

# Improved Apparatus Aids Tandem Switching

*Full Mechanical Tandem Equipment Helps by Reducing Chance of Error*

WITH the increased use of the telephone in large metropolitan areas which require an ever increasing number of central offices it has seemed advisable to install tandem exchanges. This type of central office effects quite a saving in outside plant as each exchange is connected to the tandem office instead of being connected to every other exchange.

But the use of this type of connection of course does not eliminate the chance of error in a subscriber to subscriber call as the number must be repeated several times during the progress of setting up the connection and each time it is repeated there is the chance that it will be misunderstood resulting in a "wrong number" call.

However, with the installation of machine switching offices and the cordless "B" board in the tandem offices the chance for error is somewhat reduced and with the inauguration of full mechanical equipment in tandem offices the chance of getting the wrong number through a tandem connection becomes very small.

The recent completion of additions to the Metropolitan Toll Tandem office on the 18 and 19 floors of the Walker - Lispenard Building in New York make such a system available and creates as near as possible a mechanical brain—less likely to err than the human one.

There have been in operation in New York City for some time, several manual tandem offices and one semi-mechanical tandem office (the original Metropolitan Toll installation). The manual tandem offices serve to connect two other offices in the manual telephone system. The semi-mechanical office performs essentially the same function except that mechanical equipment is employed in the tandem office for completing the connection and in addition it is possible to complete calls to a full mechanical office without the assistance of another operator in the terminating office. The new full mechanical tandem equipment accomplishes in the machine switching system practically the same function as the manual tandem office in the manual system except that it is much more efficient on account of its automatic operation. In order to gain an understanding of the operation of this new equipment a comparison with the

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manual system has been indicated in the accompanying diagram.

Figure "A" illustrates the path of a call between two subscribers served by manual offices where manual tandem routing is used. In this system an "A" operator in the originating office responds to the subscriber's line signal and obtains the order verbally from the subscriber. The "A" operator passes this order verbally over a call wire to a tandem operator in the manual tandem office who in turn assigns a trunk over which the "A" operator may complete the call in the originating office. The tandem operator then passes the order verbally to a "B" operator in the terminating office who in turn assigns a trunk over which the tandem operator may complete the call in the tandem office. The "B" operator then completes the call through her switchboard to the called subscriber's line. It will be noted that in this system the number was passed from one

person to another three separate times and two different trunks were also assigned verbally thus making a total of five verbal operations in the completion of the call.

With the introduction of the machine switching system, a subscriber to subscriber call, corresponding to that just described in the manual system, originating in a machine switching office and terminating in a manual

office was handled, and is still being handled in most cases, by tandem call indicator equipment installed in the manual tandem office. The path of this call is illustrated in figure "B." In this case when a calling subscriber originates a call, the calling line becomes associated automatically with a "sender" through the operation of a line finder and sender selector in the machine switching office. Here it will be well to explain that a line finder is a device which provides the means whereby a calling line gains access to a path through the automatic exchange. The sending selector is a piece of apparatus which selects an idle sender. But to resume, the subscriber upon receiving "dial tone"—that steady humming sound heard by the machine switching subscriber which indicates the line is ready for him to dial—causes the called number to be registered in the sender by operating the dial installed at his station. The sender upon receipt of the desired number, operates automatically to

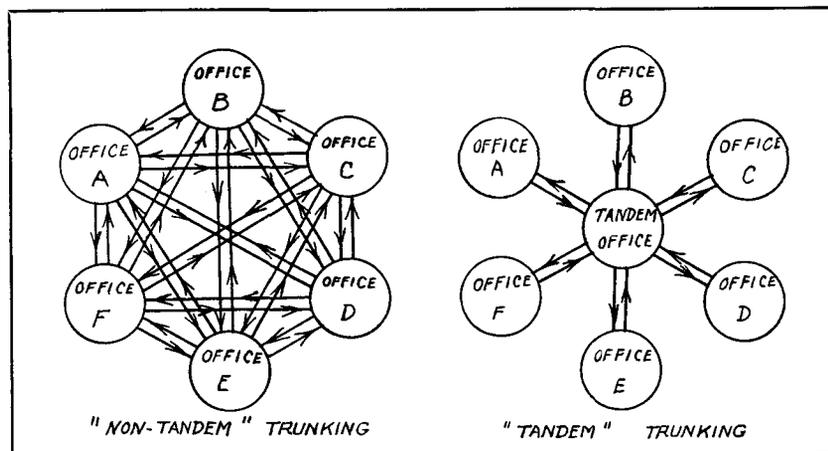


Diagram illustrating the principle of Tandem Trunking. Note that when no tandem office is employed trunks are required to each office from every other office in the area while the introduction of the "Tandem" office permits the use of one trunk group in each direction between the "Tandem" office and each other office

