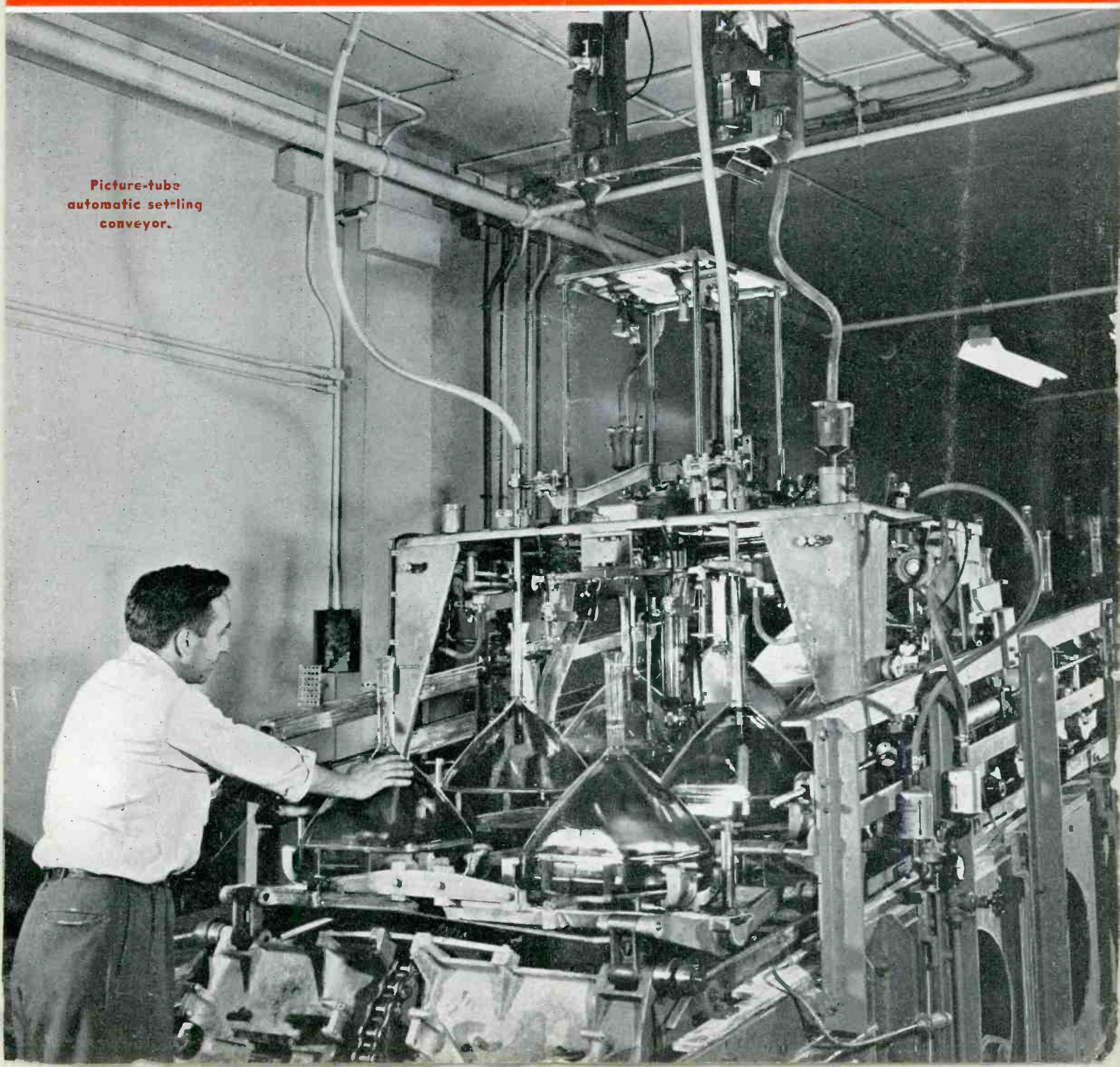
TELE-VISION ENGINEERING

AUGUST, 1951



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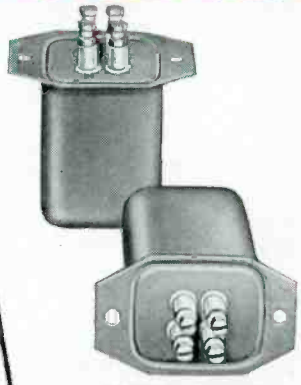

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VOLUME 2 **AUGUST, 1951** **NUMBER 8**

MONTHLY FEATURES

Cover Illustration

Automatic settling conveyor which dispenses and settles uniform TV picture-tube screens.
(*Courtesy Hytron*)

Editor: LEWIS WINNER

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TELE-VISION ENGINEERING
LEWIS WINNER, Editor

August, 1951

Boosted ERP's Liven TV Scene—As wires sped around the country to dozens of stations with the good news that powers can now be upped to their capacities, and the *erp*'s roared to levels that doubled, and in some instances tripled coverage, broadcasters, setmakers, sponsors and practically everyone involved in the business began to beam. The expanded trading areas were envisoned as a blessing by makers and sellers of not only transmitters and receivers, but antennas and the host of accessories that might be necessary to provide pictures to those in the primary and secondary fringe sites, who have been waiting so long for the occasion.

The stepped-up audience possibilities intrigued time buyers, prompting reams of enthusiastic predictions on the tremendous possibilities now on the scene and in store for the future, as new stations come on the air.

The break in the ice jam routed much of the gloom which had been hovering over industry since the early part of the year. The telephone company's announcement that the long-promised Atlantic-to-Pacific video line would become an eventuality before world-series time, was also noted as quite a boon.

All that is necessary now to cause the bells to ring wildly is that news flash, which FCC's headman promised Congress would be aired soon—news declaring *finis* to the freeze. We're waiting, Mr. Commissioner.

South-of-the-Border TV Stepping Along—In Mexico, Cuba, Uruguay and Brazil, TV activity is rapidly becoming an item of major import. With six stations now in operation, and eighteen scheduled for installation soon, a market for nearly two-million receivers, and millions of dollars worth of accessories in the transmitting, as well as the listening field, lies ahead. In Cuba, present plans call for the spending of nearly two-million dollars for stations and equipment, which will include a chain of microwave retransmission points in outlying provinces. In Uruguay, over $100,000 has been set aside for a TV station, and probes to survey the potentialities of additional telecasting.

Reports from other Latin American countries indicate corresponding interest in the possibilities of sight and sound.

A Wise Appointment—Haraden Pratt, who has been serving industry in a sterling fashion for nearly four decades, now has a new job, one of the most important ever assigned: Telecommunications Advisor to the President.

It will be his responsibility to formulate national policy on frequency allocations here and abroad, not only insofar as government is concerned, but industry, too. His complete familiarity with frequency applications throughout the spectrum should enable him to judge everybody's needs wisely, and proffer decisions which will be equitable.

The Pacific Coast Meeting—A host of extremely interesting papers on broadcast-TV services have been scheduled for the annual western IRE convention, convening at the Civic Auditorium in San Francisco on Wednesday, August 22. The session, presided over by Al Isberg of KRON-TV, will feature talks on microwave relays, klystrons and color TV. In addition, there'll be held the first western meeting of the IRE Professional Group on Broadcast Transmission Systems.

Here is an event that merits an enthusiastic reception.

TV at the Radio Fall Meeting—The annual IRE-RTMA meeting, usually held at Syracuse, and this year scheduled for Toronto, has on the program a variety of excellent talks on TV receiver and component design.

At the three-day gathering, beginning on October 29 and ending on the 31st, papers presented will cover noise in TV receivers, suppression of local oscillator radiation, miniature triodes for *uhf* TV tuners, converters, phase linearity, pencil triodes, and color TV. Among those who will present the talks are: S. J. H. Carew, Stromberg-Carlson; John Van Duyne, DuMont; K. E. Loofbourrow and C. M. Morris, RCA; H. R. Hesse, DuMont; Herbert Kiehne and Stanley Mazur, Emerson; and John W. Busby, RCA.

The First UHF Symposium—At Franklin Institute in Philadelphia, on September 17, a historic episode in TV progress will be staged, as eight leading ultrahigh specialists gather to report on the state of the art. Sponsored by the IRE Professional Group on Broadcast Transmission Systems, of which ye editor is chairman, there'll be talks on 850-mc transmission, 700-mc installations, impedance and frequency measurements at the ultrahighs, side-fire helix *uhf* transmitting antennas, receiver design, transmission-line problems and field-strength analyzers, by Dr. George H. Brown, RCA; William Sayer, Jr. and Elliot Mehrbach, DuMont; R. A. Soderman and F. D. Lewis, General Radio; L. O. Krause, G.E.; W. B. Whalley, Sylvania; Raymond Guy; NBC; J. M. De Bell, Jr., DuMont; and Frederick W. Smith, NBC.

The program will begin at 10 a.m. and run until 6 p.m.

It'll be quite a day. Circle that date, *September* 17, on your calendar now. Hope we'll be seeing you!—L. W.

A Progress Report

TV . . . Now . . . and This Fall and Winter: Beset by a chain of stubborn obstacles, stemming from, in the main, mismoves in the nation's capital, TV production, particularly on the chassis front, during the past months, has been quite a gloomy item. With production down to around 20,000 units a week, from a high of 218,000 set in October, '50, and inventory figures even more startling, up from around 50,000 sets in November to a total of over 700,000 a few weeks ago, the scene has been a distressing one.

Although four factors have been commonly cited as the reasons for the decline, namely, the freeze, color, material scarcities and regulation W, the latter has been noted as the real culprit. Describing the ravages this ruling had cast on industry, RTMA prexy Glen McDaniel pointed out, during a recent address before the Electric League in California, that up to 50,000 had been released from production lines, because of lack of sales, caused by the W ruling.

Declaring that the ruling was not necessary to divert materials and manpower, McDaniel said that the NPA and other organizations have been set up to do that job directly and are doing it well. A recent survey was noted as showing that less than half of the plant capacity of the industry had been employed in June in civilian work, with defense work taking a small fraction of the remaining half. "Nothing could be more plain than that," declared McDaniel, "that there is no justification for regulation W on the ground of defense production needs, either now or at any time in the past."

Fortunately, Congressional committees became cognizant of the damage wrought by the ruling and have provided a relaxation, reducing down payments to 15 per cent, a move, McDaniel felt will recapture the fading market, and strive to empty those bulging warehouses this fall and winter.

Commenting on possible troubles from material shortages, the association's headman said that, thus far, they have not delayed deliveries of either military or civilian electronic goods. As far as television sets are concerned, McDaniel declared, RTMA's industry-wide program for the conservation of critical materials through the exchange of information gives great promise of *more television sets* with fewer pounds of critical material and without loss of quality.

It was pointed out that some shortages may be expected to pinch civilian production in the fourth quarter, but it is very difficult to learn the facts and make predictions with any accuracy. Industry feels that it can do its part in the mobilization effort, said McDaniel, and still have enough materials for a healthy and active civilian production.

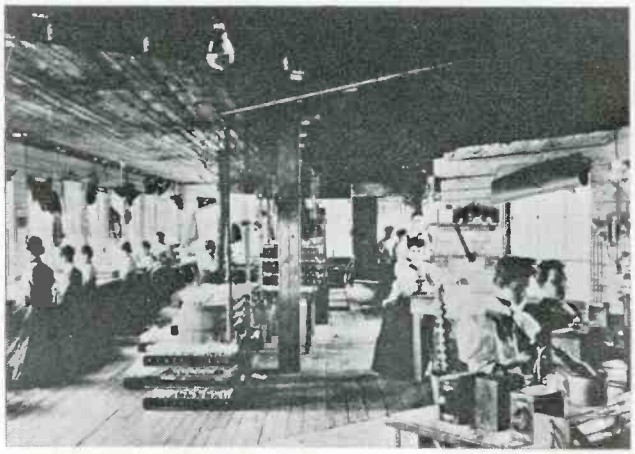
Reviewing the steps FCC has taken to shorten the television allocation hearings by dispensing with oral testimony, RTMA's prexy pointed out that while this is a commendable move which will greatly hasten the lifting of the freeze, the lifting will not come before the end of the year and new stations will not be on the air until a year from now or more. However, he said, the Commission's action in opening the question of increased power for existing stations is an encouraging step, and one that may help set sales relatively soon.

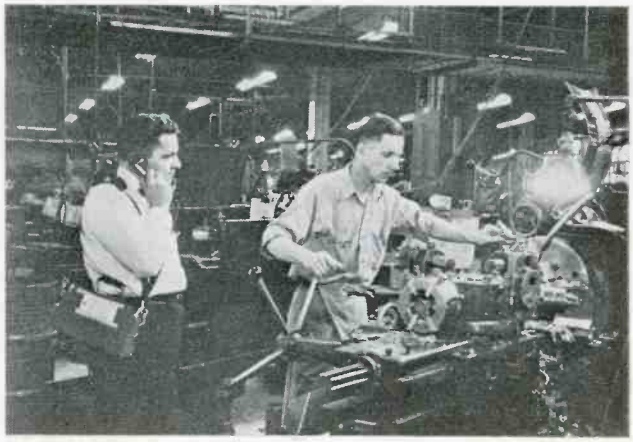
Detailing the effect of color on future production, McDaniel noted that the development of color television will be slow. Manufacturers will make sets and converters of the mechanical type, and there will also be adapters for those who want to receive the color telecasts in black and white, the Californians were told. The limited colorcasting schedule will naturally reduce the potential audience, it was pointed out.

"Meanwhile," declared McDaniel, "the efforts of industry to devise a system of color television which it considers better than the one adopted by the FCC are proceeding. When the tests are completed there will no doubt be applications to the FCC for authority to operate an improved system."

Surveying the striking progress that TV has made and will make on a continuing basis, the RTMA spokesman noted that any industry which can jump from a production of several thousand units to many millions in four years can't help but succeed in a bustling way. Quoting the rising values of television stations as another example of industry expansion, McDaniel said that transmitting setups today are truly priceless. "A television station that sold for $375,000 two years ago sold a one-quarter stock interest in the station, recently, for the same price," he declared. And it won't be long before even that price will be considered low, quite low for so powerful a medium, it was pointed out.

Below: Production line in 1901: At the small plant of Sylvania, in Middleton, Mass., where women performed most of the operations. Sole output was refilled lamps. Burned-out bulbs, which arrived in barrels, were cleaned, sorted, given a new filament, resealed after the air was exhausted, and packed for shipping. Sylvania, now celebrating its golden anniversary, operates plants in 20 communities in six states, and employs more than 22,000. Products now made include incandescent and fluorescent lamps, receiving tubes, picture tubes, photoflash tubes, industrial electronic tubes, receivers, lighting fixtures, tungsten parts, chemicals for radio and TV, metal parts and stampings, wire and plastic parts. Right: Modern production line at the Weatherhead Co., in Cleveland, where handie-talkies are used to report to production control center, in this instance, on the status of the parts being machined. By this means the company is able to maintain a continuous inventory of orders in production.
(Courtesy Motorola)





Production Pools

Small-Plant Grouping Plan Revived: During World War II, many small manufacturing plants organized and operated production pools to facilitate the solicitation of subcontracts and thus increase war production. The move proved so successful that the DPA has returned the plan for the current defense drive. Noting that under favorable individual circumstances, the use of these pools has been and can be helpful, and in such cases will be encouraged, DPA has declared that a new pooling section of the NPA, in Washington, on behalf of DPA, has been set up to assist those interested in production pools. According to J. C. Pritchard, DPA deputy administrator for small business, a production pool is desirable if it serves to increase the capacity to produce defense goods and services by broadening the production base; obtains a more desirable distribution of defense production without hurting existing capacity; accelerates the rate of defense production by reducing the backlog of unfilled orders of procurement agencies and prime contractors; prevents capacity from being lost during partial mobilization; relieves the load on businesses able to produce other items of greater scarcity; produces a product or service which can pass necessary tests and can be delivered on schedule; and decentralizes defense production.

Production pools have been found to aid small manufacturers in securing contracts, as a member of a pool, for items not otherwise available, by pooling skilled labor, finance, machines and plants, since the pool has available to it the best management experience to be found in any one of the individual member firms. Such a pool would have more highly trained and experienced managerial, engineering and accounting supervision. By combining complementary facilities, the pool can deal more effectively with Government procurement officers and prime contractors than can its members individually, and at a fraction of the cost of time and effort.

There are several important organizational problems. There has been, in the past, a tendency toward attempting too loose an organization, rather than one which is too centralized. The type of small plants entering the pool is also of basic importance. Any pool made up exclusively of foundries or wood-working or machine shops with the same kind of facilities would certainly be at a disadvantage, when compared with another pool whose individual plant facilities complement each other. A complementary group might include a foundry, machine shop, sheet metal working shop, welding shop, and plating and finishing shop.

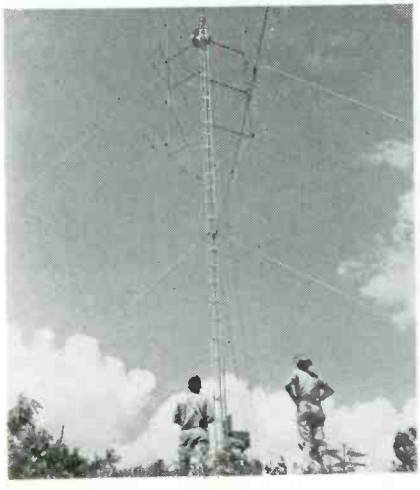
The collaborative organization into a common unit of separate business enterprises might be viewed as a combination of conspiracy in restraint of trade or commerce or an attempt to monopolize trade or commerce in violation of the Federal antitrust laws and the Federal Trade Commission Act. According to DPA, if the administrator considers the voluntary program justified, under which a particular production pool will be formed, he will consult with the Attorney General and the FTC chairman. If and when the pool requests are approved by the Attorney General, the administrator has the authority to approve the voluntary program, make his finding that it is in the public interest as contributing to the national defense, and note that the companies who have agreed to pool their efforts will not be subject to monopoly prosecution.

