



With the assistance of their instructor, these students are testing and checking National's large Television camera and the associated photo-electric cell amplifier.



## TELEVISION DEPARTMENT

### *Keeping Pace With Latest Developments*

**N**OW, you are ready to begin your training in Television. As we have shown you, by the time you reach this department, you will have built up a solid foundation upon which to base this advanced training. Much of the training you received in the preceding departments—in the Preparatory Department, in Radio Construction and Service, in Public Address and in Oscillographs—anticipates the jobs you will be called upon to do in Television.

#### **Television Made Easy to Understand**

NATIONAL keeps your training absolutely unified. Each step is related to the one following it. No matter how advanced the work may become, no matter how technical and involved, you will understand it perfectly, because you already will have been grounded in the underlying principles.

You will find yourself operating the Television Amplifiers, adjusting the Photo-Electric Cells, posing subjects before the Television Pick-up, with confidence and assurance. NATIONAL training is so thorough; our method of training is so simple and practical; you advance so gradually, that you probably will be surprised at your own knowledge and skill.

Make no mistake about it—Television is here! The visual broadcasting stations listed by the Federal Communication Commission, include three in New York City, two in Long Island, two in Kansas City, Mo., one in Los Angeles, one in Chicago—and one or more stations in each of the following states: Michigan, Iowa, Kansas, Indiana, Wisconsin, Pennsylvania, and New Jersey. Thus, twenty-five Television stations are now located at strategic points throughout the United States. Many of these stations are on the air with regular scheduled programs, the others are on the air intermittently as experimental developments are being worked out.

#### **A Field of Tremendous Possibilities**

It is true that none of the present Television Broadcasting units are commercial stations. The Federal Communications Commission has not, as yet, granted licenses for any but Experimental Visual (Television) Broadcast Stations. However, even upon this experimental basis, employment opportunities are opening up here and there for Television engineers, Television operators and Television technicians.

*"This world belongs to the energetic"—Emerson*



## TELEVISION—Continued

Since the world began, every history-making invention has had to go through the doubting stage. Away back in the 1800's the majority of people thought lighting by electricity impossible. There were many to laugh at the early experimenters in Radio. Within our own times, in fact, just a few years ago, some people said that Radio reception would never actually be perfected. In answer to these uninformed doubters, the Radio Industry grew up almost over night. A recent survey showed 25,000,000 Radio Receiving Sets in the United States alone. People in towns, cities and on the farms are listening to programs from all over the world.

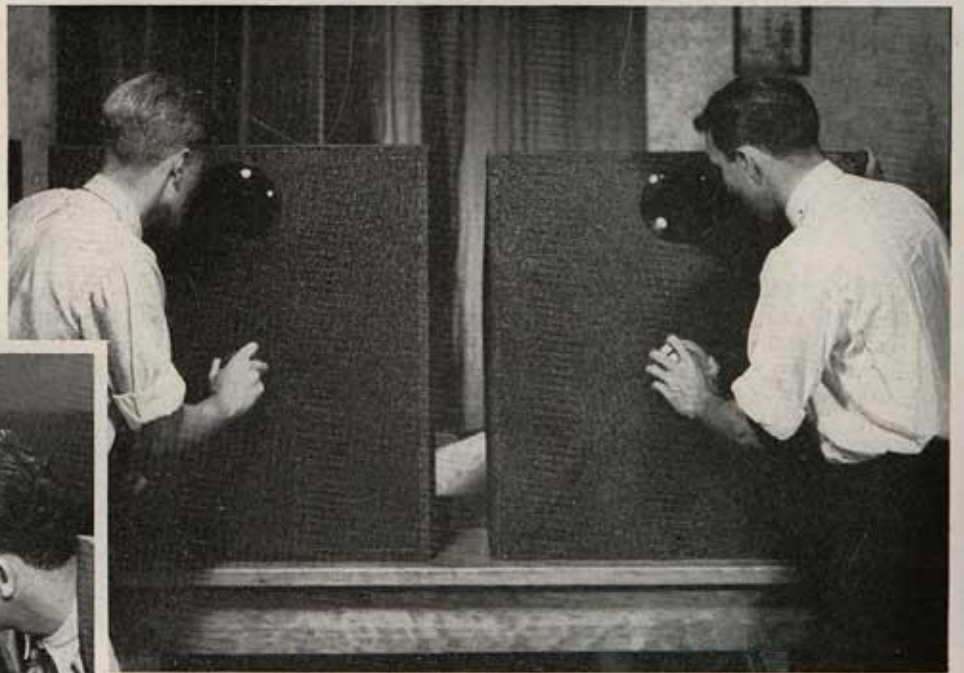
### Television Is Here to Stay

Television has gone through the same experiences as Electric Lighting and Radio; but, as in all other similar instances, men who are really informed realize that Television is here, NOW! These men, and there are many of them, are right now making their plans. They are the ones to whom will go the rare opportunities opened up by this most amazing industry.

When the present plans are consummated, and Television is commercially perfected, there will be an immediate demand for thousands of Television receivers. Trained men will be in demand, on a large scale, for installation, maintenance, repair, etc. Never, since the early days of the Radio Receiver, has the trained technician had the opportunity to derive such returns from intelligent craftsmanship as he will have with the coming of commercial Television.

