



UNIVERSAL SWITCHBOARDS SELECTION AND INSTALLATION CRITERIA CIRCA 1914-1916

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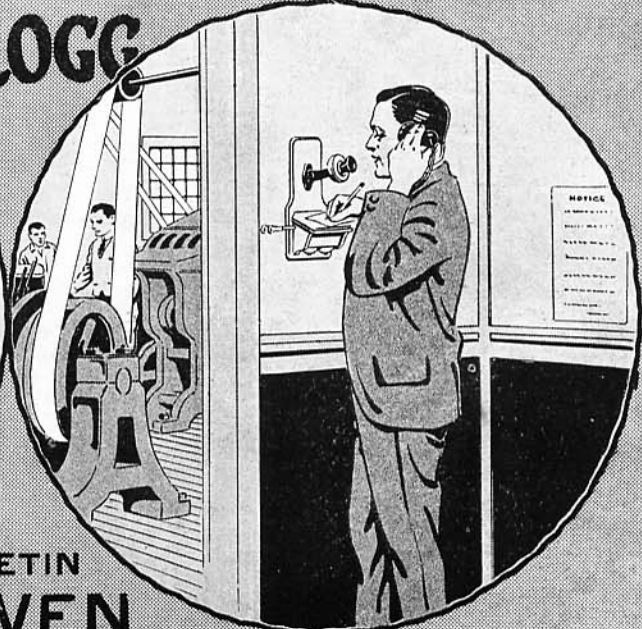
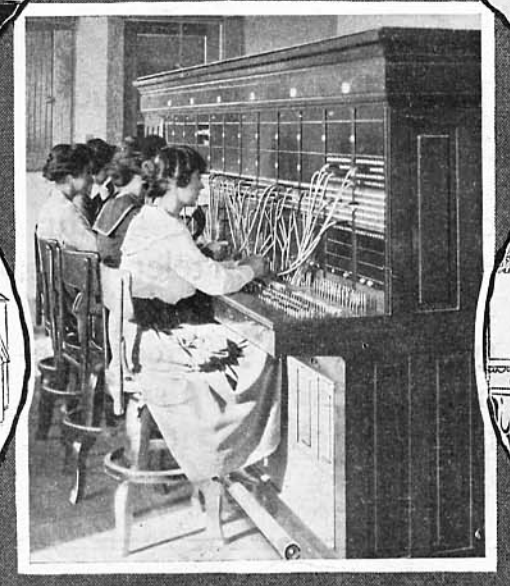
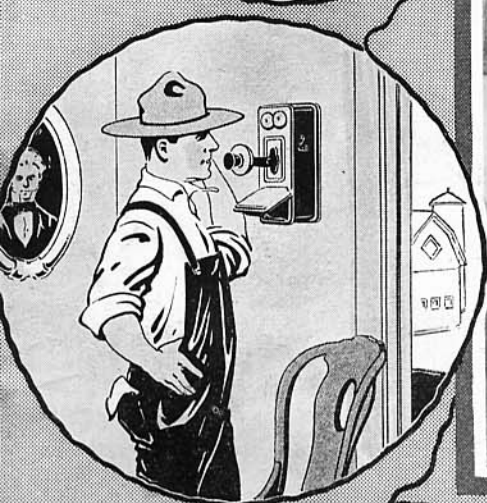
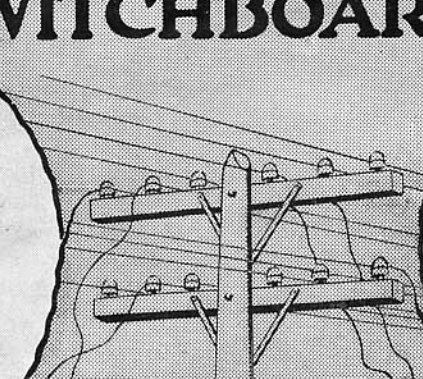
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UNIVERSAL SWITCHBOARDS



KELLOGG

**BULLETIN
ELEVEN**

LOCAL battery telephones
for rural line service,
party line town telephones,
common battery individual
or party city line telephones;
either wall or desk stand
types; all give efficient, eco-
nomical service with the Kel-
logg Universal Switchboard.

KELLOGG UNIVERSAL LAMP SIGNAL SWITCHBOARDS

WHAT TYPE OF SWITCHBOARD SHOULD BE INSTALLED



It is conceded by all telephone authorities that the magneto system will remain the standard equipment for small town and village exchanges where large numbers of farm lines are to be switched.

It is also conceded by the best traffic experts in the country that the full common battery system with the modern refinements of automatic ringing and listening, with flashing, or line lamp recall will remain the standard for large city exchanges.

Now, between these two we encounter a "twilight zone" in the larger towns and smaller cities and it is for the needs of such exchanges that the equipment described in this bulletin has been designed.

For the villages and smaller towns the full line of Magneto Switchboard equipment described in our Bulletin No. 10 meets every possible requirement. Both farm lines and city lines terminate on combined drops and jacks of identical construction, even if of different windings, and all lines, both city and country, may be connected indiscriminately with one kind of magneto cord circuit. In other words, a magneto switchboard is really *universal* as regards the interconnection of city and country lines.

A great many small exchanges of from 300 to 900 lines in agricultural sections of the country are, in our opinion, making a mistake in considering the installation of a common battery switchboard with all of the above mentioned automatic features on the cord circuits, notwithstanding the fact that such exchanges will average from 45% to 50% as many rural subscribers as they have city subscribers.

Such exchanges should bear in mind that their present magneto switchboard is really a full Universal equipment as regarding its ability to indiscriminately connect city lines and country lines with all of the cord circuits on the board. Where a common battery board with cord circuits having full automatic features is used, it becomes almost necessary to confine the rural lines to one or two positions on the board, devoted especially to this service, since the automatic cord circuits are not adapted to rural service. This means that all calls from city to rural will have to be transferred to the rural operator and cannot be completed by the operator answering the local call, as they can be on the present magneto equipment or on the Universal equipment described in this bulletin.

IMPORTANCE OF PROVIDING RURAL MULTIPLE

The first question to be settled, therefore, is whether the rural lines are to be confined to one or more rural positions and not multiplied in front of the local operators, or whether the rural lines are to be multiplied in front of all local

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operators, just as are the local lines, so that any operator can complete any connection which she may be asked for without transferring and without assistance from any other operator.

We do not know of any exchanges installing a multiple of their rural lines available to all local operators who have ever regretted doing so. Although it was the former idea that rural multiple should be dispensed with as soon as the local exchange reached 600 or 800 telephones, the experience of the last few years, in agricultural sections in particular, indicates that the advantages of multiplying the rural lines and of installing Universal cord circuits throughout, outweighs the advantages of automatic features on local cord circuits. So whenever the telephone manager is in doubt, we would recommend the installation of a Universal equipment and the multiplying of country lines, as well as city lines, throughout the entire board and the use of simple four relay Universal cord circuits for all positions.

In the majority of small exchanges only a very brief study is needed to show that it would be inadvisable to attempt to separate the rural lines at one or two positions on the end of the board, and, as soon as it is decided that the rural lines must be multiplied, the use of Universal cord circuits throughout follows as a matter of course. The only question then remaining is whether or not the lamp signal line circuits shall be straight common battery or Universal.

WHAT THE KELLOGG UNIVERSAL BOARD IS AND DOES

Although the Kellogg Company has installed a large number of full Universal equipments, by which we mean both line and cord circuits full Universal, a great deal of misinformation has been spread about the country as to the real make-up of such equipment, and we believe a statement of the facts to be in order at this time.

In the first place, there has been a great tendency to call these equipments "convertible switchboards" and we wish to draw a sharp distinction between the *convertible* switchboards offered by several companies and the *Universal* Switchboards which the Kellogg Company has been installing during the past ten years.

The convertible switchboard is a magneto equipment, which, by the addition of more or less new equipment, can later be changed to common battery. A *Universal* switchboard, as defined by the Kellogg Company, consists of a lamp signal equipment which can be installed in any exchange, in place of the present magneto board, and *changed to full common battery, one or more lines at a time, without adding or taking away a single piece of apparatus and without disturbing any of the permanent cabling; by merely changing the strap wire and "hairpin" connections at the relay rack.*

The Kellogg Universal line circuit consists of a standard 3-wire common battery lamp signal line circuit with the addition of an extra contact at the line relay.

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In reality this extra contact could be dispensed with and the line relay allowed to lock up through the subscriber's line and telephone. But as this would involve the question of the condition of the present lines and present equipment, the extra contact has been added to the line relay to give the latter a local lock-up path *so that no battery current is ever released to magneto subscribers' lines, either before or after calling.*

Changing a line from magneto to common battery, therefore, consists of moving one end of a hairpin connection from one spring on the line relay to another spring on the same relay and the disconnection of the extra contact from the battery strap wire.

The changed circuit is then a standard common battery line circuit exactly the same as would be furnished in an entirely new common battery switchboard equipment.

In addition to changing the line circuit to common battery it is, of course,

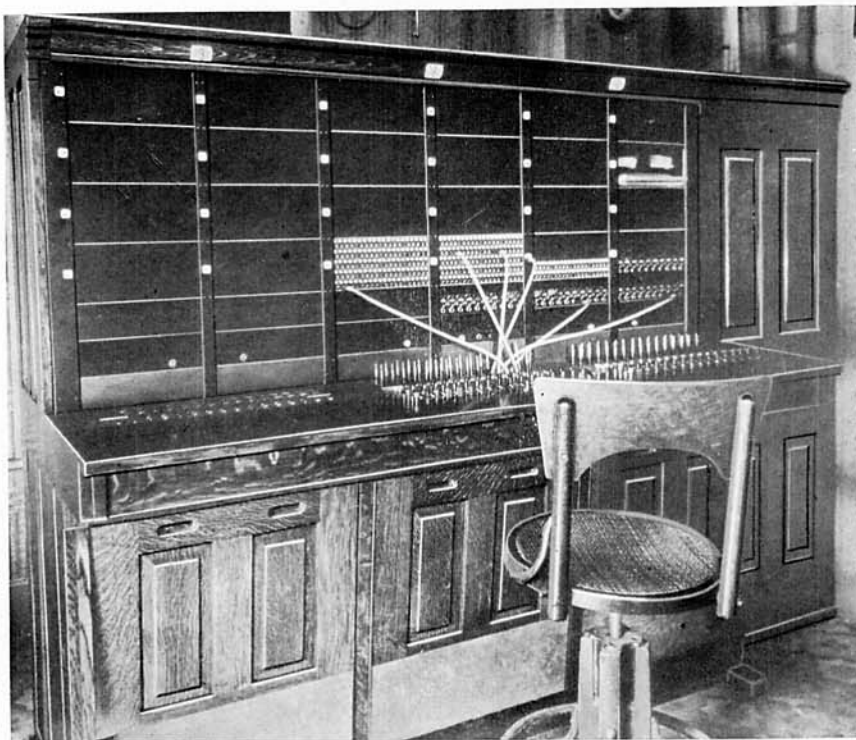


Figure No. 1101—Universal Switchboard at Mt. Horeb, Wisconsin

necessary to so change the cut-off relay that the Universal cord circuits may be able to distinguish between magneto and common battery lines.

This is accomplished without changing the cut-off relay or cut-off relay coil, as the Universal line circuit is provided with a cut-off relay having two 1,000-ohm

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winding in series which affords a 2,000-ohm cut-off relay, practically equivalent to an open circuit, for magneto lines and a 500-ohm cut-off relay for common battery lines when the series connecting strap has been cut in the center and the two ends swung around and soldered so as to put two 1,000-ohm coils in multiple.

The entire change can be made in less than one minute after the soldering copper has been heated, and nothing is disarranged or out of place after the change has been made. And it is furthermore unnecessary to open up or approach the switchboard itself as the entire change is made at the line and cut-off relay rack.

Therefore, any exchange finding it necessary to install Universal cord circuits in order to multiple rural lines, can, at trivial expense, have the local line circuit so arranged so that they, too, will work either magneto or common battery.

OTHER USES BESIDES RATE RAISING

In former times this Universal line circuit feature was taken advantage of only in exchanges where it was necessary to give common battery service to business houses and others desiring same, but where it was found impossible to secure the horizontal increase in rates (affecting all classes of service) necessary to change all subscribers to common battery.

The Universal equipment still remains the last solution for this rate raising dilemma and experience has proven that even where it is desired to make a clean-cut change to common battery in the average sized exchange, the Universal equipment has many advantages over the so-called straight common battery system.

In practically all cases where an exchange is to be changed from magneto to common battery, it is necessary that the plant be largely rebuilt in order to change existing grounded lines to metallic circuits, inasmuch as it is never advisable to attempt to give common battery service, at higher rates than magneto service, unless the common battery service is to be given on metallic circuits.

To rebuild a plant ready for an instantaneous cut-over to common battery, requires practically new material throughout, whereas if the cut-over can be spread over six weeks or two months, thousands of dollars worth of good material, which would otherwise have to be discarded or sold for junk, can be worked into the rebuilding of the plant and it becomes advisable to carefully study the saving which can be effected by the use of Universal line circuits, even where it is not desired to make use of the same for rate raising purposes.

COMPOUND AUTOMATIC UNIVERSAL CORD CIRCUITS NOT DESIRABLE

In advising against attempting to multiple rural lines in front of positions equipped with automatic cord circuits, we are doing so after having built and

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installed a number of equipments containing "compound" cord circuits, combining the automatic features of city service with the Universal features of city to country connections.

We have furnished such equipments only under protest, as common sense teaches that a cord circuit containing all automatic features is already sufficiently complicated without attempting to add thereto the universal features necessary to enable such cord circuits to distinguish between rural and city lines.

As already mentioned, the universal cord circuits, contemplated in this bulletin, contain only four relays, each cord circuit containing two pairs of relays identical in construction. Therefore on an entire Kellogg Universal installation it is only necessary for the maintenance man to become acquainted with the line and cut-off relay at the relay rack and with the supervisory and switching relay in each cord, whereas in automatic cord circuits he must become familiar with from eight to ten relays in each cord circuit and with fourteen to sixteen relays in compound automatic cord circuits retaining the universal feature.

