DEPARTMENT OF COMMERCE AND LABOR

BUREAU OF THE CENSUS

S. N. D. NORTH, DIRECTOR

BULLETIN 102

TELEGRAPH SYSTEMS: 1907

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DEPARTMENT OF COMMERCE AND LABOR.
BUREAU OF THE CENSUS,
Washington, D. C., May 25, 1909.

SIR:

I have the honor to transmit herewith Census Bulletin 102, which contains a compilation of statistics and general information concerning the telegraph industry, and forms a part of the census of electrical industries for 1907. Other reports and bulletins for this census will present the statistics for street and electric railways, central electric light and power stations, telephone systems, and the electrical industries of Porto Rico.

There have been three censuses of the telegraph systems of the United States. The first formed a part of the census of 1880. The others were made in compliance with the acts of Congress of March 6, 1902, and June 7, 1906, and relate to the years 1902 and 1907, respectively. The last two censuses were taken and the results were compiled under the supervision of Mr. William M. Steuart, chief statistician for manufactures. Mr. T. Commerford Martin, of New York city, has been the consulting expert special agent of these two censuses in matters relating to the statistics of electrical industries.

The history and development of telegraphy were treated very fully in the Census report on telegraphs in 1902, and therefore are not discussed at any length in this report.

While statistics of employees and salaries and wages are presented in the several tables, the rates of compensation, working conditions, etc., are not discussed in this bulletin, since these features are the subject of an elaborate report, Senate Document No. 725, Investigation of Western Union and Postal Telegraph Cable Companies, which was prepared in pursuance of Senate resolution of May 28, 1908.

Very respectfully,

S. N. D. North
Director.

Hon. CHARLES NAGEL,
Secretary of Commerce and Labor.

TELEGRAPH SYSTEMS.

INTRODUCTION.

For census purposes the telegraph industry of the United States is divided into the following five classes, or groups, of systems:

1. The commercial telegraph and ocean cable companies, organized primarily for the transmission of messages for the general public. This group comprises all commercial systems except those using the wireless telegraph.

2. Wireless telegraph companies, organized for general commercial business.

3. Railroad telegraph systems, established primarily for the transaction of the business of the steam railroad companies.

4. Governmental telegraphs, which include the systems owned and operated by various branches of the Government of the United States.

5. Municipal electric fire alarm and police patrol signaling systems. While the work of these systems is different from that of the other four groups, it has similar characteristics in the transmission of messages, and therefore the statistics for them are associated with the others under the general caption of "telegraph systems."

The census includes all forms of apparatus, employed on a scale of industrial importance, for the transmission and reception of messages and signals by means of electrical current.

Only fragmentary information could be obtained concerning the governmental telegraph systems, and the statistics for these systems should not be accepted as complete.

Only a few items are common to the various kinds of telegraph systems, and it is therefore impossible to prepare a statistical summary that will convey a definite idea of the combined systems. Table 1, however, presents a summary of the data received in the census for the various systems, with the exception of the governmental telegraphs.

TABLE 1.—TELEGRAPH SYSTEMS—SUMMARY, BY CLASSES: 1907.

	Total.	Commercial telegraph systems.		Railroad telegraph systems.	Fire alarm and police patrol telegraph systems.
		Land line and ocean cable.	Wireless.		
Number of systems	1,813	25	6	625	1,157
Line construction, miles:					
Pole line for wires or cables	[1]	239,646	.....	224,476	18,489
Owned	[1]	198,127	.....	94,405	2,650
Leased	[1]	41,519	.....	130,071	15,839
Overhead cable	[1]	2,589	.....	[2]	406
Cable in subways or conduits	[1]	1,130	.....	[2]	1,971
Submarine cable[3]	3,769	3,769	.....	[2]	.....
Ocean cable[4]	46,301	46,301	.....	[2]	.....
Single wire, miles	[1]	1,577,961	.....	860,342	70,812
Owned	[5] 2,072,851	1,570,773	.....	431,266	70,812
On pole or roof line	1,527,070	1,486,094	.....	[2]	40,976
In overhead cables	41,886	40,066	.....	[2]	1,820
In subways or conduits	65,247	37,231	.....	[2]	28,016
In submarine cables	7,382	7,382	.....	[2]	.....
Leased	436,264	7,188	.....	429,076	.....
On pole or roof line	6,692	6,692	.....	[2]	.....
In subways or conduits	496	496	.....	[2]	.....
Employees:					
Average number	98,591	28,034	182	[6] 68,197	2,178
Salaries and wages	$57,055,276	$17,808,249	$87,571	[6] $37,242,479	$1,916,977
Expenses	$81,208,851	$41,879,613	$169,782	$37,242,479	$1,916,977
Income	[7] $51,706,022	$51,583,868	$122,154	.....	.....
Number of messages	368,470,509	103,794,076	163,617	[8] 264,512,816	.....
Number of telephones in use	33,952	.....	.....	30,115	3,837

[1] Total omitted to avoid duplication.
[2] Not reported.
[3] Cable used for crossing rivers, harbors, etc. Does not include ocean cables of submarine cable companies.
[4] Nautical miles.
[5] The detail for owned single wire mileage does not add to the total "owned," for the reason that the 431,266 miles owned by railroad telegraph systems was not reported in detail.
[6] Telegraph operators and dispatchers and their wages only.
[7] No income reported for railroad telegraph and fire alarm and police patrol telegraph systems.
[8] Includes 5,923,483 commercial messages, income for which was reported by commercial systems.

No figures are shown for the total mileage of line construction or for the total mileage of single wire, since such totals would contain duplications. Much of the pole line mileage reported for railroad and fire alarm and police patrol telegraph systems is included in the mileage for the pole line construction of commercial telegraph companies. By far the larger proportion of the wire used for railroad telegraphing is strung on the poles of the commercial telegraph companies along the right of way of the railroads. In fact, most of the leased pole line construction and the leased wire shown for railroad telegraph systems in 1907 was identical with the pole line construction and wire owned by commercial telegraph companies. It is also usual for the wires of fire alarm and police patrol signaling systems to be carried on the poles or in the conduits of the local telegraph and telephone companies. The entire leased pole line of these systems is therefore a duplication of pole line construction reported for telegraph companies shown in this report, or of that for telephone companies shown in the special report on telephone systems.

After the duplications in the data for the wire used in the telegraph business have been eliminated as far as possible, there remains a total of 2,072,851 miles of wire in operation at the end of the year 1907. Since wire is not a factor in the equipment of wireless telegraph systems except as it is required for the antennæ and other apparatus at the station, no wire was reported for these systems. The wire used by railroad telegraph systems was not reported in the same detail as that for commercial telegraph systems, but it is fair to assume that nearly all of it was on pole line. The entire mileage of wire owned by railroad telegraph systems has been included in the total mileage for wire on pole or roof line in the following tabular statement, which shows the quantity of wire employed for purposes of intercommunication in telephone and telegraph systems:

Miles of single wire: 1907.

	Total.	Telephone systems.	Telegraph systems.[1]
Total	15,072,220	12,999,369	2,072,851
On pole or roof line	7,050,559	5,092,223	1,958,336
In overhead cables	2,959,000	2,917,114	41,886
In subways or conduits	5,034,549	4,969,302	65,247
In submarine cables	28,112	20,730	7,382

[1] Exclusive of governmental telegraph systems.

To use a familiar form of illustration, the single wire employed in telegraph and telephone systems could encircle the earth at the equator more than six hundred times.

The statistics of employees, salaries and wages, expenses, income, and number of messages which are contained in the various reports indicate the economic importance of the telegraph and the telephone.

As there is no direct financial income derived from the operation of railroad telegraph systems or of the fire alarm and police patrol systems, no financial statistics, other than the amounts expended in salaries and wages, are shown for either of these branches of the telegraph industry. The number and the wages of telephone operators of the 233 railroad systems using telephones only in the operation of their lines were not reported.

Telephone and telegraph systems.—The 25 commercial land line and ocean cable telegraph systems represented by far the largest proportion of the telegraph business of the country, and it is interesting to compare the statistics for them with those for the telephone industry. In the early stages of its development, the telephone industry was associated with the telegraph industry, but the two are now distinct and the telephone is a competitor of the telegraph for the business of long distance communication. The first telegraph line in the United States was opened for business in 1844, and thirty-two years later the telephone was introduced. At the census of 1880 the telegraph companies reported the operation of 291,213 miles of wire, as compared with 34,305 miles reported for the telephone companies. By the census of 1902 the amount of wire for the telegraph systems had increased to 1,318,350 miles and that for the telephone systems to 4,900,451 miles. Thus in 1902 the mileage of wire devoted to the transmission of telephone messages was almost four times as great as that used for telegraph purposes.

TABLE 2.—*Telephone and telegraph systems—comparative summary: 1907.*

	Total.	Telephone systems.	Commercial telegraph systems.[1]	PER CENT OF TOTAL.	
				Telephones.	Telegraphs.
Number of systems and lines	22,996	[2]22,971	25	99.9	0.1
Single wire, miles	14,570,142	[3]12,999,369	[4]1,570,773	89.2	10.8
Ocean cable[5]	46,301	.....	46,301	.....	.....
Salaried officials, clerks, etc.:					
Number	29,470	25,298	4,172	85.8	14.2
Salaries	$22,093,360	$19,298,423	$2,794,937	87.3	12.7
Wage-earners:					
Average number	142,733	118,871	23,862	83.3	16.7
Wages	$63,994,016	$48,980,704	$15,013,312	76.5	23.5
Capital stock and bonds outstanding, par value	$1,034,909,579	$814,616,004	$220,293,575	78.7	21.3
Income	$236,045,615	$184,461,747	$51,583,868	78.1	21.9
Expenses	$182,681,918	$140,802,305	$41,879,613	78.2	22.9

[1] Does not include wireless telegraph systems.
[2] Includes 17,702 independent farmer or rural lines.
[3] Includes 486,294 miles of wire on independent farmer or rural lines.
[4] Exclusive of 7,188 miles of leased wire.
[5] Nautical miles.

Both industries developed rapidly between 1902 and 1907, and by the end of that period the mileage of single wire devoted primarily to the telephone business was eight times as great as the mileage used for the commercial telegraph business. In the amount of business done, the amount paid in salaries and wages, and the capital invested, the telephone business was a

little over three and one-half times as extensive as the telegraph industry in 1907, and during the year it furnished employment for more than five times as many persons.

MILES OF SINGLE WIRE: 1907 AND 1902.

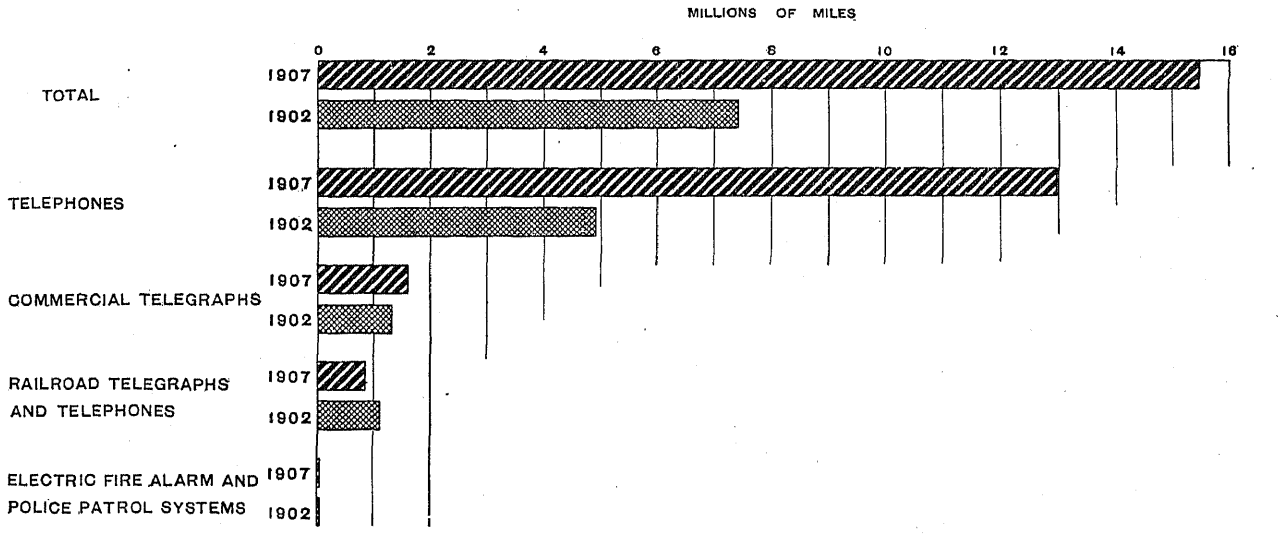


Table 2 does not include statistics for the telegraph and the telephone lines owned by steam and electric railway companies and operated along their rights of way for service purposes, nor does it include the wire used exclusively for governmental telegraph and telephone service and the municipal fire alarm and police patrol systems. In 1907 a total of 14,570,142 miles of wire was in use for the transmission of commercial messages, and of this total, 12,999,369 miles, or 89.2 per cent, were used primarily for telephone messages, and 1,570,773 miles, or 10.8 per cent, for the telegraph business. The telephone business has increased more rapidly than any other branch of the industry. Between 1902 and 1907 there was an addition of 8,098,918 miles of wire for the use of the telephone systems of the country, as compared with an increase of 259,611 in the mileage of owned and leased wire for the use of commercial telegraph systems. The increase in the wire mileage of the telephone systems during that period of five years is more than six times as great as the total amount of existing wire that has been added to the telegraph business since the date when the first statistics concerning the industry were gathered.

The development of the long distance telephone system and the increasing use by railway companies of the telephone for the dispatch of business have necessarily had some effect on the extension of the use of the telegraph. Naturally the increase in the use of the telephone has greatly outdistanced the increase in the use of the telegraph.

COMMERCIAL TELEGRAPHS AND OCEAN CABLE SYSTEMS.

The statistics in this section relate to all operations of domestic land telegraph and ocean cable companies organized primarily for the transmission of messages for the general public, and they are based on the third census of the industry. The first census covered the fiscal years of the companies ending nearest to June 1, 1880, and the second and third, the fiscal years ending nearest to December 31, 1902 and 1907, respectively.

Because of the close relationship existing between the land and the ocean telegraphs it has been impossible to segregate the statistics for them. As the larger land telegraph systems are operated in a number of states, it has also been impossible to segregate the statistics so as to show the capitalization, income, expense, and equipment for the different states. Hence only totals for the United States are given.

Comparison with previous censuses.—At the census of 1880 data relative to ocean cable systems were not reported separately, and it is uncertain whether any data relative to them were included. A comparison of the totals for that census and those for the censuses of 1902 and 1907 can therefore be considered only as reflecting in a general way the relative magnitude of the commercial telegraph industry at the three census periods.

TABLE 3.—*Comparative summary: 1880 to 1907.*

	1907	1902	1880
Number of companies or systems	25	25	[1] 77
Miles of single wire owned and leased	1,577,961	[2] 1,318,350	291,213
Nautical miles of ocean cable	46,301	16,677	([3])
Number of messages [4]	103,794,076	91,655,287	31,703,181
Number of telegraph offices	29,110	27,377	12,510
Income, total	$51,583,868	$40,930,038	$16,696,623
Telegraph traffic	$45,255,187	$35,300,569	$13,512,116
All other sources	$6,328,681	$5,629,469	$3,184,507
Expenses, total	$41,879,613	$30,948,034	$10,822,622
General operation and maintenance, including salaries and wages and legal expenses	$34,057,298	$24,455,511	$8,732,167
Interest	$2,653,004	$1,950,282	$564,341
All other expenses	$5,169,311	$4,542,241	[5] $1,526,114
Balance sheet: [6]			
Assets, total	$261,807,899	$195,503,775	$97,232,640
Construction and equipment, including real estate	$210,045,959	$161,679,579	$93,062,922
Stocks and bonds of other companies	[7] $36,486,446	$25,939,944	([8])
Machinery, tools, supplies, etc	$3,574,989	$1,512,129	([8])
Bills and accounts receivable	$8,010,162	$3,084,739	$3,081,922
Cash and deposits	$3,690,343	$3,287,384	$1,087,796
Liabilities, total	$261,807,899	$195,503,775	$97,232,640
Capital stock	$155,089,575	$117,053,525	$67,901,255
Funded debt	$65,204,000	$45,893,000	[8] $9,309,165
Cash investment of unincorporated companies, reserves, bills and accounts payable, dividends due, sundries, and surplus	$41,514,324	$32,557,250	[9] $19,962,220
Capitalization:			
Capital stock, authorized, par value	$161,603,900	$123,233,075	$75,907,250
Capital stock, outstanding, par value	$155,089,575	$117,053,525	[10] $66,529,200
Dividends on stock	$7,477,083	$6,256,693	$4,136,750
Funded debt, authorized, par value	$83,004,000	$49,893,000	([11])
Funded debt, outstanding, par value	$65,204,000	$45,893,000	$8,167,493
Interest on funded debt	$2,651,511	$1,949,150	([3])
Employees and salaries and wages: [12]			
Average number	28,034	27,627	14,928
Salaries and wages	$17,808,249	$15,039,673	$4,886,128

[1] Includes 6 operated by Western Union Telegraph Company, 1 not in regular operation, and 1 which failed to report income and expenses.
[2] Includes miles of wire operated by Western Union Telegraph Company outside the United States.
[3] Not reported separately.
[4] Includes cable messages: 1907—5,869,317; 1902—820,498. In 1880 messages were reported for 54 companies only.
[5] Includes $40,000 sinking fund appropriation.
[6] Reported by only 42 companies in 1880.
[7] Includes $558,800 treasury stock; not reported separately in 1902 and 1880.
[8] Includes floating debt.
[9] Reported as profit and loss.
[10] Issued for cash.
[11] Not reported.
[12] There were 2 companies in 1907 and 1 in 1902 which were unable to separate the amount paid for salaries and wages from the general operation and maintenance expense. The 2 companies in 1907 failed to report the number of employees.

The noticeable decrease at the two census periods since 1880 in the number of separate companies, or systems, is due to numerous consolidations of formerly competing companies. The decrease since 1880 in the number of separate companies has been accompanied, however, by a very large increase in business and equipment.

The land telegraph industry in the United States in 1902 and 1907 was dominated by two companies—the Western Union Telegraph Company and the Postal Telegraph-Cable Company. These companies control numerous subsidiary companies and operate to some extent in Canada, Mexico, and other foreign countries. The statistics in this report, however, relate, as far as possible, only to operations within the United States.

Five cable companies were reported as distinct organizations in 1907—the Commercial Cable Company, Commercial Pacific Cable Company, Mexican Telegraph Company, Central and South American Telegraph Company, and the United States and Hayti Telegraph and Cable Company. The increase of 29,624 nautical miles in the length of cable at the last census as compared with the preceding one is due primarily to the fact that since 1902 the Pacific cable and the New York-Habana cable of the Commercial Cable Company have been laid.

A comparison of the number of messages at the earliest census period and the number at either of the later ones is affected by the fact that in 1880 only 54 of the 77 companies reported messages. The total number of messages for 1902 and 1907 are comparable, but the number of cable messages given in the footnotes for those years are not, for the reason that in 1902 it was impossible to segregate the cable messages from the total messages in the case of 1 company doing both a land and an ocean business.

