The NEW McBERTY AUTOMATIC TELEPHONE SYSTEM

THE NORTH ELECTRIC MFG. COMPANY
Galion, Ohio

MEMBERS OF THE TELEPHONE INDUSTRY:

It is most interesting to look back over the 58 years which have elapsed since I became actively interested in the telephone business. In those early days we were greatly concerned over details and procedures which are now so simple and so standardized, that it is hard to realize that they existed as major problems.

It was my great good fortune to be associated with development activities from my earliest days. The long and varied experience gained in the years prior to my connection with The North Electric Manufacturing Company, has been of inestimable value in our more recent efforts. The following partial list will give you an idea of what we had to create:

Self-restoring drop for magneto exchanges.

All of the elements of the early types of common battery switchboards, including magnetic signals, springs, jacks, plugs, cords, line and cut-off relays and the usual keys.

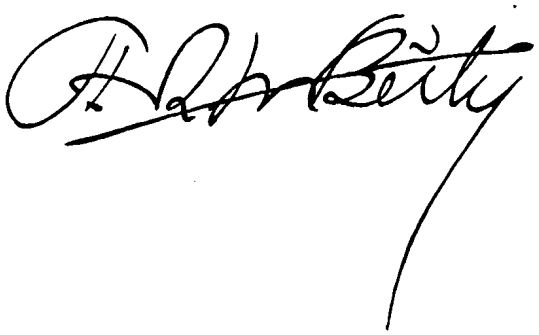
The lamp in place of the magnetic type signal. This involved all of the details of the lamp itself together with its holder, its cap and all related circuits. It was even necessary for us to design and work out the plant facilities required for the manufacture of these items.

The full multiple common battery switchboard which became the foundation for all of the large metropolitan exchanges.

Several varieties of automatic telephone switchboard apparatus including the now well-known Rotary System, still extensively used in spite of its antiquity of design.

When I became associated with North, I found that they had been carrying on an extensive development of telephone apparatus, and that considerable effort had been directed towards telephone instruments and the well-known Automanual System. My own development background plus that of North gave to our enterprise an unusually strong foundation for our further developments. From this, among other things, the well-known and broadly recognized "All-Relay" System evolved.

In presenting our new system to the Operating Companies, we do so with the assurance that we have perfected a type of apparatus which is superior to any so far utilized in the Telephone Industry. We have built around our experience of many years, and have taken advantage of the latest materials and techniques. We have avoided pitfalls in design which have become apparent to us as a result of long and trying experience in the design and fabrication of telephone apparatus, and have left the way open for new ideas and development. We do not expect this or any other apparatus to be perfect. We do feel that, in this design of the present and of the future, we have brought to the Telephone Industry a system which has all of the characteristics needed for successful operation under present day conditions, and adequate flexibility to take care of future requirements as yet unknown.



OUR OBJECTIVE

Experience gained from the installation of a great number of "All-Relay" switchboards led to the conclusion that refinements in this system were possible.

When we first formulated our development program, aimed at an improved "All-Relay" System, certain primary objectives were set up as our goal. We set out to achieve:

The best possible service to the Telephone Subscriber.

Adaptability to meet standardized service requirements.

Minimum space requirements.

Low maintenance (low operating cost).

Long life (low depreciation factor).

Minimum labor requirements.

Lowest possible capital investment commensurate with low operating cost.

Unimpeded internal transmission.

Several years were expended in research embracing various designs, materials, manufacturing methods, assembly processes, and other related factors. Characteristics of numerous new alloys were carefully analyzed. New base metals were thoroughly studied. Test units of many types were designed and constructed. Slowly, but surely, there evolved the carefully tested basic elements which ultimately resulted in the new McBerty Automatic Telephone System.

In the course of this development, intensive laboratory tests of our new system bore eloquent testimony of its surpassing efficiency. Not completely satisfied with laboratory tests alone, our Company next proceeded to subject this system to actual operational test conditions of incredible severity. Several years of such widely diversified operation in the field fully confirmed the results of our previous laboratory tests.

The new system which resulted represents the application of the fundamental and time-tested "All-Relay" principles to the ultra-modern and highly efficient relays which compose the new McBerty Automatic Telephone System.

NOVEL FEATURES OF THE SYSTEM

An integral spring—armature—contact structure which does away with pivots or hinges common to most telephone relays.

Use of special spring wire with the resultant elimination of metal fatigue common in the usual flat spring pileups.

Small, light weight moving elements to permit the reduction in size of coils and to minimize current requirements.

A basic mounting structure usable as a single multi contact relay or as a group of 3, 4 or 5 independent relays.

Molded bobbin type coils wound to characteristics as needed. Cores, welded to the mounting frame as required.

Extensive use of welding for the fabrication of mounting frames, and for wire terminals in lieu of soldering.

Bare wire for multiples.

Use of plastic materials as a basic means of construction, replacing built up sub-assemblies.

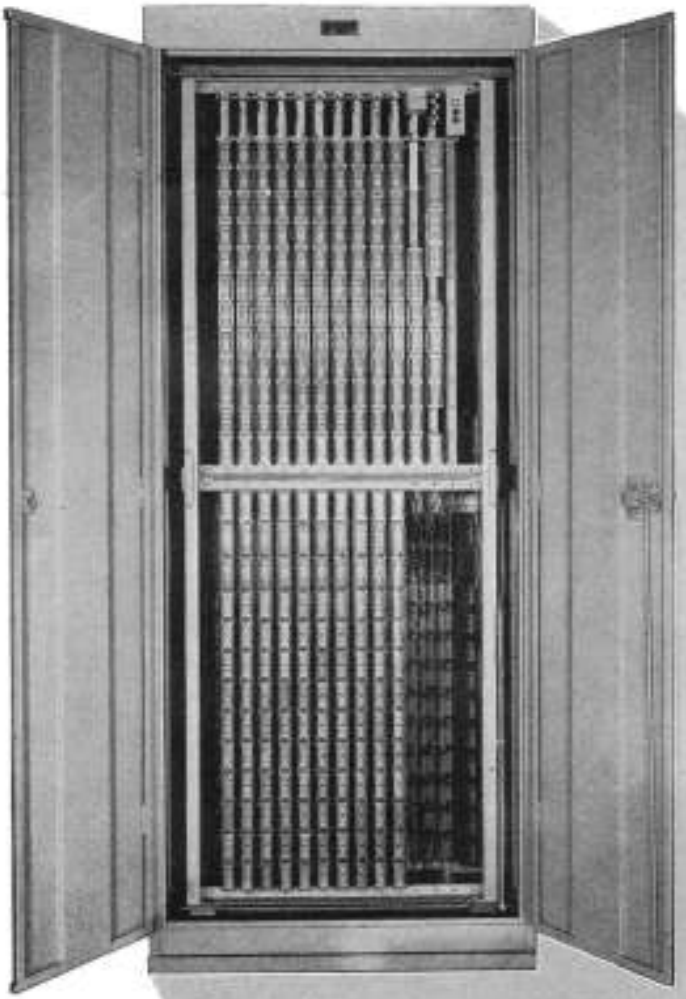
Strip mounting of associated relay groups to simplify manufacture and to facilitate changes and additions to operating installations.

Gold alloy contacts throughout.

Equipment layouts of various types to take advantage of the fundamental advantages of this design.

The NEW McBERTY

AUTOMATIC TELEPHONE SYSTEMS



TIME CHANGES EVERYTHING

Time changes the works of man. This truth is no where more striking than in the realm of science. No branch of science has shown a more ardent spirit of inventive genius than has Telephony. Today that science is a giant colossus which bestrides the world. Only yesterday it was a hoped-for vision.

Shortly after Alexander Graham Bell breathed life into that vision, another American, Frank R. McBerty began experiments in this field. As a result he determined to make this infant science his career.

For fifty-seven unbroken years the interest of Frank R. McBerty has been directed to the telephone industry in the United States and abroad. His efforts have been given world wide recognition. Personally responsible for hundreds of inventions and technical improvements, he is regarded, today, as one of the foremost authorities in the communications field.

It has been the unusual good fortune and privilege of this Company to have Mr. Frank R. McBerty as its president and guide. During the past few years his inventive wisdom has been directed toward the design of an improved automatic telephone system. The result is the new McBERTY SYSTEM.

