A Dial PBX For Large Residences

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Equipment Development

. . . "and I want telephones here and here and here," a recent Telephone Company advertisement pictures a woman saying as she plans her new home. The advertisement calls attention to the fact that many families who were satisfied with a single telephone not so long ago, now realize the advantages of having several.

Even more evident is a growing appreciation of adequate telephone service for very large residences and country estates, where local service between the rooms is almost as useful as central-office service. To supply the telephone needs of such residences at any hour of the day without a special attendant, a new dial private branch exchange has been produced.

On calls from a central office, the butler or one of the other servants commonly answers at a small cabinet in one of the service rooms, and in one of the living rooms another cabinet may be provided at which a member of the family may answer when desired. Local and outgoing calls require no attention, so that the total addition to the servant's duties is slight. The only evidence of the switchboard in a room where incoming calls are answered is a handset and a small cabinet, in appearance a good-looking piece of furniture suitable for installation in any part of the house.

This new PBX is the third of a series, alike in general design but intended for different fields of use. Each of the three comprising a cabinet for answering incoming calls, a power plant, and the necessary switch and relay equipment, serves less than 100 lines. Since the incoming calls are routed from the cabinet to the desired extension by dialing, there is no manual switchboard at which all the extension lines would otherwise appear, after the fashion of larger dial PBX's. In addition, the arrangement for handling incoming calls permits high efficiency on the part of the attendant in combining other duties with the work of answering calls.

The first of the series to be produced was the 740-A PBX, which provides for a maximum of 88 station lines and is intended primarily for business establishments.* Further simplification and economy mark the 740-B which, also mainly for business use, is a smaller form with as many as 38 lines and 10 trunks. These give the same grade of service, and use the same attendant's cabinet. On account of the smaller number of stations, the 740-B is marked by simplified construction, which has been carried over to the new residence switchboard. The most substantial of these savings has been in the terminal banks for the switches and the corresponding wiring; one bank of terminals, instead of two, is adequate for each switch.

The new PBX system, 740-C, resembles the 740-B in many respects,

* BELL LABORATORIES RECORD, *August*, 1928, *pp.* 399-402.

and also provides for 38 extension lines. Since it is intended for residence use, requirements are different. The traffic is normally much less than in a comparable business installation, and on that account fewer switches and central-office trunks are sufficient. In other respects, however, demands are more exacting. The cabinet must match rooms decorated according to a carefully chosen plan, rather than the somewhat plain and undistinguished furnishings common in business establishments.

The attendant's circuit and the central-office trunk circuits have been so arranged that there cannot be a talking connection between the outside line and the extension unless the attendant's telephone is disconnected. After dialing one of the extensions to complete an incoming call, the attendant can talk to the person calling or to the person who answers at the extension or to both of them alternately, but cannot talk to them at the same time.

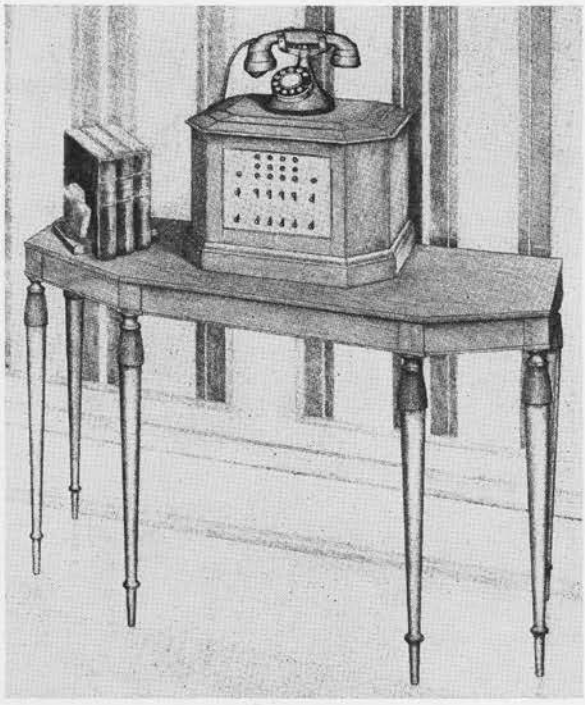

Fig. 1—The small attendant's cabinet, pleasing in appearance, may be placed where convenient

In most large residences it will be desirable to have two attendant's cabinets in different rooms. One of these will be located in the butler's pantry or one of the other service rooms, to be answered by a servant on duty. All calls can be answered there except when its "Switchboard Service" key is operated to transfer control to the second cabinet. This will usually be placed in the lobby, the reception room, the library, the principal bedroom, or some other location convenient for members of the family, but both cabinets may be located in the servant's quarters if such is preferred.