The telegraph offices include railway offices, which form much more than one-half of the total. Of 29,110 telegraph offices reported for 1907, the number in railway stations was 22,282. These railway telegraph offices are not used exclusively for the transmission of messages for the general public, but they play a very important part in the commercial telegraph industry, and it is necessary to include statistics concerning them.

The increase in the number of salaried employees and wage-earners in 1907 as compared with 1902 was but 407, or 1.5 per cent. As compared with 1880, however, the increase was 13,106, or 87.8 per cent. The amount paid in salaries and wages during 1907 was 18.4 per cent greater than the amount paid during 1902 and nearly four times as large as the amount paid in 1880. The census inquiry called for the average number of persons employed during the year, which was described as the number that would be required at continuous employment for the twelve months. It also provided that if any of the persons enumerated spent a portion of the time in the telegraph service and a portion in other service, the wages paid for the telegraph service only should be reported. All regular officers and employees engaged in the work of maintenance, canvassing, collecting, operation, or in other regular work of the commercial telegraph companies were to be reported, while employees engaged exclusively on additions or extensions and those employed at railway offices and paid by railway companies under agreement or understanding with the telegraph company as to the use of the telegraph company's lines were not to be reported.

There is a variety of methods under which telegraph operators are employed, and for large systems it is very difficult, if not impossible, to ascertain the true average number employed during the entire year. Therefore the number reported should not be used as a basis for the division of the total wages in order to compute the average annual wages per employee.

In the case of 2 of the cable companies the system of bookkeeping used was such that it was impossible to separate the amounts paid for salaries and wages

from the regular operating expenses. While the number of salaried officials and wage-earners employed by these companies was not large, in comparison with the total number reported for all other systems, still the omission of the amounts paid them in salaries and wages makes the aggregate amount shown as compensation for labor somewhat less than the true total.

The figures relating to capital stock as reported at the census of 1880 are hardly comparable with those for either of the subsequent censuses, since only 42 of the 77 companies or systems shown for 1880 made any report as to capitalization. The par value of the capital stock outstanding at the census of 1907 exceeded that shown for 1902 by $38,036,050, or 32.5 per cent.

The data relative to revenue and expenses are practically comparable for the three years shown in Table 3, as the 2 companies failing to report these items in 1880 operated only 680 miles of single wire. The total revenue in 1907 exceeded that reported for 1902 by $10,653,830, or 26 per cent, and that shown for 1880 by $34,887,245, or 208.9 per cent.

The statistics concerning assets and liabilities for 1880 covered the operations of only 42 of the 77 companies or systems reported for that year, and therefore can not be compared with similar data, either for 1907 or for 1902.

Number of companies.—While there were 25 companies in operation both in 1907 and in 1902, they were not the same companies, as 4 of those operating in 1902 had either gone out of existence or been absorbed prior to the later census. Of the 4 companies reporting for 1907, but not at the earlier census, 2 were not in existence in 1902, 1 was not an operating company in that year, and 1 was not at that time required to make a report, since it had no lines or cables within the United States. The 4 companies reported for the first time in 1907 were incorporated. In 1907 there was only 1 unincorporated company, while in 1902 there were 4. In order to preserve the comparability of the figures, the Postal Telegraph and Cable Company was counted as 1 company at both censuses, although in 1907 separate census reports were received for 39 subsidiary companies.

Capitalization.—With the exception of 1 comparatively unimportant system, the entire commercial telegraph and cable industry of the country is operated under the incorporated form of ownership, and the statistics for capitalization are given in Table 4.

TABLE 4.—*Capitalization of incorporated companies: 1907 and 1902.*

	1907	1902	Per cent of increase.
Number of incorporated companies	24	21	14.3
Capital stock and bonds:			
Authorized, par value	$244,607,900	$173,126,075	41.3
Outstanding, par value	220,293,575	162,946,525	35.2
Capital stock—			
Total authorized, par value	161,603,900	123,233,075	31.1
Total outstanding, par value	155,089,575	117,053,525	32.5
Dividends paid	7,477,083	6,256,693	19.5
Common—			
Authorized, par value	160,403,900	122,033,075	31.4
Outstanding, par value	153,889,575	115,853,525	32.8
Dividends paid	7,462,083	6,193,693	20.5
Preferred—			
Authorized, par value	1,200,000	1,200,000	0.0
Outstanding, par value	1,200,000	1,200,000	0.0
Dividends paid	15,000	63,000	[1]76.2
Bonds—			
Authorized, par value	83,004,000	49,893,000	66.4
Outstanding, par value	65,204,000	45,893,000	42.1
Interest paid	2,651,511	1,949,150	36.0

[1] Decrease.

The large increase in 1907 as compared with 1902 of $71,481,825 in par value of capital stock and bonds authorized is explained by the facts that the 4 companies which did not report in 1902 had a combined authorized issue of stocks and bonds of over thirty millions in 1907, and that 4 of the companies which reported at both censuses increased their authorized issue of stocks and bonds by nearly forty millions since 1902.

Of the total authorized issue of stocks and bonds in 1907, capital stock constituted 66.1 per cent and bonds 33.9 per cent. At the end of the year covered by this report, 96 per cent of the total authorized issue of stock and 78.6 per cent of the bonds had been issued and were outstanding.

Bonds outstanding were reported by 5 companies. These bonds had a par value of $65,204,000 and interest to the amount of $2,651,511, or an average rate of 4.1 per cent, was paid on them during 1907.

Of the 24 incorporated companies reported for 1907 only 11 paid dividends on their capital stock, and the same number, though not necessarily the same companies, declared dividends for 1902.

TABLE 5.—DIVIDEND AND NONDIVIDEND BEARING STOCK: 1907 AND 1902.

	Census.	COMMON STOCK.				PREFERRED STOCK.			
		Number of companies reporting.	Outstanding, par value.	Dividends paid.		Number of companies reporting.	Outstanding, par value.	Dividends paid.	
				Amount.	Average rate.			Amount.	Average rate.
Total	1907	[1]24	$153,889,575	$7,462,083	5.0	1	$1,200,000	$15,000	1.3
	1902	[1]21	115,853,525	6,193,693	5.4	1	1,200,000	63,000	5.3
Reporting dividends	1907	10	149,698,250	7,462,083	5.0	1	1,200,000	15,000	1.3
	1902	10	113,913,725	6,193,693	5.4	1	1,200,000	63,000	5.3
Reporting no dividends	1907	[1]14	4,191,325						
	1902	[1]11	1,939,800						

[1] Includes 1 company reporting dividends on preferred stock.

In 1907, of those companies which paid dividends on their common stock, 4 paid at the rate of 5 per cent or less, 3 at the rate of 6 per cent, and 1 each at the rate of 9, 10, and 15 per cent. In 1902, 2 companies paid 5 per cent, and 1 each paid 2.5, 6, 8, 9, 9.6, 10, 14, and 15 per cent on common stock. A larger number declared the higher rates of dividends in 1902 than in 1907.

Financial operations.—The financial operations of the land telegraph and ocean cable companies can best be shown in the form of an income account and an operating expense account.

TABLE 6.—*Income account: 1907 and 1902.*

	1907	1902	Per cent of increase.
Gross receipts from operation	$45,255,187	$35,300,569	28.2
Operating expenses	36,579,084	26,592,411	37.6
Net earnings from operation	8,676,103	8,708,158	[1] 0.4
Income from other sources	6,328,681	5,629,469	12.4
Dividends on stock of other companies, including interest on bonds	1,406,401	1,159,658	21.3
Lease of lines, wires, and conduits	4,430,245	4,185,799	5.8
Rent from real estate	210,014	205,070	2.4
Interest	3,439	6,719	[1] 48.8
Miscellaneous	278,582	72,223	285.7
Gross income less operating expenses	15,004,784	14,337,627	4.7
Deductions from income (fixed charges)	5,300,529	4,355,623	21.7
Taxes	783,686	588,726	33.1
Interest:			
Floating debt	1,493	1,132	31.9
Funded debt	2,651,511	1,949,150	36.0
Rental of leased lines	1,863,839	1,816,615	2.6
Net income	9,704,255	9,982,004	[1] 2.8
Deductions from net income	7,477,083	6,256,693	19.5
Dividends on preferred stock	15,000	63,000	[1] 76.2
Dividends on common stock	7,462,083	6,193,693	20.5
Net surplus for year	2,227,172	3,725,311	[1] 40.2

[1] Decrease.

The total receipts of the telegraph companies for 1907 exceeded those for 1902 by $10,653,830. Gross receipts from operation, including all receipts for messages sent over the lines of the companies or systems represented in this report, whether originating in the United States or forwarded for foreign systems under traffic agreement, constituted 87.7 per cent of the receipts for 1907, and "income from other sources" formed 12.3 per cent of the total.

Although the receipts from operation in 1907 show an increase of 28.2 per cent over those for 1902, the rate of increase for operating expenses was higher, with the result that there was a decrease of four-tenths of 1 per cent in the net earnings from operation in 1907 as compared with 1902.

"Income from other sources" was greater in 1907 than in 1902 by $699,212, or 12.4 per cent. The principal source of revenue under this head was receipts from the lease of lines, wires, and conduits. This item constituted 70 per cent of the total income from other sources for 1907, and was 5.8 per cent greater than the similar item for 1902. The income for 1907 from dividends on stock of other companies, including interest on bonds, constituted 22.2 per cent of the total revenue from other sources, and was greater by $246,743, or 21.3 per cent, than the corresponding income for 1902. Miscellaneous revenue was greater for 1907 than for 1902 by $206,359, or 285.7 per cent. This large increase was probably due to the fact that in 1907, $237,228 received for messenger service was included in this item by 1 of the larger systems, which showed no similar source of revenue in 1902.

Although the gross income, less operating expenses, was somewhat larger for 1907 than for 1902, the net income was slightly less, on account of the large increase in fixed charges at the present census as compared with the similar item for 1902.

The increases in cost of operation, in fixed charges, and in dividends in 1907 as compared with 1902 caused the net surplus for the present census to be less by $1,498,139, or 40.2 per cent, than that for the earlier census.

There were but 5 companies or systems which were not operated at a profit during 1907. These 5 companies reported a total loss of $18,652, but as they operated only 9,007 miles of single wire the figures in Table 6 are not greatly affected by their inclusion.

The extent to which this industry is controlled by a few companies is indicated by the fact that in 1907, 6 companies reported 97.7 per cent of the income and 97.5 per cent of the total operating expenses. In 1902 the 6 largest companies reported 99 per cent of the total income and the same proportion of the expenses.

TABLE 7.—*Operating expenses: 1907 and 1902.*

	1907	1902	Per cent of increase.
Total	$36,579,084	$26,592,411	37.6
General operation and maintenance	34,057,298	24,455,511	39.3
Salaries and wages	[1] 17,808,249	[2] 15,039,673	18.4
Operation and maintenance, including legal expenses	16,249,049	9,415,838	72.6
Rentals of offices and other real estate	1,684,352	875,213	92.5
Rentals of conduits and underground privileges	18,080	7,808	131.6
Telegraph traffic—amount paid or due other companies	701,697	724,826	[3] 3.2
Miscellaneous expenses	117,657	529,053	[3] 77.8

[1] Two companies were unable to separate the amount paid for salaries and wages from the general operating expenses.
[2] One company was unable to separate the amount paid for salaries and wages from the general operating expenses.
[3] Decrease.

Salaries and wages formed the largest item of operating expenses, and constituted 48.7 per cent of all operating expenses in 1907 and 56.6 per cent of all such expenses in 1902. The expenditure for operation and maintenance, including legal expenses, constituted 44.4 per cent of all operating expenses in 1907 and 35.4 per cent of those reported for 1902. The remaining items, rentals, amounts paid or due other companies for telegraph traffic, and miscellaneous expenses, amounted to 6.9 per cent of all operating expenses in 1907 and 8 per cent in 1902.

The increase of 18.4 per cent in salaries and wages in 1907 as compared with 1902 appears normal and is consistent with the increase in telegraphic traffic. The increase of 72.6 per cent in the expenses of operation and maintenance, including legal expenses during the same period, is very large, and while this increase is in a

measure due to the fact that the 4 companies which reported at the present census but not at the census of 1902 were much larger than the 4 which reported for the earlier year but not for 1907, it also probably is caused in part either by extensive repairs in 1907 or by betterments of the lines, possibly through replacing iron with copper wire. In addition to this item for 1907 there were expenditures by 11 companies for new construction, amounting in all to $3,087,066.

The large increase in rentals for offices and other real estate for 1907 as compared with 1902 is due largely to the fact that 1 company did not report any amount for this item at the earlier census, while at the later census the same company showed nearly six hundred thousand dollars for such expenditures.

The large decrease in miscellaneous expenses at the present census in comparison with the earlier census is more apparent than real, because some companies made a better segregation of the statistics for 1907, assigning a smaller proportion to the miscellaneous item.

Assets and liabilities.—Although the several companies or systems used different methods of bookkeeping and different items in their annual statements of assets and liabilities, it was found possible to construct for the censuses of 1907 and 1902 a balance sheet in the form shown by Table 8.

TABLE 8.—*Balance sheet: 1907 and 1902.*

	1907	1902	Per cent of increase.
Assets.			
Total	$261,807,899	$195,503,775	33.9
Construction and equipment, including real estate	210,045,959	161,679,579	29.9
Stocks and bonds of other telegraph companies	[1] 36,486,446	[2] 25,939,944	40.7
Cash and deposits	3,690,343	3,287,384	12.3
Bills and accounts receivable	8,010,162	3,084,739	159.7
Machinery, tools, and supplies	2,513,456	945,795	165.8
Sundries	1,061,533	566,334	87.4
Liabilities.			
Total	$261,807,899	$195,503,775	33.9
Capital stock	155,089,575	117,053,525	32.5
Funded debt	65,204,000	45,893,000	42.1
Reserves	8,257,963	7,859,648	5.1
Bills and accounts payable	[3] 10,409,219	6,244,585	66.7
Dividends and interest due and accrued	[4] 421,179	366,666	14.9
Sundries	2,100,024	7,310	.....
Surplus	20,325,939	18,079,041	12.4

[1] Includes $558,800 treasury stock and $11,129,346 other permanent investments.
[2] Includes $900,282 other stocks and bonds.
[3] Includes $2,199,286 floating debt.
[4] Includes $120,000 interest due and accrued.

This table is a combination of the balance sheets of the 25 companies or systems reporting at the two census periods, and represents the financial condition of the entire industry at the end of the respective census years.

Of the assets, by far the largest item at both censuses is cost of construction and equipment, including real estate. This item constituted 80.2 per cent of the total assets in 1907 and 82.7 per cent in 1902. The increase in this item in 1907 over 1902 of $48,366,380 is due largely to the inclusion at the present census of 2 submarine cable systems and 2 land telegraph companies which were not represented in 1902, the aggregate cost of their construction and equipment, including real estate, constituting 70.1 per cent of the increase. The residuum of the increase is due to extensions made between 1902 and 1907 by many of the companies or systems reporting at both censuses.

The other increases shown in Table 8 are more or less affected by the inclusion for 1907 of the 4 companies or systems referred to in the preceding paragraph, although there was a normal increase in the finances of the commercial telegraph and cable systems which reported at both censuses.

Stocks and bonds of other telegraph companies, held for investment or for the purpose of controlling the operations of such companies, constituted 9.5 per cent of the total assets in 1907 and 12.8 per cent in 1902. The amount of other permanent investments reported for 1907 was $10,229,064 greater than the amount reported for 1902. This increase is due largely to the practice of some companies of investing in railroad bonds and securities other than stocks and bonds of other telegraph companies. The amount of such assets contributed by the 4 companies which were not represented in 1902 is but 3.4 per cent of the total increase.

The increase for 1907 as compared with 1902 in cash on hand or on deposit, as well as the very large increase in bills and accounts receivable, is due almost entirely to natural conditions, as the amounts added to these items by the 4 new companies do not greatly affect the percentage of increase. This is not true, however, for the two items, "machinery, tools, and supplies," and "sundries," as the amount added to the first item by the 4 new companies was 42.9 per cent of the increase, while in the case of sundries the amount added was 80.1 per cent of the increase.

Capital stock outstanding constituted 59.2 per cent of the liabilities of commercial telegraph and cable companies in 1907 as compared with 59.9 per cent in 1902. The cause of the increase of 32.5 per cent in this item for 1907 has already been explained under "capitalization."

Funded debt constituted 24.9 per cent of the liabilities in 1907 as compared with 23.5 per cent in 1902. The cause of the increase of 42.1 per cent in this item between the two censuses is due to the increase in the issue of outstanding bonds since 1902 by several of the companies reporting at both censuses, and to the funded debt of a company reporting in 1907 but not at the previous census.

Combined reserves and surplus constituted 10.9 per cent of all liabilities in 1907 and 13.3 per cent of all in 1902. The amount of these two items in 1907—$28,583,902—is $2,645,213, or 10.2 per cent, greater than the amount for the previous census. About 40

per cent of this increase is caused by the surplus reported for the 4 companies which were not represented at the earlier census.

Bills and accounts payable constituted 4 per cent of the liabilities for 1907 and 3.2 per cent of those for 1902. The increase of 66.7 per cent in this item at the present census as compared with the earlier census is due almost entirely to business conditions existing when the several reports were made, and is but little affected by the figures included from the reports of the 4 companies not reporting in 1902.

Dividends due, including interest due and accrued, was two-tenths of 1 per cent of the liabilities at both of the census years. The slight increase in this item at the present census over the previous one is due entirely to the fact that 1 company which did not report in 1902 showed $120,000 due for interest in 1907.

Line construction.—Table 3 shows that 1,577,961 miles of single wire were controlled by the telegraph companies. The details of line construction are shown in Table 9.

TABLE 9.—*Line construction: 1907 and 1902.*

	1907	1902	Per cent of increase.
Line construction, miles:			
Pole line	239,646	237,990	0.7
Owned	198,127	218,148	[1]9.2
Leased	41,519	19,842	109.2
Cable	7,488	1,972	279.7
Overhead	2,589	1,467	76.5
Underground	1,130	399	183.2
Submarine[2]	3,769	106	3,455.7
Single wire, miles	1,577,961	1,307,046	20.7
On pole line	1,492,786	1,265,668	17.9
Copper wire owned	513,569	333,456	54.0
Iron wire owned	972,525	863,953	12.6
Leased wire	6,692	68,259	[1]90.2
In cable	85,175	41,378	105.8
Overhead	40,066	19,041	110.4
Underground	37,727	21,658	74.2
Submarine[2]	7,382	679	987.2

[1] Decrease. [2] Does not include ocean cables of submarine cable companies.

The pole line and cable mileage, exclusive of overhead cable, amounted to 244,545 in 1907 and 238,495 in 1902, the increase being 6,050 miles, or 3 per cent. The only decrease was in pole line owned, and this is probably more apparent than real, as in 1902 the distinction between owned and leased pole line was not as sharply drawn as at the present census.

The single wire mileage in 1907 was greater than in 1902 by 270,915 miles, or 20.7 per cent. The combination of the owned and leased wire necessarily results in a duplication in the total, but the exact extent of the duplication can not be determined from the Census reports. The greatest relative increase was in miles of wire in submarine cable, while the largest actual increase was in miles of copper wire owned. Of the large increase in miles of single wire in submarine cable, one of the largest systems, which did not report any wire in submarine cable at the census of 1902, reported over one-half of the total shown at the present census.

Of the total number of miles of single wire, that strung on pole line constituted 94.6 per cent; that in overhead cable, 2.5 per cent; that in underground cable, 2.4 per cent; and that in submarine cable, five-tenths of 1 per cent.