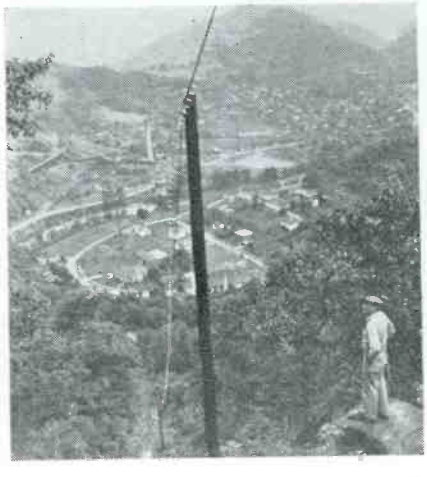
Procurement

Small-Business Assistance: More than 200 full-time small business specialists have been appointed by the Army throughout the country to aid small-business firms interested in learning how they may participate in the current military procurement program.

Named as small business specialists, for the Signal Corps, are: District of Columbia—Jean P. Jaquette, Room 2C 263, Pentagon; Illinois—George Boyajean, 226 West Jackson Boulevard, Chicago; New Jersey—John B. Cannon, Ft. Monmouth; New York—Randolph C. Bradshaw, 180 Varick St., N. Y. C.; Pennsylvania—Maj. Ed. E. Regan, 2800 South 20th St., Philadelphia.

Below: Sixty-five-foot tower with three yagis, cut for channels 4, 5 and 7, on mountain peak 1000' above Hazard, Ky. Installed to pick up programs from Huntington, West Virginia and Cincinnati, Ohio, 90 and 150 airline miles away. Right, below: View of poles on which have been mounted about 3000' of open-wire leadin, feeding signals to amplifiers. At bottom of hill amplified signals are fed to coax cable mounted on poles of the local electric light company. From these poles, smaller coax cable, strung into each home, feeds sets. Amplifiers have been placed along the system at intervals to compensate for line losses in signal strength. Junction boxes, which can be mounted on any pole, permit four homes to be connected into the system from a single pole. At present, about 600 feet of the heavy cable has been strung on power company poles, and about twenty receivers have been installed. (Courtesy G.E.)





Below:

A 40' helical antenna designed by G.E. to boost erp of uhf transmitters by 20. Antenna is now being used at Electronics Park, in Syracuse, N. Y., with low (100-watt) and high-power (5-kw) experimental transmitters.

Color Television

Colorimetry: The recent surge of interest in the reds, greens and blues has prompted the initiation of many intriguing studies on not only new methods which will provide improved transmission and reception, but on those principles which other industries allied in the color world have found to be really basic in the art. In this category, the science of colorimetry has loomed as perhaps the most important of the essentials which must be carefully evaluated. During meetings of many of panels of the NTSC, the term has served as the basis of series of discussions on techniques, standards, etc.

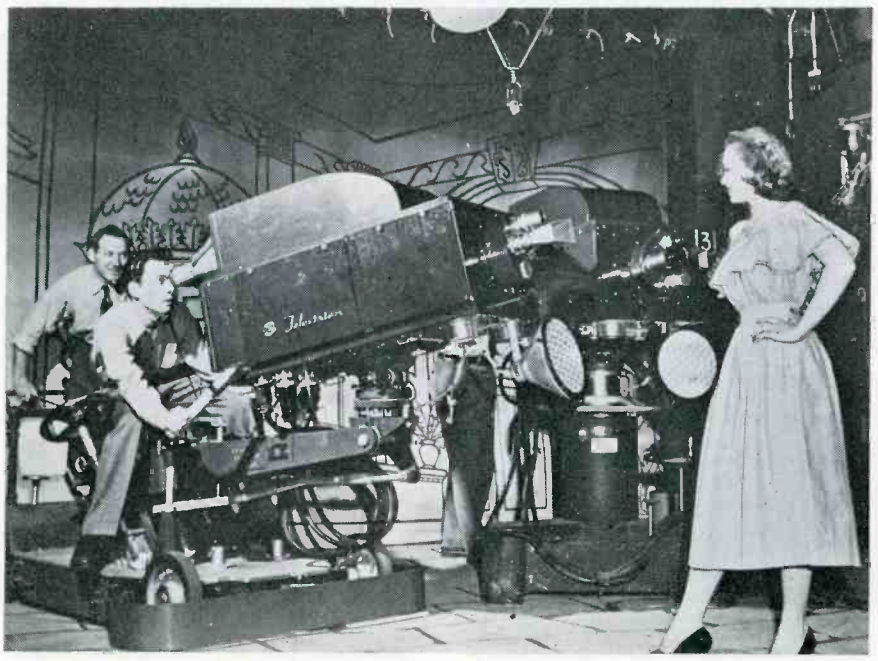
The significance of colorimetry in setting standards has been also explored during quite a few lectures. One of the most revealing reviews of the subject was offered by Frank Bingley during the recent annual IRE meeting in New York. Describing signal packaging, for instance, he noted that such an approach revolves about the manner in which colorimetric information is placed together for shipment over the ether. In his opinion, packaging must be such as to protect the information from significant damage in shipment, but yet, be no more robust than necessary.

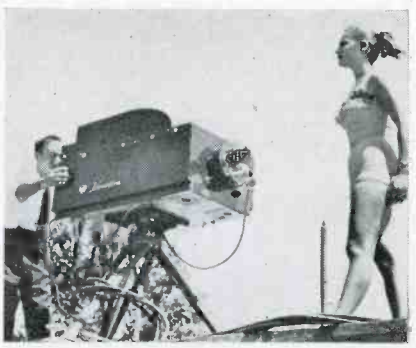
Analyzing the system which would be involved, he said that the brightness information, Y, is transmitted directly over the normal picture carrier, using present black and white television standards so as to render the system compatible. The balance of the information is placed upon a subcarrier, or a color carrier. it was then pointed out, with the quantities Z-Y and X-Y used to amplitude modulate two color carrier vectors which are in quadrature. The resultant color carrier, which is then both phase and amplitude modulated, he said, is mixed with the normal Y brightness signal, and the complete signal transmitted on the normal picture carrier; the color carrier frequency is chosen to have minimum visibility. The fact that since both X-Y and Z-Y vanish for white input pictures (there is no color carrier on white) was cited as being particularly important, since it improves compatibility by insuring that a color carrier is present only when necessary to transmit color. Therefore, it was noted, colors near white have only small carrier amplitudes.

Projection-TV Room Fire Prevention

Safety Requirements: The equipment necessary in TV station projection rooms has been found ot create possible hazards of the same type inherent in the projection rooms of motion picture theatres. With the present use of 35-mm film and projectors equipped with the *synchro-lite*, instead of the conventional carbon arc lamps, hazards affecting the safety of the operating personnel appear to be continuously present. Describing this problem at the recent SMPTE meeting in N. Y., Samuel R. Todd of the Chicago Board of Examiners declared that the gas discharge gap lamp in the light source employs potentials up to 5000 volts across its terminals, a high voltage which could be a trouble source when nitrate base film is used, unless safety regulations of the type employed in projection rooms of motion picture theatres are adopted.

The panic that may be created by the sudden explosion due to the ignition of perhaps a thousand or more feet of nitrate film or the uncomfortable situation incident to one of the operating personnel lying prone from the effects of an electric shock are, it was pointed out, possible situations requiring very special consideration from those individuals charged with the responsibility for formulating safety rules and regulations for TV station projection rooms. Todd said that the safety requirements for projection rooms in TV stations should include as a minimum: (*a*) standard fireproof construction of the projection room; (*b*) the proper floor dimensions to provide good operating conditions; (*c*) approved storage facilities for the film; (*d*) an approved rewinding device for 35-mm film; (*e*) installation of approved, self-closing, automatically-controlled, fire shutters for the port holes; (*f*) proper projection room ventilation, including both natural gravity and forced draft methods, and (*g*) provision of adequate means for instant exit for the operating personnel through openings equipped with fireproof self-closing doors opening outward.





Above: Colorcast pickup on compatible system cameras, at the Palisades Amusement Park pool, across the Hudson River from N. Y. City, during the recent RCA tests. Left: Compatible color TV in action in the studios, during the recent field tests.

Microwave Instruments

Magnetic Attenuator: Recent studies in the use of attenuators at microwave frequencies for adjusting power levels, isolating monitoring equipment, or padding oscillators from variations in the load, have indicated that the operation usually becomes complicated because of control inaccuracies and mechanical inflexibility.

In conventional microwave attenuators, the energy is usually dissipated in an element made of resistive film on glass or bakelite, powdered carbon, or polyiron materials having characteristics that vary with length, composition, and the operating frequency. The dissipative element must often be carefully machined to close tolerances and is usually very fragile. Additional difficulties arise when variable attenuation is required in a transmission line circuit. Complex mechanisms which are necessary to insure a high degree of precision and fineness of control, have been found to result usually in bulky, hard-to-handle controls at substantial increased costs.

In an effort to find an instrument which would avoid many of these disadvantages, Frank Reggia of NBS discovered that a magnetic attenuator, composed of a slug of some highly permeable and resistive ferromagnetic material placed within the field of an electromagnet, was very effective. The significant feature of the device was found to be a change in the loss properties of the dissipative material when it is subjected to a magnetic field. Because the magnetic field is produced by an electromagnet, its magnitude can be changed simply and precisely by varying the current in the field coils. Consequently, the permeability and loss characteristics of the dissipative material can be controlled, and a variable attenuator results. In addition, the control characteristics are linear over a substantial range. An NBS investigation of materials such as polyiron and ferrites (with electrical resistivities from 10^2 to 10^7 ohms/cm) indicated that the loss characteristics not only depend upon the composition and length of the material, but increase with increasing frequency.

The size of a magnetic attenuator for $\frac{3}{8}$" coax transmission lines was 4" x 4" x 2", and the dissipative material, a cylinder of polyiron, about $\frac{1}{2}$" long and $\frac{3}{8}$" in diameter. In fabricating the model, a recessed conductor hole for the center conductor was drilled into the cylinder, ceramic insulators placed at the extremities, the whole assembly encased in a metal sheath, and connector pins fastened to the ends of the center conductor. Standard male and female type N coaxial connectors completed the assembly.

The electromagnet requires a *dc* power source of 0 to 250 volts, with a maximum of 30 milliamperes current to produce a magnetic field of 1500 gauss in the air gap. Small changes in the magnetic field can be obtained by controlling the field current with a multi-turn potentiometer.

An experimental model of the magnetic attenuator which uses polyiron as the dissipative element was operated at frequencies from 1000 to 3000 mc. Variations in the losses of the polyiron were produced which were large enough to reduce the attenuation 60 per cent, change the power by a ratio greater than 60:1, with a voltage-standing-wave ratio always less than 1.5.

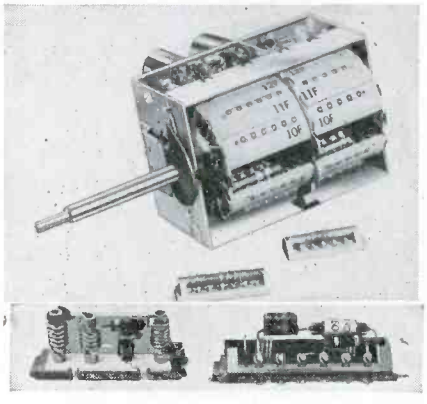
More recently, a study was made at NBS of an attenuator that employs a slug of Ferramic B $\frac{1}{2}$" long and $\frac{3}{8}$" in diameter as the dissipative medium. The dependence of the losses in the material on frequency was strikingly demonstrated by this experiment. At 2200 mc the attenuation was reduced from 17 db to less than $\frac{1}{2}$ db, and less than 45 milliamperes of current were required to maintain the magnetic field. At a frequency of 2600 mc, changes in attenuation greater than 20 db were obtained with the same electromagnet currents.

Magnetic-Material Standardization

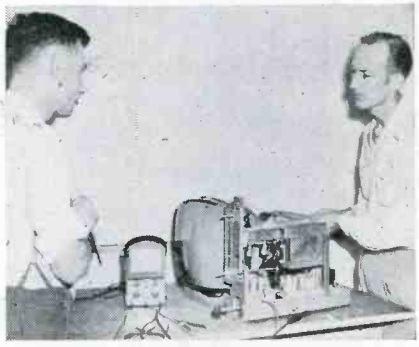
New Core Specs: In an effort to standardize the variety of core materials used in coils, transformers, etc., there has been prepared a chart listing 25 basic materials and their commercial identities, as supplied by eight manufacturers: Empire Coil Co., Inc.[1]; Magnetic Core Corp.[2]; National Moldite Co.[3]; Powdered Metal Products Corp.[4]; Pyoferric Co.[5]; Radio Cores, Inc.[6]; Spear Resistor Corp.[7]; Stackpole Carbon Co.[8] Materials itemized include carbonyl *C, E, HP, L, SF, TH*; IRN-*2-3-6-8-9-16-31;* Plast-Sponge *C3H-BG30, CIC-A30, C3H-A30;* Plast-Coriron *KIJ-A33;* Plast-Iron *A3G-G10, A3G-A10, A2B-A10;* Plast-Iron Flakes *M17K-A16;* Magna-Tite *A, C, H,* and Magnetites.

The data sheet, prepared by the Metal Powder Association, states that cores made from basic raw materials by different core manufacturers are not necessarily interchangeable. It is suggested, therefore, that to obtain identical characteristics a mutual agreement on standards will be required. The designations offered are basic and may be modified by the manufacturer to indicate variations in the formula, such as type and amount of insulation and binder.

[1]85 *Beechwood Ave., New Rochelle, N. Y.* [2]142 *S. Highland, Ossining, N. Y.* [3]1410 *Chestnut Ave., Hillside, N. J.* [4]9335 *W. Belmont, Franklin Park, Ill.* [5] 621 *E. 216th St., New York* 67, *N. Y.* [6]9540-50 *Tully Ave., Oak Lawn, Ill.* [7, 8] *St. Marys, Pa.*



Left: Turrett-type tuner (Standard Coil) which can be adapted for ultrahigh pickup, through removal of two vhf channel coils (shown at right of tuner) and replacement by uhf channel coils shown below in separate illustration. In adapting sets equipped with these tuners an unused channel is selected, and with a screwdriver, the small clips that hold the two channel strips in place are released. Then the uhf strips can be inserted in place of the vhf strips. According to Standard, there are approximately four and one-half million owners of TV sets equipped with these tuners, or about 40% of the TV sets made to date.



Above: J. E. Krepps, left, and W. A. Fuller, right, staff engineers of the Sarkes Tarzian engineering research and development laboratories, testing a receiver with a uhf tuner mounted on a currently-produced chassis.

Printed-Circuitry

Circuit Printers for Flat and Cylindrical Surfaces: Two semi-automatic machines for printing circuits, one for flat surfaces and the other for cylindrical surfaces, have been developed by Robert L. Henry and associates of the Bureau of Standards.

The printer for flat plates is motor-driven and more fully automatic than the printer for cylindrical surfaces. In the flat plate printer, a turntable accepts the unprinted plate at a loading position, carries it to a printing position, then carries the printed plate to an unloading position, where it is automatically flipped into a chute.

In regular operation, three plates are processed simultaneously: while the first plate is unloaded, the second is printed, and the third is loaded. The turntable stops while these operations are performed, then advances the plates one-third of a revolution, stops again, and so forth. The usual production rate, about 1,000 plates per hour, can be increased to 1,500 per hour without loss of printing quality but at the expense of excessive wear and tear on the machine.

As the turntable advances the plates from position to position, they rest on rectangular platens about 3″ by 4″ in size. These flat platens are normally flush with the turntable. However, when a plate-carrying platen reaches the printing position, the platen rises and presses the plate against the underside of the printing screen, which occupies a fixed horizontal position. While the plate is held against the screen, a rubber squeegee is automatically moved over the top surface of the printing screen, forcing conducting paint through the screen onto the plate in the desired pattern. The platen is then lowered to its flush-with-the-turntable position and is advanced by the turntable another third of a revolution to the unloading position. Here the platen is tilted, and the printed plate slides into the discharge chute.

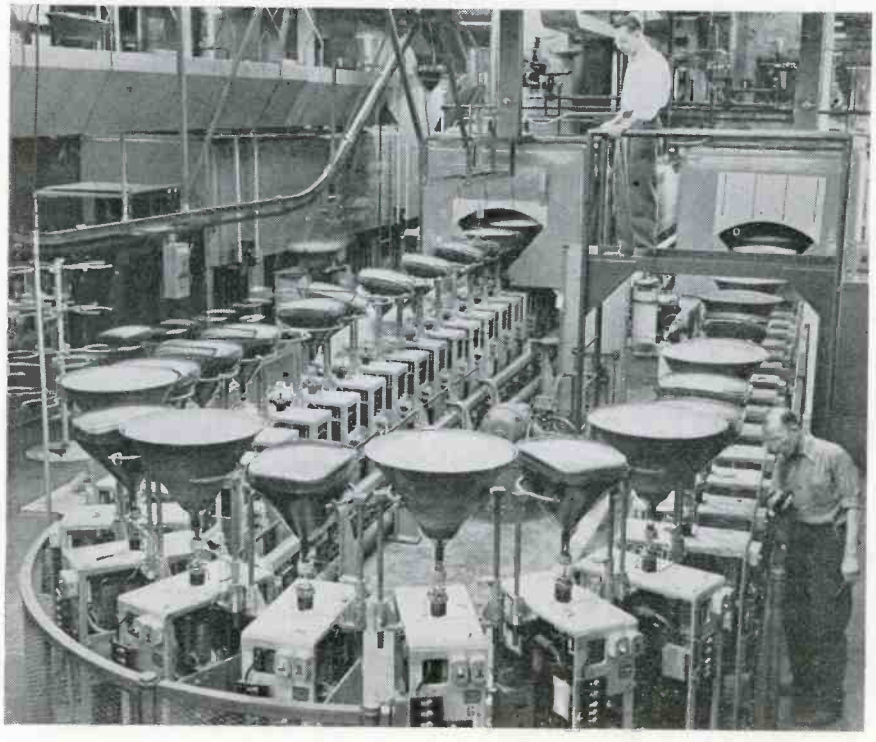
The flat-surface printer is at present loaded by hand, one plate at a time, as the turnable moves the three platens past the loading position. Otherwise the process, including the flipping of the printed plates into the discharge chute, is entirely automatic. The loading of the unprinted plates, and also the carrying away of the printed plates, could be done automatically by conveyors.

