# WE

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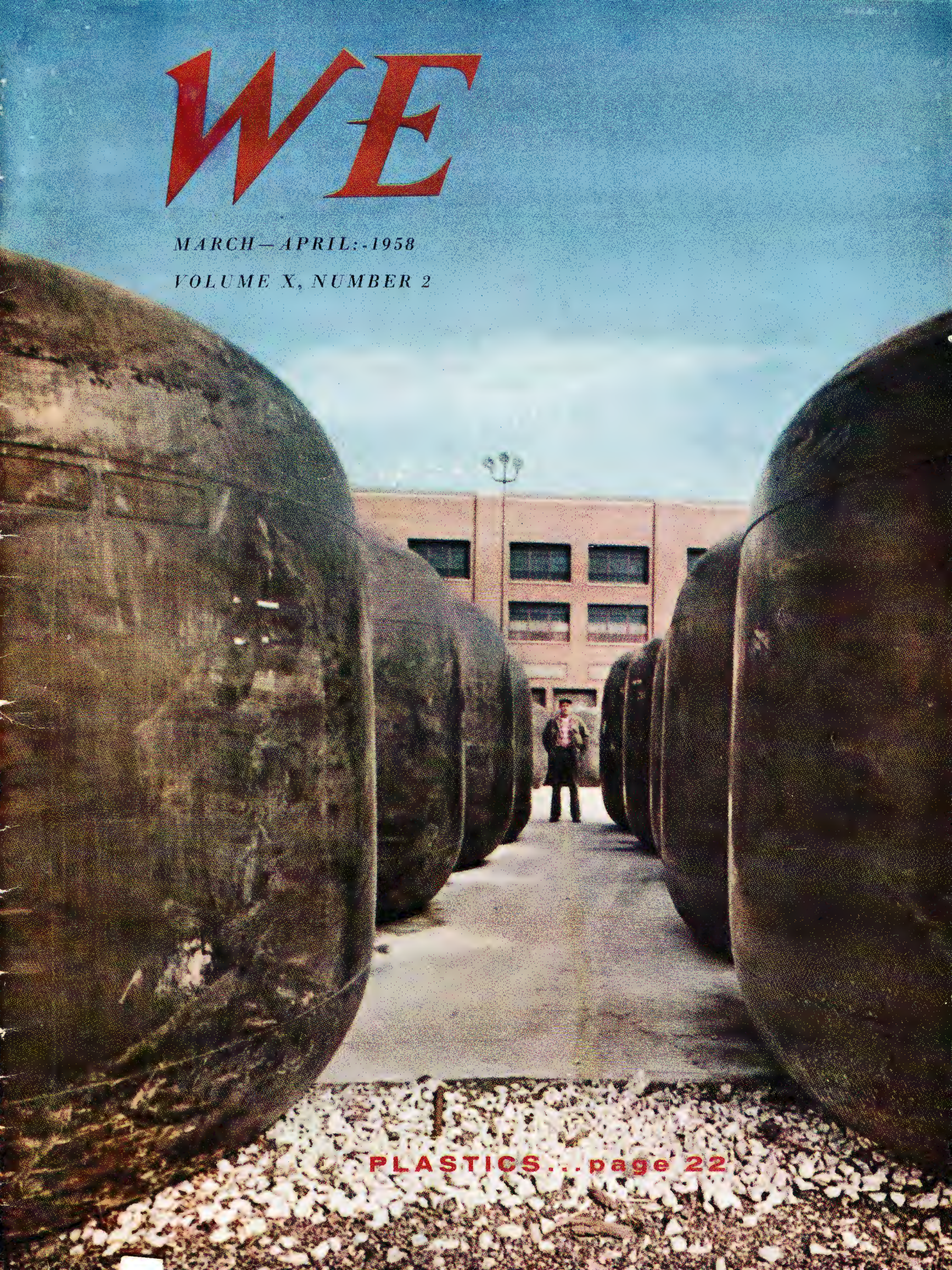

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Volume in which plastics are used by W.E. is indicated by these rows of huge airtight bags of plastic (also shown on this month's cover) on a storage pad at Point Breeze. Called Sealdbins, the bags are made of neoprene plastic. Each one holds 10,000 pounds of polyethylene granules for insulating wire. In the distance is William Ritter, whose job title—"Polyethylene Attendant"—is a symbol of the plastics age at W.E.

