

# ELECTRICAL COMMUNICATION

A Journal of Progress in the  
Telephone, Telegraph and Radio Art

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# Panel Type Machine Switching System in the United States

By H. P. CLAUSEN

Engineering Department, International Standard Electric Corporation

EARLY in 1922, the Western Electric Company, Inc., completed the installation of the first panel type machine switching system in Omaha, Nebraska, and, during 1925 the 500,000 line mark in the installation of this type of equipment by the Bell System was passed. According to present plans, the installation of over 750,000 lines of panel type equipment will have been completed in 1927. In view of the large number of lines in

Following the Omaha, Nebraska, installation, the Pennsylvania office was placed in operation by the New York Telephone Company in New York City. The original installation of this office provided for 6,384 lines. At the present time, it comprises over 9,000 lines and gives service to something over 23,600 stations. This large number of stations per line, approximately three, is due to the importance of the private branch exchange development in this district.

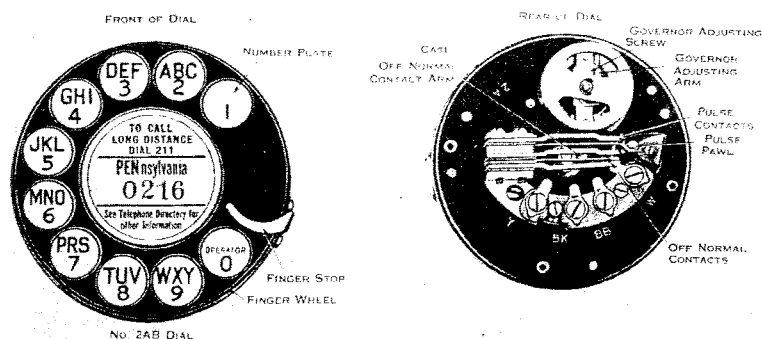


Figure 1—Subscriber's Dial

actual operation and scheduled for completion, it is the purpose of this article briefly to outline the progress made in the installation of this system and the program for the next two years as well as to indicate some of the operating results obtained.

On the basis of the program of 750,000 lines decided upon for completion in 1927, the following cities will be served by panel type equipment.

Location	Approximate No. of Lines
Metropolitan Area of New York City, including Mount Vernon and Brooklyn	300,000
Philadelphia (Pennsylvania) Area	100,000
Boston (Massachusetts) Area	80,000
Seattle (Washington) Area	44,000
St. Louis, Missouri	38,000
Newark (New Jersey) Area	37,000
Pittsburgh, Pennsylvania	28,000
Chicago, Illinois	27,000
Kansas City, Missouri	27,000
Detroit, Michigan	23,000
Cleveland, Ohio	16,000
Baltimore, Maryland	16,000
Omaha, Nebraska*	14,000
Providence, Rhode Island	14,000
Atlanta, Georgia	8,000
Buffalo, New York	5,000
	777,000

\* First city in which a two office unit was installed.

## DESCRIPTION OF EQUIPMENT

Before describing a group of exchanges in operation in New York City, the following

Argent Co, 1400 Bway	GRE City	5713
Argentina Brazil & Chile Shipping Co		
	70 Wall	HAN over 0307
Argentine Genl Consulate, 17 Batry pl.	REC tor	6948
Argentine Impt & Expt Corp, Prod Ex	BRO ad	1768
Argentine Mercantile Corp, 42 Bway	BRO ad	5066
Argentine Naval Commission, 2 W 67	COL mbus	5623
Argentine Quebracho Co, 80 Maiden la	JOH n	1652
Argentine Railway Co, 25 Broad	BRO ad	1383
Argentine Trading Co, 1164 Bway	MAD Sq	1871
Argeres Bros, Restnt, 86 6th av	SPR ing	5337
Argero A. Grocer, 119 9th av	CHE lsea	6255
Argis A. Tobacco, 74 Wall	HAN over	6311
Argirople Theodore, Jwlr, 406 8th av	FAR ragut	9772
Argo Packing Corp, 705 Greenwich	FAR ragut	4505
Argon Dress Co, 24 E 12	STU ysnt	2011
Argonaut Supply Corp, 50 Union sq	STU ysnt	7476
Argonne Steamship Co, 17 Battery pl	REC tor	2493
Argos Ad-Art Co, 1133 Bway	FAR ragut	5986
Argosy The (A Pub), 280 Bway	WOR th	8800