*Two of National's scanning disc type Television receivers. The students are "framing the picture" which as viewed through the large lense is about four inches square.*

*Below you see an early Television receiver of the same type as the later models pictured at the right. National students have done a great deal of research work with this early equipment.*



### National Believes in Television

Here at NATIONAL, we believe whole-heartedly in practical Television. The training you will receive in this department has been planned and developed by men who know Television as the result of years of actual experience and actual work with Television equipment. You may be sure that your training in Television is practical and is based upon the very latest methods and technique.

You will assemble the component parts of both Transmitters and Receiving equipment. You will test the complete assembly and you will finally view the moving image which you, as a Television technician, have made possible. For the man of vision, for the man who is looking ahead, the training in this department represents an opportunity whose final extent cannot even be estimated.

### Summary—Major Subjects Taught

The following is a general outline of the training you will receive in the Television Department.

#### The Television System

Scanning device; Light sensitive cell; Amplifier; Transmission line; Transmitter; Receiver; Conversion of Electrical impulses into light; Reproduction of image.

#### Scanning the Object

Reproducing a picture point by point; Slicing the picture into strips; Persistence of vision; Mechanical versus electrical scanning.



**Pick-up Systems**

The scanning disc; Direct pick-up; Flying spot system; Film pick-up; Photo-electric cell; Image dissector tube; Iconoscope.

**Television Amplifier**

Frequency requirements; Calculating maximum and minimum frequencies; Methods of coupling; Isolation of plate and grid circuits; Power supplies; Calculating gain; Design of the amplifier; Building the amplifier; Working test of the amplifier; Amplifier analysis with cathode ray oscilloscope.

**The Transmitter**

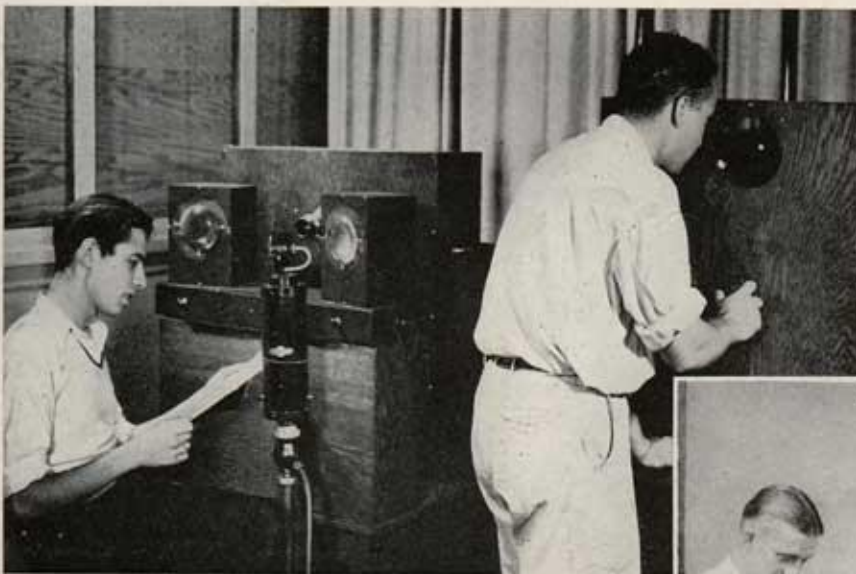
Frequency band required; Frequencies allocated for Television; Coverage; Transmission line problems; Theory of co-axial cables; Synchronized sound and Television.

**Television Receivers**

Tuned radio frequency; Superheterodyne; Side band cutting; Band pass tuning.

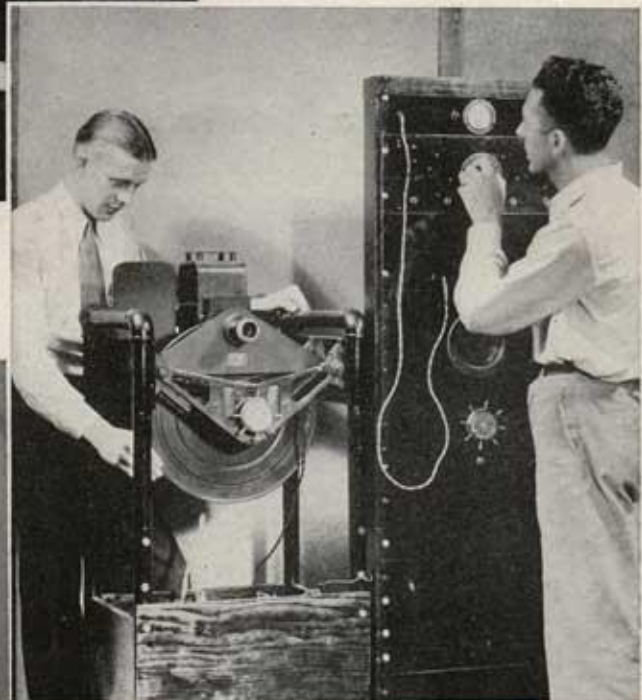
**Reproduction of the Image**

Electrical impulses to light; Neon tubes; Crater-arc lamps; Lens discs; Direct viewing; Projection of image on screen; Cathode ray images; Kineoscope.



*A complete Television set-up placed in operation by National students. The man on the right is viewing the image of his companion who is sitting before the two-cell Television camera on left.*

*Below: A National student, with his instructor, inspects the lense disc of our crater-arc projector which throws a large picture on the screen in National's Television Theatre.*



*A flying-spot projector with outer case removed and a panel type monitor receiver such as is used to check the image before transmission.*