direct a district selector and office selector to a trunk terminating at the tandem board in the manual tandem office. The tandem operator upon receipt of a lamp signal, depresses a key which causes the equipment to function in such a way that the called number and office code are displayed on an indicator at the tandem position. The tandem operator then passes the called number verbally to the "B" operator in the desired terminating office and that operator assigns a trunk over which the tandem operator completes the call in the tandem office. The "B" operator then completes the call in the terminating office to the subscriber's line. With the introduction of the machine switching system, the verbal operations required in the completion of a tandem call were reduced to two, namely: the passing of the called number from the tandem operator to the "B" operator and the passing of the trunk number from the "B" operator to the tandem operator.

With the introduction of the full mechanical tandem equipment, the handling of a machine switching to manual (subscriber to subscriber) call is further improved, as illustrated in figure "C." In this case the call is handled in the machine switching office in the same manner as described above except that a trunk to the full mechanical tandem office is selected. At the full mechanical tandem office, the equipment operates automatically in such a manner as to cause the impulses which formerly served to operate the tandem call indicator to be registered instead in the full mechanical tandem sender, which is associated with the trunk finder and sender selector circuits in the tandem office. The full mechanical tandem sender, upon receipt of the registration directs the tandem district selector to a trunk serving an office selector in the mechanical tandem office. The office selector is in turn directed by the full mechanical tandem sender to a trunk terminating at the "B" board of the terminating manual office. The "B" operator receives a lamp signal to which she responds by depressing a key causing the called number to be displayed on an indicator at her position. The "B" operator then completes the call manually to the called subscriber's line. No verbal operations are required in this call and only one manual operation is involved, that of the "B" operator's completing the call.

The full mechanical tandem system makes possible, for the first time, tandem operation between two machine switching offices. Figure "D" illustrates the operation of the machine switching to machine switching tandem call. The call is originated by the machine switching subscriber in the usual way and is registered in the full mechanical tandem sender in the manner already described. The full mechanical tandem sender directs the tandem district selector and the tandem office selector to a trunk extending to the terminating machine switching office. At the terminating office, incoming and final selector circuits are directed by the full mechanical tandem sender to the called subscriber's line. It will be observed that this call is handled entirely automatically and therefore requires no verbal or manual operations. This makes possible much more rapid and efficient subscriber's service over the tandem route.

A further function of the full mechanical tandem equipment is illustrated in figure "E" which shows the method of handling a call to a toll point originated by a machine switching subscriber. In this case the originating subscriber dials zero and is answered by an operator at the machine switching

