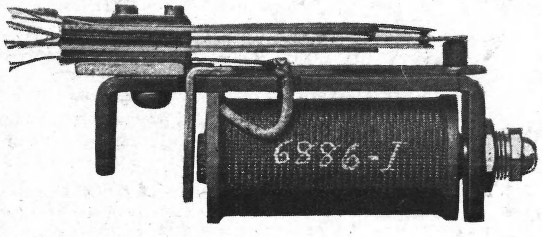
The North
All-Relay
Automatic Telephone System

An Insight into
the Evolution & Advantages
of the "All-Relay" Exchange



THE NORTH ELECTRIC MFG. CO.

GALION — — — OHIO

The Evolution Of The "ALL-RELAY" System

HISTORICAL

The North Electric Manufacturing Company has been engaged in the manufacture of high grade telephone equipment since 1884. As pioneers in the telephone field Mr. North and The North Company occupy an enviable position, and The North Company now owns and controls one of the most important patent groups.

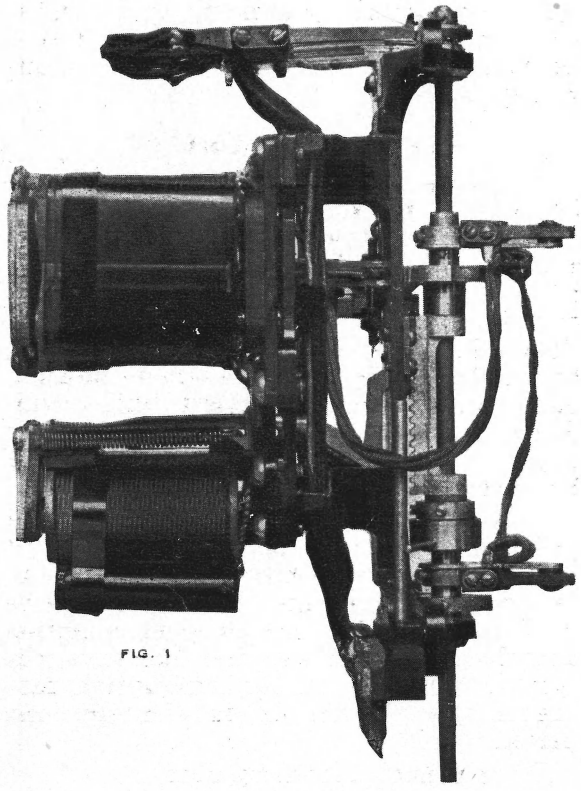


FIG. 1

CITY EXCHANGES

For the past two decades The North Company has engaged in the manufacture and installation of city automatic exchanges. In these, a combination of electrical relays and mechanical switches is employed to perform the automatic switching functions. These two classes of equipment appear in the following functional arrangement:

The RELAY Equipment—Performs Line Selection and Distribution.

The SWITCH Equipment—Performs Trunk Selection and Connection.

Every completed call in such a system therefore traverses a combination of relays and a combination of switches.

THE SWITCHES are protected from dust,
SEE FIG. 1 are inspected,
are routined daily,
are adjusted,
are cleaned,
are lubricated,
are repaired,

because such action is essential to maintain operation.

THE RELAYS are NOT protected from dust,
SEE FIG. 2 are NOT inspected,
are NOT routine tested,
are NOT adjusted,
are NOT cleaned,
are NOT lubricated,

because the faults occurring do not warrant it.

PERFORMANCE

Records of performance in actual service under these conditions show that, of the total trouble (interruptions in service) experienced, only an INFINITESIMAL PORTION IS TRACEABLE TO THE RELAYS; the ratio of cases of trouble to relay operations is, on the average

1 TO 5,216,271

PRIVATE EXCHANGES

These facts inevitably led to the conclusion that, for industrial use, a Private Exchange composed of RELAYS EXCLUSIVELY would provide an ideal automatic telephone system free from interruptions of service and maintenance requirements, and this brought about the inception of the

ALL-RELAY PRIVATE EXCHANGE

MAINTENANCE

"All-Relay" Automatic Telephone systems are thus the latest completed development in the automatic telephone art. They have been designed and constructed with the express idea of reducing maintenance requirements and costs to the very minimum.

The accomplishment of this ideal is plainly seen in the unfailing reliability and continuity of operation achieved by the elimination of mechanical switches with their frictional movements, step-by-step hammering actions, their associated mechanical intricacies such as pawls, ratchets, racks, dogs, spiral springs, etc., and their substitution by the simple electrical relay of which the "All-Relay" system is composed. These relays, once assembled, adjusted, and correctly installed, will, throughout years of operation, not lose their adjustment, not require lubrication, cleaning, repairing and tinkering.

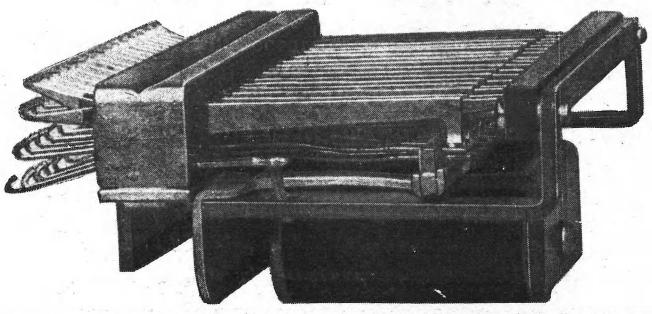


FIG. 2

Practical Merits Of The "ALL-RELAY" Automatic Telephone Exchanges

CONSTRUCTION

THE North "All-Relay" Automatic Telephone Exchange is composed wholly of relays and permanent cables. It consists of a line and cut-off relay for each line, interconnecting relay links in number necessary to carry the required number of simultaneous conversations, (which links are used in common by all the lines) number registering relays, battery feed relays, busy test relays, ringing and ringing current cut-off relays, and signal and overload relays.

