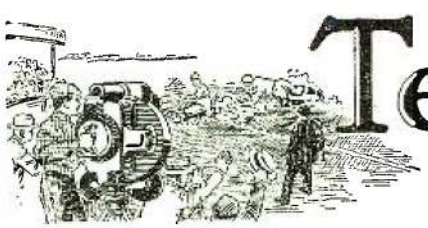


Television

Under this heading, RADIO NEWS publishes each month descriptions of the latest developments in the extremely interesting field of television.

Successful Television Accomplished on Broadcast Band

ALTHOUGH the opinion has been expressed, by many radio engineers and government radio experts, that television on the regular broadcast band is practically impossible of accomplishment because of the 5,000-cycle modulation limit under which all broadcast stations operate, a group of Chicago experimenters has actually performed the feat to the satisfaction of a number of that city's radio experts and leading television skeptics. A highly-successful demonstration was given late in June, the transmitting being done through station WCFL on its regular 620-kilocycle wave. The receiving was done with a commercial neutrodyne installed in a club house several miles from the Municipal Pier, on which WCFL's transmitter is located.

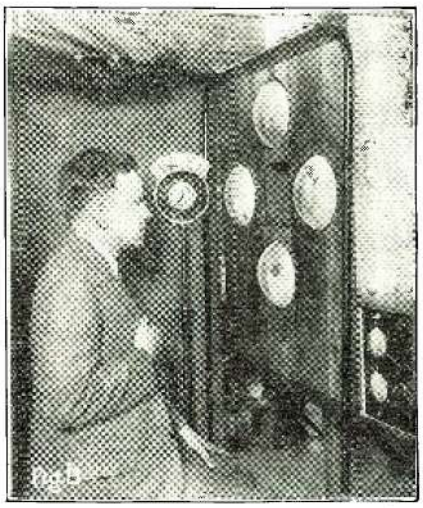
E. F. Nockels, secretary of the Chicago Federation of Labor, was the subject who was "televised." Several of his friends who witnessed the demonstration in the club room had no difficulty in recognizing the image of him that appeared in the receiving apparatus, yet the operators in charge of the equipment stated that not only did the television signals stay within the legal 5,000-cycle limit, but they seemed actually sharper than ordinary voice and music impulses.

The television transmitting equipment used for this demonstration, and also a test receiver employed for experimental work in the WCFL laboratory, are shown in the pictures on this page and the following one. The apparatus was designed by Ulises A. Sanabria, a young experimenter who has been working quietly on television for the past five years, and by his assistant, M. L. Hayes. They have had the helpful cooperation of Virgil A. Schoenberg, chief engineer of WCFL. No pictures were taken of the television receiver actually used for the radio demonstration, but a good idea of its construction may be obtained from Fig. D, which shows a duplicate of the model.

CONSTRUCTION OF THE TRANSMITTER

In general arrangement, the television transmitter used by Sanabria is a development of the well-known Ives system, but it is considerably simpler than the complex machines used by the Bell Telephone Laboratories and the General Electric Company in the demonstrations these companies gave during the past year. Fig. D shows the complete instrument set-up at WCFL. The transmitter, the parts of which are designated by the letters P, L, D and A, is in the background, while the "check" machine, which is a television receiver connected by direct wire to the transmitter for monitoring purposes, is in the foreground.

As shown in Fig. A, the first unit of the television transmitter is a powerful spotlight, A, which may be an arc light but which in this case is a 1,000-watt mazda lamp inside a protecting case. Revolving in front of the aperture through which the light of this lamp issues is a disc D, drilled with a spiral of tiny holes. The synchronous motor M drives this disc through the belt B. An important feature of the mechanical construction is the weight and rigidity of the parts; the shaft to which the disc is attached revolves in ball bearings in a heavy cast-iron frame, which in turn is bolted to a massive cast-iron base which also supports the driving motor. The disc itself is of thin metal, but faced with two flanges ½-inch thick, which overcome any tendencies on its part to wobble. As pointed out in the article on page 222 of this number, a variation of this kind, if allowed to develop, will ruin the transmission.