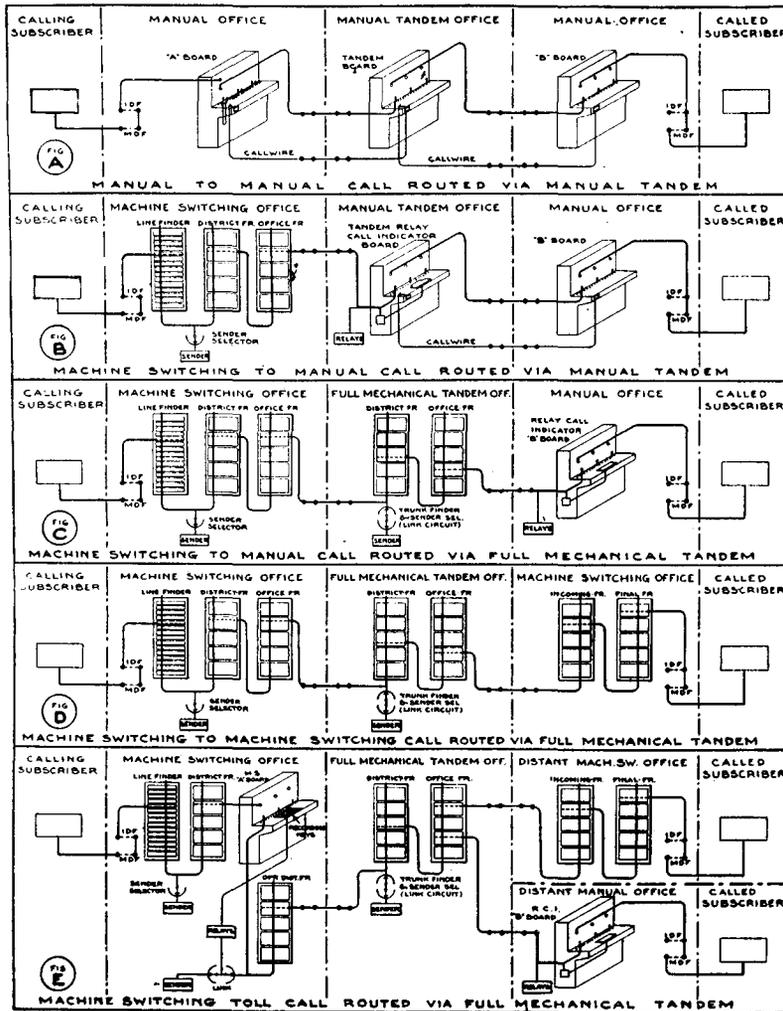


Diagram showing the switching operations for the different types of apparatus

ing "A" board. This operator makes a record of the number desired on a suitable ticket and records it on a set of keys with which she is provided at her position. This record is transferred electrically from the recording keys (which have the general appearance of a comptometer) to a sender which has become associated with the positional equipment automatically through the operation of the link circuit. The operator's sender then directs the operator's district selector circuit to a trunk terminating in the full mechanical tandem office. The number is recorded and the call handled outward from the full mechanical tandem office in essentially the same way as regular