SIMPLE EQUIPMENT THE ULTIMATE STANDARD FOR SMALL PLANTS

Common sense teaches that for the small and medium sized exchanges throughout the country, the simpler cord circuits will eventually become the ultimate standard. We know of no instance where a man previously entrusted with the care of a plain magneto switchboard has had the slightest difficulty in taking care of a Kellogg Universal equipment. For this reason we recommend the Kellogg Universal board, either with or without the Universal Line Circuit feature for all exchanges desiring something better than an ordinary magneto board up to city exchanges where the rural traffic becomes so comparatively unimportant that it can be confined to one section of the switchboard, and automatic cord circuits with their many desirable features for large exchanges used in the local cord circuits to secure maximum speed and economy of local operation.

DROP AND JACK MAGNETO MULTIPLE SWITCHBOARDS NOW OBSOLETE

With magneto switchboards up to 400-lines with two operators, no system of transfer is required. With three operators and 450 lines, or more, a transfer system is required involving two operators in the completion and taking down of all transferred connections.

One way to avoid these transfers is by resorting to magneto multiple. We do not hesitate to say that 600 lines should be made the limit for magneto multiple switchboards with combined drops and jacks, and many companies have found it highly advantageous to install instead, the LAMP SIGNAL UNI-

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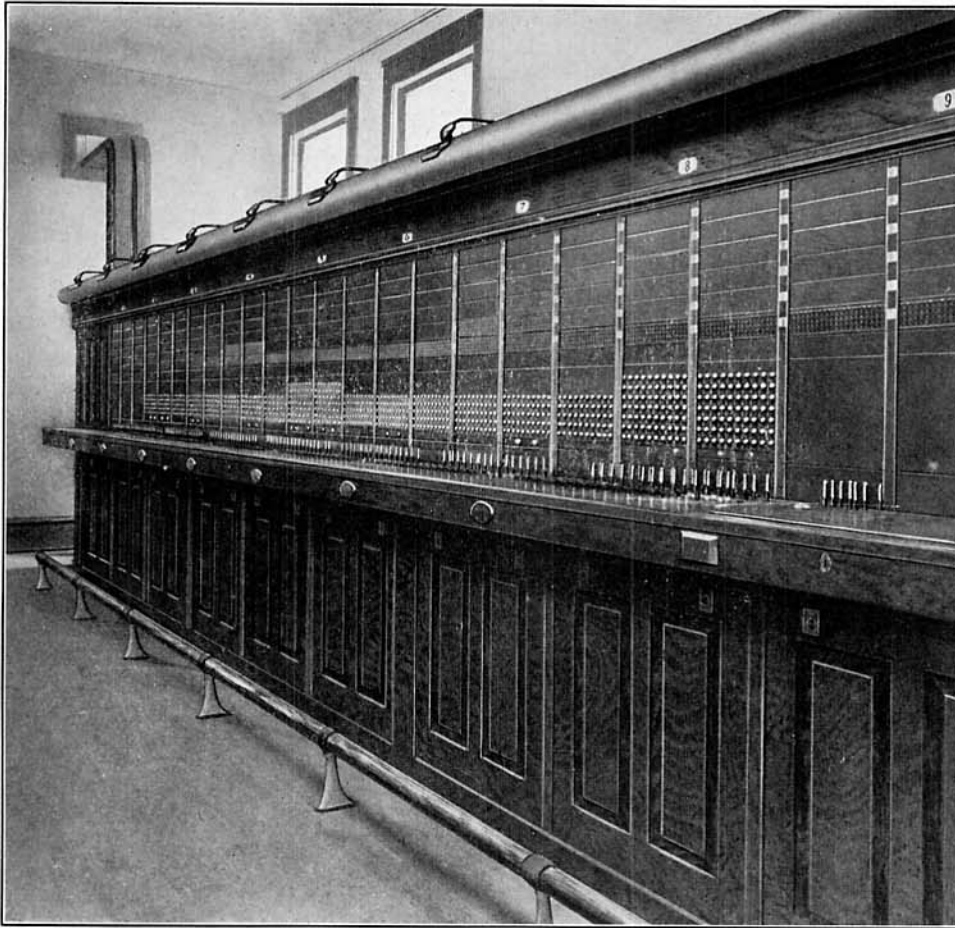


Figure No. 1102—Owosso, Mich., Installation, Universal Lamp Signal

VERSAL SWITCHBOARDS, herein described, with present installations of only 300 to 400 city lines.

Large magneto multiple boards should be no longer manufactured. This statement from the Kellogg Company should receive careful consideration as our large Magneto Multiple Switchboards have been the most successful and satisfactory in the country.

A 1,400-line Kellogg Magneto Multiple board installed for the Fort Dodge (Iowa) Telephone Company in 1901 has been operated with phenomenal satisfaction and freedom from trouble. The Fort Dodge Company have replaced this board with the highest type of Kellogg full common battery equipment.

At the time the new board was installed the old one was caring for approximately 3,500 telephones on the 1,400 combined drops and jacks. But notwith-

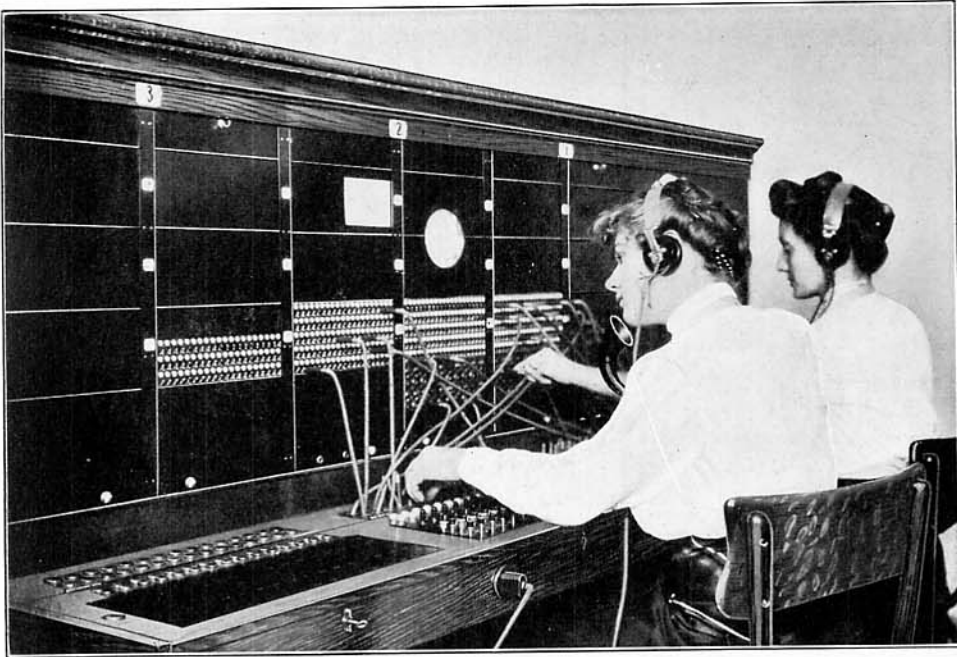


Figure No. 1103—Universal Switchboard at Tomah, Wisconsin

standing its twelve years of continuous usage, under this heavy traffic, the board was in such good condition that when offered for sale by the Fort Dodge Company it was immediately snapped up by one of the best informed managers in the country, who installed it, *replacing another make of Magneto Board only about half as old*. He has already had more than five years of service from it, making 17 years to date, with the equipment still giving good service.

The foregoing is but one of many instances showing that when drop and jack multiple boards were the best available practice for large magneto plants the best of such boards were built by the Kellogg Company. But the UNIVERSAL LAMP SIGNAL SWITCHBOARDS, developed by the Kellogg Company later, possess so many advantages both from the traffic and financial standpoints that no one in need of a larger magneto switchboard can afford to consider the now obsolete magneto multiple equipment.

COMPARISON OF THE TWO BOARDS

Just to remove for all time any lurking doubts, let us take the case of an 800-line equipment and draw a parallel between full magneto multiple with combined drops and jacks and the Universal lamp signal equipment of modern practice. On page eleven we show a diagramatic comparison of the relative amount of space required by the apparatus necessary for each type.

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800 Lines Full Multiple with Combined Drops and Jacks.

One hundred sixty lines per operator maximum number that can be assigned. A greater number would push the multiple equipment up clear out of reach and one operator cannot give efficient service to more than 160 lines due to the inherent slowness of the system.

Five local operators required for the 800 local lines under consideration.

The extra operator's salary represents interest on \$3,500 to \$5,000 according to locality and salaries paid.

Number of lines per operator must be determined in the beginning and each position given room for 160 drops and jacks regardless of whether traffic is many times as heavy in some positions as in others.

Operators' maximum reach for highest multiple jack is 25 inches above plug shelf. Multiple jacks are congested on one-half inch centers both vertically and horizontally, making them difficult to locate accurately at this height.

Accidental cut-offs frequently occur due to congestion of multiple jacks as it is sometimes difficult to withdraw one plug without accidentally disconnecting adjacent plugs in worn multiple jacks.

800 Lines Full Multiple Universal Lamp Signal.

Experience has proven that operators can handle 200 to 300 lamp signal lines, with double lamp supervision, more efficiently than they can the 160 lines of standard magneto multiple practice and that 200 lines per operator is a safe minimum.

Four local operators can give better and more efficient service with the UNIVERSAL LAMP SIGNAL equipment.

Difference in first cost of the LAMP SIGNAL UNIVERSAL BOARD is more than offset, right from the start, by saving in operation to say nothing of its greater efficiency, rate raising possibilities, lack of depreciation and the better service which it never fails to give.

Number of lines per operator need not be definitely determined in the beginning as the number of lines in any position may be varied at will from 20 to 800 by the mere shifting of lamp signals and without changing any line or multiple jack connection or confusing the numbering system.

Operators' maximum reach for highest multiple jack is only 16 inches above plug shelf. Multiple jacks are spaced out on one-inch centers vertically insuring accurate connections except in cases of gross carelessness on the operators' part.

Accidental cut-offs are practically impossible as operators have free finger and thumb space above and below each plug regardless of how heavy the traffic may be.

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COMPARISON OF THE TWO BOARDS (Continued)

D. & J. Magneto Multiple.

Not practical to answer remote calls in the multiple because the drop has to be restored. Even with those monstrosities known as electrically restoring drops it is very slow and difficult to answer in the multiple as the operator must first make mental note of the number of the drop which is down and then hunt up the corresponding number in the multiple.

False busy reports sometimes given when a subscriber on a four-party line calls by number for someone on his own line.

Lamp Signal Universal.

Any operator can answer remote calls without observing the number of calling line. When a distant lamp lights, the operator plugs in on its exact level and in the same location in her panel as that of the calling line lamps in the distant panel. In other words one operator can handle the entire board at times of light traffic without leaving her chair.

Impossible for this confusion to arise as the answering cord already occupies the nearest calling jack foregoing on the operators' attention the fact that it is a *reverting* party line call.

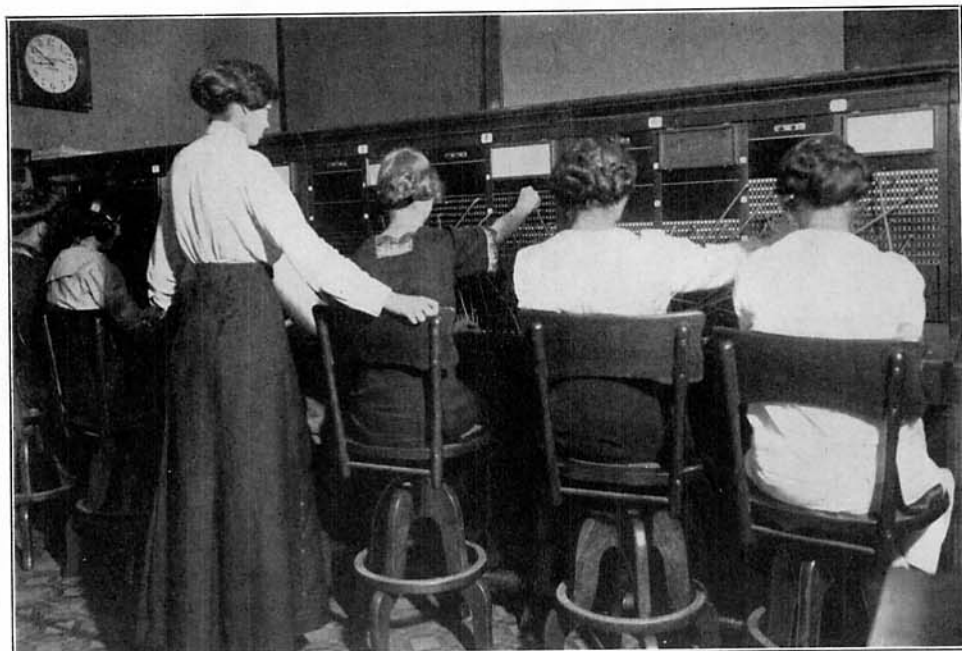


Figure No. 1104—Universal Switchboard at Nevada, Iowa

D. & J. Magneto Multiple, Cont'd.

Board contains total of:

- 2,800 Five-Spring Jacks.
- 2,800 Pairs Contact Points in Jacks.
- 14,000 Jack Springs.
- 11,200 Multiple Cable Conductors.
- 22,400 Soldered Joints in Multiple.
- 800 Line Drops.

Lamp Signal Universal, Cont'd.

Board contains total of:

- 1,600 Three-Spring Jacks.
- No contact points in jacks.
- 4,800 Jack Springs.
- 4,800 Multiple Cable Conductors.
- 9,600 Soldered Joints in Multiple.
- 800 Line and cut-off relays mounted in pairs under steel covers, also 800 indestructible lamp jacks, caps and lamps.