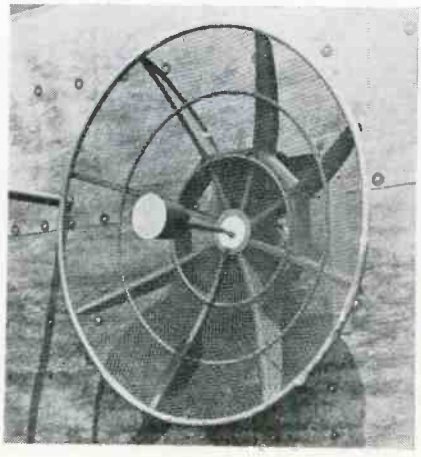
The NBS cylindrical-surface printer was developed for the printing of cylindrical ceramic forms less than .5″ in diameter.

The cylindrical-surface printer is loaded manually by slipping the cylinder to be printed over a mandrel. A single stroke of hand-operated control lever then puts the machine through the entire printing cycle and operates a release mechanism which drops off the printed cylinder.

This printer differs from a conventional printer in that the squeegee remains stationary. As the control lever is brought forward, the mandrel, bearing the cylinder to be printed, rises to meet the stenciled screen. Simultaneously the squeegee, which is directly above the mandrel, drops to press against the top surface of the screen. The screen, which remains flat and horizontal at all times, then starts to move (forward on one stroke, backward on the next) over the cylinder, and the cylinder rotates in response to the horizontal motion of the screen pressing against it. While the cylinder rolls against the screen, the squeegee forces conducting paint onto the cylinder through the pervious pattern of the screen. When the cylinder has made one complete revolution, both cylinder and squeegee are moved away from the screen. As the control lever is moved back to its starting position, the mandrel carrying the cylinder is rotated from a horizontal to a downward position, a release mechanism on the mandrel is actuated, and the printed cylinder drops off.

With hand loading of the cylindrical surface printer, an operator can print 1,500 cylinders in an 8-hour day. The addition of an automatic feed mechanism and electric drive, it is said, should increase the production rate to a probable 500 or 1,000 cylinders per hour.





Left: In-line exhaust machine at the G. E. Electronics Park picture-tube plant which is capable of taking both round and rectangular tubes up to 24 inches in size. Each buggy has an oil diffusion pump which creates a vacuum. As the tubes move through a tunnel, they go through a bake-out process, which consists of heating each tube, to a temperature of 400°C, at which time the pump draws out the gases and other impurities. Below: Microwave-link antenna at Deer Island installation, used to transmit radar information from island to receiving station at Commonwealth Pier, South Boston, which served as a harbor radar centre for a recent test and demonstration by Raytheon and Port of Boston Authority.

TVE-grams . . . Personals

New Posts: Gordon Groth, formerly president of the Electra Manufacturing Co., Kansas City, Mo., has been appointed executive vice president of the Erie Resistor Corp. . . . *W. C. Phillips* has joined the electronic parts division of the Allen B. DuMont Labs as assistant sales manager. . . . *Carl E. Smith*, formerly supervisor of equipment sales service for the Sylvania radio tube division, has been named supervisor of factory sales service. . . . *Dr. C. J. Breitwieser*, formerly chief of electronics and head of the engineering laboratories at Consolidated Vultee Aircraft, has been named executive assistant to Dr. . R. Hensel, vice president in charge of engineering at P. R. Mallory & Co. . . . *William A. Sredenschek* has been appointed manager of materials and purchasing for G.E., headquartering in Schenectady. . . . *Ray Simpson*, chairman of the board of the Simpson Electric Co., has been named chairman of the subpanel on indicating instruments, a part of the Panel on Components of the Research and Development Board. . . . *P. M. Pritchard*, formerly director of sales for Victor Electric Products Inc., has been appointed general sales manager for the parts division of Sylvania Electric. He will headquarter in Warren, Pa. . . . *Walter Lukas* has been promoted to the post of chief television engineer at Emerson Radio. *Francis J. Burger* and *L. G. Zucker* have been named chief radio engineer, and chief mechanical engineer, respectively. . . . *Earl H. Kirk*, formerly manager for Van Sickle Radio Supply Co., has been named assistant sales manager for the Regency division of Industrial Development Engineering Associates. . . . *Karel Van Gessel* has been appointed coordinator of foreign manufacturing affiliates at Sylvania Electric. . . . *Frederick W. Timmons, Jr.*, has been appointed regional sales manager for the cathode-ray tube division, at DuMont, headquartering at Allwood, N. J. . . . *Bernard Grae* has been named product design manager of CBS-Columbia, Inc. . . . *A. D. Plamondon, Jr.*, president of Indiana Steel Products Co., has been named chairman of the RTMA small business survey committee established to draft a program for association assistance to small manufacturers in both military and commercial fields. Other members are: *G. O. Benson*, Premax Products Division; *G. R. Haase*, Dukane Manufacturing Co.; *Otto H. Hoffman*, General Magnetic Corp.; *Matt Little*, Quam-Nichols Co.; and *Richard W. Mitchell*, I.D.E.A., Inc. . . . *Tyler Nourse*, has been named assistant to Peter H. Cousins, RTMA director of information. *Ralph M. Haarlander* has been promoted to assistant secretary of RTMA aiding the RTMA transmitter division, parts and the amplifier and sound equipment divisions. . . . *Dr. Louis T. Rader* has been appointed manager of engineering of G.E.'s control divisions at Schenectary. *Harry L. Palmer* has been named assistant to the manager of engineering of the division, and *Benjamin Cooper* has been appointed division engineer of the electronics and regulator engineering division. . . . *Edward M. Tuft*, formerly director of personnel at RCA, has been appointed vice president in charge of organization development of the RCA Victor division. *Albert F. Watters*, formerly assistant director of personnel, has taken over Tuft's former post. . . . In the Telechron department of G.E., *Donald E. Perry* has been named industrial sales manager; *Joseph Dunn*, clock sales manager; and *Edwin C. Pease*, merchandising manager for both clocks and industrial products. . . . *John H. Cashman*, president of the The Radio Craftsmen, Inc., has been elected chairman of the Association of Electronic Parts and Equipment Manufacturers. Others elected were: *Francis F. Florshein*, president of Columbia Wire and Supply Co., vice chairman; *Helen Staniland Quam*, Quam-Nichols Co., treasurer; and *Kenneth C. Prince*, executive secretary. . . . *J. J. Kahn*, president of Standard Transformer Corp., has been named chairman of the RTMA promotion committee. Other members named were: *Max F. Balcom*, chairman of the board, Sylvania Electric; *Paul V. Galvin*, president of Motorola; and *Leslie F. Muter*, president, The Muter Co. . . . *H. N. Henrye Saller*, John E. Fast and Co., has been reappointed chairman of the RTMA credit committee. *D. F. Reed*, Raytheon, has become eastern vice chairman and *A. D. Sigler*, Crucible Steel Co. of America, western vice chairman of the committee. . . . *Malcolm V. Fields* is now head of the special products division of The LaPointe Plascomold Corp., Windsor Locks, Conn. . . . *H. B. Nelson, Jr.* has become assistant to the sales manager of replacement tubes for the G.E. tube divisions. . . . *Henry Onorati* has joined the Crosley Division, Avco Manufacturing Corporation, as director of electronics advertising. Onorati was formerly assistant advertising manager and national promotion manager of RCA Victor Records. . . . *Ray F. Sparrow* has been elected executive vice president of P. R. Mallory & Co., Inc., Indianapolis, Inc. . . . *Harold C. Buell*, Mallory sales manager since '45, has been promoted to vice president in charge of sales to succeed Sparrow. . . . *Dr. Henry M. O'Bryan*, assistant executive secretary of the Research and Development Board in Washington since '47, has been appointed manager of the physics labs of Sylvania at Bayside, N. Y. . . . *Donald B. Sinclair* of General Radio has been nominated for the presidency of the IRE for '52. . . . *Dr. W. R. G. Baker* has been reappointed head of the RTMA television committee. Membership of the committee now includes *Benjamin Abrams*, Emerson Radio; *Robert S. Alexander*, Wells-Gardner; *Max F. Balcom*, Sylvania; *W. J. Barkley*, Collins Radio; *H. C. Bonfig*, Zenith; *John W. Craig*, Crosley; *Allen B. DuMont*, DuMont Labs; *J. B. Elliott*, RCA; *E. K. Foster*, Bendix; *Paul V. Galvin*, Motorola; *W. J. Halligan*, Hallicrafters; *L. F. Hardy*, Philco; and *W. A. MacDonald*, Hazeltine. . . . *Irwin D. Bereskin* has been appointed head of the governmental department of Columbia Wire and Supply Co. Bereskin will handle and facilitate all governmental orders, both prime and subcontracts.

Ray Simpson

Frederick Timmons, Jr.

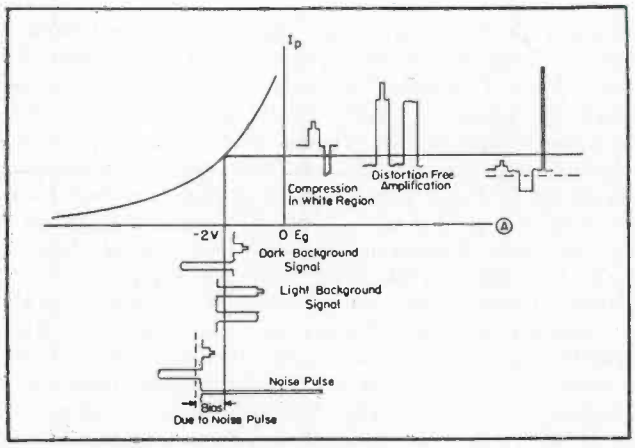
E. M. Tuft

Albert F. Watters

Ray F. Sparrow

HIGHLIGHT CONTROLS

Recently Completed Probe on High-Frequency Boosting Reveals That Circuitry Featuring Capacity Coupling and Cathode Bias Permits Amplification to Take Place With a Relative Expansion of Light Areas of Picture and Some Compression in Dark Areas if Input Signal Is Nominal. Emphasis of Light Regions, Where Detail Is Most Apparent, Found to Result in Improved Sharpness, Lacking in Pictures Amplified With Compression in White Regions.



Operational characteristic plot for circuit shown in Figure 1.

Figure 1

Typical video amplifier circuit, which it has been found has several deficiencies: severe compression of total signal due to operation on non-linear part of characteristic and noise pulse present at plate of tube, interfering with sync.

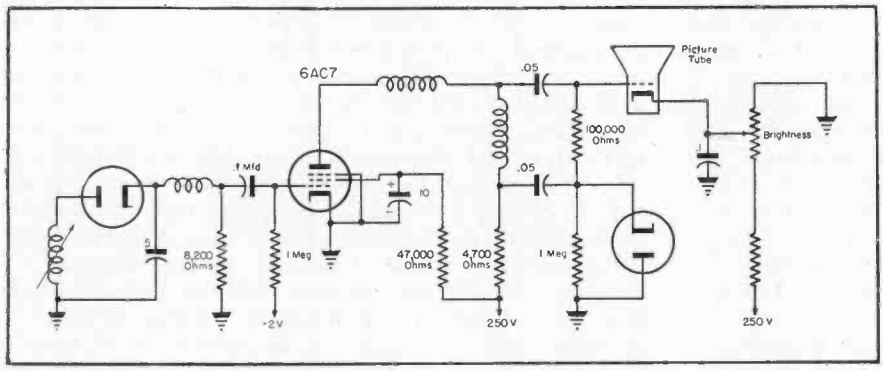
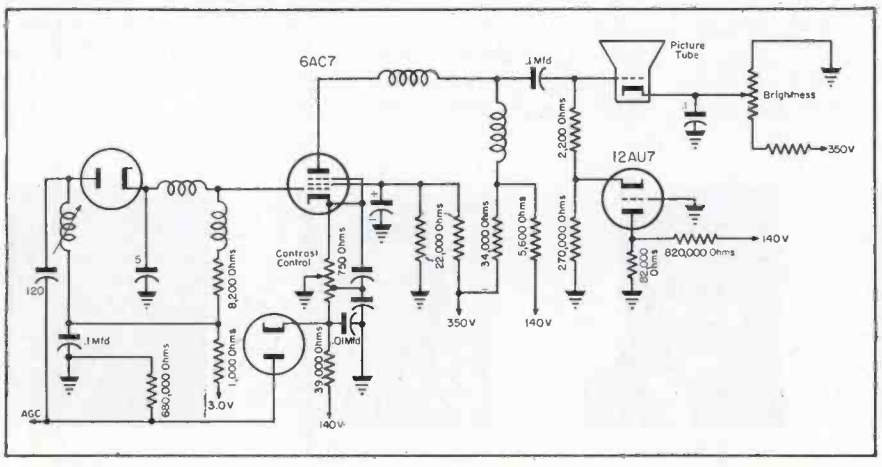


Figure 2 (below)

Another type of video amplifier, whose efficiency is slightly better than the system shown in Figure 1. By tolerating slight shift in the operating part of the transfer characteristic used by different average brightness signals, it is possible to operate the screen from a higher voltage source through a bleeder, as illustrated in this circuit, thus utilizing the full gain and output capability of the tube.



IN THE DESIGN OF A VIDEO amplifier many factors must be taken into consideration to provide a satisfactory picture from the composite video signal impressed on the video amplifier grid.

Some attention must be given to: The frequency and phase characteristic of the amplifier; transmission of the *dc* component of the picture; noise-limiting properties, which should be good to assist the sync separator system; utilization of the non-linear portion of the tube characteristic to the best advantage; interaction between the brightness and contrast controls which should be at a minimum; suitable range of contrast levels to satisfy all viewer preferences; sufficient maximum output to overdrive the picture tube without undesirable signal amplitude distortion; sound output, which should be free of sync buzz at all signal levels and contrast control settings, if the 4.5-mc sound signal is amplified by the video amplifier; introduction of a minimum of sync signal clipping or compression at all contrast control positions and signal levels to maintain stable horizontal hold and good vertical interlace; and adequate gain to drive the picture tube with the minimum useable output signal from the video detector.

Since it is sometimes not practical to satisfy all of these requirements completely, the designer may sacrifice performance of one characteristic to emphasize another. Many operating characteristics are the result of field experience and customer preference. For instance, field experience has shown that it is desirable to reduce the interaction, and limit the range of such controls, as contrast and brightness, to such an extent that the viewer is always able to find his way back to a normal picture after having tried all other set-

In Video Amplifiers

by RALPH H. COOK, *Engineer in Charge of Radio and Television Development*
Scott Radio Laboratories, Inc.

tings of the controls. This signifies that the picture must not disappear, bloom excessively, curve, twist, or fall out of vertical or horizontal hold with any combination of positions of the brightness and contrast controls.

However, the engineer must also consider those viewers whose interests lie in determining the so called *reserve of power* of the receiver. If, by the manipulation of the contrast and brightness controls, it is possible to produce excessive blooming, darken and distort the picture beyond viewability, the receiver can be classified as one having the necessary *reserve of power.*

The trend of design seems to be in the direction of chasses with fewer operating controls, using circuits of greater stability, which permit the brightness, vertical and horizontal hold controls to be classed as service items.

It is usually possible to achieve all the requirements of good video amplification, using only one high transconductance pentode, or a dual triode, although compensation problems and fewer components may favor the pentode.

The gain of the pentode is a function of the transconductance and the plate load resistor. However, the operating transconductance has been found to be usually somewhat lower than the values found in the handbooks, when the tube is used in a video amplifier circuit.

For a given bandwidth, the video plate load resistor is a function of the tube and circuit capacitances. Therefore, a tube of low input and output capacity, used in a circuit that has little stray capacity to ground, would permit the use of a higher value plate load resistor for greater gain and output.

The maximum output voltage of a video amplifier is a function of the *dc* plate current and the plate load resistor, which might indicate a high I_P and high R_L. However, circuit capacitance, the maximum needed drive for picture tubes, drain on power supply, and cost of tubes limit the output of a video amplifier to a practical value. Accordingly, a video amplifier should possess a high transconductance, low input and output capacities, and a reasonably high *dc* plate current. If one were to disregard the input capacity of the tube, since it would influence only the previous stage gain, it may be stated that the gain is a function of g_m/C_{out}, while the maximum output voltage is given by I_p/C_{out}.

Since the input capacity of a triode is given by $C_{in} = C_{gk} + C_{gp}\ (1+A)$ where A is the stage gain, compensation becomes a problem when the triode has an appreciable stage gain. For a 6SN7GT with a stage gain of 6 x, the input capacity becomes $C_{in} = 3.0 + 4\ (1 + 6) = 31$ mmfd, which is a relatively high-input capacity, compared to 6-11 mmfd for a pentode amplifier.

When degeneration is introduced in the cathode of a pentode video amplifier, with the use of an unbypassed contrast control, the C_{gk} component of the input capacity of the pentode is reduced by the factor $1 + g_m R_k$. Since the major component of the input capacity of a pentode is the C_{gk}, the total input capacity can be considered reduced by this factor. For a 6AC7 with 160 ohms of unbypassed cathode resistance, the input capacity becomes

$$C_{eff} = \frac{C_{in}}{1 + g_m R_k} = \frac{11}{1 + (.009)\ 160}$$

$= 4.52$ mmfd.

The use of a bypassed fixed resistor plus an unbypassed control in the cathode of the video amplifier offers a satisfactory method of tube bias and a means to vary the gain of the tube for a contrast control. Using other methods of bias such as signal grid current bias or *dc* coupling to the video detector, the maximum output of the stage has been found to be limited by the safe dissipation rating of the tube under no signal conditions. Also, using this type of bias, the transconductance of the tube is not constant since the operating bias is a function of the signal amplitude.

