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THE NEW HOME OF THE ENGINEERING DEPARTMENT

By J. W. HORTON*

DATA are at present not available as to the extent to which the deplorable condition of the shoemaker's wife and the blacksmith's horse extends to the laboratories of instrument makers. However, in view of the reports prevalent on such matters the General Radio Company has given special attention to the new laboratory facilities recently made available to its engineering department.

The anniversary issue of the *Experimenter* referred to the new building

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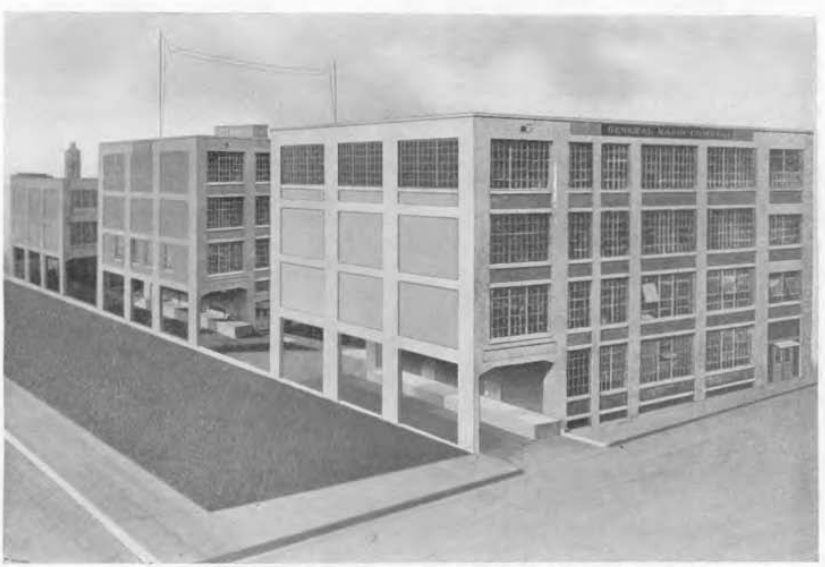

FIGURE 1. The plant of the General Radio Company at Cambridge, Massachusetts. The new laboratories occupy the second and third floors of the right-hand wing

FIGURE 2. A typical laboratory. It will be noted that the power outlets are so located that they may be used conveniently for apparatus on the bench or on the shelf. Each outlet has its own switch and pilot lamp

unit being added to the General Radio plant. The primary purpose of this new building was to provide suitable space for the engineering department which, due to its growth during the last two years, was finding its previous quarters somewhat crowded.

The laboratories in use have been designed with the particular requirements of our organization in mind. The nature of our engineering problems is such that both the technical and the commercial phases may most effectively be followed by a single individual, consequently each engineer's room is, to more than the usual degree, a combined laboratory and office. While convenience and orderliness are highly to be desired in any laboratory, they are especially necessary in one serving this dual rôle.

Beginning with the building itself, considerable pains were taken in planning the construction so that the engineering quarters might be as comfortable as possible. To this end the partitions have been constructed of material having sound-absorbing characteristics and the ceilings have been specially treated to make the rooms as quiet as possible. In addition, the heating system has been arranged to provide ventilation without the necessity of opening the windows, consequently both outside noises, including those from the remainder of the plant, and sounds made within the laboratory are so attenuated that they create little disturbance in the several rooms.

The results of this arrangement are more than gratifying and it is felt that the physical comfort thus provided will amply repay the effort made.

In planning the laboratory facilities,

the combined experience of the engineering department was called into consultation. The resulting arrangement is indicated in the illustrations of Figures 2 and 3. It will be noted that the space beneath the benches is entirely used for organized storage of apparatus which should be preserved or which should be continuously available. The danger of having this space exhibit the characteristic appearance of a back attic or a woodshed is thereby avoided. The cabinet space between the drawer sections is provided for batteries. The bottom shelf is arranged for filament batteries and the top shelf for high-tension batteries, which may be either dry cells or storage cells. Wiring to the batteries is facilitated by setting the benches forward a short distance so that a space is left between the backboard and the wall. This space is crossed by the supports of the benches and hence may be used as a convenient channel for leads when apparatus separated by an appreciable length of bench is to be connected. It has been found that this simple expedient contributes much to avoiding the clutter which so frequently exists when temporary circuits or experimental set-ups are involved.