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The new McBERTY AUTOMATIC TELEPHONE SYSTEM

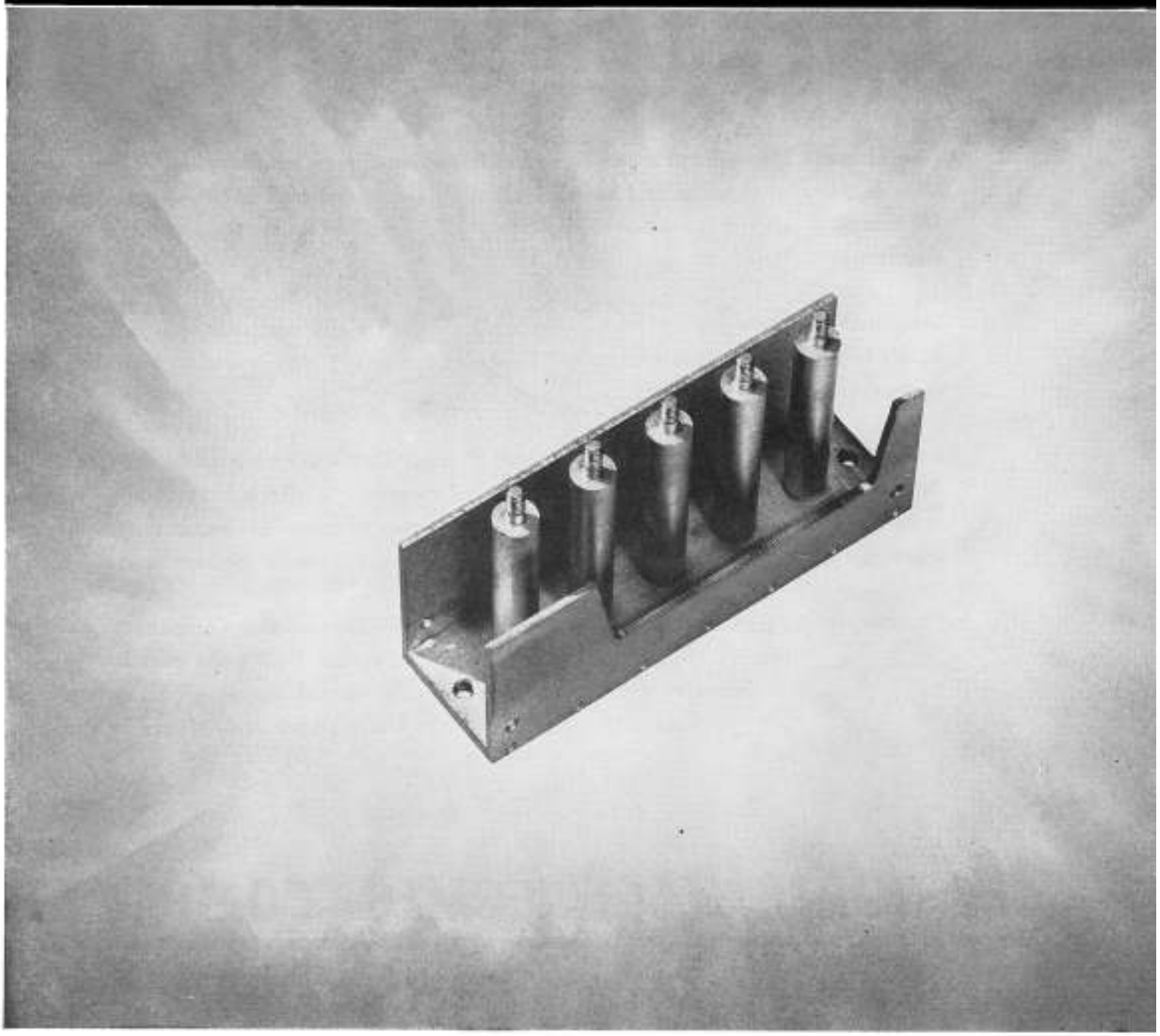

PHOTO SHOWS SIDE PLATE OF FRAME CUT AWAY

THE FIRM FOUNDATION

The FRAME of our new relay is fashioned of steel which alone can give the rigid permanence necessary for long life and constant service. By the careful selection of proper alloys, we derive a foundation structure within which closely controlled magnetic circuits can be set up for the one or more relay operations required.

The elements going into the FRAME comprise the base plate, the one or more cores, and the two side plates. By the use of precision welding, we build these elements into a single metallic unit. Numerous highly desirable operational characteristics result from this design and technique, all leading to relays of minimum size and maximum effectiveness.

The hazards of corrosion are taken care of by special plating processes, the initial step toward the protection of the final equipment against all effects of climate, and such other abnormal atmospheric conditions as may be encountered.

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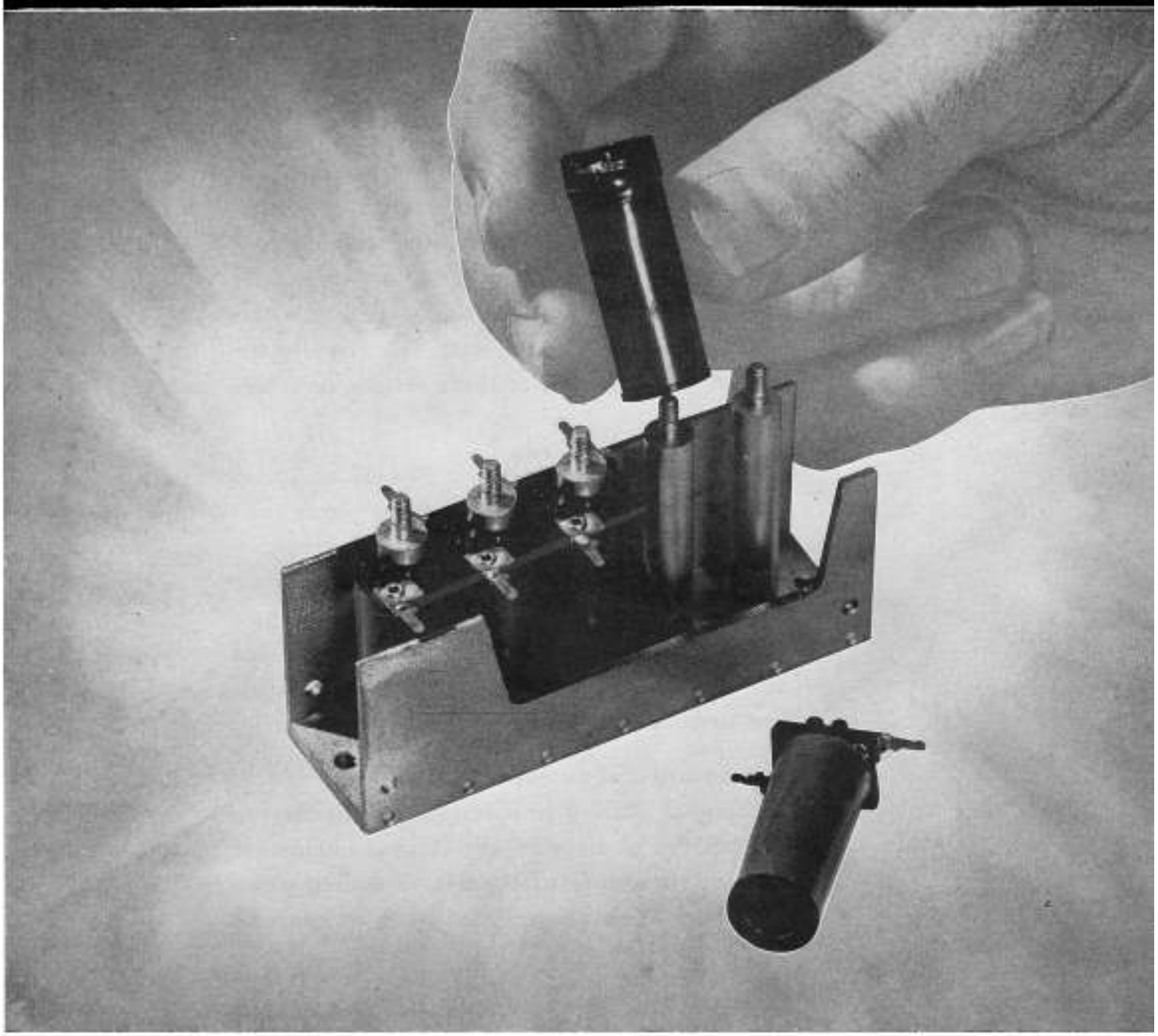

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SOURCE OF POWER

Power for relay operation is provided by a new type of coil. Among other improvements, we have accomplished:

A. Security against internal breakdown;

B. Reduction in size per function accomplished;

C. Simplification of assembly in manufacture;

D. Facility of replacement.

From a high quality plastic spool, we wind and finish a coil which is easily slipped over the fixed core.

The coils are designed to operate with small inductive loads, thus reducing the arcing problem. Contact wear and erosion are minimized with a resulting increase in life expectancy.

A relatively small coil can be utilized due to the direct action characteristic inherent in the design of this relay. The end result permits compact assembly into operational equipment with subsequent reduction in space requirements.

