The empty bulb that will become a television picture tube is preheated on a 16-head rotary machine, as shown above, before the metal button for the second anode is inserted in its side. The button is made of a special alloy that conducts electricity well and also forms a vacuum-tight weld with glass wall of the tube.

Following application of the phosphor coating, which glows to produce the television picture, the inside of a tube is swabbed with a mixture of graphite and silver that forms a conducting surface. This machine rotates the bulb while the operator holds the swab inside. Later a similar coat is applied to the outside.

60 Television Tubes an Hour

They're being made faster and cheaper now.

PSM photos by W. W. Morris

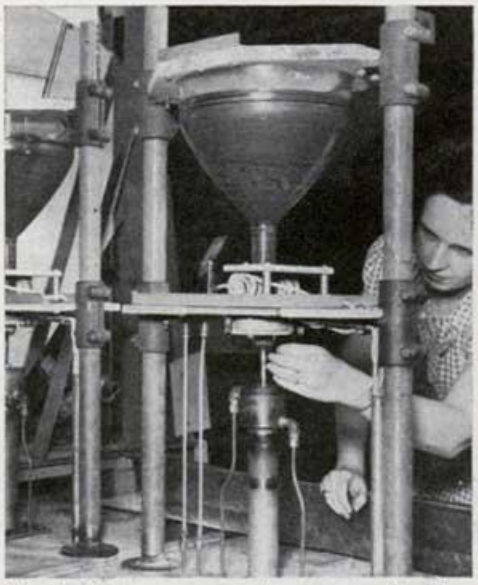
TELEVISION for everybody comes a step closer with the development of mass-produced picture tubes, the heart—and one of the most expensive components—of video receivers. RCA's new plant in Lancaster, Pa., is already set up to turn out one of the big cathode-ray tubes every minute, and at a price that may reduce the cost of small television sets.

These tubes are lineal descendants of the ordinary neon sign, or gas-discharge tube. About 80 years ago the British physicist Crookes pumped all the gas out of a discharge tube and found that the light inside the tube disappeared, but the end of the tube itself began to glow! His interest aroused by this effect, Crookes proved that it was caused by a stream of extremely small charged particles coming from the negative electrode in the tube.

Other scientists added electrically charged metal plates to control the electron beam, producing the modern cathode-ray tube that has proved so valuable to physics. J. J. Thomson used it to measure the ratio of charge to weight of the electron. More recently it has furnished the viewing screen for radar, and the oscilloscope.

These same cathode-ray tubes make the picture end of television receivers. They are so difficult to manufacture, however, that until now they have been constructed by hand and were therefore expensive. With the production of television receivers expected to top a half million sets in 1948, hand methods had to go. RCA engineers devised machines and conveyer systems that practically eliminate the human element.

Automatic burners seal a glass ring to the head wire, on which the electrodes are mounted. After the stem is sealed to the bulb, it will be ready for the vacuum pumps. A big problem in designing this mass-production system for cathode-ray tubes was cleanliness. No machine could be permitted to stir up dust, leak oil or grease, scratch or strain the glass. The building is air conditioned, and much of the equipment for heat-treating is surmounted by fans to suck away dirt, and curtained with spun glass to keep out drafts. Even the plant floor is inlaid with waxed maple blocks so that workers will not scuff up tube-spoiling dust.



Terminals are connected to a power line before tube enters the exhaust machine, so that the elements can be turned on, insuring good vacuum. During the 64-minute trip through this device, pressure inside the tube is reduced by steady pumping to 10,000 million times less than outside pressure.

The final step is testing. A special pattern made up of Indian heads, lines, numbers, and letters was designed by engineers to indicate a tube's ability to produce a clear image. If this inspector is satisfied with its performance, it is ready to be assembled into a television receiver —and to bring you the prize fights.

Popular Science, January 1948