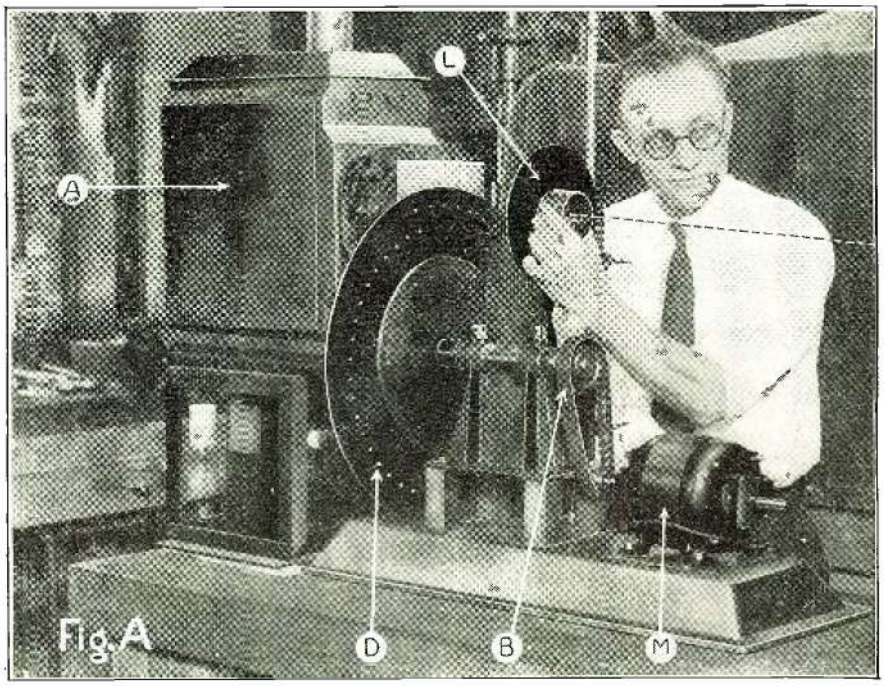
M. L. Hayes, seated before the photoelectric cells of WCFL'S television transmitter.

After the light from the lamp passes through the holes in the disc, it is concentrated by a powerful condensing lens, L, in such a manner that tiny pinhead beams are projected straight forward. One such beam is indicated by the dotted line in Fig. A. Of course, as the disc revolves, a continual series of beams will be thrown forward.

The person to be televised sits in a shaded booth (See Fig. B), facing directly into the lens, but about four feet from it. In front of him is a large wooden box with a square hole in its center to allow the light to pass through. Surrounding this opening is a bank of four photoelectric cells, marked P in Fig. D. A close-up of this booth and the photoelectric-cell box is shown in Fig. B, with Mr. Hayes acting as the subject.

TELEVISING A SUBJECT

The operation of the apparatus now becomes evident. As the disc revolves, it



A close-up of the disc assembly: A, 1,000-watt lamp unit; D, scanning disc; B, driving belt; M, driving motor; L, condensing lens. The dotted line represents a beam of light as it is directed upon the subject's face.

U. A. Sanabria, left, and V. A. Schoenberg, right, showing the difference in size between an ordinary photoelectric cell and the large type used at WCFL.

causes beams of light to pass over or "scan" the face of the person sitting in the booth. Because of the spiral arrangement of the holes, (48 holes were used in this particular disc, which is of 24-inch diameter), each beam starts at a slightly lower point than the preceding one; with the result that the face is "swept" by a series of concentric arcs of light. The light is reflected from the subject's face and falls into the photoelectric cells, which set up varying electric currents corresponding in amplitude to the light and dark portions of the skin, hair, eyes, etc. These currents, which are extremely weak, are amplified by a six-stage resistance-coupled audio amplifier (PA in Fig. D).

