases so proportionately will the details of the picture increase in clearness and detail and in actual practice I prefer to employ from four to six thousand tubes according to the fineness of the detail in the pictures to be sent or received.

For the purpose of illustration I diagrammatically indicate in Fig. 3 that the frame 15 contains two thousand one hundred and four of the tubes 16 which, after being wound and insulated from one another as by painting them with shellac, are assembled and secured in the frame, as shown, with the coils of No. 1 tube connected to the wire 25 and coils of tube No. 2104 connected to wire 26.

With parts so arranged an alternating electrical current entering the coils of tube No. 1 will pass on one phase of the frequency successively through all the coils of the intermediate

tubes until it passes out of the coils of tube No. 2104 and then the direction of the flow of the electrical current is reversed on the other phase of the frequency to energize the tubes 16 in succession from tube No. 2104 to tube No. 1, and so on for an indefinite period or so long as the apparatus is to be continued in use.

As previously indicated the purpose of energizing the coils of the tubes in a successive order is to successively create a magnetic field in each tube of sufficient intensity to separately turn the planes of polarized light in the tubes ninety degrees so they can pass out of the tubes through the prism opposite to the one through which the light entered, the purpose being to interrupt the light in all the tubes until the moment necessary to flash light of each in a proper order to illuminate an object to be scanned or to project a received picture to a visualizing screen. Each tube in use of scanning a scene illuminates its respective part of the area thereof; and in receiving a picture transmits its small area to a screen, which illumination while distinctly separate for the purpose of transmitting and receiving pictures is accomplished with such great rapidity that the intervals between the flashes cannot be detected by visualization so that the picture received or sent appears to be an undivided scene.

Referring to Figs. 1 and 3 it is assumed that the picture of the flower 27 is to be sent by wireless to the distant receiving station 28. The light from the lamp 17 is reflected from the flower to and through the polarizer prism 11 into the multiple tubes 16 in the frame 15 that is assumed to be submerged in the nitro-benzol tank 10 that is indicated by dotted lines.

Any suitable solution for light turning purposes may be used. As is well understood, the purpose of nitro-benzol in the tubes is to make it easier for the magnetic fields to turn the polarized lights in the tubes.

The tubes are focused in one direction on the flower 27 and in the other on a light reflector prism 29 that is arranged to transmit the flashes of light from the tubes 16 toward a photo electric cell 30 that is connected by wires 31, 32 with the local picture sending set 33 that, through its antenna 34, is in wave communication with the antenna 35 of the distant receiving set 28. A lens 36 is arranged adjacent the prism 12 to focus the flashes of light from the multiple tubes 16 to the prism 29.

With parts so arranged and an alternating electrical current supplied to the wires 25, 26, the light in all of the tubes 16 will be flashed in the consecutive order heretofore described and the picture of the flower 27 will be transmitted to the distant receiving station 28.

In Fig. 2 the parts of my apparatus are arranged to receive a picture from the assumed distant sending station 37 and reproduce it on the prism 12 or through the lens 38 project it to the visualizing screen 39.

By wireless the picture impulses from the antenna 40 are transmitted to the antenna 41 of the local receiving set 42 that is connected by wires 43, 44 with the impulse shutter 45 that is used for varying the intensity of the electrical impulses and through which the light from the lamp 15 passes after it has passed through the polarizing prism 11 in one end of the benzol tank 46 shown in detail in Fig. 8.

The shutter 45 includes the tank 46 with top, sides and bottom formed of opaque material and

with prisms 111 and 112 closing its ends. The tank is filled with nitro-benzol in which a single light tube 47 is submerged with its ends open toward the prisms and this tube is wound with a coil that extends from end to end thereof with the ends of the coil connected by wires 43, 44 to the receiving set 42, it being understood that the set 42 is standard with means therein for properly energizing the coil 48 on tube 47 when necessary.

After the light from lamp 18 has passed into the tank 46 through prism 111 and is influenced by a magnetic field caused by energizing the coil 48 the impulses of light will pass through the prism 112, lens 49, light straightening screen 150 through prism 11 into the nitro-benzol tank 10 where it can pass through all of the tubes 16 in frame 15 to the prism 12 where it is interrupted until each tube in a separate consecutive order from 1 to 2104 is electrically energized, as previously described. When so energized the picture received from the station 37 through the lens 38 will be projected to the visualizing screen 39 as previously stated.

