



## Telephone Sets in Color

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*The author (left) and E. C. McDermott checking pigmentation of the new 500-type color sets.*

**Today's color-conscious homemakers can now choose a telephone that blends or contrasts effectively with the general decor. Eight colors are presently available, and are meeting with widespread approval. The engineering of these new telephone sets involved several interesting problems, both in the matter of color preference and in the use of materials.**

The demand for telephone sets in color has grown rapidly because customers have found them to be attractive as well as useful instruments to have in the home. Supplying color sets has become possible because the needs for telephone service are now being met substantially on a current basis.

The latest telephone set, the 500 type, has been made available in eight colors which have met with quite widespread approval by the telephone customer. This is not to imply, however, that color is something new in telephone sets. Actually, colored telephones of the handset type are almost as old as that kind of telephone instrument itself. In 1930, shortly after the introduction of the handset, a small group of artists and decorators was consulted to obtain suggestions for suitable colors. This group, among whom were Virginia Hamill, Harvey Wiley Corbett, Ralph Walker, Lee Simonson, Norman Bell Geddes and John Vassos, selected five colors: ivory, gray-green, old rose, Pekin red, and dark blue. In addition, several so-called metallic finishes — old brass, dark gold, statuary bronze and oxidized silver — were also provided.

All of these finishes were obtained by the use of suitable paints or lacquers applied to the handset and base of the original hand telephone set. This is the type that required a separate bell box. The finishes were also applied to the early "combined" set (302 type), in which the bell and all necessary components were assembled in one metallic hous-

ing. With the advent of thermo-plastic materials and their subsequent use in the housing of the 302-type set, the five basic colors were reproduced in these materials in 1941. Since no practical method of reproducing the metallic colors in plastic had been developed, these finishes continued to be supplied on a more or less special basis. No particular effort was expended during the years immediately following the war to promote sales of color sets, since the Bell System was directing most of its efforts toward furnishing basic telephone service to fulfill customers' demands. During these years, however, the development of the new 500 set was undertaken with the knowledge that it would ultimately be provided in color. Consequently, the design of the set was engineered to permit its economical manufacture either in the conventional black or in color.

With the launching of the 500-type set into full scale production in 1950 and with the anticipation of a greater demand for color, it appeared desirable to review the field of color. Inspection of the production reports of the previous years revealed that ivory sets represented 70 per cent of the sales, green 12 per cent, with the other three colors making up most of the remainder. In view of this and the known changing of color preference with time, it was decided to obtain the services of a specialist in color styling. Through the office of Henry Dreyfuss, the industrial designer retained by the Labora-

tories for appearance design of apparatus, the services of Howard Ketcham were obtained. Mr. Ketcham has worked with American industry for over twenty years to make products more appealing to more people by the scientific use of color. His color recommendations have been used for automobiles, airplane interiors, trains, marine equipment and for more than one hundred industrial and home furnishing products, ranging from fountain pens to prefabricated houses.

Mr. Ketcham was asked to recommend a line of colors for the telephone which would be appropriate for present-day trends in interior decoration, and would also have a reasonably long-range appeal. In other words, instead of high-style colors that go out of fashion rapidly, good basic colors that would wear well over the years were desired. Originally, six colors were proposed: ivory, green, beige, red, gray, and brown. At the same time, a poll of the telephone companies as to what colors customers requested indicated that a blue and yellow should also be made available, and these two colors were added to the line. Telephone sets in these eight colors comprise the full color series of sets, with handset, housing and dial in color, a clear plastic finger wheel on the dial, and matching or harmonizing cords. A supplementary line of two-tone sets has also been made available in which a color housing in any of the eight colors replaces the standard black housing, with handset, dial and cords remaining black.

To permit economical manufacture of color sets, a number of interesting problems had to be solved. For example, the handle of the 500 set requires special treatment in design, because, for economical molding, its wall sections should be fairly uniform in thickness. Thus it is necessary that the handle be essentially hollow. With the black 500 set, this handle is compression molded from a phenol-



*Fig. 1 — E. C. McDermott testing the transmission characteristics of the 500-type color set.*

formaldehyde compound. Compression molding is employed because the compound is thermosetting; it is molded into the correct handle shape at high pressure and high temperature, and the subsequent chemical change causes the material to harden. The basic resin of the phenol-formaldehyde material, however, is a rather dark amber and does not permit pigmentation to light colors. Even though some pigmentation is possible, the nature of the material is such that it soon becomes darker on aging. The handset handle for the color telephones is therefore made from cellulose acetate butyrate, the basic materials of which are essentially water-white. It can be provided in any color by adding suitable dyes and pigments. This material is thermoplastic, which permits molding by the injection technique. The material is heated to a plastic state and then is injected into a relatively cool, closed mold, where the plastic hardens essentially on contact and can be removed with little time needed for cooling.