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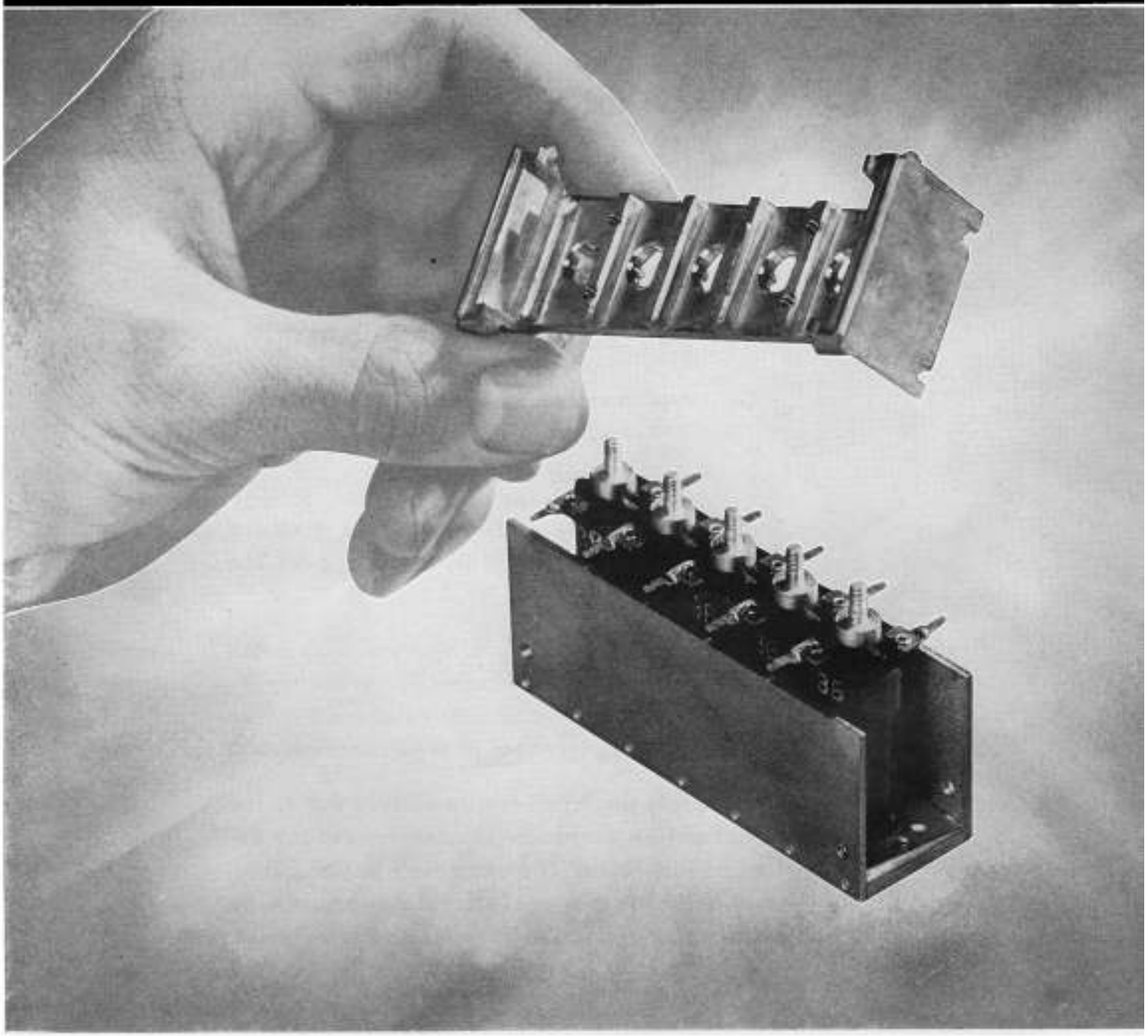

THE KEY TO PRECISION

The ALIGNMENT BRACKET is die-cast to exact form and dimension using a non-magnetic alloy. With it firmly in place, the coils are locked in position on their respective cores and the various other elements of the assembly are held in proper relationship.

This part provides the principle means for the control of speedy and accurate assembly processes. With it, precision of manufacture is assured, and the many dimensional relationships of the relay parts are maintained.

Our ability to use small elements in the relays is fundamental to this system. Close tolerances are essential. The accuracy provided by the ALIGNMENT BRACKET is a factor in the accomplishment of our objective, a system which insures

Operational Perfection

with

Minimum Space Requirements

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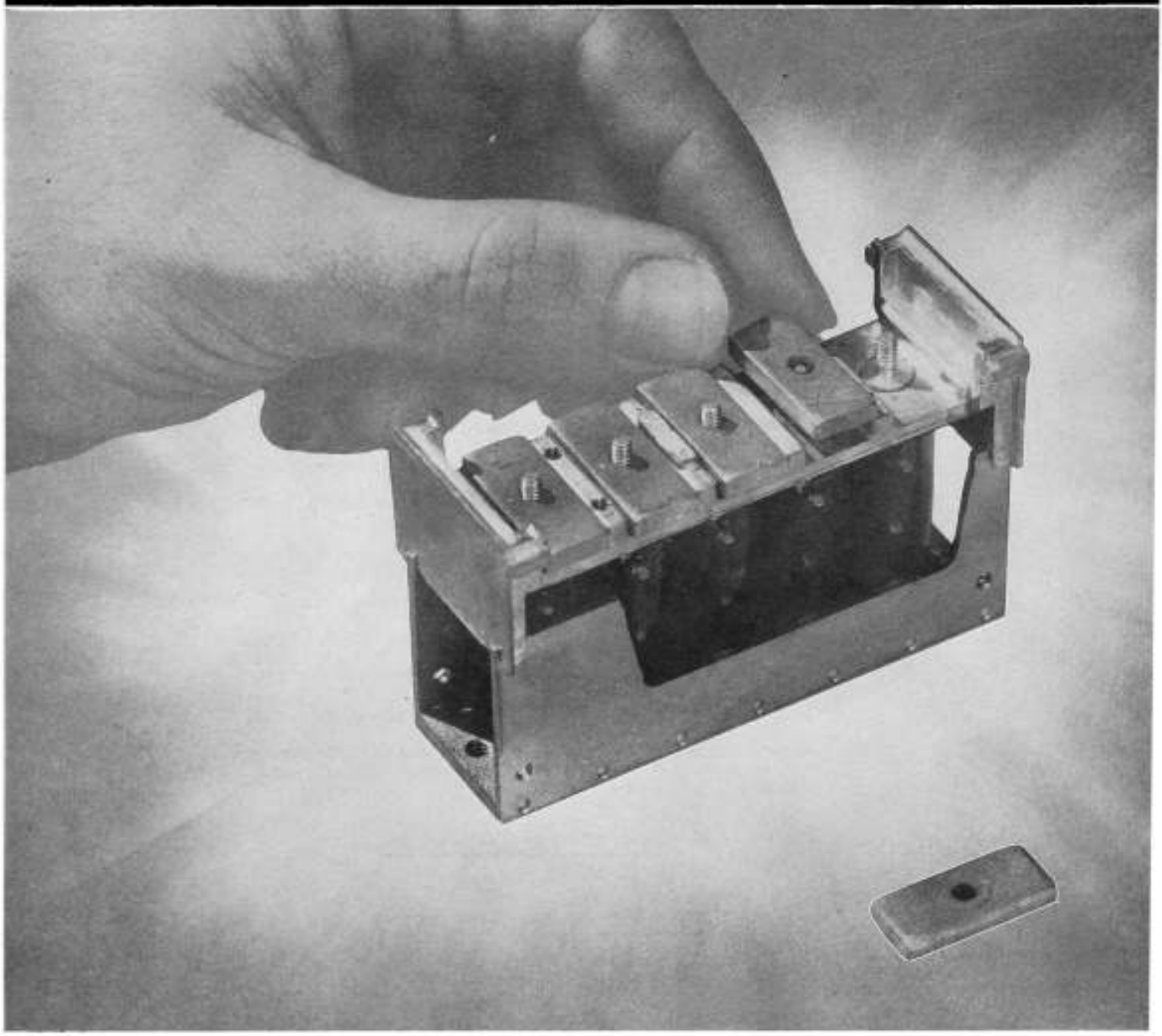

PHOTO SHOWS SIDE PLATE OF FRAME CUT AWAY

THE MAGNETIC PATH

The steel alloys used to insure the most effective Magnetic Paths within the Frame are again used to further develop the magnetic circuit for each individual coil.

Each POLE PIECE is slipped over the threaded extension on its particular core. It is held here in exact relationship with the other parts by the Alignment Bracket.

We can now see further details of construction which vary considerably from the time-honored methods used in telephone relay manufacture.

New ideas, new materials, new designs, new processes, all are essential to provide the last word in telephone systems.