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COMPARISON OF THE TWO BOARDS (Continued)

D. & J. Magneto Multiple.

Board contains total of:

150 Ring-off drops (presuming magneto board to be of highest type with double ring-off drops in cord circuits). These subject to continual battering from plugs and cords and likely to get into bad adjustment.

Small storage battery power plant essential for satisfactory operation of busy test, pilot lamps, operators' sets and ringing equipment.

All lines must remain magneto at the old rates until a new board is installed when the old one must be junked or sacrificed on the second-hand market. In other words there can be no progress toward better service and better rates while this board remains in service.

Lamp Signal Universal.

Board contains total of:

120 Pairs Cord Relays mounted under dust tight steel covers requiring practically no attention and capable of lasting forever. Also 120 supervisory lamp jacks, lamps and protecting caps.

Power Plant for Universal Board somewhat greater in first cost but practically no more trouble or expense to install and maintain.

Any one of the magneto lines can be changed to common battery at any time by changing connections at line relay and without adding or removing any apparatus. In this manner the plant can be changed to common battery gradually and higher rates charged for the common battery service.

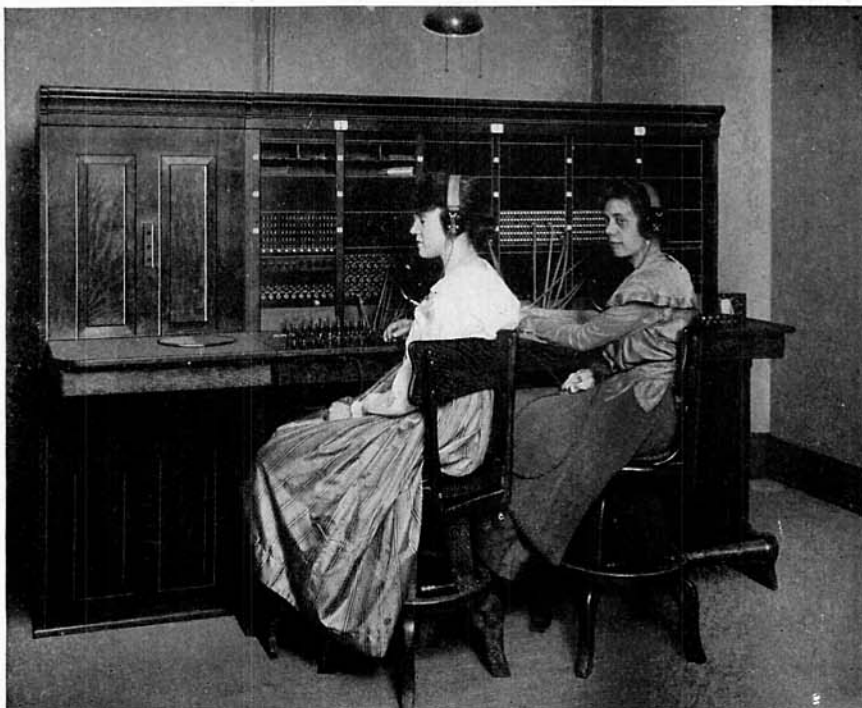


Figure No. 1105—Universal Switchboard at Blair, Nebraska, ultimate capacity, 1,200 lines

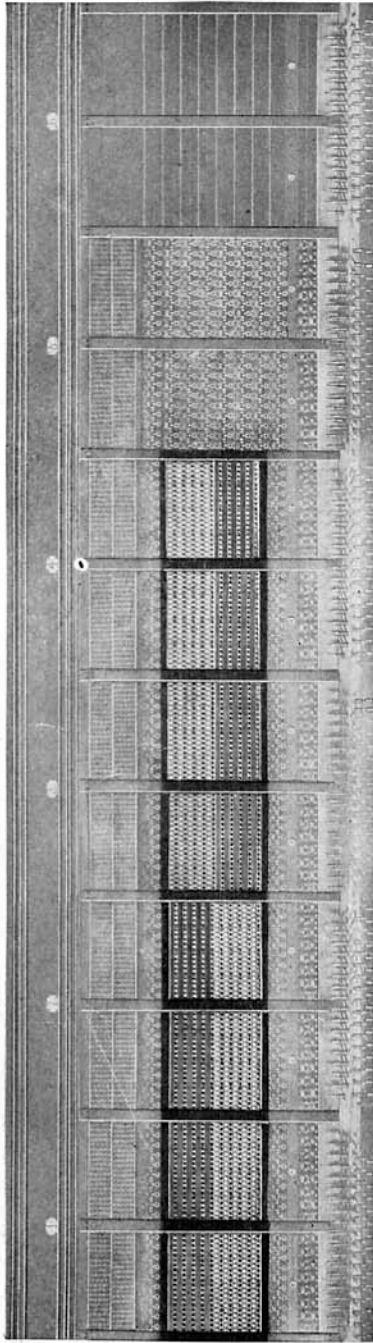


Figure No. 1106.—Panels in heavy outline at left are superimposed on face of board to show the small amount of space required by 800 Universal Magneto Common Battery lamp signal lines in comparison with the large amount of space required for 800 line Magneto multiple with combined drops and jacks.

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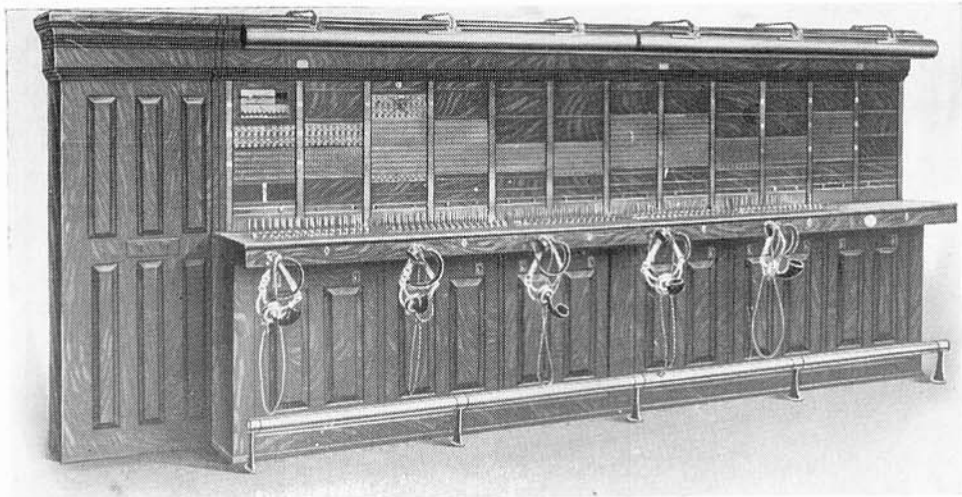


Figure No. 1107—Universal Switchboard at Minneapolis, Kansas. This company has since bought two larger boards of this type for their Beloit and Clay Center exchanges



Figure No. 1108—Universal Switchboard at Ashland, Kansas

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Figure No. 1109—Universal Switchboard at Beloit, Kansas, 600 Lamp Lines. An exact duplicate of this equipment subsequently purchased for their Clay Center exchange

UNIVERSAL OR STRAIGHT COMMON BATTERY

The foregoing pages show the overwhelming advantages of the UNIVERSAL LAMP SIGNAL SWITCHBOARD over the old style magneto multiple which no one can now consider for a magneto exchange of any great size or importance.

The only question is whether it is better to purchase a UNIVERSAL LAMP SIGNAL BOARD and change to common battery gradually as the outside lines are changed from grounded to metallic and as the increased rate can be secured for the better service; or whether a greater initial investment should be made to provide a new lamp signal common battery board, a full set of new telephones and a new cable plant to make all grounded and common return lines full metallic.

Now, whenever a telephone company is able and willing to rebuild a magneto plant and put in a new switchboard and new telephones all at once and can get an adequate rate for the common battery service, we would of course recommend the installation of a full common battery equipment at the outset.

But, in the case of small plants having a very large proportion of farm line patrons, when it is desired to change the city system to full common battery, we emphatically recommend the installation of a UNIVERSAL LAMP SIGNAL SWITCHBOARD and the multiplying of farm lines as well as city lines so that any operator can complete any connection.

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This means a somewhat greater investment than a strictly common battery switchboard with only one position arranged for farm work, but where the proportion of farm line traffic to the total is very heavy, the increased investment is justified many times over.

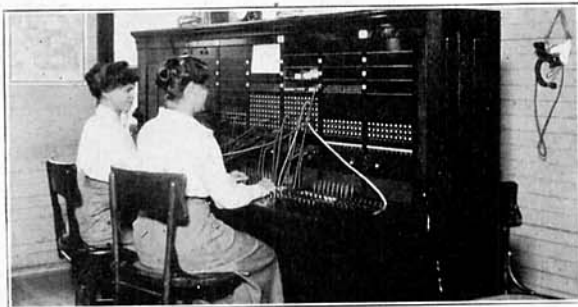


Figure No. 1110—Universal Switchboard at Lamoni, Iowa, 300 Lamp Lines

So that the entire switchboard proposition resolves itself into the following:

1. For small exchanges expecting to remain magneto indefinitely; magneto switchboards with combined drops and jacks as described in our Bulletin No. 10.

2. For medium sized exchanges, expecting to cut

over to common battery at some future time; UNIVERSAL LAMP SIGNAL SWITCHBOARDS with which the installation of common battery telephones at higher rates can begin immediately.

3. For medium sized exchanges, desiring to change to common battery at once, retaining a large number of farm lines, magneto UNIVERSAL LAMP SIGNAL SWITCHBOARDS with which all cord circuits in the entire board can be used to switch farm and city lines indiscriminately.

4. For large magneto exchanges where for any reason full common battery cannot be installed at once; UNIVERSAL LAMP SIGNAL SWITCHBOARDS should be installed so that common battery telephones can be introduced gradually and the rates raised without excitement or trouble.

5. For large exchanges where common battery service is already being given or

where it can be installed all at once at an adequate rate; regular common battery switchboards may be installed with all lamp line circuits wired common battery and with Universal cord circuits in a sufficient number of positions to care for

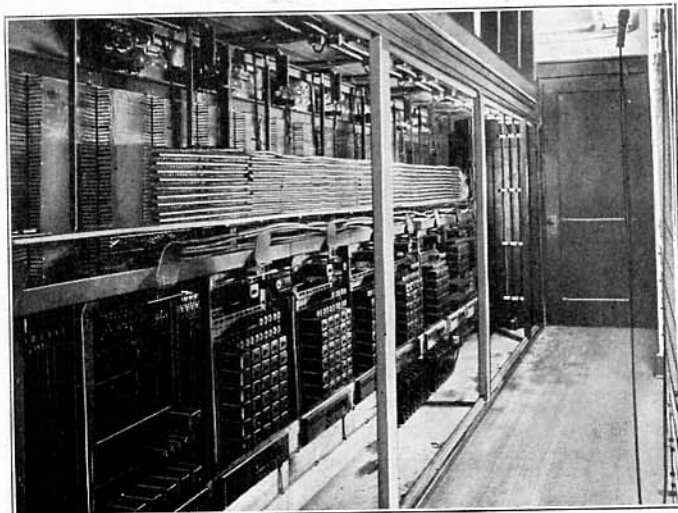


Figure No. 1111—Rear view Beloit, Kansas, Universal Switchboard

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farm and night toll lines, the cord circuits in all other positions being common battery with the automatic features previously described.

UNIVERSAL LAMP SIGNAL SWITCHBOARDS therefore fill the important gap between very small and very large exchanges and there is no subject of greater interest and importance to the live and wide-awake telephone manager at this time.

GENERAL DESCRIPTION OF SYSTEM. Each line terminates at the central office in a Universal line and cut-off relay, except in the case of small non-multiple boards, when the cut-off relay is not required. The line and cut-off relays are mounted outside the switchboard on a heavy and substantial relay rack as shown in Figures Nos. 1112 and 1113. Each strip on the relay rack contains 20 pairs of line and cut-off relays, each relay being mounted on the strip under a dust-tight steel cover. This places the working parts of the relay clear beyond

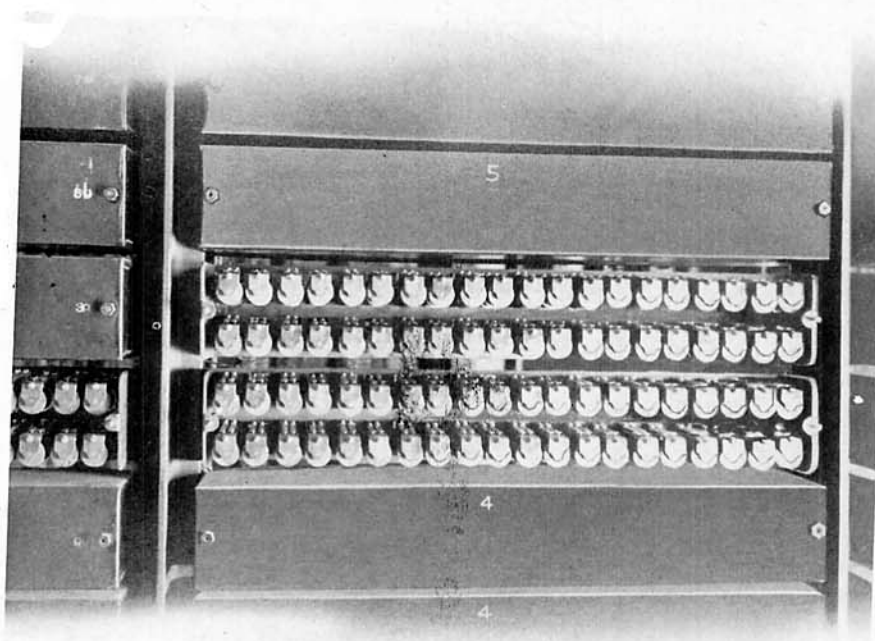


Figure 1112—Line and Cut-off Relays

the possibility of damage through dust, moisture or violence, the whole equipment being characterized by solidity and permanence.

