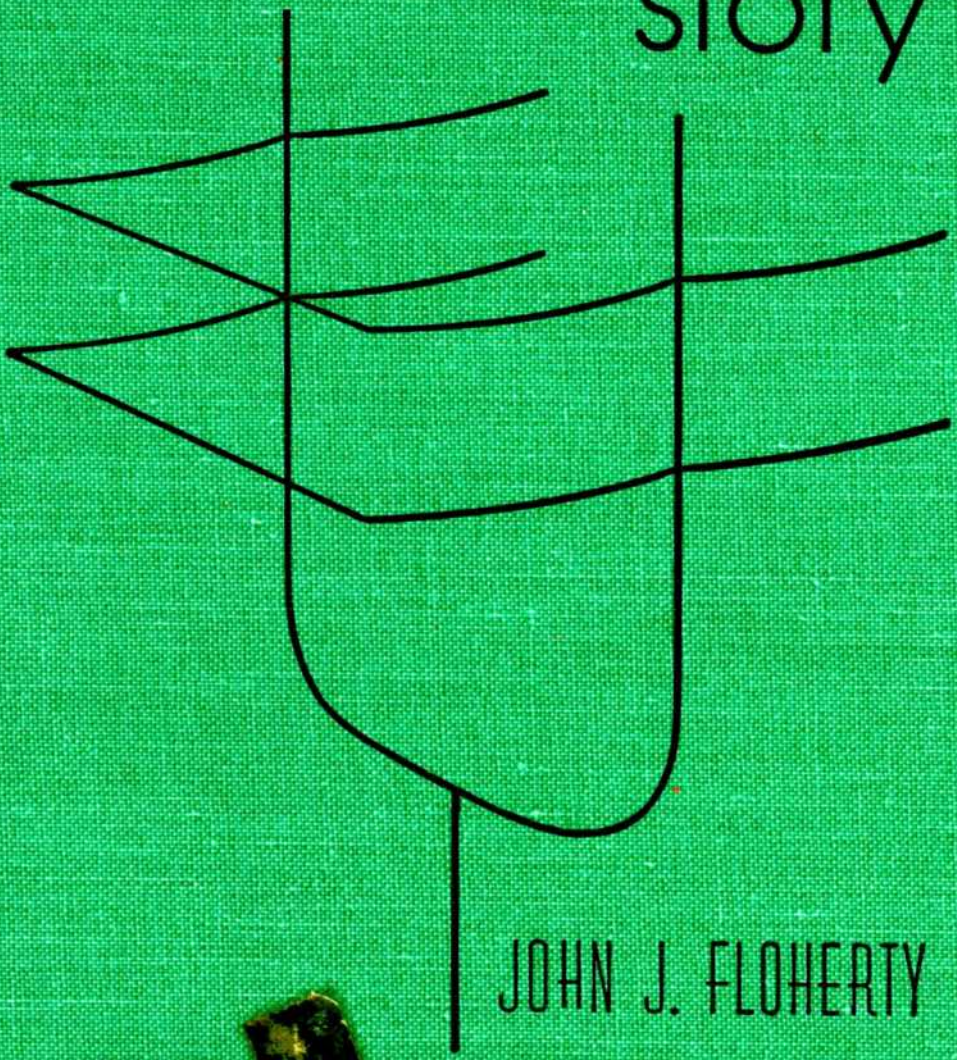
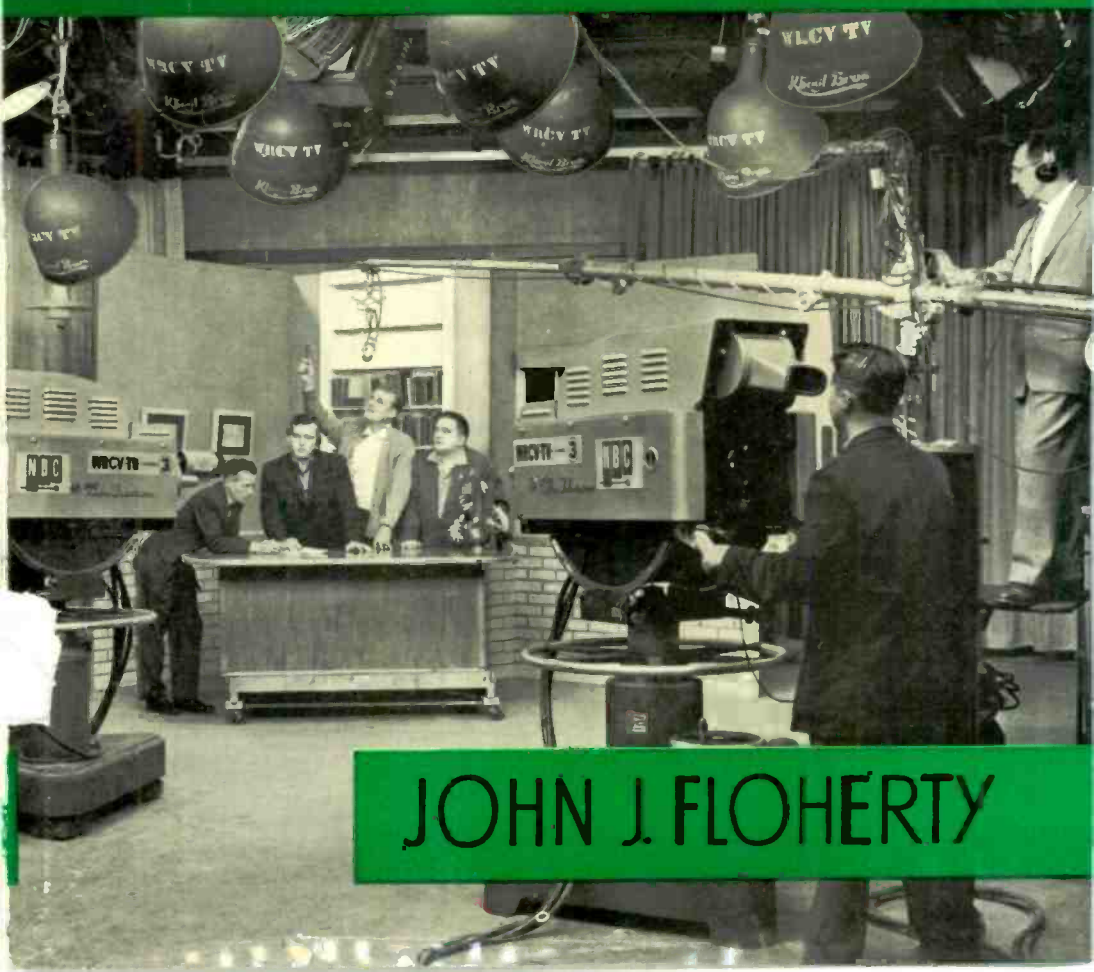
TeleVision story



JOHN J. FLOHERTY

TeleVision story



JOHN J. FLOHERTY

REVISED EDITION

TELEVISION STORY

by John J. Floherty

Television! This amazing device has revolutionized our way of life and points the path to the future.

John Floherty, using his tried and true method of getting his facts at the source, has written a book for young people and their elders that reveals the startling pageant of television from its origin and early experiments down to color television and other modern techniques.

In this, the most exciting assignment of his career as reporter, the author spent six unforgettable months exploring the fabulous world of television. He visited laboratories, factories, telecasting studios, advertising agencies, and homes. He interviewed scientists, technicians, producers, directors, cameramen, actors, writers, sponsors and the host of lesser lights engaged in an endless variety of jobs.

Here, in simple, dramatic terms, Mr. Floherty tells how programs of various types are put on the air—drama, films, comedy acts and sports news events covered by the amazing mobile unit. Here are the countless vocational opportunities in television, and an up-to-date chapter on color television. In short, here is TV, from 1870 to the present—a graphic profile of an industry, of a scientific "miracle," presented for the stimulation, enjoyment, and understanding of young people.

32 pages of photographs

Jacket photograph courtesy of WRCV-TV, Phila.

Sixth Printing

A famous journalist is your guide to the varied and exciting world which lies behind the headlines of a modern newspaper.

GET THAT STORY

Journalism—Its Lore and Thrills

by John J. Floherty

REVISED EDITION
Illustrated with photographs

Here are the inside stories of the men and women who gather, write, edit and print the news you read today, plus a great deal of sound advice for young people who are thinking of entering the field of journalism. Presidential press conferences, Paris fashion showings, on-the-spot reports from far-off countries, sports events, the latest books, glamorous theatrical first-nights, scientific discoveries — these are but a few of the areas in which news is made. Today's big city newspapers cover such a wide range of subjects that many of their writers and reporters are highly trained specialists, experts in their particular fields.

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Description of a police career in town and city.

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TeleVision story

BY JOHN J. FLOHERTY

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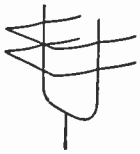

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J. B. LIPPINCOTT COMPANY, PHILADELPHIA AND NEW YORK

REVISED EDITION

SIXTH PRINTING

Library of Congress Catalog Card Number 57-6779

To GRACE GAETA

from whom, when she was a seventh grader, I learned many things about TV that might have escaped me.

Books by John J. Floherty

FOREST RANGER

TROOPERS ALL: STORIES OF STATE POLICE

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MONEY-GO-ROUND

Books by John J. Floherty and Mike McGrady

SKIN-DIVING ADVENTURES

WHIRLING WINGS

YOUTH AND THE F.B.I.

FROM A GRATEFUL AUTHOR

During the time I spent as a close-up observer in the field of television, I felt many times like Alice in Wonderland. Wherever I turned, surprise awaited me or fascinating vistas lay before me.

Soon I began to realize that I was in a newly discovered land in which pioneers had settled quite recently, but in which past and present were already emerging into a future as bright as the noonday sun.

In my role as a reporter covering many fields, I have leaned heavily on the "old-timers" for the answers to many of my endless questions. In television I found few, very few, whose span of service extended over more than, say, a dozen years. This was particularly true in the broadcasting studios and in the TV departments of advertising agencies. In those branches of the industry youth was dominant—youth fairly crackling with ideas and untrammeled energy. In laboratories, in factories and even in retail shops I found that the same pioneer spirit prevailed.

Even a casual observer could sense the astonishing teamwork that has made possible the building of a great industry—and all in a relatively few years.

Nowhere in our beloved country can one find a better example of the cohesiveness of voluntary effort that has placed the United States firmly in the forefront of the world's great nations.

The courtesy and helpfulness tendered me on every hand made my assignment one of the most pleasant of my career. I was met with a stimulating spirit of co-operation from the high executives all the way down through the ranks to the humblest employees. To those my sincerest thanks.

I am particularly indebted for their invaluable assistance to the Radio Corporation of America, the National Broadcasting Company, the Columbia Broadcasting System, and the Radio Division of the United Nations.

J. J. F.

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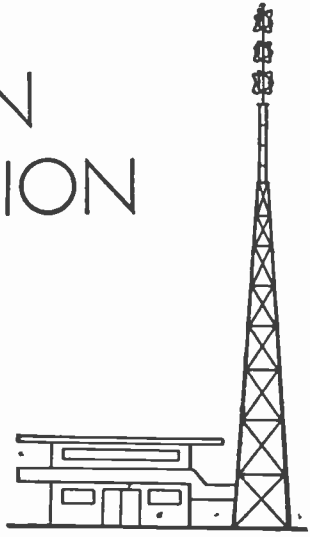
CHAPTER ONE

THE DAWN OF TELEVISION



TWENTY eventful years have come and gone since I had my first view of television. As a guest of the Radio Corporation of America, known the world over as "RCA," I was visiting its famous laboratories then at Camden, New Jersey. My mission was to gather first-hand material for a book on which I was then engaged—subject: Radio.

At that time, 1936, television was still in the experimental stage. Few of the country's population had ever heard of it. The limited number of primitive sets in use were mostly in the homes of radio executives who were willing to act as guinea pigs. There were no established programs, no advertising sponsors, no publicized televising schedules. Still in the embryonic state, it lacked the educational, entertainment and informative features that have established it as an adjunct to the American home comparable in importance with the telephone or the electric refrigerator. It was in short an interesting and mysterious gadget on which none, least of all

its inventors and owners, would predict a practical future.

On the occasion of my visit to the laboratory the young engineer, Kevin McCabe, who was my mentor and guide, had already gained some prominence in the field of radio engineering. Ordinarily he would have been a rich source of the kind of information I was seeking. I soon discovered, however, that despite my persistent attempts to confine our discussion to the subject of radio, he lapsed frequently into rhapsodies on the electronic marvels of television.

Knowing little of the subject, I asked, "Just what *is* television?"

His answer was prompt and precise. "Television," he said, "is the transmission and reproduction of a view or scene showing people and objects in action by a device that converts varying light rays into electronic waves of similarly varying intensity that in turn are reconverted into visible light rays that reproduce at a distant point the original view."

"Isn't that similar in a way to radio broadcasting?"

"True," he replied, "radio and television are electronic sisters. Let's call one Audible and the other Visible. Like human sisters they have many family traits in common but their behavior often differs widely."

"For instance?" I asked.

"Well," he explained, "a radio signal transmitted through the ether can be received thousands of miles away. It travels at the speed of light and, broadly speaking, follows the curvature of the earth's surface. Intercontinental radio communication is already an established business. Its sister Visible is more temperamental. A transmitted television signal also travels through the ether with the speed of light but it does not follow the curvature of the globe. Its direct range, therefore, is limited by the horizon."

"Since radio programs are transmitted successfully over

long distances by *wire*, why isn't it possible to transmit television in the same manner?" I asked.

The engineer paused before answering. "There again is where the electronic sisters Audible and Visible show a marked difference in behavior. Audible travels over all ordinary telephone wire as if born to it, while the temperamental Visible balks at anything quite so simple. Some day, perhaps, we will develop a special type of cable that will be more to its liking, and then look out! television will sweep the country, and affect the domestic, social, economic, educational and entertainment habits of the American family."

"When will this television materialize?"

"It is hard to say," he replied. "We have come a long way since 1873 when a young man named May made his first experiments with selenium crystals. We have learned much, but there is still so much more to learn that no one can foretell when television will be established commercially or what the public reaction toward it will be. My guess is that it will be ten or more years before the average American family can enjoy a baseball game or see a play or visit with celebrities without leaving home."

For two thrilling days I moved in a world of electronics where science was a religion and every man's job a sacred rite. In those days radio was a healthy stripling taking on stature with each year. Many techniques and developments in the fields of radio engineering and broadcasting were emerging from a nebulous state to become standard practice.

On the morning of the second day, while my new-found friend Kevin McCabe and I were exploring the realms of radio, we came upon an open door. Inside it, in a subdued light a sweat-stained man was juggling what appeared to be a glass bubble larger than a basketball. Inside the sphere was suspended mysteriously a rectangle of white a little larger than a playing card.

"What in the world is that?" I inquired.

"Oh that," replied the engineer, "is really nothing yet. It is only the first stage in the making of an iconoscope."

"An iconoscope?" I echoed.

"Yes," he said, "it's the electronic eye of television. The name is derived from the Greek words *eikon* (image) and *skopein* (to view). Doctor V. K. Zworykin applied for a patent on the iconoscope as far back as 1923. The initial advent of the iconoscope was the turning point in the development of television."

Just then the noon whistle blew. "Time for lunch," he said. "Let's talk it over at the table."

The company restaurant was a spacious and attractive room in which groups of pensive men seemed to be more interested in the abstruse problems of science and production than in the palatable dishes set before them.

At a nearby table were five men engaged in what appeared to be a scientific discussion. One of them whose back was toward us was broad-shouldered and deliberate.

"That is Doctor Zworykin," said my friend the engineer in a hushed voice. "He is the godfather of television."

"But I thought television had its beginning in 1873—"

My companion became thoughtful. "That is only partly true," he replied. "Long before that date men of science had contributed knowledge of certain electrical forces and phenomena without which television might have been an unattainable dream. As far back as the year 1600, one William Gilbert stoutly maintained that the revolving earth was a stupendous magnet, generating a mysterious force and possessing magnetic poles. About the year 1780, in the city of Bologna, Luigi Galvani discovered that a direct current of electricity flowed from a battery he had just created. To this day the term 'galvanic battery' is used. In 1794, Allesandro Volta devised an apparatus for the chemical de-

velopment of electric current. It was called the 'voltaic cell' or 'voltaic battery.' The volt, a unit of electric measurement, was also named for him. In 1831, Michael Faraday discovered the laws of electro-magnetic induction. All those discoveries and inventions provided a kind of chart that enabled future scientists to pursue their explorations in practically virgin territory."

"But," I questioned, "how did those earlier scientists actually contribute to the modern evolution of television?"

"That is a strange story," he answered. "In 1817 a Swedish chemist named Berzelius devoted himself with no apparent purpose, to isolating a curious element that varied its electrical conductivity in the presence of various degrees of light. He called it selenium because of its soft luminescence resembling that of the moon, for which the Greek word is *selene*. His research completed, Berzelius went on to other things. Selenium was considered merely a scientific curiosity and was soon forgotten.

"In 1857, the first telegraph cable was laid between the United States and Ireland. Two continents were joined by a strand of wire over which messages flashed with the speed of light. This was looked upon as one of the wonders of the world. Despite its success as a feat of engineering, it was bedeviled by many mysterious phenomena, chief of which was the periodic fading or weakening of the signal—which at best was on the feeble side.

"For sixteen years all efforts to increase the strength of the signal failed until one day a young Irishman named May, a telegrapher employed by the cable company, decided to try his hand at increasing the strength of the elusive signal. With but little scientific background he devoted long and sleepless hours to the problem that had baffled the scientists of two continents—how to make more robust the electric impulses that carried the dots and dashes on their

three-thousand-mile journey. In his effort to create an effective resistor he experimented with many substances and made numerous contrivances."

"What is a resistor?" I inquired.

"It is a device that offers electrical resistance and is used in an electric circuit for protection or control. It might be likened roughly to the nozzle that controls the stream from a hose.

"For a while it looked as if all of May's work had been wasted. Just about the time he was ready to give up his experiments, he met one of his old professors, a man of profound and varied knowledge. Glad to meet one to whom he could tell of his deep disappointment, he poured out his troubles in the story of his many failures.

"The kindly old man listened attentively to the end and then after a period of thoughtful silence said, 'My boy, all you need is perseverance. Stick to your guns! Don't give up! Something tells me that one of these days you will hit on the solution of your problem.' He paused as he seemed to probe through the embers of his memory and continued, 'It seems to me I read somewhere many years ago that a Swiss chemist isolated an element he called selenium. And if my memory serves me right, it had many curious and mysterious properties. It must be all of fifty years since I picked up that little kernel of information.'

"May's flagging ambition was rekindled. He resumed his experiments with a new vigor and centered them on a selenium crystal secured with the aid of his aged professor.

"He had scarcely resumed his experiments when he was elated to discover that his selenium resistor transmitted electrical impulses that were strong and vigorous when exposed to light but weak and puny when operated in darkness. With that fact established it took no great engineering skill to improve transatlantic communications. By exposing a

selenium cell installed in the cable circuit to a continuous source of light, the strength of the signal became constant, operating as well during the hours of darkness as it did during daylight hours.

"May's discovery of the effect of light on selenium created a stir among the scientists of Europe. At first they were inclined to belittle the value of a mere telegrapher's brain child. One by one, however, they began a series of tests with the intent of disproving rather than confirming May's claims. It was with some embarrassment that they emerged from their laboratories proclaiming May's discovery of how to convert light into electric impulses as a major contribution to science.

"This discovery opened up new horizons for the scientists. It led to the development of the photo-electric cell for which industry has found hundreds of uses. Its principle placed modern electronic television within the reach of man. During several succeeding decades scientists and inventors were spurred to frantic effort to develop a means by which images could be transmitted by wire over long distances just as sounds were transmitted by telephone.

"First of the experimenters was an American, G. R. Carey, whose efforts failed to transmit more than a blurry visual signal. In England two physicists also went down to defeat in their attempts to transmit images electrically. Another British scientist delivered a lecture before the Physical Society of England and demonstrated his particular method of sending a picture over a wire. The image, however, was a mere outline, foggy and indistinct.

"So far, the experimenters had concerned themselves with the transmission of single still pictures. It had not occurred, even to the most erudite of them, to attempt to send over a wire pictures in motion—a horse running, a girl dancing, an automobile speeding.

"Then one day a Frenchman, Maurice LeBlanc, threw a bombshell into scientific circles. He insisted that pictures in motion could be transmitted over long distances by wire. In answer to the critics who poohpoohed his idea, he explained that a series of still pictures of a moving object, if transmitted rapidly and in their proper sequence, would create the illusion of motion. Although he did not know it, he was expounding the fundamental theory on which the motion pictures of today are based. Indeed there are those who insist that the idea that made motion pictures possible was evolved first in the brain of LeBlanc.

"And then there was Paul Niepkow whose scanning disc translated the variations of light and shadow of a subject into electric impulses that could be received at a distance with some fidelity. Crude though it was, the scanning disc proved to be a step of major importance in the direction of practical television."

Here I interrupted. "But," I said, "the efforts of those you have mentioned were concerned with sending a picture or pictures from one point to another *over a wire.*"

"That is true," McCabe replied, "but you must remember that little was known about the phenomenon of electromagnetic waves. Although the existence of these waves was surmised as early as 1864, twenty-four years passed before Heinrich Hertz proved their existence and demonstrated that they could be measured in what we know as wave lengths. These 'Hertzian waves,' as they were called, opened up the field of communication between widely separated points without the aid of wires.

"A few years later an Italian lad named Marconi put the Hertzian waves to good use. Working secretly on his father's estate at Bologna, he succeeded in sending and receiving electronic signals over a distance of several hundred feet without the aid of a wire. That was in 1894. It was the

first of a series of experiments in wireless communication.

"Two years later Marconi had increased the range of his wireless telegraph to two miles. Then in rapid succession distances were increased to ten, fifteen, twenty-five miles. Although Marconi had not been granted a British patent, British ships were installing the new system of wireless communication. Already lives had been saved at sea through wireless when Marconi was granted a patent in the year 1900.

"Presently the young Italian inventor established an electronic highway across the Atlantic from Poldhu, Cornwall, to St. John's, Newfoundland. After months of preparation he transmitted three audible dots, Morse code for the letter S, for a distance of two thousand miles through the ether. Those three pips of sound were another milestone in electronic communication and so great was their impact that the press of the world devoted columns to the story. Marconi had succeeded where such prominent scientists as Branly, Preece, Lodge and Righi had failed. During his earlier experiments young Marconi had been a pupil of Professor Righi.

"In that period between the turn of the century and 1914 science turned its attention mostly to the rapidly growing radio. Television had become a kind of neglected stepchild. There were a few scientists, however, who pursued their exploration of the electronic world without thought of financial reward. Braun, a German physicist, developed a cathode ray tube that projected a luminous spot on its base. Later, while investigating the Braun tube, a Doctor Rosing discovered that he could give the pip of light controlled motion. Now each of these discoveries, inventions and developments was a step nearer to television.

"With the advent of World War I the adolescent radio took on new stature. Rapid communication was as vital as

rapid transportation. Radio was the answer. Millions were spent on its development. Science in shirt sleeves worked day and night in eliminating one by one the 'bugs' that lurked in it. By the war's end it had established itself as a practical if not profitable medium of commercial communication by the dot-and-dash method.

"In the confusion of conflict television had been put on the shelf and all but forgotten. Broad research and endless experimentation are voracious consumers of money. Postwar economic disruption blinded inventors to its future commercial possibilities. Radio could at least compete with the telegraph, then a prosperous enterprise, while television, its poor relation, could not be expected to compete with the motion picture, then in its silent days and at best a flickery but financially successful form of entertainment.

"Few saw in television anything more than an interesting and short-lived toy. Only the scientists stuck to their opinion that a bright future lay ahead of it. Almost before the echoes of war had died out, they resumed their research and experiments. They were rewarded by the discovery of several mineral and chemical substances more sensitive to light than the good old selenium.

"Despite the efforts of many men, however, to apply their discoveries, television remained a will-o'-the-wisp. With each advance the ultimate goal, which was a strong and steady image, leaped nimbly out of reach. Two obstacles, each of which seemed to be insurmountable, barred the way—the inadequacy of mechanical scanning and the weakness of the electrical impulses. The transmitted images were fuzzy, indistinct and occasionally distorted out of all resemblance to the televised subject.

"Lee de Forest had been working without fanfare on a three-electrode vacuum tube. A pioneer in radio research, his intent was to create a device that would strengthen or

amplify the radio signal and make the radio transmission of complex sounds possible—the human voice, the roar of the crowd, the intricate sound pattern of an orchestra. The ultimate result of his invention in 1906 raised radio from the status of a commercial communications enterprise and made possible the founding of an empire of entertainment and information that has come to be known as radio broadcasting.

"The De Forest vacuum tube improved immeasurably the picture obtained from the mechanical scanner. Television took a new lease on life. The press of two continents welcomed the innovation and predicted practical television for the public in the near future.

"In the United States, the improved television was shown to various gatherings by C. F. Jenkins. It fell short, however, of what people had been led to expect in the enthusiastic press reports. The image was undoubtedly stronger but it was still shivery and without sharp definition. Those who viewed it accepted it as a victory for science but were skeptical about its potentialities as a form of entertainment.

"In London, John L. Baird gave a demonstration of his mechanical scanner before members of the Royal Institution. There too the flickering created by the slow rate of scanning caused eye-strain that made viewing both difficult and unpleasant.

"Although the Bell Telephone Laboratories had succeeded in sending an image accompanied by sound over a wire from Washington, D.C. to New York City, few experts were convinced of the practicality of television. Few had the courage to prophesy for it any commercial value.

"Concurrently with the slow progress of television, its sister radio was growing into a substantial industry to which amateurs with little or no scientific background contributed materially. Even long before words or music came over the

air, thousands of boys and their elders took to probing the ether waves with homemade 'crystal sets' in the hope of catching stray messages in Morse or International Code.

"With the advent of the vacuum tube and the introduction of the human voice, music and entertainment, complex 'hook-ups' were discussed wherever two or more radio fans got together. A technical jargon, bewildering to the lay person, crowded into their conversation. The comparative efficiency of heterodynes and superheterodynes were discussed as casually as if housewives were discussing the nutritive value of bacon and eggs or pork and beans.

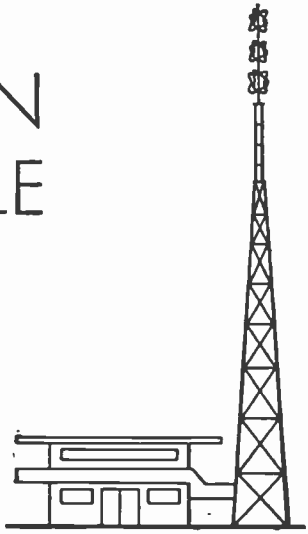
"Almost overnight, radio became an industry. Broadcasting, at first confined to a few evening hours, was spread across the waking hours. The thousands of listeners grew rapidly to millions. Advertisers saw a fertile field that would yield quickly a rich harvest of sales. Factories worked day and night to supply a clamoring public with ready-made radio sets. Tens of thousands of new jobs were created in numerous trades and arts and crafts. It was the Radio Age. Video, its temperamental twin, was all but unknown to the public.

"Scientists, however, with their usual tenacity, continued the struggle to overcome the many obstacles that stood between them and practical television. Chief of their problems was the inadequacy of mechanical scanning. Indeed it looked hopeless from every angle.

"However, during this period of uncertainty and discouragement, a young man of Russian birth who had come to the United States, was quietly working on what later proved to be the salvation of television."

CHAPTER TWO

SCIENCE IN THE SADDLE



AT PRESENT when television is as commonplace in the home as the telephone, the name of Vladimir Kosma Zworykin ranks high among the scientists who in the face of what seemed to be insurmountable obstacles enabled us to see over great distances.

Zworykin was born in Mourum, Russia, in 1889, and graduated at the age of twenty-three from the Petrograd Institute of Technology. It was there he came under the benign influence of the great physicist Boris Rosing, who designed a method of using a cathode ray tube in the reproduction of pictures. Young Zworykin, then only eighteen, was carried away by the consuming enthusiasm of Professor Rosing. In 1907, Rosing was granted a patent on a television system in which the receiver was essentially the same in principle as the receiving sets in use today.

Living, studying and working in an atmosphere of electronics under Rosing, the student Zworykin became obsessed

with the conviction that the future of television lay along lines that were electronic rather than mechanical.

Graduating from the Institute and still hungry for knowledge, Zworykin spent two years as a student at the Collège de France in Paris. His studies were interrupted by World War I, during which he served in the Signal Corps of the Russian Army. At war's end came a period of economic depression, a dislocation of business that was worldwide. With much of Europe a physical and financial shambles, Zworykin who yearned for opportunity and broader horizons, came to the United States. During the lean months that followed, the young scientist lived in Greenwich Village, New York, where intellectuals often assembled to engage in heated discussions on science, art, politics or any subjects that promised sharp differences of opinion. It was during this period some of Zworykin's advanced ideas in electronics caught the attention of the Westinghouse Electric and Manufacturing Company, where later he was employed in the research division.

A profound student of electronics, he longed for the moment he could apply his knowledge to the problems that were then besetting the men of science who had faith in the future of television. All through the nine years he spent with Westinghouse, his fame spread in his chosen field. It was in the period of the Terrible Twenties, the era of sure profits in radio, movies, automobiles, oil speculation and a hundred quick-dollar enterprises. But it was also a period of some progress in television. For Jenkins sent a still photo of President Harding from the Naval Station in Washington, D.C. to Philadelphia, a distance of 130 air miles. A little later, in 1926, Jenkins in Washington and Baird in London experimented separately with "pictures" by radio. However they were mere silhouettes without detail or motion.

What seems to have been the first exhibition of anything

remotely resembling modern television in which the images showed motion was given by Baird in 1926. Again the images were so fuzzy and faltering that the demonstration had no commercial value. Investors saw in it no indication of future profits.

It was in that tumultuous decade, 1922 to be exact, that station WEAF in New York City broadcast the first radio commercial—an advertisement for a real estate concern. The results went beyond the rosiest dreams of sponsor and broadcaster. Gold had been discovered in the air waves! With this new source of wealth established, the field of radio broadcasting soon became a free-for-all. New stations sprang up overnight, the air became a chattering bedlam in which each station tried to outshout the other. An army of amateurs added to the confusion by their incessant babblings. There was neither control nor restraint. Any broadcaster, amateur or commercial, could broadcast on any frequency without regard for the rights of others.