For testing purposes the output of this amplifier is carried directly to the checking receiver, which comprises the neon tube T, the revolving disc RD and the driving motor RM. For actual television broadcasting, an additional five-stage amplifier is hooked in before the impulses are allowed to actuate the broadcast transmitter proper.*

The receiver, it will be seen, is a comparatively simple affair. The disc is a duplicate of the one used in the transmitter, while the neon glow-tube T, which responds to the television impulses just as a loud speaker responds to musical impulses, is a standard bulb.

For laboratory demonstrations the transmitting and receiving discs are rather easily synchronized; as both motors run off the same power line. During the radio demonstration, no trouble in synchronizing was experienced, because the city of Chicago is fed by one power system. The receiving motor was simply snapped on and off several times until the received picture assumed the proper "frame;" that is, until the positions of the holes in the discs were synchronous, as well as the speeds of rotation.

* For more detailed descriptions of television machines of practically identical nature, see RADIO NEWS for April and May, 1928, and *Television Magazine*, issued by the publishers of this magazine.

RESULTS OF HIGH QUALITY

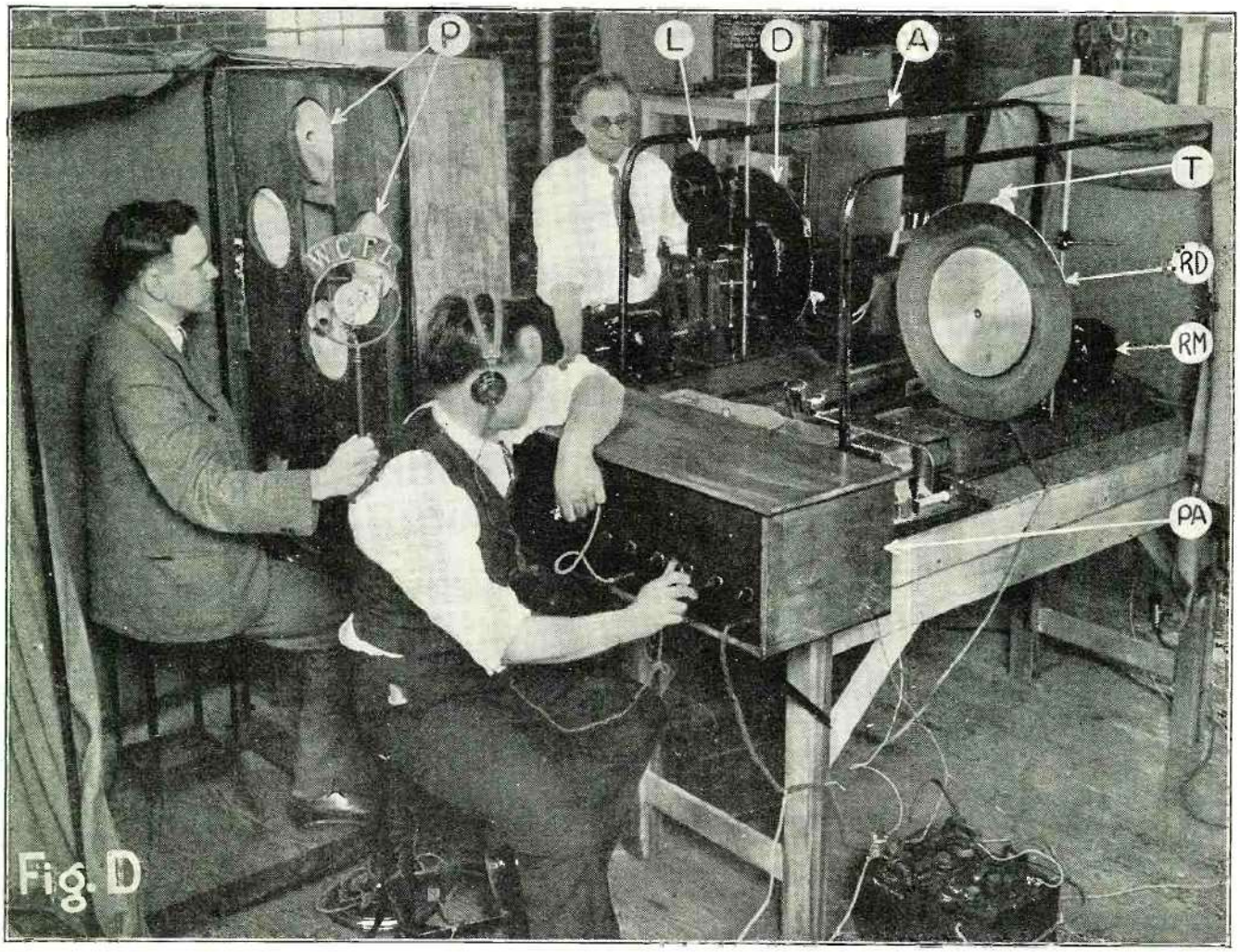
The images visible in the check receiver, as viewed by a member of RADIO NEWS' staff, were really very good. It is difficult to describe the exact grade of their definition, but it can be said that the televised faces are distinctly recognizable. The images are streaked with the fine lines characteristic of television disc systems; but they are distinct enough to show the reflection of eyeglasses on the subject's face and the shadow of smoke from a cigar in his mouth.