The magneto subscriber desiring to call, turns his crank in the usual manner. The first impulse of current passing through his line relay causes the latter to automatically cut itself out of the line circuit into a local circuit where it is firmly locked up by the 24-volt storage battery, thereby causing the line lamp in the switchboard to burn until the operator answers. The battery current does not go out on the calling subscriber's line and no magneto line ever has battery on it until it has been changed to the common battery connection at the line relay.

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All line relays remain locked up with equal firmness, and all line lamps in the board burn with equal brightness regardless of the condition of the calling line; its only requirement being the ability to get the one current impulse into the line relay.

The purpose of the CUT-OFF RELAY is to cut the line relay entirely out

of circuit on insertion of a plug and so afford an absolutely clear path for talking current. No matter how many jacks the line circuit may be multiplied into, none of these jacks contain any contacts. Instead of having one or two pairs of exposed contacts in each jack we have only one pair of contacts for each line and these are enclosed under the dust-proof steel cover where there can never be deterioration of any kind.

The operator cannot possibly overlook the calling party's line lamp because of the large *pilot lamp* which lights in unison with it. When a plug is inserted to answer the call the cut-off relay operates automatically, whereupon, the disconnected line relay likewise operates automatically and the line lamp automatically goes out. The operator thereupon ascertains the desired number in the usual manner and inserts the calling plug in the desired number, which she can always easily reach without passing the cord to another operator. Should the person on the line called for happen to be talking from some other jack,

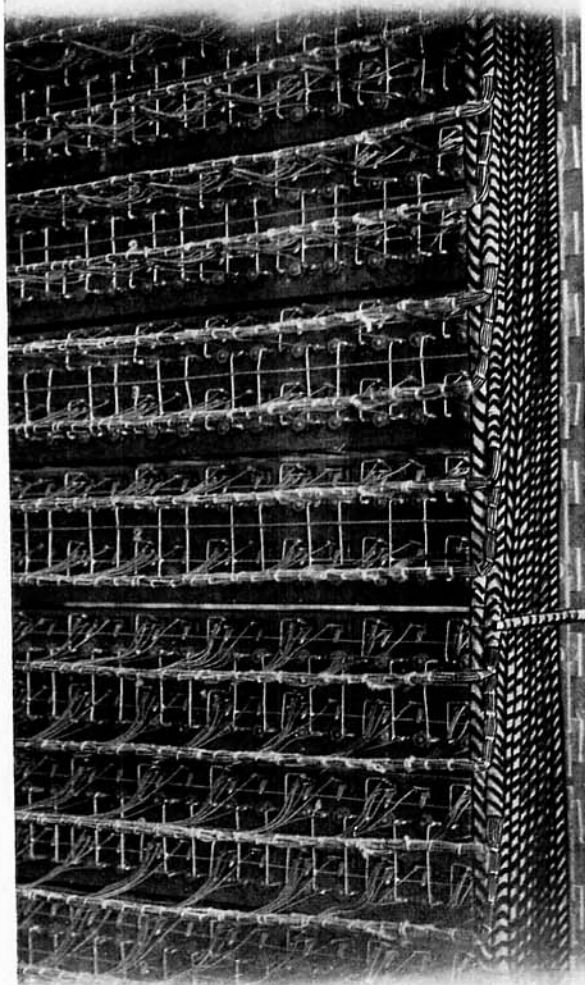


Figure No. 1113—Terminal Side of Relay Rack

the operator will automatically receive a warning click in her ear when she starts to insert the plug. In such case she will of course not ring on the line, but will report to the calling party that it is busy. But if no click is received the operator

(Continued on Page 19)

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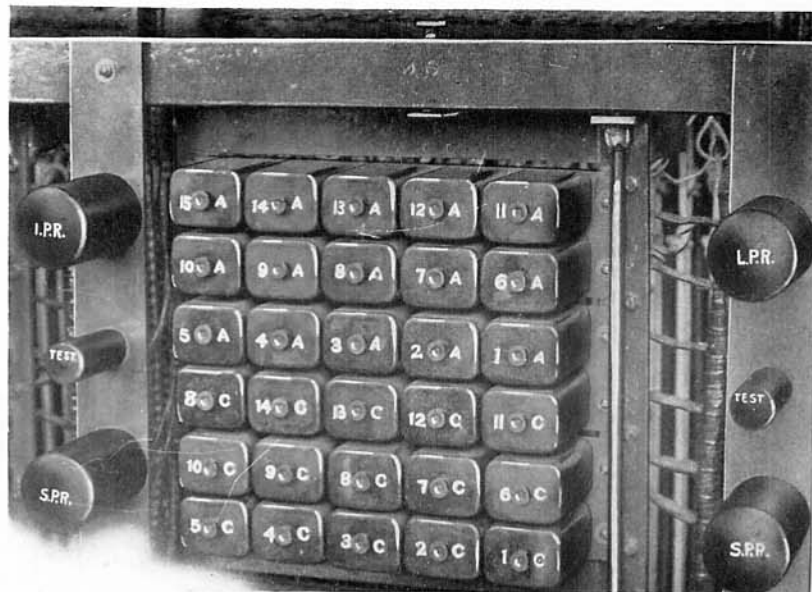


Figure No. 1114
Supervisory Relays, Mounted on Swinging Rack

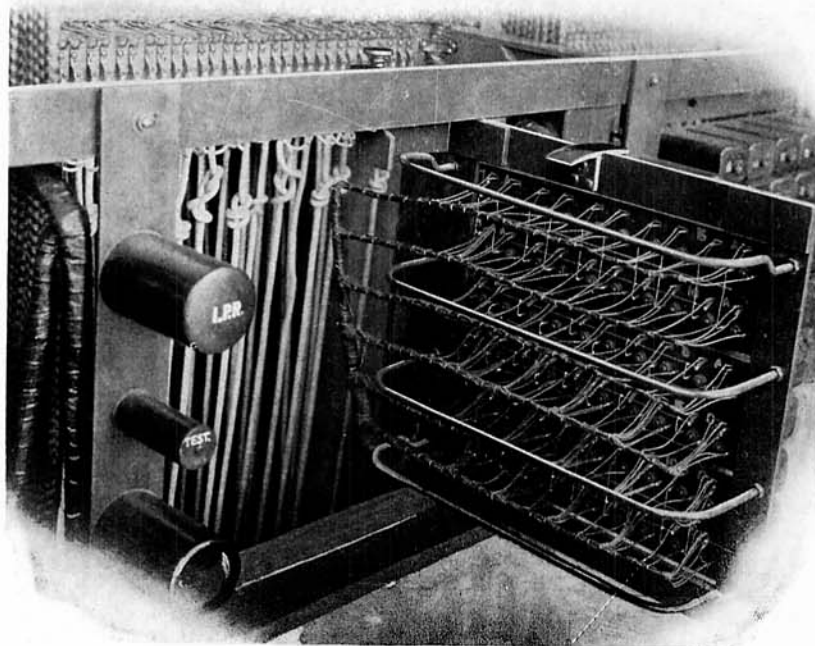


Figure No. 1115
Supervisory Relays with Rack Swung Back Showing Wiring

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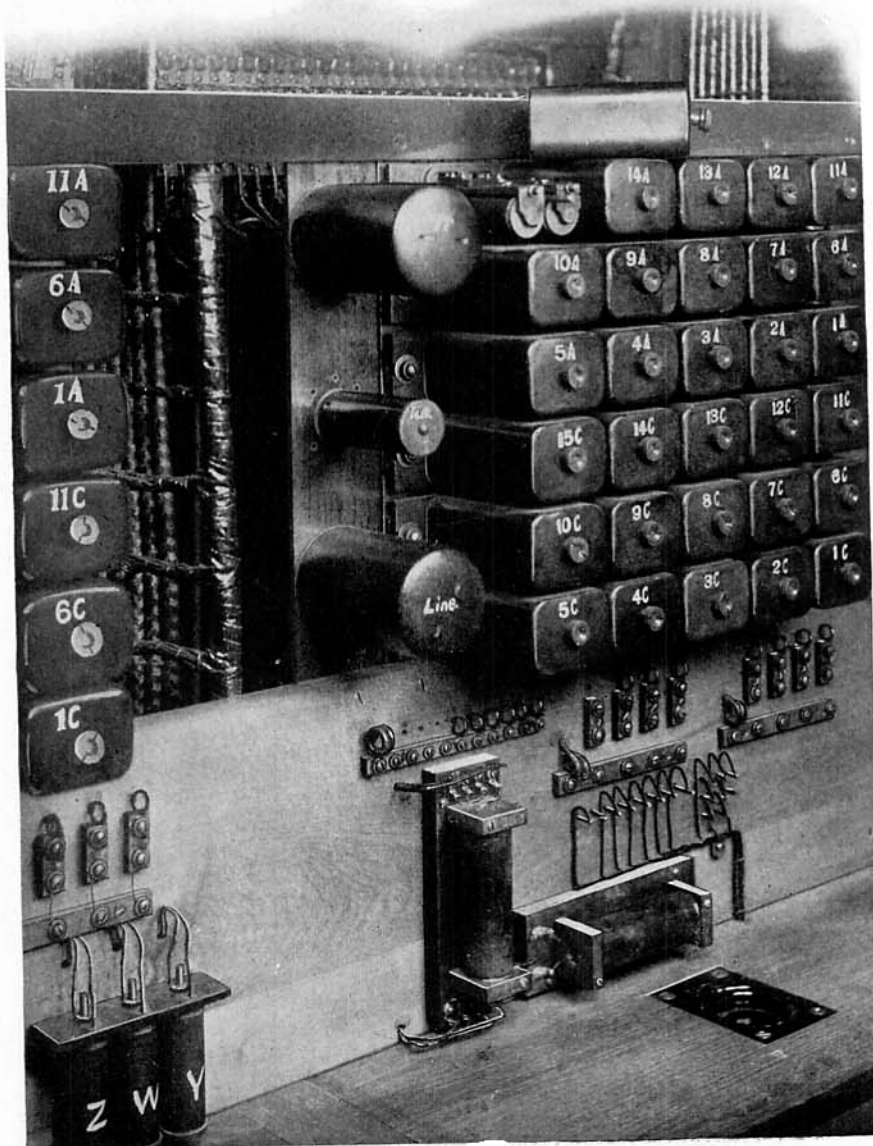


Figure No. 1116
Stationary Type Relays, Showing Cabling, Connections and Coils

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will insert the calling plug and ring, as the insertion of the plug will automatically pull up the cut-off relay and so clear the called line for ringing and talking.

The two subscribers are now afforded the highest type of magneto service,

for by a touch of his crank either party can light his own supervisory lamp and secure the operator's attention. On the completion of a call, if either party wants another connection at once, he can instantly get the operator in on the connection, and there is no chance of the operator's "guessing wrong," as to which of the connected parties is making the call, since the cord lamp shows this absolutely.

Should either party become impatient and call the operator in on the connection for any purpose, the act of listening in will automatically extinguish either party's supervisory lamp and leave it ready to be relighted when the final ring-off is given.

Farm lines are terminated on ordinary combined drops and jacks to enable the operator to answer her own signals only, instead of having to plug in on all calls as would be the case if these lines were terminated on locking relay lamp signal circuits. But when connected with city lines and with

each other the farm lines get full benefit from the double lamp supervisory cord

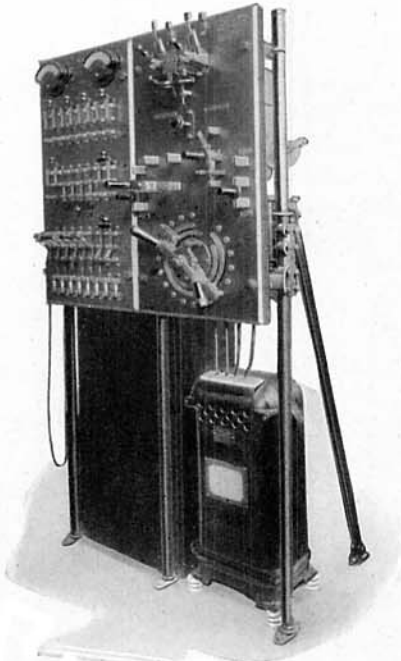


Figure No. 1117
Power Board, Beloit, Kansas

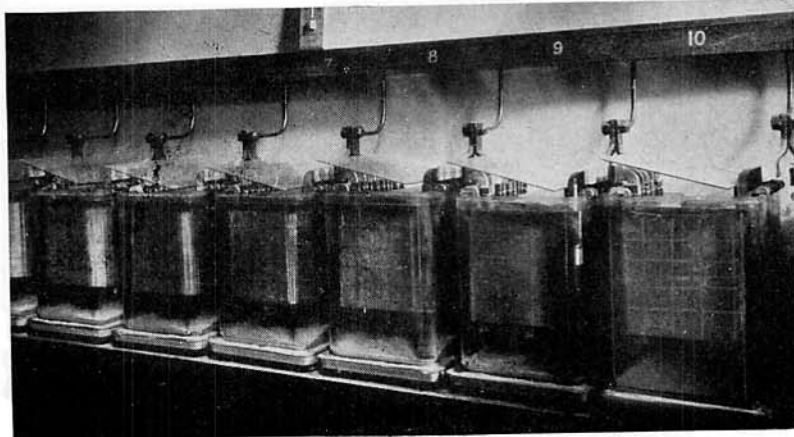


Figure No. 1118—View of one side of well arranged Battery Room.

circuits which operate on farm line connections in exactly the same manner as on city magneto lines as above described.

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When it is desired to change any subscribers' lines to common battery, it is only necessary to change connections at the line relay *without making any changes or additions of apparatus*. Such subscribers will then call central automatically by the mere removal of receivers from their hooks and automatically light their cord circuit supervisory lamps when they hang up their receivers, thereby giving the operators an unmistakable signal to disconnect. If the called party in any connection has a common battery telephone, his supervisory cord lamp will automatically light up as soon as the plug is inserted and remain lighted as a signal to the operator to continue ringing from time to time until the called party answers. The cord lamp will then automatically go out until it automatically relights as a signal to disconnect after the conversation has been finished.