This condition prevailed for a while only. By 1926 a crisis was at hand, radio broadcasting was on a spot. Listeners tired of the nightly struggle through a morass of meaningless sound and were giving up in disgust. Congress, sensitive to public reaction, created the Federal Radio Commission, later to become the Federal Communications Commission, F.C.C.

In the same year, the first radio network was established by the National Broadcasting Company, a subsidiary of the Radio Corporation of America.

A pioneer in the science of electronics and with laboratories widely recognized as a center of radio-electronic research, it was only natural that in its quest for top-flight scientists in the field of electronics, RCA should go after Zworykin, who as early as 1923 had applied for a patent on the iconoscope, television's electronic eye.

Almost from the moment Zworykin joined the RCA in 1929, television, heretofore the chonic invalid, began to shows signs of improvement. That very year Zworykin demonstrated an all-electronic television receiver, using the kinescope or picture tube which he had developed. From that moment the progress of television was closely linked with RCA and with its wizard who had made the electrons behave.

In 1930 television made its bow to a public audience in a New York theater where RCA had installed a six-by-eight-foot screen on which the images were projected. Startling as the demonstration was, it failed to arouse enthusiasm. Audience and theater owners looked at it merely as an interesting experiment. A friend who was present told me recently that the clarity and definition of the pictures were far below the standards already established on the motion picture screen. "As a matter of fact," he said, "the audience, knowing little if anything about the miracle of television, considered the showing as an inferior movie."

To tell the full story of television progress with its developments and disappointments, its heartening advances and its heartbreaks would require a volume much larger than this one. Baird, Alexanderson, Dieckmann, Farnsworth, Sanabria, Fleming, De Forest, Karolus, Dumont, the American Telephone and Telegraph Company, Ives and a score of others—all made contributions that hastened the day when even a modest living room would become a stage on which drama and comedy, music and art, science and current events would pass in review at the turn of a switch.

The progress of television in the last twenty-five years can be described most concisely by relating the achievements of a single organization in which science and industry joined forces in research and engineering, development and manufacture, communications, broadcasting and technical train-

ing. Through such massed effort the Radio Corporation of America with its 78,500 employees has succeeded in placing television among its most successful enterprises.

With rare foresight RCA selected the tower atop the Empire State Building in New York, the world's loftiest skyscraper, as a site for its NBC television transmitter. Before the end of that year, 1931, field tests were initiated between New York City and Harrison, New Jersey. The receiver was all electronic. A rotating scanning disc was used at the transmitter. In 1932, RCA gave its first television demonstrations to a large group of its officials and sales engineers. So promising were the results that the National Broadcasting Company began experiments with live talent and paved the way for a demonstration for the members of the Federal Communications Commission.

The next two years were filled with high hopes and uncertainties. To date television at its best was temperamental and cumbersome. Its images or pictures were still on the fuzzy side due largely to the limitations of mechanical scanning, for which a disc, revolving vertically at very high speed, was used. Through a spiral pattern of holes in the disc split-second glimpses of the subject were caught in rapid succession and converted into electric impulses by the transmitter. Mechanical scanning was done also with the aid of a revolving drum on which were mounted a large number of tiny mirrors, each of which was set at a precise angle so that it reflected into the transmitter its particular fraction of the subject being televised.

Meanwhile Zworykin was assiduously at work on an electronic camera that was destined to be the living heart of a world-wide industry. When in the early 30's, RCA demonstrated a television camera, television took a new lease on life. In 1936, outdoor pictures were transmitted to a point a mile distant. Then in 1937 there followed an electron

projection "gun" that made possible eight-by-ten-foot pictures on a screen. Soon mobile television vans were shooting the news on New York streets for the first time. Scenes from the Broadway hit *Susan and God* were telecast successfully from NBC studios in Radio City. During the 1939 New York World's Fair, RCA and NBC televised the opening ceremonies featuring President Roosevelt, the first chief executive to be seen by a television audience.

Despite all the advances that had been made in television, it still had many imperfections. The iconoscope, which contributed so much toward establishing it as a practical enterprise, was incapable of picking up a satisfactory image except under a blinding intensity of light. The resulting heat in the televising studio was often insufferable. Outdoor scenes could be televised only in bright sunlight. For all its scientific merit, the television camera remained only about as efficient in translating light and shade into a satisfactory picture as a two-dollar Brownie camera.

While Vladimir Zworykin was engaged in the development of the iconoscope, another scientist, Philo T. Farnsworth, was hard at work on another type of cathode tube to which he gave the descriptive name "image dissector." Its function was to break up the televised subject into numerous parts, which were transmitted separately and reassembled at the receiver. During the late 30's television systems in most countries were based on the Farnsworth or Zworykin patents. In popularity Zworykin's iconoscope and his cathode ray receiver, the kinescope, were foremost.

Zworykin then brought to television his crowning achievement, the "image orthicon," a cathode tube so sensitive to light that it could capture a picture of a person's face illuminated by a candle or a single match. The orthicon was welcomed in television studios as a blessing from heaven. It brought great, though not complete, relief from the prostrat-

ing heat made by the many banks of blinding lights. It made possible the televising of subjects that hitherto eluded the camera. The introduction of this wonder tube by RCA in June 1939 opened up a new era in television; any subject that could be photographed could be televised. Major League baseball was telecast for the first time by NBC. The game was between the Brooklyn Dodgers and the Cincinnati Reds at Ebbets Field. Four weeks later the first college football game, Fordham vs. Waynesburg, was televised by NBC in New York. As if to defy the limitation of the horizon, an RCA receiver plane flying over Washington, D.C., picked up a telecast from NBC in New York, two hundred miles away. Then the dream of newscasting, of showing a picture of a distant news event at the moment of its happening, became a reality. RCA demonstrated to the Federal Communications Commission portable television equipment supplemented by motorized mobile stations.

In 1940, television was rapidly gaining stature. In February of that year RCA demonstrated an electronic receiver that produced images in color without the use of any moving mechanism. In March it televised New York City from the air for the first time, using a portable transmitter. In May, at a meeting of its stockholders, it showed television pictures projected on a six-foot screen. A week later passengers on the *President Roosevelt* while far at sea, viewed a television program broadcast from NBC, New York.

Within a month the coaxial cable was used for the first time in television program services. Television leaped far beyond the limits of the horizon. Scenes at the Republican National Convention were transmitted to New York over the miraculous wire that later made television networks possible. It was a year of tremendous progress. First tests were made by NBC of 507-line pictures that set a new standard for clarity and definition. This in turn opened the way for news

coverage by television. The 1940 election returns were telecast by RCA—NBC. The chattering teletypes of the Press associations were shown in action, reporters gathering facts and figures, commentators at the microphone, prominent figures in politics, in fact, anyone or anything that had news value or interest.

Despite World War II, then in progress in Europe, 1941 bid fair to be an eventful year in television. In January the motion-picture industry got its first inkling that television might become a serious competitor. A large audience in a New York theater viewed on a 15-by-20-foot screen a prize fight televised in Madison Square Garden a mile away. A little later scenes at Camp Upton, Long Island, were automatically relayed to New York. These were the first remote pickups handled by radio relay stations.

In the following month, color-television pictures in motion were put on the air by NBC. It was the first telecast in color by mechanical means from a telecasting studio. On July 1st, television received official recognition when WNBT became the first commercially licensed transmitter to go on the air.

The high hopes for television that then prevailed were dashed before the year's end as war engulfed the nation.

Thousands of men and women who had been engaged in the none too stable industry of television, soon were caught up in the grim business of war. The chaos that followed was all but devastating to television enterprises. Radio on the other hand, although fearfully handicapped, seemed to thrive on the world-wide upheaval. Primarily a means of rapid communication, it brought news to a news-hungry public with the speed of light. It left to the slower medium, the press, the job of amplifying the news it had already broadcast. Its entertainment proved invaluable as a builder of morale, an antidote for the jitters and anxieties that had

seized millions whose sons and husbands were in the armed services.

Quite frankly, TV had little to offer to the public but it had much to offer to the cause. In 1942, mass education through its facilities was initiated by RCA—NBC. Thousands of air raid wardens were trained in the New York area. Major sports and other events were televised for wounded servicemen in television-equipped hospitals within range of its transmitters. Even while TV was more or less in a state of war coma, certain progress was made in shop and laboratory. With sales at a standstill and production curtailed almost to zero, many of the scientists and technicians who were exempt from military service, devoted themselves to the development and improvement of existing facilities with an eye to the upsurge of interest in television that was inevitable with the return of peace.

In 1944, NBC announced plans for a nation-wide television network. In spite of the war, then in its most critical period, 1945 proved to be a year of achievement. Three major contributions came out of RCA laboratories—a projection-type receiver with an 18-by-24-inch screen, greatly improved black and white reception made possible by the "image orthicon" and color television in three dimensions featuring live talent.

In 1946, TV joined hands with aviation. After months of laborious development by RCA and NBC in co-operation with the U.S. Army, the U.S. Navy and the U.S. Air Forces and the National Defense Research, a demonstration of aerial reconnaissance in which the video rather than the photographic camera was used, startled military observers and bid fair to revolutionize military tactics.

Three months later fight fans in Washington, D.C. were enabled to see for the first time a heavyweight championship fight that was taking place in Yankee Stadium. The battle

was televised by NBC and transmitted to the nation's capital over a newly installed coaxial cable.

In the autumn of that year came the startling news that the Radio Corporation of America had produced color television pictures entirely by electronic means. A demonstration was given at the Company's laboratories at Princeton, N. J. The images were clear and sharply defined, the color was comparable with that of the current color motion pictures. Simultaneously a simple converter was announced that would enable existing receivers to reproduce in black and white programs televised in color.

With the advent of peace, a war-weary public was in a receptive mood for something that would help it forget the horrors of half a decade. Television was the answer. Almost overnight new video enterprises began to spring up. Despite the fact that only a small handful of the population had ever seen TV, rumors of its miraculous work spread from mouth to mouth, from home to home, from coast to coast. The fact that a family, seated in its living room, could witness events at the very instant they took place hundreds of miles away, gripped public imagination and fairly trampled down sales resistance.

As if to make up for lost time, the television industry went to work with a will. Laboratories and factories toiled around the clock. Cautious capital took courage, sales forces grew, advertising began to appear, telecasting took on a semblance of continuity, pay rolls rose with unforeseen rapidity as new and hitherto unheard-of jobs were created. Producers, directors, engineers, script writers, cameramen, advertising experts, copy writers, actors, musicians, conductors, commentators, announcers and a hundred other aspirants flocked to the new industry. Many of those applying for jobs had never been inside a television laboratory, shop or studio.

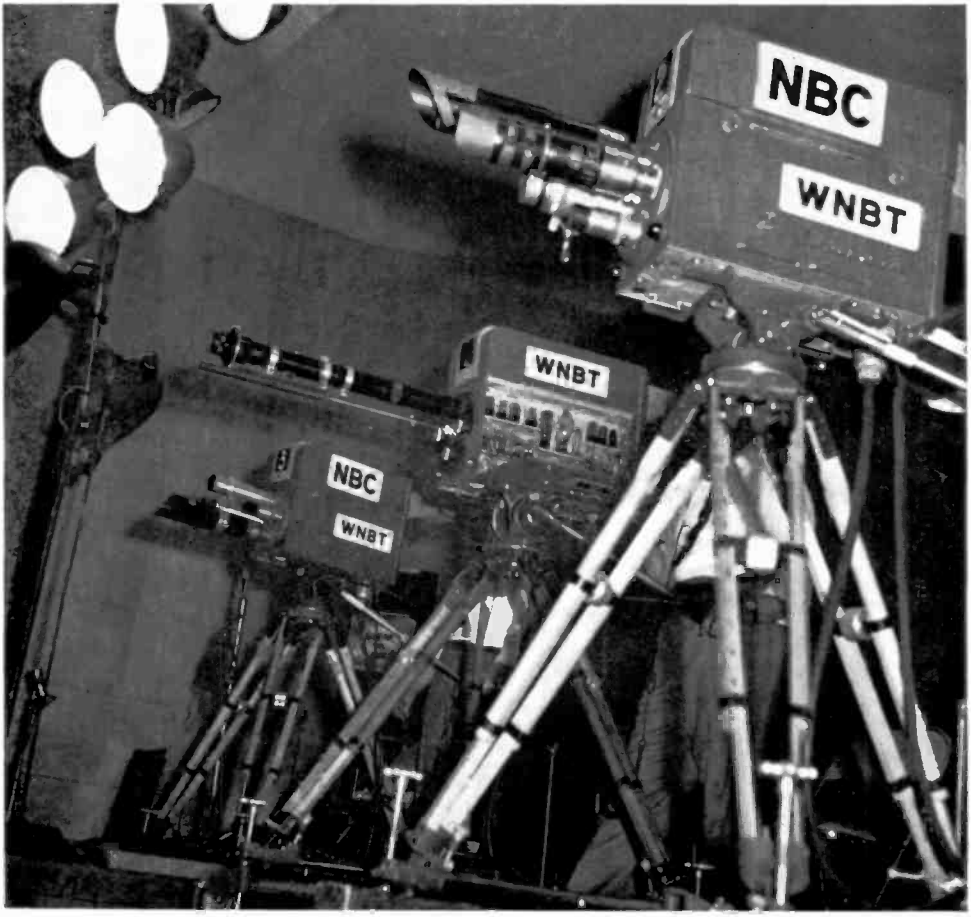
This antennae tower on the Empire State Building, a quarter mile above the sidewalks of New York, acts as the jumping off place for TV programs broadcast from several stations.

Chief Engineer O. B. Hanson, atop the RCA Building, inspects Radome, a parabolic antenna developed for microwave relay between New York and distant cities.

The TV transmitter of NBC, perched high on the Empire State Building, is a model of efficiency and functional design.

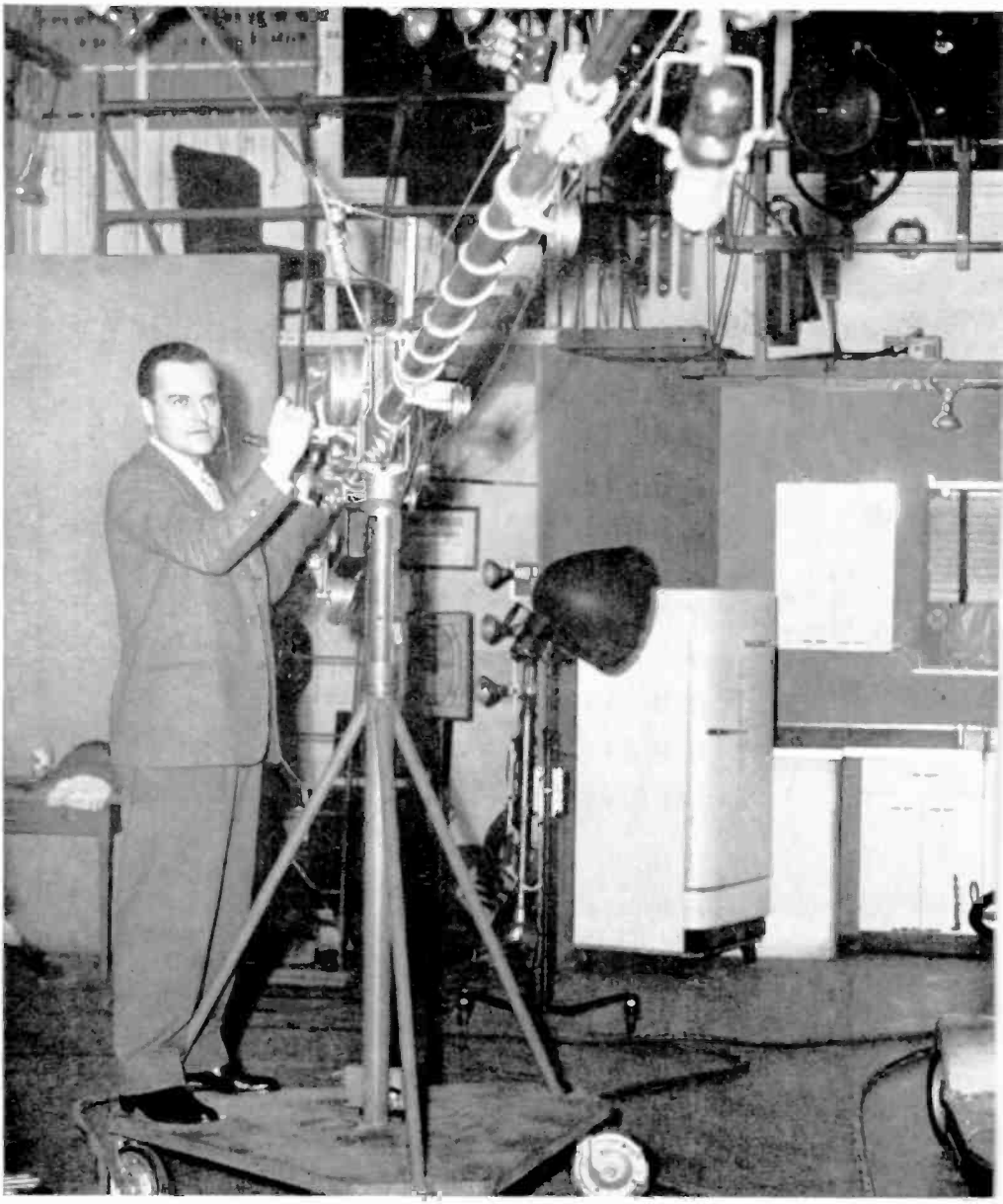
Here is the dolly camera, a kind of roaming reporter in the studio. Its huge bulk is pushed around by a "dolly man" at command of the cameraman, with whom he is connected by a complete telephone system.

Typical television cameras in action during an outdoor telecast. The circular panel on which lenses are mounted is known as the turret. A simple mechanism throws the desired lens into action.



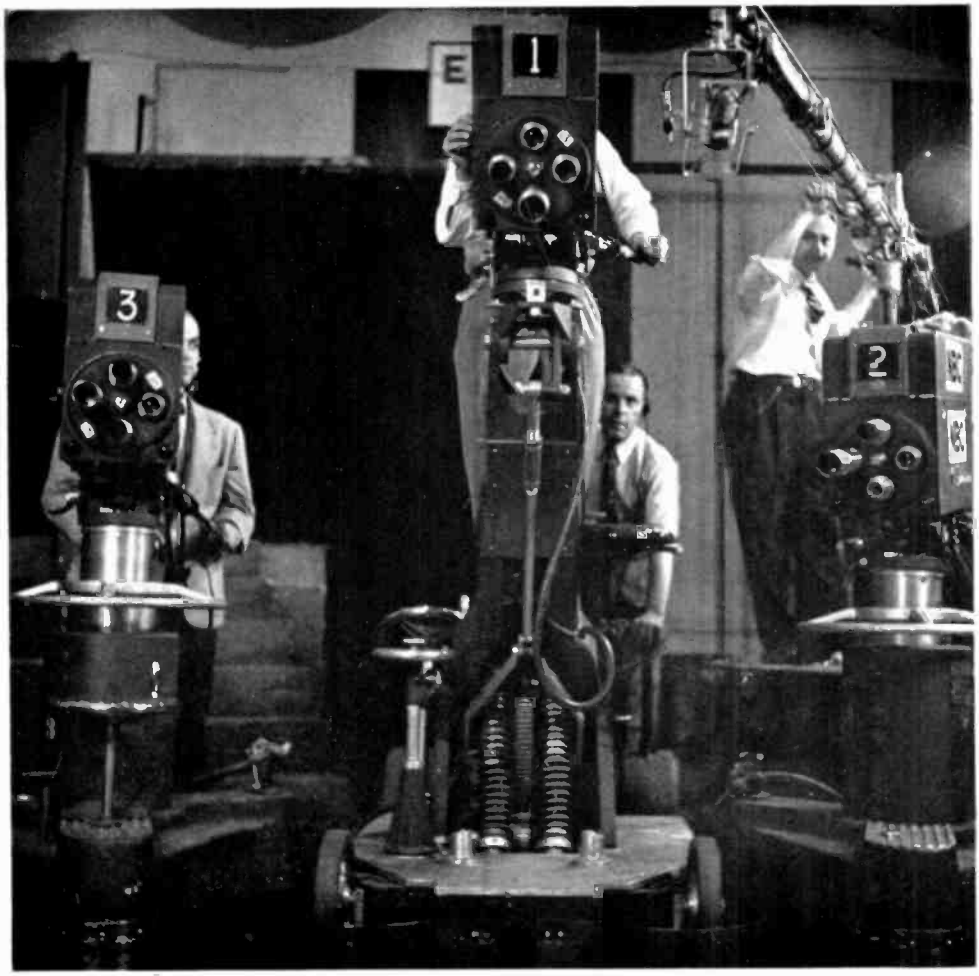
Battery of cameras in action during a TV show. These are supplemented by the more mobile dolly camera. Note telephoto lens on center camera. It is essentially a telescope that brings a distant image close to the viewer.

Here is a popular production in process of being televised. Note that several scenes are ready for shooting—actors in place, cameras on the alert, awaiting the director's signal.

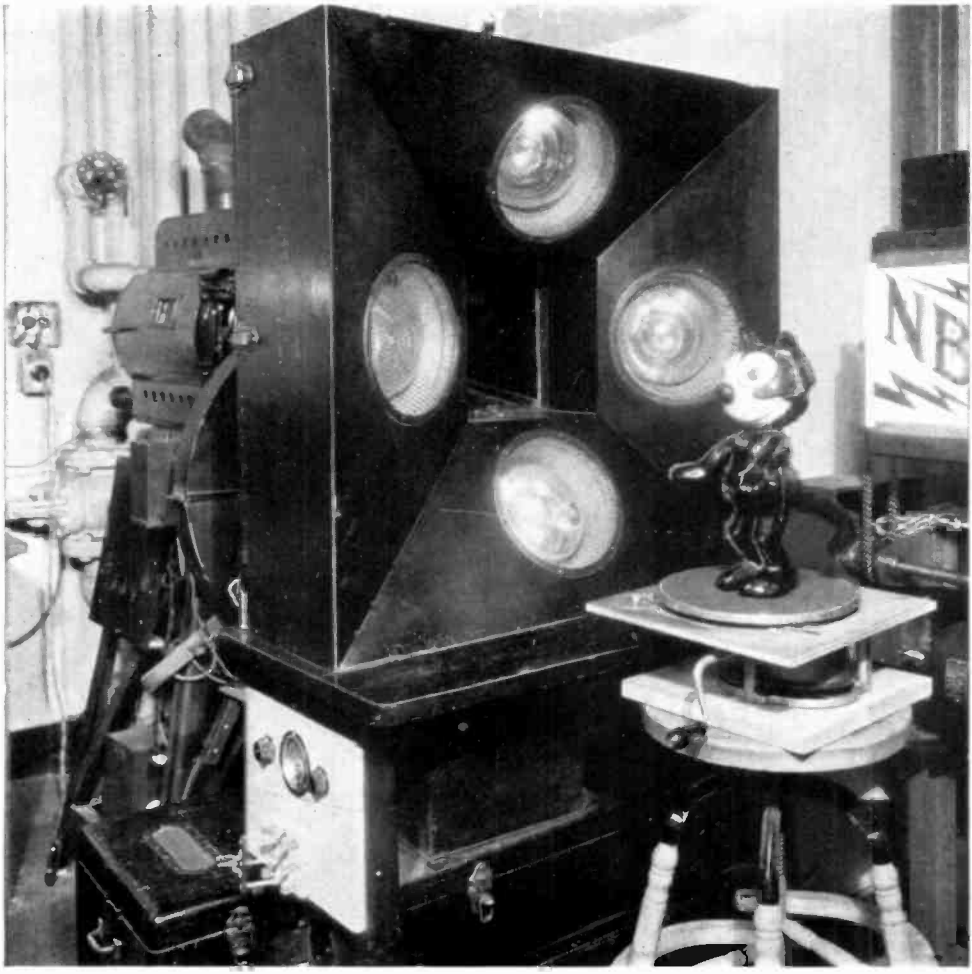


Here is the often mentioned "boom." Next to the camera, it is the most important device on the set. It is a long derrick arm on the end of which is hung the microphone that picks up voices and sounds and sends them hurtling simultaneously with the TV signal into millions of homes.

Scene in control room during production. Second from the left, front row, the director issues his orders to the technical director on his right and to the audio and video engineers on his left. His eyes are focused on the monitor, which is out of the picture. In the rear is the operator of phonograph turntables which supply appropriate music and sound effects.



This is the scene that confronts every TV actor. Cameras and boom glaring and eavesdropping on every gesture and word make even the most seasoned actor quail at times.



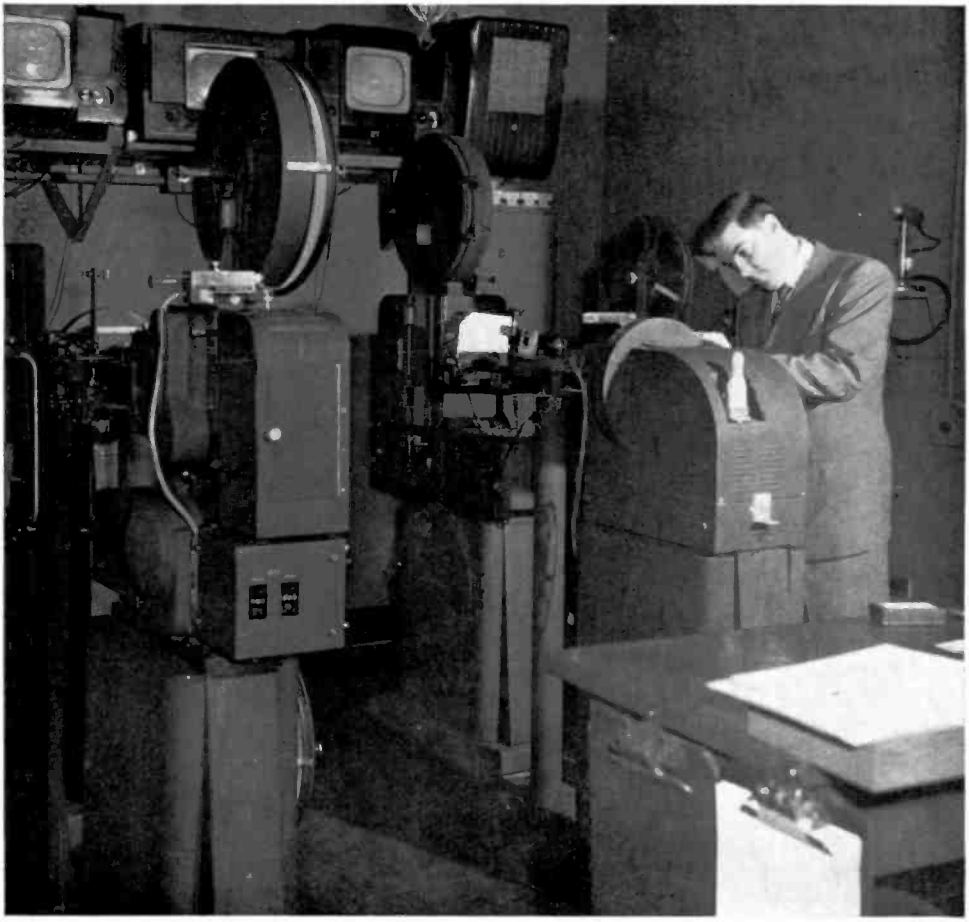
The first actor to appear in television was Crazy Cat, a plastic replica of a popular cartoon character. Placed on a phonograph turntable, he turned round and round before a primitive and cumbersome camera.

In television, electronic action plays strange pranks on the human skin. A fine clear complexion in real life appears mottled and muddy on the screen. Skillful make-up is therefore vital to actors and actresses who would look their best. The leading studios have make-up artists who are past masters in the art of camouflaging skin defects into touches of beauty.

Before a dramatic production on TV, long hours are spent in rehearsal. Photo shows director and cast discussing script.

Mr. Emery Kelen (standing), Producer and Director of the United Nations TV News coverage, and Miss Helen Dunlop, the program's Assistant Director, watch the video engineers in the control booth during the telecasting of a program from the United Nations, New York.

The General Assembly in session at United Nations Head quarters, showing the double row of booths in which camera-men and commentators work, overlooking the delegates' seating floor.



Kinescope recording equipment used in televising motion-picture film. Much fine entertainment and information are provided on our TV screens through the medium of film, new and old.

In 1947, RCA exhibited all-electronic color pictures on a ten-foot screen to a theater audience in Philadelphia. Soon afterward it made its first showing of TV in Europe at Milan and at the Vatican where Pope Pius XII graciously consented to be televised.

September of that year marked an important milestone in TV's career. From the operating room of a New York hospital several surgical operations were televised and transmitted for viewing by members of the American College of Surgeons assembled in a New York hotel. A surgeon friend of mine told me later that it was one of his most thrilling professional experiences. "I saw more and learned more by watching the television screen," he said, "than if I'd been actually present in the operating room." Those viewing surgeons did not hesitate to predict that television would be the medical lecture hall of the future.

Television was getting into its stride. Among the "firsts" of which TV can boast were telecast pickups made in the House of Representatives and the White House. Later a televising of the World Series was followed by a presentation of the Theatre Guild's *John Ferguson.* Then by way of variety the Louis-Walcott prize fight in Madison Square Garden.

1948 saw more advances in the field. Services were telecast from Trinity Church for the first time. An all-Wagnerian concert, conducted by Toscanini, was simultaneously broadcast by radio and televised. Two weeks later the NBC Symphony Orchestra rendered Beethoven's Ninth Symphony, Toscanini conducting. This concert was also "simulcast." It was estimated that the TV audience numbered 370,000.

Then, reverting to more mundane events, NBC telecast the Republican and Democratic National Conventions at Philadelphia. As a result of this enterprising contribution

more people were enabled to eye-witness the events than the total of all who attended in person the conventions for presidential nominations during the preceding hundred years.

After that came the TV coverage of combat maneuvers of the carrier U.S.S. *Leyte,* twenty miles off Long Island. Released by NBC and its east-coast network, that telecast was viewed by an estimated two million people. The rapid increase in the size of the audience is an index of the rate at which television was growing in popularity.

Meanwhile the RCA laboratories were credited with many "firsts." The first split-screen TV image was displayed by NBC during a Television Broadcasters' Association Clinic held in New York. Two pictures from different originating points appeared side by side on the same kinescope picture tube. Presently a practical control system for reducing co-channel interference of television stations was developed.

A direct-view metal cone picture tube, sixteen inches in diameter, was a startling contribution that made possible larger and clearer images.