# PLASTICS

***Praised as a wonder material, maligned as a cheap substitute, man-made plastics have proved themselves as the Bell System's No. 2 raw material***

HARD AS NAILS, soft as butter—tough as leather, brittle as glass. Also: dense, spongy, supple, rigid, thick, transparent, opaque, rubbery, stiff, colorful, dull.

Plastics are all of these and more. Indeed, these man-made materials with their bewildering variety and range of physical properties are among the wonders of the post-war world.

Suddenly, almost unnoticed, plastics have outstripped such traditional basic materials as lead and zinc. Still thought of by many as a cheap substitute or as the stuff toys, baby bottles and ice cube trays are made of, plastics emerge today as industry's most versatile material and perhaps the one with the brightest future.

In the telephone industry evidence of the quiet revolution that plastics have wrought can be seen as dramatically as anywhere.

Last year Western Electric paid nearly $29 million for plastics—not enough to challenge copper seriously as the leading Bell System raw material, but sufficient, with some to spare, to displace steel as the No. 2 purchased material.

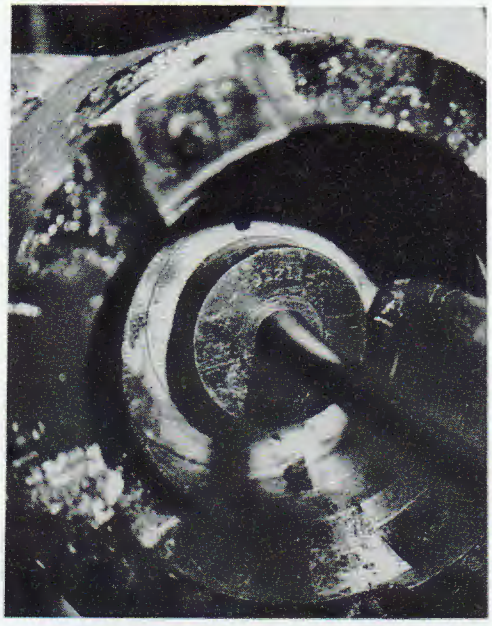
At W.E. manufacturing locations today, plastics abound. Black and viscous, they ooze from cable extruding presses; brightly colored, they ride streams of air into wire insulating machines; soft and pliable, they fill the intricate cavities of molding dies; film-like, they roll through coil winding machines.

Plastics gained wide fame in the Bell System with the flowering of the color telephone. Yet only about ten per cent of the plastics used by Western Electric goes into the making of the telephone set. Switch-