Along the right of way of steam railway companies the commercial telegraph companies had 197,012 miles of pole line, and 1,255,254 miles of single wire, or 79.5 per cent of all the single wire operated by the telegraph companies. Of this wire on railroad right of way, 69.1 per cent was iron and 30.9 per cent copper.

Wire operation.—There are four different methods of operating telegraph wires: The single system, by which only one message can be sent at a time; the duplex system, by which two messages can be sent simultaneously in opposite directions over the same wire; the quadruplex system, by which four messages—two from each end—can be transmitted over one wire at the same time; and machine or automatic systems, which make possible a higher rate of speed than can be attained by hand.

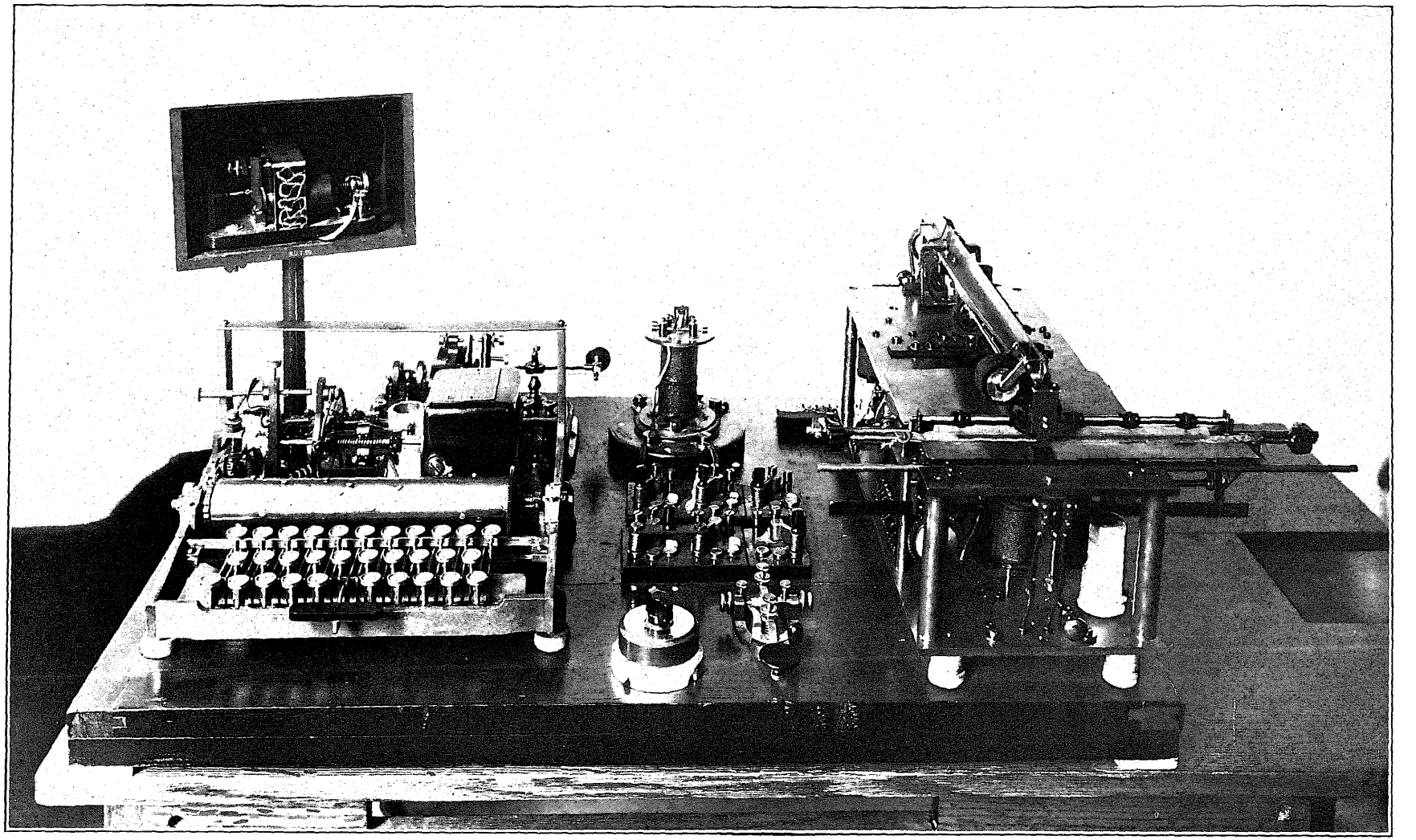
The distribution of the single wire mileage, owned or leased, according to method of operation, is shown for 1907 and 1902 in Table 10. These figures do not include the 46,301 nautical miles of ocean cable, all of which are worked duplex.

TABLE 10.—*Miles of wire operated, distributed according to method of operation: 1907 and 1902.*

METHOD OF OPERATION.	1907		1902	
	Miles.	Per cent.	Miles.	Per cent.
Total	1,577,961	100.0	1,307,046	100.0
Single	1,047,458	66.4	816,593	62.5
Duplex	239,278	15.2	185,048	14.2
Quadruplex	266,337	16.9	294,910	22.6
Machine or automatic	24,888	1.6	10,495	0.8

Of the total wire mileage operated in 1907, almost two-thirds was operated by the single system. This proportion is somewhat greater than the corresponding proportion for 1902. Less wire was operated by the quadruplex system in 1907 than in 1902, but more than twice as much was operated by machine or automatic systems at the present census than at the previous one. The use of automatic telegraphs has largely increased since 1902. Among the systems now in use in this country are the Barclay, Rowland, and Dean.

In the Barclay page printing system an automatic perforator perforates on a paper tape the holes necessary for producing the desired combinations for the message to be transmitted. This perforator forms a character or letter by one stroke of a key lever selected on a universal keyboard. The perforated tape is passed through an automatic transmitter, and the signals are received at the distant end on a polar relay, the points of which control the local apparatus operating the receiver, or printer. There are 56 characters grouped in two rows on the periphery of



MODERN PRINTING TELEGRAPH EQUIPMENT FOR SHORT-HAUL TRAFFIC OVER ORDINARY MORSE CIRCUITS.

the printer type wheel; thus a perfect alignment and a uniform imprint are insured. The message is printed on the standard receiving blank ready for delivery; the only attention required at the printer is to feed it with blanks and remove the completed messages. The time consumed in changing blanks averages from one to two seconds. At the sending end two handlings are necessary—one by the perforating clerk and the other by the transmitting clerk.

The Barclay system is on the polar duplex principle and its operation is not dependent in any way upon an increment of current. It is a nonsynchronous system and has a wide range in line current values.

Since messages are prepared on tape for transmission, no time is lost on the wire because of slow keyboard manipulation, difficulty in deciphering illegible copy, or other interruptions of like character. The correctness of the tape can be verified as it is prepared and then sent over the line in quantities sufficient to fully occupy the circuit and at a speed and with a precision that can not be approached by the most expert keyboard operator.

A picture is shown herewith which illustrates the latest development of the Barclay system as now in use by the Western Union Telegraph Company. The equipment is especially designed and adapted to handle the short haulage traffic over circuits at present operated by means of the Morse code. The sending apparatus, shown in front at the left-hand side of the figure, consists essentially of a keyboard transmitter, provided with a rapid make-and-break device for transmitting the signaling impulses directly into the main line. These impulses are received at the distant station upon a main line neutral relay (shown immediately behind the transmitter), which repeats them into a local escapement magnet, through whose operations a typewheel is rotated into the proper position for printing, the impression itself being effected at the moment when, by the depression of a key at the transmitting station, the character of the current is changed from a pulsatory to a steady one. The receiving apparatus, which is seen at the right of the illustration, includes a series of electro-magnets for actuating the typeshift, carriage return, and feed mechanisms.

The speed at which this new system can be operated is approximately 40 words per minute, ordinary telegraph blanks being utilized for the reception of messages. Should it be desirable at any time to resort to Morse working, this can be readily accomplished by means of the switching arrangement observable in the center of the illustration.

The Rowland system consists of a synchronous arrangement employing an electric motor which drives the mechanism producing an alternating telegraphic current of about one hundred complete periods per second and the commutator for synchronizing purposes. The use of the alternating current in this system furnishes great possibilities for long distance transmission, especially when worked octuplex.

The fact that telegrams to be transmitted by the Rowland system are distributed to the sending operators is a feature which recommends it to telegraph engineers. At the receiving end messages are recorded upon the regular telegram forms ready to be turned over to the delivery department. The printing of the message is accomplished immediately, no perforated or otherwise prepared tape being used at either the sending or the receiving end. At the receiving end the keys of a typewriter are controlled by the operation of a similar keyboard at the sending station.

The multiplex feature of the Rowland system necessitates a working of the typewriter different from that of an ordinary typewriter. The duration of the operation from the time a key is pressed at the sending station until the character is printed on the blank at the receiving station is less than a quarter of a second. On account of the distribution of the line to the different operators the keys are locked and unlocked automatically at intervals of one-fourth second. A sending operator may depress a key only when it is unlocked. The key, however, remains depressed until the letter has been correctly transmitted. After the expiration of one-fourth of a second the sender can depress another key, and the key previously depressed will automatically return to its normal position. Those operations of the receiving typewriter which move the paper from line to line and which return the carriage to the beginning of a new line are controlled by the keys of the sending typewriter called the lining, backing, and blanking keys.

At the sending station a tape recorder indicates to the sending operator the manner in which the telegram is being printed on the receiving blank at the distant station. In place of the bell signal, which is an attachment of the ordinary typewriter to indicate when the carriage has approached within a certain number of characters of the end of the written line, in the Rowland machine a red signal lamp is automatically lighted. Depression of the backing key on the sending typewriter causes the carriage of the typewriter at the receiving station to return to the beginning of a new line, whereupon the signal lamp is automatically extinguished.

In "feeding" receiving blanks to the receiving typewriter long bands of paper about 8 inches wide, on which the form of the telegraph blank is printed, are carried around a roll and between a platen and a constantly revolving wheel. In actual practice the speed obtained is about forty words a minute.

The advantages claimed for the Rowland system are: (1) Direct method of operation; (2) large carrying capacity per wire; (3) large capacity per operator; (4) message printed in page form ready for immediate delivery; (5) small liability of error; (6) ease of manipulation; (7) printed record at sending station.

The system of automatic telegraphy invented by Robert L. Dean, of Kansas City, Mo., was in operation during the year covered by this report over a three hundred and twenty mile circuit between Kansas City and St. Louis, Mo. The wire employed in this system is also used for telephone purposes. Specially constructed typewriters are used for both sending and receiving. The typewriter at the sending end is used to prepare the telegram for transmission. The messages are prepared at the rate of about fifty words a minute, after which the transmitter sends them over the line at a high rate of speed. At the receiving end the words of the message are printed in Gothic letters in page form, in a manner similar to the old Bonelli chemical telegraph reproduction.

Power generation in telegraph offices.—The power necessary to generate the electricity required to operate the commercial land telegraph and ocean cable systems is not always supplied by them, but is frequently leased from outside sources.

TABLE 11.—*Electric generating plants in offices: 1907 and 1902.*

	1907		1902		Per cent of increase.	
	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.
Engines	42	718	20	340	110.0	111.2
Steam	15	283	20	340	[1] 25.0	[1] 16.8
Gas	27	435	[2] 75	[2] 321		
Dynamos	128	604			70.7	88.2
Electric motors	144	369	[3]	[3]		
Motor generators and dynamotors	1,406	2,101	1,138	1,616	23.6	30.0
Batteries:						
Primary, cells	451,761		634,626		[1] 28.8	
Storage, cells	29,434		19,733		49.2	

[1] Decrease. [2] Not reported separately. [3] Not reported.

There were 42 engines having 718 horsepower reported for 1907, compared with 20 engines having 340 horsepower reported for 1902, an increase of 110 per cent in number and 111.2 per cent in horsepower. In 1902 the kind of engine, steam or gas, was not stated, though it is known that some gas engines were used, and they were evidently included in the total for steam engines. Therefore the decrease shown for steam engines is more apparent than real. With the exception of cells of primary batteries, all other items shown for 1907 are in excess of those shown for 1902.

The item of poles is an important element in the operation and maintenance of telegraph lines, and the following summary gives the information received in reply to an inquiry on the subject:

Number and cost of poles purchased by telegraph companies: 1907.

	Number.	Cost at point of purchase.	Average cost per pole.
Total	450,714	$1,133,254	$2.51
Cedar	288,626	849,336	2.94
Chestnut	159,836	277,222	1.73
All other	2,252	6,696	2.97

Submarine cables.—At the census of 1907 the companies in the United States operating submarine cables reported a total of 46,301 nautical miles, compared with a total of 16,677 nautical miles at the census of 1902. The large increase in mileage at the later census is due to the inclusion of the Pacific cable, which was laid subsequent to 1902; the new cable between New York and Habana operated by the Commercial Cable Company; the New York-Colon cable, as well as the other cables of the Central and South American Cable Company; and the ocean cables leased by the Western Union Telegraph Company.

Statistics relating to the financial operations of the cable systems apart from the land telegraph systems are not shown, because 1 company controlling both land and ocean telegraph lines was unable to make the necessary segregation.

The Pacific cable connects the United States with Hawaii and its island possessions in the far East and also with Japan and China. The original offer to construct a cable from San Francisco to Manila without Federal aid or subsidy was made by Mr. John W. Mackay in August, 1901. Despite some congressional opposition from those wishing the Federal Government to undertake the work, a charter was granted the Commercial Pacific Cable Company, and by the end of June, 1903, or within eighteen months after the contract was signed, the entire line from San Francisco to the Philippine Islands, a distance of over eight thousand miles, was successfully laid.[1]

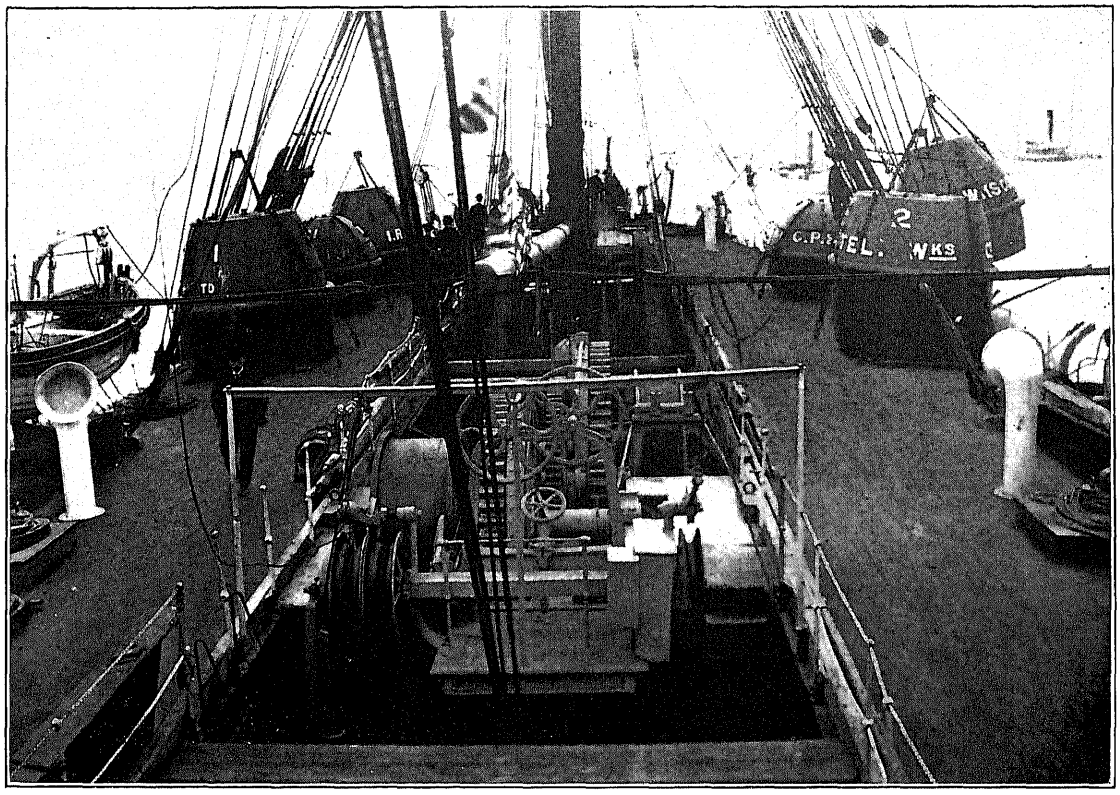
Upon the completion of the San Francisco-Manila line, which touches at Midway and Guam, the cable was extended to China and completed in April, 1906. The cable from Guam to Japan was finished in June of the same year, and thus the greatest single ocean cable enterprise in the world was brought to a successful termination in less than five years from the date of Mr. Mackay's offer, in August, 1901.

On October 18, 1907, the New York-Habana cable of the Commercial Cable Company was completed, and on October 21 was opened for public business. This cable is 1,285.5 nautical miles in length.[2]

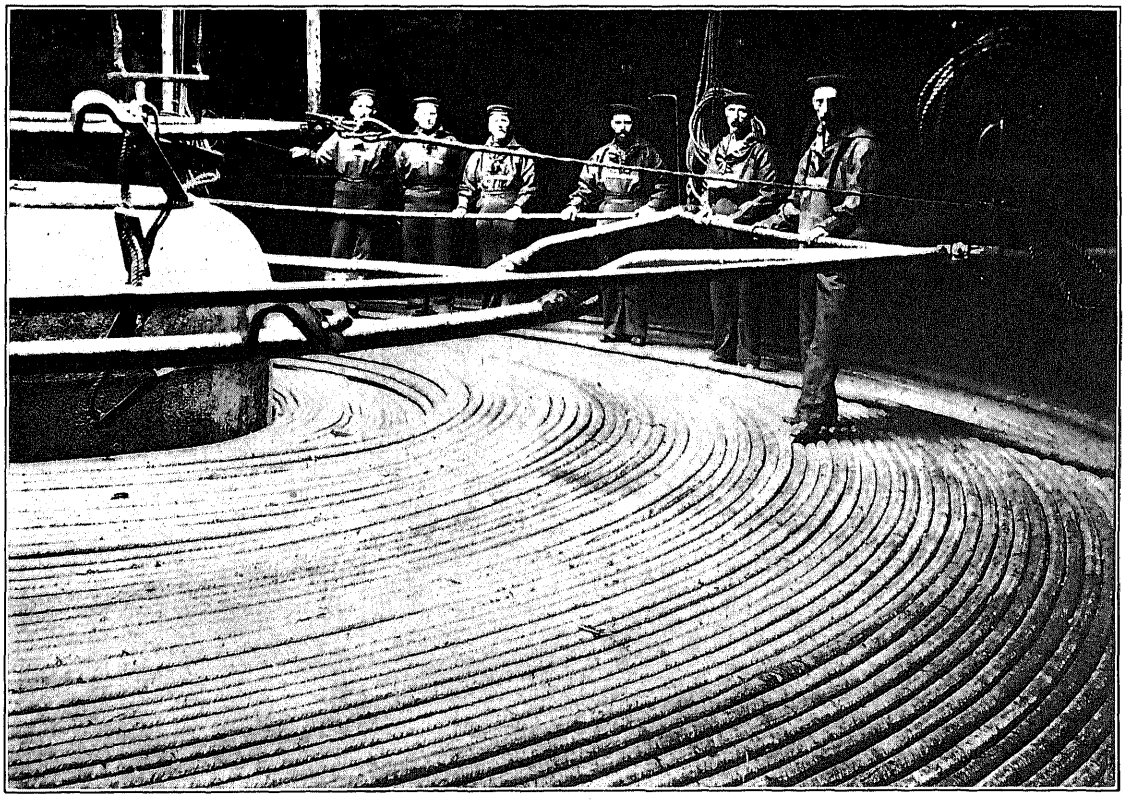
Ocean cables of the world.—The first ocean cable to be laid was one across the English Channel between Dover and Calais, which was opened in 1850.[3] This line was laid with English capital, and English capital still controls more than half the length of the submarine lines of the world.