By this time more and more people were turning to television for entertainment, current events and the latest news. Scenes at the inauguration of President Truman were transmitted from Washington, D. C. over the fifteen-station NBC television network extending from Boston to St. Louis. More than ten million Americans sat at their TV receiving sets in the comfort of home viewing the impressive ceremonies and the kaleidoscopic events that mark a presidential inauguration.

July saw another step in the march of progress. Large screen theater TV was introduced on a commercial basis. A contract between RCA and Fabian Theatres, Inc. was signed for the first permanent installation of instantaneous theater-size television projection equipment.

Within a month the new all-electronic color TV was

announced by RCA to the Federal Communications Commission. Besides unusually high fidelity, it had the added advantage of compatibility, that is, it did not make obsolete the receivers then in use, since they could receive RCA colorcasts in the usual black and white.

Then followed in quick succession many refinements of existing video: a shorter tube making possible smaller receiving cabinets, a receiver that would operate on power supplies of varying frequencies, a multiple antennae system that solved the antennae problem of apartment houses, stores, schools, hospitals and commercial buildings. These and other improvements were made available.

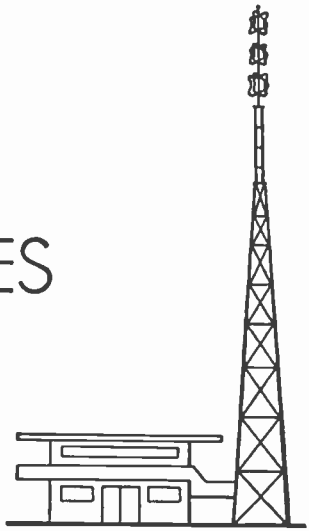
One of the more spectacular contributions of 1950 was a new system of industrial television demonstrated before the Institute of Radio Engineers. Simpler, more compact and less costly, its chief feature is the diminutive pickup tube called the Vidicon. About the size of an ordinary flashlight, this tube operates in a camera no larger than those used for sixteen-millimeter movie film.

Almost at the same time RCA introduced a direct-view type of color kinescope in which three electron guns are used, one for each of the primary colors.

Typical of the quick development of color television, of which a more detailed story will be found in Chapter Eleven, was the famous telecast of the Tournament of Roses Parade at Pasadena, California, on New Year's Day, 1954, the first broadcast of a network color program by a coast-to-coast series of stations; and the dedication of NBC's Color City in Burbank, California, on March 27, 1955, the first TV studio ever constructed specifically for colorcasting. The ceremony was part of the Spectacular, "Entertainment 1955."

CHAPTER THREE

REPORTER BEHIND THE SCENES



AMONG my favorite TV programs is the Monday evening half hour of excellent music by a famous orchestra and renowned vocal soloists. A fine example of the best in television, a delight to the eye as well as to the ear, I chose it as the first of many programs I was to see in rehearsal.

In my role of reporter I have visited many strange places and have seen groups, large and small, of people engaged in performing or preparing for a variety of tasks that were rich in drama and human interest—movie making in Hollywood, a Coast Guard cutter in a hurricane, communities in the grip of flood or fire, back stage during a Metropolitan opera performance, gigantic industrial plants from which commodities flow in endless procession. In those and a host of activities in various fields, I have always been impressed by the evidence of an orderly pattern of co-ordinated effort.

As one unacquainted with the procedures and techniques

of the television studio, I was met by a scene of what at first glance appeared to be utter confusion. On a low stage scarcely higher than the seat of a chair, nearly a hundred instrumentalists stood or sat or lounged, coatless with shirts thrown open, hair rumpled, many unshaved and in nondescript clothing. They might have been a group of factory workers during lunch hour, waiting for the whistle to send them back to work. The place was filled with strange dissonance; an oboe crooned a somber passage, a piccolo chirruped, trumpets sounded, several of them blaring away in complex improvisations. The liquid rippling of a harp was lost in the rapid-fire blasts of trombones, while cellos, bass viols and tympani gave out like distant thunder.

On the floor of the studio, almost as large as a baseball diamond, were half a hundred persons who wandered aimlessly or who seemed to be engaged in some obscure job. Some wore overalls, some just shirt and pants, some looked as if they had stepped from behind a bookkeeper's desk, and others, evidently big brass like a sponsor or official from the broadcasting company, were tailored expensively. There was no sign of pleasure or joy or hint of laughter. Rather there was on every face a grim seriousness born of anxiety.

Great banks of hooded lights of many varieties flooded the place with midsummer sunshine. On the left of the stage men were erecting what appeared to be a large motion-picture screen of dazzling whiteness, while on the right a smaller screen stood gaunt and unattended. Nearby, a drawing of a window stood on a kind of easel; it was a cleverly executed perspective, as if the window were seen from a considerable height. The floor was littered with wires and cables of various sizes, the largest of which led to the cameras. Two of these cameras were mounted on heavy tripods with caster wheels for mobility. The third and largest camera was mounted on a dolly, a heavy trucklike affair

with rubber-tired wheels and a movable crane supporting the camera, at the rear of which is a saddlelike seat on which the cameraman sits. It is raised or lowered to meet the requirements of the angle at which he is shooting.

A temporary framework was erected quickly in front of the large screen on the left. Long streamers of Spanish moss were suspended from it and under it was placed a rustic seat. Close by, a strapping young fellow, coatless and wearing a blue shirt with collar open, was deep in conversation with a young woman dressed in modest gray who might have just come in from a shopping tour. A few paces away a group of eight men stood around with a slight air of boredom. Dressed as they were in street clothes, they might have been salesmen at a convention.

The orchestra conductor mounted the podium. Accustomed, as I was, to seeing him on the television screen in formal evening dress, it was startling to see him appear coatless and a trifle disheveled. The orchestra members settled in their chairs, their instruments in readiness. Cameras moved into position. One viewed the musicians through harp strings; another put the emphasis on the violin section. The ponderous dolly camera began with an overall shot of the entire group.

The conductor tapped his desk. The instrumentalists, alert as sprinters on the mark, waited for the down beat. An oboe began a plaintive passage, by twos and threes other instruments came in on signals from the conductor, who presently tapped again with his baton. In the ensuing pause he gave curt instructions here and there to the various sections; some of the men made pencil notations on their scores. "Let's try it again," he said.

Again the oboe led the way and was joined by the other instruments. And again the conductor rapped. "That's better," he said, "but still not right."

Not until the few bars had been played some half-dozen times was the maestro satisfied. Meantime a number of important activities were going on at once. Electricians rearranged lights. Cables and wires were pushed aside so as not to interfere with camera movement. Saws and hammers made a lustier clatter. A microphone boom, a giraffe-like mechanism, was shunted here and there, raised and lowered in the vicinity of the big screen. Cameras were rolled to arranged positions for various shots; chalk marks were made on the floor to mark the spots. The orchestra, now in full action, filled the place with a veritable avalanche of exquisite harmonies, to which, sad as it seems, the workers at their different jobs paid not the slightest attention.

At the time I was attracted by three men of executive type who stood aloof from the area of activity and who went into an occasional huddle, seemingly to discuss with the gravity of Supreme Court judges some particular phase of the rehearsal. Later I learned that one represented the sponsor, another the advertising agency and the third the broadcasting company. All three men were there to insure maximum return on the sponsor's huge investment in the way of entertainment and the good will of the millions who looked and listened in front of their television sets when that evening's program took place.

Suddenly a quiet spread through the studio. On the large screen on the left of the stage was projected a charming and spacious mansion of the Old South, its porticoed front embroidered by the shadows of live oaks. The Spanish moss I had seen festooned from a wooden frame in front of the screen swayed gently in the breeze from an electric fan. The coatless young man and the girl in shopping attire casually took their positions by the rustic seat. Behind them the group resembling salesmen stood at attention, their eyes on the camera, which was cautiously dollying into its appointed

place. A man wearing headphones gave a few quiet orders that brought the entire group within the scope of the camera lens. I learned later he is known as the "floor man."

Conductor and orchestra were in readiness; the group on the mansion set showed a moment of tenseness. In obedience to the down beat the orchestra began the introductory passages of one of the most beautiful vocal duets in music literature. The blue-shirted young man seemed transformed as he began to sing in a baritone voice full of beauty and power. He was one of America's most beloved concert artists.

As my attention wandered from the orchestra, the singers and the cameras, I noticed for the first time that a small television set had been placed in front of the conductor to enable him to see the action on the nearby stage where the singers were performing. The use of these monitors is common in television studios despite the fact that carpenters, electricians and stage hands generally appear on the scene with disturbing frequency.

At the conclusion of the number a rest period for the orchestra was announced. Instruments were laid aside and serious musicians rushed for the exits like boys from school. During the intermission much of the studio's activity shifted to the left of the stage, where a small semitransparent screen in its simple frame was a target for one of the cameras. In the rear of the screen an operator was engaged in "threading" a film into a motion-picture projector. The singers wandered aimlessly around the studio or sat chatting in the seats that would accommodate an audience at 8:30 that very evening.

As the orchestra was assembling after its rest period, a seascape was flashed on the small screen, while the cameraman attended to such details as focus, angle, diaphragm and a minor adjustment of lights. At a signal from the conduc-

tor, the orchestra began the Sibelius *Finlandia*. The composition I had heard so often combines the moods of the sea, the serenity of pine-clad hills and the bleakness of rock-ribbed shore. Simultaneously the motion-picture film, projected on the small screen, gave the camera a pictorial approximation of the musical theme. Perhaps it was because the screen was not much larger than an oversized dinner napkin set up against the spacious studio that the film picture of the changing moods of the sea seemed to be sadly inadequate, particularly when compared to the overwhelmingly emotional quality of the music. I noticed, however, that the cameras on the stage, concentrating on the movement pattern of the instruments and the trucklike dolly camera on the floor that searched for its drama in masses rather than detail, were more active than I had seen them during the afternoon.

Even while the most uplifting passages of *Finlandia* were filling the studio, stage hands were setting up a curiously distorted drawing of a window. Done on a single sheet of drawing board with a fine knowledge of perspective, it still seemed to be a most ineffective prop for the enhancement of the work of a renowned orchestra.

These rehearsals continue for hours on end, sometimes to the point of exhaustion for all concerned. When I had seen and heard the various numbers, orchestral, vocal and scenic, and had observed closely the visible mechanics of the production, I left the studio and soon found myself caught in the crowds on Fifth Avenue. In taxi and train I reviewed the afternoon while journeying homeward. I recalled that at no time had I seen or heard a director such as one on a movie set or at the rehearsal of a play. I heard no order issued that would govern the incessant movement of the cameras, the microphones, or the placement of props.

Also I was puzzled by the number of persons who wore

earphones, among whom was the sweating man who pushed the dolly camera. It was astonishing, the number of individual tasks that were performed seemingly without direction by people whose jobs were widely unrelated. Although orchestra and conductor were the foundation on which the whole production was built, they seemed aloof and unconcerned with the activities of the others.

And then I was mystified by the eerie processes by which the scenes and the sounds created in the studio would be broadcast later from the Empire State tower nearly a mile distant, or find their way into the coaxial cables that would carry them for rebroadcasting into millions of homes.

To find the answers to the many questions that arose in my mind would require many more visits to studios in which programs of varied types were televised.

Later that evening as I sat before our television receiver, waiting for the program I had seen rehearsed a few hours earlier, it did not seem possible to create from the chaotic scenes of the afternoon a smooth and coherent program.

At 8:30 the orchestra conductor, now in impeccable evening dress, appeared on the receiver screen, his baton beating time with grace and sensitiveness, his face a study in complete concentration as the theme motif was played by the unseen orchestra. A quick dissolve! Another camera brings in the baritone soloist in immaculate evening clothes. He sings the theme while the orchestra, now visible in its entirety, plays an accompaniment of exquisite harmonies enhanced by close-up camera vignettes of the beautifully co-ordinated motions of the musicians.

No stage production I had ever seen opened more smoothly or with such evidence of perfect timing and expert direction. Through a trellis of harp strings and without pause, the violin section became visible as it rendered the opening passage of a Beethoven symphony, bows rising and

falling with the precise cadence of bayonets on the drill field. As each section of instruments, reeds, brasses, strings or tympani, took up the burden of the theme or its ornamentation, a camera was ready to catch a close-up of the drama of artists at work. Above all was heard the beauty of the composer's work.

Almost without a pause the scene and the mood changed. On the screen of my receiver appeared the mansion of the Old South, majestic in its setting among live oaks and bathed in the dappled sunshine. On the lawn under the overhanging moss and in the costumes of the early nineteenth century the baritone soloist, the girl and the octette rendered an old-time spiritual. Carefully groomed as they were in the fashion of the period, it was difficult to identify them as the ones I had seen in rehearsal.

The stage direction in this number was superb. The carefree air of the young actors, the beauty and realism of the setting, the excellence of the solo and choral work suggested long and arduous practice. Actually that particular number on the program had but a single afternoon's rehearsal.

The orchestral number that followed was impressive, not only for its musical excellence but for the visual effects attained by the cameras. Long shots, close-up, angle shots followed in succession and always in harmony with the musical mood. The intense concentration of a cellist, when caught by the camera lens, reveals the physical and emotional strain that accompanies a solo passage. The fluid motion of a harpist's hands, the alertness of the tympani section in which a tap on a drum or a clash of cymbals timed to a split second give the emphasis and color demanded by composer and conductor. Such intimate observation of the visual drama in music gives the television viewers a sense of personal contact that cannot be enjoyed even in the best of concert seats.

As the program progressed there followed a love scene, a baritone and soprano duo in a moonlit garden, a serenade in which the window mentioned earlier played an important part in setting the scene. It was as if the camera had been pointed from a higher level at the window inside of which the serenaded lady fair was supposed to be coyly hiding. As I looked and listened, I remembered the drawing and its distorted perspective. On the television screen it had a strange realism that gave one the feeling of being several stories above it. It was in short a masterly piece of scenic design peculiarly adapted to TV.

The scene changed. A restless ocean with rank on rank of wind-whipped waves charging in on a rocky shore. Pine-clad hills and placid lakes in turn filled the screen with drama and sheer beauty. Sibelius' symphonic poem, as rendered by the orchestra, was filling that same sea and sky, those same lakes and forests with overwhelming grandeur. This single number, in itself a soul-satisfying treat for any lover of music and drama, left me uplifted but still mystified. Having seen and heard the rehearsal, I could not reconcile the seeming casualness of it all with the artistry, direction and timing I had just witnessed. I knew, of course, that somewhere there must be a directing head, a master of dramaturgy, an expert hand that guided these groups of people in unrelated arts and crafts through a maze of cues, each of which was timed to the split second.

Almost within the hour I had made arrangements to visit another studio in which a weekly mystery drama was televised. I chose this studio because of the rapid action, the suspense, the frequent changes of scene, the variety and originality of the camera work and the skill of the actors.

The building in which the studio is located is a factory-like structure devoted to video, motion pictures and related activities. Situated in New York's upper East Side in the

heart of a populous district, it relieves the gaunt drabness of a neighborhood that might well be called a slum. Scores of unwashed children play noisy games in the street and, nearby, trains of the New York Central rumble over elevated tracks. It is the last place in the world where one would expect to find a Mecca for outstanding figures of stage, screen and video.

At a desk inside the entrance a man in uniform scrutinized every passing person, for here none may enter save those employed in the various studios. Entering through a heavy sound-proof door on the second floor, I found myself in a lofty barnlike place, one half of which was drenched with light while the other half was in shadow. On the left side a girl sat idly at a telephone switchboard. An operator with headphones manipulated a microphone boom, raising and lowering it and changing its position as if in obedience to inaudible orders. Two cameras maneuvered into varying positions; the eyes of the cameramen were glued to the finders; they too seemed to be obeying orders though I could not hear a whisper. An electrician with a long window pole changed the direction of the beams of two of the overhead lights. Occasionally an unintelligible voice boomed out from an invisible loud speaker. The girl at the switchboard began to manipulate her wires and switches, repeating the numbers called in conventional voice and manner. A "camera rehearsal" was in progress.

The scene shifted to a nearby "set" in which a ringing telephone awakened an irate man in a rumpled bed which was really a mattress and bed covers placed atop several large packing cases. A bedside table on which the phone rested was set up on a wooden box. Cameras were placed low and close up to the subject. Action and lines were rehearsed over and over, since from his semi-prone position the occupant of the bed had difficulty in "angrily" slamming the

receiver back on the instrument. A little farther on was the only luxurious spot in the studio. Before a richly brocaded silk hanging was a library table, and on it books, a pair of lamps and the usual odds and ends. A comfortable chair was nearby. Angry dialogue passed between a society butterfly and her dissolute husband. The scene ended with a pistol shot.

A short distance to the right a room with four walls had been erected. It was a small and shabby place with a cheap bed, chair and dresser. On the walls were hung a few trashy pictures and a luridly lithographed calendar. Through the shabbily curtained window light flashed on and off as from an electric sign. A microphone boom craned its long neck in over one of the walls to the center of the room. A camera was set up so that it could shoot in all directions.

Although much work had been expended in building and furnishing the room, the action occupied scarcely more than two minutes of time. Again cameras and actors moved to the right, where what appeared to be a duplex set was in readiness. A police officer was seated at a broad desk behind a conventional railing. On the wall in the rear were a number of "wanted" circulars on which were photographs and fingerprints of fugitives from the law. Separated by a partition from this room in a police station was another room in which detectives questioned a prisoner.

On the studio floor in different spots were placed three monitors, small receiving sets, in which the action of the various scenes was visible. My attention was divided between the monitors and the actors. What I saw on the various sets often bore little resemblance to what I saw on the receiver screen, although both occurred at the same instant. The girl at the switchboard, for instance, presented in direct view a rather cluttered arrangement of a small switchboard, a lackadaisical actress and unrelated props against a drab

wall. I saw, as I glanced at the monitor a startling dissimilarity to what was actually being televised. On the screen was a close-up of a busy phone operator. Only a small section of the switchboard was visible. The effect was astounding. Instead of an isolated girl, the shot suggested a line of operators of whom the girl in the scene was one, busy at a long switchboard.

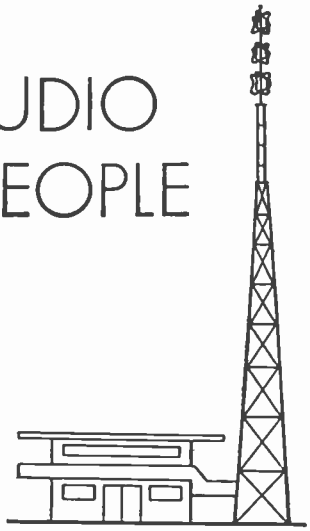
In the actual scene in which the rudely awakened man uses the phone, it was difficult to visualize the rumpled bedding set on packing cases as having the essentials of an artistic composition. Yet there it was in the monitor, a shot that would compare favorably with the best in dramatic photography. Again it was a close-up. The cameras were placed on a level with the mattress and aimed so that the man using the phone was shown only from his waist up, thus giving emphasis to his facial expressions.

In each of the succeeding scenes what I saw on the set and what appeared on the TV screen of the monitor simultaneously bore little resemblance to each other. The chief reason of course was the difference in the viewpoint of my eye and that of the eye of the camera. As an observer, I saw the entire stage and its unrelated surroundings, while the camera saw only a close-up of the characters from which everything but the mere essentials was eliminated.

Because of the very limited size of a television screen compared with that of a motion-picture screen or theater stage, the dramatic work of television actors must be restricted within a comparatively small area, so that when they appear on the screen they are large and clear enough to enjoy without undue eye strain.

CHAPTER FOUR

THE TV STUDIO AND ITS PEOPLE



I HAVE spent many hours in Hollywood studios while classics of the screen were being filmed, and have seen rehearsals of some of Broadway's stage successes. In every instance the director was the pivot around whom the entire production revolved. His authority was absolute, his word was law, his presence asserted itself as strongly as that of a monarch in the throne room.

During my earlier visits to the camera rehearsals, it became more and more evident that excellent direction came from some unseen source which, as I soon learned, was the control room.

While making frequent broadcasts on radio, I had become quite familiar with the rather sparse equipment of the average control room in a broadcasting studio and with the functions of its presiding genius, the sound engineer. I was quite unprepared, therefore, for the formidable array of instruments, devices and mazes of wiring—in which nestled

hundreds of strange multi-colored gadgets—that confronted me in the dim twilight of the television control room. Only in that amazing place can one appreciate the modern miracle of transmitting sight over thousands of miles to millions of people who can see the blink of an eye or the shake of a finger at the very instant it occurs in the studio.

Led through a narrow passage to an open door, I ascended several steps and entered a dimly lighted room. The walls and ceiling were heavily padded with a coarse soundproofing material. The place was literally packed with a strange collection of apparatus. At a long benchlike table three men, wearing headphones, sat in complete concentration. Heavily edited scripts lay before them. In the center sat the director, flanked on either side by the technical director and the video engineer. A girl, making copious notes in a sheaf of script, sat behind the director.

On the table at which the men sat were two control panels with scores of knobs, buttons, switches and tiny lights. These were manipulated by the director and technical director, before whom were placed two identical microphones. The engineer was literally surrounded by a jungle of colored wires, tubes, condensers, transformers and tiny cylinders painted with various identifying colors. The sound engineer sat preoccupied at a control panel identical with those used in radio studios.

Not far away, in a shadowy corner, were two turntables with records for background music. The red hand on a white-faced clock on the wall silently sliced off the seconds.

This control room, the nerve center of the television studio, is isolated from disturbance of any kind. Even the actors and technicians are shut out by a solid wall cluttered with electric equipment.

This anomaly of directing unseen people on an unseen stage is made possible by the use of a monitor with five

viewing screens. Three pictures, each televised by a different camera and from a different angle, appear on the monitor.

On the day of my visit the subject was the scene in the police station mentioned earlier. While making rapid notations on script, the director gave the technical director on his right instructions as to the position and height of Number Two camera so that it showed more of the desk top. Word of the director's wishes was relayed to the earphones of the cameraman who in turn instructed the man pushing the dolly. Presently on the monitor the revised shot appeared and was approved by the director and so noted on the script. This system of relaying instructions from director to technical director to cameraman to dolly pusher is practiced because of a union ruling that instructions be issued to certain union men only through the technical director, who must himself be a union man.

The red hand of the clock dominates the activities in the control room, since a scene is allotted only a certain number of minutes or seconds; the action of the actors and the lines they "read" are limited with split-second accuracy. This often necessitates a drastic cutting of the script that will not impair either the clarity or continuity of the story.

Chatting recently with a TV director who has had wide experience in motion-picture and stage direction, I asked:

"Does this remote-control direction in the television studio compare favorably with the face-to-face direction for stage and screen?"

"To my way of thinking," he replied, "it is superior, because you can see on the monitor exactly what the viewers see on their television sets at home. Of course mistakes and fluffs cannot be recalled. What goes into the camera goes out on the air. But that is an asset instead of a liability, since it keeps actors and technicians on their mettle and

puts the director on the spot if things go wrong. For instance, only recently during a tender love scene two stage hands appeared, moving a heavy sofa to another set. They were totally unconscious of the fact that they were within range of the camera. Although the avalanche of critical letters we expected did not arrive, the episode was responsible for a change in our stage management."

Since most of television's dramatic productions portray everyday subjects dealing with episodes from the lives of everyday people, it is often difficult to identify actors or actresses among those in the studio unless at moments when they are actually at work on a set. This is particularly true during rehearsals. It was an assistant director who said to me, "You can tell they are actors by the faraway look on their faces when they are standing alone. They have already learned their lines without too much time to do so. Fearful of 'blowing up' or forgetting their lines, they rehearse them silently at every opportunity.

"Unlike radio, in which the actor reads from a script richly interlarded with deletions, pauses, cues and often hints on pronunciations, the video actor must be letter perfect in his lines and cues despite his short period of preparation. He must absorb and retain direction as a sponge drinks in water. There are no retakes as in the movie studio, where scenes are shot over and over and only the best is retained for the ultimate picture presented to the public.

"In the earlier days of TV the management of a certain studio turned to the legitimate stage for its acting personnel. Among those it employed for an ambitious production was an actor who had starred on Broadway. Working in a medium that differed from that of the conventional stage, the star clashed frequently with the director. Imbued with the trouper's credo, 'The play must go on,' the actor, who

was temperamental, stuck valiantly to his job in spite of a growing fear of the camera's ice-cold eye.

"On the evening the play was to go on the air, the star seemed to be in good spirits, though a bit nervous. The scene was the interior of a British country house. Among the props was a Buddha the owner had brought from India. Imperturbably it sat with folded hands on crossed legs, the wisdom of the ages in its placid eyes, a perfect atmospheric shot for the camera.

"During an ardent love scene with the heroine, number two camera dollied in for a close-up, the lens but a few feet from the embracing couple. For a moment the star actor seemed uneasy. Then suddenly holding the girl at arm's length, he whispered audibly, 'I can't go on with that bally thing staring at me!'—meaning the camera, of course.

"Director, engineer and stage hands were in a panic. However, as the actor strode away, he realized the shock he must have caused thousands of viewers. He paused, looked angrily at the Buddha, then strode to where it sat, turned its face to the wall and continued the love scene. Only a seasoned actor could have turned such a catastrophe into what appeared to viewers to be top-flight theater. To management, producer, director and cast, it was a narrow escape from disaster.

"Similar, if not so dramatic, experiences with stage folk caused producers to turn to radio for its acting talent. But here, too, was disappointment. Although accustomed to stark walls and the uninspiring microphone, it was soon discovered that the radio actor, no matter how convincing vocally, had forgotten or never knew the value of facial expression or smooth bodily movement. Some of the most sought-after radio entertainers proved to be utter flops under the scrutinizing eye of the TV camera.

"As a last resort, television turned to the movie lots for

versatile actors accustomed to the cold stare of the camera. At first it seemed we had solved the problem. No such luck, however. Soon we discovered that the movie folk, trained to the movie technique, that of shooting only in fragments that rarely occupied more than a few minutes with only a few lines spoken, could not pass the tests. You see, the movie film, sometimes thousands of feet long, is made up of short takes that are shot again and again until the director is satisfied. The resultant film is then cut or edited and only the best of these shots are retained. Motion-picture actors, working under those conditions over a period of years, seem to lose their faculty of remembering extensive lines and carrying the theme through long sustained action so necessary to a TV production. Without the safeguard of the cutting room, which permits only their best work to pass through, they often become nervous, then panicky, and from that point anything can happen.

"I remember one actress who has played many important roles in motion pictures. Given a part in an hour-long TV drama, she did excellent work during rehearsals. As the hour approached when the show was to go on the air, she became extremely jittery. This is not unusual, even with the finest artists. The production progressed smoothly to the halfway point. Then while engaged in important dialogue with the leading man, she made a strange grimace. Terror seemed to grip her. She tried to control her features. Her leading man, fearing she was ill, advanced toward her and was met by a series of convulsive sneezes. As the paroxysms continued, the director ordered the camera to cease shooting.

"After an embarrassing pause the actress, now recovered, went on with her part as calmly as if nothing had happened. It was learned later that she had been afflicted for years by uncontrollable fits of sneezing brought on by a highly nervous state. In the motion-picture studios her oc-

casional attacks, while embarrassing, had no disastrous effect on the ultimate picture."

Eventually it became obvious that, if television were to stand on its own feet, it would have to find a new source of talent. The limitations of the TV stage, the brutal frankness of the TV camera and its electronic idiosyncrasies are grave problems. The merciless lighting that, unless carefully handled, places emphasis on the ugly points and ignores the beautiful. Even the writing of television script calls for a technique which differs from that of radio, stage and screen. Make-up that would be glamorous elsewhere may have a hideous effect when seen on video. Even the clothing worn must comply with certain optical requirements. The snow-white bosom of a man's dress shirt appears on the TV screen as a blinding blast of light. In a recent production several men in immaculate evening clothes were wearing blue shirts, collars and ties. On another set, a bedroom scene, the sheets and pillowcases were of a blue material. Then too, black garments, if made of tightly woven cloth, pick up shiny highlights that belittle the best of grooming. In viewing TV one is looking directly at brilliant fluorescent light that varies in intensity, thus forming the areas of light and shadow of which the screen picture is composed.

Furthermore, because television is most effective in close-up views, actors are handicapped by the restricted area in which they must perform. A man, graceful as an Apollo on a roomy stage, becomes hesitant, almost awkward in the cramped quarters allotted to him, especially in a screen close-up. Women adapt themselves more readily to small space.

For this reason many dramatic schools are instructing students of television acting on the subject of muscular control. Movements of arms, legs, head and torso are studied and practiced with a view to creating grace of motion while walk-

ing, sitting, rising, standing, and all within the small area encompassed by the TV camera.

The graceful and studied use of the hands is an art possessed by few, even among the most experienced performers. Many an otherwise excellent close-up has been ruined by an awkward motion of an untrained hand. During a recent dramatic production a tender love scene caused a twitter in a million homes, all because the man, while declaring his affection, thrust his hand in the direction of the camera, unconscious of the fact that on the receiving screen it appeared as large and ungainly as a shovel.

Quite as important as ease and grace in bodily movement is resonance of voice. This is a phase of TV acting on which the better dramatic schools place strong emphasis. A promising young actress who had decided to make video acting her career, was shocked to learn that a lack of voice resonance barred her from important roles. Reproducing the human voice so that it has a natural and pleasant quality is one of the sound engineer's most pressing problems.

Another problem of the television studio is the fact that the TV camera does not see eye to eye with the photographic camera in rendering the colors of flesh, clothing, accessories and surroundings into black and white. Photography is a photo-chemical process in which the film is coated with any one of several emulsions suitable for rendering various colors in their proper black and white values. Television, being an electronic phenomenon, has neither film nor emulsion. It does not see color as the human eye or the photographic camera sees it. Red, for instance, photographs dark even to the point of blackness on certain films. In television it becomes a pale gray that sometimes approaches whiteness. This characteristic brings to the TV studio many problems of coloration. Even the most meticulous make-up of a well-groomed woman at, we'll say, a fashionable dinner party,

would give her a ghostly appearance on the TV screen. Ordinary rouge and lipstick seem to disintegrate under the light frequencies used in the TV studio.