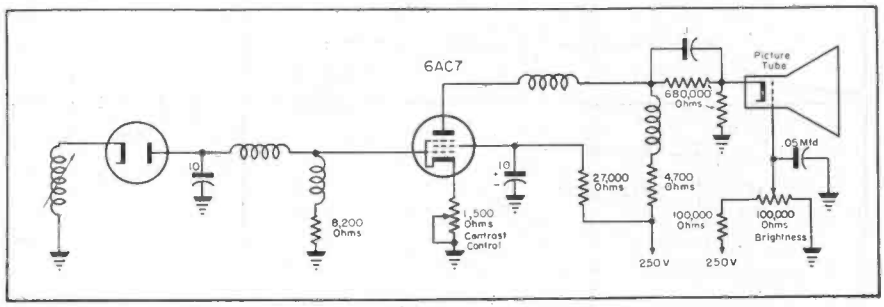
In Fig. 1 appears the circuit of a typical video amplifier which has been found to have several major deficiencies.

Since the input grid signal is capacity coupled and is sync-positive, there appears a high-intensity peak-noise pulse in a positive direction, extending beyond the static grid bias and causing the signal grid to be driven positive with respect to the cathode, thereby drawing grid current. Thus, the grid bias will shift to a greater negative value, and will be maintained at this value a considerable period of time, due to the large grid time constant necessary to maintain low frequency response.

When the operating bias is shifted to a greater negative value, the input signal operates over a very non-linear portion of the transfer characteristic, and compression of the light parts of the video signal is noted. Unfortunately, the noise pulse is amplified in a linear fashion and is allowed to pass on to interfere with synchronization.

It has also been found that this circuit will not amplify, in a linear fashion, signals of equal amplitude, but those that differ in average brightness when the input signal is of such amplitude so as to produce a maximum contrast picture. From the plot, it will be noted signals with a dark background suffer signal compression of the white parts of the picture. Since the majority of the information occurs in the light parts of the picture, this compression of the whites causes a loss of information and the whites assume a

Figure 3
A third type of video amplifier in which the polarity of the grid input signal has been reversed.



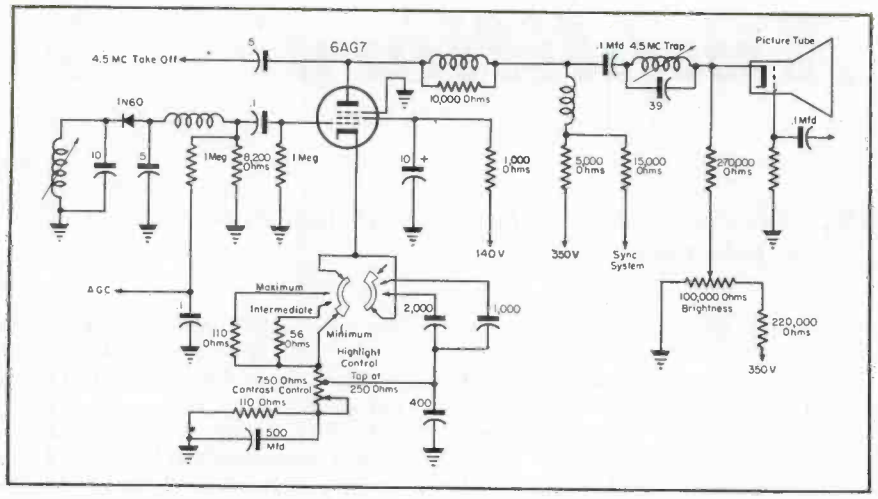


Figure 4

Video amplifier featuring the highlight control, which is shown here in minimum boost position.

pasty appearance. The circuit, however, does provide amplification of light background signals in a linear fashion.

This amplitude distortion of the signal, with different background brightness, is caused by the grid-capacity coupling. The grid capacitor prevents the *dc* voltage change, that takes place with background change, from being applied to the grid of the amplifier tube. Since the reference axis of a dark or light background picture differs so greatly, amplification on different portions of the characteristic curve will occur. For an average background picture of average amplitude, this amplifier will still give some compression of signal in the white regions of the picture.

Fig. 2 illustrates another video amplifier circuit with several modifications.. In the Fig. 1 amplifier grid bias has been found to shift with a noise impulse to such an extent that more noise is amplified. By removing the grid-coupling capacitor, and providing some static bias from a low-impedance source, which will not take a charge in the presence of noise pulses, the noise immunity of the amplifier can be greatly increased. Using a somewhat lower plate voltage also makes it possible to use plate-current saturation for noise clipping, since the dynamic operating bias of the tube is not shifted by impulse noise.

If a low impedance screen source is used, the same part of the tube characteristic is utilized by all types of picture background signals, so that the non-linear amplitude distortion and compression is, to some extent, eliminated.

The screen potential must necessarily be lower than could be tolerated under normal conditions in order not to exceed tube ratings when the input signal is high enough to overcome the static grid bias. Thus, the maximum gain and output of the amplifier would be reduced. However, by tolerating a slight shift in the operating part of the transfer characteristic used by different average brightness signals, one can operate the screen from a higher voltage source through a resistor bleeder, as shown in Fig. 2, thereby utilizing the full gain and output capability of the tube.

However, this circuit will still produce some compression of the light parts of the picture, due to the normal curvature of the tube characteristic. Also, since the gain of the tube is dependent on input signal level, there results a bias that opposes the static grid bias. Therefore, the gain of the tube varies in a manner that is the reverse of what is desired; that is, on strong signals the grid bias approaches zero which increases the amplifier gain, while on weak inputs the static bias is only slightly modified and the amplifier gain is lowered.

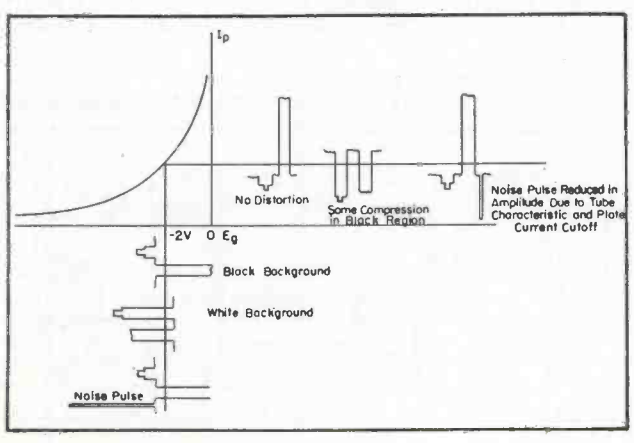


Figure 5
Operational characteristic of highlight control circuit.

With strong inputs and contrast control at maximum setting, the sync portion of the signal is compressed or eliminated by plate current saturation or grid current of the tube. This usually produces curvature of the vertical lines in a picture when the horizontal *a/c* circuit is presented a deformed sync pulse, or when the same pulses are absent. Also, intercarrier sync buzz becomes annoying when this sync signal clipping occurs, if the 4.5-mc signal is taken from the plate of the video amplifier.

Still another video-amp system is illustrated in Fig. 3. In this circuit the polarity of the grid input signal has been reversed, making the input signal sync-negative, and impressing a sync-positive signal on the cathode of the picture tube.

At maximum-contrast control position, the only tube bias is provided by the input signal which may be low enough at times, so that the tube is operating close to zero bias. To keep the tube ratings within limits, under this condition, it is necessary to limit the screen potential either by a low source voltage or through a high value of screen resistance. This reduced screen voltage limits the maximum output of the tube under large input signal levels. However, this circuit provides maximum amplification and output voltage capabilities at low input signals and reduced gain at the higher input signal levels which is desirable.

This circuit also amplifies both dark and light background signals over approximately the same portion of the tube characteristic due to direct coupling in the grid circuit, and, therefore, distortion-free amplification of both dark and light background signals is obtained. A slight sacrifice in this property has been accepted, to increase the gain and maximum output of the tube, by not operating the screen from as stiff a source as could be arranged by a bleeder-resistor divider.

It has been found that good noise limiting properties can be obtained by using a sync-negative input signal, since the noise pulses extend beyond signal grid cut-off.

Direct transmission of the *dc* component is provided by direct coupling of the grid and plate circuits. The average *dc* level is divided in the plate

circuit of the amplifier to reduce the interaction of the brightness and contrast controls with no apparent degradation of the *dc* level of the picture. Throughout the range of the contrast control it is not necessary to adjust the brightness control to obtain proper background lighting.

This divider has also been found to permit the use of a higher value of video amplifier plate voltage for greater output, without the necessity of providing a separate ungrounded filament winding for the picture tube. The use of a plate voltage of 200-300, directly coupled to the picture tube cathode, would exceed the maximum voltage rating between the cathode and filament of the picture tube, if the conventional grounded filament winding was used to supply filament voltage to the picture tube. However, since the divider is bypassed for the *ac* component of the video signal, it has no effect on the remainder of the signal.

Since this circuit produces a slight expansion of the light parts of the video signal, and a slight compression in the dark region, it is to be favored over those circuits using a sync-positive signal to the grid of the tube. Some compression which does appear in the black regions of the tube does not have any ill effect on viewing.

In Fig. 4 appears a video amplifier circuit that was found to be best suited for the operational characteristics in mind. Provided is a sync-negative input video signal to afford a degree of pulse-noise limiting by plate current cutoff. Since the screen is operated from a relatively low impedance source, the tube cutoff characteristic, although sufficiently remote to handle any amplitude of input signal present in very strong signal areas, was found to be sharp enough to limit impulse noise to a very satisfactory degree.

It has been found that capacity coupling on the grid circuit will introduce some linear amplitude distortion when compared to direct coupling, since signals of equal amplitudes but varying shades of background illumination will be amplified on different portions of the tube characteristic curve. In the case of a dark background signal, the amplification will be linear and no compression will be present. While a white background picture will show some compression in the black region, there'll be no degradation of the picture unless the compression is severe enough to eliminate or radically deform the sync signals.

With this circuit, amplification will take place with a relative expansion of the light areas of the picture and some compression in the dark areas if the input signal is of a nominal value. This

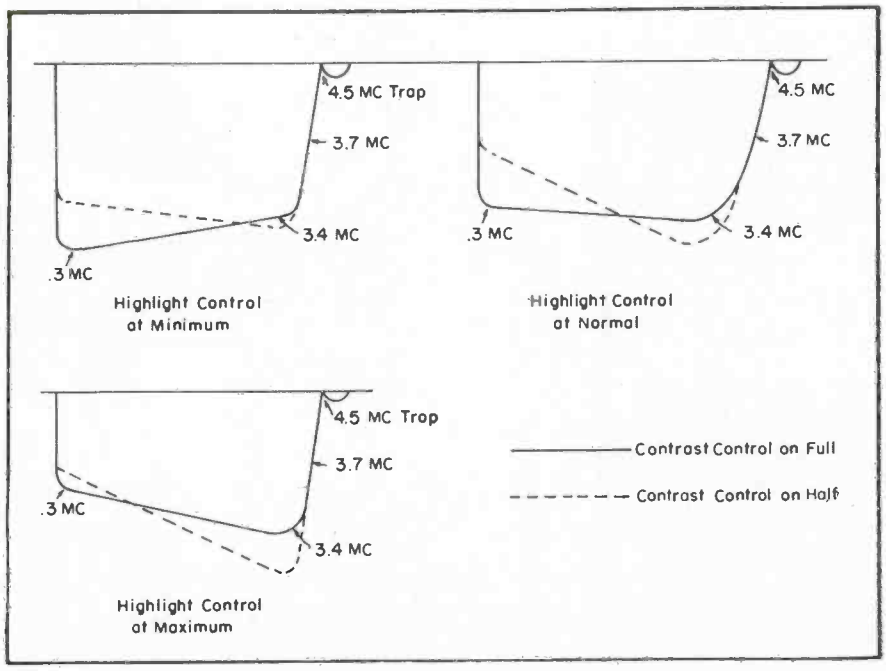


Figure 6
Sweep-frequency response curves for the highlight-control video amplifier.

emphasis of the light regions of the picture, where detail is most apparent, has been found to result in added sparkle and sharpness over a picture that has been amplified with compression in the white region of the picture.

Using capacity coupling and cathode bias it was found possible to operate the tube at such screen and plate potentials as to make available maximum gain and p-p output voltage from the tube without exceeding tube ratings at any input signal level or contrast control position.

The interaction between brightness and contrast controls has been reduced to a minimum, thereby eliminating the necessity for readjustment of the brightness control each time the contrast control setting is appreciably changed. It has been found that once the background brightness has been set it will remain constant throughout the range of the contrast control, or over a wide range of input signal levels.

Using a sync-position signal, capacity coupled from the plate of the amplifier tube to the cathode of the picture tube to provide both the *ac* video signal and the partially restored *dc* for background lighting, was found to result in an independence of operations of the contrast and brightness controls.

The normally used *dc*-restorer diode was eliminated, after sufficient viewing tests by different observers over a wide range of program material resulted in no observable difference in background conditions of the picture, in sets using a conventional *dc* restorer as against the circuit described.

It was also found desirable to allow the picture tube to remain illuminated, in the absence of signal from a transmitter, or when switching between channels, to permit the operator to note when the set was operating without a signal input.

In the Fig. 4 circuit, the grid and cathode of the picture tube operate as the *dc* restorer diode on the opposite half, from the reference axis, of the video signal than is normally used with a diode *dc* restorer.

By feeding a negative pulse of vertical peaking signal to the grid of the picture tube, through a low resistance to ground, it is possible to blank out the vertical retrace lines that are apparent at low contrast levels or theoretically improper settings of the brightness control.

This feature has been found to permit the user to choose from a wider variety of contrast and brightness control settings, than would be possible if the visible retrace lines were limiting the choice of background and contrast range settings.

To handle large p-p input signals without amplitude distortion which became apparent using a 6AC7 in the circuit, it was found desirable to utilize the capabilities of a 6AG7.

At maximum contrast control settings and input signal levels of 6 or more volts p-p, tubes of the 6AC7 class showed complete stripping of the sync signal, which resulted in vertical line curvature or *S* distortion from the horizontal *afc* system, and excessive sync buzz from the intercarrier sound system.

Although the *70* v p-p maximum output obtained with the 6AC7 produced what appeared to be an over-contrasted picture, this was actually found to be

(*Continued on page* 24)

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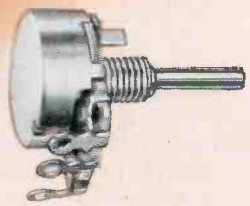
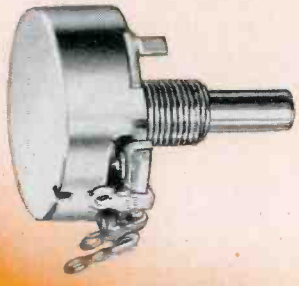
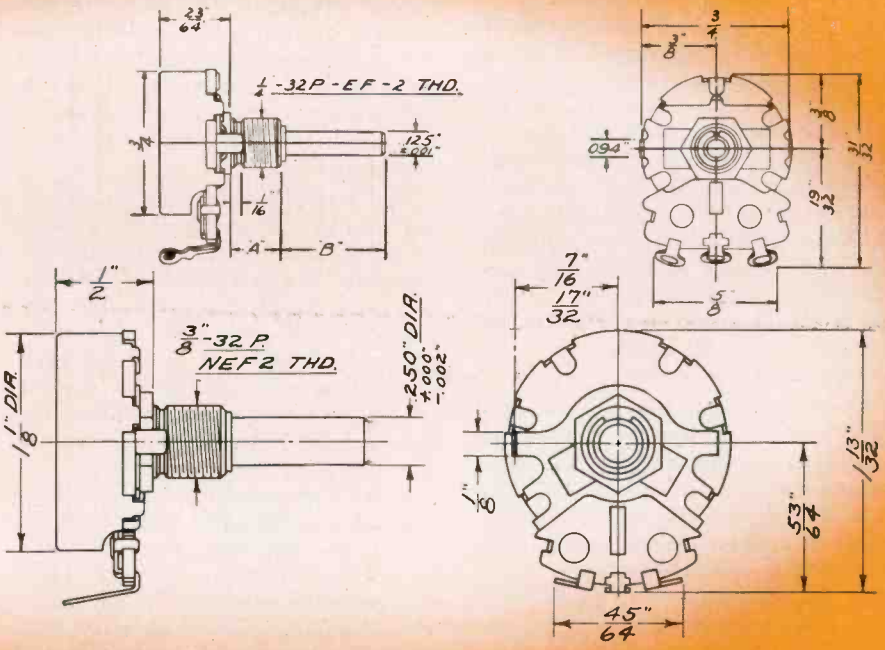


TYPE 95





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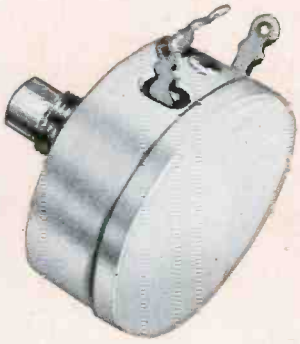

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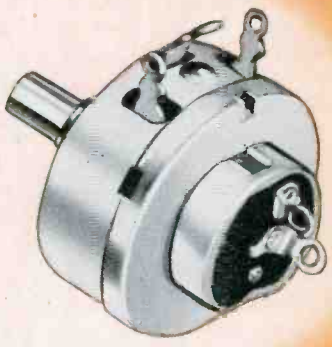

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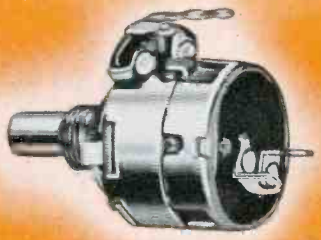
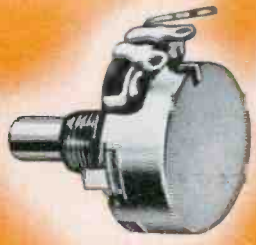
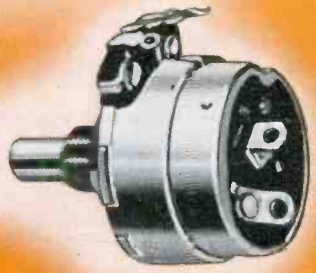
Composition



JAN-R-94, Type RV-2B
CTS Type GC 45 with Switch.