In short, this system has been designed and perfected to give the highest possible class of magneto service to magneto subscribers; the highest possible class of rural service to rural subscribers; the highest possible class of common battery service to common battery subscribers, and the highest possible class of interconnections between the different kinds of service. It is not a "*convertible*" switchboard but a UNIVERSAL SWITCHBOARD, or, in other words, the highest type of common battery switchboard with full universal cord circuits and an extra contact on each line relay which renders the line circuit universal as well as the cord circuit and which is cut dead when the line is changed from magneto to common battery.

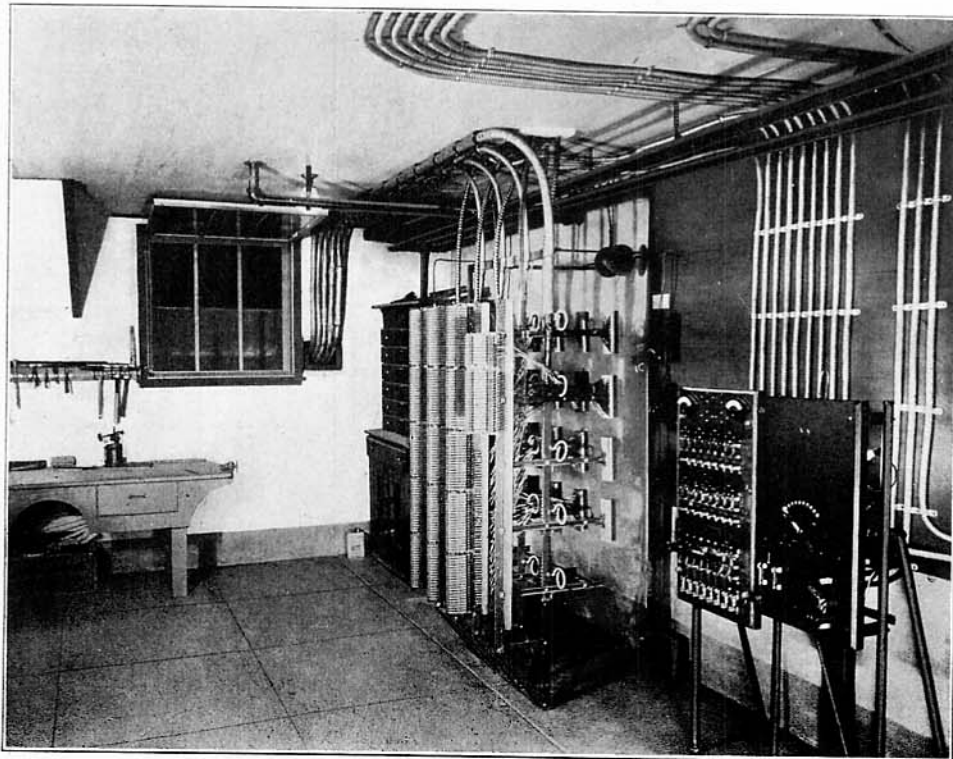


Figure No. 1119—Terminal Room, Ashland, Kansas

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UNIVERSAL SWITCHBOARD TALKING CIRCUITS

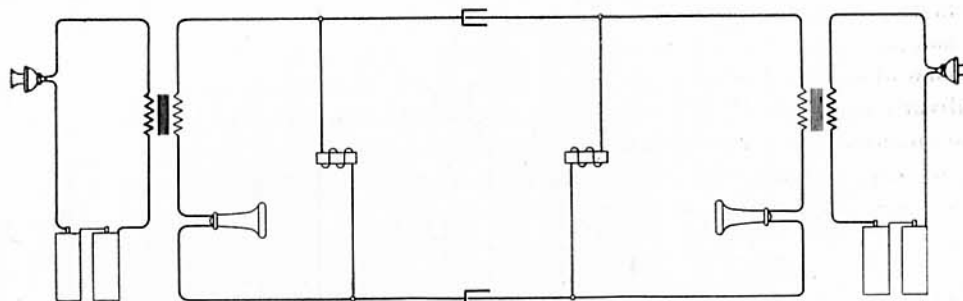


Figure No. 1120—Magneto to Magneto

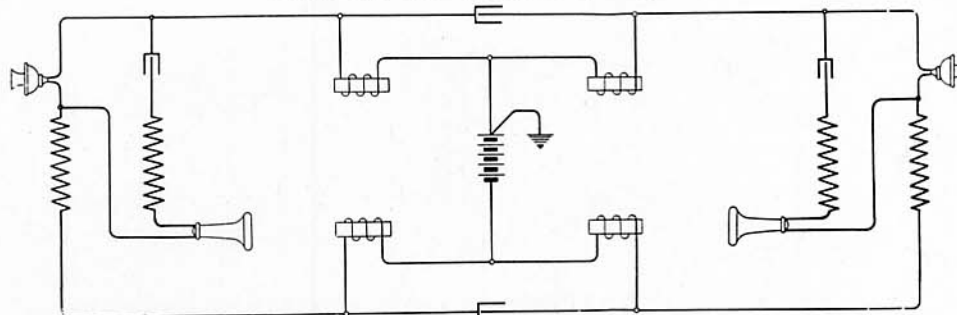


Figure No. 1121—Common Battery to Common Battery

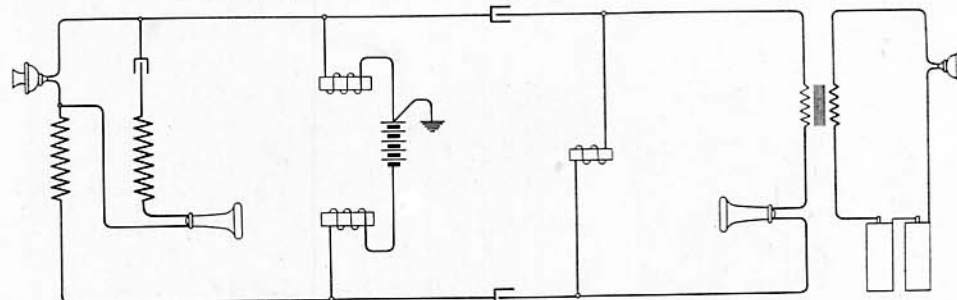


Figure No. 1122—Common Battery to Local Magneto or Farm Lines

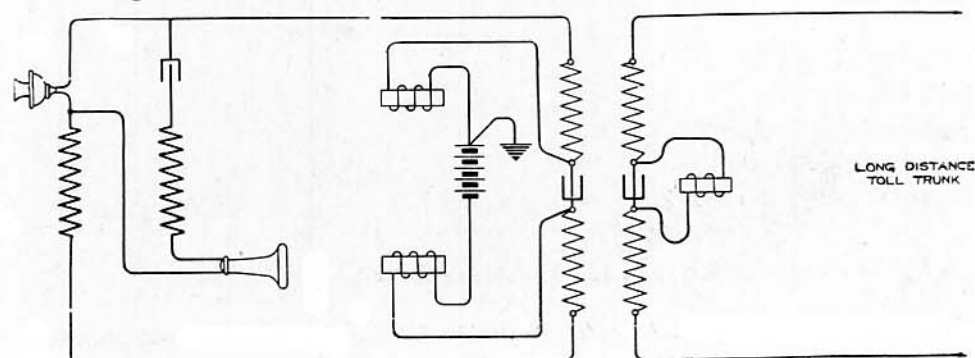


Figure No. 1123—Common Battery to Long Distance Toll Trunk Line

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Don't fail to get this important distinction. A "convertible" switchboard is one that could be changed from magneto to common battery by making sufficient changes in the apparatus and wiring which would be more or less costly and demoralizing to the service. A UNIVERSAL SWITCHBOARD is one that is already the highest type of full common battery equipment with enough added to enable it to operate on magneto also, so that the line circuits will be strictly universal and ready for either magneto or common battery connections the same as a well designed universal cord circuit.

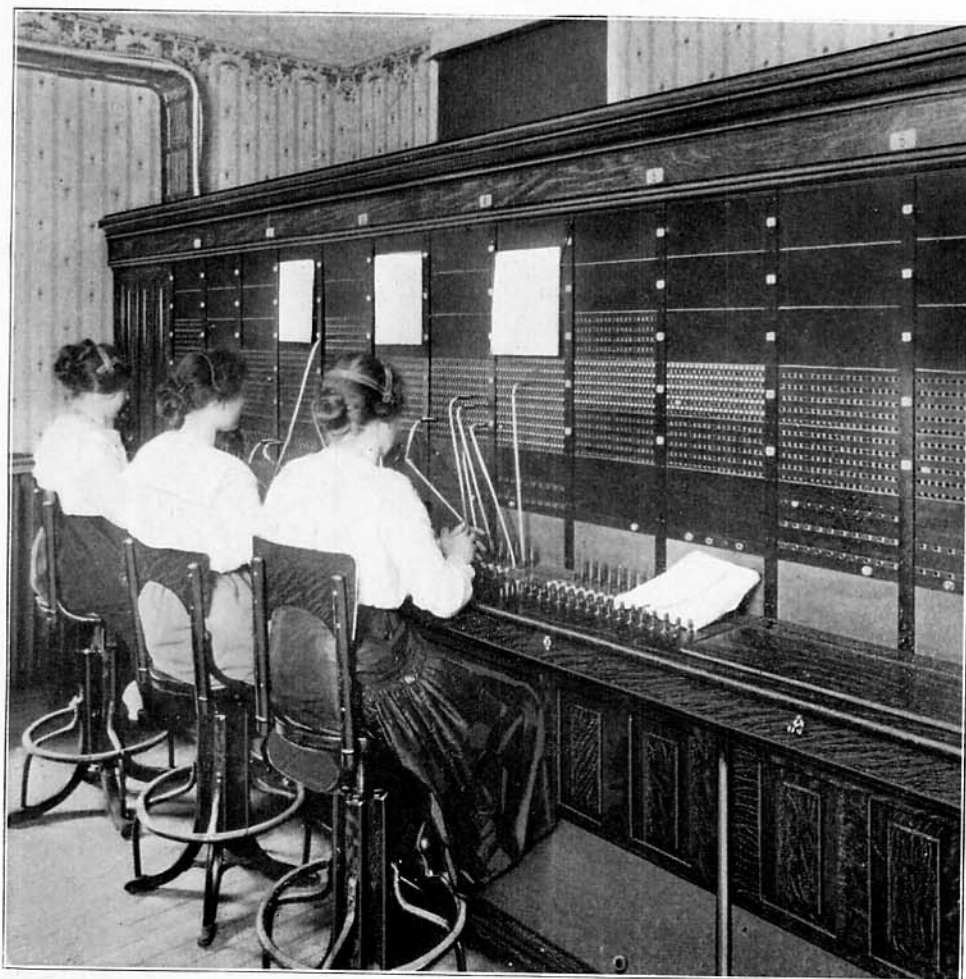


Figure No. 1124—Universal Board at Platteville, Wisconsin, capacity, 2,000 Universal Lines, multiplied every four panels

DETAILS OF EQUIPMENT

RELAYS: The apparatus features of importance in all lamp signal switchboards are the line circuit and cord circuit relays. These cannot be built too well and cannot be made too efficient, for which reason Kellogg Relays have a

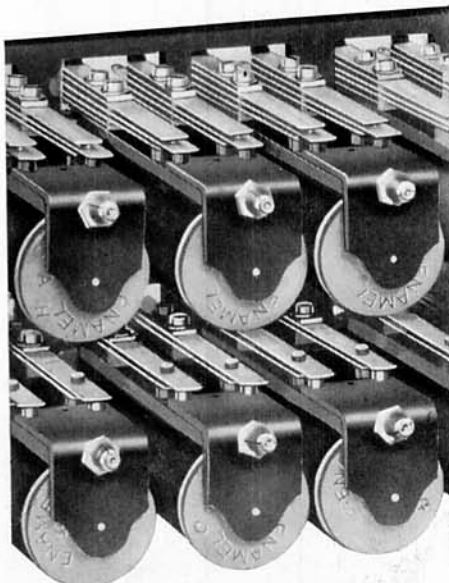


Figure No. 1125—Cover Removed
Code No. 2037-2048, Universal Relays

relay's proper operation will then not depend on the maintenance of the outside lines in wholly perfect condition.

It will be noted that the Kellogg Universal line relay has but a single winding. For magneto lines this means about double the efficiency of those relays which employ separate ringing and locking windings. But more important is the fact that Kellogg single wound Universal line relays are as free from burn-outs and lightning damage as are the celebrated and time-tested Kellogg drops.

The core and entire magnetic system of all Kellogg relays are of the finest grade of soft Norway iron, "pot annealed" to guard against any traces of residual magnetism. Kellogg relays are of the angle armature type, which more than 20 years of usage has proven superior to all other designs. Such construction is very expensive, but experience has proven its wisdom. The Kellogg Company prefers to make the equipment as perfect as money and brains will permit and to depend on a low sales expense and the general efficient and sane conduct of the business to keep prices as low as possible for the high grade of equipment furnished.