Despite the utmost care, the electrons sometimes play strange pranks. A good-looking actor, well versed in the art of TV make-up, became dissatisfied with the slight unevenness of his front teeth. Although expense and pain were involved, he decided to have them extracted and replaced with skillfully made artificial teeth. Proud of his new incisors, he stepped before the TV camera with a broad and toothsome smile. The director, who had been viewing him in the control-room monitor during the rehearsal, came rushing out on the studio floor. "What in heaven's name have you done to your teeth?" he shouted. Puzzled, the actor replied, "I've had some new ones put in." "That's where you made a terrible mistake," the director snapped. "Those teeth look like so many kernels of parched corn!" For it must be explained that the calcium in natural teeth gives them a brilliant sparkle in the presence of electrons, a sparkle that cannot be attained by false teeth.

Because television was so young it still suffered from childish ailments. Crises were so frequent that their absence suggested the ominous quiet before a storm. A microphone boom, swinging across stage during a production, knocked an actor cold in sight of millions of viewers. A goat that was supposed to add realism to a scene, destroyed the illusion by proceeding to devour the scenery. A sober scientist, demonstrating certain dramatic chemical reactions, got his ingredients mixed and nearly suffocated in dense clouds of acrid smoke. The corpse in a whodunit drama contracted a violent case of hiccups. In an effort to give gusto to a drinking song, the tenor accidentally bashed in the nose of his comrade with a beer mug. These and scores of other slips were but a few of the crises occurring on the TV stage.

But somehow they neither startled nor shocked the audience. Before the mishap was minutes old, the telephone switchboard was glutted with calls wanting to know the hows and whys and wherefores.

A seasoned director told me recently that television audiences are not unlike circus audiences. When a flying trapeze artist misses and plunges down into the net, they are horrified but they would not have missed it for the world. Few of the flood of telephone calls and letters that follow an unforeseen mishap during a TV performance are critical. Indeed they are as a rule good-humored questions. The burden of most of them is, "How the dickens did it happen?"

Very few among the millions of viewers have even a faint idea of the difficulties that arise during almost any type of program; as, say, a concert by a great orchestra, in the days before the heat from the intense lights had been mitigated. Musicians wilted, glasses became fogged, stringed instruments soon went flat. Even the keys and pads of wind instruments were affected. During rehearsals many of the musicians wore dark sun glasses which had to be discarded when the concert was telecast; many found it difficult to read their notes. It is indeed a miracle that such a high standard of performance has always been maintained under such conditions.

Neither does the public appreciate the great amount of labor and expense that goes into the televising of an hour-and-a-half-long play. As an example, take the production of George Bernard Shaw's *Caesar and Cleopatra* in the "Producers' Showcase" series, starring Sir Cedric Hardwicke, Claire Bloom, Jack Hawkins, Judith Anderson, and Cyril Ritchard, one of the most impressive all-star casts ever assembled for a "live" television show. Joseph Schrank, experienced adapter of plays to television as well as author of many originals for the medium, performed the delicate oper-

ation of adapting the Shaw play and cutting it to hour-and-a-half length. The time consuming work of casting (for an able supporting company must also be assembled) and of adaptation completed, the cast was called for rehearsal in a dingy hall in midtown Manhattan. The first day was devoted to the customary "read through," during which the producer and the director discussed with the cast the story aspect of the play until the performers had a reasonably accurate understanding of the parts assigned to them.

On the floor of the hall white lines were painted to mark the limits of the television stage. Folding chairs and a battered table or two were the props for Egyptian scenes, complete with desert and the Sphinx.

With the beginning of the actual rehearsals came the memorizing of lines in which each performer must be letter perfect. At the same time scenic designers worked on sketches for the various sets to be used. Then began the feverish labor by scene painters, stage carpenters, electricians, property men, costumers, typists and truckmen.

Anthony Quayle, well-known actor, and also director-producer of the Shakespeare Memorial Theatre at Stratford-on-Avon, England, directed the play, and for two and a half weeks the cast and Mr. Quayle and his staff practically lived in the bleak rehearsal hall.

For hours after the cast had left for their homes each evening, the director would work far into the night planning the mechanics of the play. His manuscript was almost an undecipherable jumble of deletions and diagrams with additional marginal notes. A large floor plan of the stage was spread before him on a table. With all the deliberation of a chess player he moved and re-moved four tiny wooden models of TV cameras into varying positions from which the shooting was to be done. The identifying number of each camera and its exact location were carefully noted on the script.

The clock on a neighboring church tower struck two before he put out the lights and wearily sought a few hours' sleep.

On the sixteenth day producer and scenic designer supervised the installations of the stage sets. Costumes were checked as to period, style and color. Properties, accessories and their placement were selected with special care. Just one day before the telecast, the usual camera rehearsal was called. Actors appeared in costume and make-up. Cameramen, electricians, property men and all who took part in the production were in their appointed places. The bleak rehearsal hall had been abandoned for the perfectly equipped color studio at NBC, over whose network the play was to be broadcast.

And now the easygoing tempo of the rehearsal hall gives way to a strained activity that is marked by nervous tension. Weariness is in the voice of the director as he calls, "Curtain!" There is instant silence. The play, now in final rehearsal, begins under the scrutinizing gaze of the cameras.

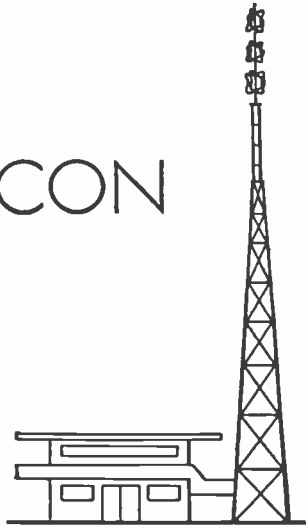
The following evening on the dot of 8 o'clock the program goes out on the air to an invisible audience of millions. Few in that vast audience realize that thousands of man hours have been expended by a hundred and fifty people on ninety minutes of entertainment at a cost to the sponsor of about a quarter of a million dollars.

Such a figure may seem exorbitant for an hour's diversion along with commercial intermissions during which the sponsor's products are extolled. Yet when compared with the advertising rates of other comparable media like national magazines, the expenditure seems moderate.

Furthermore, the television presentation commands the concentrated attention of a viewer for a full hour and a half. It is doubtful if the most sanguine magazine publisher would claim more than a momentary scanning of any advertisement by his most loyal reader.

CHAPTER FIVE

TELEVISION PRO AND CON



THE 4:29 from the Pennsylvania Station in New York to Port Washington is a local. I take it frequently when returning from the Big City because its leisurely pace gives me opportunity to chat with old friends or to read undisturbed by the hustle and rush of homing city workers.

One day some years ago I rode with an old acquaintance, John Bodine, who for many years had been an English teacher in one of the city's high schools. Shortly after pulling out from Little Neck station, our train came to an abrupt stop. Presently I noticed that many of the passengers were peering through the windows at a man in overalls perched perilously on the roof of a nearby house. He was installing a TV aerial on the vine-covered chimney. On the ground half a dozen boys and girls were looking on expectantly.

"Too bad, too bad!" Bodine murmured with a slight shake

of his head. "There goes the end of home study in that house!"

Knowing him to be a little on the pessimistic side, I asked, "Do you think that television interferes with home work?"

"It stands to reason," he replied, "that a kid can't spend hours nightly looking at a lot of claptrap pictures and still have time for home study."

His use of the word "claptrap" indicated a strong prejudice against television itself as well as its programs.

"Do you view television frequently?" I inquired.

"Certainly not!" he said sharply. "The two or three times I have watched television programs in the home of friends have been quite enough for me."

"Have you noticed much difference in the marks of children who have television in their homes and those who have not?"

"Comparative analysis of the marks of different groups is not my province," he said evasively. "I am a teacher, not a statistician."

A week later we invited the Bodines to spend an evening with us in our home. Mrs. Bodine is a gentle, cultured person; her husband, despite his peeve on television, was a pleasant and welcome guest. Before their arrival I had studied the TV programs for the evening. At an opportune moment I suggested that we *listen* to a symphony orchestra about to go on the air. With resigned expression Bodine settled back in his chair.

At first he seemed slightly ill at ease. Then I saw him relax, soothed by the exquisite rendition of the symphony. Presently he seemed to become enthralled by the superb camera shots showing dramatic close-ups of the instrumentalists, singly and in groups.

During the half-hour program that ensued he sat as if in a trance. As the conductor's baton came down on the final

beat, I heard him whisper to himself, "Beautiful! Beautiful!"

Then followed a quiz show in which the authors of quotations were to be identified. Moderator and guests represented the élite of the literary world. It was interesting to note that Bodine entered the spirit of the quiz and came through with many of the answers ahead of the experts.

Another channel brought a gripping drama of life in modern Britain. Our guest's enthusiasm flagged a bit but when he saw the keen glow of interest in his wife's face, his eyes never swerved from the screen. Well written, beautifully staged and played by a small group of artists, it was the epitome of flawless drama, building to a climax. It was as if the viewer had dropped in at the country house of an affluent and well-bred English family during a domestic crisis that had a happy ending.

As a stirring windup to the evening's entertainment, I tuned in a Western that had been filmed a decade before. It was a documentary of frontier days. Rough and rugged, it had all the elements of our history-in-the-making. It was filled with action, breakneck riding and shooting enough to satisfy an adventure-hungry boy of ten.

Surely, I thought, this is where Bodine's antipathy for TV will come to the surface. Instead, he was a-quiver with excitement, particularly during the part in which the hero fought it out with a bandit atop the careening stage coach.

At that point I approached the TV receiver as if to turn it off. A protest came from our guest the teacher. "What's the idea of stopping just when the picture gets interesting!" he remarked with a shake of annoyance. "Sorry," I said, harking back to his vehement criticism on the train and smiling to myself.

Months later I met Bodine again on the 4:28. Scarcely had the train emerged from the East River tunnel when he

said abruptly, "Somehow I've changed my mind about television. In fact, I've had a receiver installed in our home. Besides the enjoyment we get from it, it gives me an opportunity to study the various types of programs and their relation to the study habits, or study hours if you will, of young people of school age."

"And what have you discovered?" I asked.

"Many things," he replied promptly. "I am convinced, for instance, that TV will revolutionize our entire system of education. Eventually it will bring the classroom into the home, particularly in cities where greatly increased population has made existing school facilities inadequate. Then too, teachers trained in the technique of instruction by video will serve simultaneously thousands of pupils instead of the thirty to fifty that the average classroom accommodates today. This method of teaching by video has already been adopted by the U.S. Navy at its Special Devices Center at Port Washington."

"Isn't it true," I asked, still recalling our previous talk on the train, "that many teachers insist that television in the home is responsible for lower marks among students?"

"That is only a half truth," he said staunchly. "In such cases it is not television that is at fault but rather the lack of program selection by parents and their failure to allot a specified time for the children to view TV. Properly supervised, I consider television even in its present more or less undeveloped state, a splendid stimulus for young minds. It demands complete concentration and it gives a period of healthy relaxation. Besides, it has brought an army of night-prowling youngsters back into the home for the hours between supper and bed.

"A recent high-school survey disclosed a drop in the scholastic grades of pupils from homes where television had been installed. A later analysis showed that only in a few cases

were the programs supervised by parents. But it was also discovered that the few who were subject to supervision had better than average marks and a considerably higher I.Q. than the others.

"On the whole I have come to believe that installing a TV set in a home with children is not unlike bringing in a very large and luscious box of mixed chocolates. Only a foolish parent would place it before the youngsters, permitting them to surfeit themselves to the point of sickness."

"So much for the younger groups and the impact of TV on their studies," I interrupted, "but what about its effect on the young men and young women of college age?"

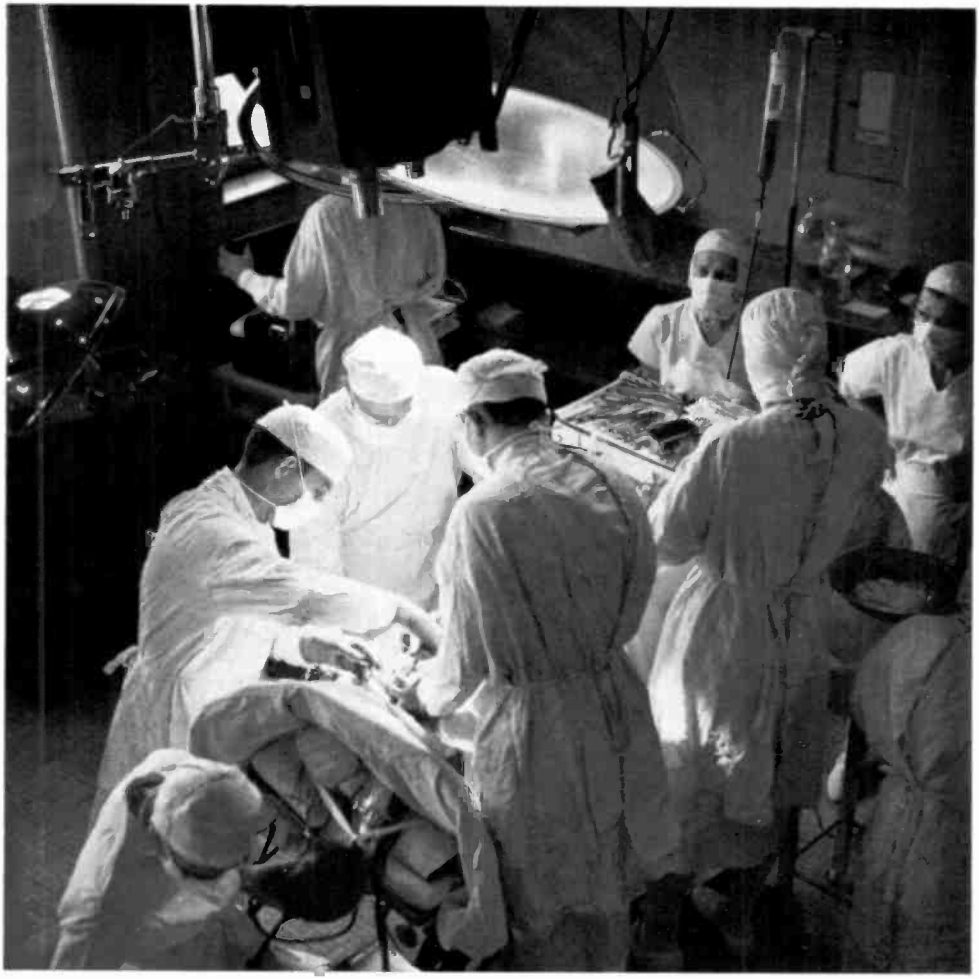
"That's a different story," he said. "Graduation from high school or prep school brings with it a certain seriousness of purpose in which the problem of earning a living or choosing a profession is paramount. In short, to the average teen-ager, a job, money in pocket and independence become something of an obsession. Higher education, unattainable to many, takes on an aspect of serious endeavor. Conscious of the need for home-study courses, Brooklyn College in cooperation with the National Broadcasting Company, is the first of its kind to use network video in college integrated studies. Students are required to listen to discussions and lectures, to do supplementary reading and submit a series of essays during a fifteen-week period. These essays will be evaluated and returned to students with suggestions and comments by members of the college faculty. Text material will be issued also on the background of questions considered on the program. Two points of college credit will be given to students matriculating in the Vocational Diploma Program. The prime purpose of the course is to make it possible for individuals throughout the nation to continue with organized education in their own homes."

Here is a peep into the control room during a major TV production. It is a place of silence and intense concentration, for here the slightest ineptness or bungling can ruin the finest production.

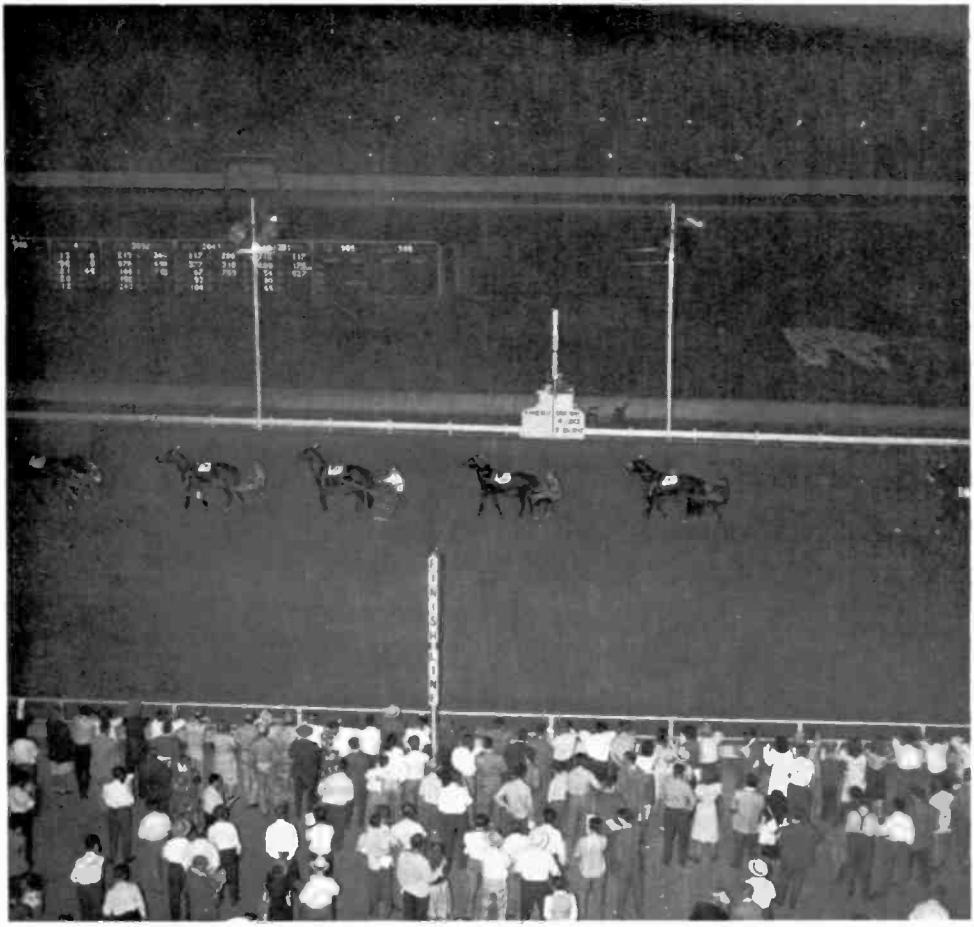
As can be seen from the position of the cameras, this is a close-up shot of the performing artist. Even seasoned stage people shudder inwardly when exposed to the merciless scrutiny of the lenses at such close range.

The quality of the picture as it appears on our home TV set depends largely on the skill and the knowledge of the video engineer. He is quick to correct, by means of the knobs and buttons on his desk, the slightest deviation from a clear and steady image.

This remote pickup from the interior of a submarine demonstrates more clearly than words the marvels of television and its limitless possibilities in the field of information. It also reveals the crowded quarters in which some men must work and live.



This surgical operation was telecast and witnessed by hundreds of medical men who were miles distant. Note television camera at top of picture, aimed directly at the focal point of operation.

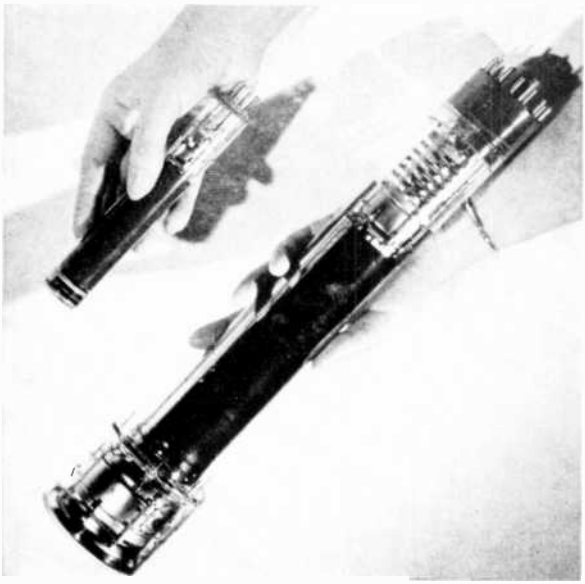


Night scene televised at Roosevelt Raceway, Long Island, N. Y. Millions enjoyed, without leaving their homes, the thrills that go with racing thoroughbreds.

Here is a perfect view of the inside of a television camera. In appearance it differs little from that of a modern radio set. The radio set, however, functions under the impact of sound waves, while the TV camera reacts to light waves.

As television increases in stature, the complexities of its equipment increase immeasurably. Here is a partial view of studio control units of the RCA all-electronic color television system in Washington, D. C.

The exterior of a television set presents merely a good example of functional and esthetic design, like any other piece of good furniture. Its interior is another story. The above photograph shows the hundreds of individual parts that are assembled with microscopic care so that we can watch the world go by from the comfort of our favorite armchair.



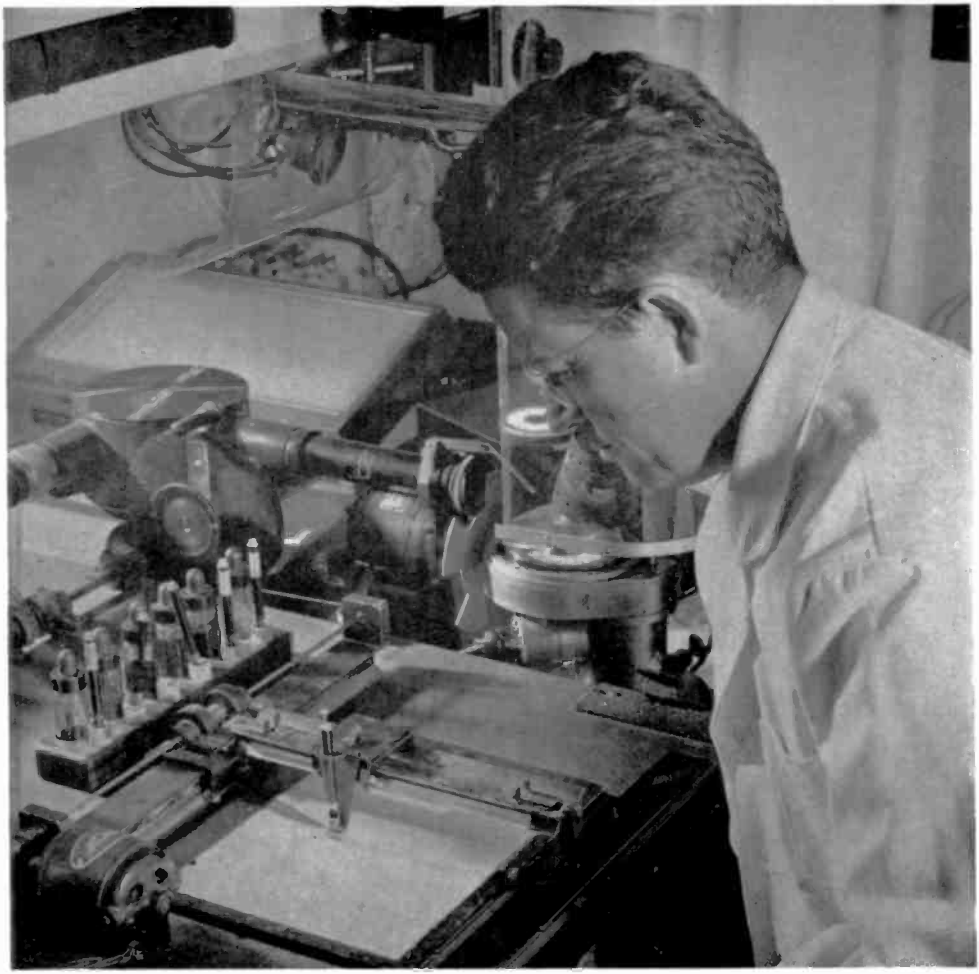
Here are two of television's seeing eyes. The upper is the tiny Vidicon, a new pickup tube developed for use in the RCA industrial TV system. The lower is its big brother, the image orthicon, the pickup tube generally used in commercial telecasting.

The Vidicon in use. Ensconced in a small camera, it produces the clear well-defined image seen in the portable monitor on the nearby table.

Doctor Vladimir Zworykin, one of the world's leading scientists and known generally as the "Father of Modern Television." He holds his earlier brain child, the iconoscope, that freed TV from the whirling disk.

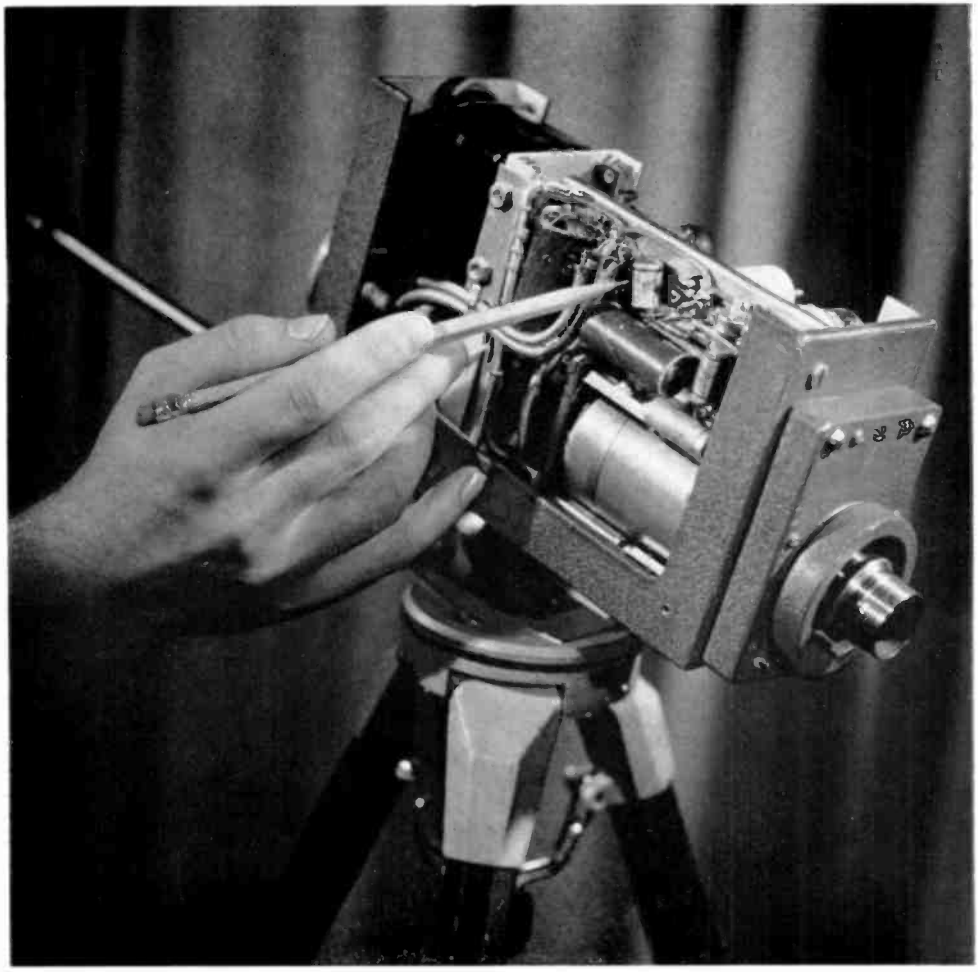
No other modern commercial industry leans so heavily on pure science as does television. Photo shows RCA scientist conducting an electronic research experiment on the evaporation of metals inside a vacuum chamber.

Here we have another RCA scientist watching from behind a protective shield a radio-active generator in operation.



Television knows no middle ground in the quality of materials. The scientist shown above is using ultra-sensitive testing instruments on a certain material.

The human eye, no matter how good, is not sharp enough to fit certain parts that go into the assembly of, say, an image orthicon. Here the microscope is a must.



One of the miracles of television is the little Vidicon camera. Into its small bulk are compressed all the essential parts and functions of the vastly larger and more cumbersome TV camera. Because of its handy size it may be used in industry at a hundred observation posts that, through risk or expense or inaccessibility, had always gone unobserved.

film and develops a negative within a minute, ready for distribution. With the highlights clipped from these pictures are built the weekly or monthly programs for educational stations, and for the schools and universities supplied by the Educational Center in Ann Arbor, Michigan. Much larger studios are planned for the near future.

Numerous other rooms in the Headquarters are necessarily given over to TV: for televising interviews, for the use of editors who cut and put together film for feature shows, for storing the files of film which record every word spoken in UN sessions for future reference, etc.

In the great Assembly Hall, empty at the moment except for two groups of visitors sitting in spectator blocks listening to guides, we saw the long double row of booths on each side, high above and overlooking the floor: such booths as I had learned about firsthand at Lake Success: compact and potent chambers, the almost hidden heart of world communication, in which cameramen and commentators, several announcing at once in different languages, produce picture and narration in what seems to the viewer to be miraculous synchronization.

The chronology of United Nations television coverage is typical of rapid development and co-operational methods in the whole TV news field. A single broadcasting company, for instance, did not operate alone for the Lake Success event of which I have spoken. Because of the cumbersome equipment, weighing several tons, that was necessary for a mobile unit at that time and because of the limitations of available space, broadcasting companies pooled their equipment and personnel so that several might participate in an on-the-spot telecast. Today the United Nations provide the pool.

In March, 1949, for the Third General Assembly at Lake Success, NBC and CBS co-operated in the first pool, of a

two-week UN coverage, the cameras being rented by UN from RCA and the broadcasting carried by NBC and CBS. In the first UN coverage to be sponsored, by the Ford Motor Company in the fall of 1949, the Columbia Broadcasting Company carried the programs. UN had its own cameras for the first time in the fall of 1950, and in the fall of 1951, when the General Assembly met in Paris, kinescope was installed for the first time by the UN. In the fall of 1952, when the UN moved into its new building in New York, a new kinescope adapted to its need was provided.

Long-distance operation of UN coverage was demonstrated at the time of the Tenth Anniversary Meetings of the United Nations in San Francisco, June 20-26, 1955, when all programs were sent to UN Headquarters in New York by coaxial cable and there were kinescoped and sent out all over the world. The whole TV staff stood by at Headquarters, working the material up into programs and translating into five different languages.

Local coverage on the West Coast was made by NBC, CBS, and ABC (American Broadcasting Company) and their affiliates and by independent stations on the West Coast; and on the East Coast the same three companies used the UN's kinescoped despatches.

These three American networks are all using rapidly processed kinescope extracts, familiarly called "hot kine," in their evening news shows; in some cases two deliveries a day are being made to them from UN Headquarters.

So much for the more serious side of televising public events of unusual significance. In sharp contrast to the methodical methods of telecasting the proceedings of a Security Council session where every action is governed by inflexible rules, the telecasting of a major league baseball game

In the midst of turmoil and excitement is a strain under which none but seasoned crews can stand up.

In the first place the cost of televising a game is tremendous.