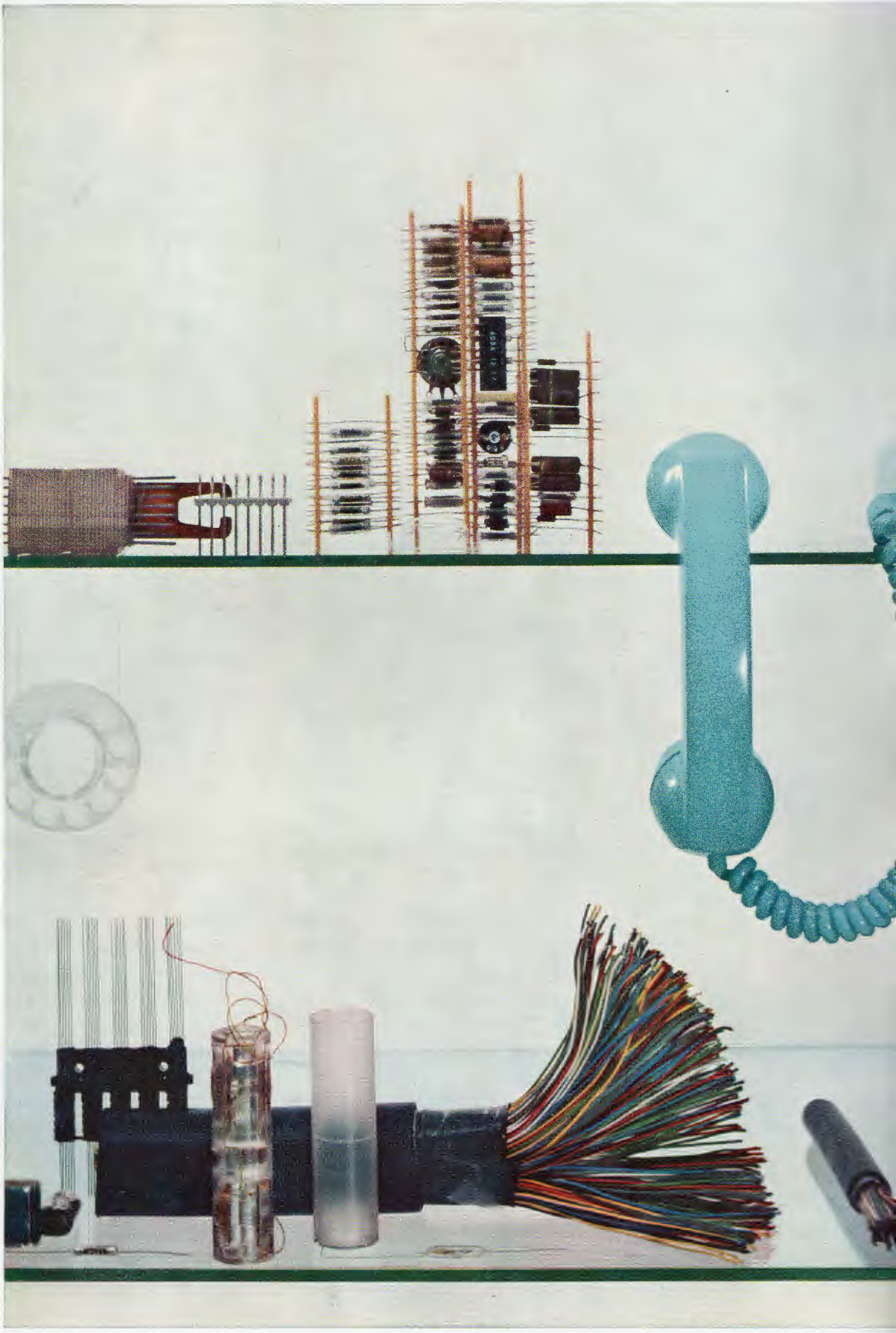
*(text continues on page 26)*

Aluminum tubes reach down to feed plastics granules into wire insulating machines. Tubes are part of an ingenious conveyor system developed by W.E. engineers for handling plastics at Point Breeze.

Plastic granules, shown in the eighteen colors used in making telephone products, served both functional and esthetic ends. In the functional sense, plastic-insulated copper wire is color-coded in ten different hues for use in cable; esthetically, plastic in eight colors enhances the appeal of the telephone itself. *(At right)* Tough, long-lasting polyethylene, blackened by a carbon additive to reduce sensitivity to light, is extruded on exchange area cable. *(Below)* Edward Smith removes plastic covers for wire spring relays from injection molding press which makes parts in one operation at Hawthorne.



***In the world of plastics the horizon seems unlimited. Plastics help man to make things that nature left unmade***



Some well-known uses of plastics: cast resin terminals; "Miniplas" assemblies, including plastic-enclosed and encapsulated components; telephone set and cord; plastic-interleaved coils; "combs" for relays; precision machined parts for undersea repeaters; plastic-sheathed cable with a plastic-wrapped core of plastic-covered wire.

Above: Jerry Symoniak, who operates a compression molding machine at Hawthorne, checks the intricate dies used to make plastic-and-wire "combs" for wire spring relays.

Right: Samples of plastics are taken from suppliers' barrels as they are unloaded from freight cars at Hawthorne. Herb Ferreri will put samples through a series of tests before okaying the shipment for use.