Of the 252,436 miles of ocean cables in operation in 1904, only 38,797 miles, or about 15 per cent, were owned by governments, the remainder belonging to private owners. Of the total, 139,136 miles were owned by English corporations and 14,963 miles by the British Government.[4]

[1] Telegraph Age, July 1, 1906, page 294.
[2] Ibid., November 1, 1907, page 572, and December 1, 1907, page 632.
[3] Ibid., March 1, 1904, page 96.
[4] Ibid., March 1, 1904.



PAYING-OUT MACHINERY OF THE CABLE SHIP ANGLIA.



CABLE TANKS OF THE CABLE SHIP ANGLIA.

The most important of these English cables are the 5 lines which stretch across the North Atlantic, and the one across the Pacific connecting Vancouver with the Fiji Islands, Norfolk Island, New Zealand, and Australia.

The United States ranks next to Great Britain in number of miles of ocean cable operated. The most important of these lines are the 5 across the Atlantic, and the Pacific cable which connects San Francisco with Honolulu, Midway Island, Guam, the Philippines, China, and Japan.[1]

France ranked third among the nations in 1904 as to miles of ocean cable owned, the French Government owning 10,092 miles, or 42 per cent of all the French lines. Denmark was fourth, with 9,488 miles, and Germany fifth, with 9,228 miles, of which more than one-third was owned by the Government. The 17 other countries having financial interest in submarine cables had only 11,131 miles of lines, almost all of which were owned by the various governments.[1]

The world's telegraphs.—According to the thirty-ninth annual report, covering the calendar year 1907, of the Bureau International des Administrations Télégraphiques, of Berne, Switzerland, the following countries owning telegraph lines were at this time adherents of the St. Petersburg convention of 1875:[2]

Argentina.
Austria.
Australian Commonwealth.
Belgium.
Bolivia.
Bosnia-Herzegovina.
Brazil.
British Indies.
Bulgaria.
Cape of Good Hope.
Ceylon.
Crete.
Denmark.
Dutch Indies.
Egypt.
France and Algeria.
French Indo-China.
Germany.
Great Britain.
Greece.
Holland.
Hungary.
Iceland.
Italy.
Japan.
Luxemburg.
Madagascar.
Montenegro.
Natal.
New Caledonia.
New Zealand.
Norway.
Orange River Colony.
Persia.
Portugal.
Portuguese Colonies.
Roumania.
Russia.
Senegal.
Servia.
Siam.
Spain.
Sweden.
Switzerland.
Transvaal.
Tunis.
Turkey.
Uruguay.

These countries represent an area of 65,895,439 square kilometers, and have a population of 945,413,154.

Of the private telegraph companies of the world, 19 are adherents of the St. Petersburg convention, 15 conform to the regulations although nonadherents, and 5 correspond with the bureau through the medium of other companies. The first group comprises the following companies:

Black Sea Telegraph Co.
Commercial Cable Co.
Compagnie allemande des cables transatlantiques.
Compagnie Est-européenne des télégraphes.
Compagnie française des cables télégraphiques.
Compagnie télégraphique germano-néerlandaise.
Compañia telegráphico-telefónica del Río del La Plata.
Direct Spanish Telegraph Co.
Direct West India Cable Co.
Eastern Telegraph Co.
Eastern Extension Australasia and China Telegraph Co.
Grande Compagnie des télégraphes du Nord.
Halifax and Bermudas Cable Co.
Indo-European Telegraph Co.
South American Cable Co.
Spanish National Submarine Telegraph Co.
West African Telegraph Co.
West India and Panama Telegraph Co.
Western Telegraph Co.

The second group comprises the following companies:

African Direct Telegraph Co.
Amazon Telegraph Co.
American Telegraph and Cable Co. (Western Union Telegraph Co.)
Anglo-American Telegraph Co.
Central and South American Telegraph Co.
Commercial Pacific Cable Co.
Cuba Submarine Telegraph Co.
Direct United States Cable Co.
Eastern and South African Telegraph Co.
Europe and Azores Telegraph Co.
India Rubber, Gutta Percha, and Telegraph Works.
Mexican Telegraph Co.
Pacific and European Telegraph Co.
River Plate Telegraph Co.
West Coast of America Telegraph Co.

The third group is composed of the following companies:

African Transcontinental Telegraph Co.
British North Borneo Co.
Commercial Cable Company of Cuba.
Postal Telegraph Co.
United States and Hayti Telegraph and Cable Co.

[1] Telegraph Age, March 1, 1904.

[2] This convention prescribed, "among other things, for the priority of government and service telegrams; the strict secrecy of messages, their prompt dispatch and delivery, and the regulation of accounts between the contracting parties. But the states adhering to the convention do not accept any responsibility on account of the service of international telegraphy, and reserve the right 'to stop the transmission of any private telegram which may appear dangerous to the security of the state, or which may be contrary to the laws of the country, or to public order or decency.' Each adhering government also has the power to suspend its telegraphic service 'for an indefinite period, if it judges necessary, either generally or only upon certain lines for certain classes of correspondence,' the sole condition being that notice shall be given to the other contracting states in order to facilitate the proper working of the convention. Any state can adhere to the convention on request. Also any state may renounce its adhesion. The convention remains in force indefinitely, or for a period of one year from the date of its renunciation by any state, its general renunciation by the contracting states."—*Telegraph Age, 1907, page 561*

The bureau also corresponds more or less regularly with the Signal Corps of the United States Army as to military telegraph lines, with Mexico, China, the states of the Malay peninsula, and the Pacific Cable Board.

Among the various cables laid or land lines constructed during 1907, as reported to the bureau, were the direct wire between Budapest and Constantinople, constructed by the governments of Hungary, Turkey, Servia, and Bulgaria; the cable connecting Russia and Denmark, laid by the Grande Compagnie des télégraphes du Nord; that between New York and Colon, laid by the Central and South American Telegraph Company; that between New York and Habana, laid by the Commercial Cable Company of Cuba; and those laid by the Eastern and South African Telegraph Company on the east coast of Africa, connecting Durban with Mozambique, Quilimane, Beira, and Lourenço Marquez.

During 1907 the number of new offices opened to international traffic was 5,200, many of which are at points hitherto inaccessible to telegraphic communication. These facts are an evidence of the expansion in the use of the telegraph.

WIRELESS TELEGRAPH SYSTEMS.

The early history of wireless telegraphy was covered in the special report on Telegraphs and Telephones for the census of 1902. Since that time rapid advances have been made in the science, and the usefulness of wireless telegraphy as a commercial factor has been widely recognized. Experimentally the art has progressed further than is shown by its present applications in practical work.

It was only in 1896 that Guglielmo Marconi filed in the British Patent Office a provisional specification "for improvements in transmitting electrical impulses and signals and in apparatus therefor." To-day the mercantile marine service has been very largely equipped with wireless apparatus, and the different governments of the world are alive to its uses in both peace and war. Equipment has been installed upon the ships of the world's navies, shore stations have been erected, and even the armies of several countries have used wireless telegraphy overland quite successfully. The Government stations at Washington and Brooklyn navy yards, which can communicate with each other both day and night, regardless of the interference of other stations, are an evidence of what is being done with overland wireless telegraphy between permanent stations. The following extract from the report of the Secretary of the Navy for the year 1907 is of interest in this connection:[1]

> The wireless station at Point Loma, Cal., heard the U. S. S. *Connecticut* and the Pensacola station communicating with one another while the former was off the eastern coast of Cuba, and copied one of the messages. This is probably the longest distance [about 2,800 miles] ever made under such conditions.

Such difficulties as often hinder advancement of an invention apparently workable have to some extent retarded the development of transatlantic wireless telegraphy. In 1902 news messages were sent from Cape Cod to Poldhu in Cornwall, England. Since October 17, 1907, a limited transatlantic commercial service has been available, new and more powerful stations having been erected on Cape Breton, the easterly point of Nova Scotia, and at Clifden in Ireland. Up to the end of February, 1908, 119,945 words had been transmitted, although the service was in operation only a few hours daily.[2]

Through the medium of wireless telegraphy the ocean liners and coastwise vessels keep in constant communication with shore stations, and thus afford valuable service not only to shipowners but also to the public.

The average charge for a wireless message between a shore station and a vessel at sea, or vice versa, is $2 for 10 words and 10 cents for each additional word.

The wireless method of telegraphy is still in a more or less formative state, and this census, which relates to the year ending December 31, 1907, gives the first statistics for the systems already established. The report includes 5 commercial companies operating in continental United States, and 1 in Hawaii. Since one of the companies in the United States was in active operation during only the last four months of 1907, the totals do not represent a full year's work. The conditions under which the wireless telegraph systems were conducted, and the lack of uniformity in the methods of bookkeeping, made it impossible to obtain uniform reports for all companies; the statistics, however, are representative of the industry as it existed during and at the close of the census year.

Number of tower stations.—There were 122 wireless telegraph tower stations reported by the 6 companies as in operation during 1907. They are located at advantageous points and at most of the large ports on the Atlantic and Pacific oceans, the Gulf of Mexico, the Great Lakes, and in Hawaii.

All 6 of the commercial wireless systems were operated by incorporated companies, and their principal business for the year consisted in the transmission of 163,617 messages.

Income and expenses.—The income and expenses of the 6 companies for the year are analyzed in Table 12, as far as the statistics will permit.

[1] Report of the Secretary of the Navy, 1907, page 347.

[2] Western Electrician, July 4, 1908, page 8.

TABLE 12.—*Wireless telegraph companies—income and expense account: 1907.*[1]

Income, total	$122,154
Receipts from operation	114,302
Miscellaneous income	7,852
Expenses, total	169,782
Operation and maintenance	164,120
Taxes and interest	[2] 5,662
Net deficit	47,628
Salaries of corporation and general officers	25,275
Salaries of clerks	9,354
Wages	52,942

[1] Includes 1 company located in Hawaii.
[2] Includes $66 interest on floating debt.

While the total income of the wireless telegraph companies was $122,154, the total cost of operation, including taxes, was $169,782, leaving a net deficit of $47,628. Only 3 companies reported a net income on the year's business, the total amounting to $9,732, but this was more than counterbalanced by the $57,360 reported as the net deficit of the 3 systems for which the expenses exceeded the income.

Wages constitute 31.2 per cent of total expenses and 32.3 per cent of general operation and maintenance expenses; while salaries of officers and clerks are 20.4 per cent of the first and 21.1 per cent of the second. Salaries and wages together form 51.6 per cent of all the expenses and 53.4 per cent of the expenses charged for general operation and maintenance. The proportions should not be accepted as showing exact conditions, as the Census statistics represent the magnitude rather than the cost of operation and profits of the industry.

Balance sheet.—The financial condition of the 6 companies considered as a single system is shown by the combined balance sheet given as Table 13.

TABLE 13.—*Wireless telegraph companies—balance sheet: 1907.*[1]

Assets.	
Total	$33,011,060
Construction and equipment	367,614
Treasury stock	[2] 5,620,399
Machinery, tools, and supplies	58,001
Bills and accounts receivable	333,543
Cash and deposits	18,652
Patent rights, good will, contracts, etc.	26,169,070
Deficit	443,781
Liabilities.	
Total	33,011,060
Capital stock	32,726,242
Floating debt	38,897
Bills and accounts payable	245,921

[1] Includes 1 company located in Hawaii.
[2] Includes $1,919, other permanent investments.

The items in this table are obtained by combining the balance sheets of the several systems, and therefore do not represent the financial condition of any separate company. The statistics are confined to systems that were in actual operation during the census year, and do not represent the financial condition of projected or partially constructed systems.

The cost of construction and equipment, amounting to $367,614, is the total amount expended for this purpose up to the end of the census year. During the year the companies expended $37,891 on new construction. Patent rights, good will, contracts, etc., constitute 79.3 per cent of the total assets, and treasury stock, 17 per cent. It is not at all remarkable that these two items should constitute over 95 per cent of the entire assets, as a similar condition would naturally exist in any new industry so technical in character and in so formative a condition.

Capitalization.—The authorized capitalization of the 6 companies consisted of stock with a par value of $39,450,000, of which $10,000,000 was preferred stock. At the end of the census year there had been issued and was outstanding stock to the value of $32,726,242, or 83 per cent of the authorized capitalization. While all the authorized preferred stock has been issued, only 77.2 per cent of the common stock is outstanding. Two of the companies issued their stock at a par value of $100, 3 companies at $10, and 1 company at $1.

Employees and wages.—The statistics of the employees required to operate the 6 systems are shown in Table 14.

TABLE 14.—*Wireless telegraph companies—employees, salaries, and wages: 1907.*[1]

Salaried employees:	
Total number	37
Total salaries	$34,629
Officers of corporation:	
Number	11
Salaries	$23,000
General officers:	
Number	3
Salaries	$2,275
Clerks and bookkeepers:	
Number	23
Salaries	$9,354
Wage-earners:	
Total average number	145
Total wages	$52,942
Operators:	
Average number	120
Wages	$42,018
Male—	
Average number	118
Wages	$41,288
Female—	
Average number	2
Wages	$730
All other employees:	
Average number	25
Wages	$10,924

[1] Includes 1 company located in Hawaii.

The salaried employees constituted 20.3 per cent of the operating force in all systems, and they received 39.5 per cent of the total amount expended during the year for salaries and wages. Operators formed 82.7 per cent of all the employees classed as wage-earners, and their wages formed 79.4 per cent of the total

wages. The statistics of employees and wages are affected to some extent by the inclusion of those employed on the system that was in operation during only four months of the year.

Physical equipment.—Considerable machinery is required to generate the electricity employed in the operation of wireless telegraphy, and the statistics for this machinery are given in Table 15. These statistics include only the machinery connected with the operation of the land stations, and not any portion of the equipment connected with the ship installations, owned by the several companies.

TABLE 15.—*Wireless telegraph companies—power plants in offices: 1907.*[1]

Engines:	
Number	[2]15
Horsepower	[2]115
Dynamos:	
Number	15
Horsepower	119
Motor generators and dynamotors:	
Number	118
Horsepower	423
Transformers:	
Number	137
Horsepower	400
Batteries in offices:	
Primary, number of cells	86
Storage, number of cells	75

[1] Includes 1 company located in Hawaii.
[2] Includes 4 kerosene engines of 12 horsepower each.

RAILWAY TELEGRAPHS AND TELEPHONES.

The census of 1902 was the first to present statistics relating to railway telegraphs and telephones. That report embraced all lines and wires operated in connection with steam railroads to subserve their business as common carriers. Thus the lines and wires owned and operated by railroad companies were included, and also lines and wires operated by commercial telegraph or telephone companies along railroad right of way. On some of the commercial lines, through agreement, messages relating to railway business were given preference. Much of the data presented for 1902 was compiled from the reports made by the steam railroads to the Interstate Commerce Commission.

At the present census, however, all information was obtained directly from the reporting companies, except that relating to track mileage, which was secured from the twentieth annual report on the Statistics of Railways in the United States for the year ending June 30, 1907, prepared by the division of statistics and accounts of the Interstate Commerce Commission. The wire mileage reported in 1907 includes that owned by the railways, as well as that owned by commercial telegraph or telephone companies and used by the roads through agreement. A large proportion of the leased pole line and wire mileage reported by the steam railroads was owned by commercial telegraph and telephone companies, and is included in the reports relating to those companies. An undetermined portion of the items shown for railway telegraphs and telephones is therefore a duplication of portions of similar items shown in the reports on commercial telegraphs and telephones.

Comparison with previous census.—In comparing the data presented at the two censuses, apparent discrepancies exist, which are due largely to the change in the methods of collecting the information.

The decrease in the number of reporting companies in 1907 as compared with 1902 is due to the consolidation of two or more roads, the absorption into large systems of formerly independent roads, and the inclusion at the present census of two or more operating companies in a single report. The nonreporting roads in 1907 were those which did not use either telegraphs or telephones in their operations.