The selection relays which connect the link with the calling line when the telephone of the latter is taken for use, and those relays which connect the same link with the called line under the guidance of the calling subscriber's dial are, in fact, knife blade switches having blade springs of German-silver and blades of hard phosphor-bronze, operated by powerful magnets. This method of selection and the relays which perform the selection are a distinctive feature of The North Company's exchange, and are made by no other manufacturer. The line and cut-off relays and the various relays not required to switch the heavier currents are of usual and standard character with double-point phosphor-bronze contact springs, though of especially durable, strong and reliable construction. All other leaf-spring relays are equipped with German-silver springs having double contact points of standard platinum or platinum-gold alloy.

All relay springs are cut in proper relation to grain of metal, having ample margin of pressure at the contact points, and are sufficiently long that the metal is never in danger of straining beyond elastic limit.

All insulation of metal parts is of bakelite especially baked, and practically without change in time.

All armatures are supported on knife-edge bearings, with no pivots to loosen or to require adjustment. Application of motion from the armatures to the springs is in all cases by direct pressure.

The residual studs are of hard non-magnetic metal riveted in place; they are not adjustable, having been initially fashioned of correct size, and there are no attached parts which can work loose, fall out, or change in adjustment with service.

In the leaf-spring relays, in order to ensure permanently uninterrupted operation, the contact points are double, acting in multiple, thus ensuring contact for the reason that, even in the rare event of failure of one pair of platinum contacts, the other pair in multiple with it will not fail at the same time.

All circuit connections are soldered; all wires are highly insulated and bound into firm cables, well fastened to the frame, to prevent breaking by accident or by vibration. All adjacent metal parts are tested for reliability of insulation to 600 volts, A. C.

SERVICE RELIABILITY

So far as can be foreseen by reason of experience of a quarter century in building telephonic apparatus and ten years of studying materials and forces involved, of laboratory tests, and of recording and studying failures experienced, The North Company's relay system has been brought to a condition of solid, reliable enduring perfection which, we assert with confidence, has not been even approached in any other automatic telephone system or like electrical apparatus.

This equipment can be housed in closed and locked cabinets and left for periods of months or years without any attention to the switching apparatus. If the battery be kept charged, the lines in good condition and the telephones and dial operative, the system will work without interruption, failure or attention for an indefinitely long period.

It is not affected by dust.
It is not affected by humidity.
It is not affected by oxidation, by sea air, or sulphurous or acid vapors under any habitable condition.
It requires no adjustment.
It requires no cleaning.
It requires no lubrication.
It is not affected by violent shock or vibration.
It is protected from extraneous destructive currents.
It is indestructible by any currents originating within its own system.
It has the minimum number of contacts in the trunking circuit.
It is not affected by large changes in battery voltage.
It is not affected by large variations in speed of dials.

The contact surfaces are so adapted to the normal current strength that they will not be eroded or worn to the point of failure or of requiring adjustment within a quarter or a half century.

Because of its freedom from change when not manually interfered with, it does not require skilled maintenance. If left alone it does not require the attention or even the presence of electricians who understand the circuits. The wiring in circuits, though complex, is permanent and unless deliberately or accidentally torn never demands attention. The only working parts are the armature hinges and the spring contacts; all these are simple and visible and their functions are obvious, so that a mechanician with the simplest information and the most ordinary skill can by observation discover directly or by comparison whether they are in proper condition and position, or have been damaged, and can restore them to normal.

There are no parts, relations, or functions requiring minute adjustments; there are no variable opposing forces and resistances which, by altering quantitively, can leave the system inoperative.

Excepting the extremely rare chance of defects in insulation undiscovered in our careful testing processes, or defects produced by accident in shipment, or erection, this automatic exchange can be expected to function indefinitely without maintenance work, without inspection and without interruption of service.

For these reasons it can be sealed in dust-smoke-water proof housing, guarded against tampering and interference; and it can be employed in places which are remote and unattended, or where trained, informed, or skillful attention is not available.

JUSTIFIABLE CLAIMS

THIS IS CLAIMING MUCH but these results have been the studied aim of competent designers for many years, and their success has been confirmed by the use of many equipments through long periods under a great variety of conditions.

Such reliability of performance is in fact necessary for telephone service. Telephonic communication is not confined to places and circumstances where technical knowledge and mechanical and electrical skill are available, or where, in the temporary or permanent absence of such skill, frequent or long-enduring failure is tolerable.

We have aimed to and succeeded in producing an automatic telephone exchange which can be installed and uninterruptedly used without skilled attention.

The North Electric Manufacturing Co.

THE North Automatic Telephone System is not a new invention. It is rather a development embodying the latest improvements in the telephone art. The principles involved are the results of more than 40 years of experience in the telephone field. Since 1884 The North Electric Mfg. Co. has been engaged in the manufacture of equipment for public telephone exchanges.

The same careful technical knowledge and the same careful workmanship that go into its public exchange equipment are incorporated in North Automatic Telephone Systems for privately owned installations.

The economy of owning, instead of renting, internal telephone systems is just beginning to be appreciated.

North engineers have been able to make astounding savings in the cost of intercommunication with a comparatively small capital outlay. A traffic study of your telephone facilities will in all probability reveal wastes which are undreamed of. May we make such a study for you without cost?

The North Electric Manufacturing Co.

Galion, Ohio

Manufacturers of
North Automatic City Telephone Exchanges
North Private Automatic Telephone Systems
North Westinghouse Remote Control Equipment
for Electric Power Stations.

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