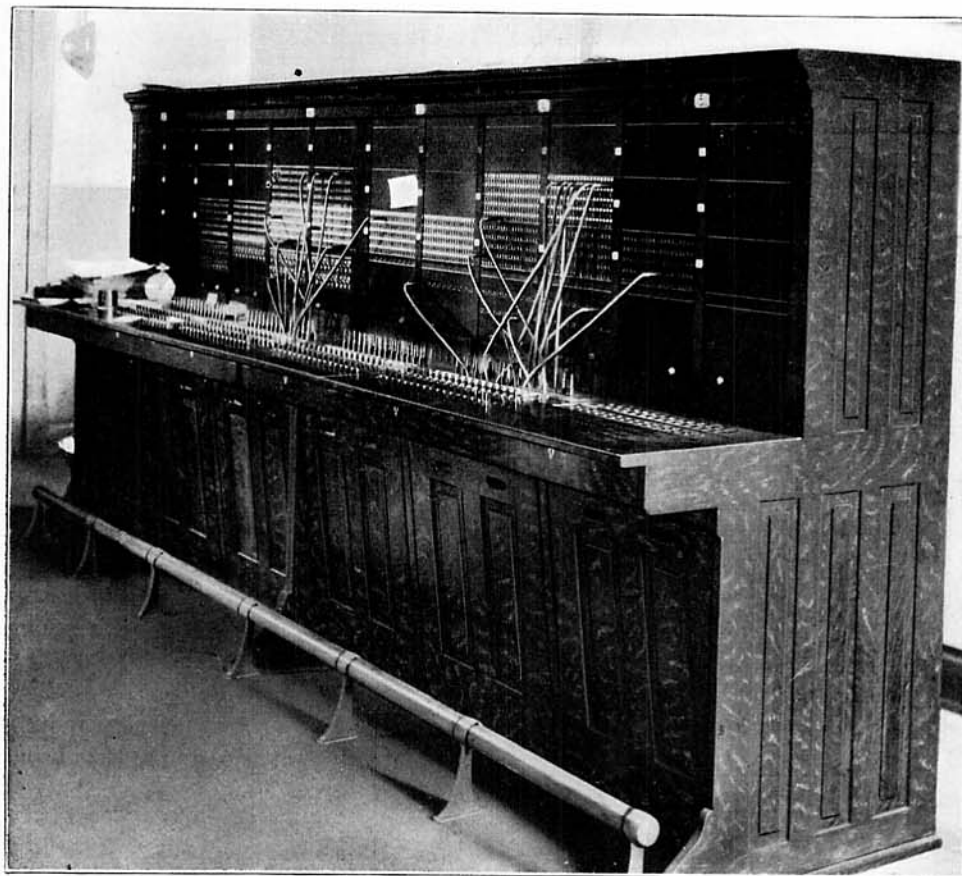


Figure No. 1126—Universal Board at Aurora, Nebraska

MULTIPLE JACKS: All Multiple Jacks in Kellogg Universal Switchboards are of the conical spring type, which exactly fit the profile of the plug.

This type of construction decreases wear on both plugs and jacks to an unbelievable extent, and wearout tests made with automatic machines equipped with counters indicate that tempered contact jack springs of this construction are practically indestructible and that the plugs will give as long or longer service than plugs have been accustomed to give heretofore in connection with the ordinary brass thimble jacks of former practice.

It will be noticed that the entire framework of these jacks is of heavy and rigid construction. The jacks are of the three-conductor type without contacts of any kind other than the rubbing contacts made with the plug.

Instead of placing an extra pair of contact springs in each jack, making a total of five springs and running, talking and signalling circuits through such a maze of contacts, a single pair of springs under the dust-proof steel cover of the cut-off relay serves for all the multiple jacks on that line and renders the multiple system simple and practical.

KELLOGG SWITCHBOARD AND SUPPLY COMPANY

The Kellogg Company considers it *Possible but Not Practicable* to operate a multiple system having 5-point jacks mounted on half-inch centers, and all regular multiple jacks on half-inch horizontal centers are therefore limited to three springs and where five-point jacks must be used, as in the multiplying of farm lines, it is urged that such multiple jacks be placed on not less than

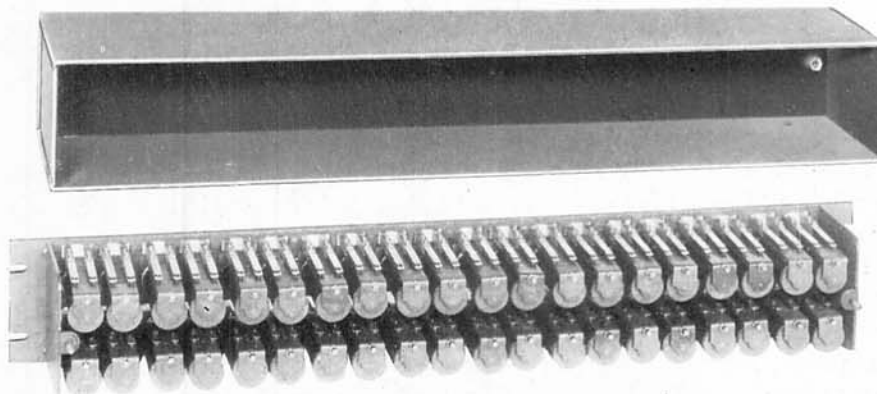


Figure No. 1127—A Strip of Universal Type Relays

one-inch horizontal centers so that the average space between spring centers on the rear of the strip will be one-fifth of an inch instead of one-tenth of an inch as on half-inch centers.

Now, since the Kellogg Company objects to the mounting of a few five-point farm line multiple jacks on half-inch centers, knowing such congestion to

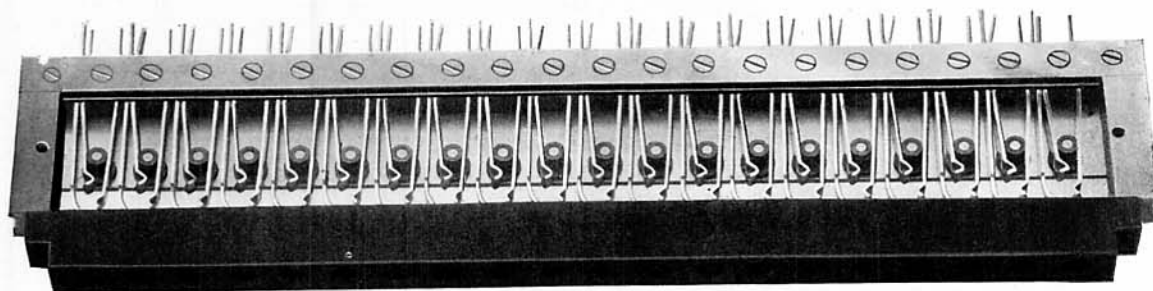


Figure No. 1128—Strip of Twenty Multiple Jacks

be inadvisable. consider how impractical is the idea of building the entire multiple board on the scheme of ten jack springs to the inch. Such equipment is frequently foisted by competitors upon buyers without experience in the operation of multiple boards, but it is not the *standard* equipment of any manufacturer and we hope no readers of this bulletin will ever be misled into the purchase of any multiple board having five-point jacks with springs congested ten to the inch.

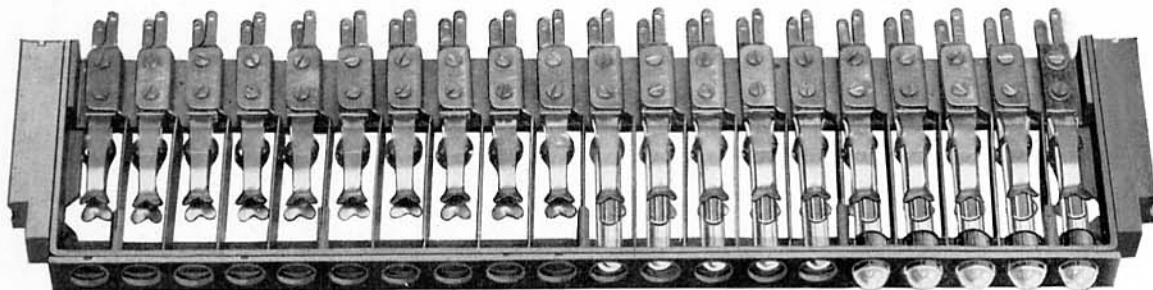


Figure No. 1129—Strip of Lamp Jacks

LAMP JACKS, LAMPS AND CAPS: Kellogg lamp jacks are constructed throughout of brass, mica and lava (all indestructible materials) and contain no rubber to be warped or damaged by the heat from line lamps when rows of the latter are allowed to burn for a considerable period as sometimes happens during fires and other occasions of great excitement. Each lamp is partitioned by brass strips so that there is no leakage of light to partially light adjacent light caps. These partitions and all interior portions of the jack are given a white finish to prevent absorption of light from the lamp, which accounts, in part, for the powerful illuminating qualities of Kellogg Lamps, greatly facilitating the answering of distant calls in the multiple in times of light traffic.

KELLOGG TIPLESS LAMPS are scientifically constructed to project the light straight ahead through the lamp cap and produce powerful illumination with extreme minimum of current consumption. The lamps possess long life as they do not have to be "over-lighted" to brilliantly light the heavy and substantial opal lamp caps. Kellogg line lamps are built to burn with operative brilliancy for an average of 1,000 lighted hours, which is equivalent to more than one million calls. If the average call rate be ten calls per line per day, the average life of the lamps, with usual promptness in answering, will be over 300 years, so that line lamps can be considered as practically indestructible.

Answering supervisory lamps should show equally satisfactory life if disconnects are promptly attended to, and while calling supervisory lamps on common battery lines must burn until the called-for party answers, these lamps require renewals so rarely that such expense is practically negligible. (Fig. 1130.)

KELLOGG LAMP CAPS are of solid semi-spherical opals with a brass retainer spun around the edge of the cap so that the latter cannot come loose and drop out, thus rendering the opals free from breakage by the plugs except in cases of gross violence and improper operating.

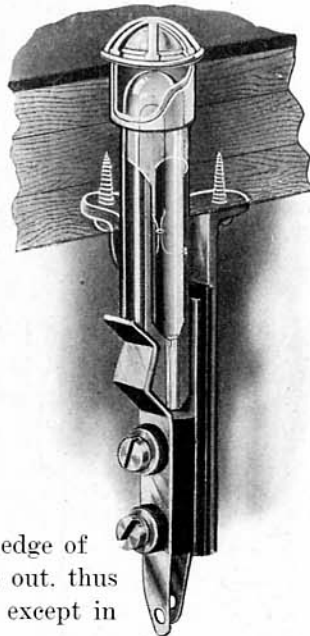


Fig. No. 1130

KELLOGG SWITCHBOARD AND SUPPLY COMPANY



Figure No. 1131—Kellogg
Pilot Lamp Caps

PILOT LAMPS: Operators have little opportunity to neglect line calls and disconnects because of the line and supervisory pilot lamps which burn in unison with the line and disconnect lamps and remain lighted as long as any signal remains unattended. Provision is always made for multiplying the line and supervisory lamps of each switchboard position into

the chief operator's or manager's desk so that the character of the operator's work may be under observation at all times, and experience has always shown it a powerful incentive to best efforts on the operator's part.

SWITCHBOARD PLUGS: The plugs used with Kellogg Universal Switchboards are all of the three-conductor type, thereby affording a clear, full metallic talking circuit and a separate third conductor for controlling the switching relays which automatically adapt the cord circuit to whatever combination of lines are to be connected.

In this manner the operator can answer any line with any cord and plug without ascertaining whether the calling line is magneto or common battery; in fact, the operator has no means of knowing whether a calling line is magneto or common battery, which insures both classes of patrons equally prompt and courteous attention.



Figure No. 1132—Five pairs of lamps on manager's desk lighting in unison with line and pilot lamps in a five position local board. Also five order wire keys for listening in on same number of operators' sets

In like manner, on learning the number desired, the operator has only to insert the calling plug, and ring, as the calling half of the cord circuit will automatically adapt itself to magneto or common battery service and the operator does not need to know which class of service is being given to the party called.

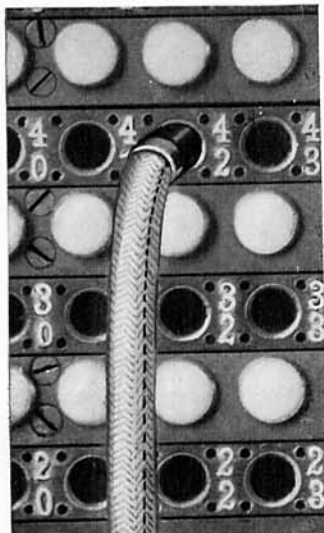


Figure No. 1133—Showing Tangentially Stitched Cord

This is REAL UNIVERSALITY and the speed of operation possible with a multiple board of this type has to be seen to be fully appreciated.

Time was when three-conductor plugs and cords were presumed to be much shorter lived and considerably more expensive to maintain than two-conductor. This might have been correct in the case of cords in the days of plain tinsel conductors and dry linen braid, but since the advent of the combination steel and tinsel cords with sewed wax linen outer braids, three-conductor cords have likewise lost all of their former objections and we believe that the average three-conductor cord lasts fully as long as the average two-conductor, any tendency to shorten life in the three-conductor being fully offset by the



Figure No. 1134

fact that three-conductor cords are used principally in the larger exchanges where more attention is paid to proper methods of operating and the proper care and handling of equipment.

The KELLOGG three-conductor plug is built along the same lines and embodies all the advantageous features found in the Kellogg two-conductor plug and can be depended on for the same staying qualities that have made the two-conductor Kellogg plug so well and favorably known.

RINGING AND LISTENING KEYS

The REQUIREMENTS of a perfect ringing and listening key are as follows:

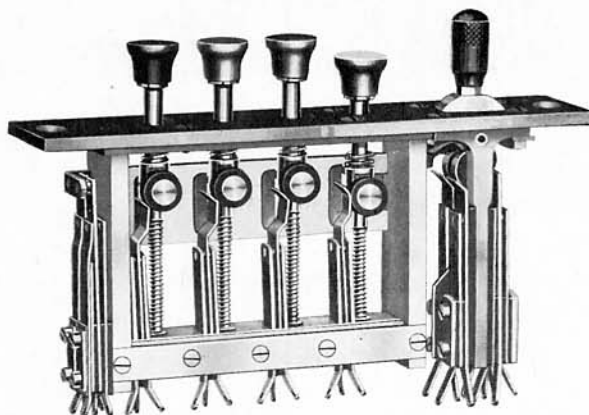


Figure No. 1135—Individual indicating 4-party key
(Used when number of party line stations is in excess of individual lines)

1. Must afford absolutely reliable connection for the talking circuit, since the connected parties have to talk through four contacts in the two ringing keys of each cord circuit.