JAN-R-94 Type RV-2A
CTS Type 45, 1 2/16" Diameter
Composition



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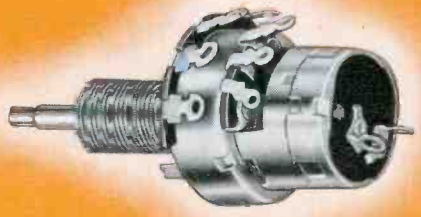

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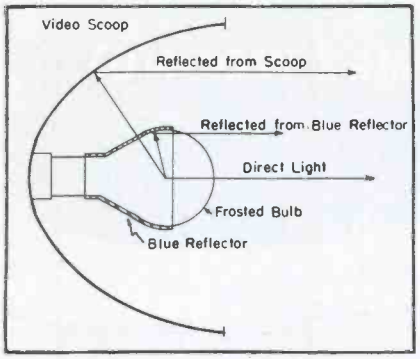


Figure 1
The TV blue lamp in a video scoop.

Blue TV Lamp Design Report

by R. D. CHIPP, *Director of Engineering*
DuMont Television Network, Allen B. DuMont Laboratories, Inc.

SINCE THE EARLY DAYS OF TV considerable experimental and development work has been done with various types of light sources for studio use. Concurrently, pickup tube developments have allowed a decrease in the quantity of light required, and more attention has been given to the *quality* of light.

Types of Light Sources

Types of light sources used have included incandescent, fluorescent, and mercury vapor, in various combinations. Each source has been found to have certain advantages and disadvantages in terms of initial cost, maintenance cost, efficiency, spectral characteristics, ability to dim and focus, physical size and flexibility, etc.

Incandescent lamps, for instance, have been found to be flexible, compact, easy to maintain, dimmable and controllable. However, they have been also found to be generally deficient in not only energy at the blue end of the spectrum, but highlight efficiency. Fluorescent light sources, on the other hand, can provide more energy at the blue end of the spectrum, have a high color temperature, and relatively high-light efficiency. The principal disadvantages of the fluorescent lights lie in their large size, lack of flexibility and control. Although mercury vapor sources have the advantage of high-light efficiency, they have not as yet found widespread use due to their spectral and control characteristics.

In view of these many variables, the selection of studio light sources has been a complex problem frequently solved by the heuristic method.

Problems Surveyed

Early in '49 it was considered desirable to attempt the development[1] of a new light source which would combine a maximum number of the good features, be available in different sizes for different applications, and have long life. It was determined to use an incandescent filament as the basic source, and work toward low cost, long life, high color temperature, even spectral characteristic, flexibility, and ease of control. The study resulted in

[1] ***Development undertaken by Luxor Lighting Products, under the supervision of chief engineer Herbert Anderson, working with the DuMont general engineering department.***

Figure 2
Spectral characteristics of solar radiation and TV light sources.

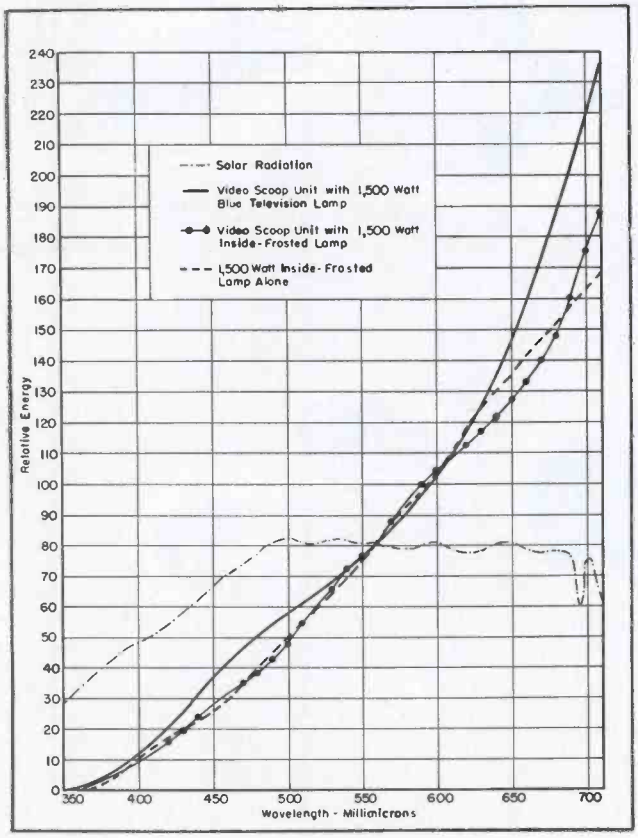
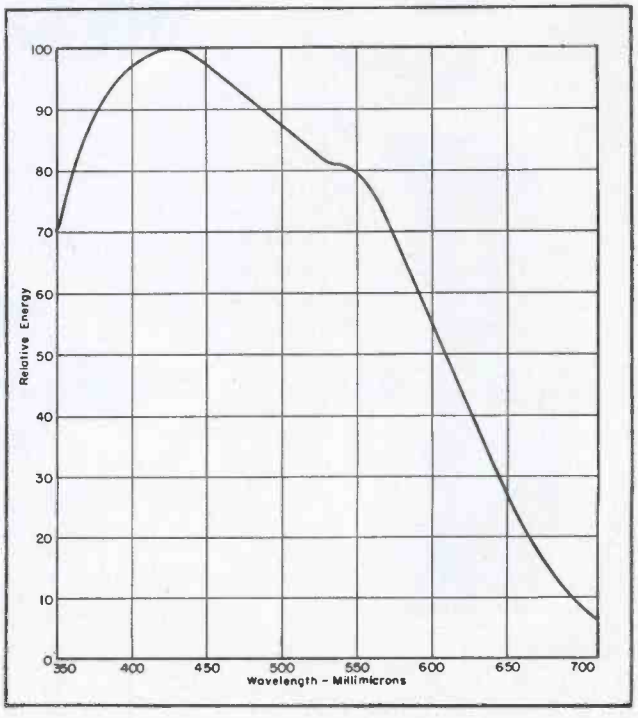


Figure 3
Spectral characteristics of 5820 image orthicon.



Recently Processed Light, with Improved Spectral Characteristics, Features Blue Ceramic Reflector, One-Third of Light Being Emitted Directly from Filament Through Frosted Portion of Bulb, With No Color Correction, Providing High Content of Red; Some of Balance of Light from Filament is Reflected by Translucent Blue Reflector So as to Provide Mixture of Colors From Red to Blue

Rodney Chipp and Robert Bigwood, chief facilities engineer of the DuMont network, viewing the blue lamp's coating.

the evolution of a blue TV lamp, representing a good compromise between the foregoing conflicting desires.

The unusual manner in which color correction was obtained in the light is illustrated in Fig. 1. With a specially processed blue ceramic reflector, it was found possible to secure emission of approximately one-third of the light directly from the filament through a frosted portion of the bulb with no color correction, thereby providing a high content of red. It was also found that some of the balance of the light from the filament was reflected by the translucent blue reflector in such a way as to provide a mixture of colors from red through the entire spectrum to blue. The last portion of light, from the filament, passing entirely through the translucent reflector, was found to have a high content of blue. When the lamp is used in a reflector fixture, these additional blue rays add to the total light output of the lamp. In Fig. 2 are a curve representing the spectral energy of solar radiation, and three curves representing the spectral characteristics of a standard 1500-watt inside frosted lamp, the same lamp used in a scoop or *videolite*, and a 1500-watt *blue lamp* used in a *videolite* fixture. It will be noted that there is an increase in energy between 450 and 500 millimicrons. The color temperature of the 1500-watt inside frosted lamp was measured as 2840° kelvin, whereas the color temperature of the *blue lamp* was measured as 3000° kelvin, with both lamps mounted in the same type of fixture.

Inasmuch as the 5820 image orthicon is widely used as a camera tube, tests were made with these pickup tubes and the *blue lamp*. Fig. 3 illustrates the spectral characteristic of a typical 5820, and Fig. 4 shows the relative photographic effectiveness of solar radiation, a 1500-watt incandescent lamp in a *videolite*, and a 1500-watt *blue lamp* in a *videolite*. The response in the blue region is quite revealing.

Long life is a prime requirement in any light source used for television, in view of the high maintenance costs in-

(*Continued on page* 29)

(Above)
John Colgan, chief electrician at the Adelphi theatre, used for DuMont telecasts, checking blue TV lamp.

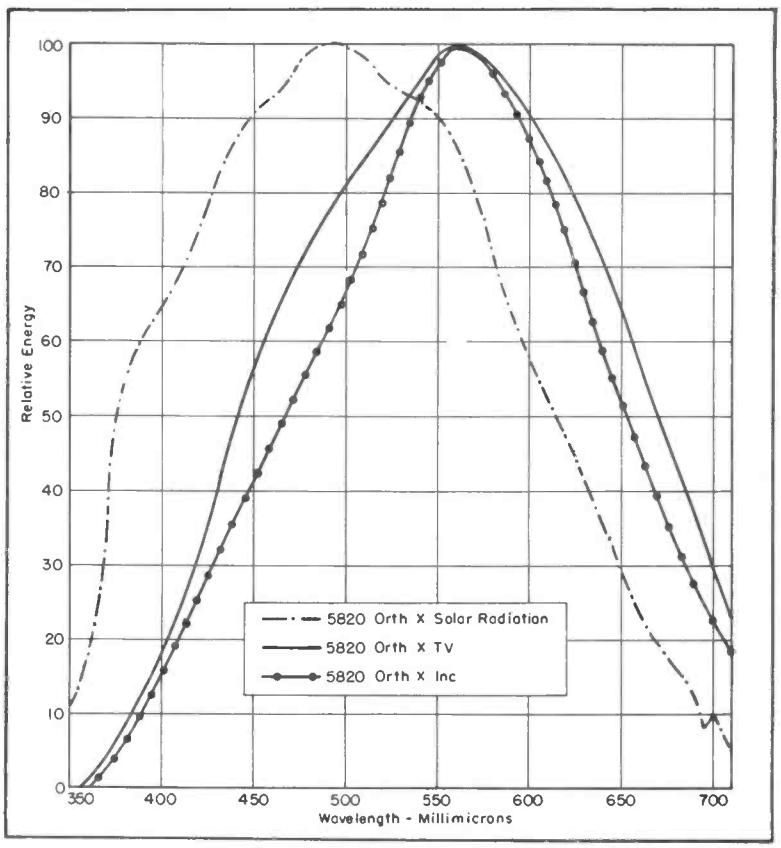


Figure 4
Relative response of 5820 with various light sources.

Liquid

RESINS, which have always been popular on the production line, during the past few years have become an even greater favorite not only in the plant but on the engineering and development front, serving to solve those tricky problems of potting, filling, encasing or encapsulation of coils, capacitors, transformers, and printed circuits. In addition, the compounds have also been found to be the key, in many instances, to speedier production with a minimum amount of equipment. The use of resins, which can be cured rapidly at elevated temperatures has contributed substantially to these step-up schedules.

Elevated-temperature cures, of course, can only be used if there are inherent characteristics in the resins which permit this approach. One type resin[1], a light-colored liquid solution of unsaturated polyester in monomeric styrene, was found to be ideal for the process because heat is liberated during polymerization; an exothermic reaction. The amount of heat liberated is constant in any one resin and is determined by the chemical composition of that resin (degree of unsaturation and type of vinyl monomer). However, the rate at which the heat is liberated is directly proportional to the cure temperature and type and amount of catalyst used. Moreover, the resins shrink due to polymerization and thermal contraction. Under adverse conditions, the result of the foregoing factors is a highly stressed product which, in turn, usually results in cracks and crazes.

Certain applications are more adaptable to elevated temperature work than others. This does not mean, however, that all applications cannot utilize some form of heat to realize some benefits from this technique. Keeping in mind the generalization that the curing time is inversely proportional to the curing temperature, the maximum temperature possible for any one application will be dependent upon: mass of resin; type of resin; amount and type of fillers, if any; size and type of confining and heating medium; and type and amount of catalyst.

Mass of resin: Generally speaking, the temperature should be lowered as

[1]Paraplex P series; Rohm and Haas.
*Paraplex P-13.
**Paraplex P-43, P-43-HV.

Resin Curing in Component Manufacture

by RALPH G. PETERS

Review of Elevated-Temperature Cure Techniques Which Have Been Found to Expedite Production of Parts.

the mass of the resin increases.

Type of resin: Since one resin* is less reactive than others**, it can be cured at higher temperatures.

Amount and type of fillers: Since fillers do not enter into the co-polymerization reaction; they reduce the concentration of active ingredients and consequently reduce the severity of the exotherm. Therefore, higher temperatures can be used with higher filler concentrations.

Size and Type of Confining and Heating Medium: The heat transfer efficiency of the confining medium must be considered here. Higher temperatures can be used when metal molds are involved, because metal readily dissipates the exothermic heat. Consequently, lower tempertaures should be used when resins are cured in wood, plaster, cellophane, in hot air, etc.

Type and Amount of Catalyst: The more reactive catalyst such as benzoyl peroxide, require lower temperatures. However, optimum production conditions can be obtained with the most active catalysts and the highest temperatures.

In laminating and molding, elevated temperatures between 220°*F* and 280° *F* have been found to be best. The catalyst most generally used is benzoyl peroxide. Casting and potting are more easily accomplished at lower temperatures using less reactive catalytic systems.

Cures at Room Temperature

In certain applications, where the mass of the resin is large, it may be desirable to minimize the development of exothermic heat (and resultant cracks and high stress concentration) by initiating polymerization at lower temperatures than are required by use of catalyst alone. In other cases, it may be impractical to introduce extraneous heat. For this type of work

(*Continued on page 27*)

PROPERTY		A	B
Mechanical Tests:			
Flexural Strength			
Ultimate, PSI		17,500	-
Mod. of Elast., PSI		533,000	6,400
Tensile Strength			
Ultimate, PSI		9,000	1,600
Compression Strength			
Ultimate, PSI		21,300	-
Hardness			
Rockwell		110-120	-
Barcol		45-50	-
Shore a Durometer		-	80-85
Elongation			
Percent		Less Than 5%	220
Electrical Tests:			
Dielectric Constant	60 CPS	3.3	4.2
	10^3	3.2	4.2
	10^6	3.2	4.0
	10^7	3.2	3.7
	3×10^7	3.1	3.4
	10^{10}	2.6	-
Power Factor	60 CPS	0.006	.005
	10^3	0.006	.011
	10^6	0.017	.052
	10^7	0.022	.080
	3×10^7	0.034	.105
	10^{10}	0.043	-
Loss Factor	60 CPS	0.020	.021
	10^3	0.019	.046
	10^6	0.054	.208
	10^7	0.070	.296
	3×10^7	0.105	.357
	10^{10}	0.112	-
Water Resistance (% Wt. Absorbed, 24 Hrs.):			
25°C		0.3	0.6
100°C		3.0	2.0
Miscellaneous Properties:			
Shrinkage During Cure (Volume Percent)		7.0	9.0
Specific Gravity		1.235	1.122
Ref. Index		1.5564	1.5378
Thermal Expansion (Cm/Cm/°C)		8.2-10.2 x 10-5	-
Thermal Conductivity, BTU/Sq. Ft./ Hr. for Temp, Gradiant of 1°F/Inch Thickness		1.25	1.12

Figure 1

Chart of physical properties of cured, unfilled resins: A representing Paraplex P-43, a light-colored viscous fluid which cures to a transparent thermoset rigid product; and B representing Paraplex P-13, an amber fluid which cures to a thermoset composition whose flexibility is similar to that of plasticized polyvinyl chloride.

Automatic Synchronizing

Equipment, Providing Establishment of Timing Relationships and Proper Output Signals to Convey Timing Information to Allied Apparatus, Features Use of Binary-Scaler Counters to Supply 525-1 and 2-1 Divisions and Also to Provide Gates for Sync Signal Generation.

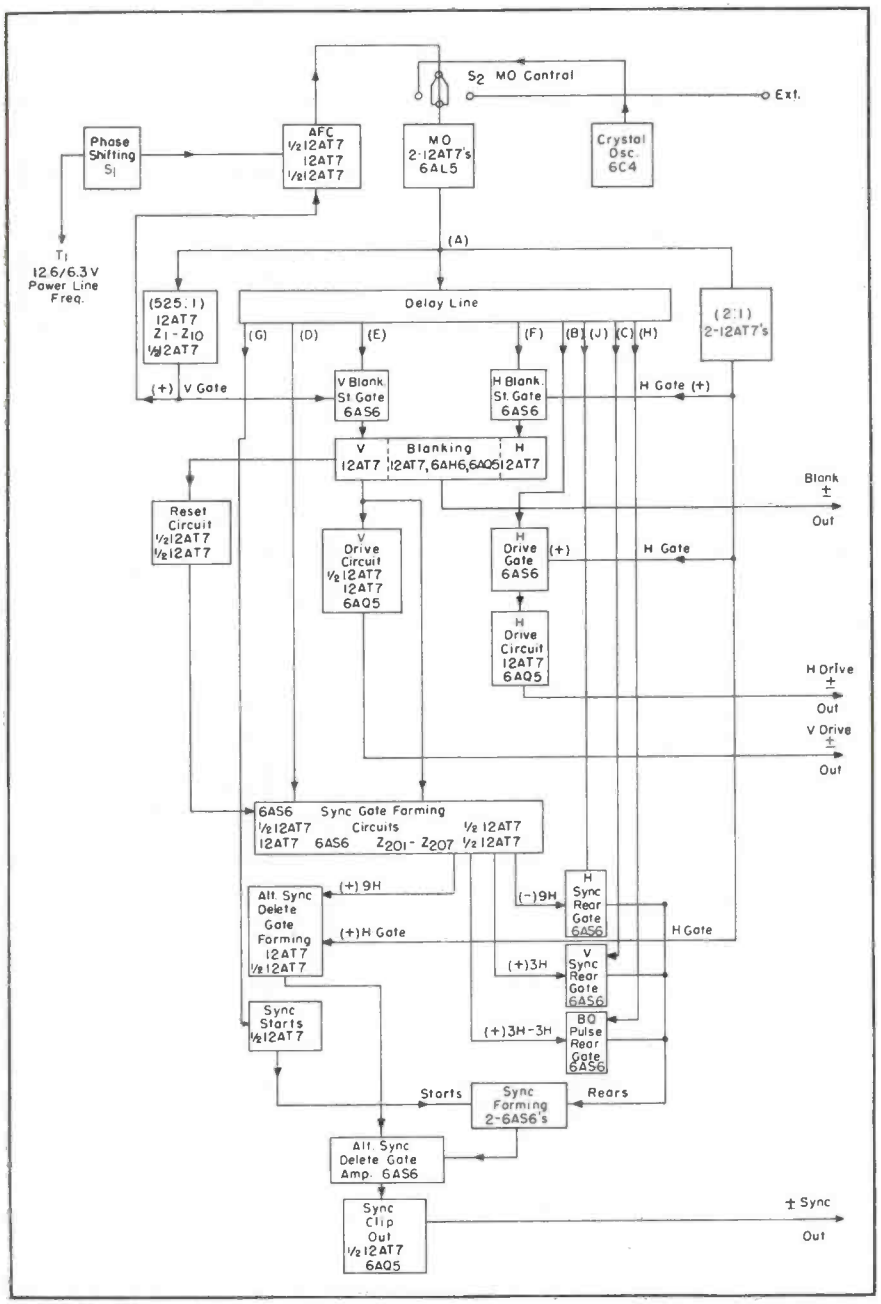


Figure 1

Simplified block diagram of synchronizing generator.