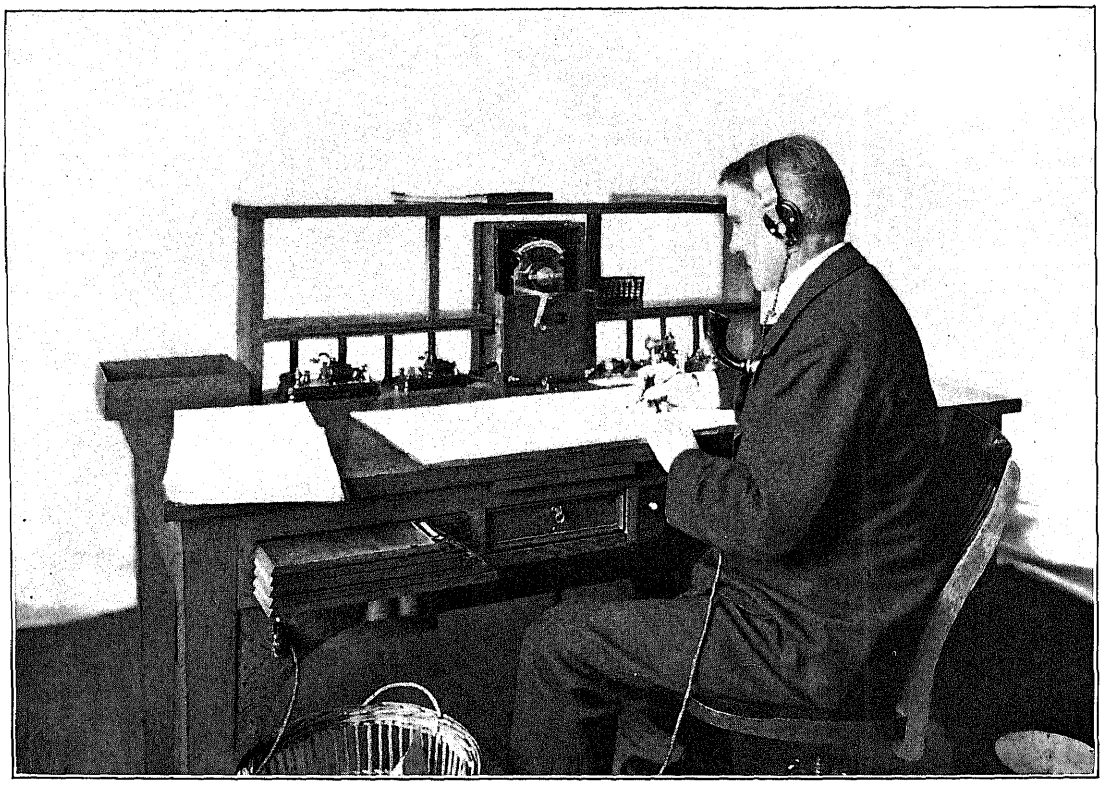
TABLE 16.—*Railway telegraph and telephone systems—comparative summary: 1907 and 1902.*

	1907	1902
Number of companies	625	[1]684
Single track, miles	225,059	[1]204,583
Pole line, miles	224,476	([2])
For telegraph wires:		
Owned	87,809	([2])
Leased	128,418	([2])
For telephone wires:		
Owned	6,596	([2])
Leased	1,653	([2])
Single wire, miles	860,342	[1]1,127,186
Telegraph wire:		
Owned	383,833	[1]242,837
Leased	423,991	[1]884,349
Telephone wire:		
Owned	47,433	([3])
Leased	5,085	([3])
Number of telegraph offices	33,441	31,278
Telegraph operators and dispatchers:		
Number	68,197	[1]30,336
Wages	$37,242,479	[1]$20,040,730
Number of sets of instruments:		
Morse	99,519	85,150
Other	4,384	603
Number of cells of batteries:		
Primary	383,891	278,203
Storage	13,411	11,914
Number of telephones	30,115	17,606
Number of telegraph messages sent during year:		
For railroad business only	258,589,333	201,743,756
Commercial	5,923,483	4,474,593

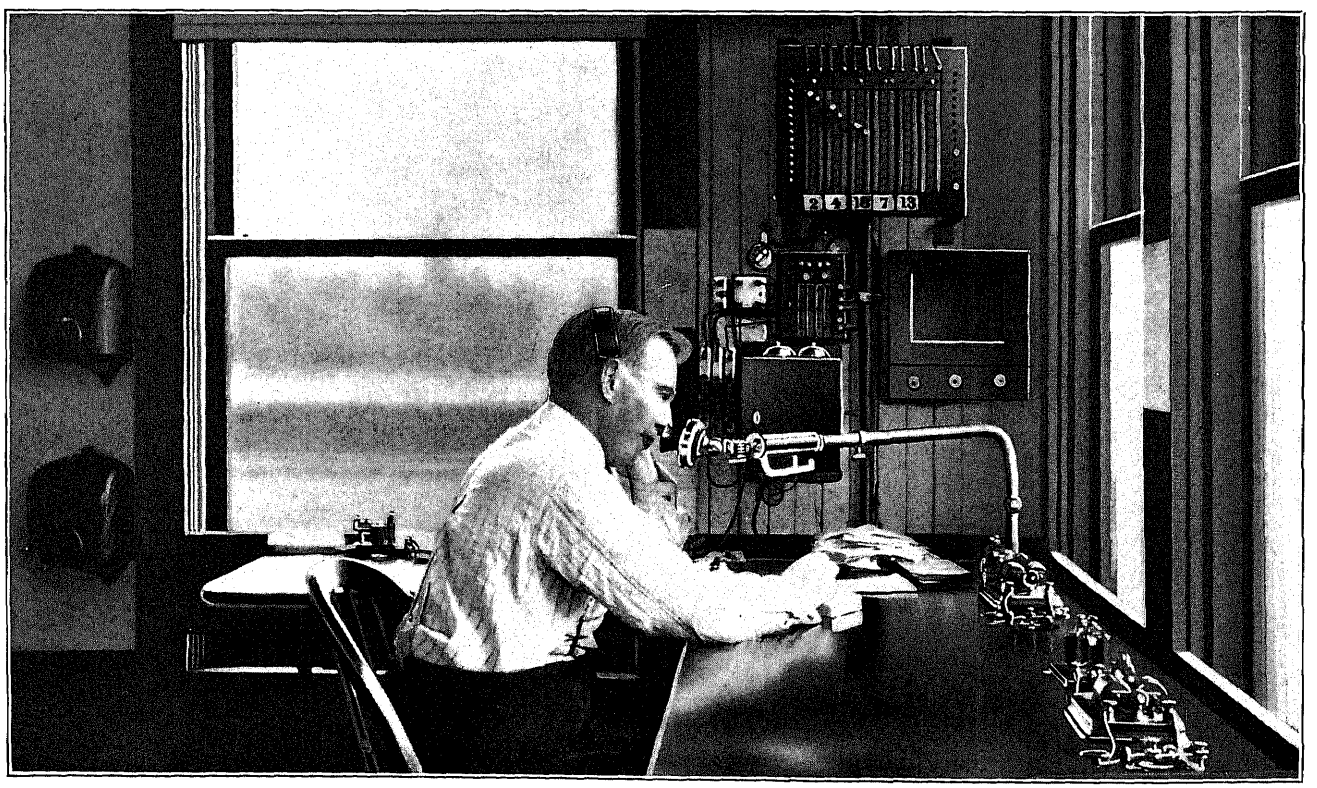
[1] Compiled from reports made to Interstate Commerce Commission in 1902.
[2] Not reported.
[3] Not segregated from telegraph wire.

The roads for which telegraph and telephone statistics are included in the present census operated 225,059 miles, or 95.8 per cent, of the mileage of all single track operated by the steam roads within the United States on June 30, 1907. No similar comparison can be made for 1902, as the figures shown at that census as single track mileage contained an unknown amount of trackage other than single track.

No comparison can be made between the two censuses as to the pole line along the right of way of the railroads, for the reason that in 1902 no data were obtained relating to this subject. In 1907 the pole line used in railroad telegraph and telephone service owned by the railroads was 42.1 per cent, while 57.9 per cent was owned to a very large extent by commercial telegraph and telephone companies. In a few cases the pole line has been constructed for private purposes and is owned by private parties.



TRAIN DISPATCHING EQUIPMENT, WITH TELEPHONE, USED ON DELAWARE, LACKAWANNA AND WESTERN RAILROAD.



TRAIN DISPATCHING TELEPHONE EQUIPMENT, USED ON LAKE SHORE AND MICHIGAN SOUTHERN RAILROAD.

In 1902 the commercial telegraph companies reported 181,921 miles of pole line along the right of way of steam railways, while in 1907 they reported 197,012 miles, an increase of 8.3 per cent.

While only about 7 per cent of the pole line owned was reported as being used exclusively for telephone wires, there is an undetermined amount of line used for both telegraph and telephone wires.

The decrease in the total wire mileage reported in 1907 as compared with 1902 is due to the inclusion at the earlier census of wire mileage not used by the railways, but owned by commercial telegraph and telephone companies along railroad right of way. In 1907, however, only leased wire actually used by or reserved for the use of the railroads was included.

The wire mileage owned by the steam railroads in 1907 aggregates 431,266 miles, or 50.1 per cent of the total used by them, and is an increase over 1902 of 188,429 miles, or 77.6 per cent. In 1907, of the 625 reporting companies, 351, operating 56,243 miles of single track, did not report the use of wires other than their own in the operations of their trains.

The miles of single wire which the commercial telegraph companies had along the right of way of steam railroads in 1902 amounted to 954,319, or 73 per cent of the total wire mileage operated by all commercial telegraph systems in that year. In 1907 the mileage amounted to 1,255,254 miles, or 79.6 per cent of the total operated by the commercial systems.

The increase in the number of operators and dispatchers in 1907 as compared with 1902 is more apparent than real, as at the census of 1902 only those employees who performed the duties of operators exclusively were included, while at the present census the railway companies were requested to include all employees who acted as operators and in addition performed other duties. The great increase in wages, moreover, is due in part to the inclusion of the wages of these additional employees.

As but few railroads maintain telegraph lines for other than railway business, the commercial privileges, as a rule, being granted to commercial telegraph companies, it is probable that most of the commercial messages shown in Table 16 have also been included in the reports of the commercial telegraph companies.

At the census of 1902 the total number of telephones used by railroads, including those used for public purposes, was secured, but no attempt was made to obtain the mileage of telephone wires. At the present census, however, the number of those telephones used only in the operation of railways and the wire mileage used exclusively for telephonic purposes were asked for. Therefore any comparison between the number of telephones reported at the earlier census and the number shown for the present census would be misleading.

It is known, however, that the use of telephones by railroads exclusively in connection with the operation of the roads has increased rapidly since 1902. At the present census 30,115 telephones were reported as being used exclusively in the operation of the railways, and the length of wire reported as being used exclusively for telephonic purposes was 52,518 miles, of which 47,433 miles were owned by the railroads and 5,085 miles were owned by private or commercial telephone companies and used by the railroads under contract.

Train dispatching by telegraph.—Telegraph service was first employed by a railroad in 1844, when the Baltimore and Ohio Railway, in return for the permission to use its right of way, was given the use of certain wires for communication purposes, but it was not until later that this road employed the telegraph for train dispatching.[1]

The Erie Railroad, the first to use the telegraph in the handling of trains, issued the first train order at Turners, N. Y., in 1846.[1] Since that year the employment of the telegraph by railroads has increased very rapidly, and at the present time a railway telegraph department is a very essential branch of a railroad.

Some of the larger railway systems have found it necessary to establish instruction schools in telegraphy in order to recruit efficient telegraphers. The school of telegraphy established in 1907 by the Pennsylvania Railroad at Bedford, Pa., for the purpose of training young men in the theory and practice of railroad telegraphy and accounts, is considered one of the best in this country. It is equipped with a miniature electric railroad with 10 block and telegraph stations, and the workings of the little railroad are most practical.[2]

Train dispatching by telephone.—Although the electric interurban roads early recognized the advantages of the telephone for dispatching purposes, the larger steam roads have been disinclined to substitute the telephone for the long-established telegraph. Their general objection has been that the telephone is not as reliable as the telegraph, because of the liability to mistakes through the similarity in the sound of different words when transmitted by telephone.

In connection with the report on Electric Railways for 1907 it has been ascertained that 406 electric roads owned 14,546 miles of single telephone line which was used for train dispatching purposes.

In 1882[3] the use of the telephone for the dispatching of trains was successfully demonstrated on the Boston, Revere Beach, and Lynn Railroad, and for some years the telephone has been used in the directing of trains at the large terminal stations throughout the United States. At the census of 1907, 233 roads used the telephone exclusively in their operation, with 6,289 miles of single track; 122 roads and systems had 43,896 miles of telephone wire

[1] The Northwestern Bulletin, No. 9, December, 1907, page 13.
[2] Telegraph Age, June 16, 1908, page 418.
[3] Railroad Gazette, December 30, 1892.

in addition to their telegraph wire; and 69 roads and systems used the same wires for telegraphing and telephoning. However, the use of the telephone for the dispatching of trains was not at all general at the census of 1907.

Some of the larger roads have experimented on a scale sufficiently extensive to determine satisfactorily the possibilities of the telephone for train dispatching. The subject of this use of the telephone is receiving much thoughtful consideration at the present time, and every phase of its development and application is being studied with interest. Railroad telegraph superintendents are seeking every available source of information in their desire to inform themselves as to means and methods.

The use of the telephone for the dispatching of trains was indorsed at a meeting of the Western Division of the American Association of Railway Telegraph Superintendents, held in Chicago, Ill., September 17, 1908. Eighteen of the larger railroads north and west of the Ohio river were represented at this meeting. Various subjects were discussed, but the use of the telephone for the dispatching and blocking of trains was the one of greatest interest. It was reported that within the preceding two years over six thousand miles of road had been placed under telephone operation, and that nearly all of this mileage was on heavy divisions, both single and double track. The discussion showed the advantages for both safety and efficiency resulting from this use of the telephone, and reports indicated that on divisions so operated train movements were expedited by the greater speed and flexibility of the telephone system, and that the train dispatcher's duties, as well as those of the operator, were lightened.[1]

At a meeting of the Eastern Committee of the Association of Railway Telegraph Superintendents, held in New York city November 19, 1908, the subject of train dispatching by telephone was carefully discussed. A number of reports were read giving the results of the experience of various roads with train movement by telephone. These reports also covered the use of the telephone for local railroad message business by the roads already supplied with such circuits, and with phantom circuits between large cities. The results shown were so satisfactory that the following resolution was adopted:[2]

Resolved, That in the judgment of this association the use of the telephone in the dispatching and blocking of trains is just as safe, if not safer, than the telegraph, and in addition thereto has many advantages. Therefore we unanimously recommend its use and its further adoption for such purposes.

GOVERNMENTAL TELEGRAPH AND TELEPHONE SERVICE.

The report on Telephones and Telegraphs at the census of 1902 contained a chapter devoted to the Government telegraph and telephone service, and fully described such service of the several branches of departments of the Federal Government which used the telegraph and telephone to a large extent. Since that report was written the telegraph and telephone lines operated by the Government in Alaska and the Philippines have been greatly extended and the use of wireless telegraphy has been further developed. By 1907 the insular government of Porto Rico was operating profitably a telegraph system, and the Panama Canal Commission, jointly with the Panama Railroad Company, was operating a telegraph and telephone system in the Canal Zone.

TABLE 17.—*Governmental telegraph and telephone systems: 1907.*

	Panama.	Porto Rico.[1]	Alaska.[2]	Philippine Islands.[1]
Line construction, miles	65	484	1,403	6,438
Single wire, miles	2,204	774	.....	.....
Submarine cable, miles	.....	.....	2,524	1,437
Employees, number	60	132	.....	.....
Salaries and wages	$43,800	$41,101	.....	.....
Expenses	$50,988	$51,945	$179,000	.....
Income	$7,818	$59,226	[3]$236,912	.....
Messages, number	91,401	216,489	[4]310,000	472,418
Telephones, number	792	175	.....	396

[1] Includes statistics for telephone system.
[2] The statistics are taken from the report of the Chief Signal Officer of the United States Army, and are for the fiscal year ending June 30, 1907.
[3] Government business was handled to the value of $135,746.
[4] Includes 260,000 commercial messages.

Table 17 is incomplete in that it contains no data in regard to the wireless telegraph systems of the United States Army and Navy.

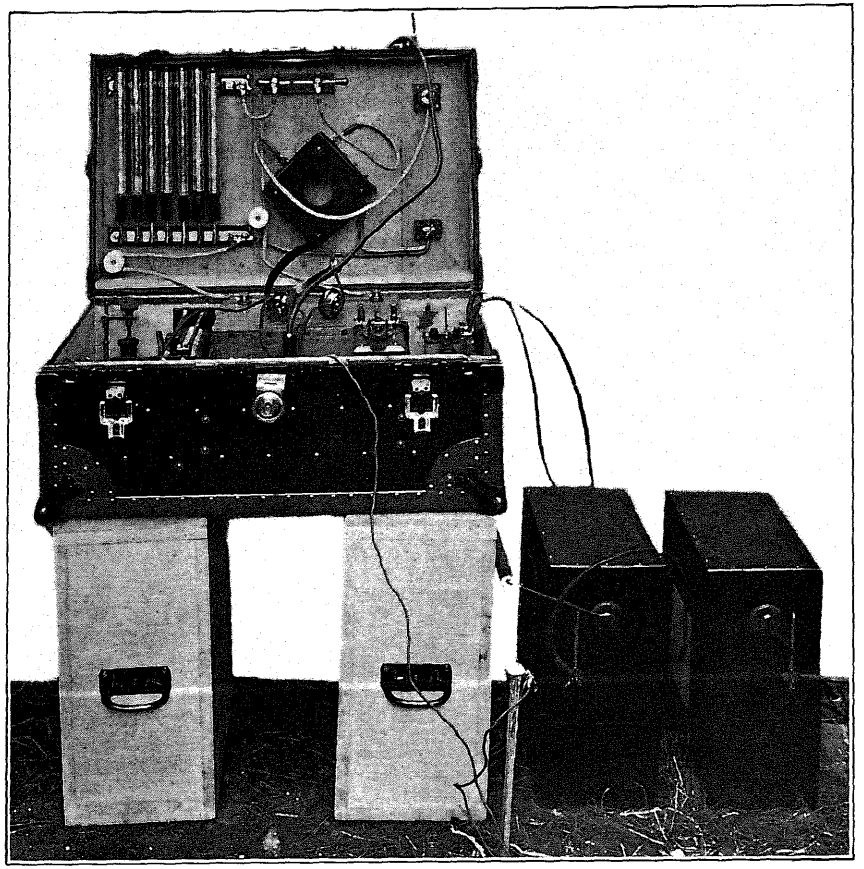
Signal Corps of the United States Army.—On June 30, 1907, the United States Government had 145 miles of military telegraph lines in operation, while during the year ending with that day 33.8 miles of such line had been discontinued, either because of the abandonment of the military posts with which they were connected or because they had been changed into telephone lines.

During the fiscal year the sum of $535 was collected for the transmission of commercial messages over these military lines, and, in addition, $4,672 was collected and transferred to connecting commercial companies in payment for the transmission over the lines of the commercial companies of messages received by the military lines. The military telegraph lines handled 52,280 messages during the year 1907.

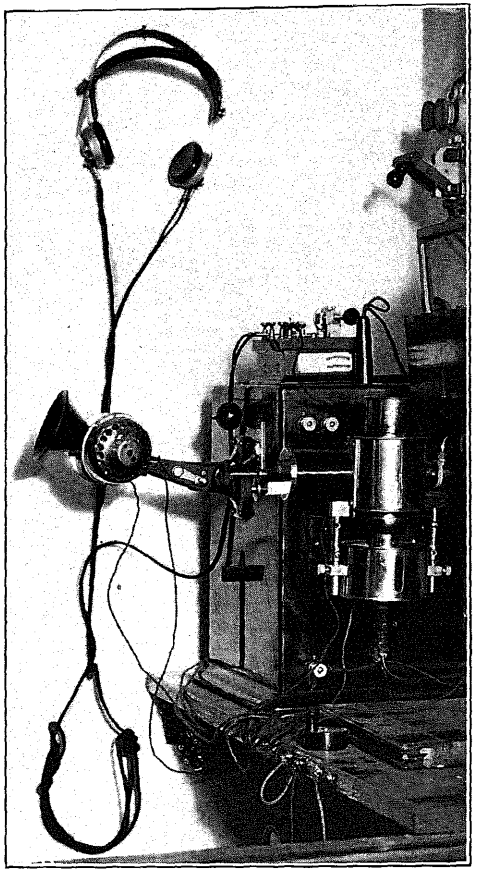
In addition to these military telegraph lines, 54 telegraph offices were operated at military posts in the United States by enlisted men of the Signal Corps and line soldiers who were operators. These offices were on short branches of commercial lines brought into the posts to facilitate the service, and their status is the same as branch offices of commercial companies.

In 1907 as compared with 1902 there was a decrease of 362.5 miles in the length of line owned by the Gov-

[1] Railroad Age Gazette, September 25, 1908, page 994.
[2] Telegraph Age, December 1, 1908, page 789.



FIELD WIRELESS TELEGRAPH RECEIVING SET OF THE UNITED STATES SIGNAL CORPS.



COMPLETE RADIO WIRELESS TELEPHONE APPARATUS.

ernment, and a decrease of $1,678 in the revenue to the Federal Government, although the revenue collected for connecting commercial companies increased $1,221 and the number of messages, 10,475.

The Alaskan telegraph system, built and maintained by the Signal Corps of the United States Army, consisted in 1904 of a total of 3,625 miles, comprising 2,079 miles of submarine cable, 1,439 miles of land lines, and a wireless system of 107 miles. On June 30, 1907, this system consisted of a total of 4,034 miles, including 2,524 miles of submarine cable, 1,403 miles of land lines, and 107 miles of wireless. The increase during the three years was 409 miles. Table 18 shows the stations and distances.

The Alaskan system in 1907 contained 45 telegraph offices and 10 cable offices, of which 18 were money transfer offices. During the year 310,000 messages were handled, of which 260,000 were commercial and 50,000 official. The receipts for commercial messages amounted to $236,912, and the Government business handled was valued at $135,746.