Figure 2—Section of New York City Telephone Directory

brief reference to the more important features of the panel type system may be helpful.

Figure 1 illustrates the type of dial adopted for service in New York City. This particular illustration shows the designation plate of a telephone served by the Pennsylvania office.

Figure 2 is a section of a New York City directory showing how the exchange names and numbers are designated. When a call is desired for say the "Argent Company, Greeley 5513," the subscriber dials the letters "G," "R" and "E," and then the numerals "5513." When making the call, the subscriber does not

switching operator to complete the connection with the manual subscriber's line in the usual manner, by means of a connecting plug placed into the multiple jack of the called subscriber's line.

When a call originates in a manual office for a subscriber located in a machine switching area,

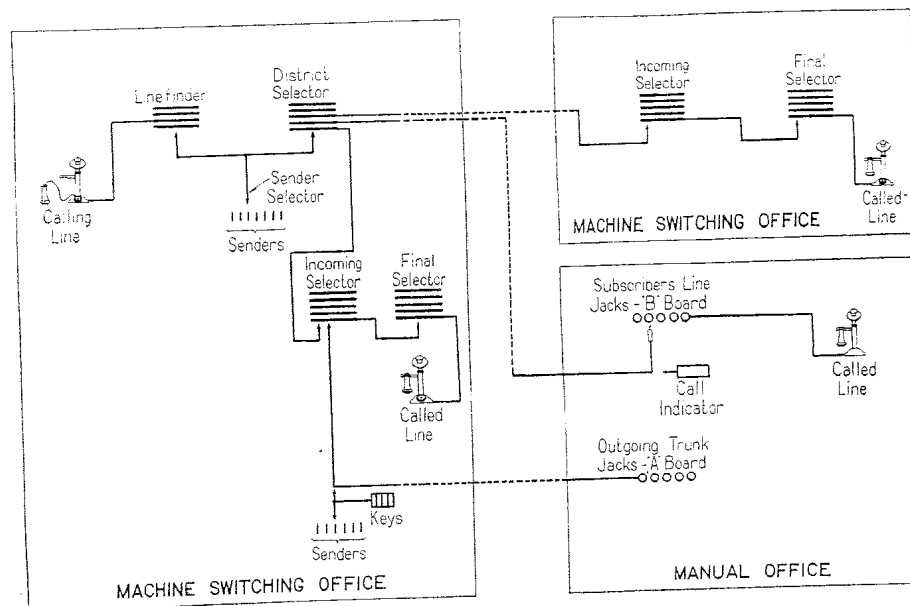


Figure 3—Diagram Showing Connections from Machine Switching to Machine Switching, Machine Switching to Manual and Manual to Machine Switching

have to know whether the number called is connected to a manual or machine switching exchange.

Figure 3 is a diagram showing the connections between machine switching offices, and between machine switching and manual offices.

Figure 4 gives a general idea of the appearance of a group of typical selector frames.

Where machine switching offices are installed in multi office cities served by manual equipment, it is necessary to route calls from machine switching to manual exchanges, and means have been developed by which the number dialed by a calling subscriber will be displayed automatically by a call indicator installed before a switching operator in the manual office.

Figure 5 shows the call indicator equipment as a part of the incoming trunk position. It will be noted that the numbers dialed by the calling subscriber are displayed in the indicator panel. Their appearance permits the manual

the A operator extends the call through to a cordless B operator in the machine switching office. Figure 6 shows a number of cordless B positions. As stated before, the subscriber need not know whether the line wanted connects to a manual or machine switching exchange.