THE PHOTOELECTRIC CELLS

Much of the success of this television work at WCFL is due to the photoelectric cells. They measure nine inches in diameter, are of the potassium type and extremely sensitive. The direct output of three of the four cells shown in the illustration, when led through only five stages of resistance-coupled amplification, is sufficient to operate the check receiver quite satisfactorily.

These cells, as well as three twelve-inch

(*Continued on page 277*)



The complete experimental television at WCFL. The parts of the transmitter are: P, photoelectric cells; L, condensing lens; D, scanning disc; A, source of light. Receiver (in foreground): PA, amplifier; RM, driving motor for scanning disc, RD; T, neon glow tube. M. L. Hayes, left; U. A. Sanabria, wearing phones; V. A. Schoenberg, rear.

be used and enough turns should be placed on the plate winding to cause regeneration at the highest desired wavelength. The plate winding may be located on the same coil form as the secondary and should be placed at the filament end of the latter coil. Also, in regenerative circuits of this type, an R.F. choke coil must be connected in series with the output circuit, to prevent the R.F. current from returning to the filament through the phones rather than through the plate coil.

(To be continued next month)

Successful Television on the Broadcast Band

(Continued from page 220)

bulbs acquired by RADIO NEWS for use at its own broadcast station, WRNY, were made by Lloyd Preston Garner, a graduate of the University of Illinois, in the laboratories of that institution. They represent an enormous amount of technical experimentation and constructional skill, and are probably the finest devices of their kind in existence to-day. Some idea of the size of these cells may be obtained from Fig. C, on page 220, and the illustrations on pages 221 and 256.

The radio television demonstration given in June was intended merely to show the feasibility of television transmissions on the regular broadcast band. At the present writing neither Mr. Sanabria nor the officials of WCFL have any definite plans for television broadcasting on regular schedules; but they have stated that they will make plans of this kind in the near future.

Sanabria is working on a number of ideas which, he claims, will materially improve television transmission without widening the modulation channel of the transmitter. One of these involves a disc having three sets of spirals, each covering an arc equal to 120 degrees. Another deals with the use of a local oscillator, which improves what he calls the "vertical definition" of the transmission. It is too early now to report on the success of these projects, but as the results of the experiments become known, them.

The Listener Speaks

(Continued from page 208)

"In the Ti may Rosus." This, of course, isn't grand opera, but it serves to illustrate my meaning.

I wonder, Mr. Adams, if you know that all the operas, with the exception of a very few, were composed and written in Europe? One would hardly expect an Italian, German, Frenchman or any other foreigner to write in any but his native language.

No doubt you'll say that the various operas could be translated into English. Possibly they could, but not without impairing the original beauty. To my mind, the translation is coarse and harsh, and I believe the great majority will agree to this.

That's off my chest now; let's have some more "grand uproar."

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