WITH THE EXPANSION AND GROWING complexity of studio facilities, the reliability of the sync generator has become increasingly important.

The increased use of back-porch clamps and sync-locking units, which are very critical of the exact composition of the sync signal, has also accented this factor, it being imperative that there be no deviation from the specified form or number of pulses during normal operation.

Heretofore, it has been considered desirable to lock, in both phase and frequency, the nominal 60-cycle output of the sync generator to that of the main power system of the community being served by the transmitter. This rendered the effect of hum or ripple in the received picture much less objectionable by making the resulting hum pattern stationary. With the growth and utilization of network facilities, where the transmitter and receiver may be on separate power systems, the effectiveness of power line synchronization had been found to be largely nullified. As a consequence, it has been necessary to design receivers so that they are much less susceptible to hum.

Built-in highly stable crystal oscillators, which may be used as a timing reference, in lieu of the power system, have been found to aid system stability. In localities where the power system has insufficient frequency stability or wherever portable power generators might be used, such as in remote locations or during emergencies, this approach has been found to be ideal.

The expansion of network facilities has also increased the desirability of locking the synchronizing generator to a remote, incoming sync signal.

In developing a sync generator which would meet the foregoing specs and produce correctly timed and formed signals during operation, barring a failure of a tube or component, the electrical functions of a sync generator were probed. It was found that these functions could be divided into two parts;

Generator for TV

by CALVIN ELLIS, *Broadcast Engineering Section*
Commercial Equipment Division, General Electric Company

one, the establishment of the timing relationships; and *two*, the provision of the proper output signals to convey the timing information to the various associated apparatus.

The timing relationships can be obtained in a sync generator by having a master oscillator usually operated at 31.5 kc, which is twice the horizontal scanning frequency. This is divided by 525 to 60 cycles, the field repetition rate. Additionally, the 31.5-kc frequency is divided by two to 15.75 kc, the horizontal frequency. This even and odd division results in 262½ lines per field. An interlaced pattern is a natural consequence of this half-line displacement in each field. These divisions can be seen in the simplified block diagram of Fig. 1.

Surveying means of providing system reliability, it was found that this characteristic could be obtained by having the timing relationships and the formation of sync signal determined by electrical counting circuits which are independent of normal variations in resistance, capacitance, and tube characteristics. Counters of *binary scaler* design, similar to the Eccles-Jordan triggered type, were selected, and used for the 525-to-1 division, the 2-to-1 division and for providing gates for the synchronizing signal generation.

The circuit of a binary scaler unit appears in Fig. 2. It will be noted that this is a heavily biased relaxation oscillator consisting of two triode sections direct-coupled to each other. The circuits have two stable conditions of equilibrium wherein one triode section is cut off and the other is conducting. These conditions abruptly reverse upon the application of a suitable trigger.

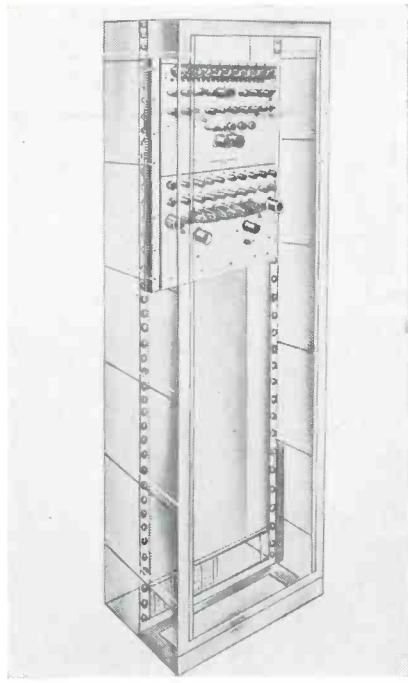
The trigger input to the binary scaler is connected to an internal network which differentiates an applied pulse, attenuating the positive pip and leaving only the negative pip to be applied to both triode sections. Thus when a positive pulse is applied to a binary scaler, only the negative-going trailing edge triggers the scaler.

The shift from one stable condition to the other is accomplished in the following manner: The negative triggering pip is applied to both sections by means of the input network. It has no effect on the grid of the cut-off tube, but on the conducting tube it causes the current to decrease, thus causing the plate voltage to rise. The rise is coupled to the grid of the tube which was not conducting, causing current to begin flowing, thus lowering its plate voltage. The voltage drop is transferred to the grid of the opposite section where it reinforces the action initiated by the trigger pip. This is an accumulative action, and results in the tube which was conducting to become cut off, and the tube which was cut off to become conducting. Another trigger pip will reverse this action, returning the scaler to the initial set of conditions which existed before the application of the first of the two triggers. The binary scaler has then gone through *one* complete cycle of operation upon the application of *two* triggers, thereby yielding a division of two.

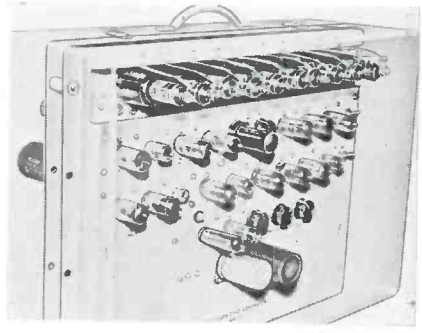
The output of each scaler is a square wave having one negative and one positive going edge or slope per cycle. However, only the negative going edge will trigger a directly connected succeeding binary scaler. Therefore, when one binary scaler output is connected directly to the input of a second scaler, the second scaler is triggered once for each cycle of operation of the first scaler. These *binary scalers* can be cascaded directly without the necessity of intermediate buffers or amplifiers. So connected and unmodified they will yield total divisions which are integral powers of two. For example, five cascaded scalers will yield a total count or division of $(2)^5$ or *32*.

In the sync generator application it was necessary to obtain a division of 525. It was found that odd numbers could be obtained from a binary scaler chain by the application of feedback loops.

For instance, if three cascaded binary scalers were connected, as shown in Fig. 3, they would normally yield a total count or division of $(2)^3$ or *8*. If a feedback circuit with a slight amount of delay were used to connect the output of the last or third scaler to the input of the first scaler, the first scaler would receive an additional trigger al-



Synchronizing generator mounted in rack for studio application. Generator is constructed on two separate chassis, each 14" in height and designed to fit a standard 19" rack. Entire generator (both units), with all tubes and components, weighs 23 pounds. Each unit contains 27 tubes; a total of 54 tubes in the entire system. The circuits necessary for the establishments of the timing relationships are located on one chassis; the timer unit. The circuits necessary for the formation of the synchronizing signal and driving pulses are located on the other chassis; the shaper unit. Below: Generator in portable carrying case. The binary counters used in the main count down, (525-to-1) and in the synchronizing signal formation chain are of the individual plug-in type. Ten of these units may be seen in the recessed sub-assembly, the top of the timer unit. Each binary counter circuit is contained in a sealed unit which plugs into an octal socket.



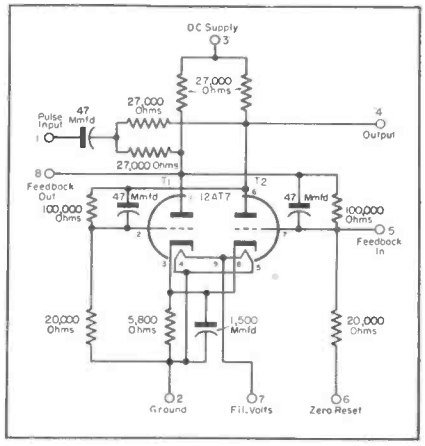


Figure 2
Circuit of plug-in binary scaler unit.

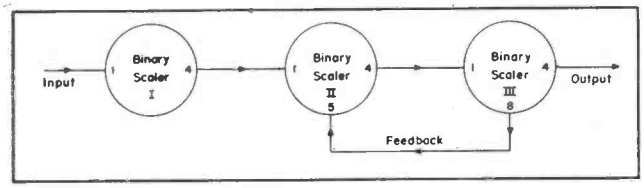


Figure 3
Binary-scaler arrangement to yield a 7-to-1 count-down ratio.

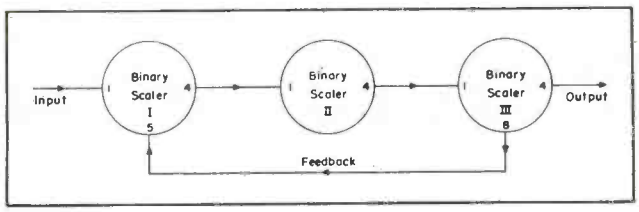


Figure 4
Binary-scaler arrangement to yield a 6-to-1 count-down ratio.

most immediately after the eighth input pulse. As a result of this extra trigger from the output, the system would then require only *seven* more regular input pulses to recycle the last scaler. Hence, the count of the system has been reduced from *8-to-1* to *7-to-1*. The disadvantage of this particular connection is that for the first cycle of the system, the count is *8*-to-*1* and *7*-to-*1*, thereafter. However, this can be circumvented by taking the feed back from the other plate of the last scaler. The pulse at this plate is of opposite polarity, or displaced 180°, from that appearing at the normal output plate. This plate will privide a negative trigger at the *4*th, *12*th, *20*th, etc., input pulse of an unmodified *8*-to-*1* system, instead of at the *8*th, *16*th, *24*th, etc. Since this feedback trigger now occurs immediately after the *4*th input pulse, only three more pulses are required for the total count. Thus, a *7*-to-*1* divider has been obtained, which is correct for the first cycle and all succeeding cycles.

Now let us consider the three cascaded binary scalers as before, but with the correctly phased feedback trigger fed to the second scaler intead of to the first one, as shown in Fig. 4. The second scaler will be additionally triggered by a feedback trigger from the third scaler immediately after the fourth input pulse to the first binary as before. Now, however, the triggering of the second scaler is the equivalent of *two* initial input pulses. This means that only two more input pulses are necessary to recycle the system. This totals six, so that total division is now *6*-to-*1*.

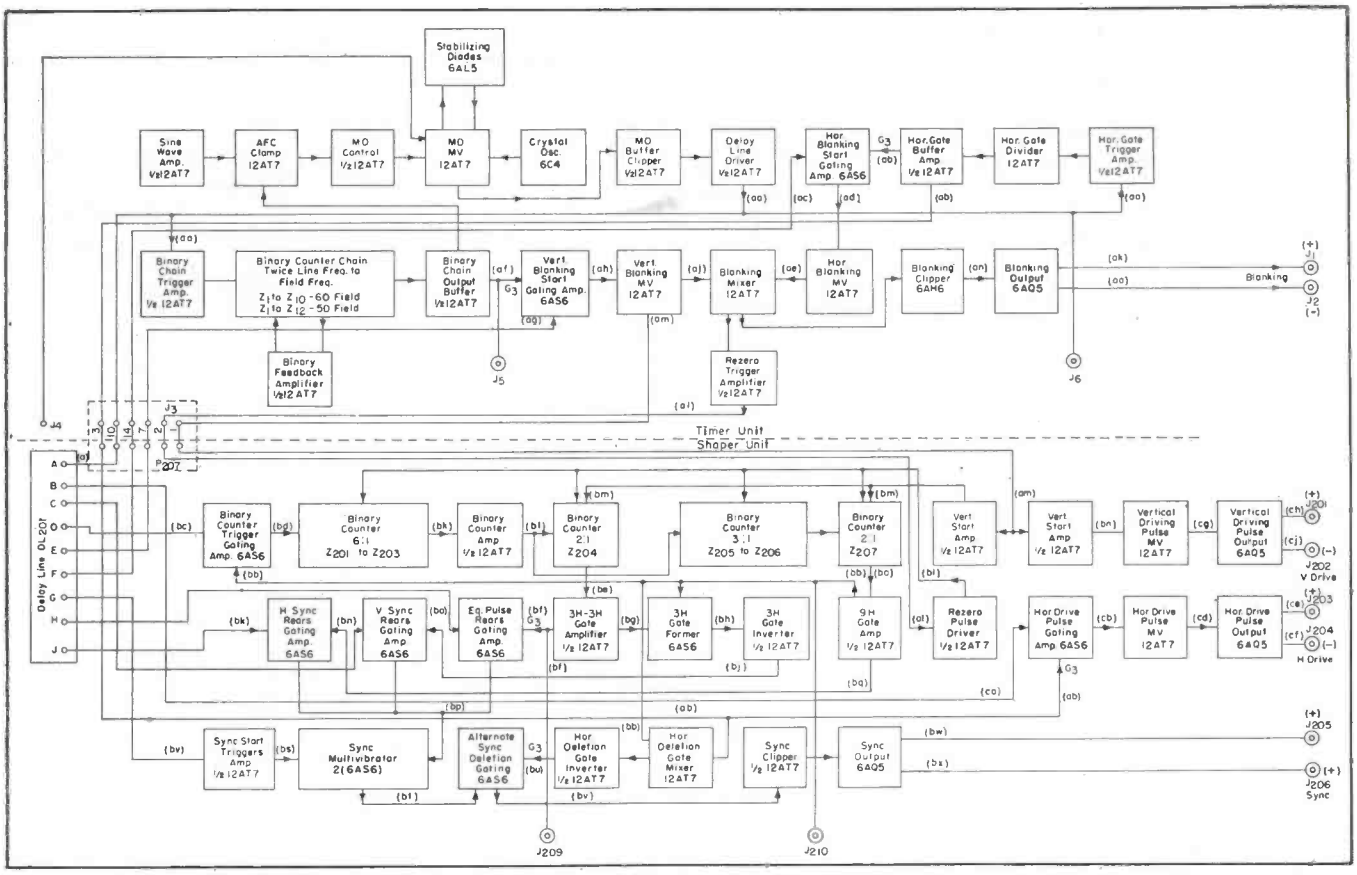
These two examples are governed by the following rule: Let n designate the number of the binary scaler in the chain from which the feedback originates, and p designate the number (from the first scaler) to which the feedback trigger is applied. The total division to the nth scaler is now $2^n - 2^p$ instead of 2^n; in other words, the feedback reduces the total count by 2^p. In the first example, n was *3*, and p was *0*, since the feedback trigger was applied to the first scaler, so that $(2)^3 - (2)^0$ *equals* $8 - 1$ or seven. In the second example, n was *3*, and p was *1*; thus $(2)^3 - (2)^1$ equals $8 - 2$, or six.

A total of four separate feedback circuits were incorporated in the sync generator to reduce the count of the ten binary scalers from $(2)^{10}$, or 1024, to 525.

All of the pulses in the sync signal are generated by one multivibrator. However, the synchronizing signal must contain pulses of different widths, namely the equalizing pulses, vertical sync pulses, and horizontal sinc pulses. Hence, the multivibrator must be con-

(*Continued on page* 25)

Figure 5
Detailed block diagram of synchronizing generator showing the function of each tube.



TV Broadcast Equipment

Image Orthicon Camera Chain

AN IMAGE ORTHICON CAMERA CHAIN consisting of a pickup head and electronic view finder; image orthicon control and monitor; pickup auxiliary; mixer amplifier; low-voltage supply; synchronizing generator; and distribution amplifier and low-voltage supply, has been developed.

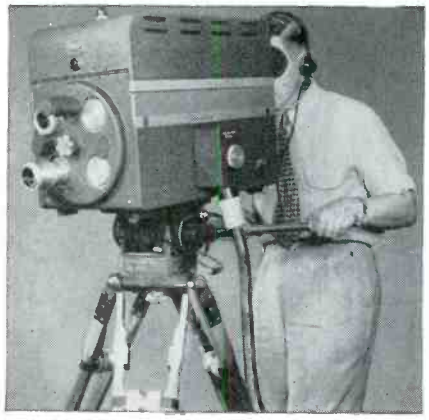
Camera setup features use of two cue lights, one above the lens turret and the other on top. Pickup tube can be rotated with respect to scanning, permitting pickup tubes to be matched in scanning position for interchangeability.

Intermediate amplifier has two separate standard RTMA video outputs at 1.4 p-p *v* 75-ohm source.

Pickup auxiliary features a focus current switch with *on-the-air* and *rehearsal* positions, which is said to extend sweeps slightly during rehearsals to prevent burning of image orthicon tube with a normal raster.

Minimum black level setup in mixer amplifier may be pre-set. Outputs are 2 separate standard RTMA video outputs at 1.4 p-p *v* 75-ohm source impedance. Unit may be used to feed directly into a telephone feed line with equalizers at receiving end.

A time-totalizer meter for recording the number of hours tubes have been operating, is provided in the low-voltage supply. A selenium rectifier power-supply powers telephone circuit for operational use. Switch with *private* and *common* positions enables control operator to speak to and hear his camera man alone, or to speak to and hear every one on the circuit. —*Model TA-124-E; Television Transmitter Division, Allen B. Du Mont Labs, Inc.*, 1000 *Main Ave., Clifton, N. J.*



Du Mont Image Orthicon Camera Chain

Theatre TV System

A THEATRE TV SYSTEM that features a mirror design for balanced light distribution over the entire screen, has been produced. Illumination at the corners of the screen, is said to be 80% of that in the center. Projection tube has a suspension mounting to facilitate cleaning. Optical barrel features a re-circulation system for cooling. An 80-kv power supply, utilizing flexible *hv* cable, is also provided.