2. Friction, and wearing parts must be reduced to a minimum or the key will be extremely short lived because of the fact that one key has to take care of the combined traffic of about ten average lines.

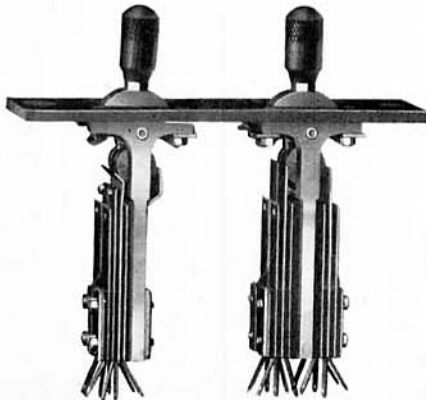


Figure No. 1136—Combined ring and ringback key with separate listening key

3. Insulation must be such that no noise or inductive disturbances from power generator ringing current will be noticed either by operator or subscriber.

4. Keys must be located so that all key shelf space will not be taken up and the operator deprived of the necessary key shelf room.

5. Key cable wiring must be soldered to non-movable portions of the key springs, or broken connections and endless trouble will result.

6. Ringing springs must be so arranged that they will break contact with the calling party before connecting with

the power generator springs. Otherwise calling party will receive a "bat" in the ear each time the ringing key is operated. The listening key must trip easily into position and remain locked until released. When released it must return gently to upright position without a slam. With many of the keys on the market it is almost impossible for the operator to pull a key from listening to normal position without producing a cut-out and in many cases ringing the called party in the ear. Such keys work so stiffly that when they do get past center they come up with a slam and the acquired momentum causes the breaking of the circuit.

All of these requirements have been carefully fulfilled in the design of the Kellogg key.

1. Perfect talking and ringing connections are made certain by the use of *platinum contacts*. Contact springs are sure to retain their resilience indefinitely and platinum contacts will never become corroded or tarnished.

2. Friction and wearing parts are reduced to a minimum by using hard rubber rollers on brass bearings. The Kellogg key is thus designed to work absolutely dry without sticking.

The Kellogg key is so designed that wear in the cam lever and rollers can in nowise affect the proper operation of the springs, and when years of continued usage have resulted in an objectionable amount of "slack," all wearing parts in the key can be easily renewed at trivial expense.

3. The insulation used in Kellogg keys is of micarta, which completely eliminates all generator noise and is free from the many disadvantages of hard rubber.

4. The compact design of the Kellogg key permits of ample key shelf room for the operator's comfort and convenience. It also affords opportunity, for the extreme neatness and simplicity of wiring for which Kellogg key shelves are everywhere admired.

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5. The wiring is soldered to the non-movable ends of the key springs. Perfect soldered joints are thus secured and these joints will always remain good, as they are not moved by the operation of the key.

6. The master springs in Kellogg keys are designed to make a clean break from their normal contacts with a very slight forward movement. They never make before breaking, and so never ring back in the called party's ear.

The service of Kellogg keys has proven that they fulfill the above conditions by years of continuous and severe usage, and it is furthermore the only key now on the market that has been so proven by the test of time.

COMBINED DROPS AND JACKS FOR FARM LINES

The REQUIREMENTS of a perfectly designed combined drop and jack for rural lines are as follows:

1. Drop must be sensitive and respond to extremely weak currents in case of line trouble.
2. The drop shutter must produce a clean cut rattle to indicate incoming signals and code rings.
3. Drop shutter must not be left to fall down, but must be KICKED DOWN by the shutter rod.

4. Automatic restoring device must be reliable in action and not subject to disability from wear and hard usage.

5. The night alarm contact must be absolutely positive and not subject to trouble from dust or to damage by the plugs.

6. The jack springs must make firm talking contact both with the tip and sleeve of new and worn plugs alike. They must wholly prevent talking parties being "cut-off" by the partial withdrawing of the plugs by accident. The springs themselves must be so designed and tempered as

to be free from breakage and yet withstand the maximum of wear and tear. Both jack springs and thimbles must be easily removable when worn out on extremely busy lines.

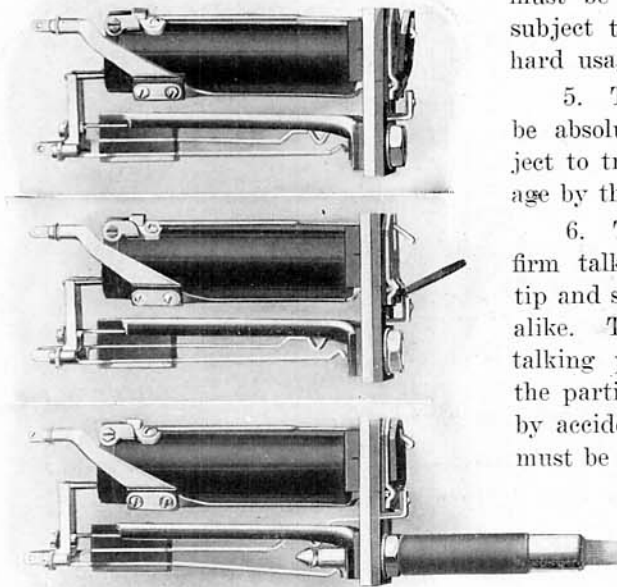


Figure No. 1137—Showing Operation of Kellogg Combined Drop and Jack

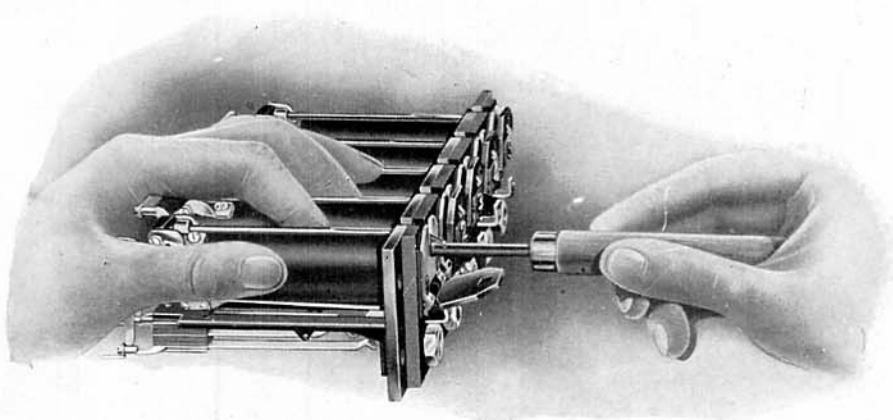


Figure No. 1138—Showing how any drop coil can be removed from mounting strip without disturbing other drops

7. All iron work about drop coils and armatures must be so treated as to be wholly rust proof and to prevent the shedding of metallic scales.

8. Each drop coil with its core and containing shell must be heavily insulated with hard rubber from the mounting plates, from the night alarm circuit, and from all other drop coils and adjacent parts. Such construction is very expensive, but it renders burnouts and damage from lightning highly improbable under any circumstances and practically impossible when proper carbon protection is employed.

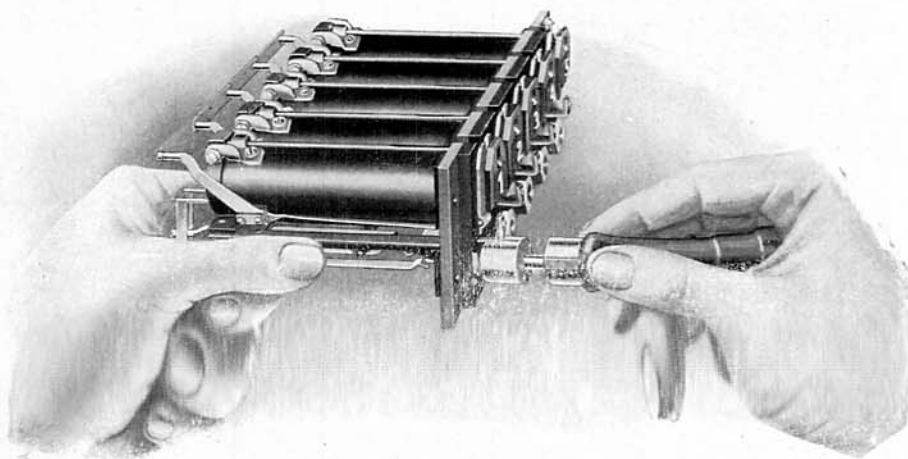


Figure No. 1139—Illustrating how any jack can be removed from mounting strip without disturbing other lines



Figure No. 1140—Strip of ten combined drops and jacks for farm lines

Each and every one of these requirements has been fulfilled in the design of Kellogg drop and jack equipment.

1. Sensitiveness: Drops will fall reliably with minimum of current as extreme sensitiveness is secured through the proper design of armature and shutter hook, so that a very small armature movement will produce a full movement of the shutter hook.

2. Clearness of Signal: Secured on all Kellogg drops by providing shutter rod with rigid surfaces to strike against. A good rattle is thereby secured and the drop is left perfectly sensitive.

3. Kellogg drop shutter is forced down by the peculiar shape of shutter rod, which is also forced to latch and hold the drop shutter when the latter is restored.

4. The restoring device used on Kellogg drops has been thoroughly tested by seventeen years of service and the drops never fail to restore, no matter how badly the plugs may be worn.

5. Kellogg night alarm contact is held point up in a long and resilient contact spring. It is completely protected from damage by the restoring device and will not fail to operate the bell on night calls.

6. Kellogg jack springs exert a firm pressure on the plugs. They hold securely old and new plugs alike. The springs are so tempered as to secure an extremely long life even on the busiest toll and country lines, while the jack springs and jack thimbles are easily renewed at trivial expense when finally worn out on extremely busy lines.

7. All iron work about Kellogg drops is permanently protected against rust and sealing, by a slowly applied plating of copper. On the drop coils this is carefully oxidized to a dead black finish which will endure unchanged for all time.

8. Every drop coil on the Kellogg board is so insulated that lightning has no inducement to jump from the winding to the core or shell. Hence, it jumps to earth at the lightning arrester instead and burnouts are practically unknown. the average being less than one drop damaged by lightning in each five hundred and forty years of drop service.



Fig. No. 1141
Showing
Kellogg Cord
Construction

SWITCHBOARD CORDS: Switchboard cords were formerly one of the greatest problems in connection with the telephone business. The cords of former days were all made of fine copper tinsel in order to secure the necessary degree of flexibility. Such cords were well covered with several braids of cotton or linen to carry the strain, insulate the conductors and protect them from breakage and injury.

It was found, however, that no matter how tightly the protecting covering might be woven, it would stretch with usage and allow the strain to be taken by the tinsel conductors. These would gradually break away at their weakest point, which was close up to the plug where the cord had been subjected to frequent bending. After becoming broken the severed ends of the tinsel conductors would still touch each other loosely and this resulted in the most exasperating thing in the telephone business from the patrons' standpoint, namely, a "scratchy," "stuttering," "choppy" cord.

The first attempt to get away from this condition was by the use of a cord employing no tinsel, but instead, conductors of steel piano wire coiled like a spring and arranged concentric or parallel.

The idea was that these coiled steel conductors would stretch out without breaking, as the cord's braid became old, and thus insure a reliable connection. Experience soon pointed out one fatal drawback to this scheme was the high resistance offered to the talking current by the highly tempered steel wire. Thus while steel cords are still used by some companies in local work, they are absolutely barred by the same companies on their toll boards and toll service trunks for which purpose the old tinsel cords with all their shortcomings and continual maintenance expense are retained.

The Kellogg Company has found proper cord construction to be the use of steel wires wound over tinsel.

The steel conductors are practically unbreakable, while the presence of the copper tinsel insures the lowest resistance to talking current. Thus a cord was secured capable of giving reliable service without any attention, until the outer braids become worn entirely through.

Experience has proven that the outer braids give way because of rotting of the fabric, caused by cords becoming saturated with perspiration from the operator's hands. This the Kellogg Company overcomes entirely by treating the

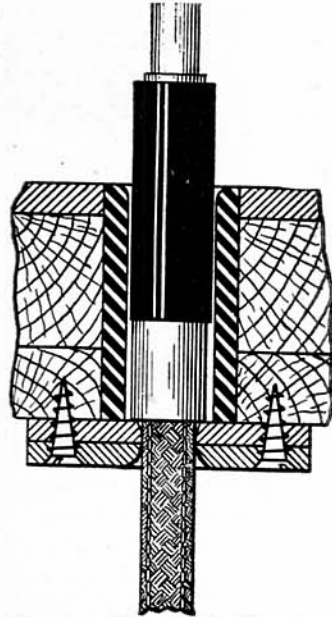


Figure No. 1142—Showing
Fibre Bushing in Kellogg
Cord Shelf and Stitch-
ing of Cord Braid

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outer layer of their cord with a compound that works down into a glazed moisture-proof coating leaving the cord perfectly flexible, but increasing the life of the outer braid three-fold. Many attempts have been made to secure like results by boiling the entire cord in wax, but this only causes the cords to ooze grease over everything in hot weather and renders them too stiff and unwieldy for use at ordinary temperatures.

The first Kellogg cord, with combination tinsel and steel conductors and waxed outer braid, was placed on the market in 1904. Unbelievable as it may seem, many of the first cords sent out lasted over six years in busy exchanges, by which fact the great durability of the cord is proven beyond question.

It seems to be the consensus of opinion, among the oldest and largest users of Kellogg boards, that these cords will last on an average of four years with two cut-backs. This certainly reduces maintenance to a minimum, especially since anyone can be taught to make a perfect cut-back which requires absolutely no material and only a knife, a pair of pliers and a screw driver, in the way of tools.

