STUDIO.

TRANSMITTER.

THE EIFFEL TOWER TELEVISION INSTALLATION

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THE EIFFEL TOWER television studio is equipped with a powerful source of light, which illuminates the persons or scenes to be televised. The reflected rays pass through a rotating Nipkow disk with 2 spirals (each with 90 holes) and are projected on a photoelectric cell, from whence the current variations are amplified and transmitted to the radio-broadcasting station.

The photoelectric cell used is in the form of a valve with two outlets. It has the property of transforming the fluctuations of luminous rays received into variable electric current. The light rays strike a layer of photo-sensitive metal inside the valve. When connected to an external circuit the cell sets up an electric current proportional in intensity to the amount of light it receives, and the current variations follow instantaneously the variations of light.

Electric oscillation is thus received in proportion to the light reflected from each point of the scene to be transmitted. As the reflected rays pass through the perforations in the Nipkow disk, a very thin and very mobile ray of light strikes the sensitive surface of the cell. The displacement speed at the end of the luminous ray, may, in certain cases, reach a speed of 1,000 meters per second.

SCANNING

The difference existing between direct vision and television, even with a steady picture, resides in the necessary division of the picture, in the case of television, so that all the consecutive parts may be transmitted consecutively. Thus it appears that improvement of television can never bring it to equal direct vision, since the scanning must of necessity be of a definite speed.

An increase in the number of lines is possible, but this does not appear to give further improvement, increasing difficulties; numerous experiments have been conducted with regard to this aspect, 180 lines and 25 pictures per second have therefore been chosen, which make it possible to employ films in ordinary use for telecinema.

The same receiving apparatus can receive, without any change, either tele-

CAMERA.

RADIO AND TELEVISION RECEIVER.

vision or telecinema broadcasting; but the apparatuses sending out the two are distinctly different. For telecinema a ray of light is used which penetrates transparent portions of the film and then encounters the cell; while in the case of direct television, the light furnished by the projectors, or the sun, floods the person or the scene to be televised and is reflected on the photoelectric cells through the mobile perforated disk.

The essential part of the receiver is the cathode-ray oscillograph, the introduction of which marked a turning point in the history of television. Its use when receiving television has abolished the revolving apparatus, synchronous disks and motors, which previously was the weak spot in the system.

At the present stage of technical progress, the cathode-ray tube is the only possible solution for a receiver. Even for broadcasting, an oscillograph seems necessary.

SYNCHRONIZATION

The problem of synchronization has been solved in a satisfactory manner and patents have been taken out in France and abroad which places the Cie. des Compteurs in an excellent position.

The result to be obtained is as follows: The centering must be absolutely stable, without any adjustment of the animated picture on the fluorescent screen, whatever the shape and intensity of modulation.

This result is obtained by an arrangement of relays of ionized gas, known as "thyratrons", and by the evident fact that there is a simple relation between the horizontal movement of the luminous spot and its vertical displacement. In fact, the quotient of time of the vertical displacement by the time of horizontal displacement is equal to the number of lines, which defines the quality of the analysis.

By means of reflecting plates in the oscillograph, the luminous spot is made to trace horizontal lines in juxtaposition on the fluorescent surface at a constant speed in proportion to the analysis speed of the picture when viewed through the Nipkow disk.

Also, the brightness of the spot is derived from the modulation arising from the exploration of the broadcasting apparatus, the "black" and "white" in the scene to be transmitted are therefore reproduced in synchronization at the proper places on the screen. This entire reconstitution of the picture should be effected in 1/25 of a second.

The two factors of the movement of the luminous spot are two movements of constant speed. One, very rapid in the horizontal plane, furnishes the line; and the other, much slower, displaces the line from top to bottom in order to give the vertical dimension of the picture. The two deviations of the cathodic screen are obtained by applying to the deflecting plates of the perpendicular parts two tensions increasing lineally as a function of time.

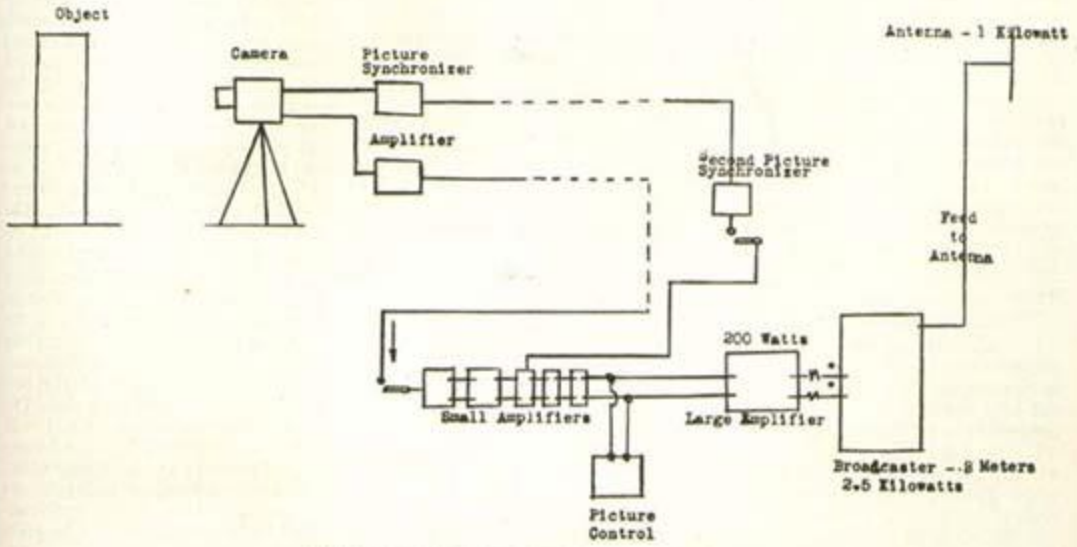
Generally the tension for causing the spot displacement is created by charging a condenser with current of constant intensity; in this instance, the potential across the condenser increases with the time during the period of charging. When the value which corresponds to the maximum desired deflection of the spot has been reached, the latter is brought back to its initial position by a sudden discharge from the condenser. This backward movement of the spot must be effected in less than one-hundred-thousandth of a second.

This condition is easily achieved by discharging the condenser through an ionized gas tube, where the internal resistance, at the moment of commencing the discharging, is very low, owing to a high positive voltage on the grid.

These periods of discharge should correspond with absolute precision to the ends of the lines of analysis, in rhythm with the broadcasting. It should be noted here that there is a noticeable difficulty in the use of "thyratrons", since the discharge tension applied to the grid does not always produce exactly the same potential when starting, with a resulting uncertainty in time, and it is then noted in the picture that the straight lines become broken lines. However, this inconvenience has been remedied.

Another difficulty, encountered more especially in slow movement, is the lack of linearity in the charging of the condenser which causes the vertical deflection. Some foreign constructors have compensated this defect with the aid of an amplifying lamp giving in inverse deformation. The C. D. C. has been able to obtain a satisfactory result without any additional lamp.

Finally, and this is the most important question, the Cie. des Compteurs has obtained control of the picture or verti-



BLOCK DIAGRAM OF EIFFEL TOWER TELEVISION INSTALLATION.

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