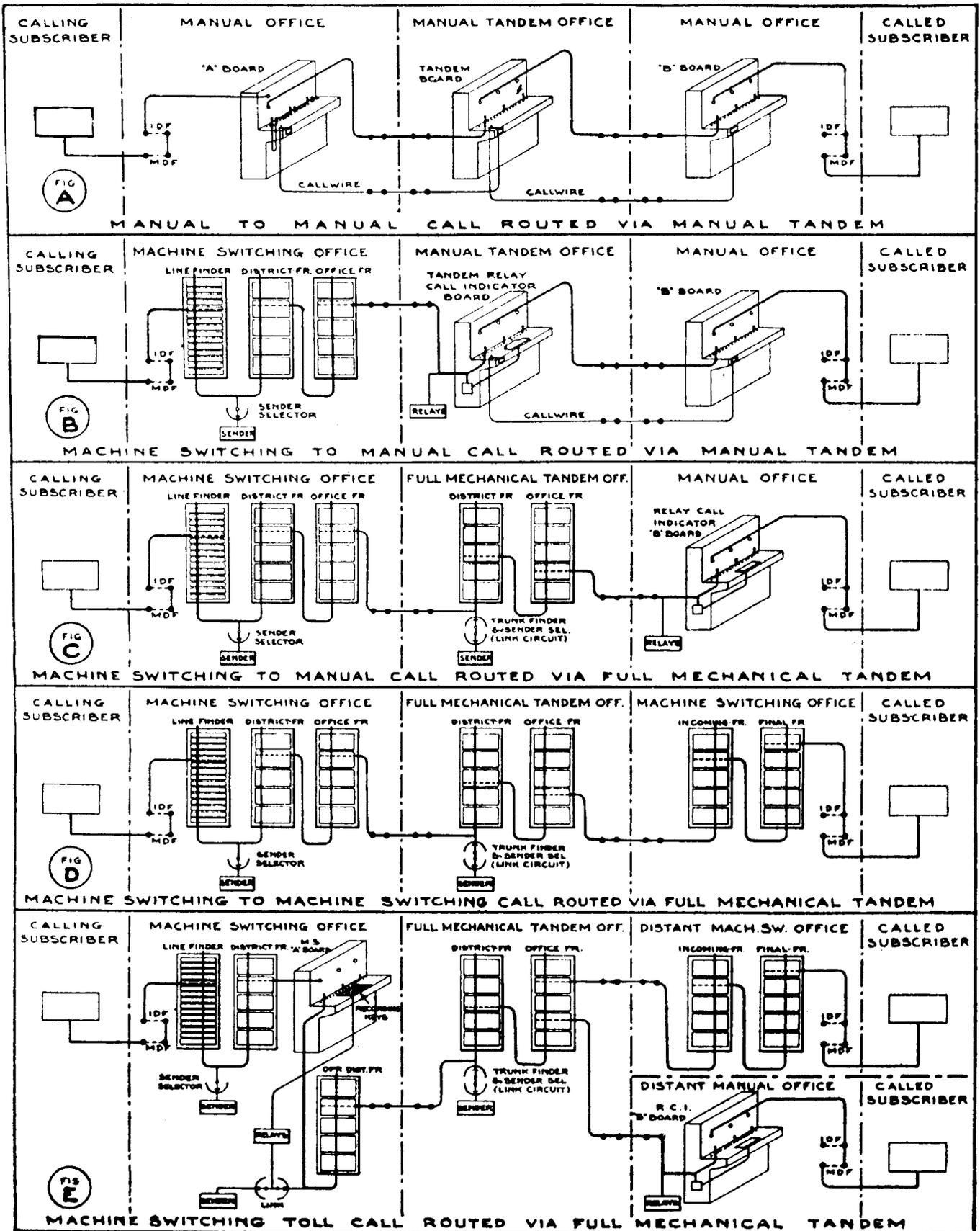
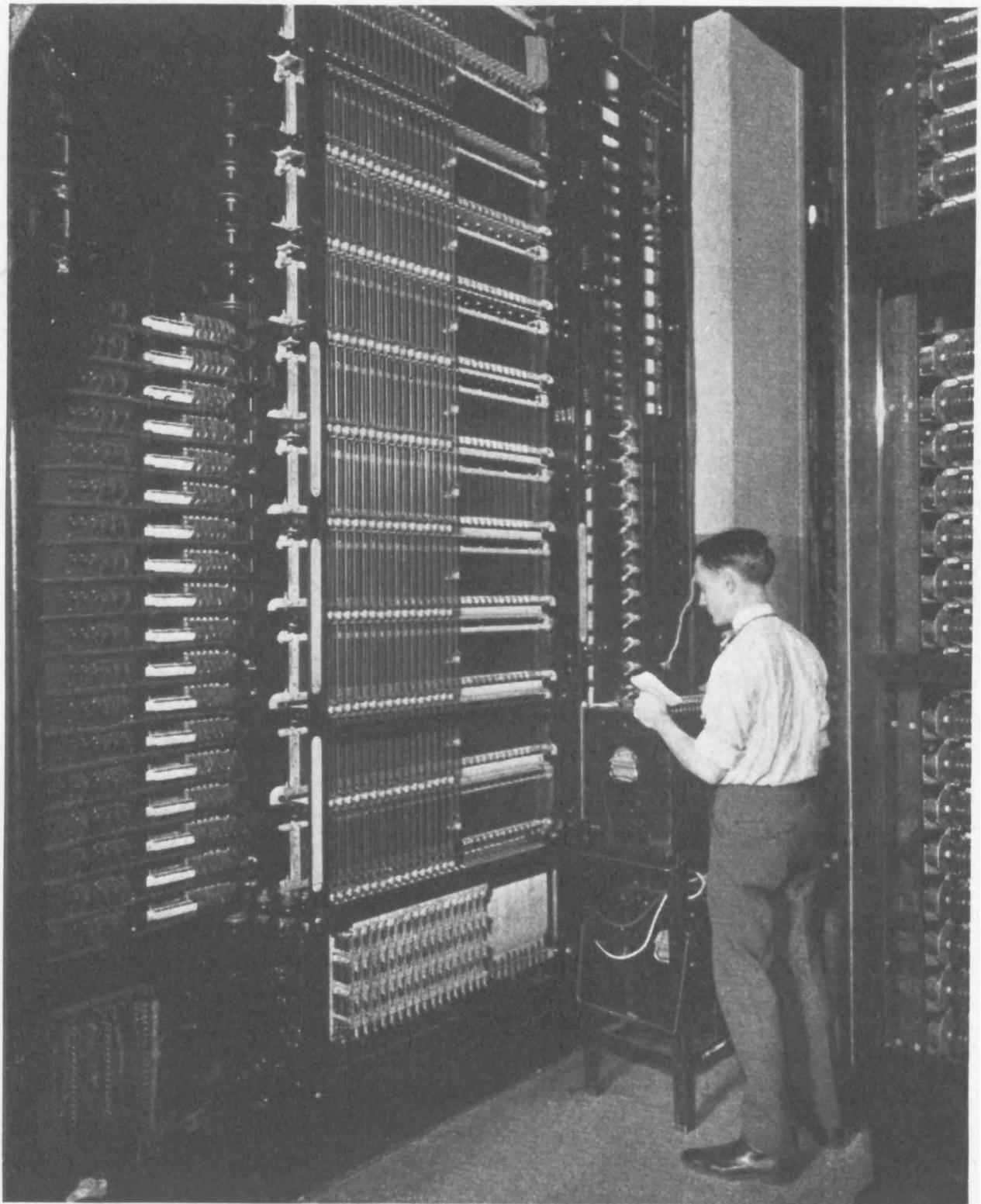
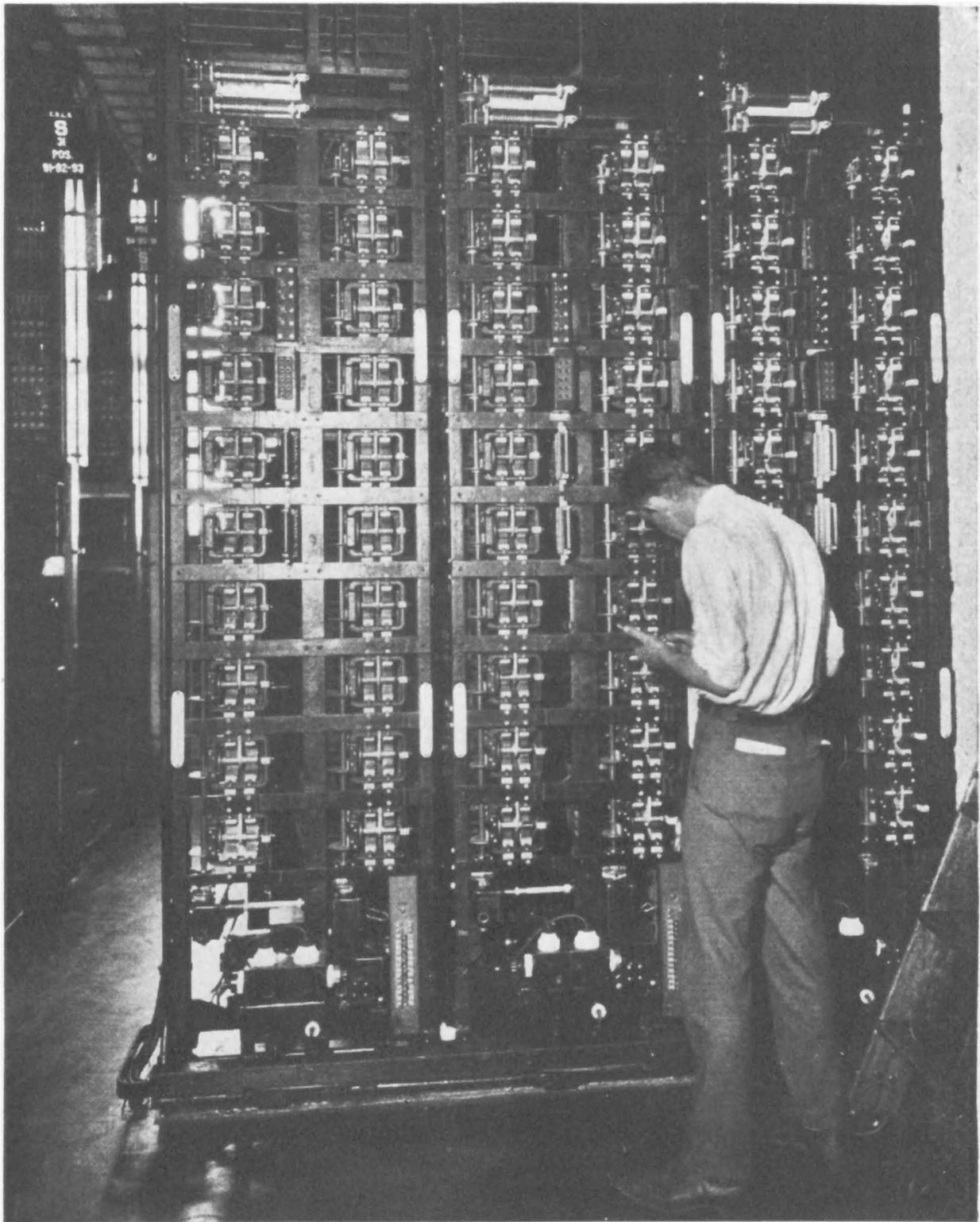


Diagram showing the switching operations for the different types of apparatus



Making "operation tests" on a frame partially equipped with full mechanical tandem translator circuits. These circuits are the "brains" of the sender. When selected by a sender through a "translator finder" they mechanically interpret the called number so as to set up in the sender the proper routing conditions for the call. The translator provides a flexible means of controlling routing of calls as required to meet varying traffic conditions



“Tracing” a call through a full mechanical tandem district finder and sender selector circuit. Each frame has ten of these circuits whose function it is to connect a tandem District Selector with a sender circuit during the time that the sender is required for directing the call through the tandem office to the called office and line