The attending cordless B operator, upon receiving instructions from the originating A operator, sets up on a set of keys the digits of the desired number and the machine switching mechanism then connects the trunk line with the line of the called subscriber.

Figure 7 shows the battery room for a group of two 10,000 line units, and Figure 8 gives a typical view of the machinery and control equipment required for a two unit office.

#### ASHLAND-CALEDONIA OFFICES

A rather interesting installation placed in operation by the New York Telephone Company during 1924 is the Ashland-Caledonia

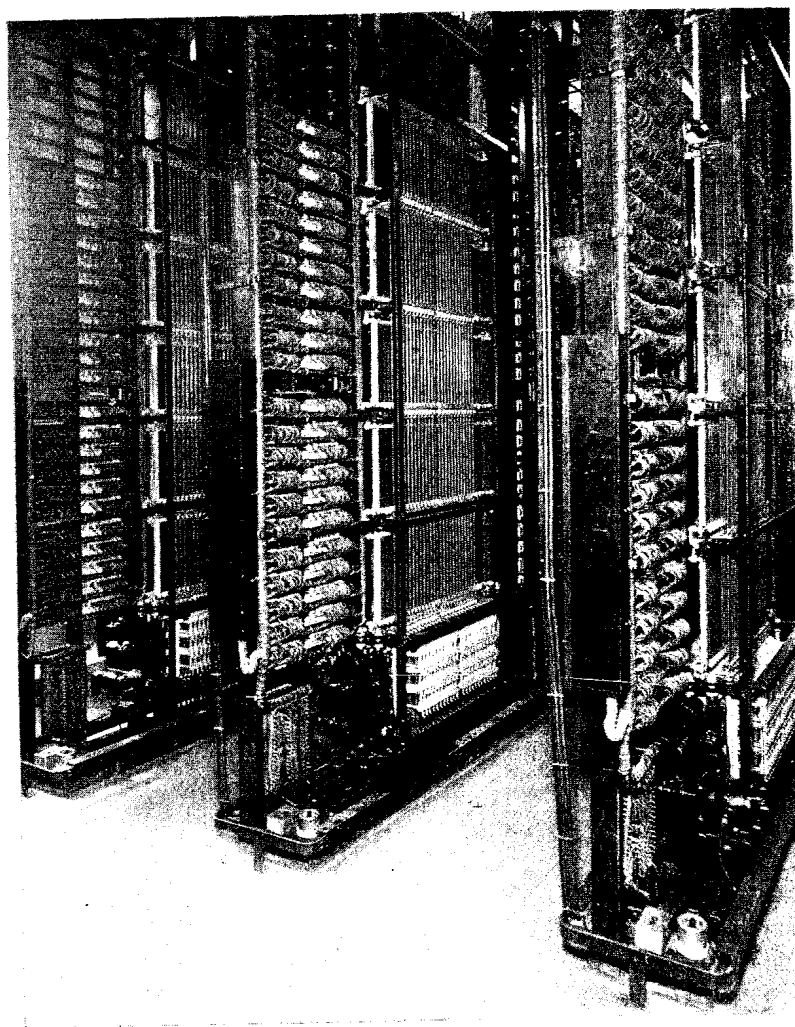


Figure 4—Group of Typical Selector Frames

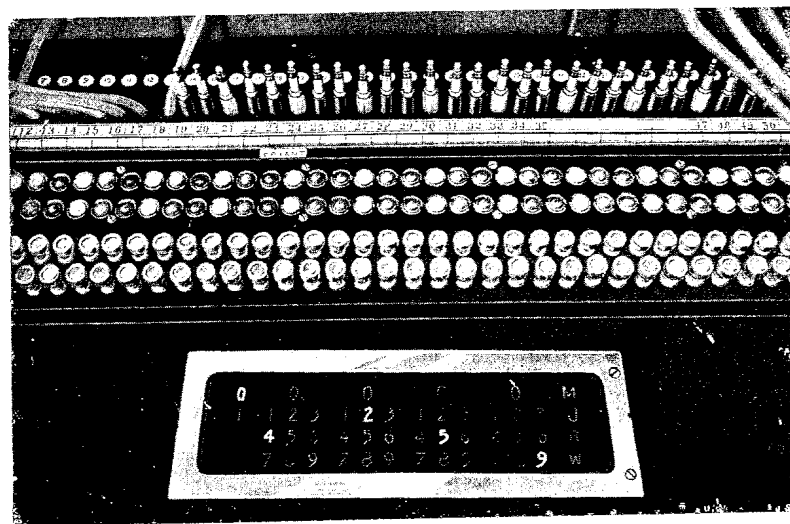


Figure 5—Incoming Trunk Position in a Manual Office Arranged for Call Indicator Operation

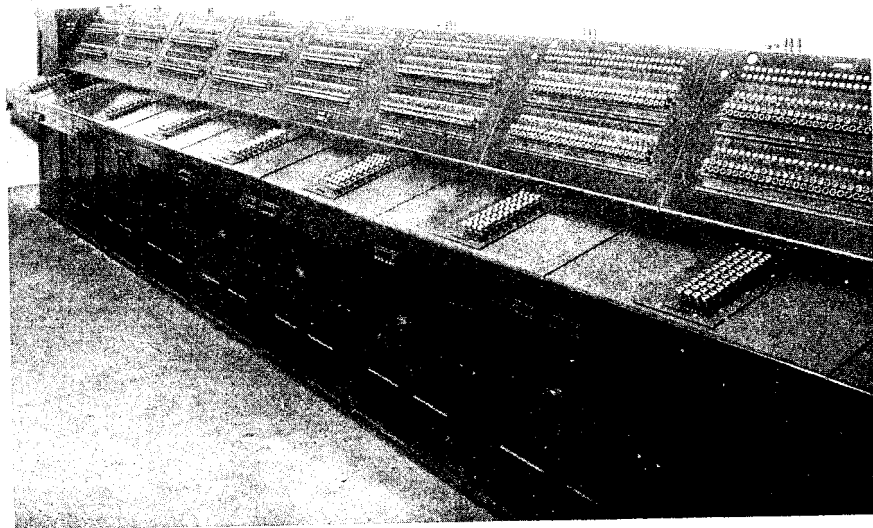


Figure 6—Cordless "B" Positions in Machine Switching Office

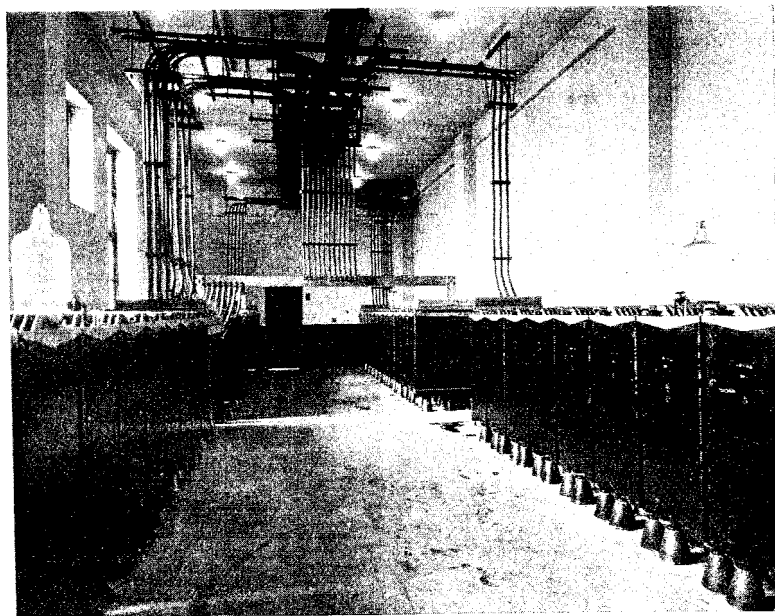


Figure 7—Battery Room for Two 10,000 Line Units

group which consists of two machine switching exchanges installed in the same building with a manual exchange at East 30th Street, New York City. Each machine switching office is equipped for 10,000 line terminals.