The color mobile unit used by NBC for this purpose is valued at seven hundred and fifty thousand dollars; while the black-and-white mobile unit is valued at eighty-five thousand. The modern TV color camera, as said before, costs fifty thousand dollars; while the black-and-white camera costs sixteen thousand. Five color cameras, four in action and one in reserve, are necessary to cover a World Series game. Then there is a crew on the spot of about nineteen employees whose combined salaries range from several hundred dollars a day down to the union scale for technicians.

At a recent major league game in New York the televising crew consisted of a director and two assistant directors, two broadcasters, a statistician, a sound engineer, three video engineers, five cameramen, a technical supervisor, a technical director and several porters. Nor does this include the host of people back at the broadcasting station who are connected, directly or indirectly, with the telecast.

The TV director at a baseball game is the busiest man in the ball park, for it is he who correlates the camera shots of plays and players so as to make a comprehensive smooth-running story. His job calls for rapid-fire editing, or selection if you will, without ever seeing a pitcher or a batter in the flesh. All he sees are the monitor screens, each carrying the picture the camera sees at the moment. In a single hawk-like glance he appraises each separately on the merits of its drama or its news value, and holds his choice on the screen until its has given up its last crumb of information. These shots rarely last more than a few seconds.

Each camera has four lenses of different focal length. It is the director's job to specify which lens he wants used. He

may require a long shot, a wide angle or a close-up. The technical director beside him transmits the order through the earphones of the specified cameraman. For dramatic effect he may order two cameras put on the screen simultaneously; or for variety he may give a player a dynamic appearance by taking a flash of him at a gravity-defying angle. Besides all this he spots the commercials between innings and times them to the fraction of a second, for time is a valuable commodity for which the advertising sponsor pays generously.

After a recent telecast game, I asked the director, who had just completed a double-header, if the physical side was not exhausting. His reply was a bit surprising:

"No," he said, "I use very little physical effort beyond the waving of an arm in directing. It is the nervous tension that wears you out. Every muscle and nerve in your body is tight as a drumhead. As you watch the monitors, there is the constant fear that the moment you bring in one camera, something much more important will appear in another and all within the same second.

"Not long ago, while covering a game at Ebbets Field, Number Two camera picked up a fracas in the stand in which a fight between two fans quickly developed into a free-for-all. It offered a touch of excitement at a moment when the game was a little on the dull side. Since the batter who was up was not noted for his batting record, I kept my eye for a few seconds on the Number Two monitor on which the scrap was progressing merrily. Suddenly my technical director shouted, 'Hey, look!' instantly putting Number Three camera on the air. The sports broadcaster's voice, coming through my earphones, was almost hysterical. A hurricane of shouts swept in from the crowd. The batter had hit an unexpected homer. I had missed the crucial wallop that won the game. But fortunately, Number Three camera

had followed the ball into the heart of the bleachers. Since then my face turns red every time I think of it."

Sports telecasting has become one of TV's major operations. It is sixteen years since major league baseball was telecast for the first time by NBC. The game was between the Brooklyn Dodgers and the Cincinnati Reds at Ebbets Field, Brooklyn. This was made possible by the development of these mobile TV vans which, as already described, carry the essential facilities of a standard broadcasting station. At that time the single camera used was mounted atop the van. Later came portable equipment, which today gives greater mobility, not only to the single camera but to the necessary group.

Today major sports events, which but a little more than a decade ago could be witnessed only by a few thousand spectators, are now televised into millions of homes. The living-room chair has become a grandstand seat. During a widely publicized race meet, some thirty thousand fans were packed into stands and paddock. I attended with a friend whose family for generations had raised blooded horses. The heat was insufferable; sweating men and jaded women milled around like a colony of ants. Although a "clubhouse guest," I caught only distant glimpses of the thoroughbreds or their performance. The following week I saw the races from the TV screen in my living room and was thrilled by the superb coverage by the cameras.

In fact, the horses and their silk-clad jockeys paraded before me, showing all their grace and fire, while an announcer, an ex-jockey, gave a concise biography of each animal. Many of the owners and big names in the racing world were introduced and interviewed for my benefit. From the camera's vantage point I looked down on the jostling throng of spectators, many of whom could not see the horses or in-

deed the race. Through the telephoto lens I had a perfect view of the "starting gate" and the delicate task of getting spirited horses into their appointed places. And then, to the accompaniment of a mighty roar, "They're off!," I saw seven magnificent animals shoot like a flight of arrows into their contest of speed and endurance. I saw a thrilling "photo finish" exactly on the instant with the judges who were in plain sight. I saw, in fact, more, much more of the highlights of the race meet than did any single person of the thousands present at the track.

A sports-conscious public such as we have in the United States, demands of its news gatherers, whether they be in journalism, radio newsreels or video, a high order of accuracy in their reporting of news events. This demands an intimate knowledge of the sport being covered, its fine points, its techniques and its vocabulary. A sportscaster, familiar with football, basketball or baseball games, might be hopelessly bogged down at a golf tournament if he could not tell a mashie from a niblick or a hook from a slice.

In its early days television was limited to a restricted area in covering sports because of the excessive weight of its required equipment. To compensate for its lack of mobility, it used generously long-focus lenses which were nothing more than refinements of a telescope through which the camera brought distant objects into close view.

In events like golf tournaments, in which several miles are covered by the players and the "gallery," which sometimes includes several thousand spectators, television coverage, therefore, was for some time not practical. Golf might be termed a close-up game. Only the action of the players and their technical skill in the use of clubs have spectator interest. The result is that the participants in a crucial game are hedged around by a breathless throng of enthusiasts which shuts out the view of the most powerful telephoto lens. Pic-

torial coverage of the ancient game was at that time done by news photographers and newsreel cameramen who, being less handicapped by the weight of equipment, could follow the players. Television cameras, if used at all, were tethered at the first tee by the cables that led to the mobile unit truck.

From its infancy TV was faced with problems that at the moment seemed impossible to solve. Now recognized as the most graphic sports news medium, its early limitations, due to the immobility of its cameras, were a challenge that spurred its best scientific brains into action. The result has been a revised camera, a microwave relay transmission and a freedom of camera movement heretofore unknown in television.

The first time that a golf match was televised from the first tee-off to the winning putt on the fifth green, at a tournament in the vicinity of New York, was a great event, but with the constant refinements of technique, the TV camera has now, of course, for some years been competing with the news photographer's speed graphic and the newsreel man's Eyemo, not only in coverage of golf but also of automobile racing, roller-skating derbies, swimming meets, boxing, wrestling, tennis, and all the other sports for which a vast television audience is now constantly on hand.

This trend on the part of the public to keep up with the sports world while enjoying the comforts of home, has aroused considerable controversy among sports promoters. There are some who claim that TV is poison to gate receipts; others insist that it is proving a powerful stimulus to interest in sports among people who heretofore have been lukewarm. Some of the major colleges have frowned on television at their football games because of a perceptible falling off in attendance. The moguls of baseball and boxing considered putting a taboo on TV for the same reason. On the other hand, the promoters of harness racing, wrestling

and roller skating attribute their rapid growth in popularity and increased gate receipts to the superb coverage of their contests by television.

During an interview with one of America's foremost sports writers I asked: "Will television seriously affect attendance at major sports events?"

His reply was perhaps too optimistic— "Not at all. In the long run it will increase the gate receipts of all sports, as it's doing today for a few. I consider TV an appetizer that stimulates a desire for more substantial fare. It is true that it gives many a viewer a front-row seat he could not otherwise afford. But there is something more to a sports event than the sport itself. There is the anticipation of attending the event, the stimulation of mingling with people in the mass, the spine-tingling roar of the crowd, the infectious excitement that grips players and spectators alike and, don't forget, the holiday spirit in which cares and worries are laid aside.

"TV has built up in a short period an audience of millions who follow the televised sports events. Among them are tens of thousands who have never seen a World's Series game, a heavyweight championship match or an Army and Navy football game but who would make any sacrifice for an opportunity to see them in the flesh. It is from the ranks of these TV fans that the sports promoters of tomorrow will reap a harvest that will exceed their wildest dreams."

This sports expert's answer to my question brought to mind two old family friends whom we will call Miss Abigail and Miss Alice, who for many years have devoted themselves to the care of an invalid aunt. Soft of voice and gentle in manner, they have endeared themselves to all who know them. About a year ago they had a television receiver installed in their very comfortable home. Their intention was

to provide their shut-in relative with an opportunity to see what was going on in the outside world.

One evening last summer I dropped in to return a book I had borrowed from Miss Abigail. As I mounted the steps to the porch, I was startled to hear raucous voices, men's and women's, coming from inside the house. Miss Alice greeted me at the door. Her eyes sparkled, her face had the flush of excitement.

"You are just in time," she said, "for some real wrestling."

The living room was in semidarkness. Miss Abigail and the invalid aunt sat transfixed, their eyes glued to the television screen. After a strangely perfunctory greeting I sat down to witness as weird a mixture of brutality, skill and showmanship as I had ever seen. One of the contestants was a mountain of a man: the other was lithe and strong with the muscles of the panther after which he was named.

"Look! Look!" cried the aged aunt, "he's gouging, the big brute!"

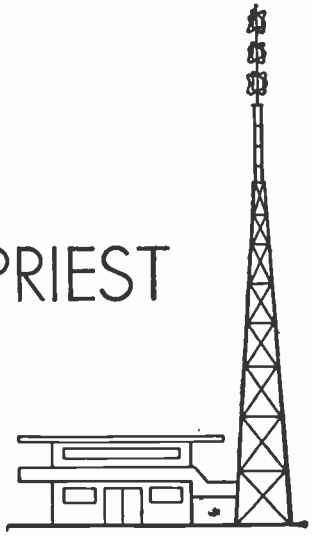
"Never mind, Auntie!" said Miss Abigail soothingly, "the Panther will put a hammer-lock on him. Serves him right!"

Having never been a student of the art of wrestling, I was astounded to hear three gentlewomen discuss flying mares and toe holds, head scissors and body scissors with all the decorum of a sewing circle.

Later I learned that a nurse had been employed to sit with the aunt the following Saturday evening. Miss Abigail and Miss Alice were attending a wrestling match some twenty miles away.

CHAPTER NINE

TV TEMPLE AND ITS HIGH PRIEST



AS I LOOK back over the years of TV development, the memory of my first view of television stands out conspicuously. It was at the RCA laboratories then at Camden, New Jersey. On a long bench at one side of a spacious room was arranged what seemed to my lay mind to be a confused tangle of wires and electrical apparatus. It suggested an electrician's cluttered workbench rather than the brain child of a scientist.

One object in particular aroused my curiosity, since it seemed out of place in such workaday surroundings. It was a glass cylinder resembling a large mason jar, set on its side and supported in a metal frame. Over the bottom of the cylinder were two concentric rings of metal, the inner one about the size of a small saucer. Several heavily insulated wires led to the neck of the jar and to recording instruments on a nearby panel.

Marveling at this strange object, I asked my host what it

was. His reply was prompt but not enlightening. "That is basically a cathode-ray tube, but in its present form we call it a kinescope or picture tube. It was developed by our Doctor Zworykin."

Still puzzled, I asked, "But what is its function? What does it actually do?"

"Rather than try to explain, I'll show you," he said. He beckoned a laboratory assistant, a young man of strong but pleasant personality. The two held a short conversation, most of which was unintelligible to me.

The young man left the lab and returned in a few minutes. There was a buzzing hum as he threw a switch. He turned a knob here and there on the panel, watching the dials meanwhile. A faint image appeared within the inner circle on the bottom of the jar. At first it was blurred and indistinct but presently it developed into an excellent portrait of the young assistant then busy with controls on the panel board.

"What you see on the kinescope," said my host, "is a photograph that has been transmitted through the ether from another part of the building."

"Television?" I inquired.

"Television," he replied, "still in swaddling clothes but watch it grow!"

Much later, in 1950, I visited the RCA laboratories again, now at Princeton, New Jersey. The purpose of my visit was twofold: to learn something of the progress of television and its potential future, also to meet the scientist, Doctor Zworykin, to whom the world is largely indebted for TV as we know it today.

It was Doctor Zworykin's intensive study of electron optics that directed his interests to the electron microscope. It was the Doctor and his group of keen assistants who perfected this instrument as a priceless aid to research. Now

serving hundreds of laboratories, hospitals and institutions throughout the world, its great value lies in the fact that it has exposed to view truths of nature that have been hidden from man since the beginning of time.

Leaving the train at Princeton Junction, I was met by a motorcar and driven two miles across the fertile Jersey countryside to what looked like the broad acres of a private estate. Nestled in the greenery of maples and oaks and shrubs was a low brick building covering several acres.

Inside an imposing entrance a spacious reception hall was flanked by a comfortable lounge for waiting visitors. At a modern businesslike desk, a receptionist, a charming woman in her thirties, greeted me. She seemed to be well informed on the purpose of my visit as she entered my name on a card and handed me the identification badge that was to be my passport to one of the world's greatest temples of science. A uniformed guard stood grimly at attention, a reminder that within those walls were stored many secrets vital to the security of our country.

Escorted by a page down several polished corridors, I marveled at the neatness and cleanliness everywhere apparent. Dust, I learned, has high priority among the enemies of electronic research.

In Doctor Zworykin's office a secretary announced as she ushered me into his sanctum, that the Doctor was expecting me.

When the great man arose to greet me, I noticed he had changed very little during the years since I had seen him in the Camden laboratory. Broad shouldered and virile, his strong but kindly face belied his sixty-one years. When he spoke, there was a resonance to his voice and a conciseness to his words that claimed his listener's fullest attention.

Confessing frankly my lack of knowledge of the complexities of electronics in general and television in particular, I

asked his permission to submit a few questions in the language of the layman.

"Fire away!" he said with a good-natured smile.

"What was your greatest problem in the development of practical television?" I inquired.

His eyebrows raised, causing tiny wrinkles to ripple along his forehead. Then with a twinkle in his eye he said, "Making a tiny dot of light behave."

He continued, "You see, the picture on your television set is composed of millions of dots that vary in intensity from slightly above zero to brilliant luminescence. It is that constant variation of light and shadow that makes the picture visible. Now when you succeed in controlling the behavior of a single dot, a million dots will behave in the same way under the same circumstances."

"Would you care to comment on the future of television?"

"A scientist is not necessarily a good prophet," he answered. "I can only give you my personal views for what they are worth. Even in its present adolescent state, it is proving to be an educational and informative medium of extraordinary power. While it is not yet required equipment in the classroom, I believe the time is not far distant when it will solve many of the economic and sociological problems that beset our schools and colleges.

"Remember that education is only the first step toward enlightenment and only an enlightened world can know peace and happiness. When we speak in pictures, we speak in a language that knows no national or social barriers. The illiterate Hottentot can read the television story that tells of the customs, the dress and the way of life of the more civilized lands. And likewise the more privileged peoples can get a better understanding of the Hottentot and his environment."

"But since we cannot now transmit television across the

ocean," I interrupted, "how are we going to reach the Hottentot and the peoples of the other continents?"

"Time will take care of that," he said. "At this moment a submarine coaxial cable, we'll say, from New York to London, is not practical. But you must remember that numerous planes are constantly in the air between the United States and Europe. Now if these planes were dispatched at regular intervals and were required to fly at specified speeds at a specified altitude of twenty thousand feet, they could serve as relay stations through which practical television service could be maintained between the two continents. Even now, while we are speaking, excellent television programs are being received in Boston from New York, a distance of 250 miles over a series of ten relay stations."

"What is a relay station?" I asked.

"It consists of an unattended tower in which is installed a receiver to capture the telecast signal and equipment to boost its power and transmit it to the next station, where it undergoes the same process. And so on from one relay station to another until the signal reaches the distant broadcasting station. Many communities, not serviced by coaxial cable, receive their television programs through this relay system."

During our lengthy conversation I noticed that the Doctor did not use a single scientific term beyond the comprehension of the average schoolboy. His English was perfect, his choice of words flawless and always on the side of simplicity.

Once in a moment of almost boyish enthusiasm, he mentioned casually "the RCA Industrial TV system." Somehow the term struck me as incongruous, since I had always looked on television as a medium of entertainment and information, particularly suited to the home or the school. It was difficult to visualize it as an implement of industry.

"Suppose you look it over before you leave," suggested

the Doctor. "I think it will interest you." Even as he spoke, he picked up the phone and spoke to one of his many assistants. He asked that I be shown the Vidicon in operation.

As I took my leave some moments later, he suggested that his secretary escort me to the laboratory I was to visit. In walking along the corridors I had the opportunity, here and there, of glimpsing science in its shirtsleeves. The doors to many of the labs were open and inside were studious-looking men, some youthful, others bespectacled and gray haired; all showed complete preoccupation in the particular project on which they worked. Nowhere did I see a sign of haste or fluster; instead a thoughtful deliberateness.

In a spacious room that was part lab and part workshop I was introduced to two scholarly men. One was absorbed in a screen that looked like a monitor used in TV studios. Even while he greeted me, his attention was focused on the screen where a dramatic under-water scene was being shown. Hundreds of strange creatures of varying shapes and sizes scurried or swam in and out of the shadowy recesses of tangled submarine growth. One dragonlike creature came into the picture and claimed the center of the stage. It was almost as long as my hand and so transparent that the churning of its digestive organs was visible. On its head were what appeared to be two rapidly revolving propellers, a device I was informed later that swept into its mouth the tiny living things on which it existed.

After making a few notes, my new mentor said to me, "Sorry, I couldn't miss the big fellow. We don't see him very often." He paused to adjust the instrument. "You see," he went on, "this is a new technique in microscopy. Instead of one person gluing his eye to a microscope, a TV camera attached to it televises what the human eye would see and transmits to it a screen that can be viewed by a group. Let me show you."

Some distance away on the same bench was a high-power microscope on which was mounted what might have been a sixteen-millimeter movie camera, its lens barrel connected to that of the 'scope itself. "This," he said, tapping the camera, "is our latest and what may prove to be one of our most important contributions to television. We call it the Vidicon camera because it is based on the new Vidicon tube, a first cousin to the image orthicon but less than a tenth of its size. It is the smallest and simplest system for non-broadcast industrial and research TV operations.

"Let me give you an illustration," he continued enthusiastically. "Last March a demonstration in a New York City prison revealed the usefulness of RCA's Industrial TV system by enabling the warden and prison officials to observe the behavior of prisoners during relaxation and working periods without leaving the warden's office.

"A camera covering a tier of cells showed the guard patrolling the catwalk while prisoners were taking their morning exercise in the yard. Another camera, set up in the prison laundry, showed prisoners at work on machines and clothing. A third camera picked up the inmates as they returned to their cells. It was the first time in penal history that a warden and his superiors could observe from the privacy of an office the behavior of prisoners and guards who were totally unaware that their every movement was under close scrutiny. Several reforms resulted from the demonstration."

"That is interesting," I said, "but it does not explain how the Vidicon camera system can be used in industry."

"Well, as you know, there are operations in many industries that entail considerable danger, particularly where lethal gases or very high temperatures are concerned. Supervision is the first requirement. With the Vidicon in use,

those operations can be viewed and directed from a point far from the danger zone.

"Systems of inter-plant supervision by TV have already been installed. The president or plant superintendent can bring in to the monitor on his desk a pictorial report on the progress of the work and the behavior of the employees in certain vital parts of the plants where constant supervision is necessary. In large engineering projects like a great dam, a tunnel or a bridge of complex design, the engineer can observe and direct the progress of much of the work without leaving his desk. Likewise the superintendent on the job can call the engineer at his office and not only discuss a problem that may have arisen but illustrate it to his chief from all angles. There is hardly a large industry anywhere that cannot profit by the use of this system of TV supervision. Many phenomena associated with nuclear reactions which formerly were hazardous to those in the close proximity that observation demanded, now can be observed from a safe distance, thanks to the Vidicon.

"Installation of the system in banks and other restricted areas would make impossible such occurrences as the recent million-dollar robbery of the bank vaults in Boston.

"The portability of the Vidicon camera and its master control unit make it invaluable in projects where the location of a specified operation is difficult of access. The control unit of the system, for instance, is about the size of an average suitcase. Its monitoring kinescope is seven inches across. The camera is approximately the size of a cigar box. If you will step over here, you can see it in operation."

A few paces away a Vidicon camera was mounted on a light tripod. Directly in front of its lens was a similar camera mounted on a slowly revolving stand. I was handed a pair of spectacles and asked to look at a master control unit which stood on a nearby table. There in the monitor was

the image of the camera that was being televised. I was startled and somewhat mystified by its strangely lifelike appearance. Indeed it was difficult to tell the picture from the solid substance of the actual camera. Noticing my puzzled look, the electronic engineer smiled as he said, "That is stereoscopic television. If you will notice, it gives the object a three-dimensional effect. It has depth as well as height and width. It can have a hundred uses in industry."

At that point a tall and scholarly man entered. When we had been introduced and had chatted a few minutes, he said, "If you would like to look around, I'll be glad to show you things that may interest you." Delighted, I accepted his offer.

Passing through a long and immaculate corridor, I noticed that every door was tightly shut, giving the whole place an air of secrecy and seclusion. Then I was startled by what appeared to be shower-bath fixtures high on the wall outside several of the doors. There were neither shower curtain nor drain nor any means of preventing the water from flooding the highly polished floor. The showers seemed as incongruous as if they were in the living-room of a well ordered home.

"Are those really showers?" I asked my escort.

"Yes indeed," he replied with a grin, "those are honest-to-goodness showers, but they are a little more powerful than you would have in your home."

Then lapsing into slang, I asked, "What's the big idea?"

"In those rooms," he answered seriously, "men are working with corrosive and inflammable substances. In case of an accident, the person affected rushes to the shower and douses himself thoroughly, clothing and all."

"But," I inquired, "why are there no provisions for carrying off the water or restraining it from flooding the corridor?"

He smiled again. "That is because there is the occasional moron who will turn a valve to wash his hands, to get a drink or just to see the water run. With no means of concealing a flooded floor they leave it alone. Besides, if and when contamination occurs, speed, not tidiness, is the important thing."

We entered an imposing room that proved to be a treasure house of electronic achievement in which was displayed a photographic and physical history of television. A striking picture of a TV mobile unit caught my attention. Dynamic and dramatic, it had all the essentials of a sure-fire news photo, but it was the caption accompanying it that caused me to stop and consider the magnitude of the task of lifting television from the status of an interesting gadget to that of a major industry. The caption read simply:

"RCA has spent more than $60,000,000 in developing and introducing television."

Among the score of superb photographs on the walls was one that aroused my curiosity. It was the picture of a grotesque toy, popular in the twenties and known to millions as Felix the Cat. Felix, I learned, served as model during the period when engineers spent long and tedious hours experimenting with early pickup devices. The comical little cat had two distinct advantages over a live-model: the strong definition of its whimsical features and its ability to spend hours under the searing heat of the lights without discomfort.

On display also was a device that makes vision possible without any visible light.

Used in World War II it was called the "snooperscope." With the aid of a beam of "black light," emitted by an infrared lamp, it enabled our riflemen to probe the darkness for enemy snipers while they themselves remained invisible.

This strange gadget was in fact a forefather of the image orthicon.

In this hall of wonders a multitude of electronic devices of different types demonstrated the invaluable contributions that RCA and the television industry had made to our war effort. Many of them played an important role as navigation aids to pilotless planes, in directing crash boats, loaded with explosives, against enemy targets, in guiding radio-controlled aerial bombs, flying torpedoes and other destructive missiles, and in transmitting maps and charts between ships and aircraft all through airborne television envisaged as early as 1934 by Doctor V. K. Zworykin.

Additional evidence of the potentialities of airborne television was revealed at the atom bomb tests at Bikini. Radio-controlled pilotless planes equipped with television cameras flew through the atomic cloud immediately after the explosion. The cataclysmic scene in all its terrifying details was flashed to observers many miles distant.

In the second Bikini test television cameras were installed on Bikini Island, three miles from the explosion. Observers on planes and Navy vessels equipped with TV receivers were given the same view of the atomic eruption as if they had been on the island itself.

Here in the midst of what is perhaps the world's finest collection of electronic achievement, I was startled to find, of all things, a humble sewing machine. From its appearance it must have seen considerable service. Outwardly it was identical with those found in homes all over the world, except for the heavy electric cables that trailed from a box-like container on its under side. Puzzled, I asked about its purpose.

"As you can see," my mentor replied, "it is essentially a standard sewing machine. But if you look more closely, you will observe that it uses neither needle nor thread. Instead,

it employs localized radio heat to bind the seams in thermoplastic garments and other articles that give protection from rain or moisture. You see, conventional stitching with needle and thread would leave countless tiny holes that water or any other liquid could enter."

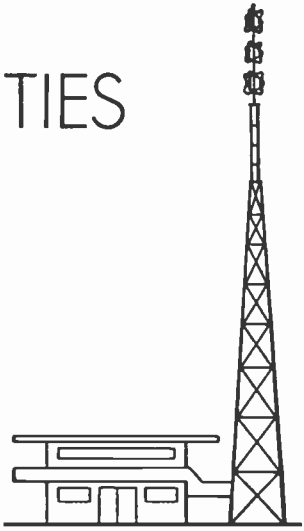
One could spend days and weeks exploring the scientific marvels that surrounded us. For instance, the electron microscope, of which several types were on display. Excellent examples of industrial design, their streamlined sleekness gave them a resemblance to pieces of modern furniture rather than parts of laboratory equipment. Everything you saw here was either a close relative or a distant cousin of television.

During my eventful visit I was shown science at work as few have seen it. In lab after lab I saw men, and women too, so preoccupied with the problems before them that they were completely oblivious of a visitor's presence. Not once did I hear a loud word or see a movement that was not deliberate as that of a surgeon, scalpel in hand. Yet one could actually feel an air of urgency, as if success depended on each individual worker. While a great diversity of projects were in a state of research or experimentation, I gathered that much of the combined effort was being devoted to the further development of television.

Here in ideal surroundings 570 people, of whom 280 were research scientists, labored daily in the multitudinous tasks of building a safer and better informed world. It was interesting to learn that even the stenographers must have a rather extensive knowledge of the verbiage and technical jargon of science if they were to hold their jobs.

CHAPTER TEN

COMMODITIES



IT WAS with a feeling of regret I parted from my friend the scientist at the Princeton Junction station. Soon after my train had pulled out, I reviewed my day. Only then did it occur to me that in all the projects and in all the apparatus and sundry equipment I had seen in use by hundreds of workers, I had not seen a single object produced that could be put on sale in a retail store. Despite the extent and the wonderful equipment of the laboratory and the large number of people it employs, to say nothing of the tremendous investment it represents, it manufactures nothing. Its only product is the result of the research, experiment and development carried on by its staff of scientists, engineers and skilled technicians.

It is the wellspring from which has flowed a constant stream of knowledge and scientific achievement that has contributed much to the fabulous growth of electronic industry.

To get a fair idea of how the brains at the laboratory are converted into industrial dollars, let's consider just one item that goes into the modern television set—the kinescope or picture tube. Near Lancaster, Pennsylvania, a modern manufacturing plant with 1600 employees, most of them women, turn out daily several thousand kinescope tubes. The plant, a masterpiece of industrial planning, covers 7½ acres of a 99-acre tract of farmland. Every morning more than 8 tons of glass bulbs go down to the production lines to undergo as strange a series of treatments as was ever conceived by the alchemists of old. By evening the funnel-shaped tubes with luminescent faces have been put together, part by part, and packed ready for shipment through the channels of trade that will take them eventually into American homes.

As the tubes, suspended from conveyer lines, pass from process to process, the magic of the production engineer is constantly in evidence. In one of the early operations a blue flame of intense heat beats upon the fragile glass to condition it for what is to come. Presently a metal button is fused into the side of the tube. Mechanical fingers hold it in place while electronic heat of 700 degrees centigrade turn button and glass a glowing red. After passing through the inferno of heat, the tube goes through an annealing process that gradually lowers the temperature for the period of an hour.

The parade of tubes, each cradled in a moving belt, marches in glistening procession from one operation to the next. Here impeccable cleanliness is almost a religion; a speck of dust, the tiniest particle of lint would be tragic in its consequences. In an automatic washing machine hot chemicals and water under high pressure are sprayed on the inside of each tube; a blast of filtered warm air does a quick job of drying.

The spotless tubes are now conveyed on an automatic belt

to a vibration-free room, where a liquid containing fluorescent material is poured into them. As the solid particles settle, they form a filmlike covering on the interior of the face of the bulb. At this critical period even the faintest suggestion of vibration would cause a rippling effect in the fluorescent particles. By an ingenious use of suction cups that grip them, the tubes are slowly inverted to let the liquid drain off while the fluorescent granules adhere to the glass through molecular attraction. When the tubes have dried, they are inspected under a powerful light. Even the merest speck of foreign matter causes a tube to be rejected.

Now for the first time the tube's ability to glow is tested. An electron gun is inserted and sealed in the neck of each tube. The gun consists of an electrically heated surface which releases the electrons that make the fluorescent surface on the end of the tube glow.

Then comes the final major operation. The air is exhausted from the tubes, creating a vacuum ten times as complete as the vacuum in a standard radio tube or in an electric bulb. After a thorough washing with soap and water and a coating of conductive paint on the outside of the tubes, they are ready for final checking and shipment to distributing centers.

In this amazing hive of industry the kinescope tubes are only one of a long list of products all closely correlated. The picture tube that makes the miracle of television possible is only so much glass and metal without the aid of many other smaller tubes, each with a different function.

Take for instance, the image orthicon tube. So complex, so intricate and so delicate are these sensitive "eyes," they demand the precision and patience of a master watchmaker in assembling the more than two hundred parts that enter their manufacture. Many of these essential items are so small that they can be put together only under a microscope.

Now the manufacture of each of those parts is in itself an operation that calls for extraordinary skill and precision. Many of them are so tiny that hundreds could be put in a thimble.

And then there is the magic of fluorescence, on which modern television depends for the brilliance of the image on the screen. Fluorescent materials, known as "phosphors" have attracted men's attention for centuries. As early as 1603 an alchemist told of light emanating from barite rocks subjected to heat.

From that time phosphors received scant attention from the scientists until television pointed to the need of substances that would glow in the presence of electrons. While it was known that sugar, salt, quartz, diamonds and many other substances had luminescent properties, it remained for various scientists and engineers to develop a process that made phosphors available for television. At first the precious luminescent material was produced in such small quantities that a cupful was considered a good day's output. Today the Lancaster Plant has a monthly production of about 15,000 pounds.