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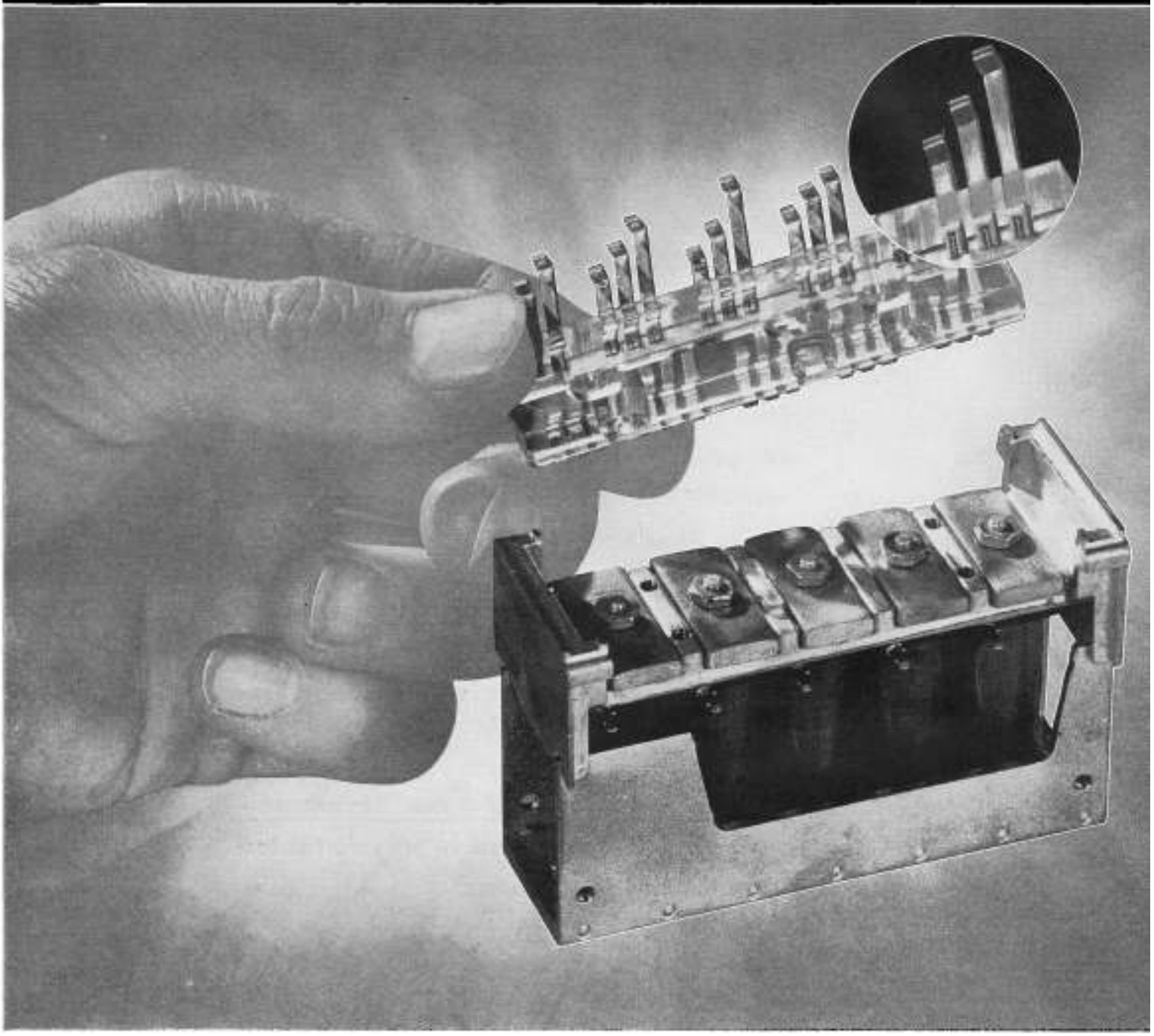

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THE MODERNIZED ANVIL

The elements necessary for the establishment of circuit contacts must now be added. Prefabricated nickel silver alloy structures with precious metal double contact surfaces are molded into an integral structure using plastic materials selected after most careful study. The ANVIL MOLDING is the result.

The individual Anvils are cut and formed to various lengths and to varying bends in order to facilitate the unusual wiring methods which we use in the fabrication of the switchboard.

The ANVIL MOLDING is slipped into its proper position on the Alignment Bracket. A few screws are spun home, and the relay assembly has passed one other step on its way to completion.

Here we have evidence of the great care taken in the selection of materials in order to insure control and transmission circuit paths of the highest order.

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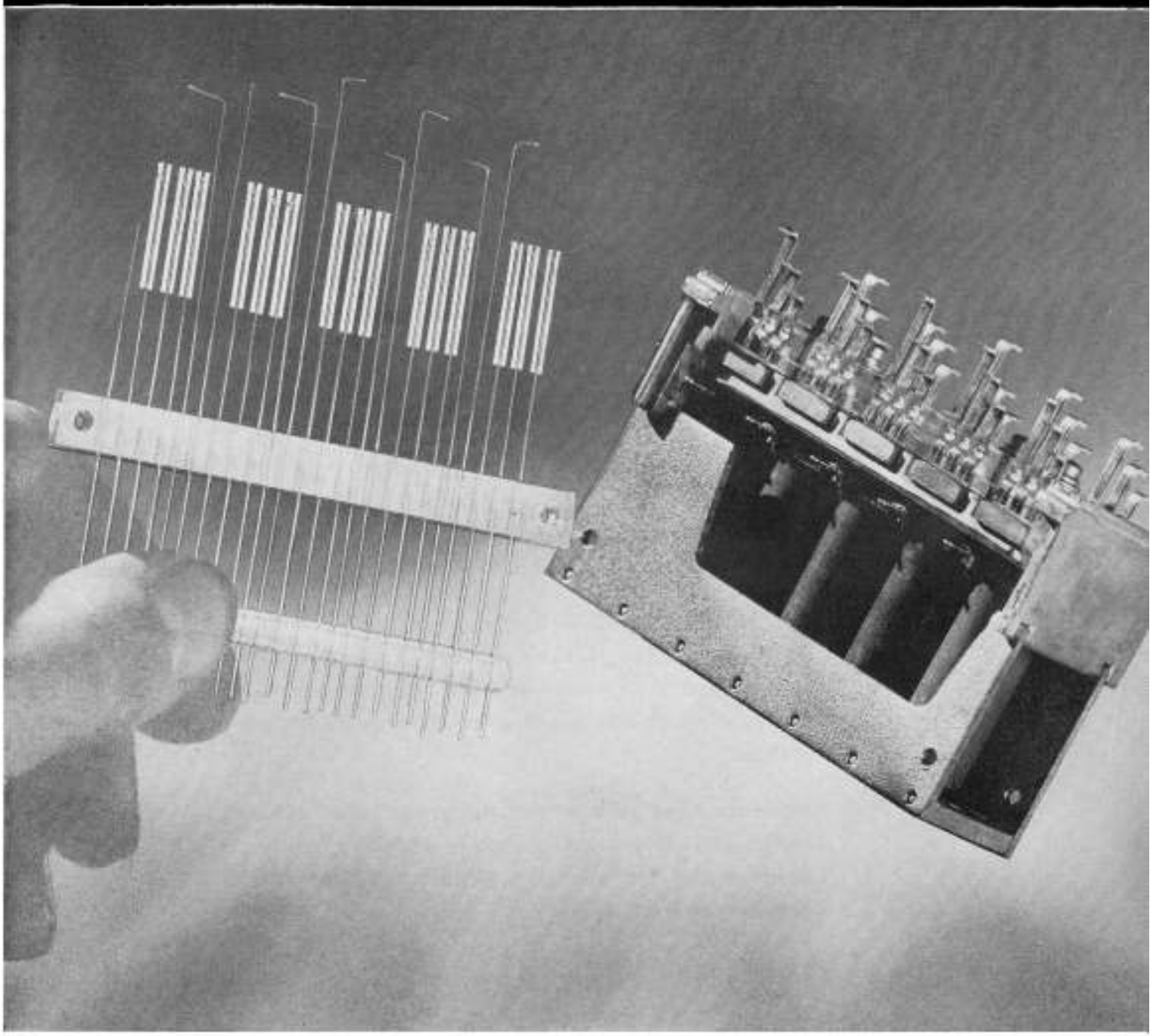

PHOTO SHOWS SIDE PLATE OF FRAME CUT AWAY

THE REED GOES TO WORK

Our structure now contains all of the elements necessary to provide one or more carefully controlled magnetic fields. We also have available fixed contacts in position and ready for use for circuit purposes. Only armatures are required as activating mechanisms.

A section of stainless steel wire becomes the REED or flexible member. A segment of selected magnetic alloy is permanently affixed to the REED and a precious metal contact is welded to the tip. Each REED is processed to preclude the possibility of twisting and to ensure that there will be unrestricted movement as positioned in the final assembly.

The necessary number of contact reeds and circuit wiring elements are fabricated into a REED MOLDING, using numerous special fixtures and the best available plastic materials and techniques.

The REED MOLDINGS (one or two on each side of the frame) are placed in position and clamped down. Each group of armatures is now in its magnetic field zone and each REED is ready to perform its function as an element of circuit control.