System has a receiver for off-the-air reception, accommodates inputs from microwave or coax feeds, may be operated over a range from 32′ and an 10′ x 8′ picture up to 80′ and a picture approximately 25′ x 19′.—*Simplex Theatre TV System; General Precision Laboratory, Inc.*, 63 *Bedford Rd., Pleasantville, N. Y.*

10-kw VHF TV Transmitters

HIGH-LEVEL MODULATED, air-cooled VHF transmitters providing a nominal peak visual power output of 10 kw, measured at the output of the sideband filter, and a nominal peak aural power output of 5 kw have been announced.

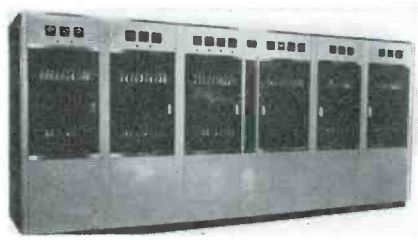
Transmitters employ only air-cooled tetrodes in the final amplifiers of both aural and visual units, with grid modulation. Other design features include single-ended *rf* circuits, built-in control of white saturation, high speed *ac* and *dc* overload protection.

Doors on cabinet are constructed of interlocking, extruded aluminum slats. Guided by small rubber caster assemblies riding top and bottom tracks, they can be rolled from front or back into the sides of the cabinets. The visual section of the transmitter consists of a crystal oscillator followed by *rf* amplifiers and a grid-modulated power amplifier. High-level grid-modulation of the final amplifier allows the operation of all driver stages as narow-band, class *C* amplifiers. Vestigial sideband filter is adjusted at the factory.

Amplifier and modulator circuits incorporate the latest design. Clamp circuit *dc* restoration is employed at the grid of the video modulator stage.

Built-in reflectometers continually measure the standing-wave ratio in the transmitter output and indicate transmission line reflections. Interlocked with the plate power supply, they automatically shut down the transmitter if the standing-wave ratio exceeds a preset value. Provision is made for continuous monitoring at various points in the system when desired.

Transmitters are 192″ long, 84″ high, and 32½″ deep overall.—*Model TT-10AL (channel 2 to 6) and Model TT-10AH (channel 7 to 3); RCA Engineering Products Department.*



RCA 10-kw vhf transmitter

Video Line Pad

A VIDEO LINE PAD for connecting one- or two-line amplifier outputs, line input and monitor input, has been produced.

Network is designed to feed from a 73-ohm source to a 73-ohm line with zero loss, and at the same time provide a branch circuit containing 14-db of isolation, for the connection of a high-impedance monitor. Pad is said to provide direct monitoring of the outgoing signal between the output of the line amplifier and the line without disturbing the transmission characteristics. Screw driver controls are provided for compensating for the shunt capacities encountered in the monitor input cables, for bandwidth adjustments and amplitude calibration.—*V-109; Daven Co.*, 191 *Central Ave., Newark 4, N. J.*

TV Parts

Coil Form Kit

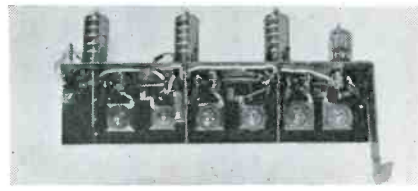
A COIL FORM KIT containing samples of ceramic coil forms is now available.

Box contains three each of five different ceramic coil forms, with a different powdered iron slug; high, medium, and low frequency. Extra slugs of silver-plated brass for each coil form are provided as alternates to the iron slugs. Forms vary in diameters from 3/16″ to ½″ and in over-all mounted heights from 19/32″ to 1 11/16″, and are made of grade L-5 silicone impregnated ceramic, meeting specifications JAN-1-10. Also provided is a chart which identifies slug types by color code and part number, and states approximate frequency ranges and permeabilities. —*Information available from Cambridge Thermionic Corp.*, 442 *Concord Ave., Cambridge* 38, *Mass.*

Cambridge Thermionic Coil-Form Kit

IF Amplifier With Die-Stamped Coils

A TV IF AMPLIFIER with die-stamped coils, operating in the range of 41.25 to 45.75 mc has been produced. Available with a stamped tuner as a prealigned assembly.—*Franklin Airloop Corp.*, 43-20 34*th St., Long Island City, N. Y.*



Franklin IF Amplifier

Cosine Yokes

COSINE YOKES with distributed windings for edge-to-edge picture focus, and ferrite cores permitting use with picture tubes up to and including 24″ where they require 70° deflection, have been produced. One model has high horizontal and low vertical inductance for use with air-core fly-back in direct-drive systems. Equipped with network and leads.—*MDF-70, MDF-30; Merit Transformer Corp.*, 4427 *N. Clark St., Chicago, Ill.*

High-Temperature Selenium Rectifiers

SELENIUM RECTIFIERS capable of operating without derating in ambient temperatures of 90° C have been developed. Rectifiers are said to be guaranteed for a minimum of 1000 hours of continuous operation.—*Sarkes Tarzian, Inc., Rectifier division*, 415 *N. College Ave., Bloomington, Ind.*

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Highlight Controls

(*Continued from page* 13)

the result of severe compression in the black region of the signal and overall distortion of the signal.

With the 6AG7 a maximum output of 150 *v* p-p without amplitude distortion or sync compression was obtained. Throughout the range of input signal encountered in the field and at any contrast control setting, it has been found possible to overdrive the picture tube without the non-linear amplitude distortion and sync buzz that is usually the result of high p-p output levels.

Experience has shown that a sharper, more detailed picture results if the overall frequency response of the video amplifier is not flat or slightly sloping down to the high frequencies, but is made to rise in amplitude with frequency. Since there are no set rules regarding the amount of boost of the high frequencies that is needed to produce a sharper picture than is obtained from a flat frequency response amplifier, it remains a matter of personal viewer judgment as to the needed high frequency boost that produces the picture which might be considered best.

The use of an upward sloping frequency characteristic has been found to produce a transient that sets up a following white line on the dark picture elements which makes them appear to stand out in a well defined manner from the surrounding picture detail.

The amount of high-frequency boost that could be considered excessive is dependent on a number of factors, which include the viewer's personal reaction as to when the amount of rise is great enough to make the picture appear artificial or to have present some characteristic that was not present in the transmitted image.

This reaction of the viewer to the presence of an additional phenomenon in the picture that was not originally present, varies with the person and his viewing distance to the screen.

A larger amount of high frequency boost is desirable when the viewing distance is increased, since it makes the pictorial detail stand out, and much detail that is apparently missing at distance viewing can become readily visible with such boost.

The highlight control, itself, consists of a switch which provides three positions of video-amplifier frequency response to produce the proper *picture highlighting* or high-frequency boost for any type of picture material, viewing distance, signal level or personal preference of the viewer.

By using a contrast control that varies the gain of the output tube by

changing the cathode degeneration it is possible to switch in bypass capacitors and resistors to obtain the necessary high-frequency boost.

Although sweep frequency response curves were used in determining the initial circuit parameters affecting the frequency response, the final values of these parameters were arrived at by actually viewing the resultant picture produced by each type of response curve.

Since the amount of high-frequency boost is determined by the partial bypassing of cathode resistance, one can readily change the shape of the curve by switching into the cathode of the amplifier different values of resistors and bypass capacitors.

In the minimum position of the highlight control, the amplifier reaches its maximum gain and has the lowest high-frequency boost. Since low level fringe area signals are accompanied by a high noise level from the input circuits of the receiver, it is desirable to have maximum gain with a minimum of high frequency boost to reduce the amount of *snow* in the picture and prevent sync instability.

The normal position of the highlight control provides an intermediate amount of high-frequency boost that will sharpen and outline the smaller detailed areas of a stronger signal picture.

A degenerative cathode resistor also allows the video amplifier tube a greater input signal handling capacity which eases the burden of the *agc* circuit to hold the input signal level at a constant value.

When the maximum position of the highlight control is used, the circuit has a maximum of high-frequency boost, which can be used to best advantage on strong signal pictures of poor quality such as some coax transmissions, movies, and television transcriptions.

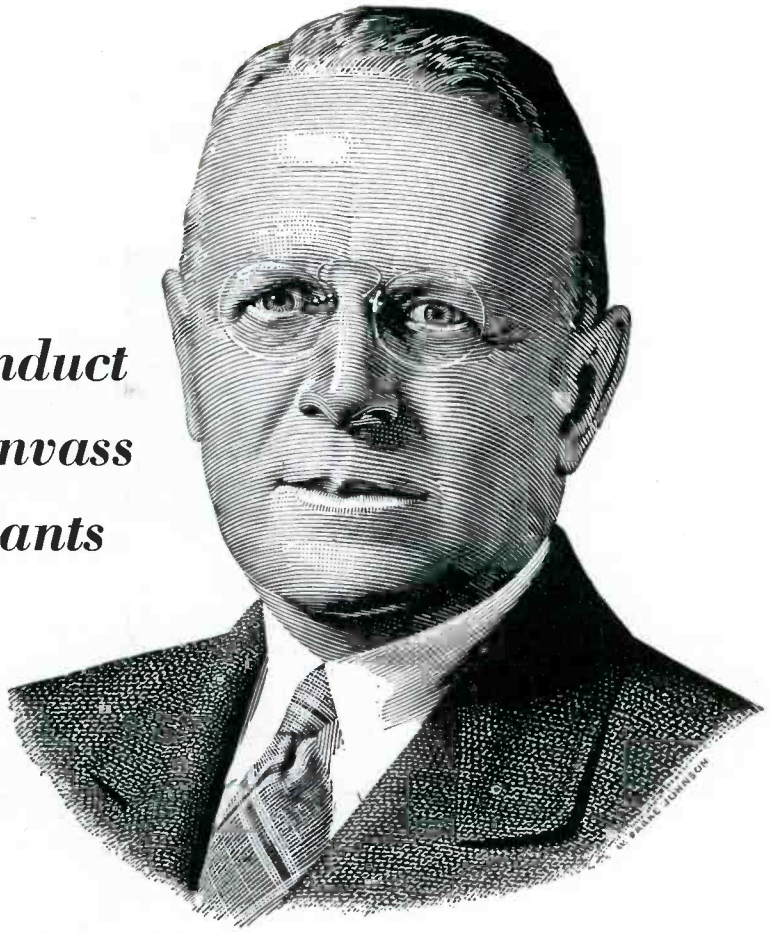
Sync Generator

(*Continued from page 22*)

trolled in its start and stop operation in the precise timing sequence corresponding to the RTMA synchronizing signal. It was found possible to accomplish this through the use of a time delay line, driven by triggers from the master oscillator. Taps on the delay line were included to provide precise timing intervals corresponding to the widths of the sync pulses to be generated. From these taps are obtained triggers which control the start and stop instants of the multivibrator. It will be apparent that the widths of the various sync pulses are determined entirely by the permanent characteristics of the delay line.

[*To Be Concluded in September*]

. . . "It was easy to conduct a person-to-person canvass at all company plants and offices"



ROY A. HUNT
President, Aluminum Company of America

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Resin Curing

(*Continued from page* 19)

it is recommend that *accelerators* which serve to activate the standard catalysts at lower temperatures be used.

There are two types of accelerators which have found most useful in this type of work:

Nuodex cobalt naphthenate, which is useful primarily in initiating gelation and in propagating complete cure at no greater than room temperature. Depending upon the concentration used, complete cure may take two days to two weeks to develop. This accelerator can be used with hydroperoxide type catalysts[1]. *Nuodex cobalt should never be mixed with the peroxide as this combination is explosively reactive.* The best means of introduction is to mix the *nuodex* into the resin first, a mixture, which is stable for a period of several months. Hydroperoxide catalyst can then be added when ready for use. Bench lives (time at room temperature to gelation) can be obtained as short as 30 minutes by use of a very active hydroperoxide[2]. This can be varied up to 6 to 8 hours without losing the characteristic of complete cure at room tempertaure. Usual concentrations for use range from .1% *nuodex* (.006% metal) to 2% *nuodex* (.12% metal).

Decreasing the concentration of accelerator has been found to lengthen the bench life, whereas increasing the concentration shortens the bench life. It is generally inadvisable to use more than 2 *nuodex* concentration, because further reduction in bench life is not possible. Bench life has been found to be affected by ultraviolet light; uncontrolled batch-to-batch variation in resin, catalyst and accelerator due to impurities, particularly metallic; age of the resin, and temperature; 85°*F* instead of 75°*F* has been found to affect seriously the results.

A disadvantage of *nuodex cobalt* as an accelerator is that it colors the resin a purple red. Consequently, it cannot be used where light, clear color is desired. If pigments or colors are used, this coloration is negligible.

Accelerator B[3], the second room-temperature type cure (organic solution), has been designed for use with hydroperoxide to give rapid gelation and initation of cure at room temperature without color. It is generally more active than *nuodex colbalt*, but it does not propogate polymerization at room temperature, and it requires heat to complete the cure. This heat may, and often does, come from the exothermic heat of reaction if the mass of resin is sufficiently large to generate it. With smaller masses which do not exotherm, it is necessary to post-heat the resin to complete the cure.

Concentrations most often used vary from 1/8% to 2%, with the higher proportions leading to shorter bench lives. Bench life in this instance, has also been found to be shortened by such factors as ultraviolet light, batch-to-batch variation, age of resin, and temperatures.

There are several ways to evaulate the state of cure of a resin. Usually, rather complete state of cure is desired, so that optimum physical properties may be obtained. In the case of the rigid resins, evaluation of state of cure is determined by hardness (Barcol or Rockwell). The evaluation of state of cure of flexible resins is more difficult, although determination of *Shore A* hardness, specific gravity, or solvent resistance may be helpful.

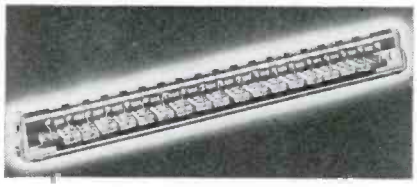
[1]Uniperox 60 (R. T. Collier Corp., Los Angeles); Lupersol DDM (Novadel-Agene Corp., Lucidol Div., Buffalo, N. Y.).

[2]Lupersol DDM. [3]Rohm and Haas.

Instrument News

Delay Lines

DELAY LINES that are equipped with eighteen taps for the selection of delay intervals ranging from .05 to .9 microsecond, have been introduced. They are said to have a characteristic impedance of 680 ohms and a bandwidth of 4.3 mc. Overall dimensions are 9¾" long, ⅞" wide and 1¼" high.—*1447-A; Tel-Instrument Co., Inc., 52 Paterson Ave., East Rutherford, N. J.*



VHF Frequency Meter

A VHF FREQUENCY METER that is said to provide a direct method of measuring or generating a frequency from 20 to 480 mc, has been announced.

Unit is said to be accurate over the frequency range within ±.0005% with a temperature variation of 32° F to 158° F. Features provision to modulate carrier frequency at a minimum of 30% at 1000 cycles.—*FM-1; Gertsch Products, Inc., 11846-48 Mississippi Ave., Los Angeles 25, Calif.*

Ultralow Frequency Bandpass Filter

A FREQUENCY BAND PASS FILTER with both the high and low cutoff frequencies independently adjustable from 0.02 to 2000 cps, has been produced. Gain is unity in the pass band and drops to a rate of 24 db/octave outside the pass band.

No peaks greater than 1 db in the gain vs frequency plot are said to be produced. —*Krohn-Hite Instrument Co., 480 Massachusetts Ave., Cambridge, Mass.*

Pulse Generator and Calibrator

A PULSE GENERATOR AND CALIBRATOR that produces two rectangular pulses of short duration whose amplitudes and polarities can be independently controlled, has been introduced.

External sync input has a positive polarity, an amplitude of 10 volts and a repetition frequency of from 50 to 500 pulses per second. Internal sync output has a positive polarity, amplitude of 50 *v* open circuit, repetition frequency of from 50 to 500 pulses per second, and a duration of 1 microsecond. Calibrator output is available in amplitudes of .1, .3, 1, 3, 10, 30 and 100 volts, with a 60 cps square wave*form.—PC-100; Department TE, Teletronics Laboratory, Inc., 352 Maple Ave., Westbury, L. I., N. Y.*

Production

Solder Pot

A SOLDER POT, the crucible of which will not crack when the heat is turned off, has been announced. Brazes formvar or enamel insulated wires without pre-stripping or pre-cleaning. Manufacturer claims that there is no need to keep the temperature on low heat during non-use hours. Unit is self-contained with a rheostat, manual control, for maintaining temperature levels. Fused with a 5-amp fuse and equipped with a 66-inch rubber-covered connecting cord. Size is 12¾" deep by 10⅝" high by 8½" wide.—*Tartak-Stolle Electronics, Inc., 3970 South Grand Ave., Los Angeles, Calif.*

Plastic Film Veneer

FILM-LIKE SHEETS (32" x 48") with woodgrain finishes, have been developed. Material can be applied to a smooth surface, either flat or rounded.

Patterns include blonde, medium and dark shades of oak, walnut, mahogany and prima vera. In addition, one leather and two marble reproductions are available.—*Transveneer Plastic Film Veneer; Di-Noc Co., 33 Public Square, Cleveland 13, Ohio.*

Adhesive Backed Felt Tapes and Sheets

REINFORCED FELT TAPE with pressure-sensitive adhesive back has been announced. Product does not require a paper or other separation material between layers. Available in rolls from ¼" to 66" wide and in the following thicknesses: 1/64", 1/32", 1/16" (100' long); ⅛" (50' long); ¼" (25' long). Also available as a cut gasket, diecut to specifications.—*Kling-Felt; Products Research Co., 5426 San Fernando Rd., Glendale 3, Calif.* Address inquiries to J. N. Schien.

Blue TV Lamp

(*Continued from page* 17)

volved in frequent lamp changes. In addition to long life it is essential that the light output remain high during this period of burning. Accordingly, a study of this characteristic was made, and the results plotted, in an average lumen maintenance curve; Fig. 5.