The development of these vital materials furnishes an excellent illustration of the relation of laboratory to factory. When the research man has reached his objective, the development and production engineers enter the picture. To them is given the problem of making practical application of the research man's discovery and at a cost that will not be prohibitive. New machinery, new methods, new materials must be designed or developed. This takes time. Five years may elapse between the completion of research and the final stage of factory development.

In order to reduce this time gap, it is not unusual for the engineers to begin their work long before research is completed. For instance: In the course of research it has been

discovered that success hinges on the engineer's ability to accomplish what appears to be the impossible—to pierce a hole one-tenth the diameter of a human hair in a piece of polished nickel scarcely larger than the nail on a little finger and then to create a machine or device that would reproduce it by thousands with unfailing accuracy. Every image orthicon contains, as one of its multitude parts, a copper net with meshes so fine they are invisible to the naked eye; there are 250,000 holes to the square inch.

At first glance it might appear that this electronics industry has gravitated into the hands of a small group of prominent firms with whose names everyone is familiar. Investigation proves, however, that there are nearly 2,550 firms, large and small, engaged in the industry. These independent businesses represent a cross section of American enterprise. Many of those concerns were born of the requirements of television. Others have their roots in the earlier radio and electronic developments.

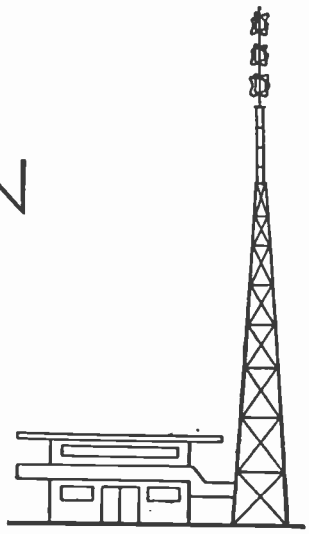
It is estimated that more than 3,000,000 people are directly and indirectly engaged in the electronics industry, in the mills, shops, stores and factories that supply raw and processed materials, parts and specialized services—and we get a picture of the interdependence in industry that has made America great.

In spite of its huge manufacturing and laboratory facilities RCA is as dependent on outside suppliers for a continuous flow of materials and services as the baker is on the farmer who grows the wheat that the miller grinds into flour. Its purchases in a single year from its suppliers of lesser size in forty-two states amount to more than half a billion dollars. This expenditure includes endless miles of wire and cable, millions of capacitators, carloads of cabinets, steel in thousands of carload lots, test gauges delicate as a fine chronometer.

This mutual interdependence of RCA and its thousands of suppliers is typical of the attitude of co-operation in American industry. Perhaps it is that spirit of "live and let live" rather than its scientific achievements that has been the secret of the phenomenal role that television is playing in the economy of our country.

CHAPTER ELEVEN

COLOR TELEVISION



IT IS NOW established, of course, that the RCA system of color broadcasting is the most practical among several systems proposed when color TV was still in the experimental stage. On October 15, 1953, one of television's memorable dates, RCA-NBC joined with other members of the industry in a final demonstration held by the National Television System Committee at the request of the Federal Communications Commission, at which time evidence was given that all-electronic compatible color television, pioneered and developed by RCA, was ready for the public; and on December 17, 1953, the FFC approved the standards.

But it is of historical interest to recall the problems and comparative merits of the differing techniques, particularly that of the Columbia Broadcasting System which was given, along with the RCA system, the most serious consideration. During months of exploration in the whole video field I had heard much discussion and some controversy on the subject.

One day by a stroke of good luck I was introduced by a mutual friend to an electronic engineer whose name I had heard many times before. The meeting took place in the world-famous Engineers Club in New York City. During a leisurely luncheon our conversation turned to the subject of television. It was a rare opportunity to ask questions.

"Can you explain in simple terms how it is possible to transmit color pictures to great distances?" I asked.

The engineer looked at me quizzically as he replied, "It's difficult to describe scientific operations in terms that are simple enough for the lay person to grasp. However, I'll try:

"First bear in mind that from the three primary colors, green, red and blue, known as fundamental primaries, may be derived a wide scale of colors, tints and hues. For instance, a mixture of blue and red gives purple that may vary from a deep royal purple to the most delicate violet, according to the proportion of red or blue used in the mixture. A full-color illustration in a magazine, when examined under a magnifying glass, will be found to consist of thousands of primary-color dots. Similarly the image in color television is made up of a vast number of primary-color dots that mix and mingle with each other so that they produce all of the colors present in the televised subject.

"As you know," he continued, "there are several systems of color television, two of which have received serious consideration from the Federal Communications Commission, whose chief concern is protecting the interest of millions of Americans who have invested, sometimes at great sacrifice, in TV receiver sets. The two chief exponents of widely differing techniques in broadcasting color are the Columbia Broadcasting System (CBS) and the Radio Corporation of America (RCA).

"First let's take the CBS system, in which colors are

transmitted with the aid of mechanically operated red, green and blue filters.

"If you look at a scene through a piece of red glass, you see it in terms of its red components. Similarly if the same scene is viewed through a blue or green glass, you see it in terms of blue or green. In other words, each piece of colored glass is a filter that eliminates from the scene all color values but its own.

"Now consider a rapidly revolving disc with six equal and transparent segments of red, blue and green arranged alternately. Due to rapid sequence of these filters, the scene when viewed through the whirling disc appears in its natural colors.

"In telecasting color a revolving filter disc, not unlike that which I have just described, is set up between the lens and the camera tube. It rotates at a speed of 1440 times a minute, giving each color filter a period of 144th of a second before the camera tube, from which the scene is sent to the transmitter as a series of black-and-white images. These in turn are sent out over the air or through coaxial cables in the form of a stream of electrons.

"As the electrons are captured at the receiver in the home, a similar color disc rotates in front of a cathode-ray image tube at precisely the same speed as that in front of the camera tube. The rapid rate of color changes creates a complete fusion in the viewer's eye at the receiver so that he sees a steady color image."

"Can these CBS color transmissions be viewed in black-and-white on an existing TV set?" I inquired.

"Not without the installation of a special adapter," he answered. "If one wishes to see pictures in color on an existing set, a color converter must be used in addition to the adapter. This color converter slides on tracks and, when pushed in front of the set, will show the image in full color.

When it is pushed aside, the set may be used as usual for regular black-and-white programs.

"The RCA color camera at the transmitting end, instead of producing one signal as in black-and-white television, produces three signals, one of which has captured in its stream of electrons the red values of the subject, the second the blue values, while the third has picked up the green values. The three signals are now combined electronically and the mixture broadcast as a single signal. At the receiver in the home or elsewhere the mixture is unscrambled so that the signal representing each color is fed to one of three guns in a special electron tube, or tri-color kinescope, that produces a picture in full color."

"Will our existing black-and-white sets reproduce color programs telecast by the RCA color system?" I asked.

"No, not without an extensive rebuilding of the receiver including the replacement of the original black-and-white tube with a color kinescope."

"Will our existing sets be able to pick up a color program in black and white?"

"That depends on the system of color transmission used by the broadcasting company," he answered. "Any existing receiver can pick up in black-and-white a program transmitted in color by the all-electronic system developed by RCA.

"The new RCA system, the result of years of research and development, requires basic changes in transmission standards of existing black-and-white television stations. That is why owners of home receivers can enjoy color programs in black-and-white without any modification."

Since then, of course, tremendous strides have been made and RCA-NBC has now spent more than $65,000,000 in the development and introduction of color, a long process of

teamwork research and invention which began in 1930, the year in which the challenge of color was taken up by RCA. These years have been full of milestones. From 1949 to 1952 RCA and NBC engineers conducted tests with color transmission over their experimental ultra-high-frequency (UHF) stations in Washington and Bridgeport, Connecticut, which proved that the system was as successful on UHF transmission as on the standard very-high-frequency (VHF) channels. The color tube was demonstrated to the public for the first time on March 29, 1950, in Washington, D.C. In March, 1954, three months after the FFC approval of the standards (on December 17, 1953), commercial production of color TV receivers with 15-inch picture tubes began at the RCA plant in Bloomington, Indiana. By late spring of that year RCA color TV cameras and other equipment necessary for origination of color programs in television station studios were being delivered.

By midsummer, 1955, a major era of expansion had begun, with simplified color TV sets; a new "preferred-size" 21-inch color picture tube with 255 square inches of viewing area—22 per cent more than any tube before available; and greatly increased color programs with network schedules of top talent and shows. To celebrate NBC's use of commercial color, the 90-minute programs known as "Spectaculars" were launched in the fall of 1954, and by the fall of 1955, one year later, color programming had increased five times in number of hours. *Peter Pan*, starring Mary Martin, the first complete Broadway show to be telecast in color, was shown on March 7, 1955, to an estimated audience of 67,000,000 viewers. The first color coverage of the World Series was conducted by NBC with the Dodgers vs. Yankees, starting September 28th of that year, and in October the NBC Matinee Theater held its premiere; this was

The conductor's voice boomed over the clatter of wheels, "Next stop Plandome!"

"This is where I get off," said Bodine. "But before I leave, let me remind you that this television we've been discussing so vehemently is still in its early infancy. In its present state it is looked upon by many as another form of entertainment, or escape if you will. But mark my words, the day is not far distant when it will be hailed as a tremendous educational force through which the various peoples of the world will be drawn together in a union of harmony and understanding."

Not long afterward I interviewed Dr. Swain, superintendent of schools in a residential community of about seventeen thousand population. Knowing him to be a man of ideas, a student of trends in our educational, economic and social life, I wasted no time in getting to the crux of the interview.

"What effect is television having on the study habits of school children?" I asked.

He paused before answering. "That depends on the individual community. I find that where ample recreation and entertainment are provided for young people both in and out of school, the effect of television on their studies is negligible. Where children are allowed to shift for themselves in the way of seeking amusement, it is only natural that those who have access to television should turn to it, even to the point of saturation. Having watched carefully all credits in our schools, I can say truthfully that television has in no way retarded the normal progress of our pupils. But then, perhaps we are more fortunate than many other communities for, aside from our well-organized program of recreational activities, we are blessed with exceptional opportunities for boating, fishing, swimming, sailing, hiking,

camping, skiing, skating, sledding and the other outlets for youthful energy that students enjoy.

"Instead of considering television taboo, many of our teachers recommend programs that have a certain educational value. Of course there are always young people who, unless properly guided, will overdo some activity they enjoy, whether it be stamp collecting, tinkering or television. But these hobbies often have a compensatory side. For instance, a boy in our seventh grade was left a valuable stamp collection by a deceased uncle. His studies began to suffer almost immediately. Yet he acquired an amazing knowledge of world geography and of the governments of many countries.

"Then we had the case of Mildred, a girl in her sophomore year in high school, who had always been a better-than-average student. Suddenly she began to lose interest in her school work. Her credits dropped like plummets. A chat between the principal and the girl's mother disclosed that she had gone 'television crazy.' Mildred, however, was not interested in the programs but in the fashions and dress accessories worn by women and girls on the screen. She spent hours each evening with pad and pencil, making innumerable sketches, studying poses and action with written notations. She took only a perfunctory interest in current fashion publications, maintaining that their illustrations had no significance for the average high school or college girl.

"Meanwhile she had accumulated a collection of original designs. Unusually clever in the art of dressmaking, she translated several of them into actual garments that were the envy of her classmates and friends. One day during summer vacation she took a bus to nearby New York, carrying with her a portfolio containing a dozen of her favorite sketches. Unfamiliar with the channels through which designs are purchased, she went to one of the large depart-

ment stores. As she stepped from the elevator, a woman who had been eying her critically said, 'Pardon me, but would you mind telling me where you bought the dress you are wearing?' Startled, the girl replied, 'I designed it and made it myself.'

"The woman seemed incredulous. A bit resentful, Mildred said, 'I have the original sketch in my portfolio. Would you like to see it?' 'Yes I would,' said the woman eagerly. 'You see, I am the dress buyer here. Will you come with me?'

"An hour later as Mildred left the buyer's office, she was accompanied by one of the country's largest manufacturers of dresses for girls of high school and college age. That afternoon it was agreed that the garment manufacturer would buy a certain number of Mildred's designs for misses' dresses to sell within a specified price range.

"That was less than two years ago. Today Mildred, still a student of television fashions, earns more money than her former high school principal."

"But that is hardly a typical case," I interposed.

"True," he answered. "It merely indicates that this widely discussed video has unheard-of potentialities as a practical educational medium for those who are smart enough to take advantage of it, and that goes for adults as well as younger people."

"Adults?" I inquired.

"Surely," he said. "There are numerous programs for adults that are highly educational in that they teach viewers, particularly women, how to do many things that are a necessary part of a housewife's education: cooking, baking, sewing, home safety, home decoration, gardening and so on.

"Then there are listeners on safety as applied to the automobile and how to drive safely, a subject of vital importance to a large segment of our population. There is also the ap-

praisal of current literature through the medium of the TV screen. In these programs which have a large public following, author and critics discuss a new book with enlightening and sometimes brutal frankness.

"Natural history and video seem to have been made for each other. I remember a recent program presenting the life cycle of a bee. Now I am neither an entomologist nor a naturalist but I can safely say that for sheer drama and inscrutable mystery, I have never seen or read anything so graphic. It was simply a gripping story of development and habits in which the lowly bee was the central figure."

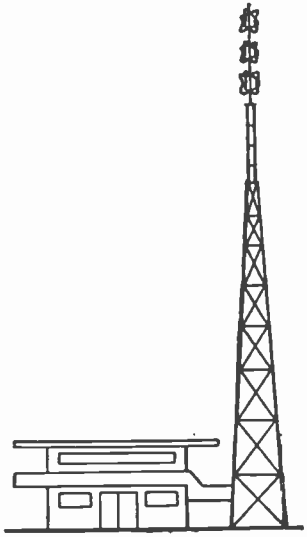
The school superintendent paused a moment and then with a quizzical smile continued, "Don't think that I am unaware of the shortcomings of television. Indeed I deplore many of them. But since I have spent long years in dealing with the problems of youth, I can attribute many of its mistakes to its sheer youthfulness. Somehow it reminds me of a boy who has grown too fast, a youth who is physically strong and filled with the joy of life but who lacks experience, having been so busy enjoying himself that he has had little time to ponder on the great opportunities that lie ahead of him. I speak of course only of the programs we invite into our homes.

"There is nothing wrong with television that time and common sense in the program department can't cure."

He glanced at his watch. "Gracious!" he exclaimed, "the game between the Boston Braves and the New York Giants will be telecast in a few minutes. Won't you join me?"

CHAPTER SIX

HOW TELEVISION WORKS



ONE DAY recently while a guest in a television studio, I was introduced to an important executive. He was accompanied by his son, a bright lad of thirteen. Half a dozen actors were busy rehearsing a play that was to be televised that evening. Besides the cast, there were some forty people engaged in as many different jobs necessary to the production. At times it was difficult for a spectator to define the tasks performed by most of the people "on stage."

The boy's attention was concentrated on the cameras. Their movement, their angles, their strange mechanisms seemed to fascinate him. During a few minutes of rest between shots, he turned to his father: "Say, Dad, how does this television work? How do they send pictures from here to our home in Montclair?"

With an embarrassed smile the father replied, "You will have to ask me an easier one than that, son. You see, I'm

in the business end of television. If you ask me about the cost of a daytime serial or how broadcast rights are sold or what a script writer, a director or cameraman is paid or the cost of rehearsal time, I can give you a reasonably accurate answer. Outside that part of TV that deals with income and expense, I know very little. The technical side of the business is beyond me."

The boy's unanswered question haunted me for days. I felt that I, too, was one of millions who would like to have the same question answered. At the first opportunity I arranged an interview with a television technician who had been in the business since the days when video was a poor relation to the then prosperous radio industry. He was kind enough to come to my home, bringing with him several books and pamphlets that he believed would be of use to me. I began our three-hour conversation by asking the simple question the boy asked his father: "How does this television work?"

"Simple as A B C," he replied, picking up a pad and pencil I had in readiness. And then began what seemed to be a learned presentation of the subject. Page after page of the pad was soon covered by diagrams, hookups and strange hieroglyphics, all of which were so much Sanskrit to me.

Fortunately he mentioned the name of a friend, Dick Baird, who was video engineer on several major programs then on the air. The name Baird struck me as significant since an Englishman named Baird was one of television's patron saints. And so it happened that my contact with the technician was not fruitless. He arranged for me an interview with his friend Baird, whom I met in the control room just as he had finished an hour-long program.

Baird was a down-to-earth sort of person who took his job in his stride, quite unruffled by its scientific complexities. Formerly a radio engineer, he turned to TV in 1939 just as

it was beginning to make its mark. Eventually he came to be recognized as one of the most capable men in his chosen field.

After a few minutes of general conversation I asked, "Can you tell me in simple terms how television works?"

"It may not be easy but I'll try," he replied. "First let me define television: it is the instantaneous transmission of a picture or image through the ether from one place to another.

"Let's start with the camera itself. Except for the lens or a group of lenses, it bears no relation to a photographic camera, still or motion. Photography demands a sensitized film or plate to catch the image in negative form. From that negative, prints, sometimes called 'positive,' are made. These prints may be on paper for personal or commercial use, or on film for use as a motion picture.

"Now let's consider two cameras, one television, the other photographic, set up side by side and covering the same news story in Washington, an address by an illustrious statesman. Every movement and every word of the speaker, as caught by the TV camera, is seen and heard in millions of homes at the instant they occur. On the other hand the motion-picture camera merely exposes a film that is rushed to a laboratory where it is developed, fixed, washed, dried and edited before it is ready for printing. The same laboratory processes are repeated in making the prints required for distribution to motion-picture houses. Assuming fast planes are waiting to fly the prints to the distributing centers, hours and sometimes a whole day will have passed before the news film can be seen by the public. In short, television pictures are swept from camera to viewer by a hurricane of electrons traveling at a speed of one-hundred-eighty thousand miles a second, while the motion picture dawdles to its destination through the channels of man-made transportation."

"Will you describe the television camera and its operation?" I asked.

"Externally it looks like an old-fashioned movie camera holding several lenses, each of a different focal length. The function of the lens being used is to project an image of the subject being televised, not on a plate or film but on a special tube that may be an iconoscope or an image orthicon. Nowadays the iconoscope is used mostly in televising motion-picture film, like the Westerns we see on the screens in our homes. The image orthicon, because of its extreme sensitivity to light, is used in the studio since it makes unnecessary the blinding light and the consequent insufferable heat that once made studio televising a trying ordeal."

"How does the image orthicon function?"

"Better ask me an easier one," he replied. "Any adequate description of its functioning would lead into a scientific discourse that would be over the head of the average reader. Roughly it is as follows: The image projected by the camera lens on the image orthicon is converted into electric impulses that vary with the changing pattern of light and shadow and is broadcast as a radio signal.

"These radio impulses, when shot out through the air, are captured on millions of antennae on housetops and on buildings and are picked up on receiving tubes.

"Right here let me emphasize the fact that this particular TV tube, known as the kinescope, is a large funnel-shaped bottle on the bottom of which the image is reproduced.

"The picture appearing in the receiving set is really composed of hundreds of thousands of tiny dots that constantly change their light value as they express shadow or bright areas in the picture. A glance through a magnifying glass at a half-tone photograph in a newspaper will reveal that it is composed of thousands of dots that express the light and shadow areas of which all pictures are composed.

"These electronic dots are shot out into the air in single file, not unlike bullets from a machine gun, and received dot by dot in the same order as that in which they left the 'gun.' The process is accomplished so rapidly, however, that thirty pictures, each consisting of hundreds of thousands of dots sent out individually, are reproduced every second on the screen of the receiver.

"Thanks to a peculiarity of the human eye, known as 'persistence of vision,' we see one picture in motion instead of thirty still pictures. The retina of the eye has the faculty of retaining an image of an object for a fraction of a second after it has passed from sight. And so, when looking at television or a movie, the individual still pictures overlap each other so rapidly and so smoothly that they give the impression of uninterrupted motion.

"The image we see on the TV screen consists of millions of these infinitesimal dots arranged in 525 horizontal lines. Thus we speak of '525-line definition.' "

"Will you explain briefly how the electron 'bullets' shot out into the air are captured and translated into a picture."

"Broadly speaking, it's the transmitting process in reverse," he said. "The iconoscope or the image orthicon converts light into electric energy that is broadcast. The receiver tube or kinescope captures that energy and converts it back into light."

"But how is the picture actually formed?"

"I will try to explain it simply," he replied. "The face of the reproducing tube is coated with a substance that becomes luminous when bombarded by electrons. The more electrons that hit the coating, the more light is emitted. Thus the areas on the screen that are subjected to heavy electron bombardment are brightly lighted while the dark or shadowy areas have little light because the electrons striking them are fewer.

"A stream of electrons is shot from an electrically heated surface and then compressed into a needle-thin beam as they travel through finely machined metal cylinders and pin-holed disks. Moving back and forth with inconceivable speed in obedience to a radio signal, the beam paints a picture on the fluorescent face of the kinescope. It 'paints' thirty pictures every second and moves back and forth across the screen 525 times for every picture."

"Now will you explain the camera and how it works?"

"The actual operation of the television camera is almost as simple as that of any other camera," he replied. "It is the skill of the cameraman, his eye for composition, his sense of light values and dramatic pictorial qualities that have raised television from the status of a peepshow to a well-defined art form. Let me put it this way: the most modern TV camera in the hands of an inept operator might well ruin a program that, if expertly televised, would be a masterpiece. For you see that in television, unlike motion pictures, there is neither editing nor cutting. What goes into the camera is what is seen by millions of viewers within practically the same instant.

"Let's look at the modern camera itself. It consists mainly of a group of lenses, usually four, an image orthicon tube and a complex collection of tubes, wires, condensers and other gadgets that differ little in appearance from what you would find in a compact radio transmitter. All are installed in what resembles an average suitcase. In external appearance it is neither imposing nor inspiring. In different surroundings it might be mistaken for a piece of factory equipment. Actually, however, it may be classed among the miraculous achievements of science.

"Its four lenses are so arranged that a turn of the turret which holds them in place puts the required lens in operation. One of these lenses is used for close-ups in which

the face of an actor or some object is to be viewed at close range. Another, the 'wide angle,' is used to encompass a broad area of stage or outdoor scene. The other two lenses are kept set in focus for different ranges and can be put in instant operation practically without focusing. The sole function of each lens is to carry an image of the subject being televised into the camera and there place it with critical precision in a cylindrical tube. Up to this point the functioning of the TV camera differs little from that of a two-dollar Brownie.

"Now the tube, the image orthicon, is the electronic eye and the brain of the camera. The instant it receives the image from the lens, it becomes a miniature world seething with strange and mysterious forces."

"Please describe the image orthicon tube and how it works," I suggested.

"In spite of its outward simplicity, it is an extremely complex electronic device. Fourteen inches long and with a diameter about equal to that of a billiard ball, it has integrated within its slim length the essentials of three tubes of differing functions—a photo tube, a cathode-ray tube, and an electron multiplier.

"The photo tube converts a visible light image into an invisible electron image that is instantly transferred to a bubble-thin glass target and there scanned by an electron beam to create a radio signal. Then the electron multiplier takes over and builds up the signal, that is, amplifies it until it attains a strength that enables it to travel over the circuits to the broadcast transmitter, from which it is sent out into the world."

Here the engineer paused, his face aglow with reverential awe as he continued. "Within its transparent walls are assembled more than two hundred distinct parts, each working with a precision that few watchmakers could accomplish.

For example, a piece of polished nickel is pierced with a hole one-tenth the diameter of a human hair. A copper mesh with a quarter million holes to the square inch is made for use in this miracle tube. The glass target for the electrons is so thin and fragile that a spider's web is thick by comparison. So small and delicate are some of its parts, they have to be assembled under a microscope."

"Just what is the difference between the iconoscope and the image orthicon?" I inquired. "Both seem to be used for the same purpose and in somewhat the same manner."

"Both are used in television cameras," he answered. "The iconoscope is the parent of the image orthicon. When it first appeared, it revolutionized the television industry. To its inventor, Doctor Zworykin, it was a kind of signpost that guided him to greater discovery and achievement in the perfection of the image orthicon which is one thousand times more light sensitive than its illustrious parent, the iconoscope.

"So keen is this later instrument's vision, it sees by candlelight or the faint flicker of a match. Literally it rivals the human eye, a trait which makes it invaluable when an outdoor telecast may start in broad daylight and wind up at dusk. Because of its sensitiveness to light, the image orthicon has saved the television studio from the torture of intense heat which formerly emanated from the array of carbon arc lights, mercury vapor lights and huge searing spotlights.

"Before the introduction of the iconoscope, occasional heat prostrations, injured eyesight and actual burns were not unknown. Smoke sometimes seemed to curl up from the head of a singer as the beauty oil applied to the hair vaporized. Many a time the He-man hero was known to wilt and collapse under the relentless heat. Even when the iconoscope replaced mechanical scanning and the blinding light was no

longer necessary, the heat in the TV studio was still far from comfortable.

"The image orthicon opened up new techniques and new opportunities in the studio and out-of-doors. Scenes and pictorial effects, formerly unattainable, came within the scope of the TV camera equipped with the new supersensitive tube."

"Is the iconoscope now obsolete?" I inquired.

"Not at all," he said. "It has merely taken second place. It is used almost exclusively in televising motion-picture films."

"Could you give me some idea of what the modern television camera costs?"

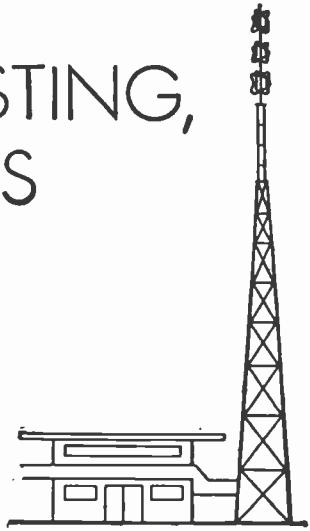
"The color camera, of course," he said, "costs much more than the black-and-white camera. A black-and-white studio camera chain costs sixteen thousand dollars complete with master monitor, power supplies, and associated components; a color camera costs fifty thousand dollars, equally complete."

No matter how you look at it, the production end of television is an expensive business. To appreciate the reasons, you should spend some time in several of the larger studios and see what it takes to put on an hour, or even a quarter-hour show in the way of investment in equipment, personnel and physical facilities, plus numerous apparently unrelated services.

"Never forget," he added, "that television is still a mere child prodigy among the billion-dollar industries. What it will contribute in adulthood to the knowledge, the culture and the social welfare of future generations is any man's guess."

CHAPTER SEVEN

BROADCASTING, A BUSINESS



BECAUSE of the variety of entertainment and information offered to an eager public, the average television studio is a bubbling cauldron of activity. A broadcasting company, beginning its day's work at 9:30 A.M., sometimes puts on as many as twenty-six programs before it puts out its lights at midnight. Working seven days a week, it must broadcast some seven thousand shows a year, no two of them alike. Once a program goes on the air, it becomes as valueless as a discarded Christmas tree. Rarely is a program repeated and then only if it has an unusual impact and has brought an overwhelming number of requests.

Every program, no matter how trivial, requires much preparation and often considerable expense. Usually it has a producer, a director and retinue of assistants, a technical director, script writers, typists and clerical help. Then there must be electricians, stage hands, video and sound engineers, to say nothing of cameramen, dolly pushers, announcer,

company representatives and a host of others whose jobs are difficult to define.

During a recent visit to a studio I asked a producer why such a large number of people were necessary to the production of a fifteen-minute program in which but a single person was televised. With a wry smile he replied, "It is just one of those things beyond our control. There are certain union regulations that prohibit the performance of certain tasks except by a member of a certain union. An electrician may not drive a nail in the erection of a set. A carpenter who may be idle at the moment may not push a camera dolly. The director for all his powers may not give an order from the control room to a cameraman, the operator of a microphone boom or to any other member of a union who is engaged in the production. He passes the order to the technical director, a union man, who sits beside him and who in turn relays it to the desired person.

"This system," he said, "although of course having its benefits in the overall picture of the television industry, used to work hardships on the owners of television stations hard put to it to meet their bills in the early days when TV broadcasting was still in the red; this, however, is of course no longer the case."

I asked him then if he would explain the financing end of production, and he went on:

"Many operating patterns are followed in producing programs. In some, the sponsor or his advertising agency deals directly with the broadcasting company. In such case the broadcasting company provides all the physical requirements for the production:—producer, director and their immediate staffs, purchase of script, rehearsal facilities, casting which is the employment of necessary talent, technical personnel, cameramen, video and sound engineers, scenic designers, electricians, property men, costumers, make-up artists, script

girls, typists and unskilled labor in many brackets. For all of these requirements, the station or network charges a fixed sum that comes within the limitations of the budget.

"In other instances the advertising agency representing the sponsor takes over the responsibility of production with its infinite ramifications and details. Several of those agencies maintain a television department equipped to carry through a video advertising campaign almost entirely on its own resources. In many of the smaller telecasting stations, sponsor and broadcasting company devise a program of entertainment and salesmanship that frequently proves to be a profitable venture.

"Quite recently a Southern city was hit by a serious transportation strike. With shoppers unable to reach the department stores, business dropped to an all-time low. An enterprising executive of the local TV station suggested to the management of the leading department store that they take the store to the housewife. It took less than fifteen minutes to close the deal. A daily period of three hours' air time for the duration of the strike was purchased.

"A television remote pickup was established in the store. Emergency telephone facilities were installed. TV viewers were treated to a daily fashion show in which local society girls acted as mannequins. Only garments fresh from the fashion centers were shown. Millinery, dress accessories and shoes were presented. Demonstrations of various housewares, furniture, draperies, children's apparel were sandwiched between brief dashes of entertainment and news. Camp counselors offered suggestions on where to send the children for the summer. Chefs revealed some of their most valued cooking secrets. Viewers were requested to telephone the store if they wished to see certain items. In a matter of minutes the desired merchandise was shown on the screen by the regular sales people. Telephone orders began to pour in

so fast that at times they glutted the wires. The store's delivery vans started operating at high speed. Television had saved the day."

An unusual business within the confines of the TV industry is the "package show." A package is a complete program owned and controlled by an individual or a concern. The owner operates somewhat in the manner of a caterer who serves a complete dinner for a certain number of people at a fixed price, supplying not only the food but the waiters, the silver, glass, napery and other necessary items.

The television "package" includes all the elements required for a program, be it a quiz, an interview, a musical or a drama, for which a stipulated price per program is paid. It may be sold directly to the sponsor, the advertising agency or to the broadcasting station. In the latter case it is known as a "sustaining program," for which the owner is paid usually only a nominal price. Frequently, however, a sustained program of merit gets a sponsor after it has had a few showings on the air.