The Ashland office is a high grade business exchange; only 2% is residence development.

these units amount to approximately 82% of the total.

Another interesting fact about this group of three exchanges is that comparing the manual with the machine switching exchanges, 91% of the private branch exchange lines and stations are connected to the machine switching units.

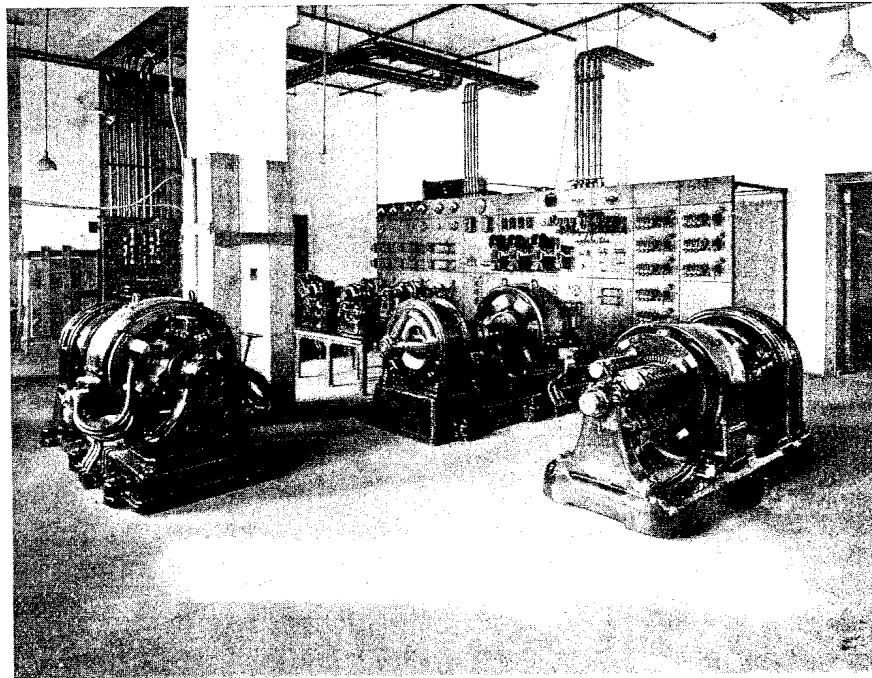


Figure 8—Power Machine and Control Equipment for Two Unit Office

The Caledonia exchange serves about 14.1% residence development. The total of the Ashland and Caledonia residence development amounts to 7.9%.

The private branch exchange development is very high. The two machine switching units have a total of 15,211 lines in service: 6,630 (43½%) of the lines connect to private branch exchanges, and the balance of 8,581 lines serve main line telephones.

The total number of stations in the two exchanges is 34,842, of which approximately 70% are located in private branch exchanges.

When the manual office at East 30th Street, known as Lexington, is included, there is a total of 20,749 lines and 42,657 stations in service. Of the lines in the group of three exchanges, 73½% are connected to the machine switching units, and the stations served from

The line and station equipment of the three exchanges, substantially correct as of June, 1925, are tabulated in Table I.

#### TRAFFIC INFORMATION

Preliminary to the consideration of traffic information relating to the Ashland and Caledonia exchanges, it may be of interest to note certain figures taken from the installation records.