In Figs. 11, 12, and 13 I diagrammatically illustrate the action of a magnetic field on the light that is assumed to be polarized and passing through the tube from the left to the right. Fig. 12 shows the light polarized into a vertical plane when passed through the prism 11 with the prism 12 arranged to trap the light in the tube until turned by a magnetic field, as stated. In Fig. 13 the dotted horizontal lines indicate the position of the plane of light after it has been turned ninety degrees or in a position in which it can pass on through the prism 12 in the course desired.

In Fig. 14 a method of winding a two-part tube is illustrated, in which instance I use an intermediate prism 312 additional to the end prisms 11 and 12.

The coils 56 and 57 cover the two parts of the tube 16 from end to end with each coil in the same circuit, but arranged so that the coil 56 is energized slightly in advance of the coil 57, by which means I accomplish a greater speed of picture impulse transmission.

In Fig. 15 a method of winding a tube is shown that is preferably employed in the parts 45, 48 and 49 shown in Fig. 2, and of which a section is shown in Fig. 8. In other words where a single tube is employed to convey all of the light of picture impulses I preferably wind the tube as indicated in the aforementioned figures. It is obvious that the tubes formed of coiled wire, as shown in Figs. 14 and 15, can be utilized in the same way as the tubes 16 shown in the other figures hereinbefore described, as the ends of the coils can be used to connect them in a series as are the other coils.

In Fig. 16 I show another method for winding a single tube in which windings I connect the coils 58 and 59 in one circuit and another coil 60 in a second circuit, both sets of coils arranged to establish magnetic fields within the tube for the purpose previously described.

In Figs. 17 and 18 I show each tube provided with its individual set of end prisms 11 and 12 reversely arranged with the ends of the tank 10 closed by the glass screens 13.

In operation the apparatus is used as hereinbefore described.

I claim as my invention:

1. An apparatus for use in television including a tank having an opaque top, bottom and sides, 75

polarizer and analyzer, prisms closing the ends of said tank that are arranged at right angles to one another, a frame in said tank that is submerged in nitro-benzol, a plurality of tubes in said frame with their ends open toward said prisms so that light can enter them through said prisms, and means including connected and like wire windings for each tube over which an alternating electric current can be passed for creating a magnetic field successively in a predetermined order in said tubes so that the light that has entered the tube through the polarizer prism can pass out of said tubes through the analyzer prism.

2. An apparatus for use in television including a tank having top, sides and bottom formed of opaque material, a frame therein, a plurality of tubes in said frame submerged in nitro-benzol, a polarizer prism closing one end of said tank through which light can enter said tubes in a predetermined course, an analyzer prism closing the other end of said tank arranged to temporarily interrupt the course of said light, and means including connected and like wire windings for each tube through which an alternating electric current can be passed for creating a magnetic field in each of said tubes in a predetermined order to singly and in succession permit the light that has entered said tubes through said polarizer prism to pass out of said tubes through said analyzer prism when said magnetic field is created.

3. An apparatus for use in television including a tank having top, sides and bottom that are impervious to light, a frame therein, a plurality of parallel tubes in said frame that are insulated from one another, a polarizer prism in an end of each tube through which light can enter in a predetermined course, an analyzer prism in the

other end of each tube for temporarily interrupting the course of said light, a lamp for supplying light through said polarizer prisms to said tubes, and like electrical wire coils on said tubes, and timing wires connecting said coils in series, said coils arranged to cause magnetic fields in each tube in a consecutive order when energized by a current of electricity to thereby turn the light in said tubes so it can pass in a consecutive order through said analyzer prisms for the purpose specified.

4. An apparatus for use in television including a tank having a top, sides and bottom formed of opaque material, a frame therein, a plurality of tubes in said frame submerged in nitro-benzol, a polarizer prism closing one end of said tank through which light can enter said tubes in a predetermined course, an analyzer prism closing the other end of said tank arranged to temporarily interrupt the course of light entering said tubes, similar electrical wire winding for each tube, said windings connected in series so that when an electrical current is passed therethrough magnetic fields will be successively created in said tubes so that the light therein can pass on through the tubes and out through the analyzer prism in a successive order, a lamp for illuminating an object so the reflected light therefrom is directed through said polarizer prism into said tubes, means for passing an electric current through said series of wire winding so that successively a magnetic field will be created in each tube to permit the light therein to pass on out through said analyzer prism, and a photo-electric cell in said apparatus for successively receiving the light impulses as they pass from said tubes through said analyzer prism.

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