In television as in radio the announcer forms an important link between the commercial side of the program and its entertaining or informative phase. TV, however, is more exacting, for besides having a resonant quality of voice, the announcer must have an attractive appearance. Like the TV actor, he must have the faculty of learning and remembering his lines, he must have the engaging personality of the supersalesman, entirely without unpleasant mannerisms of speech or action. In some programs he is merely a voice that tells the sponsor's story while pictures of the product supplant him on the screen. In other cases his role is one of considerable importance since he becomes the sponsor's emissary to millions of homes.

It is interesting to note that a new announcing technique

has developed in television. Sincerity rather than effusiveness is the keynote. TV audiences do not favor the loud hammer-and-tongs "spieler" so often heard on radio.

The commercial announcer is often classified according to the sales accruing from his effort. The advertising manager of a nationally advertised product told me recently that a change of announcers is frequently followed by an increase of sales.

Most of the TV and radio announcers are employed permanently by the broadcasting stations. In the larger stations they work under the immediate direction of a chief announcer who also plays the role of instructor. Many of those who are better known were recruited from the stage or from the ranks of singers who had studied under voice teachers. Besides a resonant voice, they must have good diction and at least an acquaintance with the correct pronunciation of French, German, Italian and Spanish words. It is a curious fact that some of them make more errors of pronunciation in good old American names, particularly those of places, than they do in the foreign languages. The script they "read" is usually prepared in the copy department of an advertising agency or by the sponsor's advertising staff.

Many of the outstanding announcers have found it more profitable to work as free lances. They offer their services to noncompeting sponsors on a fee basis and may broadcast from several studios. A fee of several hundred dollars per broadcast is not unusual. The weekly earnings of some of these super-electronic salesmen run into four figures.

The announcer's greatest bugaboo is a "fluff," that is, an accidental transposition of syllables or words. Many such fluffs have become classic in TV and radio circles.

Some star entertainers and commentators have invaded the field of commercials in both television and radio. This invasion is due of course to their large fan following.

In describing the numerous jobs in television it is difficult to generalize because the operating methods of the broadcasting companies vary widely. The picture is complicated further by the fact that many TV workers are affiliated with labor unions whose rules and regulations are rarely in harmony. But in this field as in the others, problems are coming under control. A top-flight executive once said to me that television was "like a boy doing a man's job and doing it well in spite of an occasional blunder." The boy has now quite definitely become a man.

In none of the many industries with which I am acquainted are so many specialists necessary to the performance of a single job. Take the production of a half-hour program. Eliminating the administrative and the executive staffs, such as may be found in any business employing a large number of people, we find a roster of jobs without any one of which a production would be seriously hampered if not impossible.

Under the producer, who is the executive head of the individual show, we find to our amazement the following list of those employed: a show director, an assistant director, a technical director, a sound director, a "shading" man, several cameramen, one or two microphone boom operators, an operating engineer, a sound engineer, a video engineer, a motion-picture projectionist, stage hands, electricians, stage carpenters, maintenance man, program director, script writer, script girl, scene designers, builders and painters.

Then there are actors, singers and dancers who of course must have make-up artists, costume designers or purchasers and research workers. In sponsored shows there is a retinue of agency personnel who in some cases provide the cast and direct the show. They also prepare the commercials which carry the sponsor's message to the audience.

The producer, really the business head, concerns himself with every phase of the effort. In conjunction with the sponsor and the advertising agency he decides on the character of the show to be produced on a given date. He purchases the script, interviews and employs the actors and actresses. He is responsible for all expenditures whether for personnel, materials or rentals. Working within a tight budget, he scrutinizes every outgoing dollar. He keeps a sharp eye on the progress of rehearsals. Well versed in stage technique, he makes suggestions, deletions and changes for the betterment of the show, usually with the approval of his director. In short, he is the big boss who shoulders full responsibility for the success or failure of the show.

In no other branch of the entertainment world is the producer's nose kept so continuously to the grindstone. After long and wearisome hours of preparation, often filled with annoyances and disappointments, the net result of his labor is a short interlude on the screen of fifteen, thirty or sixty minutes. After that, the grind begins all over again.

Next in command is the director, whose job is considered by many to be the most important in video production. On his shoulders rests the burden of taking the show ingredients provided him: script, personnel and equipment, and weaving them into a picture-story pattern that will please sponsor and public alike, for it must be remembered that the best script writer, the most talented actors and the finest of stage equipment, unless directed with supreme skill, will produce nothing more than a mediocre show or in theatrical terms, a "flop." Obversely, a story, cast and stage of medium merit but under able direction have often resulted in a hit.

The director's job calls for a rare combination of skills, knowledge and a strangely mixed personality. He must be an artist with a sound understanding of pictorial composition, lighting and forceful delineation of character. He must

have an inherent sense of storytelling, without which the best of scripts may be manhandled. He must be a master of dramaturgy, embodying as it does dramatic composition, representation and stage effects. He must be an authority on locution and good diction. Since video and radio are his media, he must have a certain knowledge of their operation and their limitations. Besides these and many other qualifications he must be an accomplished diplomat, who, to twist a phrase, conceals a fist of granite within a glove soft as a kitten's ear. His gently given order is as inflexible as a lightning bolt.

During my many visits to studios where rehearsals and performances were taking place, I marveled at the youth of most of the directors seen at work; few had reached their middle thirties.

Curious about the background that prepared them for their arduous job, I chose for an interview a typical director whom I had seen at work on several occasions. Meeting him by appointment in his office, I found him to be almost the antithesis of the dynamic person I had seen in the studio. His calm, judicial but kindly manner was reminiscent of some of the country's prominent men I had interviewed. Blond and of medium height, his fine physique suggested the athlete in the pink of condition. He answered my questions with an almost boyish frankness.

Laurence Schwab, Junior, was born in New York City in 1922, the son of a famous Broadway theatrical producer. He received his earlier education in his native city, then attended high schools in Beverly Hills and Miami Beach. While a student at the University of Miami, he gained much practical experience in college theatricals and with summer stock companies. Often accompanying his father on professional trips to many cities in the United States, he was brought into close contact with the stage and its people.

Despite an ardent taste for the theater, he continued his studies with a strong determination to become an engineer. Then with alarming suddenness his outlook on his future changed. During a television program at the home of a friend, he decided to make TV his lifework.

Although at that time, in early 1940, the future of television was problematical, young Schwab began to lay the foundation on which he would build his career. His first professional experience was as a kind of assistant to the stage manager of the St. Louis Municipal Opera Company. His theatrical work was interrupted when he entered the Army Air Force, where he served a long hitch in the Pacific as communications officer of the Air Transport Command.

Immediately following his discharge, he worked as copy writer in several advertising agencies. This served as an excellent stepping stone toward his goal. Soon the agency in which he was employed assigned him to its radio division. His first job in a radio station was with WIOD, an NBC affiliate. Here as assistant program director, his industry and intelligence attracted the attention of the National Broadcasting Company. Employment as television stage manager resulted. Then followed participation in several phases of video, such as the mobile unit division covering special events and sports, production, props, scenery, lighting and on newsreels for television. Despite his comparative youth, few video directors have had practical experience as varied or as extensive in this new art form as Laurence Schwab, Junior.

His first assignment as director was a half-hour variety show that met with prompt public approval. Because of its fresh approach and dramatic effects which enabled mediocre talent to give excellent performances, the way was cleared for his directorship of a legitimate drama.

Even as late as the early 1950's, the best background for

a director, Mr. Schwab said, was experience in making Class B motion pictures.

"Class B?" I queried with lifted eyebrow.

"Yes!" he said emphatically, "because they are produced on a limited and often tight budget and must produce a maximum of entertainment quality at a minimum of expense, which was also our problem."

In view of the nature and scope of the present-day TV show, this is another interesting sidelight on the speed with which television has soared.

In the television studio the camera is the focal point around which all activities revolve. It records irrevocably the ultimate results of the labors of crew and cast. What it sees, be it good, bad or indifferent, it sends out to a critical audience. It places on the shoulders of its operator, the cameraman, a responsibility that at times equals that of a director, since the most expert direction can be nullified by faulty camera work. Conversely a top-flight cameraman can enhance the work of the director by giving dramatic "punch" to the successive scenes that go scurrying off over the air waves.

It is a common fallacy that the work of the video cameraman and that of the motion-picture cameraman are similar. It is true that the cameras in both media translate actual scenes into pictorial form, but there the similarity ends. Aside from its high pressure and apparently fast tempo, shooting a motion picture is a leisurely process. There is ample time for rest between takes and retakes. Focus adjustment, light changes, camera angles, framing the shot and all the other details are done with deliberation. If an actor fluffs his lines or fails to follow direction, the shot is made over or half a dozen shots may be made of varying rendi-

tions of the same scene, one of which is selected in the cutting room as the best.

Once a television program goes on the air, the cameraman is glued to his camera. There can be no rest, no leeway, no retakes. A mistake, a miscue or faulty focus is flashed on to a million screens.

For that reason it is imperative that director and cameraman work in closest harmony. Before the first camera rehearsal the director plans on paper each individual shot that he will use in the production. These plans are all carefully noted and diagrammed on copies of the script and given to the cameramen who are to shoot the show. At a pre-rehearsal conference director and cameramen discuss and agree on the locations of the cameras and how each shot is to be made. During the first camera rehearsal with actors, props and scenery in place, the director, seated at the control room monitor, tries out each shot noted in the script. From a microphone on his desk he directs, via the technical director, the cameramen through the earphones they are wearing. He may call for a close-up, a long shot, an eye level, a down shot or a "pan," short for panorama, a slow sweep of the lens across the stage from one set to another. Whatever the order, it is carefully noted on the director's script. The cameramen, busily complying with the director's orders, have little time to make notes. Instead, they memorize the shooting sequences. Some cameramen are so proficient in this memory test that, given adequate rehearsal, they can shoot a show with scarcely a word from the director.

On the other hand there are cameramen who will shoot only on order from the director. This is typical of television, in which there seems to be no standard practice. Each producer and director works according to a formula of his own, without a thought of how the same job is carried on in another studio.

When a cameraman is assigned to a mobile unit for coverage of a news event, a baseball game, a race meet, a boxing match or a session of United Nations, he plays a different role. Since these events cannot be rehearsed, he becomes arbiter of the camera work. During these field pickups things happen so quickly that there is neither time nor opportunity for director's instruction. Indeed the director becomes a kind of timekeeper, signaling the exact split second at which a commercial, an announcement or station identification begins and ends.

At these events the cameraman turns reporter, editor, pictorial director and artist. He must capture the drama as well as the facts on the instant. What he sees in his camera finder is precisely what the TV audience sees in that same split second.

The immediacy of his work was beautifully illustrated recently while I watched on our TV receiver the trotting races at Roosevelt Raceway at Westbury, Long Island, some ten miles from where I sat. As the horses, closely bunched, came pounding into the home stretch, one stumbled and fell in the path of the others. Instantly there was a crash and a scream as three horses, sulkies and drivers were piled up in a struggling heap. It was a superb piece of camera work, an instant filled with heart-chilling drama. Without a moment's pause another camera picked up the surviving horses and followed them to the finish. Only then did it occur to me that the sound of the crash and the agonized scream reached my ears and indeed those of viewers hundreds of miles away before it was heard by the thousands who actually saw the "spill." Since sound waves travel at an approximate speed of one thousand feet a second, it took nearly a full second for the sound to reach the ears of the actual spectators at the track. The electronic waves that carried the sound of

the crash to television viewers, have the speed of light, 186,000 *miles* per second.

During a chat recently with a mobile unit cameraman, he said to me, "Luck plays an important part when you are covering a news event. If your lens happens to be aimed at a spot where a dramatic scene occurs, you have a story. If it isn't, you're just out of luck. A few weeks ago during a dull interval at a baseball game, I decided to shoot a section of the spectators in the hope of catching a bit of human interest. As I 'panned' along the rows of bored faces, two men got into a fight that soon became a riot involving half a hundred fans. The rest of the crowd, men and women, frantically tried to escape from the melee. It was a riot scene that any movie director might have been wild about. Then tragedy, when I discovered that some failure in the camera had put me off the air.

"On another occasion while televising a boxing contest, the referee stepped between the fighters and my lens at the very instant the knock-out blow was delivered, the blow that later proved fatal.

"That is the hard luck side of the job, but there is another side to it. While covering an Easter parade, the camera caught a pickpocket in the act of rifling a woman's purse. A nearby detective who had been shadowing the 'dip,' saw the same act at the same moment. Arrest followed.

"While watching a military parade, a father recognized a son whom he had not seen for several years. It was a touching scene as father and son embraced. The camera caught what was almost a close-up but it took quick action to get it."

Here was an opportunity to ask a question that had occurred to me many times while I watched cameramen at work. "What experience must a man have before he is entrusted with the operation of a studio camera?" I asked.

The cameraman paused thoughtfully. "That is hard to answer," he said. "Some have graduated to the camera from other technical jobs that gave them an opportunity to learn the complex operation of the television studio. Meanwhile they studied the work of the cameramen with whom they came into daily contact. An alert studio manager usually spots such a man and gives him a chance to familiarize himself with the camera mechanism and its operation.

"If the would-be cameraman shows unusual aptitude, he is encouraged to study lighting and composition and to acquaint himself with the jargon of the TV studio. This may go on for several years until one day he gets a lucky break. An emergency arises, an extra cameraman is needed. Assuming he is a member of the right union, he is assigned to a camera. From that point his career is in his own hands.

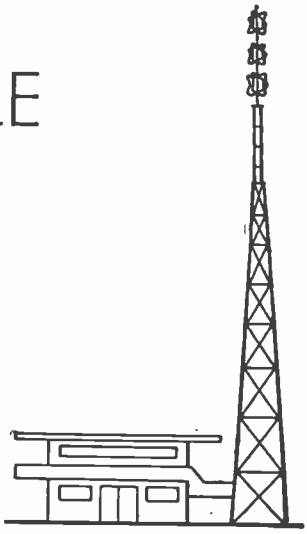
"Because of a certain similarity in operation, motion pictures have contributed several excellent cameramen to the TV studios despite the fact that the movie cameraman is basically a skilled photographer while the TV man may never have made a photograph. Both have certain things in common, however—an eye for a dramatic picture, a keen appreciation of light values, the knack of catching the director's *mental* picture and a fine sense of timing.

"Some television studios, realizing how vital good camera work is to good production, have established training courses for their technical employees including light operators, microphone boom men, projection operators, sound directors, shading men and technical directors. These technicians are given a number of hours each week to receive expert instruction in the operation of cameras and in the fundamentals of good picture making.

"Of course there are also privately run schools that include camera work in their curricula."

CHAPTER EIGHT

THE MOBILE UNIT



TELEVISION coverage of United Nations assemblies from Lake Success days to the present is a distinctive part of the story of the mobile unit, and also of the coaxial cable, which, in the case of UN Headquarters in New York, has brought camera mobility within the confines of the building itself. When I visited the UN the other day to see its now self-owned and self-contained system of news handling, I remembered vividly the day I had seen the Security Council televised at Lake Success, when in 1950 Yakov Malik was appearing as President of the Council after an absence of months.

Anxious to see television reporting at its best, I had joined a TV mobile unit from NBC. Arriving some time before the opening of the session I found the huge television van, heart and brain of the unit, in its place close to an entrance and connected with the building by a maze of cables, several of which led to the roof where a tall antennae mast stood out-

lined against the sky. Within the van, which was half as long as a railroad car, was a bewildering array of electric and electronic apparatus, and immediately behind the driver's seat was set up a complete telecasting station with four monitors set in tiers among a maze of instruments and paraphernalia.

From each of the four cameras within the council chamber, a cable led to the transmitters on the van. From there the signal was sent by cable to a microwave transmitter on the roof and from there to a relay transmitter at Belmont Park, seven miles away. Then it took a ten-mile leap to a receiver on the roof of the RCA building in midtown New York, where the picture was shaded and groomed for final broadcasting and sent over coaxial cable to the tower atop the Empire State Building, and from there it was put on the network's cables to be carried to distant communities.

Later I was to see the van's station in action, but for a while I went into the council chamber to watch the TV procedure there. At ceiling height on three sides were the soundproof booths in which the newsmen worked, each booth with a large double-plate-glass window. All aspects of the scene were plainly visible to the strategically placed cameras, and NBC news commentators added their on-the-spot story, in the dual operation known as "simulcasting."

Besides the commentators in the booth, each with a microphone before him, was the producer, whose job encompassed every phase of the assignment; the stage manager, in direct telephonic communication with the van and the director who worked in it with cameras, engineers, and assistant directors. There was also in the booth, a "script girl" acting now as scout emissary and reporter. Also there was myself, crammed into a corner, notebook in hand. Meantime the cameras worked unceasingly, shooting their constant stream

of pictures to the monitor at the left of the commentator's workbench.

In a nearby booth a camera was at work in semidarkness. Only the occasional turn of the turret that brought the required lens into play or a quick adjustment of the focus showed visible movement. With eyes glued to the camera finders the cameramen were alert as hunters stalking game. The silence was oppressive since the place was soundproof and the TV camera had no shutter click. The whispering voices of the cameramen as they spoke into their phones were scarcely audible two feet away.

It was evident that every move they made was in accordance with an order from a distant director and, filled with curiosity, I wedged my way out of the booth to find this nerve center from which their work was co-ordinated. Making my way along a labyrinth of narrow passages and down mysterious staircases, I came to the main lobby, a huge brightly lighted area two city blocks long and as broad as a six-lane highway, where men and women from every nation on earth, it seemed, hurried or sauntered by.

Separated from the lobby by a large vestibule in which leagues of cable and a variety of electric apparatus were piled, was the broad doorway, closed to all visitors, reserved for the mobile unit van, whose rear opened directly into the building. At a long bench, nearly breast high, sat the director and technical director. Several other men were also at their posts. Here again was trancelike concentration. The director, with eyes fixed on the monitors and arms outstretched in movements resembling those of an orchestra leader, signaled the technical director at his right elbow while ordering him to "kill Number One camera" and "bring in Number Three." He called for "fade ins" and "fade outs," "lap dissolves" and "double dissolves," "cuts" and "wipes." The technical director responded by pressing one

or several of some twenty keys on the control board in front of him. The work of the cameras is continuous but they are put on or taken off the air by the technical director at the will of the director.

"Number Four camera! Pan the delegates!" "Pan" is the panorama shot in which the camera lens is slowly moved in an arc, sweeping a wide area. Again the directional finger motioned: "Bring in Two!" which then probed the visitors' section, pausing here and there as it found an interesting group or individual. Now it scanned another section reserved for the hundred or more newsmen, among whom were many of the world's best-known correspondents and reporters.

It was now nearly five o'clock and evidently the proceedings would continue for more than an hour. I hurried to my home seven miles away to sit and view, like millions of others, the ultimate results of all this labor. With perfect reception on a sixteen-inch screen, I marveled at the smooth continuity: the drama, the human interest and, above all, the high standard of journalism coming in over the air in words and pictures. Although my point of observation in the council chamber was all that could be desired, it was far less effective than the seat in my own living room. And so prompt was the translation of Malik's statements or charges, and so perfect the sound control, it was difficult to realize that the words coming from his moving lips in what seemed to be flawless English were actually in Russian.

Details of camera work, sound track, and direction at the United Nations Headquarters, on the East River in midtown New York, are virtually the same as they were at Lake Success, but no mobile unit is now necessary, for the building is largely wired with coaxial cables concealed by shafts in the corridors and, as Mr. Emery Kelen, Television Officer

in the Radio Division, remarked to me, "The whole building is our studio; we have field cameras, and remote operation goes on in the building itself." The cameras are the field equipment, moved everywhere in the building by the cables invisible in the floor, and pickups may take place in all conference rooms and council chambers. Television, in fact, is reaching a peak of international usefulness in this headquarters filled with such enormous potential for understanding through communication.

The General Assembly was not in session at the time of my visit, which in a way gave me a better opportunity to see the TV facilities. Through the courtesy of Mr. Peter Aylen, Director of the Radio Division, I was turned over to Mr. Kelen, who directs all "live" TV coverage of meetings and all programs which are kinescoped. Besides this "live" programming, the UN furnishes films, still pictures, filmstrips, and other visual material to television stations; for this service the Film and Visual Material Division is responsible.

In the control room, like powerful creatures stabled and waiting, were the three Marconi cameras with their appropriate switching units which work on a broadcast standard of 525 lines, and the monitor which serves any one of the three, or all simultaneously. These cameras have very strong lenses, for in political televising the drama lies in the close-up, the face; in personality and reaction.

The UN does not have its own TV transmitter; the program picture goes on the air via the coaxial cables supplied by the Telephone Company. The picture is chosen and put together by the director from all three cameras, and with accompanying language—English, French, Spanish, Chinese, Russian. The language service is being steadily increased, German and Italian now being added.

Nearby, in its own room, is the kinescope, the hot processor, with a heat of 260 degrees, which photographs the TV

network television's first full-hour, daily dramatic show in color.

The scope of color broadcasting in the entertainment and sports fields is a matter of common knowledge; not so generally known, perhaps, is its increasing importance in scientific fields as well: on January 10, 1955, for instance, it was used for the first time, in a closed-circuit telecast, for intercity consultation and diagnosis by the Armed Forces Institute of Pathology in co-operation with RCA. The cities thus linked were Philadelphia, Baltimore, and Washington. Other highlights of 1955 were the demonstration in May of a new-type color camera costing 25 per cent less than previous models, a "Universal Multiflexer" for both color and monochrome slides and films, and special color effects equipment for studio use.

Of great importance has been, and will be, reproduction of color telecasts from magnetic tape. The first transmission over commercial network of a color program recorded on magnetic tape by RCA and NBC on May 12, 1955, opened this new era in electronic photography. The telecast originated with the prototype RCA television tape recorder installed at the NBC studios in Radio City, New York, and was transmitted over microwaves from New York to St. Paul, Minnesota, for the dedication ceremonies of a new research center of Minnesota Mining and Manufacturing Company, makers of magnetic tape used in the RCA system. The program was recorded in advance on video tape which was stored until the scheduled transmission time. A very wide usefulness is predicted for magnetic tape recording, not only in television broadcasting but also in education, home entertainment, industry, national defense and other areas, and these possibilities are already in process of realization.

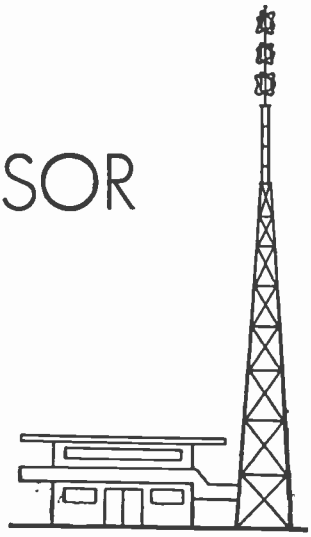
In both production and broadcasting, color television

reached new peaks in 1956. In April, NBC announced the succeeding stations to have all programs colorcast. On February 6th, the first plant to be completely converted for mass production of color-television receivers was unveiled by RCA in Bloomington, Indiana, geared to produce 60 sets an hour, one a minute, an output six times that of a year previous. A few weeks later the first portable television receiver, the RCA Victor "Personal," was put on the market; a compact set weighing slightly over 22 pounds, with newly developed "Deep Image" picture tube providing 36 square inches of viewable picture.

Scientists and engineers are now at work on developing an electronic light amplifier which will eventually eliminate the need for the picture tube and other electron tubes in a television set and will usher in "mural television," with a thin, flat screen hung on the wall like a picture. Such a screen, under the control of a little box, will be typical of the simplicity, compactness, and flexibility which will be features of the television of the future.

CHAPTER TWELVE

ENTER THE SPONSOR



DURING a recent evening spent at the home of friends the conversation turned to the subject of television commercials.

We had just enjoyed a gripping drama that had had a long run on Broadway a few years previously. The leading role was played by an actor of international reputation, supported by an unusually fine cast.

Despite the limitations of the TV medium, the production compared favorably with the theater rendition of the same play. In fact, I thought it improved by the cutting necessary to fit it into the allotted hour.

Among the friends and neighbors present were Dr. Delancey, a local physician, and his wife. Mrs. Delancey was a woman of great charm with a deep interest in civic betterment. After a discussion of the play and TV in general, the lady remarked naively,

"Television would be so much more enjoyable if the com-

mercials were eliminated. Isn't it possible to have entertainment without advertising, as in the movies or the legitimate theater?"

It was her husband who replied. "You must remember, my dear, that actors must eat and broadcasters must live. Neither actor nor broadcaster can exist without revenue. Television, as we know it today, could not live very long without the revenue accruing from the advertising of its sponsors, in other words, its commercials." Then turning to a dynamic young man on his right, the doctor asked, "What do you say, Dick? This is right up your alley."

The "Dick" to whom he referred was Richard Follinger, an advertising agency executive with wide experience in radio and TV advertising. With the assurance of one well versed in his subject, he began:

"Advertising has been a major factor in the phenomenal growth of our national economy. This holds true whether the medium be radio, video, newspapers, magazines or any one of a score of other channels through which large segments of the public are reached. With few exceptions none of those media could continue to exist without advertising patronage.

"This is particularly true of television, not only because of the heavy investment that has been poured into the industry but as a result of the great cost of production. As an example, take a single expenditure of two and a half million dollars made recently by the American Broadcasting Company to provide adequate studio facilities for its television programs. Three buildings that formerly housed an exclusive riding club were purchased. In the course of reconstruction a main studio one hundred feet square and forty feet high was built. A number of smaller studios, offices, dressing-rooms, property storage rooms, a five-story scene painting and design shop, a film laboratory, lounges,

a first-aid room and elevators with a five-ton capacity were also installed. Added to these was a paint frame forty feet high with an electrically operated scaffold on which the scene painters work.

To enlarge its color-television facilities, NBC has just started a $12,000,000 expansion program in New York, Chicago and Hollywood. And so on, all the way down the line, you will find this program of expansion of televising facilities.

"In television, as in other industries, you will find the pay envelope its heaviest burden. For a recent broadcast a comedian at the pinnacle of his popularity received a pay check of forty thousand dollars for a ninety-minute stint before the TV cameras. Including the stars of lesser magnitude who supported him and the various and sundry production charges, the hour and a half of TV entertainment cost the sponsor, a refrigerator manufacturer, the tidy sum of $140,000. The studio's earnings were only a fraction of the comedian's.

"Another comic with a following among stage, radio and motion-picture audiences, has signed an eight-year radio and TV contract with a broadcasting company at $375,000 a year, or three million dollars for the period of the contract."

"Is all television talent paid on the same lavish scale?" the doctor asked.

"Far from it," the ad-man replied. "Compared with the motion-picture industry, the stipend paid the TV actor is relatively modest. 'Name leads,' that is, widely known artists, are paid $2,000 to $10,000 for an hour's show. 'Featured players,' not so well known, get approximately $600 to $1,000 for a performance. 'Bit players,' who play minor roles, receive about $200. The director of a one-hour program receives $750 to $1,000 and about the same sum for an hour's variety show. For half-hour programs the director's

reward is less by one third. The producer's scale of pay is slightly above that of the director. In each case the sum paid covers rehearsal time.

"Among the first of the more successful television playwrights are Paddy Chayefsky, Gore Vidal, Horton Foote and others. An original script for a one-hour program will bring the writer anywhere from $1,250 to $5,000. For adaptation of a book, a play or short story, he receives from $875 to $2,000. There is no standard scale of remuneration for creative work in TV. Only for those workers who are members of certain unions are their wages and working hours regulated. As a rule, a generous budget for a sponsored program assures better financial reward for cast, producer, director and writer, than a sustaining or unsponsored show.

"No matter how you look at it, the cost of broadcasting a TV program is high. Only those studios with an adequate backlog of advertising, commercials if you will, can survive. Then too, it must not be forgotten that a sustaining or unsponsored program has no advertising revenue.

"And now, Mrs. Delancey, for the commercial as it appears on the TV receiver and to which you object! We are not unaware of the considerable number of television viewers who agree with you. However, they do not find fault with the sponsor's right to advertise but rather with the character of his commercials. Often their ill-timed introduction into the program comes at a moment of suspense.

"First let's consider their pictorial quality. At first the pictorial quality of TV commercials was on a par with the movies in their earlier years. Live production, in which actual commodities and people were televised, was a constant headache. The intense heat turned palatable foods into an unappetizing mess. Colors faded from sight. A checkered garment showed on the screen as a flat nonde-

script gray. A luscious cut of prime beef became a slab of white fat on the screen. The make-up on the pretty model's face turned into grotesque smears. Those were the days, and not so long ago, when TV audiences wondered how sensible sponsors could so caricature their products as to create consumer resistance rather than acceptance.

"With the development of a color-sensitive film, TV advertisers turned to the motion-picture commercial and presto! many of the technical difficulties disappeared like morning mist. Almost simultaneously improved techniques in the use of the television camera brought about marked improvement in picture quality. But that was only half the battle. A picture may be technically flawless yet lack the spirit or the idea that tells the story or carries the message. The picture makers for TV audiences were often artisans rather than artists.

"Not until the advertising agency art directors took over the supervision of production did commercials show improvement. Sets, costumes and props were chosen with expert care. Models were as carefully made up and coached as for a major production.

"Modern commercials are divided into three distinct classifications—live, film and animated or still drawings. In live commercials merchandise or models are shot directly by the television cameras and go on the air instantly. A film commercial is shot by a motion-picture camera and is televised days or weeks later. The third category is the animated drawing now so popular. Each has its merits and its drawbacks. The live commercial is the least expensive and the most direct method of getting the sponsor's message across to the TV audience, but it has its hazards since there is always a chance that the actor or model will fluff the lines or that any one of a hundred unforeseen gremlins may creep in to make its commercial value all but worthless. Recently

a well-known stage personality, while extolling the virtues of a nationally advertised tobacco product, was seized with a long spell of coughing that broke up the show.

"Film commercials, while much more expensive, are always under complete control since they can be carefully edited before they go on the air. The script, usually written by an advertising agency staff-writer, is subjected to close scrutiny by a group of agency radio and TV personnel.

"Then a 'story-board' is prepared. It is a running story of the scene and action called for by the script. On the left margin of each page are carefully prepared sketches of what is to appear on the TV screen. This, too, is discussed at length and usually winds up with many cuts and changes before it is ready for the sponsor's okay or rejection. The film commercial is usually directed by the film producer under the supervision of the advertising agency. In this, as in all branches of television, there is no set rule of procedure. With some agencies the story-board comes first. Script comes later. Others send photographers on location with only a rough outline of the story, after which the film footage is cut and edited and the narrative written.