Below: The specialized knowledge of several engineers is brought to bear when a new plastic is introduced into use. Studying a plastic base printed wiring circuit at Hawthorne are Frank Jana, Milton Lewis, Charles Eden, Rollin Whitaker, and Ansel Worley.

boards, Crossbar bays, cable and wire, relays, electron tubes, semiconductors, carrier units, telephone cords, and many more telephone products are prominently plastic in part.

This year more than 60 million pounds of plastics will be molded, extruded, stamped and machined into telephone products at Western Electric. In the next two years, look for a sharp increase.

What catapulted plastics into real prominence in the Bell System was the development some five years ago of plastic-sheathed telephone cable and the processes by which it can be made. Today plastic protects thousands of miles of telephone cable, largely replacing the lead sheathing formerly used.

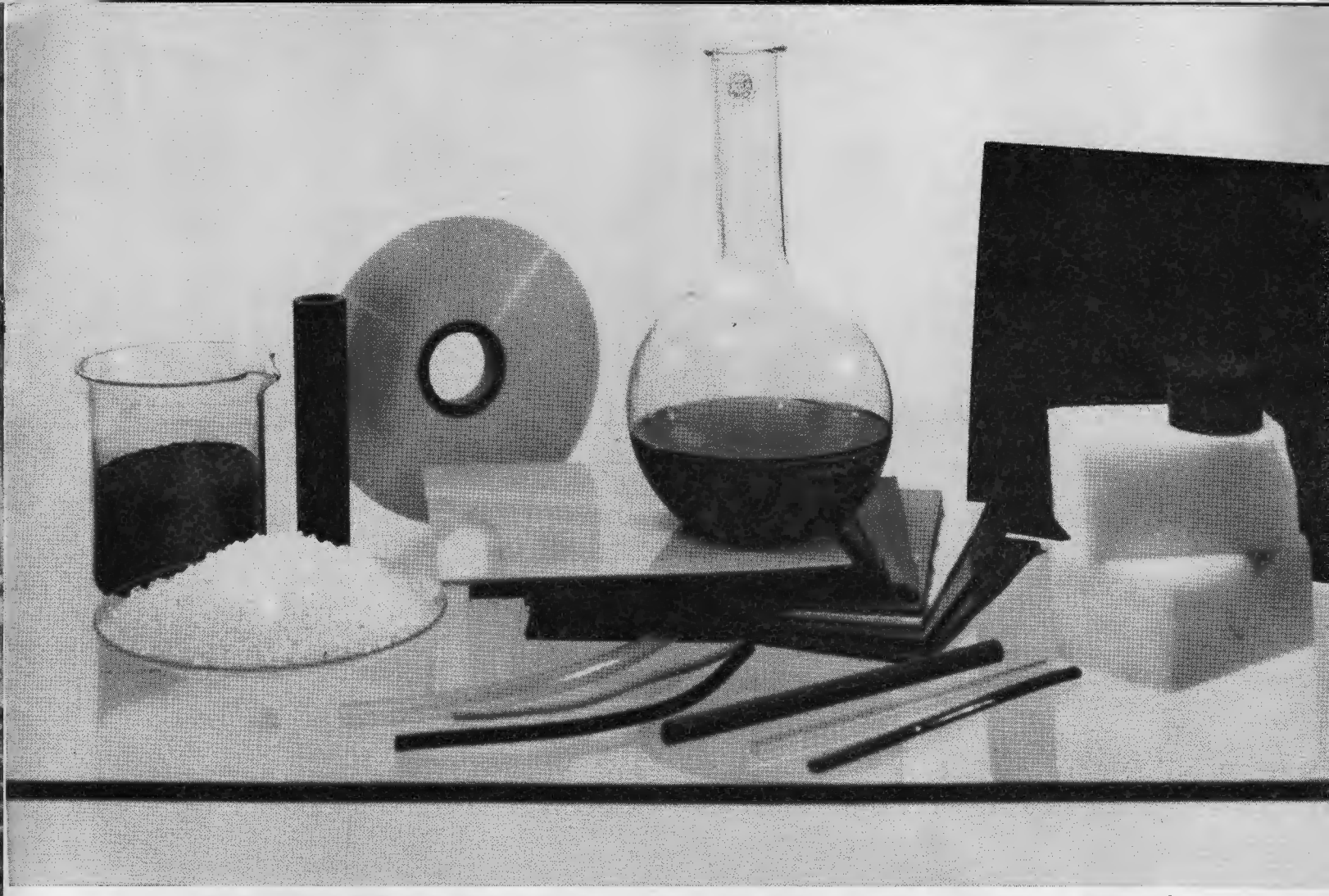
The consequences of this changeover have been remarkable. First, the use of plastic instead of lead brought about an enormous saving—more than ten million dollars each year in raw materials alone. Second, the plastic-sheathed product is in many ways superior to its predecessor. It is tougher, less susceptible to damage, and lighter, easier to transport and work with. And polyethylene has a quality of moisture-resistance unknown in any other material.