In order to provide for the trunking service from the two units to other local exchanges in the metropolitan area, provision was made for slightly under 2,800 trunks, and in order to carry the outgoing toll and long distance traffic, a special trunk equipment of 200 lines was provided. The incoming local service trunks amount to slightly under 3,800 and the calls

TABLE I  
Machine Switching System

	Ashland		Caledonia		Total	
	Lines	Stations	Lines	Stations	Lines	Stations
Main Line.....	3006	2989	5575	5520	8581	8509
Extension.....		1256		1781		3037
PBX Lines.....	3937	13446	2693	9851	6630	23296
	6943	17691	8268	17152	15211	34842

	MANUAL SYSTEM		MACHINE SWITCHING AND MANUAL SYSTEMS	
	Lexington		Ashland, Caledonia and Lexington	
	Lines	Stations	Lines	Stations
Main Line.....	4887	4865	13468	13374
Extension.....		545		3582
PBX Lines.....	651	2405	7281	25701
	5538	7815	20749	42657

TABLE II

	Ashland	Caledonia	Total
No. of Lines.....	6805	8144	14949
Originating Calls—			
Busy Hour Calling Rate.....	2.08	1.56	1.74
Busy Hour Calls.....	14200	12700	26900
Total Calls Per Day.....	103700	102000	205700
Per Cent. Busy Hour Calls to Calls Per Day.....	13.7	12.47	13.1
Originating Calls—			
Busy Hour Calls			
Toll.....	646	420	1066
Long Distance.....	43	34	77
Local.....	13511	12246	25757
Total.....	14200	12700	26900
Total Calls Per Day			
Toll.....	4100	3515	7615
Long Distance.....	270	275	544
Local.....	99330	98210	197540
Total.....	103700	102000	205700
Incoming Calls—			
Busy Hour Calls			
Long Distance and Toll.....	970	683	1653
Local.....	16030	14567	30597
Total.....	17000	15250	32250
Total Calls Per Day			
Long Distance and Toll.....	6500	4180	10680
Local.....	117800	117220	235020
Total.....	124300	121400	245700
Originating Calls—Total.....	103700	102000	205700
Incoming Calls—Total.....	124300	121400	245700
Grand Total.....	228000	223400	451400

from toll and long distance exchanges are handled by 190 trunks.

An interesting feature of the Ashland-Caledonia-Lexington installations is the provision of a main distributing frame common to the three exchanges. The verticals of this frame are 400 lines high and the entire frame contains 58 verticals, thus providing for a total of 23,200 lines.

The traffic results shown in Table II are taken from records substantially correct as of August 1, 1925. The figures convey fairly well the number of calls handled in the two machine switching exchanges.

The average number of originating calls per line, during the busy hour, for the two exchanges

is 1.74. The total originating calls during the busy hour of the day is 26,900 which is approximately 13% of the total calls for the day.

The totals of the originating and incoming calls for the day, including toll and long distance, are 205,700 and 245,700 respectively, or a grand total of 451,400 calls in the two machine switching offices.

#### NEW YORK CITY COMPLETED INSTALLATIONS AND PROGRAM

There are now in operation, in the New York City metropolitan area, twenty-eight machine switching offices, and it is planned to increase this number of offices materially within the next five years.