As a result of the increase in business it was found expedient to install duplexing instruments in Seattle and Sitka during 1906, and it is planned to install similar instruments on the Sitka-Valdez section at an early date. The advisability of duplicating the main cable between Seattle and Sitka is being considered, and the probable cost is estimated at about $660,000.

The wireless installations at Safety and at St. Michael continue to give satisfactory service, and plans have been perfected for the extension of the wireless system, with a view to constructing a complete chain of wireless stations from Safety Harbor to the mainland of the United States. An appropriation has already been made for a 10-kilowatt station at Fort Gibbon. This station and the proposed stations at Valdez and Sitka will furnish connections between the present wireless stations at Safety and St. Michael and the stations at Tatoosh Island, off the entrance of Puget Sound, and San Francisco. During the fiscal year 1907 the Signal Corps had in process of installation 2 wireless stations, 1 at Fairbanks and 1 at Circle City. These places are about one hundred and forty miles apart, and the stations are designed to have a radius of action of about two hundred and fifty miles. The power for the instrumental equipment at each place is to be derived from a gasoline-engine-driven dynamo of 1-kilowatt capacity. The antennæ are to be suspended by the use of steel towers 175 feet in height, the bases of which will be insulated with creosoted timbers and housed for protection from moisture.

When these permanent stations are established, communication can be maintained between them and boats on the Yukon river, and with such outlying stations and camps as are supplied with portable field sets.

TABLE 18.—*Stations and distances, Alaskan telegraph system: 1907.*[1]

	Intermediate.	Total.
Nome-Valdez section.		
Land lines:	*Miles.*	*Miles.*
Nome	0	0
Fort Davis	4	4
Safety (wireless)	20	24
St. Michael (wireless)	107	131
Golsova	35	166
Unalakleet	30	196
Old Woman	50	246
Kaltag	45	291
Nulato	40	331
Koyukuk	30	361
Grimkop	20	381
Louden	30	411
Melozi	35	446
Kokrines	38	484
Birches	40	524
Fort Gibbon	55	579
Rapids	24	603
Rampart	23	626
Glen	35	661
Hot Springs	21	682
Tolovana	37	719
Minto	39	758
Nenana	35	793
Chena	29	822
Fairbanks	10	832
Salcha	37	869
Delta	29	898
Richardson	2	900
McCarty	20	920
Donceleys	40	960
McCallums	37	997
Paxtons	18	1,015
165 Mile Post	29	1,044
Gulkana	37	1,081
Copper Center	26	1,107
Tonsina	25	1,132
Telkhell	24	1,156
Saina	24	1,180
Thompson Pass	5	1,185
Wortmans	7	1,192
Valdez	19	1,211
Fort Liscum	8	1,219
Fort Egbert branch:		
Gulkana	0	1,219
Talsona	20	1,239
Chistochina	20	1,259
Mentasta Pass	46	1,305
Tanana Crossing	51	1,356
Ketchumstock	55	1,411
North Fork	19	1,430
Fort Egbert	68	1,498
Boundary	12	1,510
Cables.		
Seattle-Seward:		
Seattle	0	0
Sitka	1,085	1,085
Valdez	599	1,684
Fort Liscum	4	1,688
Seward	189	1,877
Sitka-Skagway:		
Sitka	0	1,877
Cape Fanshaw (no station)	211	2,088
Juneau	98	2,186
Haines Mission	106	2,292
Skagway	18	2,310
Cape Fanshaw-Ketchikan:		
Cape Fanshaw (no station)	0	2,310
Wrangel	63	2,373
Hadley	69	2,442
Ketchikan	28	2,470
Lawton-Worden:		
Fort Lawton	0	2,470
Fort Worden	42	2,512
Ward-Lawton.		
Fort Ward	0	2,512
Fort Lawton	12	2,524
RECAPITULATION.		
Land lines		1,403
Wireless		107
Cables		2,524
Total		4,034

[1] Compiled from War Department Reports for 1907, vol. 2, page 162.

Because of the excessive cost of maintaining land lines in the interior of Alaska the use of wireless telegraphy is particularly desirable, and the completion of the proposed chain of wireless stations will, it is believed, reduce materially the burden of maintaining the present land lines and at the same time add greatly to the efficiency of the Alaskan telegraph system as a whole.

A comprehensive statement of the telegraph and telephone system in the Philippine Islands up to and including June 30, 1904, was contained in the report of the previous census of telephones and telegraphs. Of the land lines and submarine cable in operation in these islands on June 30, 1904, 3,520 miles were operated by the Signal Corps of the United States Army, and 2,965 miles by the civil government of the Philippines. The Signal Corps also operated in the city of Manila telegraph and telephone systems aggregating 174 miles of circuit, and outside of Manila local telephone systems having an aggregate of 38 miles of circuit were maintained for military purposes at 28 army posts and stations.

On June 30, 1907, 6,438 miles of land lines and 1,437 miles of submarine cable—a total of 7,875 miles—were in operation in the islands. Of these lines, the Signal Corps operated 1,572 miles of land lines and 1,217 miles of cable—a total of 2,789 miles—and the civil government operated 4,866 miles of land lines and 220 miles of cable—a total of 5,086 miles. In 1907 as compared with 1904 there was an increase of 1,390 miles in the length of line in operation, not including lines constructed and recovered during the three years.

The number of messages reported for the telegraph and cable system of the Philippine Islands is 472,418, which is made up of "240,155 messages sent and 232,263 relayed."[1]

In addition to the telegraph and cable system, the Signal Corps operated and maintained 23 local telephone systems, representing 327 miles of line and 396 telephones.

Because of the installation of a commercial telephone system in Manila, the Signal Corps system in that city has been partially dismantled since 1904, and in 1907 only 73 telephones remained in circuit to connect the various staff departments for administrative purposes.

As there was considerable interruption of service on the cable from Zamboanga to Joló, a distance of 107 statute miles, due to natural causes, the substitution of a wireless telegraph plant was authorized late in 1905. The stations were duly installed at the two points mentioned and satisfactory service was being rendered in 1907, at which time the Signal Corps was erecting another wireless station at Malabang.

The operations of the Signal Corps in Cuba date from October, 1906, when a detachment of this corps was sent to the island with the army of pacification.

The two most important features of its work were the establishment of a telephone system, with intercommunicating trunk lines, from the headquarters of the army of pacification to Camp Columbia and Habana, and the operation of the Cuban Government telephone lines between these points. As the new lines were designed to give reliable service for a considerable period of time, their construction conformed very closely to the standard for this class of work and was substantial in character. In many cases the lines belonging to the Cuban Government were repaired in order to put them in serviceable condition.

The field lines were temporary in character, being constructed by laying field or "buzzer" wire on the ground or by erecting it on lance poles, and were designed to be used for a day or two only.

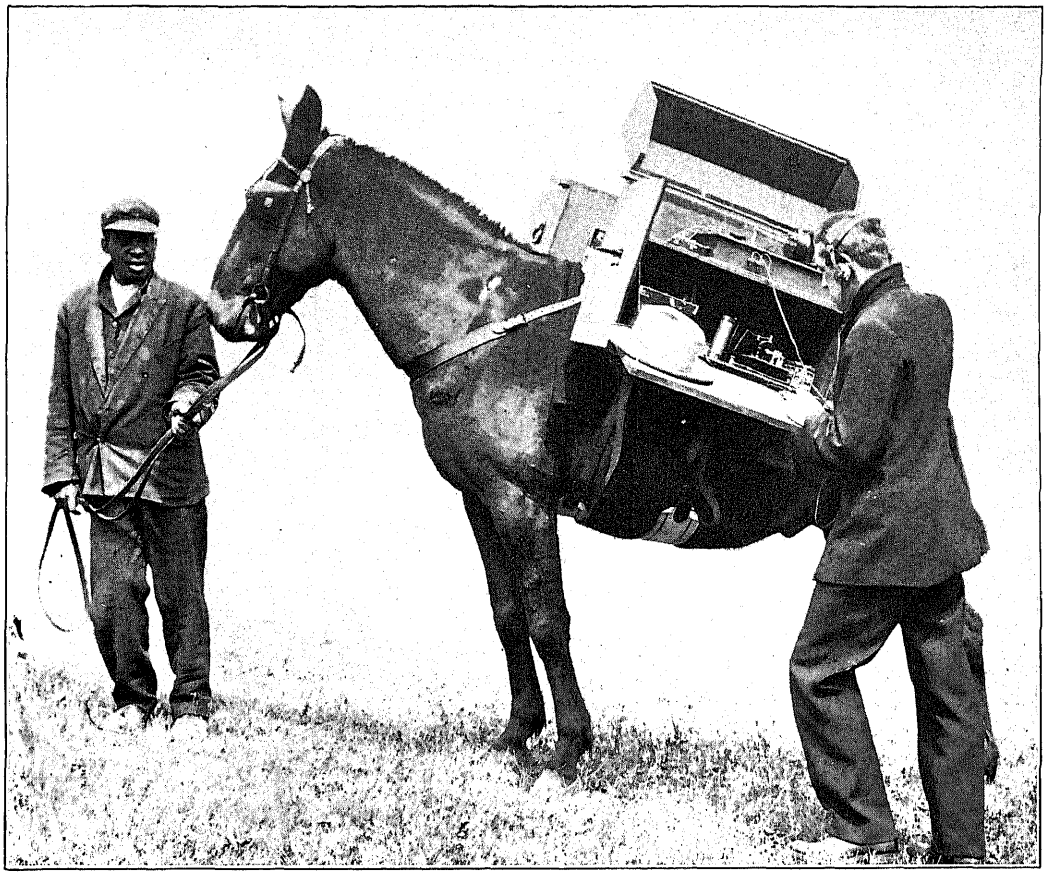
Wireless telegraphy was used successfully to replace the telephone or telegraph in places where lance or field lines would ordinarily be used, and in establishing communication between points which could not be connected by wire or cable lines. The apparatus used consisted of portable sets which could be carried by three mules. The lightness of these sets permitted quick movement and easy and rapid erection by a small force of men. The mast was 60 feet high and covered an ordinary working radius of 20 miles under the most favorable conditions. One set, with a somewhat higher mast, was installed at Camp Columbia, and afforded regular communication with Key West, 90 miles distant, and Isle of Pines, 92 miles distant. This station also served the Navy in the harbor, receiving its messages and transferring them to the land lines, and vice versa.

In addition to the work already described, the Signal Corps, at the request of the provisional government, repaired the Cuban wireless equipment in the stations at Habana and Isle of Pines, which up to that time had not given satisfactory service.

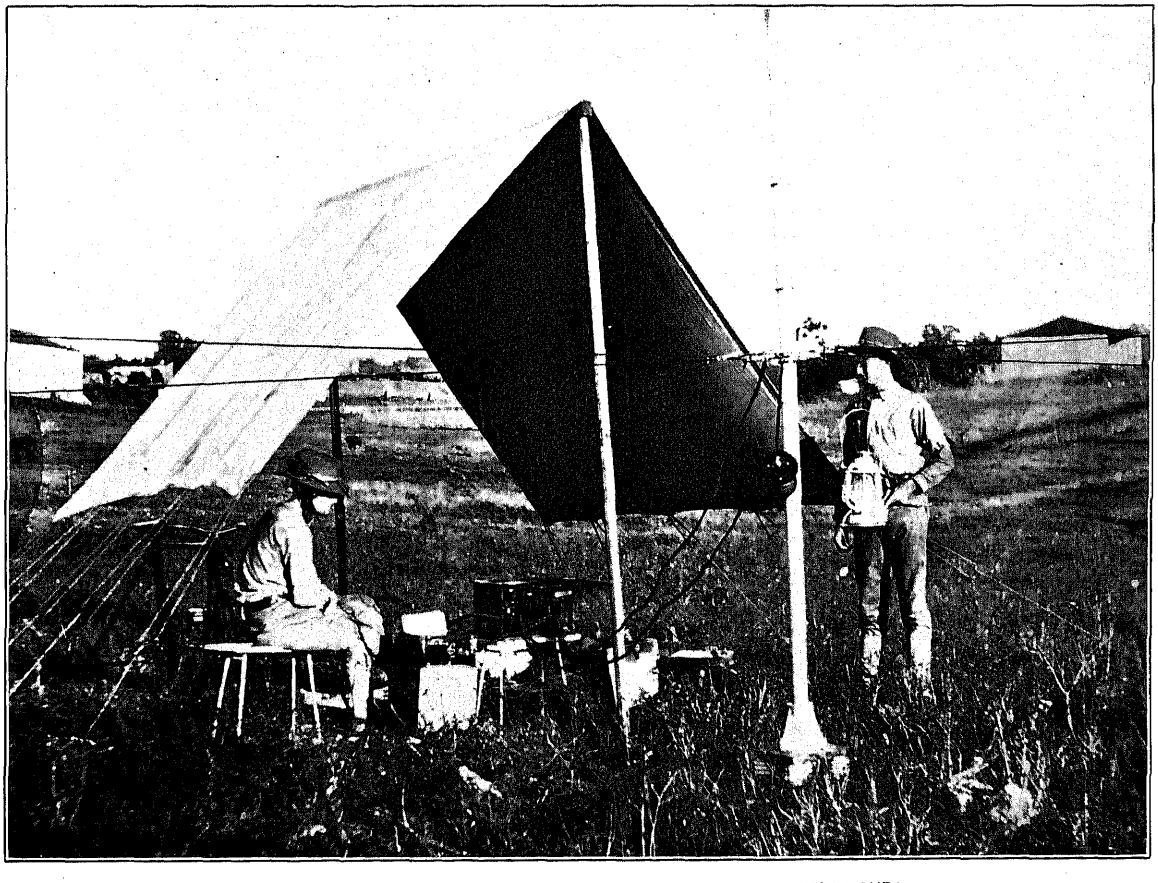
Navy Department, Bureau of Equipment.—The use of wireless telegraphy by the Navy Department was in an experimental stage at the time of the taking of the census of 1902. As the result of investigations made by a board of officers appointed to test the various types of wireless telegraph apparatus, several naval vessels and shore stations on the Atlantic coast were equipped in 1903 with the necessary apparatus of the pattern recommended. In general, the apparatus installed was found to be satisfactory, and it was recommended that all large ships of the Navy, as well as shore stations on the Gulf of Mexico, on the Pacific coast, and in the insular possessions be supplied with wireless telegraph apparatus. Since 1903 the work of installing approved wireless telegraph apparatus on the vessels of the Navy and at new shore stations has proceeded steadily. At the end of the fiscal year 1907 the Bureau of Equipment had furnished the requisite appliances for 73 naval vessels and 44 shore stations.

These shore stations are open to the public for the reception of messages from, and the transmission of messages to, vessels at sea, and such messages are received from or put on the telephone or telegraph land

[1] Annual report of the Chief Signal Officer, U. S. Army, 1907, page 168.



PORTABLE RADIO WIRELESS TELEPHONE SET FOR ARMY USE.



FIELD WIRELESS TELEGRAPH STATION OF UNITED STATES ARMY IN CUBA.

lines with which the stations are connected. These stations also receive and transmit the storm warnings of the Weather Bureau, send out noontime signals for use in comparing chronometers, and receive meteorological data from ships at sea for the use of the Weather Bureau in making forecasts.

TABLE 19.—*Shore stations for wireless telegraphy maintained by United States Navy Department—number of messages and words received and sent: 1907.*[1]

NAME.	MESSAGES.		WORDS.	
	Sent.	Received.	Sent.	Received.
Total	26,933	34,073	541,919	675,607
Cape Elizabeth, Me.	48	166	892	2,935
Portsmouth, N. H.	531	840	8,078	12,922
Boston, Mass.	373	1,183	14,169	17,835
Cape Cod, Mass.	2,673	2,304	56,186	53,903
Newport, R. I.	397	2,701	9,022	35,315
Fire Island, N. Y.[2]	81	159	1,334	872
Navy yard, N. Y.	861	1,121	22,202	31,364
Cape Henlopen, Del.	39	115	594	2,121
Annapolis, Md.	482	573	11,432	13,333
Washington, D. C.	525	786	9,335	14,577
Norfolk, Va.	1,923	2,171	31,403	33,224
Cape Henry, Va.	1,465	1,289	22,149	23,120
Light-ship No. 71	247	114	3,086	1,192
Light-ship No. 72	578	169	6,570	2,813
Beaufort, N. C.	42	537	967	6,720
Charleston, S. C.	111	196	2,466	4,407
Light-ship No. 34	7	35	188	930
St. Augustine, Fla.	122	121	2,602	2,571
Jupiter Inlet, Fla.	53	273	845	2,902
Key West, Fla.	950	1,550	18,920	27,497
Dry Tortugas, Fla.	1,228	2,703	29,278	101,902
Pensacola, Fla.	110	174	2,054	2,677
New Orleans, La.	583	1,255	1,449	1,221
Guantanamo, Cuba.	1,359	706	17,577	14,132
San Juan, P. R.	585	1,343	13,365	18,081
Culebra, P. R.	674	458	11,614	9,893
Colon, Canal Zone.	216	140	2,130	3,551
Puget Sound, Wash.	230	237	5,735	5,073
Tatoosh Island, Wash.[2]	17	61	902	1,176
North Head, Wash.[2]	100	101	2,215	2,362
Cape Blanco, Oreg.[2]	22	15	421	250
Table Bluff, Cal.[2]	42	19	1,060	373
Mare Island, Cal.	1,898	2,334	47,735	75,687
Farallon Islands, Cal.	1,889	1,221	45,338	28,768
Yerba Buena Island.	1,265	1,836	30,094	42,190
Point Arguello, Cal.	1,040	978	27,533	19,962
Point Loma, Cal.	1,672	1,532	26,528	24,384
Honolulu, Hawaii.	16	27	351	600
Cavite, P. I.	2,025	2,013	47,081	24,247
Guam.	454	517	6,959	8,525

[1] Compiled from Annual Reports of the Navy Department for the fiscal year 1907, page 348.
[2] In commission for only a few months during the year.

Weather Bureau.[1]—The importance and extent of the use of the telegraph and the telephone in the work of the Weather Bureau in 1903 were fully described in the report of the last census. Since that time the use of telegraph and telephone lines and of wireless telegraphy in distributing the forecasts and warnings of the bureau has been greatly extended. At the end of the fiscal year 1907 the telegraph was being used to supply 2,280 places with daily forecasts, 734 places with special warnings, and 5,998 places with emergency warnings, all at the expense of the Government. Through the service of governmental telegraphs, railroad telegraphs, telephones, railroad trains, and mails, daily forecasts were being sent to 2,141,151 addresses in 1907, and through the cooperation of other telephone companies the dissemination of this information was materially increased. The great increase in 1907 as compared with 1903 in the number of places receiving the forecasts is due to the number of telephone companies cooperating with the Weather Bureau in the later year, at which time 1,633 companies participated in the distribution of the forecasts, and thus made it possible for about two million subscribers to obtain daily forecasts of the weather.

The number of miles of telegraph and telephone lines operated by the Weather Bureau at the end of the fiscal year 1907 was 537, including about ninety-six miles of submarine cable. The receipts from these lines for commercial messages handled during the year were $3,393.