To design a cabinet which would fit into the decorative scheme of any room in which it might be placed, presented quite a problem. A distinctive design of any period or type would of course be unsatisfactory, since it would not harmonize with furnishings of other periods. A mahogany cabinet after Chippendale, for instance, would not be tolerated in an Italian room finished in walnut. Instead of a cabinet for each period, a single cabinet of universal application has been designed. In use it will be mounted on a table, as in Figure 1.

As a basis for the design of the exterior, a survey was made of present trends in furniture. Investigation showed that almost all good furniture is now being made of walnut or ma-

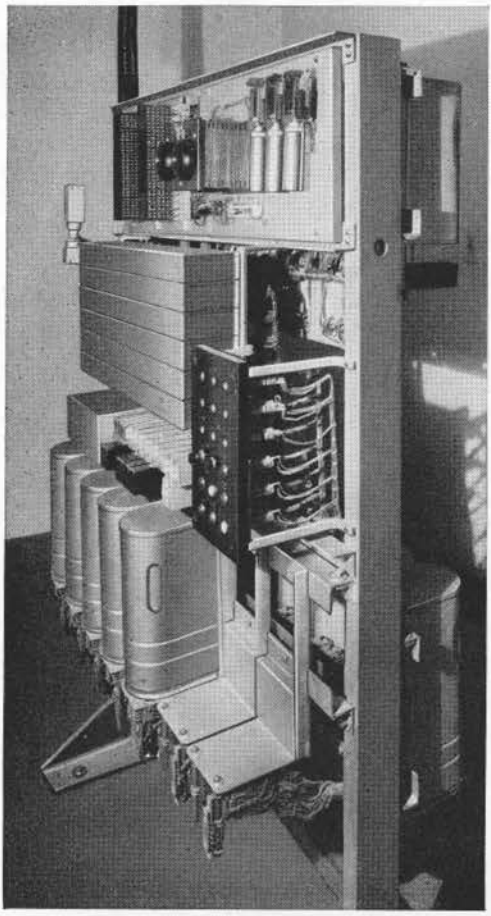

Fig. 2—All the switching equipment is located in a metal cabinet (not shown in photograph) where it is protected yet readily accessible for inspection

hogany, and that appreciable demand for any other wood is at present unlikely. The cabinet is therefore being made of each of these woods. An examination of many pieces of period furniture, originals and reproductions, revealed that finishes vary greatly, but that for each wood it was possible to choose a single finish which would harmonize with almost any setting.

For mahogany, light brown is at present the most popular color, but there is a considerable demand for dark brown as well, and there are indications that dark red may be revived. One very attractive finish shows stripes of light brown and dark reddish brown, so blended that it will harmonize with any of the three finishes most in demand; this treatment was chosen for the mahogany cabinet. Of the walnut finishes, antique walnut is by far the most popular. Since it also harmonizes with the light and dark browns of the single-tone finishes, it was selected for the walnut cabinet. A rich antique walnut finish which was used on an original Queen Anne sideboard has been faithfully reproduced in the new finish. It is particularly striking because of the natural blending of the irregular dark edges into light-colored areas.

Manufacture and installation have been simplified, and at the same time provision has been made for cases where a specially designed cabinet is wanted, by mounting all the control apparatus on an inner frame. Except for the face plate on which keys and lamps appear, this is entirely concealed by the decorative cabinet. The enclosing wooden cabinet is held in place by two concealed thumb-screws, and can be slipped off in a few seconds without disturbing the wiring or apparatus. The main advantage of this construction becomes apparent where an individually designed enclosure for the cabinet is wanted for a room decorated in a unique or unconventional plan. In such cases the inner frame only will be supplied, with the face plate and its fittings finished in accordance with instructions of the subscriber's architect or decorator, and an enclosure will be built by his cabinet maker. In certain other cases, in new residences, there will be a recess in the wall to receive the inner frame of the control cabinet, leaving

only the face plate visible. There, similarly, the standard inner frame will be supplied, unmodified except for the finish of the exposed fittings. Meeting of special demands in this manner means that the only modification of the standard control cabinet necessary under any circumstances is the use of a specially finished face plate and fittings.