SUMMARY: Nearly every large magneto exchange in the country is now operating at rates which are barely remunerative with the existing equipment and which will not permit modernizing the plant. Sooner or later the thoughtful telephone man finds himself square up against this condition: "*He can't raise his rates until he betters his service, and dares not better his service until he raises his rates.*" The only complete solution to the above is the *Kellogg Universal Switchboard*. It was designed for just such conditions, and many prosperous companies owe their very existence to its wonderful possibilities. Where there are no public service commissions, telephone companies find it practically impossible to escape from the burden of inadequate rates in any other manner. In other states, commissions welcome it as a solution to their troubles, for it enables telephone companies to fix up their plants and secure adequate rates without an arbitrary ruling which is sometimes a dangerous power to exercise too frequently. There is invariably a great demand for common battery service as soon as it becomes available, and for the telephone company not to charge a higher rate for such service would constitute discrimination which no commission would stand for.

But even in cases where the question of rates is not involved, this equipment to meet conditions described above is far superior to any straight common battery board, for the slight additional cost of making the line circuits *universal* will be offset many times by the saving of expense during cutover. It then becomes unnecessary to wire condensers into the old telephones at more or less trouble and expense in order to make an instantaneous cutover.

This equipment fits your needs and our expert, practical field men are at your service.

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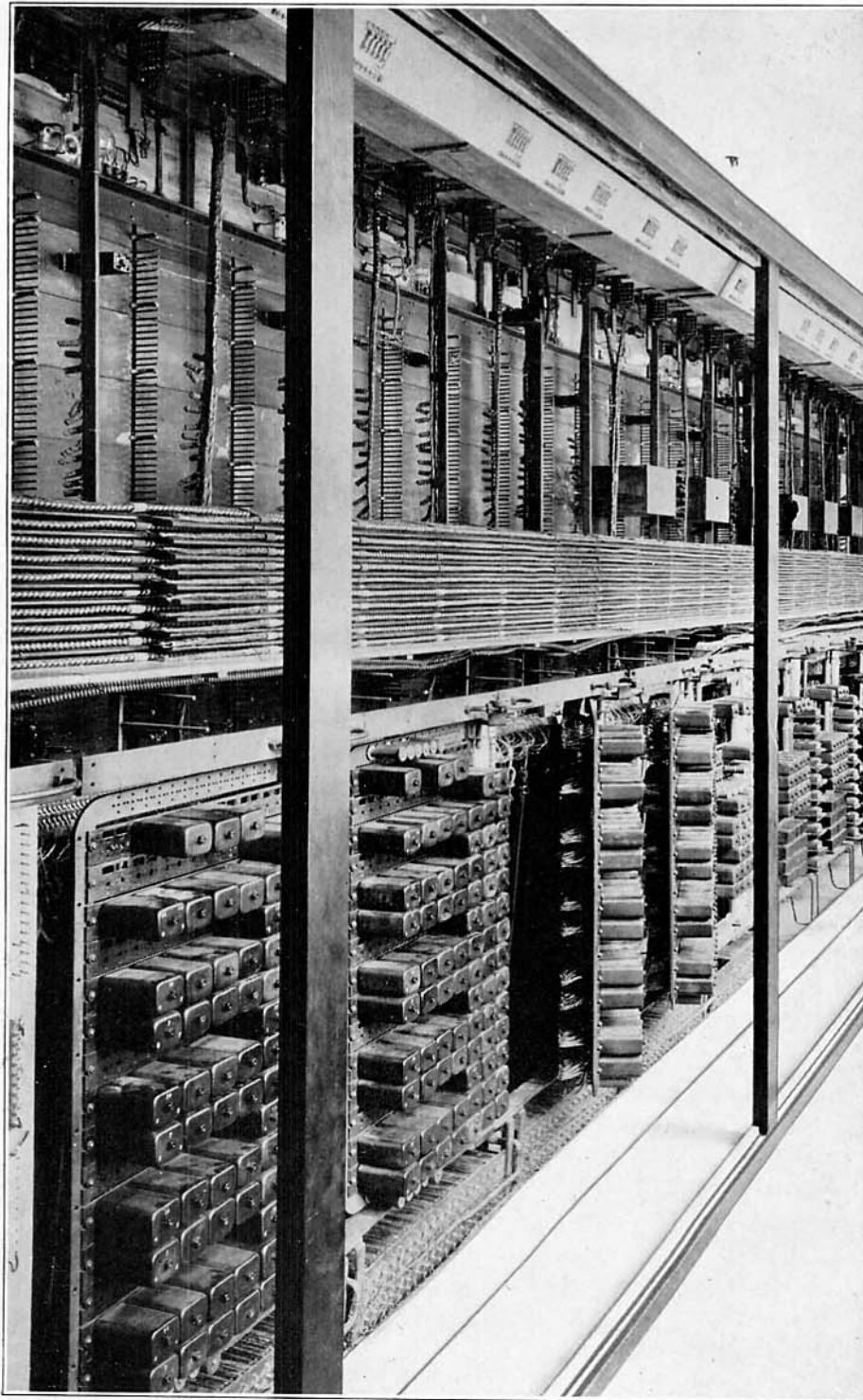


Figure No. 1143—Rear View of Kellogg Universal Switchboard

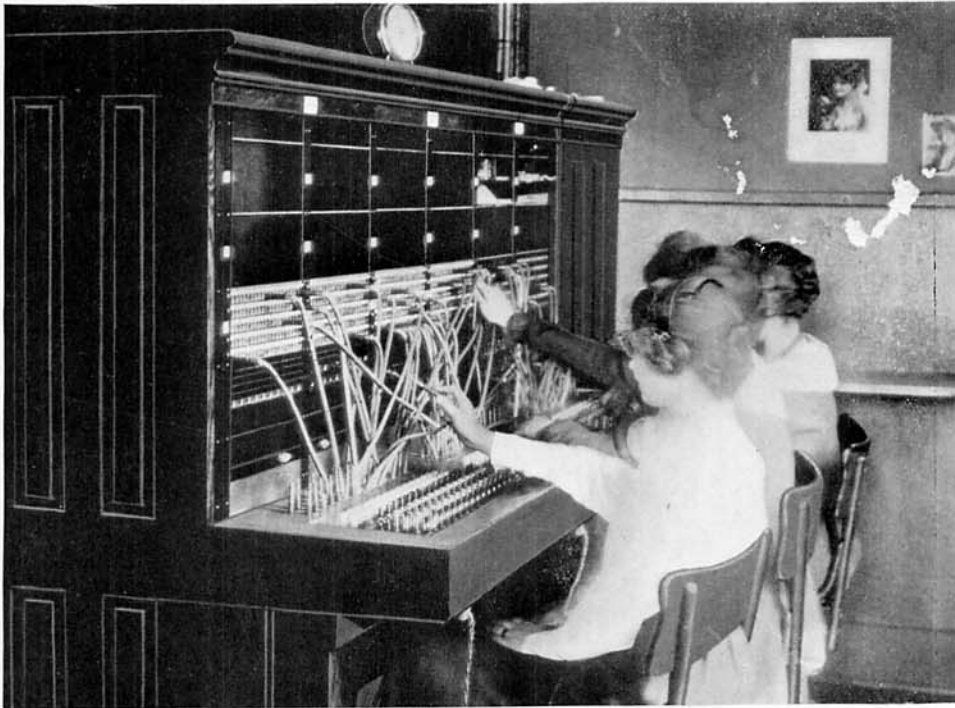


Figure No. 1144—Universal Switchboard at Loudonville, Ohio

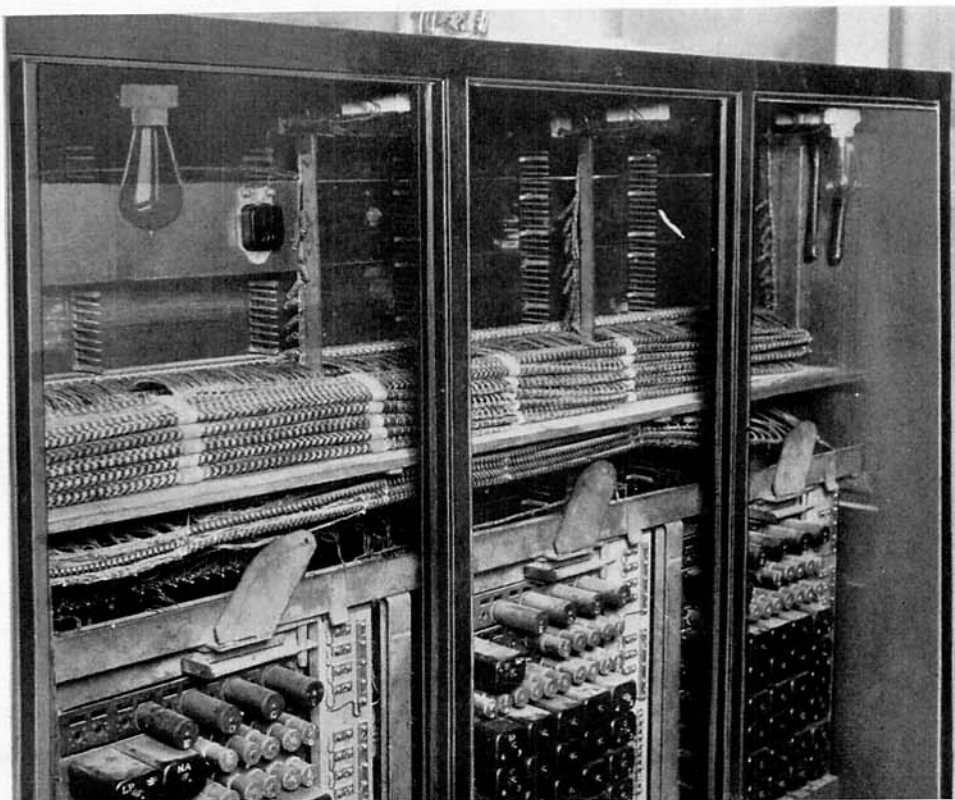
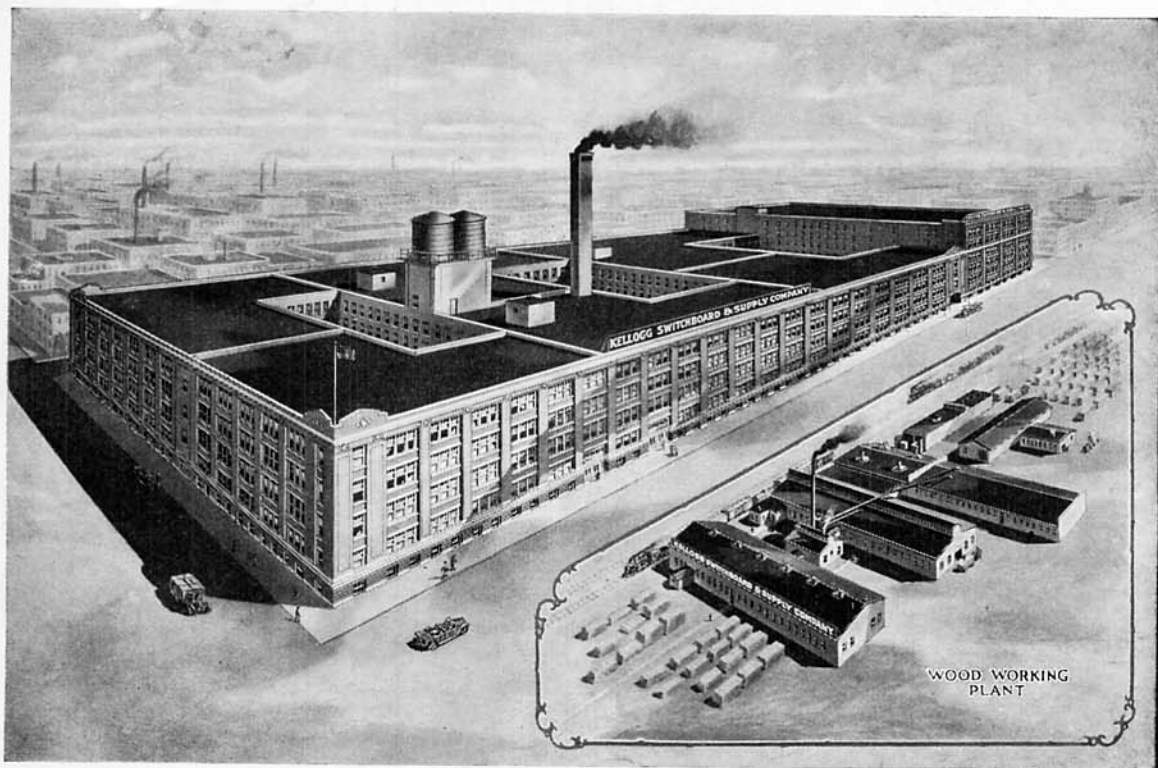


Figure No. 1145—Rear View of Universal Switchboard at Loudonville, Ohio



KELLOGG SWITCHBOARD & SUPPLY COMPANY **CHICAGO, ILLINOIS**

Branch Offices: Kansas City, Mo., San Francisco, Cal.

Columbus, Ohio, 409 Huntington Bank Bldg.

DISTRIBUTING HOUSES: Canada West Electric, Ltd., Regina, Sask., Can.; The McGraw Co., Sioux City, Iowa; The McGraw Co., Omaha, Neb.; Pacific States Electric Co., Los Angeles, Cal., Oakland, Cal., Portland, Ore., Seattle, Wash.; Northwestern Electric Equipment Co., St. Paul Minn., Duluth, Minn.; Tower-Binford Elec. & Mfg. Co., Richmond, Va.; National Telephone Supply & Development Co., Atlanta, Ga.

The Kellogg Universal Switchboard

IT RAISES YOUR RATES

One Cabinet - One Equipment
Kellogg Universal Cord Circuit
Changes your Subscribers to
Common Battery, One at a
Time without Trouble,
and makes Money
for You!

FOR THE TOWN

THAT GROWS
INTO A CITY



KELLOGG UNIVERSAL GROWS WITH THE TOWN
Kellogg Switchboard & Supply Co.
Chicago