The desirability of providing a centralized battery was considered. Several proposals were made but none had fewer defects than the simple system of maintaining an adequate supply of charged batteries and a regular routine for renewals. The batteries in each laboratory are inspected daily.

The shelf shown above the laboratory bench is planned to carry apparatus accessory to that on the bench proper. It is particularly convenient for the

FIGURE 3. A laboratory set-up. A study is being made of the performance of a number of tube-driven tuning forks. The relay-rack panel includes a constant-temperature container for housing a precision fork. A stroboscope accurately comparing two frequencies is shown in the foreground

occasional amplifier or oscillator used in conjunction with the experimental set-up on the bench. The height of the shelf has been chosen so that meters placed on it may be read conveniently by an observer working at any part of the bench.

It has been the practice in the General Radio laboratories for some time to mount certain apparatus units on small movable tables known, for obvious reasons, as tea wagons. In most of the laboratories space has been provided under the bench for parking this convenient accessory when not in active use.

As with the construction of the building itself, the reduction to practice of the ideas outlined above has been found to be more than satisfactory. In the time during which the new laboratory has been occupied by the engineering department it has been amply demonstrated that a single room may fill the needs of laboratory, office, or study without having any one rôle encroach on the others.

In addition to the laboratory rooms, which are in general each occupied by two engineers, a number of additional facilities are provided by the new building unit. One room has been set aside for standards. In this room will be kept the primary standards of the General Radio Company with the exception of the master standard of frequency which has quarters of its own. In the standards laboratory are also permanent bridge set-ups of a type which it is not advisable to move about. These will be continuously connected with the necessary auxiliary equipment so that measurements of the primary constants of any piece of equipment may be expedited. The value of such an arrangement to a laboratory engaged in circuit problems is obvious.

The apparatus continuously available in the standards laboratory is

FIGURE 4. The experimental shop. A variety of machine tools are available so that the shop may promptly supply the needs of the most enthusiastic experimenter

supplemented by other units such as oscillators, oscillographs, and the like, which may be readily moved from place to place, as mentioned above, but which are continuously available for use.

The importance of its master standard of frequency to the General Radio Company has become so great that a separate room has been assigned to it. The apparatus which has been in use for some time, and which has been described in the *General Radio Experimenter* and in other publications, is being set up in the new laboratory with certain additions which it is believed will increase still further its already high precision.

The Experimental Shop, which has for some time been a part of the engineering department, has also been provided with new quarters conveniently located to the laboratories. This shop is on the third floor of the new building unit. Figure 4 shows a general view of the arrangement of this division of the engineering department. As many of our readers know, the function of this experimental shop is primarily to facilitate the construction of apparatus needed by the engineers. Experience has shown that it is highly desirable to separate this shop from the regular production units, thus freeing the workmen from any contact with routine production schedules. The men employed in this shop have had long experience in this highly specialized type of work. The intimate contact thus possible between the engineer designing a piece of apparatus and mechanics familiar with the manufacturing processes is of inestimable value.

FIGURE 5. The engineering library. In addition to the usual library facilities this room provides space for the company's collection of historic apparatus. It also serves as a conference room for the Engineering Department

USES FOR PLUGS AND JACKS IN THE LABORATORY

By A. G. BOUSQUET*

IN the laboratory the space provided under the bench too often becomes the resting place for discarded "breadboards," a procedure which soon proves both unsightly and uneconomical. A satisfactory solution is a "universal breadboard" with possibly a "universal panel" provided with the necessary jacks for plugging in various circuit elements.

Again, the laboratory bench soon becomes cluttered with batteries in various stages of deterioration, if some system does not provide for locating all batteries in a battery compartment and make them available to any part of the laboratory by resort to a simple trunking system.

Distribution systems find many applications. In the laboratory they can be extended to include standard testing frequencies, and unassigned lines can be made available for special trunking purposes. The radio dealer finds a distribution system quite an asset in demonstrating different loud-speakers.