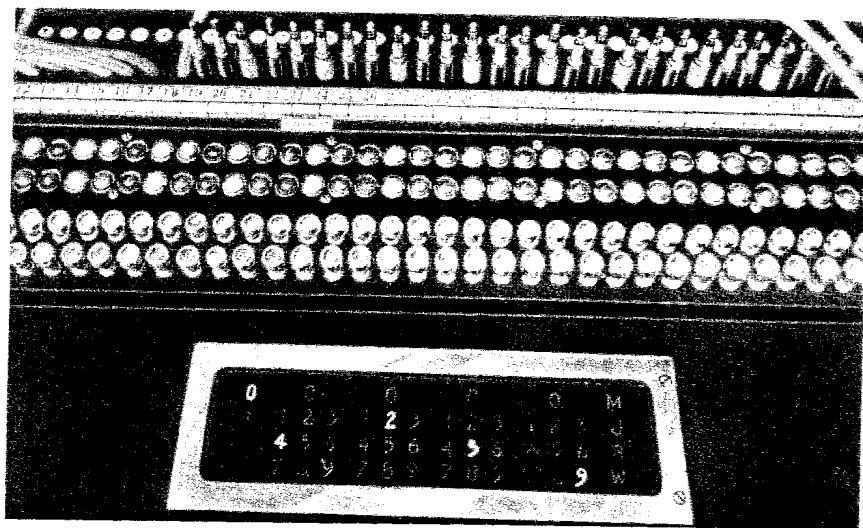


Fig. 6-66. Call indicator at an incoming-trunk position in a manual office. (Craft, Morehouse, and Charlesworth 1923, Fig. 23)

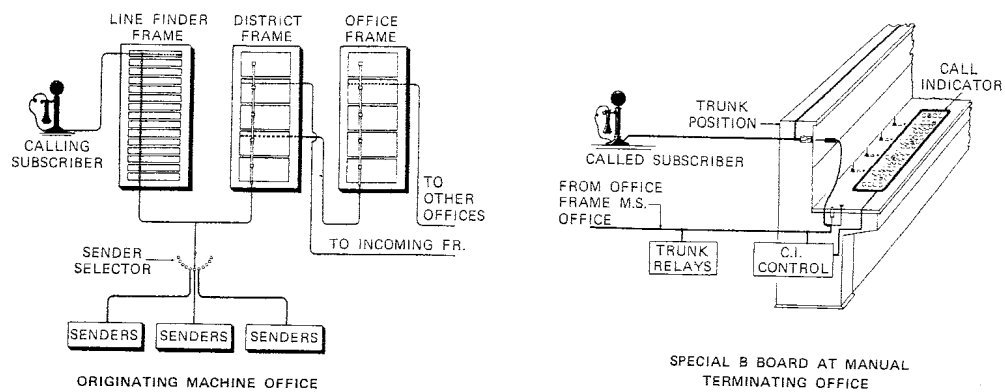


Fig. 6-67. Diagram of a connection from a machine to a manual office. (Redrawn from Craft, Morehouse, and Charlesworth 1923, Figs. 18 and 21)

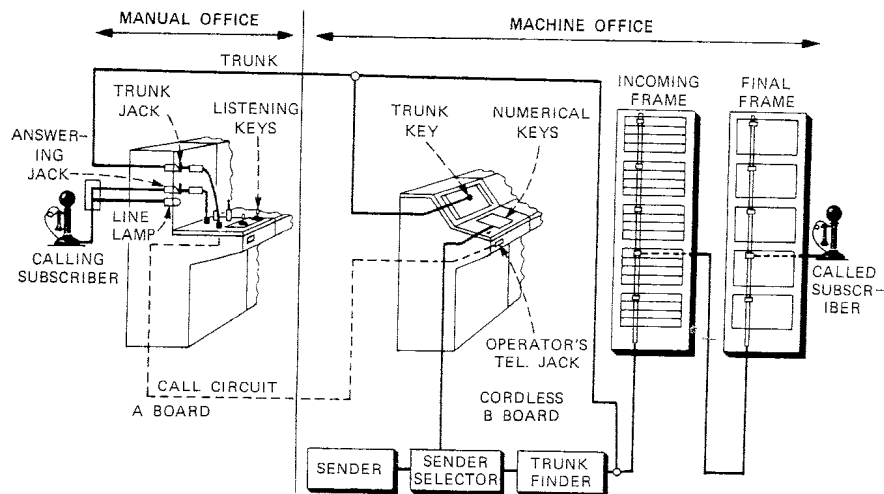


Fig. 6-68. Diagram of a connection from a manual to a machine office. (Redrawn from Craft, Morehouse, and Charlesworth 1923, Fig. 24)