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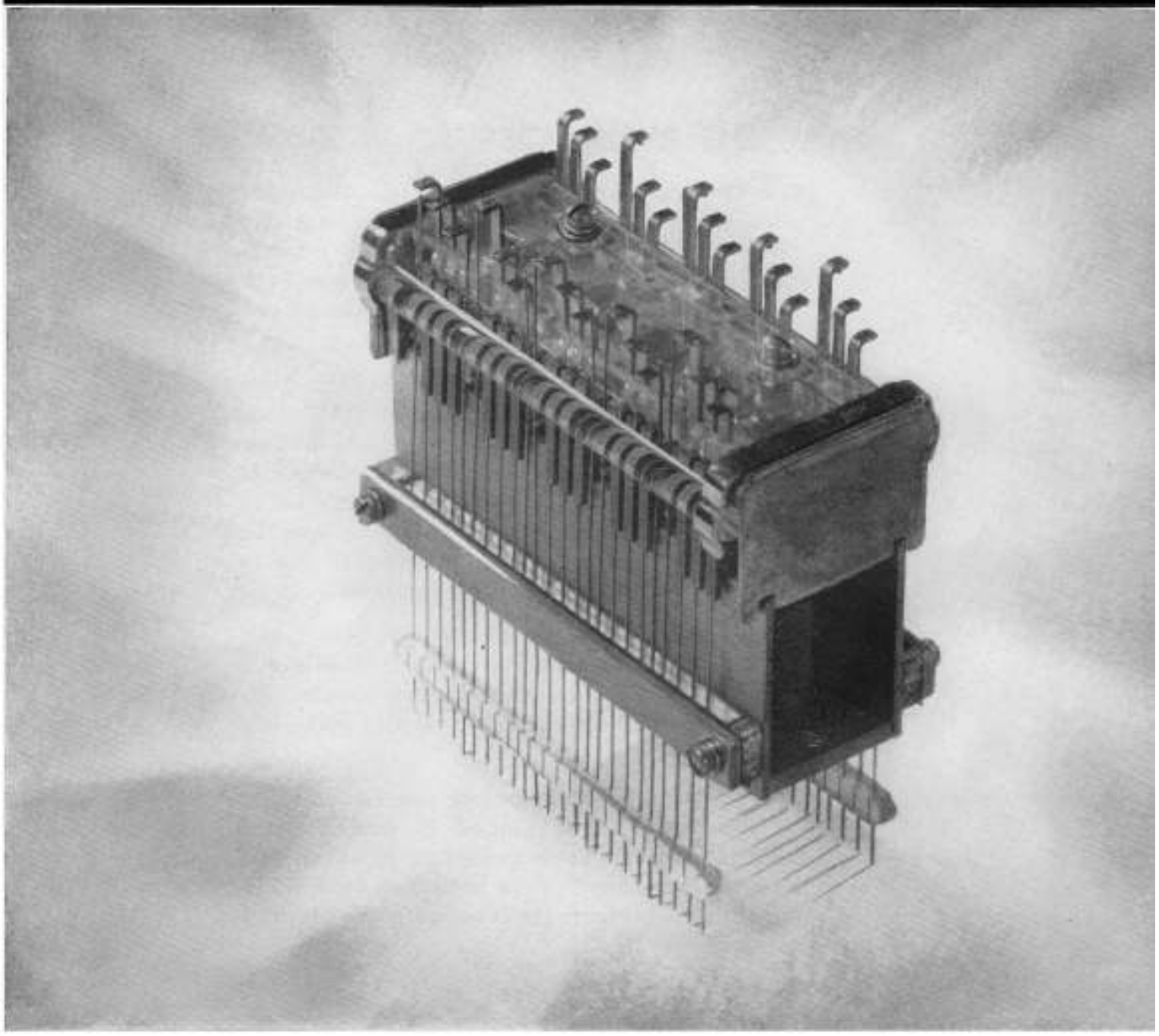

READY FOR THE HARNESS

You now see the work horse of our new system. The last step in fabrication has been accomplished by mounting a Pyrex glass rod on each side of the structure by the use of clips. These rods function as a protection to the reed armatures, and as a means of holding the armatures and their contacts in exact relationship with the anvil or fixed contact members.

The illustration shows one of several similar units. These relays will be mounted in strips. They will then be interconnected by means of novel wiring arrangements, as necessary to accomplish the circuit functions of the complete automatic telephone system.

Here you will note, for the first time, our use of welding processes in making circuit connections. You can trace the path of a circuit from a connection made at the outward end of the wire, inward through the reed, its armature and its precious metal contact, to the anvil or fixed position contact, and outwards through a lead-out wire as welded to the bent over section of the anvil.

The basic functional unit is now available. We can next proceed with the selection of relay units best suited for each job to be done. Our wiring will harness the units together, thus making a well balanced pulling team ready to perform its assigned task.

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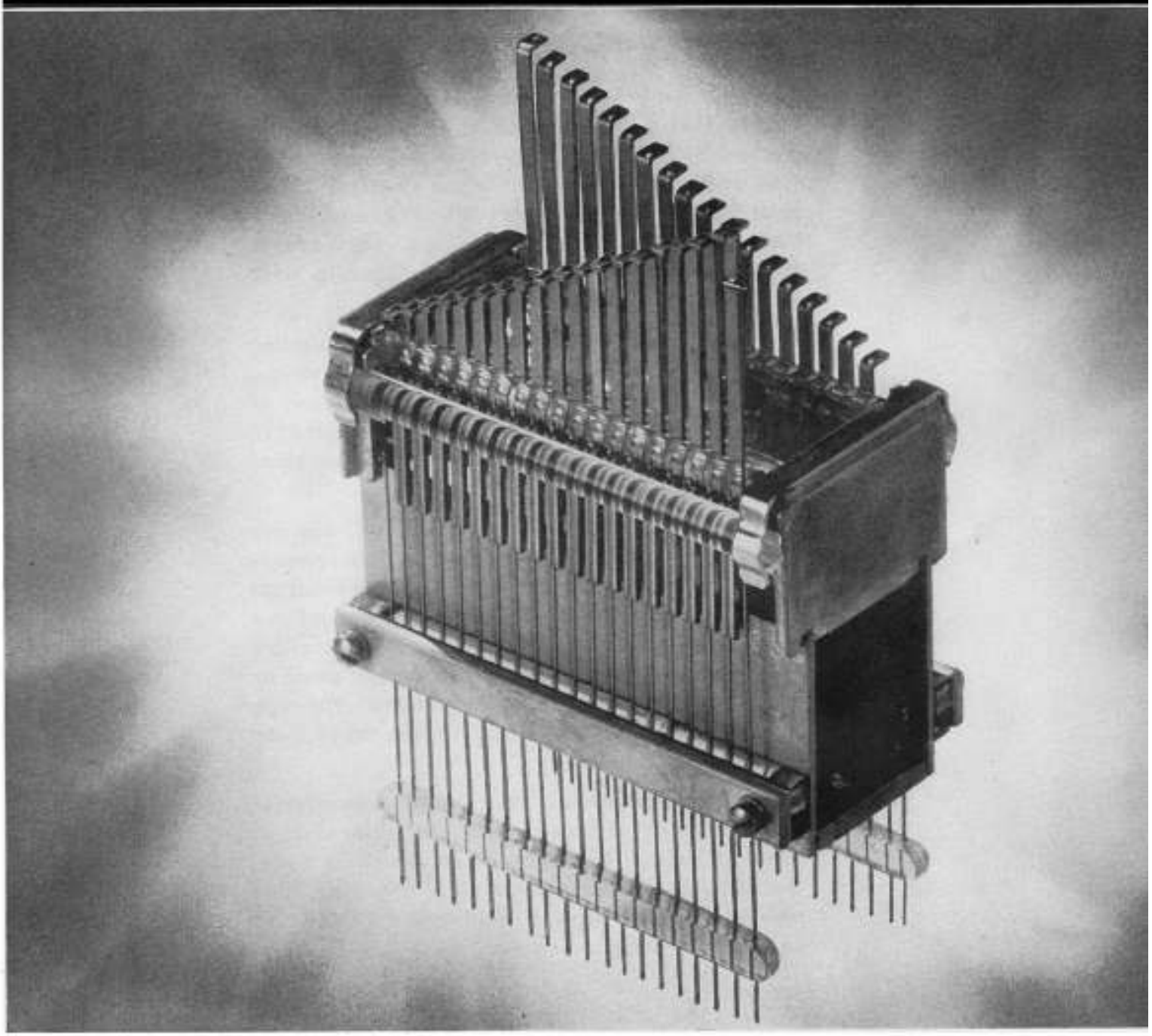

MULTIPLE CONTACTS

Our new relay structure must take several forms in order to accomplish various functions, and to meet the circuit requirements of an up-to-the-minute automatic telephone system.

The TENS RELAY shown here plays its part in the cross-connection of circuits.

Each of the two Reed Moldings includes eighteen armatures with their associated contacts. One molding is mounted on each side of the frame. A single coil is provided with characteristics necessary to establish a single, common magnetic field. The result is a structure which will simultaneously make thirty-six individual circuit contacts.

Exhaustive operational tests made by others give conclusive evidence of the long life expectancy of this relay. Its reliability under rugged operating conditions has been proven.