These lines rendered valuable service in obtaining aid for shipping in distress; in reporting inbound and outbound vessels to owners, maritime associations, and others; and in affording to residents in isolated places and others probably the only means of telegraphic communication. When the steamer *Larchmont* was lost near Block Island in February, 1907, the Weather Bureau cable from the island to the mainland furnished the only available telegraph facilities. Nearly thirty-four thousand words of press matter alone were sent over this cable in connection with this disaster.

By the use of wireless telegraphy meteorological observations are collected from vessels at sea, and weather forecasts and storm warnings based upon these observations are transmitted to vessels at sea.

A large number of vessels equipped with wireless apparatus have been authorized to transmit to the bureau the record of the daily Greenwich mean noon meteorological observations, and have been supplied with telegraphic code, instructions, and forms necessary for such reports. All vessels of the United States Navy have been instructed to transmit the daily weather dispatch while at sea, and the wireless shore stations controlled by the Navy Department are required to receive weather messages from merchant vessels for transmission to the bureau and to dispatch weather forecasts and storm warnings free of cost to such vessels at sea as request them.

Of the 738 weather reports received by wireless telegraphy during the year from vessels at sea, 679 were from transatlantic liners.

Life-Saving Service.—At the census of 1902 a detailed description of the work of this branch of the Federal Government was published. This service uses the telephone exclusively between life-saving stations. No data are available as to physical equipment of these telephone systems.

Porto Rico.—When the insular government took charge of affairs in Porto Rico the existing telegraph system was not in a high state of efficiency, but to-day it more than pays the cost of maintenance.

Table 20 presents the data reported concerning the Porto Rican telegraph system for the fiscal year 1907.

The Porto Rican legislature authorized the expenditure of $15,000 during the fiscal year ending June 30, 1907, and by an act approved March 14, 1907, appro-

[1] From the Annual Report of the Chief of the Weather Bureau, for the fiscal year ending June 30, 1907.

priated an additional sum of $25,000 for the development of the insular telegraph system by the construction of auxiliary telephone lines.

A telegraph school is maintained at San Juan for the purpose of teaching telegraphy, accounting, and office management. Before a pupil is given employment he or she must be proficient in keeping office accounts and reports, have a thorough knowledge of the topographic circuits of the entire island, and show ability in the technical management of an office. Business is transacted in both English and Spanish, and it is necessary that every operator be able to speak, read, write, and receive from the wire in both languages. The operators have a knowledge of space-telegraphy gained through the intercommunication of the insular system with the wireless system in San Juan, and many of them are also proficient in heliograph work. The wages vary from $40 to $100 per month; the women operators are required to do the same work as the men and are paid the same wages.

TABLE 20.—*Porto Rico telegraph system—summary: 1907.*[1]

Number of telegraph offices	128
Length of pole line, miles	484
On railroad right of way	117
Length of wire, miles	774
Number of employees	132
Salaried officials, clerks, etc	4
Wage-earners	128
Operators	70
Male	51
Female	19
All other employees	58
Salaries and wages	$41,101
Income	$59,226
Expenses	$51,945
Number of messages	216,489

[1] Includes statistics for telephone system.

Panama Canal Commission.—The following statement relative to the telegraph and telephone system in the Canal Zone was made by W. J. Rodman, superintendent of telegraphs and telephones of the Panama Canal:[1]

Beginning with practically nothing, the telegraph and telephone department has to-day a line of 18 wires from Colon to Culebra; 24 wires from Culebra to Panama, on iron rail poles along the railroad; and a line of 8 to 24 wires from Bas Obispo to Pedro Miguel on creosoted wooden poles along the canal prism. These wires are for the use of the excavation force in the Culebra cut, practically every steam shovel or other important unit in the cut being connected by telephone with engineering headquarters. It has established 11 telephone exchanges; installed 800 telephones, opened 24 new telegraph offices, making a total in all of 32; erected 20 four-arm, iron mast, semaphore signals, with which has been established a manual block system with stations about two miles apart, with telegraphic communication from block to block.

The wires are divided into uses as follows: 8 for telegraph, 3 of which are used by the Central and South American Telegraph Company, 1 being in through circuit from New York to Buenos Ayres, leaving 5 wires for Zone use as follows: One train wire, 1 block wire, 1 through wire, and 2 locals. There are also 5 pairs of telephone wires between Colon and Panama, with 3 additional pairs between Culebra and Panama.

* * * * * * *

Three trunk lines, 6 wires, are of No. 9 copper wire; one trunk line, 2 wires, is of No. 12 copper wire; the telegraph and local telephone lines are of Nos. 9 and 10 double galvanized iron wire.

* * * * * * *

[1] Telegraph Age, February 1, 1908, page 159.

The department has been called upon a great many times to make quick moves and changes in the lines. It has moved 35 per cent of the lines at different times and places, practically without interruption to communication. It has been called upon a great many times to have communication established quickly at different points without waiting for permanent work and material. This necessitated temporary work, to be later converted into permanent work without interrupting communication.

The equipment installed is of the best quality. The instruments in use are the best made, and the work done is better than is required in the United States. The weather and atmospheric conditions here are so unfavorable that it is essential to take precautions here that are altogether unnecessary in the states. Hard rubber for terminal strips must be used, because wood exposed to atmosphere gathers moisture enough to cause current leakage and crossings.

The extremely bad conditions here which would naturally cause undue cross talk from induction have practically been eliminated. Wherever possible, electric light wires have been run into the switchboards, placing 4 wires to 6 lights inside which are kept burning all night. The heat from the lamps keeps out moisture.

Through the chairman and chief engineer of the Isthmian Canal Commission, the Bureau of the Census obtained the following data relative to the telegraph and telephone system in the Canal Zone on June 30, 1908:

TABLE 21.—*Panama Canal Zone telegraph and telephone systems—summary: 1907.*

Line construction, miles:	
Pole line	65
Overhead cable	7
Single wire, miles	2,204
On pole line	1,761
Copper wire	604
Iron wire	1,157
In overhead cable	443
Number of telegraph offices	42
In railway stations	18
Number of telephone exchanges	14
Number of drops on telephone switchboards	1,292
Number of telephones	792
Salaried employees:	
Number	2
Salaries	$6,300
Wage-earners:	
Number	58
Wages	$37,500
Power plant:	
For telegraph service—	
Motor generators and dynamotors—	
Number	2
Horsepower	10
Batteries—	
Primary, number of cells	250
Storage, number of cells	84
For telephone service—	
Dynamos—	
Number	4
Horsepower	12
Electric motors—	
Number	2
Horsepower	5
Storage batteries, number of cells	81
Income	$7,818
Expenses	$50,988
Number of telegraph messages	91,401

The system was owned jointly by the Isthmian Canal Commission and the Panama Railroad Company. Fifty miles of the pole line, on which were strung 1,442 miles of wire, were along the right of way of the Panama Railroad Company. Four hundred miles of wire were operated singly, while 1,804.5 miles were worked duplex. The Central and South American Cable Company leased 150 miles of single wire, for which it paid $3,000, during the year covered by the report. An expenditure of $52,319 was made for additions to the system during the year.

No figures as to the number of telephone messages were obtained.

Bureau of Forestry.—Governmental telephone lines aggregating 548 miles had been constructed in the National Forests by the end of the fiscal year 1907. At the end of the fiscal year 1908 this mileage had increased to 2,524 miles. These lines are primarily for use in policing and protecting the forest reservations.

MUNICIPAL ELECTRIC FIRE ALARM AND POLICE PATROL SIGNALING SYSTEMS.

The present census, covering the field of the industrial application of electrical current, includes municipal electric fire alarm and police patrol signaling systems as well as the more important branches of the science—electric street railways, light and power companies, and telephone and telegraph companies—and this report deals with the operations of such systems during the calendar year 1907 or the "fiscal year of the municipality most nearly conforming" to that period.

A census of municipal electrical systems was taken covering the year 1902. Since this earlier Census report dealt quite fully with the development of these systems from the historical and descriptive standpoints, this report is devoted principally to a discussion of the statistics. The present inquiry has been conducted along the lines followed for the earlier census, with a few unimportant differences in details.

In the Census report for 1902 the statistics for fire alarm and police patrol systems were presented separately, and this method of treatment has been followed in the present report where the manner of operating the systems has permitted. In 1907 as well as in 1902, in a number of instances, however, fire alarm and police patrol systems were operated as combined systems, and it has been impossible to segregate the statistics in such cases. On account of this difficulty and of the common use of pole construction and underground conduits by fire alarm and police patrol systems, statistics for the two classes are sometimes combined in the report.

This report does not include electric fire alarm systems operated under private or corporate ownership, of which there are many, very elaborately equipped, installed in large industrial establishments.

Several schedules were received for systems which were considered as not coming within the scope of the census. The reports which were excluded represent in the main an adaptation of the local telephone service for fire alarm or police patrol uses. A fair example is that at Mt. Vernon, Ohio, where the local telephone company operates, through the regular switchboard at the telephone exchange, 18 telephone boxes which it has placed on the sides of houses for fire alarm purposes.

The rule that was adopted for the census of 1907 for deciding whether or not a system was covered by the census was to include only systems in which the boxes and wire mileage were used exclusively for the sending of signals or messages to a central office of the fire alarm or police patrol department. The fact that a system of this character might be wholly or partly leased from a telephone or telegraph company by the municipality would not exclude it from the census. All variations or adaptations of the local telephone system would be excluded, however, as well as all mechanical devices used for giving a general alarm without being received or registered at a central office.

Boards or departments of administration.—At the census of electrical industries of 1902 statistics showing the officials or boards which exercised authority over electric fire alarm and police patrol systems were published, and similar information for 1902 and 1907 is given in Table 22.

TABLE 22.—*Electric fire alarm and police patrol systems—number, grouped according to boards or departments of administration: 1907 and 1902.*

BOARDS OR DEPARTMENTS OF ADMINISTRATION.	FIRE ALARM SYSTEMS.		POLICE PATROL SYSTEMS.	
	1907	1902	1907	1902
Total	979	764	226	148
Administrative bodies	215	341	31	50
Board of aldermen and police and fire commissioners	14	1	.....	.....
Board of assessors	1	2	.....	.....
Board of commissioners for public utilities	12	10	2	.....
Board of fire commissioners (or commissioner)	65	62	.....	.....
Board of fire engineers	62	67	.....	.....
Board of police commissioners (or commissioner)	2	.....	27	27
Board of police and fire commissioners	10	.....	11	6
Board of public safety (or director or commissioner of)	65	36	24	14
Board of public works (or commissioner of)	23	6	5	4
Board of selectmen and board of engineers	12	1	.....	.....
Board of trustees elected by voluntary firemen	3	2	.....	.....
Chief of fire department and city electrician	16	2	.....	.....
City council and chief of fire department	11	4	.....	.....
City council and fire marshal	3	5	.....	.....
City council and superintendent of fire and police departments	5	1	.....	.....
Committee appointed by citizens at town meetings	5	2	.....	.....
Department of electricity (or city electrician)	44	21	26	7
Department of fire and police patrol telegraphs	4	1	11	2
Department of police and public (or city) property	3	1	1	1
Department of wire inspection	7	2	6	1
Fire and police board	8	1	2	.....
Fire and water committee of the sanitary improvement commission	15	1	.....	.....
Fire commissioner and city council	17	.....	3	1
Fire department (chief, committee, or director of)	251	141	4	.....
Fire marshal	2	2	.....	.....
Joint board of fire wardens and selectmen	5	1	.....	.....
Mayor	2	.....	1	1
Mayor and board of police commissioners	3	.....	6	1
Mayor and chief of police	1	.....	1	1
Mayor and city council	9	20	4	3
Mayor and city marshal	1	.....	1	1
Mayor, city council, and fire department	8	1	.....	.....
Ordnance Department of United States Army	.....	1	.....	.....
Park commission	.....	.....	2	.....
Police and fire commission	12	12	.....	.....
Police and fire department	8	1	5	.....
Police department (or police)	2	.....	40	24
Special committee by vote of town	2	.....	1	1
Superintendent of fire alarm and police patrol telegraph	12	4	3	.....
Superintendent of police and board of public safety	6	.....	3	1
Water department	3	1	.....	.....
Water and light department	8	1	2	.....
Not specified	22	10	4	2

The figures in Table 22 possess little significance on account of the difference in the titles applied in different localities and states to officials or boards exercising similar functions. As was explained in the last Census report on this subject, the term "administrative bodies," under which a large number of these systems are conducted, includes boards of aldermen, boards of selectmen, city councils, etc., and there was apparently a large decrease from 1902 to 1907 in the sys-

tems governed by such bodies. Systems administered under exactly similar conditions have been reported as directed by officials bearing dissimilar titles, but whose duties were alike. Among the municipal officials themselves considerable doubt and confusion exist as to the real authority. While in many cases the direct control of the fire alarm may have been a part of the duties of the chief of the fire department, that official, regarding himself in a sense as a subordinate of the mayor, may have reported the administration of the system as vested in the mayor, or in himself, or jointly in both. Ordinances which clearly define the duties of the various municipal officials are not always accessible and, frequently, positive information could not be obtained. The statistics seem to indicate a general tendency toward placing the control and management of these systems under the heads of the fire or police departments or under departments of electricity.

Combined electric fire alarm and police patrol signaling systems.—Table 23 is presented for the purpose of giving the statistics of electric fire alarm and police patrol signaling systems as a whole, and to make a comparative showing of the statistics reported for these systems at the two censuses.

The figures of line construction are omitted from the table, for the reason that it is impossible to eliminate the duplications, the overhead and underground construction, poles, and conduits being used in common by the two classes of systems. Subject to the limitations described in the discussion of the tables presenting the statistics for each class of systems, Table 23 affords an accurate indication of the growth and development of electric fire alarm and police patrol signaling systems from 1902 to 1907

TABLE 23.—*Electric fire alarm and police patrol signaling systems, with per cent of increase: 1907 and 1902.*

	1907	1902	Per cent of increase.
Number of systems	1,157	889	30.1
Single wire, miles	70,812	54,710	29.4
Overhead	42,796	40,008	7.0
Open wire on pole or roof line	40,976	36,529	12.2
In cables	1,820	3,479	[1]47.7
In underground subways or conduits	28,016	14,702	90.6
Open wire	1,328	720	84.4
In cables	26,688	13,982	90.9
Boxes or signaling stations, number	62,504	46,767	33.6
Signaling	58,121	45,597	27.5
On poles or posts	51,393	40,135	28.1
All other	6,728	5,462	23.2
Telephoning	4,383	1,170	274.6
On poles or posts	3,079	1,060	190.5
All other	1,304	110	1,085.5
Special telephones, number	3,837	3,529	8.7
Fire alarms received, number	120,719	85,070	41.9
Central office equipment:			
Transmitters, number	679	539	26.0
Manual	287	226	27.0
Automatic	392	313	25.2
Receiving registers of all kinds, number	2,427	834	191.0
Circuits, number—			
Receiving	4,269	3,048	40.1
Transmitting	2,189	2,223	[1]1.5
Single	258	464	[1]44.4
Telegraph switchboards—			
Number	583	250	133.2
Total capacity, number of circuits	4,917	2,631	86.9
Telephone switchboards—			
Number	313	238	31.5
Total capacity, number of drops or jacks	7,575	8,774	[1]13.7
Battery cells, number—			
Primary	56,504	73,739	[1]23.3
Storage	99,838	56,417	77.0
Steam engines—			
Number	6	7	[1]14.3
Horsepower	54	58	[1]6.9
Gas engines—			
Number	3	[2]	.....
Horsepower	9	[2]	.....
Dynamos—			
Number	30	19	57.9
Horsepower	75	51	47.1
Electric motors—			
Number	38	[2]	.....
Horsepower	114	[2]	.....
Motor generators and dynamotors—			
Number	118	89	32.6
Horsepower	116	60	93.3

[1] Decrease. [2] Not reported.

FIRE ALARM SYSTEMS.

Possibly as succinct and graphic a statement of the development of fire alarm systems as can be made is afforded by presenting a contrast of the equipment of the first working system in the United States—that in Boston—at the time of its establishment and at the present time. The present system is an evolution from the first electric fire alarm, which was installed on the 28th day of April, 1852, through the united efforts of Dr. Willing F. Channing and Moses G. Farmer, the inventors.

The first alarm for fire was struck on April 29, 1852. The original plant comprised 40 miles of wire, 45 signal boxes, and 16 public bells, with a central station equipped with the necessary apparatus. The corresponding equipment in use in 1907 consisted of 1,762 miles of single wire, 706 signaling boxes, and very elaborate and complete central office apparatus. The number of bell alarms for the first year was 156, or an average of 13 per month. The number of bell alarms, not including still alarms, reported for 1907 was 2,441, an average of 203 per month.

The manual transmitter used in the central station for striking the first alarm and a signal box of the type used for sending the alarm in are now in the custody of the Smithsonian Institution.

Table 24 indicates that there was a considerable extension and enlargement of electric fire alarm systems between 1902 and 1907. In this table combined or interchangeable systems, which are used for both fire alarm and police patrol purposes, are included at both censuses. The statistics for these systems are shown separately in Table 26. As the same figures are also included in Table 32, which is a comparative summary of police patrol systems, an element of duplication is introduced, the extent of which is measured by the figures in Table 26. The only justification for including these statistics in Tables 24 and 32 lies in the fact that without them the presentation of both fire alarm and police patrol data would be very incomplete. It should be borne in mind that certain items in both tables are unduly increased by the inclusion of the figures in question, and to that

extent may be misleading. The fact should not escape attention, moreover, that 13 principal cities reporting single systems in 1902 reported combined and interchangeable systems for 1907.

TABLE 24.—*Electric systems used exclusively for fire alarm signaling, and systems used interchangeably for fire alarm and police patrol purposes: 1907 and 1902.*

	1907	1902
Number of systems	979	764
Line construction, miles:		
Pole line for wires or cables	15,384	13,750
Owned	2,385	2,798
Leased	12,999	10,952
Overhead cables	132	(1)
Subways or conduits (street miles)	1,164	859
Owned	427	414
Leased	737	445
Duct	1,999	(1)
Owned	1,240	(1)
Leased	759	(1)
Cables in underground subways or conduits	1,239	(1)
Single wire, miles	57,234	39,635
Overhead	34,577	28,202
Open wire on pole or roof line	33,556	27,721
In cables	1,021	481
In underground subways or conduits	22,657	11,433
Open wire	1,079	526
In cables	21,578	10,907
Boxes or signaling stations, number	53,810	37,832
Signaling	51,122	37,832
On poles or posts	45,694	34,860
All other	5,428	2,972
Telephoning	2,688	(1)
On poles or posts	2,358	(1)
All other	330	(1)
Special telephones, number	2,994	1,900
Fire alarms received, number	120,719	85,070
Central office equipment:		
Transmitters, number	505	450
Manual	195	155
Automatic	310	295
Receiving registers of all kinds, number	2,046	452
Circuits, number—		
Receiving	3,381	1,973
Transmitting	1,698	1,361
Single	243	442
Telegraph switchboards—		
Number	493	214
Total capacity, number of circuits	4,390	2,407
Telephone switchboards—		
Number	152	62
Total capacity, number of drops or jacks	5,019	6,480
Battery cells, number—		
Primary	43,703	57,010
Storage	91,675	49,327
Steam engines—		
Number	6	7
Horsepower	54	58
Gas engines—		
Number	2	(1)
Horsepower	8	(1)
Dynamos—		
Number	28	19
Horsepower	73	51
Electric motors—		
Number	35	(1)
Horsepower	107	(1)
Motor generators and dynamotors—		
Number	107	81
Horsepower	106	47

[1] Not reported.