"Then there is the animated-cartoon type of commercial in which the imagination of script writers can run the gamut of the artist's capabilities. Many of the artists engaged in turning out these animated drawings are alumni of the Hollywood studios in which Mickey Mouse, Donald Duck and other whimsical characters had their origin.

" 'Then,' one may ask, 'why doesn't the TV animated cartoon compare in quality and artistry with a Donald Duck movie film?' The answer is, 'Budget.'

"In the movies large staffs of specialists participate in the production of an animated cartoon. As many as seven thousand individual drawings enter the production of a Donald Duck or a Mickey Mouse film. The cost of these classics

exceeds by many times the appropriations of a TV sponsor for an entire program. Since those movie films are a huge source of revenue, the lavish cost of production is absorbed quickly, while the animated cartoon used in a TV commercial is merely another item of expense to the sponsor."

"Speaking of sponsors," Dr. Delancey interrupted, "who has the final word in the preparation of a commercial?"

"Well, we like to think that the advertising agency has a free hand," said Follinger, "but the fact is that the whim of the sponsor often determines the character of the commercial. Except in rare instances, the agency submits all ideas for script, pictures, slogans, musical jingles and so on, to the sponsor. The presentation often represents the combined brains of our creative staff, each of whom is expert in evaluating public reactions to advertising in its many phases. Now the sponsor is invariably a successful and often brilliant businessman who would not dream of questioning the professional advice of his doctor or lawyer but who will hem and haw over the recommendations of his advertising agency and often permit his personal whims to overrule its recommendations, even though he could not devise or write a profitable ad any more than he could write a medical prescription or a legal brief, and this despite the fact that he pays his agency for its advertising services sums vastly in excess of those he pays either his doctor or his lawyer."

Here another guest, a chemical engineer who had been an interested listener, asked, "What are some of the special techniques necessary for good picture quality in TV commercials?"

Follinger threw up his hands. "There are scores of them," he said. "Some of them we know. About the others we can only guess. As in chemical photography, black and white are poison. High-density colors like navy blue and light pastel shades can create havoc with a broadcast. In a recent

TV commercial for a motor-oil concern the white coveralls worn by the service station attendants turned out so dazzling white that they had to be dyed sky blue. A guest star on another program wore a dinner suit made of a medium blue material. It looked black as the ace of spades. A co-star on the same program was dressed in a finely tailored tuxedo in conventional black. It appeared drab on the screen, as if it had known hard wear for many years. More than that, it was outlined by a glowing halo that proved a decided detriment to the actor's work. Reds are the bugbear of television. One shade will photograph light on film while another shade will photograph dark. In live production, that is, photographed by the TV camera, certain reds fade out even to the vanishing point.

"In an effort to solve the many problems incident to televising film commercials, many agency producers are turning to Hollywood. There in the heart of Movieland casting is easier because of the diversity and number of professional people always available. Studio, laboratory and directional facilities are also greater. In Hollywood the motion picture is a major industry. In the East it is a struggling enterprise, a stranger in a strange land."

"Is color television solving many of the problems you've mentioned?" asked the chemical engineer.

"On the contrary it demands more and greater care in production," said the advertising man. "Let's take a packaged product, for instance. Most packages are designed in lurid, or in what are termed eye-catching, colors that when rendered in black and white have only a faint resemblance to the original. Then too most packages have a glossy surface to insure better printing. This gloss or sheen reflects light that makes good photography impossible. The only alternative then is to make a dummy package with gray tones on a dull or nonreflecting surface. These tones are

skillfully balanced so as to give a fairly accurate monochrome rendition of the original colors.

"In color television there can be no such subterfuge. The behavior of some colors on the kinescope is unpredictable. A television play may be a symphony of color, an artist's dream. Indeed it may surpass in the beauty of its color harmony the coloration of the actual stage production. The reds may be deeper or, who knows, brighter, the greens cooler, the blues of the shadows more pearly in their softness.

"Like many of the best artists, television paints colors as it feels them rather than as it sees them. And therein lie many headaches for producer and art director of TV commercials. The design and color of his package is almost as important to the sponsor as his trademark, which may be valued at millions of dollars. He will not tolerate any deviation from the original, be it ever so slight.

"Unlike color photography, in which chemistry comes to the aid of the camera in rendering color with reasonable fidelity, and in which the retouching artist can, if necessary, do a certain amount of color correction, television can only hope that the phosphors, glowing under the bombardment of billions of speeding electrons, will produce colors that will match exactly those of the object televised.

"Since many sponsors are sensitive to the slightest deviation from the approved color and design of their products, televising commercials in color presents grave problems to the studio and to the advertising agency. Reproducing the beauty, the glamour and the eye-appeal in any pictorial medium, printed or electronic, is never an easy job. In television it is a challenge to the ingenuity and resourcefulness of those who are charged with the preparation of the article to be televised. In short, the problem is one of 'make-up.' No actor or actress would submit to the merciless glare of

the TV lights without a skillful use of make-up. The color and texture of the human skin, except in rare cases, do not adapt themselves readily to television. That is why make-up artists are employed to restore with grease paint and eye shadow and pencil and powder the good looks lost in transit through the sequences of the television process."

Here Dr. Delancey interrupted. "Can you explain," he asked, "why television has gained such widespread popularity in such a short period?"

"Certainly," replied the ad-man. "Remember that from earliest times man has had an unconquerable desire to see beyond the horizon. It was this age-old desire that prompted Galileo to invent his telescope and the Mongolfier Brothers to make the first balloon ascent. During the early days of aviation, press and public were more interested in altitude records than in distances flown.

"With the advent of video and the coaxial cable came the extension of man's range of vision over thousands of miles. The living room became the observation post from which young and old, rich and poor, could watch the world go by. A Presidential address in Washington, a wrestling match in Chicago, an operatic production in New York, a symphony concert in Philadelphia. In pre-video days those events were witnessed by only a few thousand people. Today any one of them commands an audience of millions.

"The rapid adoption of TV by the public is also due to its inherent power to advertise itself and to be its own best salesman. Millions of receiving sets have been purchased by people who, seeing TV for the first time in the homes of friends, decided then and there that they too must witness the passing parade of people, events and entertainment under their own rooftree."

"Is it true," asked the engineer, "that television has prospered at the expense of certain types of business?"

"Only in part," Follinger replied. "Let me illustrate. About nine-thirty one recent evening I was riding in a taxicab along Thirty-fourth Street, a busy thoroughfare in the heart of New York City. Brilliantly lighted stores lined both sides of the street. The sidewalks, usually crowded, were practically deserted.

" 'Where are the people?' I asked the taxi driver.

" 'Sitting around their television sets,' he answered with an angry shrug.

" 'Do you mean you carry fewer fares?' I asked.

" 'And how!' he snarled. 'On a night like this only a couple of years ago this cab was good for at least twenty bucks. Now I'm lucky if I take in fourteen for a night's work.'

"As if to bear out the cab driver's plaint, transit companies in several cities have complained of a serious drop in the number of passengers in buses and streetcars between the hours of seven P.M. and midnight. A Midwestern city attributed its thirty per cent decline in fares to the newly acquired habit of television. Even the rapid transit lines of New York City report eighty million fewer riders than in the preceding year. Some authorities attribute this to the increased fare. Others, however, insist that it may be laid at the doorstep of television. In a prosperous New Jersey town a movie theater, unable to compete with TV, was converted into a super market. In the other States 580 motion-picture houses closed their doors for the same reason.

"A transit company in California, feeling the rivalry of video, installed TV screens in its buses. Concealed from the drivers but in full view of the passengers, they attracted riders in such numbers that the company is considering making permanent TV installations in all their buses.

"On the other hand, in areas with a high concentration of TV sets, neighborhood stores report a sharp increase in the

sales of beverages, snack foods and other entertainment necessities. Groceries and delicatessens attribute to television a sharp increase in the sales of many commodities."

"What are some of the larger business aspects of television?" the engineer asked.

The advertising agency man paused before replying, then said slowly, "In spite of its youth, television has developed into a business now approaching the three-billion-dollar mark. As recently as 1948 there were only about 100,000 TV receiving sets in use. By 1950 the number had increased to 7,000,000. Today there are 427 commercially operating TV stations located in 266 markets, serving 48,000,000 homes, which have 36,900,000 TV sets. A country-wide survey shows that the average receiving set has an evening audience of approximately 2.7 persons.

"Advertisers are a canny brotherhood, slow to lavish substantial appropriations on a new advertising medium, yet they spent some twenty-five million dollars on broadcast time during the past year. The collective production costs on their various programs were many times that sum. Before making the large investment necessary for a comprehensive video advertising campaign, the advertiser scrutinizes closely the character of the TV audience—the number of viewers, their age, sex, income and occupation.

"Some idea of the growth of television may be gained from the fact that in January, 1947, a little more than five thousand television sets were manufactured while in January, 1950, the output was around half a million. For the whole year 1955, the number was 7,800,000.

"New telecasting stations are coming on the air with startling frequency and these will attract new televiewers who in turn will create new markets for commodities advertised on the TV screen.

"Never has an industry opened up so many jobs for so

many people in so short a period. Therein lies one of the modern miracles of industry. When, after years of struggle and adversity, the tide turned and TV became popular, there was only a handful of people in all the United States who had had either experience or background in making or assembling the myriad component parts of TV transmitters, receivers, cameras or controls. Just think of the skill and precision required to, for instance, pierce a hole with a diameter of a spider web through the length of a tiny metal cylinder! It seems like a task beyond human accomplishment, or indeed human comprehension. Yet millions of these microscopic marvels of the machine age are turned out annually by operatives, many of whom had never seen the inside of a television set until they secured a job in a TV factory."

"Speaking of jobs," interrupted Dr. Delancey, "what vocational opportunities does television offer young people who have completed their school years and who are confronted with the universal problem of earning a living?"

"There is no richer field for bright young people to explore in search of an outlet for their abilities. In the field of television you have laboratories, factories, broadcasting stations, advertising agencies, sales, installation and the servicing of receivers, film studios and publishing in all of which there are openings.

"A manufacturer said to me not long ago, 'Our greatest problem is securing the right kind of help.'

" 'What do you mean by the *right kind?*' I asked.

"His reply was prompt. 'Young men and women capable of absorbing instruction.' Then he added, 'Our personnel department prefers those who have a high-school diploma. Two years or more of college is considered also an asset in an applicant for employment. Of course those with previous experience and a good record in our particular branch of the

industry have an advantage. All in all we favor getting them young and training them in strict adherence to our standards. You know the old saying: It's hard to teach an old dog new tricks.'

"Well, that holds true in practically every branch of the industry. Take my business, for instance. Our advertising agency, established many years ago, has kept step with the growth of industry through advertising by means of the printed word—newspapers, magazines and periodicals. Then came the spoken word through the medium of radio. And now has come video through which the sponsor's message is broadcast visually and audibly to the buying public. With it has come new problems of which advertising men of a decade ago had not dreamed.

"Some of the best advertising copy used in publications comes from the brains of writers who would rather face a firing squad than a television audience. In radio there are top-flight announcers in whose voices is the exuberant ring of youth but who lack the physical qualifications necessary for an appearance before a TV camera. In television the commercial announcer must be endowed with a good voice and presence; his diction must be faultless; his grooming impeccable; and above all, he must be able to project sincerity into every word and gesture.

"It is evident, therefore, that good TV announcers, men or women, are not easy to secure. In the TV division of our agency every young man or woman entering our employ is a potential announcer, producer or director. Since advertising in any medium is only another form of salesmanship, we watch carefully those who seem to have the selling instinct and particularly those blest with an unswerving tenacity and an unfaltering determination to win. Whenever we discover those qualities in our young men or women, we give them the green light to better and bigger opportunity while

we train them for their goal. This policy has paid off. Many of our staff have grown up with television since its infancy."

Bright and early next morning I set out on an exploration trip to one of the world's most fabulous places, the top of the Empire State Building tower, 1353 feet above New York's sidewalks.

Whenever one discusses television transmission, "the tower" is sure to crop up sooner or later. The tallest of man-made structures, it is the jumping-off place for the countless quadrillions of electrons that carry the TV picture to several million receivers. On the eighty-fifth floor of the building, immediately under the observation deck, are the transmission equipments of Stations WRCA-TV and WJZ-TV. From there the signals are led through cables to the antennae several hundred feet higher.

The upper reaches of this famous building make a favorite roosting place for Science. On the eighty-seventh floor the New York Telephone Company has installed a number of microwave receivers that relay, for broadcasting, television pick-ups from mobile units covering various types of news events. Here, too, is a kind of telephone central through which automobiles and ships equipped with radio telephone are connected with their "party."

From the eighty-eighth floor of the quadrangular portion of the building rises a sixteen-story cylindrical tower commonly known as "The Mast," an inappropriate and erroneous term handed down from the structure's earlier days when the tower was supposed to be a mooring mast for dirigibles.

Atop the tower is the antennae mast 199 feet high constructed a few years ago. It is used by five television and two F.M. radio stations. Immediately below the base of the antennae is a space known as "the attic." Here the General

Electric Company conducts experiments each summer in measuring and photographing the lightning bolts that strike the tower. As many as thirty bolts have struck in a single season.

Elsewhere in this fantastic aerie, cosmic ray experiments are carried on. An electronics concern amplified the sounds of carillon music by thousands of decibels and learned something of the strange behavior of sound waves. For instance, the musical clang of the bells could be heard plainly at a distance of sixteen miles while the passers-by on the streets below could scarcely hear the melodious hurricane that was sweeping into adjacent counties.

Here too are carried on various kinds of research such as a count of flies and other insects as possible polio carriers, the amount of soot suspended in the air, velocity and behavior of wind currents, the night migration of many kinds of birds, warnings sent out to nearby airports of the approach of dense fogs. Other scientific observations, dealing mostly with electronics, are conducted under a cloak of secrecy.

This wonder tower is the embodiment of the old saying, "Head in the clouds, feet on the ground," since its upper stories are often hidden in dense clouds while good visibility prevails nearer the ground. One of the weather peculiarities that sometimes disturbs those admitted to the privacy of the upper strata of the tower is a form of St. Elmo's fire that causes an unpleasant tingling in the finger tips due to the heavy charge of static electricity in the air.

Once while on the observation platform during a heavy blow, my escort informed me that the building swayed in the wind some three inches. The movement is too gradual to be noticed by a visitor, however. None of these phenomena affect the quality of the television signal.

Since coaxial cable and microwave relays have been mentioned constantly in preceding chapters, a word of ampli-

fication may not be out of place. The cable, broadly speaking, consists of a copper wire running through the center of a copper tube and insulated from it by non-conducting discs placed about one inch apart. It is called "coaxial" because the tube and the wire have the same axis. The tube is about the size of one's little finger. Most Bell System coaxial cables containing eight of these tubes, are about as big around as a man's arm. The coaxial tubes carry electrical energy as a pipe carries water but with a speed almost equal to that of light and without spreading it in all directions as in radio broadcasting.

Originally developed by the Bell Laboratories to increase telephone traffic facilities, its great capacity has enabled it to carry the complex signal necessary for television, thus releasing TV from the limitations of the horizon.

The coaxial cable, however, is but one of two facilities used in intercity television networks. The other is known as "radio relay" which, strange to say, is patterned after the old-time Pony Express that worked in relays from one lonely outpost to another, over hill and plain, mountain and prairie. By the television relay method super-high frequencies called "microwaves" are transmitted from station to neighboring station. Like light waves they travel in straight lines and as a rule do not follow the earth's curvature. But they can be focused like a searchlight and aimed from one point to another distant point. However, a clear line of sight must exist between these relay stations.

The microwaves are about half the length of a lead pencil. Four billion of them pass a given point every second. They are concentrated into narrow beams by the use of unique lenses and require no more power than the amount needed to light an ordinary flashlight bulb to span the approximately twenty-five-mile gap between stations.

Just as the mounts of the Pony Express tired during their sprints from outpost to outpost, so the microwave signals

become weary and weak while they speed over the air to the appointed relay station. There the signals are refreshed and revitalized and are amplified a millionfold before they are off and away to the next rest cure.

These relay stations now dot the landscape in all parts of the country. They range in height from 40 feet to 200 feet and are usually identifiable by the square horn-shaped directional antennae topping the structure.

As the picture signal reaches the end of its journey, it must be accompanied by the sound or audio portion of the program which normally travels over a separate channel. Technicians at control centers co-ordinate picture and sound and dispatch them to the studio for broadcasting.

Coaxial cable and the relay system had their origin in the telephone industry, where they have been in practical use for many years. Without them, long-distance telephone as we know it today, would be impossible, as indeed would our vast telephone system. Comparatively few years ago, 250 wires would have to be employed to carry 1800 simultaneous telephone conversations. Today a single coaxial cable, two and a half inches in diameter, can do the job.

During my meanderings through the field of electronics there was scarcely a moment without a thrill or a surprise. It was as if I had stepped into a new world in which time had moved a quarter of a century ahead. Wherever I turned were men whose thoughts were focused on the future. At every hand research, experiment and development were in full swing on some device, technique or gadget that in all probability would not reach fruition for years to come.

Everywhere it was apparent even to the most casual observer that science and the arts, industry and labor, education and entertainment had joined hands in an effort to make this a better and perhaps a happier world.

The End

A GLOSSARY OF TERMS IN TELEVISION

ANIMATIONS Mechanical devices which in various ways impart seeming movement to inanimate objects.

ANTENNA . . A radiator used in the transmission of radio frequencies.

AUDIO . . . . Pertaining to the electronic transmission of sound. Also (*noun*) the sound portion of television.

BACKGROUND Any material, set, drape, drop, etc., used behind actors or other foreground objects.

BACKGROUND PROJECTION The projection of a scene on a translucent screen to be used as a background for a studio set.

BACKGROUND SOUND Supplementing the main source of sound, such as background music.

BLIZZARD HEAD A blonde whose hair appears white on video screen.

BOOM . . . . . A mechanical contrivance for suspending a microphone.

BREAK . . . . A break in rehearsal, time out. Also as in "Break a set," to remove set from studio. Also "Break it down," to remove and disassemble equipment used on an outside broadcast.

BRIGHTNESS The average over-all brilliance of the television image.

BRIGHTNESS CONTROL A manual regulator for adjusting over-all brilliance of the television image.

BROADS . . . Units or batteries of incandescent or fluorescent lamps.

BUSINESS . . Incidental action or devices used to add atmosphere and interest to the program.

BUSY . . . . . Term to describe a setting or background that is too elaborate or which contains excessively detailed ornamentation.

CAMERA . . . A unit containing the optical system and light-sensitivity pickup tube which transforms the visual image into electrical impulses.

CAMERA FIELD ANGLE The area inscribed by the borders of the camera picture at various distances from the lens.

CAMERA LIGHT Light on camera which, when it is on, indicates that the camera is on the air.

CANS . . . . . Telephone receivers or head phones worn by personnel in the studio.

CARTOON SET A drop or other background treated as a large line drawing suitable as a setting for some types of variety or educational programs or to create mood as in a fantasy.

CATHODE-RAY SCREEN The fluorescent material covering the inner surface of the picture end of the kinescope.

CATHODE-RAY TUBE A vacuum tube employing a controlled beam of electrons.

CELL . . . . . See TRANSPARENCY.

CENTERING CONTROL A knob or knobs on the television receiver for framing the picture properly on the TV screen.

CHANNEL . . A specific wave length; a band of frequencies for transmission.

CLOSE-UP SHOT Very narrow angle picture, i.e., head shot of a person.

COAXIAL CABLE A specially constructed cable used extensively for the transmission of the television signal because of its relatively low loss of power at the higher video frequencies.

CONTRAST . The brightness relationships between the various elements of a picture.

CONTRAST CONTROL A knob on the television receiver for adjusting the range between highlights and shadows in the picture.

CONTRAST RANGE The range of light values between the lightest and darkest elements of a transmitted picture.

COSTUME DEFINITION A quality in a costume which either through contrast in tone quality, texture or design makes it stand out distinctly from the background or from surrounding objects without the agency of special lighting.

CROWFOOT . A three-legged device placed under tripod to prevent television cameras from slipping.

DEMONSTRATION A special television program produced for sponsor and agency viewing but not for public distribution.

DIORAMA . . A miniature setting usually employing free perspective in its execution, and used as a means of establishing large locations impossible of construction in the studio.

DIRECT-VIEWING RECEIVER A type of television receiver in which the picture is viewed directly on the end of the kinescope.

DISC . . . . . A recording.

DISSOLVE . . The momentary overlapping of an image produced by one camera with that of another and the gradual elimination of the first image.

DOLLY . . . . A perambulator or four-wheeled carriage for a camera.

DOLLY IN . . To move in from far for close-up by means of a camera mounted on a perambulator.

DOLLY OUT . (Reverse process.)

DRESSER . . A person responsible for the delivery, checking and handling of costumes for individual program units.

DRESSING . . Properties, set decorations, art objects and other material added to a setting to provide character or interest.

ELECTRON GUN A system of metallic cylinders arranged in the narrow ends of both the camera and receiver tubes in which the electron beam used for scanning the image before the television camera, and for reproducing it in the television receiver, is formed.

FACILITIES DIRECTOR The supervisor of all matters of scenic equipment in the production of a program, co-ordinating production ideas with stage set, costume, make-up, and properties.

FADE IN . . . To bring up the television image electronically so that it appears gradually.

FADE OUT . . (Reverse process.) To black out television image electronically so that it disappears gradually.

FALSE CEILING Term used to describe various devices such as partial ceilings, beams, etc., utilized to create the effect of a room enclosed from above without effecting an actual covering which would prevent effective overhead lighting.

FIELD PICKUP The transmission of out-of-studio events by mobile-unit cameras.

FILM PICKUP The electronic transmission of motion pictures from film by means of television.

FILM STRIP . A sequence of several 35mm frames shown individually.

FILM STUDIO A studio equipped for televising motion-picture film.

FILTERS . . . Lens filters used to eliminate or reduce a portion of light spectrum.

FIXED INSTALLATION Permanent installation.

FLAG . . . . . A large sheet used to screen off light from cameras.

FLOOR LIGHT Light at studio floor level, used for modeling.

FRAME . . . . A single complete picture.

FRAME FREQUENCY The number of times per second the complete frame is scanned.

FREE PERSPECTIVE The deliberate falsification of normal perspective in the painting of construction of television settings in order to achieve a greater depth or distance.

FREEZE IT . . Term used to indicate that set designs and arrangements, or positions of furnishings, dressing, or other production facilities are approved and should be executed as planned.

GETAWAY . . An offstage means of descent from raised flooring areas within a set. Also a passageway behind settings provided as a means of unobserved access to other settings or locations within the TV studio.

GHOST . . . . An unwanted secondary image of the transmitted picture appearing on the receiver kinescope caused by a reflection or several reflections of the transmitted signal.

GIVE . . . . . Direction to actors to get into their parts and act.

GISMO . . . . Generic term. In television, anything for which a technical designation is lacking or has been forgotten by the speaker.

GOBO . . . . . A dark mat used to shield camera from lights.

GROUND GLASS Glass in camera viewing on which image is projected for viewing by cameraman.

HAND PROPS Movable materials of all kinds utilized by actors in portraying their roles. Also, any of numerous small items used to dress a set.

HEAD ROOM The leeway between the actor's head and the actual top of any setting. Refers to the amount of upward camera movement possible without overshooting.

HIGH HAT . . A camera mount for use on table top or other such waist-high object.

HOT LIGHT . A concentrated light used in the studio for emphasizing features and bringing out contours.

ICONOSCOPE A camera pickup tube used in the RCA television system, consisting essentially of an electron gun and photo-sensitive mosaic plate enclosed in an evacuated container.

IMAGE-ORTH Abbreviation of image orthicon, a supersensitive camera tube developed by RCA, capable of picking up scenes in semi-darkness.

INKY . . . . . An incandescent lamp.

J.I.C. . . . . "Just in case."

KEY LIGHT . Over-all general illumination.

KILL . . . . . To order the elimination of anything in the studio, e.g., "kill the chair" or "kill that light."

KINESCOPE . A cathode-ray tube having a fluorescent screen used to reproduce the television picture in the receiver or monitor.

LENS TURRET An arrangement on a camera which permits several lenses to be mounted on the TV camera at one time to facilitate rapid interchanging.

LINE AMPLIFIER Amplifier that supplies signal to a transmission line.

LIVE TALENT TV broadcast of animated or live subjects.

LIVE TALENT STUDIO The place in which live action is televised directly.

LIVE TITLES Titling material which is photographed directly by television cameras in the studio rather than supplied by slides or film.

LOCAL . . . . Restricted to local station as opposed to network. Also (*noun*) the announcement of station identification.

LOSE THE LIGHT Term used in directing cameras, i.e., "Move to your next position when you lose the light."

MAGNI-SCALE An object produced in larger than actual size in order to make clear and effective detail which would otherwise be incapable of effective TV reproduction.

MASKING PIECE OR WALL A wall section arbitrarily included in a setting to provide a backing for acute changes in camera angles.

MINIATURE A small-scaled setting or display usually used to establish a locale; a maquette.

MOBILE UNIT Field equipment mounted in trucks, and generally used only in such vehicles.

MODEL . . . . To order to move expressively before a camera, e.g., as in fashion shows.

MODEL SET . A small-scale execution of a TV set employed in planning stage business or camera movements.

MONITOR . . A control kinescope. Also (*verb*) to check action or review productions on a kinescope.

MOSAIC . . . A large number of photo-sensitive elements covering the mica plate in the television camera tube. Its counterpart in a film camera is the photo-sensitive emulsion of the film.

MULTIPLE RELAY More than one relay station.

NARROW-ANGLE LENS Lens with narrow angle of projection, which picks up small portion of set at a given distance.

NEMO . . . . . Broadcast originating in some location other than the television studios.

NOISE . . . . . An unwanted signal picked up by the receiver, such as a short wave diathermy or radio frequencies from adjacent channels. Interference.

NOODLE . . . To play a few bars of background music or improvisation, usually with titles. Known as noodling.

OFFICE SET . A conventional arrangement of furnishings and wall units suitable as a stage setting for an interviewer or a news commentator.

ON-THE-AIR Program in process.

OPTICAL LENS The lens focusing the image of the scene to be televised on the light-sensitive plate of the camera tube.

OPTICAL VIEW FINDER The device on a television camera which allows the cameraman to frame and focus accurately the desired portion of the scene to be televised.

P. L. . . . . Private line (telephone).

PAN . . . . . To follow action to the right and left or up and down with the camera. To move camera across a scene, e.g., "Pan left" or "Pan right."

PARABOLA . . A special-direction microphone mounting used to pick up crowd noise, band music, etc.

PICTURE . . . The image telecast.

PIPE . . . . . Telephone.

PLATTER . . A recording.

POINTILLAGE A painting technique used in television (and in stage painting) to build up a simulated plasticity on a plain surface.

PORTABLE UNIT Field equipment which can be installed where needed. Generally consisting of numerous suitcase-size pieces of equipment.

PROJECTOR . A motion-picture or slide projector.

PROPERTIES All physical materials used in a scene, such as furnishings or decorations utilized by actors in portraying their roles.

R.F. PICKUP . Radio frequency transmission of a video or audio signal.

RELAY POINT Location of relay transmitter.

RELAY STATION Generally a radio frequency transmitter located at a remote point from the main transmitter to relay its signal to a more distant point.

RELEASE STUDIO Expression directed by producer to studio personnel, indicating end of broadcast and "off the air."

RING MIKE . Microphone installed over the ring at boxing and wrestling matches to pick up referee instructions and ring sounds.

ROLL IT . . . A cue to start the film projector.

SAVE THE LIGHTS Order to switch off the lights. Also "douse it."

SCANNING . . The process of electronic analysis of the optical image, focused upon the mosaic of the iconoscope, by means of a moving electron beam, into a series of parallel horizontal lines traced

from left to right in sequence from top to bottom in the manner of reading a page of print.

SCHMIDT-OPTICS A principle of optical projection used in some projection-type television receivers.

SCOOP . . . . . A multiple lighting unit in the studio.

SCRIPT GIRL Director's assistant in matters of script preparation, clearance, editing, etc. and prompter at rehearsals.

SET UP . . . . To install a set in studio. To install equipment for a broadcast, using portable equipment.

SHADOWING Simulating by paint treatment or exaggerating a natural shadow which cannot be effectively created through the use of lighting alone.

SIGNAL . . . . Any transmission of electronic waves.

SLIDE . . . . . Usually a title or picture on a single 35mm-film frame projected into camera.

SNAP . . . . . Relates to contrast and sharpness of a picture.

SPECIAL EVENTS Programs of news interest (generally not scheduled) e.g., sporting events, and parades.

SPECIAL EFFECTS Miniatures, dioramas and various electrical and mechanical devices used to achieve scenic or dramatic effects.

SPOT . . . . . The spot of light formed by the impact of the electronic scanning beam in the receiver that reproduces the televised picture on the fluorescent screen of the kinescope.

SPOTS . . . . . Spot lights.

STAND-BY . . Anything such as an announcer or a film held in reserve to be used only if necessary. Also (*verb*) instruction given to cast or crew that program is about to go on the air.

STATION BREAK A cue given by a station originating a program, to network stations, signaling that it is time for individual stations to identify themselves to local audiences.

STILL . . . . . Photographic or other illustrative material which may be used in a TV broadcast.

STRETCH . . Stall for time.

SUPERIMPOSITION The overlapping of an image produced by one camera with the image from another camera. A blending or merging of images to any desired amount.

SWITCH . . . To switch from one camera to another. A change of camera angles.

TAKE IT AWAY "You're on the air."

TALK BACK . Phone circuit from director to announcer on nemo broadcasts.

TECHNICAL DIRECTOR The director of all technical facilities and operations—lighting, cameras, sound—in a studio production.

TELECAST . . A television broadcast.

TELEPHOTO LENS Lens of very narrow angle used to provide large-size images at extreme distances.

TELEVIEWER A member of the television audience.

TEST PATTERN TV transmission of a schematic design especially made for correct focusing and tuning of the image.

TEXTURE . . A feeling of depth and irregularity imparted to a plain surface through the use of paint or other decorative techniques. See pointillage.

TILTING . . . A vertical movement of the camera.

TITLE ARTIST Artist or draftsman who prepares titles, cards, signs, title backgrounds, maps, special displays, slides, etc.