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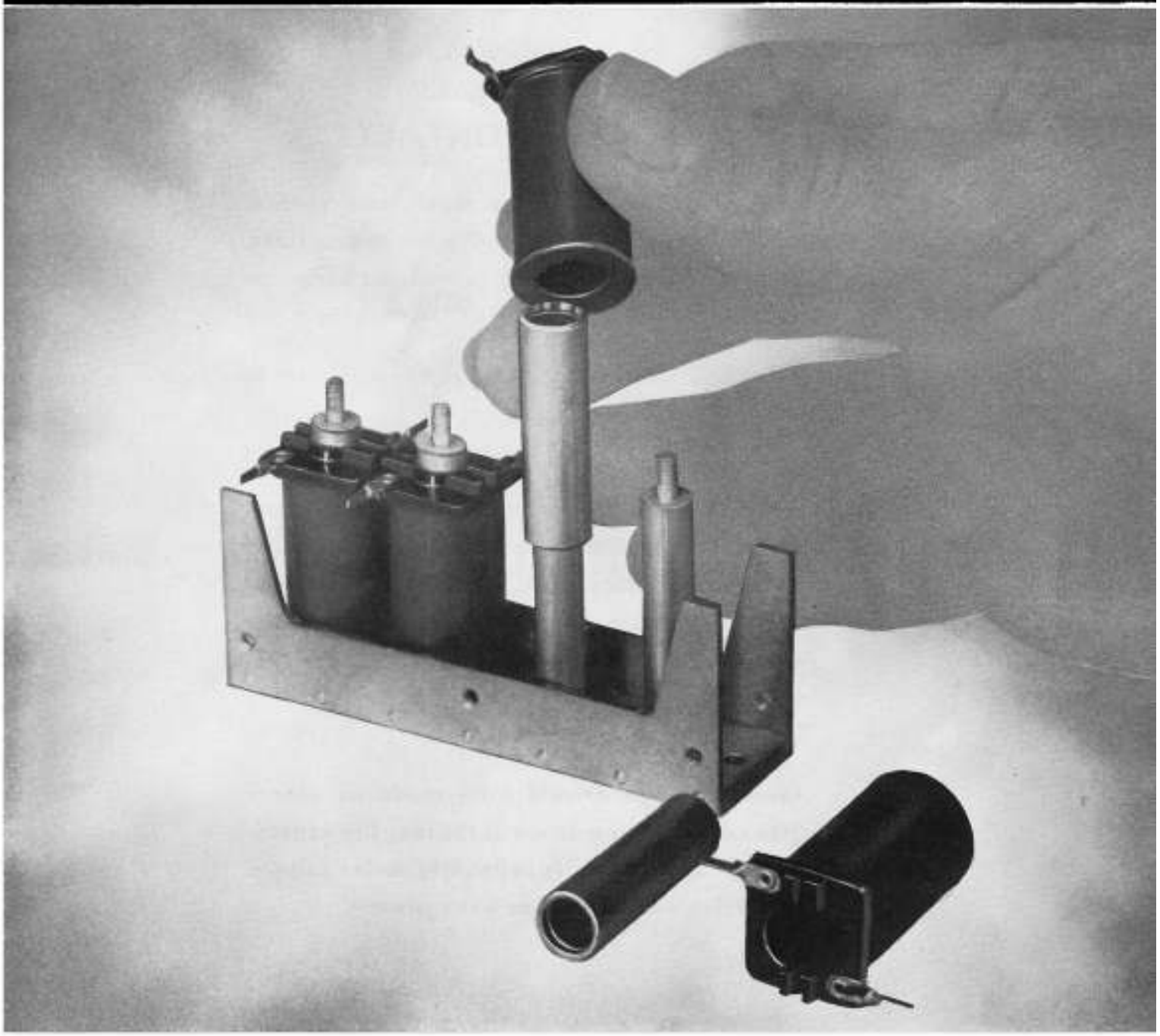

CONTROLS

The control functions of the McBerty System are generally comparable to earlier types of automatic telephone equipment. These call for such relay properties as normal action, fast action, delayed action, and the variables thereof. Contact arrangements of various types must be available to meet the circuit requirements.

One form of our new relay structure has been designed for these general purposes. Coils of various characteristics can be mounted as needed. Delayed action can be accomplished by the selective use of metallic sleeves with overlay coils.

In this unit we have available the means for providing various related relay actions in close proximity and within a minimum of space.

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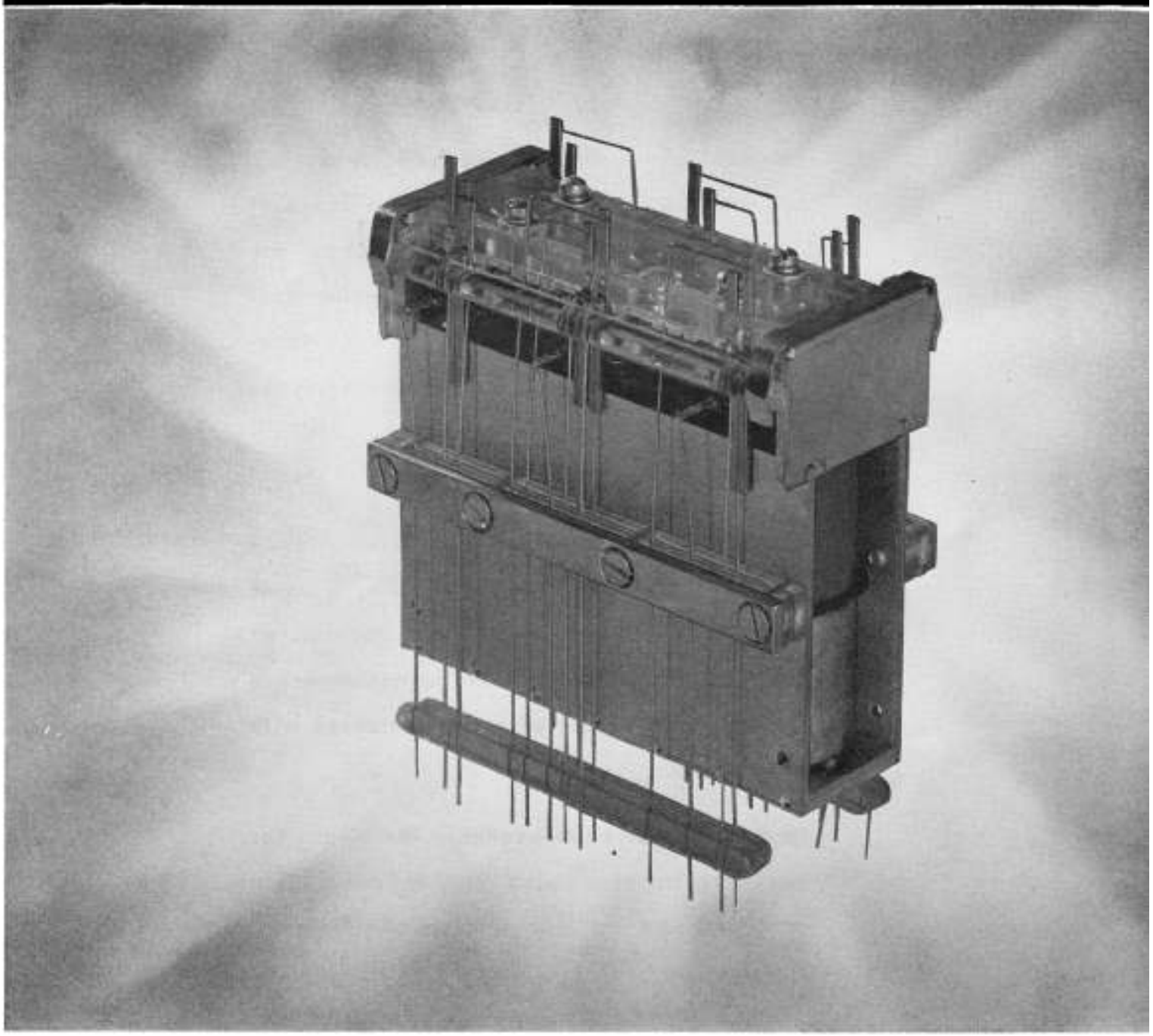

PHOTO SHOWS SIDE PLATE OF FRAME CUT AWAY

SLOW ACTION

Since the early days of automatic telephony, advantage has been taken of the slow release characteristic produced by a copper slug placed on the relay core adjacent to the coil winding.

One form of our new relay structure has been designed to utilize this feature. Various operational requirements have been met.

With this we have available another time tested element to take advantage of improvements in materials and techniques.