But the "universal breadboard" or the distribution system, to be effectively flexible, must be based on standard plugs and jacks spaced at predetermined intervals. To meet this need the General Radio Company has developed several devices built around the TYPE 274 Plugs and Jacks. A spacing of ¾ inch has been adopted.

Any number of small condensers, resistors, and inductors when individually mounted on TYPE 274-M Plugs can be readily paralleled or interchanged. A few examples are given in the photographs on the opposite page. Grid-leak clips, salvaged possibly from an old grid-leak holder, are screwed to the sides of a TYPE 274-M Plug by two 10–32 flat-head screws ¼ inch long, which replace the setscrews furnished with the plug and make the necessary electrical contact.

The experimenter knows the value of plug-in coils. Why not plug-in variable condensers, meters, rheostats, and even sockets? A TYPE 410 Rheostat and a TYPE 368 Variable Air Condenser are shown mounted on TYPE 274-M plugs. The TYPE 274-P Basic Plug screws very neatly into the binding posts on the General Radio TYPE 349 Socket which is designed for the UX-type tube. An extra plug in one of the socket-mounting holes provides a locating mechanism. The TYPE 438 Socket, designed for the UY-type tube, can be mounted on a bakelite strip fitted with five plugs to adapt it for interchangeability with the TYPE 349 Socket.

The TYPE 274 Transformer Mounting Bases increase the flexibility of an amplifier. To change from transformer to resistance coupling or to compare different types of transformers, it is simply necessary to plug in the required coupling device. The TYPE 274-HP 6-Gang Mounting Base can be used for mounting push-pull transformers and for grounding the transformer case. While the TYPE 274 Bases are designed primarily to mount General Radio transformers, an extra hole or two will adapt them to any device that may be required. As an example, a resistance-coupling unit is shown in the accompanying photograph. Not only the resistors but even the coupling condenser can be changed quickly to meet circuit requirements.

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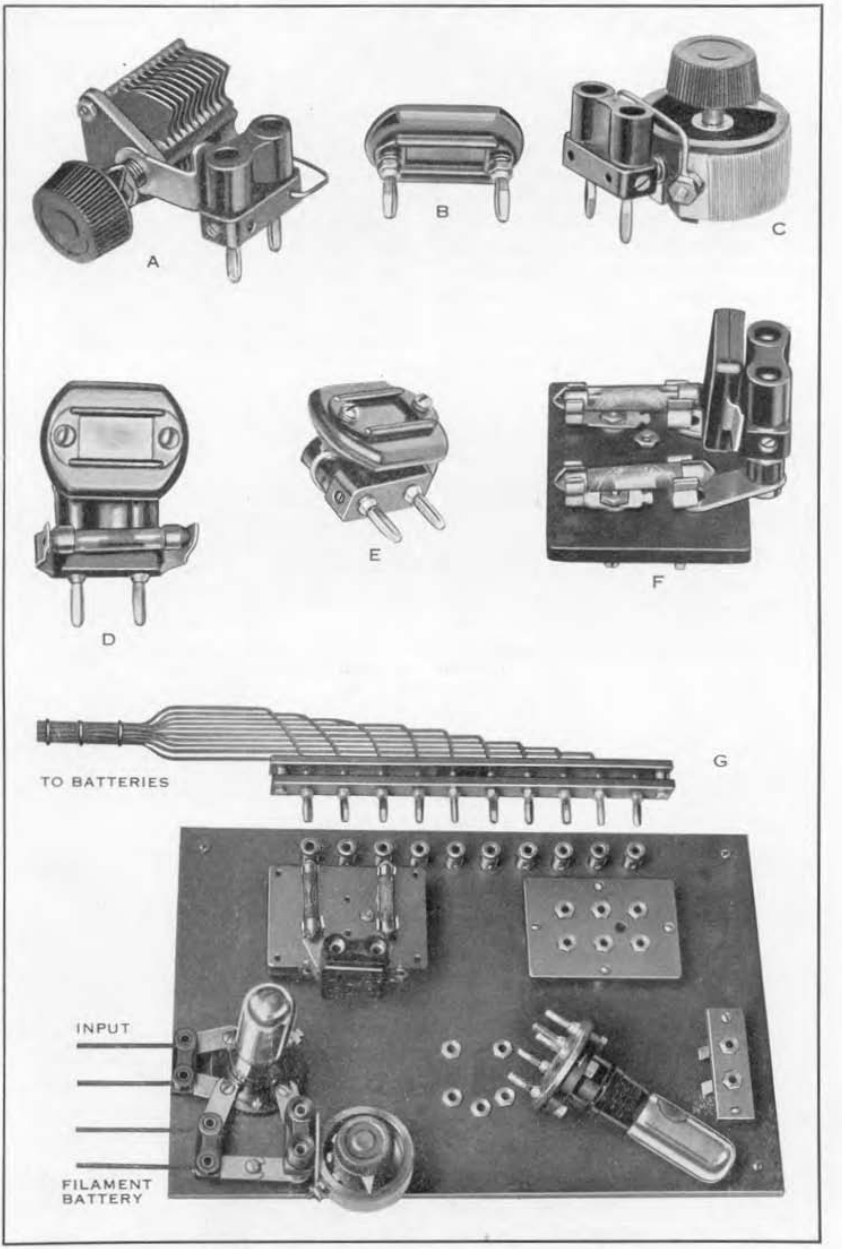