While operation is virtually that described previously for the 740-A PBX, and the apparatus within the attendant's cabinet is the same in purpose and in operation, the apparatus mounted on the keyfront has been changed in form to meet the requirements of appearance. Two lever-type key units are used for each trunk circuit, but they are mounted on a single plate which also supports the mountings for the signal lamps, rather than on the customary sheet metal strips. The mounting plate is covered by a face plate which conceals the edges of the lamp sockets and the mounting screws by which the key units are attached, and which gives space for engraved designations at the keys and lamps. Instead of the commonly used key handles of hard rubber, with knurled surface, the handles used are of a shape to harmonize with the cabinet, and are given a metallic finish to match the face plate. With the mahogany cabinet, the surface of the face plate will be statuary bronze, the associated handset will be given a similar finish, and the lamp caps will be green, of the faceted (jewelled) shape. For the walnut enclosure, keys, face plate and handset will be of old brass finish and the lamps will be covered by amber caps.

The step-by-step apparatus is quite similar to that of the 740-A and the 740-B exchanges. A maximum of seven line finders and seven selector-connectors can be mounted on the switch frame, and there is room for relay equipment for four central-office trunks. Thus with all the apparatus installed, seven conversations can be carried on at once, four of them with the outside. Where less traffic is expected, two or three trunks will be installed, and the number of step-by-step switches will also be reduced. In such cases additional pieces of apparatus can be added at any time, should the degree of use increase, without interfering with those previously installed. It is merely necessary to place a trunk unit, or a line finder and selector-connector, upon the supports of the switch frame, and it is ready for service.

Switches and associated apparatus

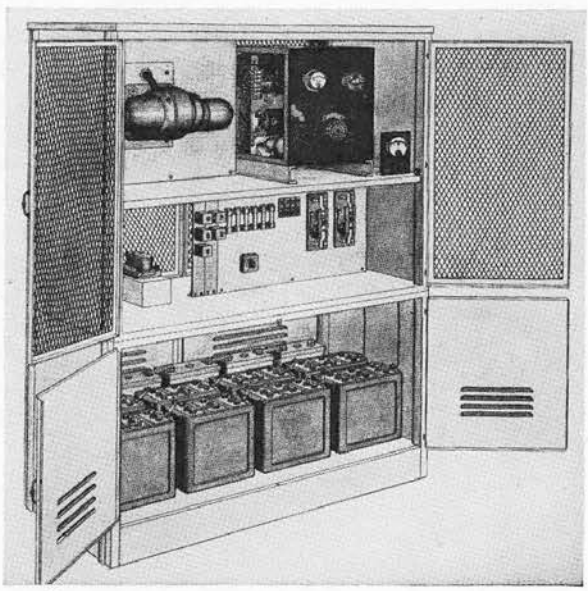

Fig. 3—The compact and self-contained power plant is usually located close to the switching equipment

are mounted on a single frame. On one side are the selector-connectors, the circuits for trunks, and the attendant's circuit. The line finders are mounted on the other side, as are also the line relays for the extensions, relays for transferring the trunk circuits and attendant's circuit from one cabinet to the other, and miscellaneous apparatus.

The power equipment is also like that furnished with the two larger 740-type PBX's, but is arranged somewhat differently. Current is supplied by a 23-cell storage battery, locally charged, and the voltage is maintained automatically between 44 and 50 volts with NAK counter cells. Ringing currents for the extension lines may be secured from the central office to which the PBX is connected or, if a local source is preferable, a motor-generator set may be installed at the PBX to supply alternating current for ringing and signal tones. This set will not normally be in operation, but will be controlled by a relay, and run only when ringing current, dial tone, or busy tone is needed.

Switch frame and power plant will ordinarily be located together, in a part of the house used for storage or for housing mechanical equipment. For each there is an enclosing casing of sheet metal, as a protection from dust. The two cabinets are of the same height and depth, and will ordinarily be placed end to end. Their shape and appearance and their olive-green finish make them attractive and appropriate for any room in which they will be installed.

New Property for the Laboratories

The holdings of the Laboratories in Morris County, New Jersey, have been augmented by the purchase of an eighty-five acre plot known as the Tillou farm and located on the road from Chester to Dover, in the township of Dover. The property will be used by the Outside Plant Development Department in carrying on outdoor exposure tests. A thirteen acre tract adjoining the recently purchased land has been used for the past two years by Outside Plant for experimental work on open wire spacing