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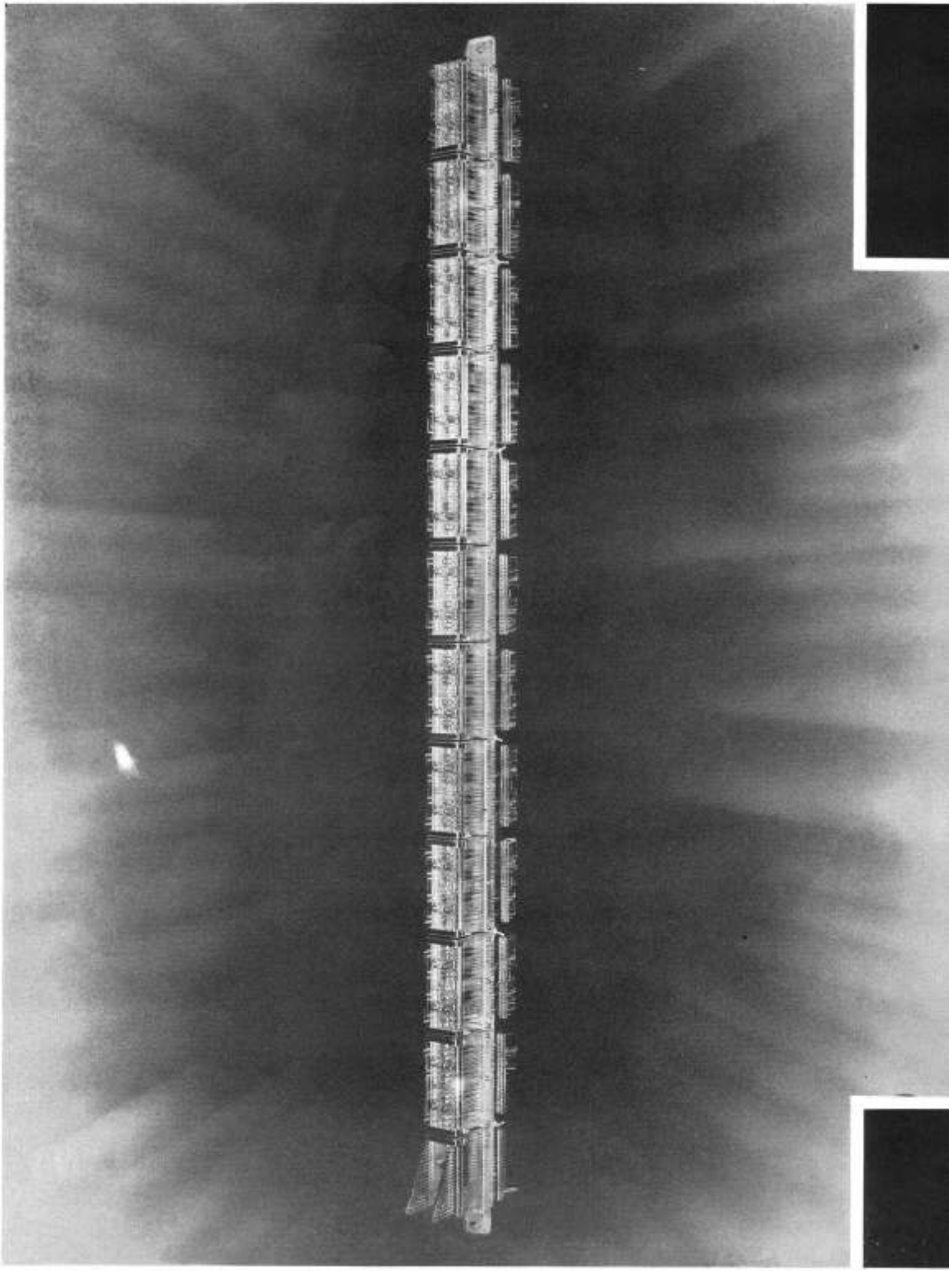

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LINE RELAY STRIP

This assembly is composed of the relay equipment for ten subscribers lines mounted on a steel strip.

Relay structures are designed to incorporate the various characteristics required for any standard or special line operations, as required. These relays are mounted vertically. They are then inter-connected circuitwise with "bare wire multiples," and by "strip cables" of nickel wire insulated with an extruded plastic.

Wiring is next brought to a terminal block and circuits are completed by inter-strip and inter-unit cables.

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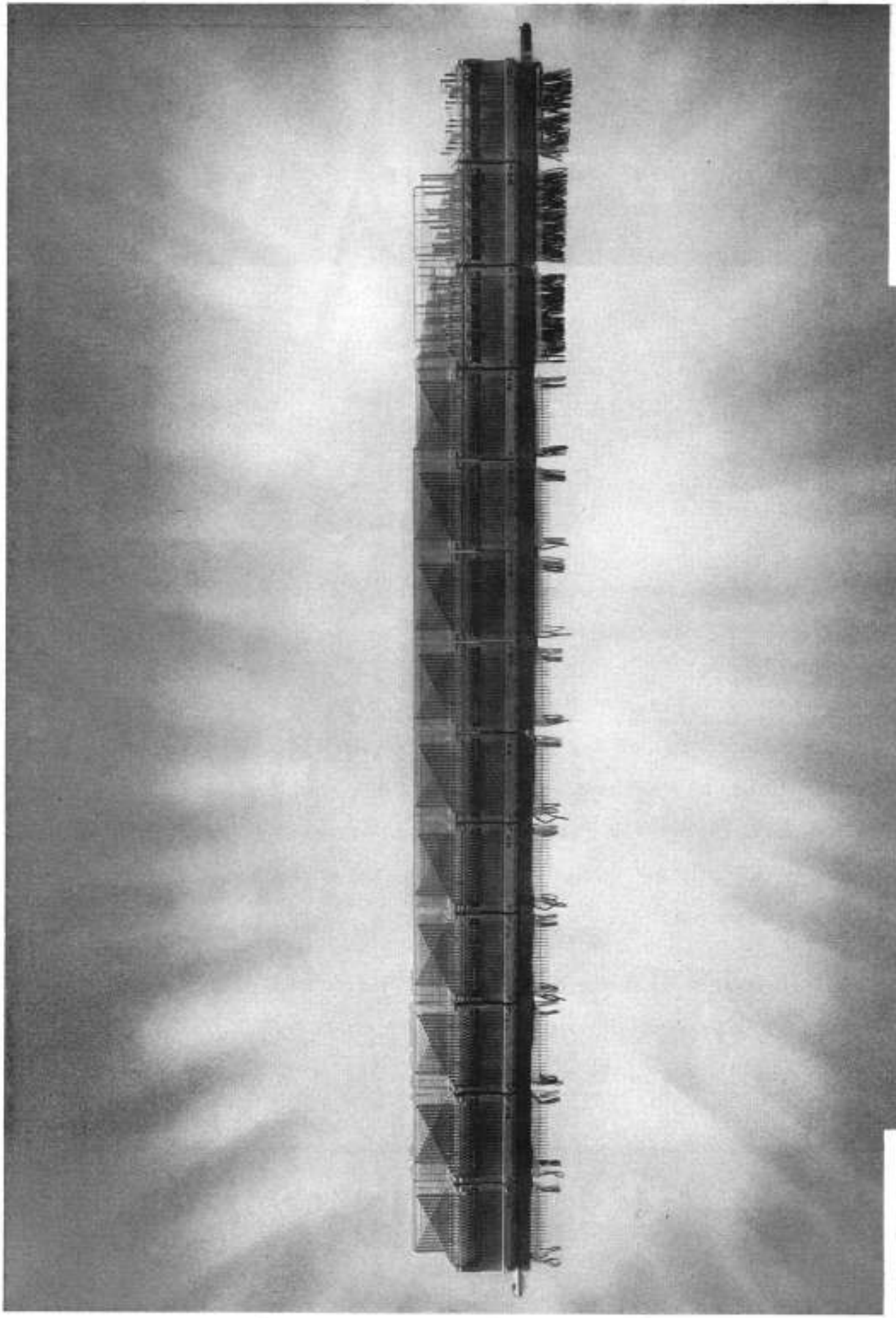

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CONNECTION STRIP

Tens Relay and Units Relay are mounted to make up the CONNECTION STRIP. These elements provide the means for connection in our finder, selector, and connector circuits. Under the control of various other relays, they are used to establish the desired circuits to a calling line, to an interconnecting group, or to a called line.

The Vertical Multiple is here in evidence. This is fabricated of bare wire welded to the appropriate contact on each of the Tens Relays. Simplicity of construction and stability of circuit elements are apparent.

Service requirements are met by the proper selection and mounting of operational units.

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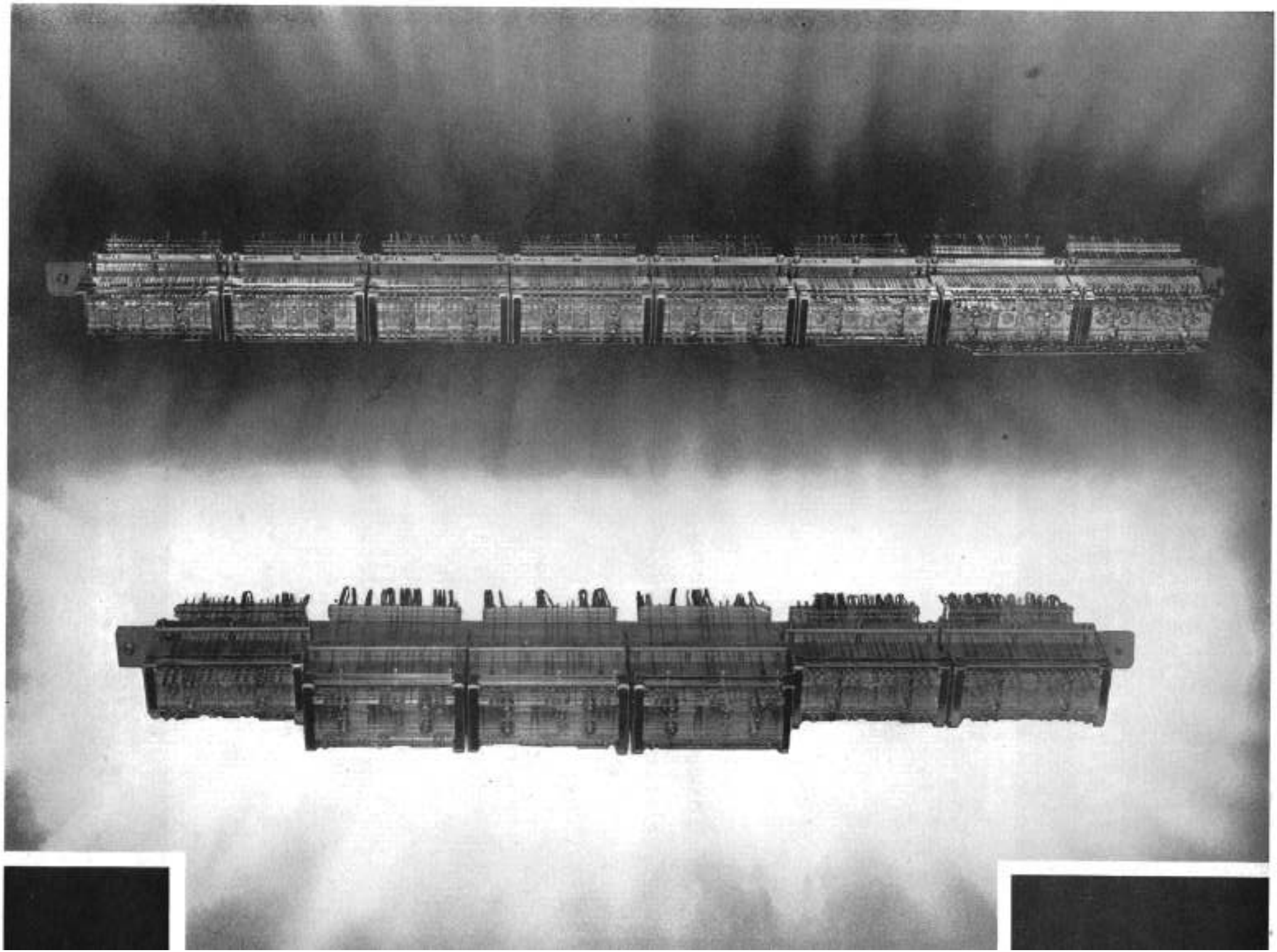