Lest it be thought that plastics have only the most favorable attributes, it should be added that they do have peculiarly unpredictable traits. The story of polyethylene is a case in point. When first used, it was found that the material, while amazingly tough and long-lasting, had powerful enemies. Light and heat, scientists found, caused oxidation that shatters polyethylene molecules.

But the good qualities of polyethylene were not to be passed up lightly, so Bell Labs scientists tackled the problem of overcoming the deficiencies. In the laboratory and in the plants of W.E. suppliers, experimentation was carried out on a large scale. Finally, the answer was found. Now certain ingredients are added to plastic by the producers of the sheathing plastic: lampblack to check the ravages of light, and specially developed antioxidants, to guard against attack by heat.

In the story of polyethylene sheathing can be found practically all of the many virtues of plastics: they are cheaper than most other basic manufacturing materials; they can be formed into almost any shape by any number of processes; they offer an incredibly wide range of characteristics; they are man-made, and their nature can be changed as needed.

Although the post-war plastics revolution happened at an awesome rate, it came as no great surprise to a group of Western Electric and Bell Labs engineers



Plastics come to W.E. factories from many suppliers in many forms—as powder, as granules, as liquid, and so on. A product of modern chemistry, plastics are made by a process known as "polymerization." Thereby an organic material is changed into a totally different compound having giant molecules made up of long chains of atoms. Polyethylene, for example, is made from gaseous ethylene, a by-product of the cracking of petroleum. Under heat and pressure, or by the addition of catalysts, the gas changes into a remarkable solid.

who had been working with plastics for many years.

Rollin Whitaker, a Hawthorne engineer who is one of W.E.'s top plastics experts, wrote the first Bell System plastics specification—No. 58267—back in 1929. It was for a phenolic molding compound for telephone handsets, which had, in fact, been made of plastic for some time before the actual "spec" was put down in black and white.

Since then both W.E. engineers and Labs people have pioneered both the development and use of high-quality insulating plastics. Many of the standards for the plastics industry were written by Western Electric engineers and published as a guide for plastics makers and users in the *Standards of the American Society of Testing Materials*, the raw materials engineer's bible.

At times it was an uphill battle, for in the early days of the plastics revolution the emphasis was on appearance rather than performance. Indeed, W.E. men can take much of the credit for the existence of plastics with high dielectric quality, with stability even when moist and with a long life expectancy.

And while these pioneers were busy upgrading plastics, other W.E. engineers were devising ingenious ways to handle and shape the marvelous new materials. Their achievements—as significant in their own way as the development of the materials themselves—have helped speed the plastics revolution.

On the horizon are new things in plastics that will change the shape and substance of many of tomorrow's telephone products. At Bell Laboratories they will show you a telephone handset made of a new kind of plastic, a first cousin of polyethylene, only much harder, completely stain-resistant (polyethylene is not), and much less expensive.

And at Hawthorne W.E. engineers are experimenting with the polymerization (changing an organic material into a totally different compound) of plastics by means of nuclear energy. The implications are immense, for it is conceivable that materials, changed by radiation, will yield a new material having a molecular arrangement never before achieved.

The age of plastics is still ahead.