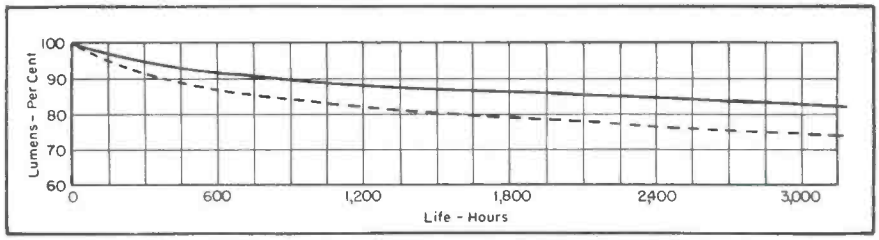
Although it has been found that the initial cost of these bulbs is greater than that of standard incandescent lamps, the long-life feature has resulted in a cost reduction. For example, on the basis of completely lamping a small studio with standard incandescent lamps, an operating cost, including maintenance, of $1.84 per million lumen hours has been estimated. The cost of completely lamping the same studio with the *blue lamps* has been found to be $1.57 per million lumen hours.

Lamp's Features

Compared with certain types of available light sources, the *blue lamp* offers long life with attendant cost reduction; improved spectral characteristic for use with camera tubes; good color temperature from standpoint of the psychological effect on talent, etc.; flexibility of control, and ease of handling and stocking.

It is believed that still further improvements are possible, and development work is continuing.

Figure 5
Lumen maintenance plot. Solid line represents results from 500-TV lamp, and dashed lines show results from 1500-watt lamp.



Industry Literature

Eitel-McCullough, Inc., San Bruno, Calif., has released a 4-page booklet describing a schedule of maximum salvage values allowed for the return of certain used Eimac tubes. A total of 50 tubes are listed.

Cornell-Dubilier Electric Corp., South Plainfield, N. J., has compiled a manual, *TV Replacement Guide TVR-7*, listing over 400 TV twist-prong electrolytic capacitors. Guide lists alphabetically the names of 68 set manufacturers, set model numbers and chassis numbers, recommended C-D twist-prong electrolytic replacements, physical and electrical characteristics and a cross index of former electrolytics and present equivalent part numbers. Priced at $.50.

The Thomas & Betts Co., Inc., 82 Butler St., Elizabeth, N. J., has issued a data sheet, *S4*, detailing technical information on self-insulated *Sta-Kon* terminals with insulation grip.

John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., has published a 344-page book, *Linear Computations*, by Paul S. Dwyer, math professor at University of Michigan. Described in terms of elementary algebra are the theorems and methods involved in solving simultaneous linear equations. Included is material on determinants and matrices. Priced at $6.50.

Sylvania Electric Products, Inc., Emporium, Pa., has published the eighth edition of the Sylvania *Technical Manual* in a snap-open, loose-leaf format. Manual contains technical data on more than 500 receiving-type tubes, standard TV picture tubes, and general information on vacuum tube operation. An 84-page engineering data section includes text on fundamental electrical laws, properties of vacuum tubes, definitions of radio terms, general tube and circuit information, tube dimensions, use of curves, resistance coupled amplifier data, information on obsolete tube types, tube base diagrams, and data on panel lamps, ballast tubes and plugin resistors. Priced at $2.00.

Engineering Products Department, Radio Corp. of America, Camden, N. J., has published a 16-page brochure, *2J8024*, describing magnetic tape recording equipment for professional broadcast use. Detailed are a magnetic tape recorder, custom-built recording and editing equipment in rack or console combinations, and accessories including remote control units, metering panels and vacuum equipment for holding tape in place during cutting and splicing operations.

Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif., has released an issue of *hp Journal* which describes a new low-frequency function generator, model *202A*, that is said to provide frequencies as low as 1 cycle per 100 seconds and sine, square and triangular wave outputs.

General Radio Co., Cambridge, Mass., has published an issue of *The Experimenter*, which describes decade resistors and a multirange filter for audio and ultrasonic amplifiers.

Magnecord, Inc., 360 North Michigan, Chicago, Ill., has released a catalog detailing a line of magnetic tape recording equipment for professional use. Described are conversion and adaption equipment, and accessories such as special switches, spooling mechanisms and adapter panels.

Elliott Manufacturing Co., 350 State St., Binghamton, N. Y., has released an 8-page circular, *207*, describing flexible shafting for power transmission. Included is a table illustrating dynamic torque with varying radius of bends.

Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif., has published an 8-page condensed catalog, *RJC-4*, describing plugs, receptacles and accessories for use with microphones, radios, tape recorders, amplifiers and television cameras.

Allen B. DuMont Labs, Inc., 750 Bloomfield Ave., Clifton, N. J., have released a 28-page stockholders' annual report for 1950 with the financial statement for the year. Included is a review of the company's activities during the past ten years.

Federal Tool Equipment Co., 532 Mulberry Street, Newark 5, N. J., has published an eight-page bulletin, *No. 253*, on the *tweezer-weld bench-head* line for small parts welding. The line is said to feature single pair electrodes, double pair electrodes, two welds simultaneously and bench heads with automatic wire feed and cut off arrangements.

VWOA News

Old, Old Timer John B. Gambling, whose morning broacasts over WOR, during the past two-decades, have been welcomed into millions of homes, has become a VWOA'er. Way back in '13 John began pounding brass as a member of the British School of Telegraphy in London. In July '14, he received his radio operators license. Ten days after the outbreak of World War I, he enlisted in the British Navy as a radio operator. He served on several ships of the British Navy, including three years on a converted fishing trawler minesweeping in the North Sea. On several occasions, in '16, he was mentioned in dispatches for meritorious service. In early '19 he was released from the British Navy, but after a few weeks ashore, he decided to return to sea again and joined the British Merchant Marine where he remained until in '20, when he decided to do a bit of seagoing with the U.S. Merchant Marine, an assignment which lasted five years. During three years of this period he sailed aboard the SS Creole. In February, '25, John quit the oceans, married, and set sights for a land job. The search ended quickly, thanks to his friend Jack Poppele, who asked him to join WOR as a radio operator. After operating awhile he transferred to WOR's engineering department and then to announcing. And since that moment, 26-years ago, John has been running WOR's 7.15 to 8 AM daily program. When World War II broke out, John again offered his services to his country, but he could not meet the medical requirements of the Navy. So, he turned over to the Coast Guard, his 40-foot cruiser for the duration. . . Another new member in our fold is Jesse W. Holland, whose key days began in the U.S. Navy in April, '17. Until October, '19, he served as radio operator, and from Jan., '21 until Aug., '23 he was with RCA Communications at New York. He has served with the FCC and is currently working with the *Voice of America*. . . W. H. Medd, U.S.N. (Ret.), has told ye secretary that his career in radio began 50 years ago, when he studied visual signals and electricity, while in Europe on board the USS Chicago, at the time Marconi made his transatlantic record. He completed courses of the Navy Wireless and Electrical school in '03-'04 and was assigned to Highlands, Navasink, as electrician, second class under Jack Scanlon, chief of the station. "During a cruise to South America, while serving as apprentice, second class aboard the USS Dixie," he said, "de Forest conducted his first sailing reports of the Lipton Sailing Races from the Highlands of Navasink."

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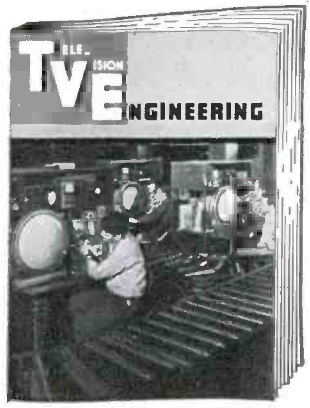

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Briefly Speaking . . .

TV CENTERS IN NEW YORK CITY, in the dream stage for years, are rapidly skipping off the drawing board into the land of reality. On the west side of the city, *WOR-TV* is constructing a streamlined building which will centralize all of the studio, film and remote operations. On the east side, on the site of the old Central Opera House building, *DuMont* has broken ground for a 7-story building which will provide five studios for live telecasts, and two for the coordination of film and remote programs. In addition, there'll be facilities for the engineering and programming staffs. . . . *G.E.* has made an agreement with *20th Century Fox Film Corp.* to develop color studio equipment to be used with the Swiss Eidophor projection system for theater television. . . . *Thomas Scott* is now representing *The Workshop Associates*, division of the *Gabriel Co.*, in Michigan. . . . *Radion Corp.* has appointed the *George E. Anderson Co.*, 1901 Griffin St., Dallas, Texas, as rep for Texas, Arkansas and Louisiana. . . . *Jerome T. Keeney* has retired recently from *Simpson Electric* after 35 years as a sales engineer of testing equipment and panel instruments. . . . *William Dubilier*, technical director and founder of *Cornell-Dubilier Electric Corp.*, South Plainfield, N. J., sailed recently for a stay of more than three months in Europe, covering England, Austria, Germany and France in connection with C-D business. . . . *David C. Prince*, a vice president of *G.E.* on the president's staff, and formerly head of the general engineering and consulting laboratory, has retired after 32 years of service. . . . *Edwin I. Guthman and Co., Inc.*, have recently opened a 55,000 square foot plant, the former home of Howard Radio Co., in Attica, Indiana, which will duplicate the Chicago plant operation. . . . *G.E.* will construct a 20,000 square foot manufacturing building on a two-acre site along New Jersey Route 29, Springfield, N. J., for *Precision Laboratories, Inc.*, now located in Irvington, N. J.; Precision is a manufacturing unit of the G.E. components division. . . . *Westrex Corp.*, and *Reeves Soundcraft Corp.*, have completed negotiations under which Westrex will distribute on a world-wide basis the complete line of Reeves Soundercraft magnetic recording films, including not only standard 35-, 17½- and 16-mm magnetic coated films, but *Magna-strip*, a narrow strip of magnetic material coated on clear motion picture film base. . . . *Hytron Radio and Electronics Co.* is now a division of *CBS*. . . . The third edition of Kaufman's *Radio Operator's License Q&A Manual* is now available, according to John F Rider Publisher, Inc., 480 Canal St., New York 13. . . . *LaPointe Plascomold Corp.* has purchased *The Sculli Machine Co.*, East Hartford, Conn., manufacturer of aircraft parts. . . . *International Resistance Co.*, Philadelphia, Pa., has purchased the *Hardy Instrument Co.* Further operations will continue under the IRC name, and will be transferred to the specialty division at 401 N. Broad St., Philadelphia, Pa. . . . *General Radio Co.* has begun construction of a plant in Concord, Mass., a three-story brick-faced building of 72,000 square feet, providing facilities for about 200 employees.

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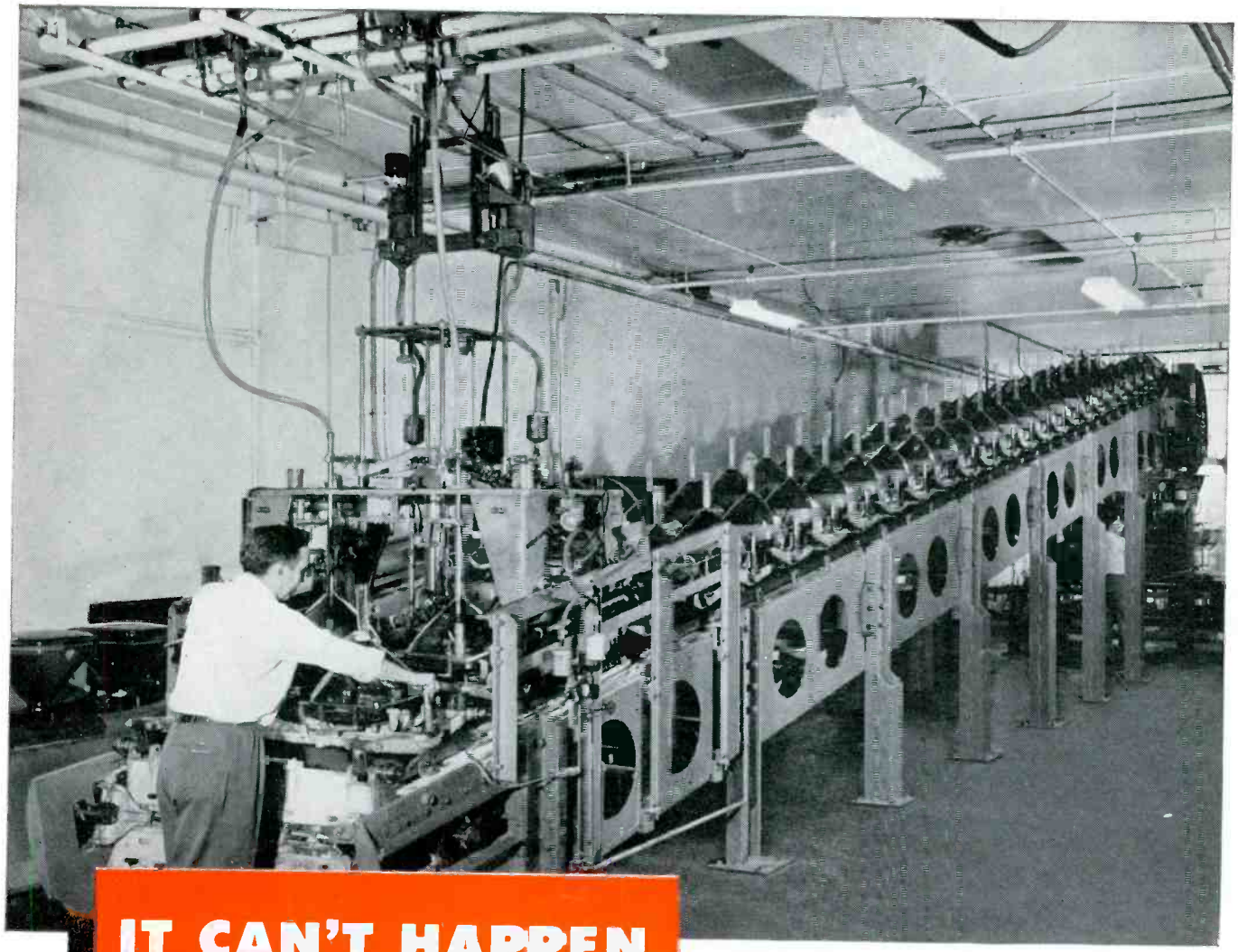
TELEVISION ENGINEERING

AUGUST, 1951



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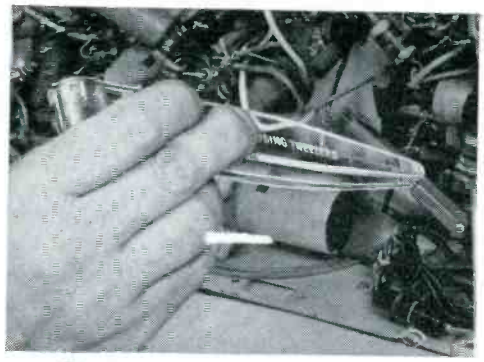

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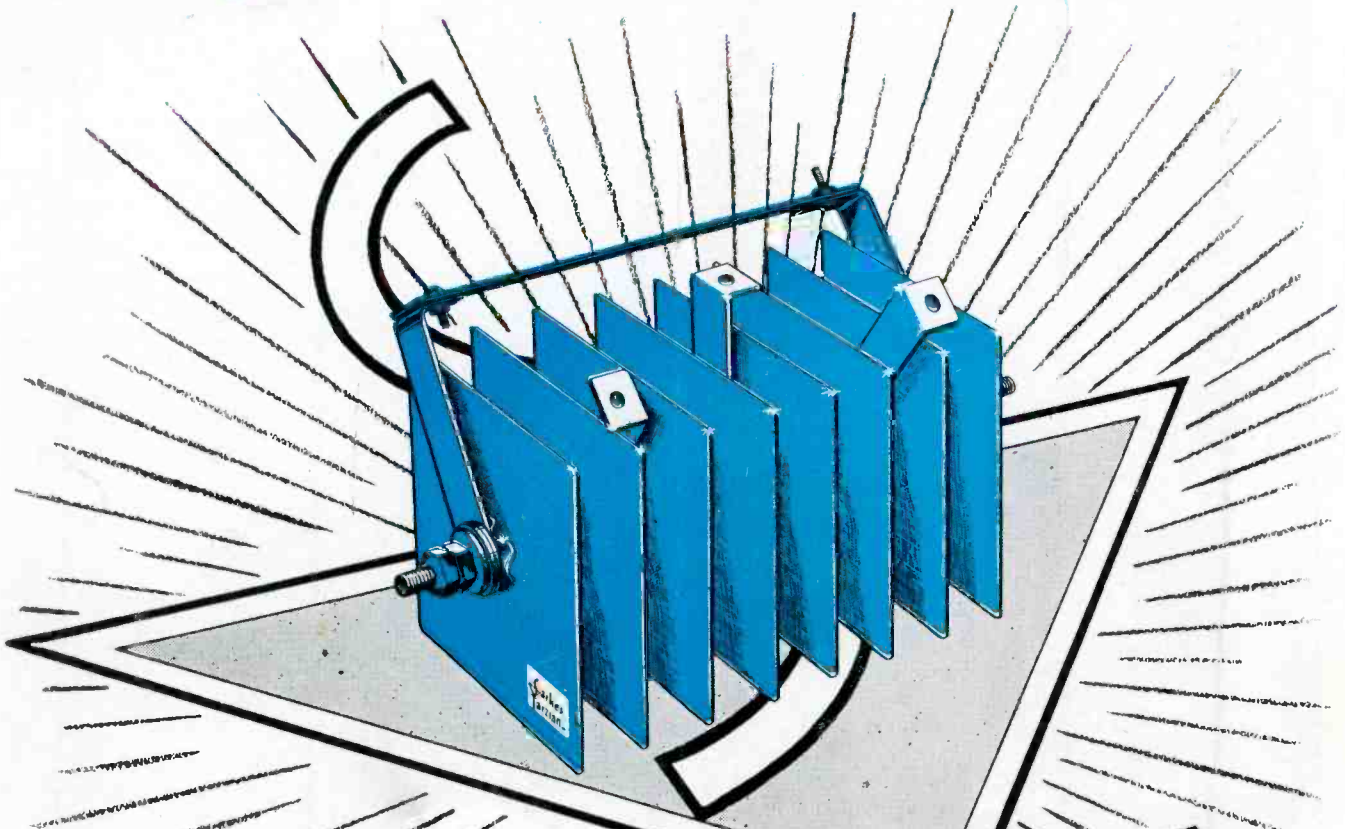

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