The housing, the dial number plate, and the transmitter and receiver caps of the set are also



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GEORGE A. WAHL received a B.S. degree in Electrical Engineering from New York University in 1934. He joined Bell Telephone Laboratories in 1927 and was concerned with the development of telephone transmitters and receivers from that date until 1930. Until 1941 he worked on the development of handsets and telephone sets and the application of plastics to telephones. During World War II he was engaged in the development of transmitters, receivers and loudspeakers for the military. He was later in charge of a group working on coin collectors for public telephones. Mr. Wahl has since been supervising a group engaged in the development of telephone sets and associated equipment including color telephones and the recently announced Speakerphone. He is a member of the American Standards Association.

fabricated with butyrate by injection molding. So far as the molding processes are concerned, the shapes of these parts are less complex than that of the handle and are therefore more readily adaptable to the injection method.

The color of the characters on the dial number plate, which are white on the standard black set, had to be determined for each of the colors to attain maximum contrast and legibility. A new polyvinyl chloride compound had to be developed for the jacket of the cords so that it could be pigmented and still would wear as well and be as

smudge-proof as the neoprene used for black cords. This involved problems of color fastness, perspiration resistance, and marring of furniture finishes.

With the solution of these problems both in design and manufacture, the Western Electric Company undertook the production of the color sets. Limited quantities became available early in 1954, and their ready acceptance by customers is attested to by the fact that Western Electric manufactured over a million sets in color in 1955. The present expectation is that shipments of well over double this quantity will be made in 1956.

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### *Variety of Businesses Help Western Electric Supply Bell System Needs*

The town of Southfield, Massachusetts has a unique business—Turner and Cook—a company that has made buggy-whip cores since the middle 1700's. Once these cores, which are wrapped with canvas to form buggy whips, were made from whalebone, but today they are made from water buffalo hide imported from Asia, India and the Philippines. Turner and Cook also make rawhide mallets for the Western Electric Company according to Bell System specifications.

This old firm is only one of some 30,000 suppliers who helped Western Electric meet its commitments to the Bell System and to the U. S. last year. In 1955, Western spent about one billion dollars in payments to suppliers for goods and services. Geographically these suppliers are located in over 3,000 communities in every state in the Union and in 26 foreign countries.

Many of Western's suppliers are leaders in their fields, such as the Gorham Manufacturing Company, one of the country's oldest and foremost silversmiths. Gorham's principal product is its famed silverware, but for many years the firm has manufactured for Western Electric component assemblies for waveguides, used to transmit microwave frequencies in some of Western's U. S. government-contract electronic systems.

Another example is the Bard Parker Company of Danbury, Conn., which supplies a large percentage of the removable surgical blades used throughout the world. For Western, Bard Parker's 300 people make, among other things, a wide variety of highly precise component parts for the No. 1A card translator used to route calls across the nation in direct distance dialing. The Gilbert Clock Company of Winsted, Conn., also assists Western. Established in 1810, Gilbert makes and adjusts spe-

cial telephone keys for carrier equipment manufactured by Western Electric.

In a less familiar field is the Ludlow Sales and Manufacturing Company of Needham Heights, Mass., which is one of the prime producers of jute yarn and "roving" in this country. Western uses these materials in the manufacture of cable, and Ludlow, with its large interest in India, is a reliable source of this vital material.

Western buys Bell System supplies, raw materials and equipment from small firms as well as large. In fact, more than 90 per cent of last year's 29,980 individual suppliers are classified as "small business"; that is, less than 500 employees. Washington Machine and Tool Works in Minneapolis is one of these. Its 60 people, of whom 80 per cent are stockholders in the company, do an annual business of some \$1,500,000 with Western. Another small supplier is Diecraft, Inc., of Baltimore. This firm began in 1932 with three people in a small walk-up loft in Baltimore as a machine engraving shop. Today the plant employs 350 people. Harry Dundore, the founder and present head, feels that the greatest impetus to his business came when he started producing work for the Western Electric Company some twenty years ago.

One small business which Western is particularly gratified to count as a "partner" in its supply function in the Bell System is the Paraplegics Manufacturing Company located in a remodeled garage in Franklin, Ill. Here some twenty-five paraplegics, persons with spinal core injuries which paralyze their legs, work on jobs for W.E.'s Hawthorne Works. Another "partner" is Chicago's Lighthouse for the Blind, where for some thirty years W.E. and several other firms have been providing work on a subcontract basis for blind people.