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CONTROL STRIP

The operational circuits of our various types of finders, selectors, and connectors require the usual Control Relays. Units having the necessary characteristics are assembled and interconnected, as illustrated, in a sub-assembly known as the CONTROL STRIP.

Our bare wire technique assures simple and permanent inter-unit circuits. The strip cable of nickel wire with a modernized extruded plastic insulation provides a flexible and reliable means for handling the balance of internal and inter-strip circuits.

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THE HORIZONTAL MULTIPLE

A simple means of interconnecting the common circuits of the numerous connector strips has been evolved. This consists of the unique and effective HORIZONTAL MULTIPLE shown here.

Bare wire is used and held in exact position by means of molded plastic SPACERS. Each horizontal wire is welded to the appropriate relay contact reed on each connector strip in the group.

Here again we see the result accomplished by modern design, materials, and methods of fabrication and assembly.

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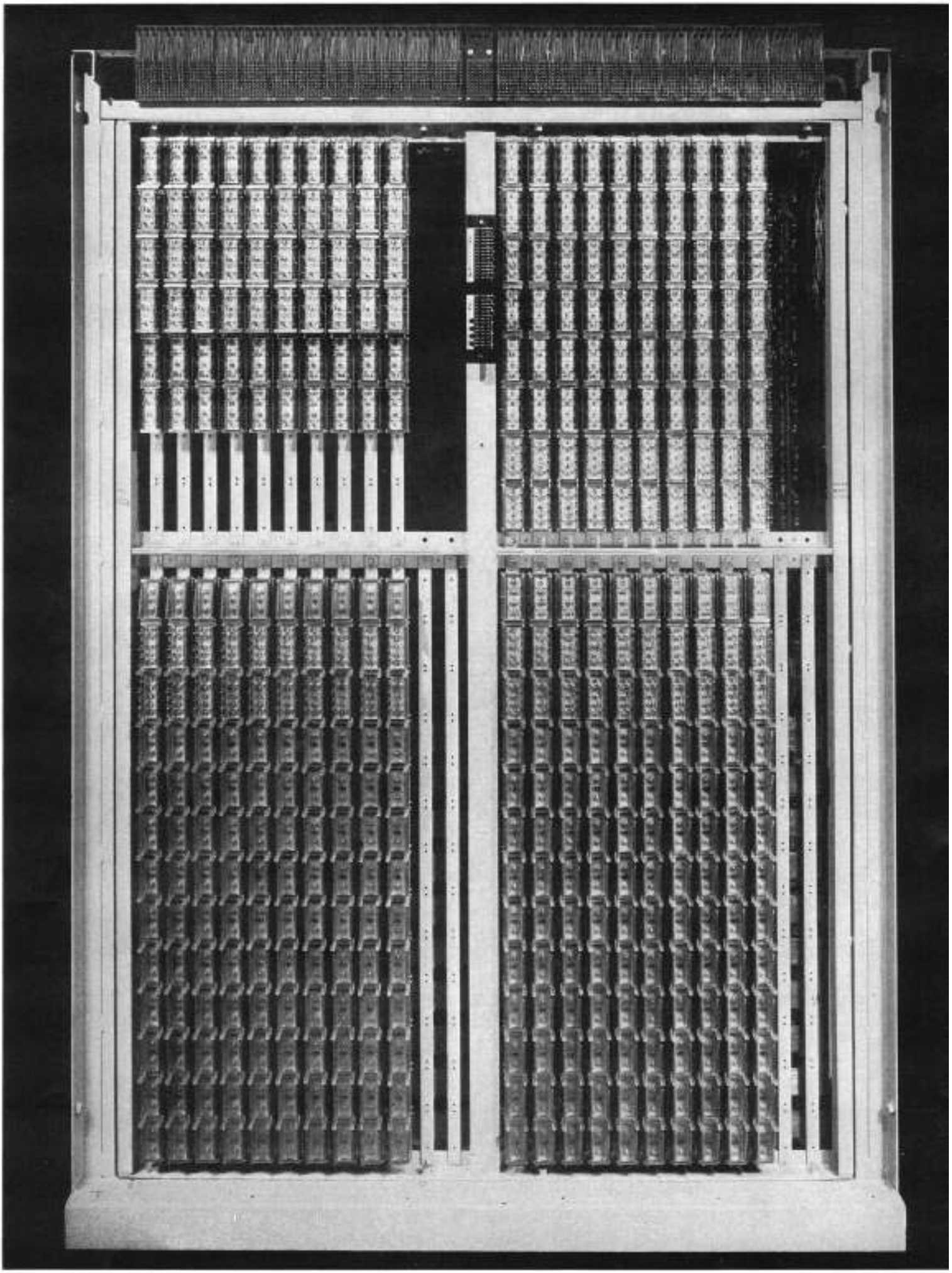

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THE SWITCHBOARD

Here we have a basic 100 line unit of the new McBerty System. Within a compact space we mount the various types of selectors and connectors needed to provide the particular type of telephone service as required by the Operating Telephone Company. Ample provision has been made for the addition of units of equipment to take care of traffic growth and to provide for minor or major expansion of the central office or network.

The Design of this system represents years of research and analysis — the Materials used have been proved by exhaustive and abnormally severe tests in the laboratory and in the field—Service Characteristics include refinements suggested by several years of active operation, under the rigid conditions imposed by the Armed Services and as a part of the Operating Telephone Company networks.

We salute the officers and engineers of the Operating Telephone Companies who pioneered the early commercial installations of this equipment. The new McBerty Systems which are being manufactured and installed represent the outgrowth of many years of experience in the design, manufacture, installation, and operation of telephone apparatus used by the Telephone Industry.

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BREADTH OF ENGINEERING ACTIVITIES

Our Engineering Staff is well qualified to design switchboards for inter-city dialing, and to serve as consultant in local and dial operating problems presented when two or more companies are involved in a conversion. With rapid expansion of telephone service a certainty, it is vital that future requirements be given the fullest consideration.

Interconnecting equipment is engineered to fit the particular community problem involved. Flexible numbering schemes are developed to meet the long range program.

Study of transmission and traffic problems is a continuing program, giving us an insight into those questions confronting the telephone operating companies.

Through adaptation of trunking and terminating equipment, it is possible to affect a saving to the operating company when the question of new line construction versus additional or revised central office trunking facilities arises. Our engineers can advise on these points.

Our engineers are specialists in All-Relay operation; and are well informed regarding all of the other standard types of equipment, either manual or automatic. This enables us to assist in arrangements for interconnecting new and existing exchanges.

Members of our engineering staff have had varied experience in operation, maintenance and design of equipment which renders them competent to deal with the various problems confronting telephone operating companies.

Our Engineering Staff includes experienced mechanical engineering personnel. This enables us to design the mechanical details of exchange layout and equipment best suited to your building.

Constant study is being made on new methods of building construction used by the operating companies so that we can determine the best facilities for housing your equipment, and make recommendations accordingly.

ENGINEERING SERVICE

If additional information concerning this new system is desired, write us, and we will endeavor to furnish you with any further data you may require. On the other hand, if you prefer, we can arrange to have one of our consulting engineers visit you and discuss any relevant operational problem which may confront you.

NORTH "ALL-RELAY" DIAL AUTOMATIC EQUIPMENT

Central Offices, 10 lines to 10,000 lines

Telephone Instruments

Automatic Toll Boards

Manual Toll Boards

PABX Attendant

PABX Attendantless

Service Observation Desks

Chief Operators' Desks

Information Desks

Repair Clerks' Desks

Traffic Recording Desks

Wire Chiefs' Desks

Test Panels

Main Distributing Frames

Power Boards

Battery Chargers

Battery Racks

Special Services Equipment