A few common plug-in circuit components, easily built up from standard TYPE 274 Plugs, Jacks, and Mounting Bases

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ONCE a year we look through our stock and offer at bargain prices any items which are not in our current list or of which we have an excess stock. Here is our list for this year. Every item is new and guaranteed. Inasmuch as the quantities are limited, this offer is made subject to prior sale, and in any case, if items are not sold, this special price expires February 1, 1931. Send cash with order, and we shall pay the postage anywhere in the United States or Canada. Minimum sale, $1.00. Be sure to mention "Special Sale" and mail your order to Department X at the Cambridge, Massachusetts, office. This material is not available elsewhere.

TYPE 127-A (flush mounting) and TYPE 127-B (front of panel mounting) 1.5 amp. Hot-Wire Meters for radiation or filament (d.c. or a.c. use).... Regular price $6.00 SALE PRICE **$2.50**

TYPE 164 Audibility Meter. A fine opportunity to keep a record of signal strength.... Regular price $34.00 SALE PRICE **$15.00**

TYPE 170 Hot-Wire Meters 100 mla. to 20 amp. Ranges follow closely those given for TYPE 127 Hot-Wire Meters in Bulletin 932-X. If the size you want is gone, we will send the next largest size unless you instruct us otherwise.... Regular price $20.00 SALE PRICE **$5.00**

TYPE 277 Inductors. Just the thing for experimental circuits. Identical with TYPE 577 Inductors except for location of mounting pins. A, B, and C sizes.... Regular price $1.00 SALE PRICE **$0.35** **(3 for $1.00)**

D¼ and D½ size.... Regular price $1.15 SALE PRICE **$0.40**

TYPE 440-A Filament Transformer. Power rating 70 watts with following voltages available: 2, 3.5, 5, 7.5; all windings separate. Operates from 110-volt, 60-cycle line. Regular price $7.00 SALE PRICE **$3.50**

TYPE 565-A Half-Wave Transformer for 110-volt, 60-cycle line. Power rating 200 watts. Secondary voltages 600, 2.25, and two windings of 7.5 volts each. Corresponding currents 200 mla., 4 amps., and 2.5 amps.... Regular price $13.50 SALE PRICE **$6.50**

	Regular Price	SALE PRICE
TYPE 301 10-ohm Rheostat (without knobs)	$0.80	**$0.20**
TYPE 309 Socket Cushion (sponge rubber)	0.25	**0.05**
TYPE 285 Amplifier Transformers (D, H, and L sizes available)	4.00	**2.00**
TYPE 171-F Switches	0.30	**0.10**
TYPE 587-B Speaker Filter	4.50	**2.50**
TYPE 587-C Speaker Filter	9.00	**4.50**

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