The increases shown from 1902 to 1907 in line construction, wire mileage, signaling stations, and central office equipment seem entirely consistent with the increase in the number of systems. The data with regard to the source of energy for these systems are especially noteworthy, the number of storage battery cells having almost doubled, while there was a large decrease in the number of primary battery cells, indicating apparently that storage batteries are displacing primary battery cells to a considerable extent.

In the report for 1902 statistics were presented which purported to show the number of electric fire alarm and police patrol systems installed each year from the date of the earliest reported installation to the period covered by the report, and an inquiry designed to elicit similar data was made a part of the schedules for 1907. Comparing the figures for the two censuses, there appeared so much contradictory information that the statistics are omitted from the present report. The number of fire alarm systems established each year since 1902, according to the information received, was as follows: 1903, 32; 1904, 46; 1905, 43; 1906, 38; 1907, 32. The combined systems are included in the foregoing. These figures show that 191 new systems were installed during those years, while Table 24 shows a gain of 215 fire alarm systems, which indicates the inaccurate character of the information.

Table 25 shows statistics for the systems used exclusively for fire alarm signaling, while Table 26 shows similar statistics for the systems used for both fire alarm and police patrol signaling.

The fact that Table 25 does not contain the statistics for interchangeable systems necessarily affects the showing made, especially for the largest cities, those in the group of 100,000 and over, as much the larger proportion of the equipment of such interchangeable systems is in cities of that class. A correct statistical presentation of all fire alarm systems for the several groups of cities can only be made by a combination of Tables 25 and 26. As would be expected in the case of the cities of large population, 100,000 and over, while the number of systems is comparatively small, the statistics reported for most of the items of equipment form much the largest proportion of the totals for the United States.

Most cities, whether large or small, realize the importance of installing some means of promptly alarming the fire department in case of fire. These systems, with respect to their equipment, range from the most elaborate ones in the larger cities to the simple bell striker of the small village.

At the census of 1900 there were in the United States 38 cities with a population in excess of 100,000. At the present census 36 of these cities were reported as having electric fire alarm systems, while the remaining 2 cities, Kansas City and St. Joseph, Mo., depended entirely upon the telephone as a means of fire alarm.

Of the 40 cities having from 50,000 to 100,000 inhabitants, 39 reported fire alarm systems, and Kansas City, Kans., depended entirely upon the local telephone service as a means of reporting fire alarms.

Of the 82 cities having a population of 25,000 but under 50,000, 79 reported electric fire alarm systems. The cities of Quincy, Ill., and Chester and Williams-

port, Pa., were reported as having no fire alarm systems.

Of the 281 cities with from 10,000 to 25,000 inhabitants, 245 reported having electric fire alarm systems, and 36 reported that they had no such systems. Five cities in the latter group—Belleville and Galesburg, Ill.; Ashtabula, Ohio; Guthrie, Okla.; and Austin, Tex.—depended upon the telephone as a means of reporting fires. Kokomo, Ind., was reported as installing an up-to-date fire alarm system. One system covers both Bay City and West Bay City, Michigan.

Information was received from the mayors of the following cities to the effect that no fire alarm systems were in use:

Fort Smith, Ark.
Pine Bluff, Ark.
Manchester, Conn.
Cairo, Ill.
Jeffersonville, Ind.
Muscatine, Iowa.
Atchison, Kans.
Galena, Kans.
Lawrence, Kans.
Leavenworth, Kans.
Alpena, Mich.
Ann Arbor, Mich.
Natchez, Miss.
Hannibal, Mo.
Sedalia, Mo.
Millville, N. J.
Dunkirk, N. Y.
Lorain, Ohio.
Beaver Falls, Pa.
Butler, Pa.
Columbia, Pa.
Mt. Carmel, Pa.
Cranston, R. I.
Warwick, R. I.
Greenville, S. C.
Spartanburg, S. C.
Denison, Tex.
Laredo, Tex.
Sherman, Tex.
Alexandria, Va.

TABLE 25.—ELECTRIC FIRE ALARM SYSTEMS, GROUPED ACCORDING TO POPULATION OF CITIES, AND THE PER CENT EACH GROUP IS OF TOTAL: 1907.

	Total.	POPULATION GROUPS.					PER CENT OF TOTAL.				
		100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.	100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.
Number of systems	931	28	35	69	231	568	3.0	3.8	7.4	24.8	61.0
Line construction, miles:											
Pole line for wires or cables	13,502	2,429	1,363	1,954	3,537	4,219	18.0	10.1	14.5	26.2	31.2
Owned	1,915	372	85	215	440	803	19.4	4.5	11.2	23.0	41.9
Leased	11,587	2,057	1,278	1,739	3,097	3,416	17.8	11.0	15.0	26.7	29.5
Overhead cables	93	56	4	8	20	5	60.2	4.3	8.6	21.5	5.4
Subways or conduits (street miles)	[1] 764	461	125	51	80	41	60.3	16.4	6.7	10.5	5.4
Owned	233	180	30	6	15	2	77.2	12.9	2.6	6.4	0.9
Leased	[1] 531	281	95	45	65	39	52.9	17.9	8.5	12.2	7.3
Duct	[1] 836	493	130	99	75	34	59.0	15.6	11.8	9.0	4.1
Owned	302	191	34	59	16	2	63.2	11.3	19.5	5.3	0.7
Leased	[1] 534	302	96	40	59	32	56.6	18.0	7.5	11.0	6.0
Cables in underground subways or conduits	[1] 739	513	99	49	48	24	69.4	13.4	6.6	6.5	3.2
Single wire, miles	35,337	17,218	3,377	3,447	5,322	5,973	48.7	9.6	9.7	15.1	16.9
Overhead	24,687	8,368	2,386	3,093	4,966	5,874	33.9	9.7	12.5	20.1	23.8
Open wire on pole or roof line	23,794	7,597	2,355	3,072	4,907	5,863	31.9	9.9	12.9	20.6	24.7
In cables	893	771	31	21	59	11	86.3	3.5	2.4	6.6	1.2
In underground subways or conduits	10,650	8,850	991	354	356	99	83.1	9.3	3.3	3.4	0.9
Open wire	1,003	536	327	28	75	37	53.4	32.6	2.8	7.5	3.7
In cables	9,647	8,314	664	326	281	62	86.2	6.9	3.4	2.9	0.6
Boxes or signaling stations, number	40,897	12,367	4,268	5,424	8,812	10,026	30.3	10.4	13.2	21.6	24.5
Signaling	40,401	12,151	4,268	5,387	8,700	9,895	30.1	10.6	13.3	21.5	24.5
On poles or posts	36,529	10,281	3,874	4,888	8,125	9,361	28.2	10.6	13.4	22.2	25.6
All other	3,872	1,870	394	499	575	534	48.3	10.2	12.9	14.8	13.8
Telephoning	496	216	.....	37	112	131	43.5	.....	7.5	22.6	26.4
On poles or posts	288	72	.....	21	97	98	25.0	.....	7.3	33.7	34.0
All other	208	144	.....	16	15	33	69.2	.....	7.7	7.2	15.9
Special telephones, number	2,143	899	224	271	353	396	41.9	10.5	12.6	16.5	18.5
Fire alarms received, number	96,516	39,581	10,700	14,372	17,688	14,175	41.0	11.1	14.9	18.3	14.7
Central office equipment:											
Transmitters, number	450	54	50	66	149	131	12.0	11.1	14.7	33.1	29.1
Manual	164	30	16	14	46	58	18.3	9.8	8.5	28.0	35.4
Automatic	286	24	34	52	103	73	8.4	11.9	18.2	36.0	25.5
Receiving registers of all kinds, number	1,719	166	122	176	464	791	9.7	7.1	10.2	27.0	46.0
Circuits, number—											
Receiving	2,809	584	265	368	712	880	20.8	9.4	13.1	25.4	31.3
Transmitting	1,470	332	182	196	366	394	22.6	12.4	13.3	24.9	26.8
Single	241	.....	.....	.....	28	213	.....	.....	.....	11.6	88.4
Telegraph switchboards—											
Number	439	56	32	52	140	159	12.8	7.3	11.8	31.9	36.2
Total capacity, number of circuits	3,603	1,076	269	423	653	1,182	29.9	7.5	11.7	18.1	32.8
Telephone switchboards—											
Number	76	29	13	16	8	10	38.2	17.1	21.0	10.5	13.2
Total capacity, number of drops or jacks	2,706	1,992	238	218	110	148	73.6	8.8	8.0	4.1	5.5
Battery cells, number—											
Primary	36,179	8,812	3,839	1,716	6,490	15,322	24.4	10.6	4.7	17.9	42.4
Storage	74,640	20,888	11,594	12,951	16,429	12,778	28.0	15.5	17.4	22.0	17.1
Steam engines—											
Number	6	2	.....	.....	1	3	33.3	.....	.....	16.7	50.0
Horsepower	54	45	.....	.....	5	4	83.3	.....	.....	9.3	7.4
Gas engines—											
Number	1	.....	.....	.....	.....	1	.....	.....	.....	.....	100.0
Horsepower	3	.....	.....	.....	.....	3	.....	.....	.....	.....	100.0
Dynamos—											
Number	23	3	.....	2	6	12	13.0	.....	8.7	26.1	52.2
Horsepower	63	35	.....	5	8	15	55.6	.....	7.9	12.7	23.8
Electric motors—											
Number	26	4	.....	4	7	11	15.4	.....	15.4	26.9	42.3
Horsepower	80	10	.....	12	20	38	12.5	.....	15.0	25.0	47.5
Motor generators and dynamotors—											
Number	86	47	.....	9	10	20	54.6	.....	10.5	11.6	23.3
Horsepower	91	34	.....	20	9	28	37.3	.....	22.0	9.9	30.8

[1] The total exceeds the sum of the items for the reason that the underground construction in cities reporting less than 1 mile (shown in Table 29) is included in the total for the United States but not in the groups.

TABLE 26.—COMBINED AND INTERCHANGEABLE ELECTRIC FIRE ALARM AND POLICE PATROL SIGNALING SYSTEMS, GROUPED ACCORDING TO POPULATION OF CITIES, AND THE PER CENT EACH GROUP IS OF TOTAL: 1907.

	Total.	POPULATION GROUPS.					PER CENT OF TOTAL.				
		100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.	100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.
Number of systems	48	8	4	10	14	12	16.7	8.3	20.8	29.2	25.0
Line construction, miles:											
Pole line for wires or cables	1,882	1,172	162	210	231	107	62.3	8.6	11.1	12.3	5.7
Owned	470	321	18	40	69	22	68.3	3.8	8.5	14.7	4.7
Leased	1,412	851	144	170	162	85	60.3	10.2	12.0	11.5	6.0
Overhead cables	39	20	2	4	12	1	51.3	5.1	10.2	30.8	2.6
Subways or conduits (street miles)	400	335	13	29	21	2	83.8	3.2	7.3	5.2	0.5
Owned	194	194					100.0				
Leased	206	141	13	29	21	2	68.4	6.3	14.1	10.2	1.0
Duct	1,163	1,090	15	31	25	2	93.7	1.3	2.7	2.1	0.2
Owned	938	938					100.0				
Leased	225	152	15	31	25	2	67.5	6.7	13.8	11.1	0.9
Cable in underground subways or conduits	500	423	29	29	18	1	84.6	5.8	5.8	3.6	0.2
Single wire, miles	21,897	19,223	1,154	763	601	156	87.8	5.3	3.5	2.7	0.7
Overhead	9,890	8,208	490	526	518	148	83.0	5.0	5.3	5.2	1.5
Open wire on pole or roof line	9,762	8,154	475	501	486	146	83.5	4.9	5.1	5.0	1.5
In cables	128	54	15	25	32	2	42.2	11.7	19.5	25.0	1.6
In underground subways or conduits	12,007	11,015	664	237	83	8	91.7	5.5	2.0	0.7	0.1
Open wire	76	25		20	25	6	32.9		26.3	32.9	7.9
In cables	11,931	10,990	664	217	58	2	92.1	5.6	1.8	0.5	(1)
Boxes or signaling stations, number	12,913	10,033	796	962	774	348	77.7	6.2	7.4	6.0	2.7
Signaling	10,721	8,118	669	931	665	338	75.7	6.2	8.7	6.2	3.2
On poles or posts	9,165	6,906	492	872	565	330	75.3	5.4	9.5	6.2	3.6
All other	1,556	1,212	177	59	100	8	77.9	11.4	3.8	6.4	0.5
Telephoning	2,192	1,915	127	31	109	10	87.4	5.8	1.4	5.0	0.4
On poles or posts	2,070	1,836	99	17	108	10	88.7	4.8	0.8	5.2	0.5
All other	122	79	28	14	1		64.8	22.9	11.5	0.8	
Special telephones, number	851	759		41	39	12	89.2		4.8	4.6	1.4
Fire alarms received, number	24,203	19,832	959	1,848	945	619	81.9	4.0	7.6	3.9	2.6
Central office equipment:											
Transmitters, number	55	25	6	12	9	3	45.5	10.9	21.8	16.4	5.4
Manual	31	17	2	4	6	2	54.8	6.5	12.9	19.3	6.5
Automatic	24	8	4	8	3	1	33.3	16.7	33.3	12.5	4.2
Receiving registers of all kinds, number	327	203	33	40	34	17	62.1	10.1	12.2	10.4	5.2
Circuits, number—											
Receiving	572	356	34	74	81	27	62.2	6.0	12.9	14.2	4.7
Transmitting	228	108	20	52	35	13	47.4	8.8	22.8	15.3	5.7
Single	2					2					100.0
Telegraph switchboards—											
Number	54	26	4	10	9	5	48.1	7.4	18.5	16.7	9.3
Total capacity, number of circuits	787	586	54	78	54	15	74.4	6.9	9.9	6.9	1.9
Telephone switchboards—											
Number	76	62	4	4	5	1	81.5	5.3	5.3	6.6	1.3
Total capacity, number of drops or jacks	2,313	2,080	110	24	94	5	89.9	4.8	1.0	4.1	0.2
Battery cells, number—											
Primary	7,524	6,178	370	207	444	325	82.1	4.9	2.8	5.9	4.3
Storage	17,035	9,790	2,595	2,521	1,765	364	57.5	15.2	14.8	10.4	2.1
Gas engines—											
Number	1		1					100.0			
Horsepower	5		5					100.0			
Dynamos—											
Number	5	3	2				60.0	40.0			
Horsepower	10	5	5				50.0	50.0			
Electric motors—											
Number	9	3	4	2			33.3	44.5	22.2		
Horsepower	27	6	13	8			22.2	48.2	29.6		
Motor generators and dynamotors—											
Number	21	15	4	1	1		71.4	19.0	4.8	4.8	
Horsepower	15	10	2	1	2		66.7	13.3	6.7	13.3	

[1] Less than one-tenth of 1 per cent.

TABLE 27.—ELECTRIC FIRE ALARM SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cables.
United States	233	[1] 531	302	[1] 534	[1] 739	10,650	1,003	9,647
Arkansas		2		5	5	12		12
Little Rock		2		5	5	12		12
California		9		9	3	51	6	45
Bakersfield		1		1		1	1	
Fresno						1		1
Los Angeles		2		2	2	41		41
Pasadena		1		1	1	3		3
San Diego		5		5		5	5	

[1] The total exceeds the sum of the items for the reason that the underground construction in cities reporting less than 1 mile (shown in Table 29) is included in the total for the United States but not in the figures for states and cities.

TABLE 27.—ELECTRIC FIRE ALARM SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907—Continued.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cables.
Colorado	.....	1	.....	2	3	18	.....	18
Denver	.....	1	.....	2	3	18	.....	18
Connecticut	54	1	58	1	2	188	120	68
Hartford	20	.....	24	.....	.....	92	92	.....
Meriden	.....	1	.....	1	1	2	.....	2
New Britain	1	.....	1	.....	.....	7	7	.....
New Haven	33	.....	33	.....	1	87	21	66
Delaware	.....	.....	.....	.....	1	2	.....	2
Wilmington	.....	.....	.....	.....	1	2	.....	2
Georgia	1	10	1	10	15	96	.....	96
Atlanta	.....	10	.....	10	10	40	.....	40
Savannah	1	.....	1	.....	5	56	.....	56
Illinois	10	8	10	8	16	89	.....	89
Evanston	9	.....	9	.....	6	13	.....	13
Joliet	1	.....	1	.....	2	11	.....	11
Peoria	.....	8	.....	8	8	65	.....	65
Indiana	2	8	2	8	10	44	.....	44
Anderson	.....	1	.....	1	1	6	.....	6
Fort Wayne	2	.....	2	.....	2	8	.....	8
Indianapolis	.....	5	.....	5	5	25	.....	25
Mishawaka	.....	1	.....	1	1	2	.....	2
South Bend	.....	1	.....	1	1	3	.....	3
Iowa	.....	4	.....	4	12	31	.....	31
Davenport	.....	3	.....	3	4	10	.....	10
Des Moines	.....	1	.....	1	8	20	.....	20
Keokuk	.....	.....	.....	.....	.....	1	.....	1
Maine	.....	17	.....	17	17	106	3	103
Bangor	.....	4	.....	4	3	8	3	5
Eden	.....	3	.....	3	3	6	.....	6
Portland	.....	10	.....	10	11	92	.....	92
Maryland	27	.....	27	.....	27	180	.....	180
Baltimore	27	.....	27	.....	27	180	.....	180
Massachusetts	10	118	10	102	82	2,011	471	1,540
Arlington	.....	3	.....	2	.....	7	7	.....
Boston	5	45	7	45	58	1,349	.....	1,349
Brookline	.....	10	.....	10	2	18	8	10
Cambridge	.....	1	.....	1	1	3	.....	3
Clinton	.....	2	.....	.....	.....	5	5	.....
Fall River	.....	5	.....	5	5	50	.....	50
Fitchburg	.....	.....	.....	.....	.....	1	.....	1
Haverhill	.....	6	.....	.....	.....	21	21	.....
Hyde Park	1	.....	.....	.....	1	2	.....	2
Leominster	1	.....	.....	.....	.....	1	1	.....
Lexington	.....	1	.....	2	2	5	.....	5
Lowell	1	.....	1	.....	6	50	.....	50
Lynn	(1)	(1)	(1)	(1)	(1)	45	15	30
Malden	.....	3	.....	.....	3	19	.....	19
Manchester	.....	.....	.....	.....	.....	1	.....	1
Marblehead	.....	.....	.....	.....	.....	1	.....	1
Milton	.....	2	.....	2	2	5	.....	5
Needham	.....	.....	.....	.....	.....	1	.....	1
North Adams	.....	1	.....	.....	.....	1	1	.....
Pittsfield	.....	1	.....	.....	1	8	.....	8
Plymouth	2	.....	2	.....	.....	7	7	.....
Springfield	.....	25	.....	25	.....	200	200	.....
Swampscott	.....	.....	.....	.....	.....	1	.....	1
Walpole	.....	.....	.....	.....	.....	1	1	.....
Watertown	.....	1	.....	.....	.....	1	1	.....
Westfield	.....	2	.....	.....	.....	3	3	.....
Worcester	.....	10	.....	10	1	205	201	4
Michigan	7	61	7	61	70	860	9	851
Battle Creek	1	.....	1	.....	6	48	.....	48
Bay City	.....	3	.....	3	3	7	.....	7
Charlotte	.....	.....	.....	.....	.....	1	.....	1
Detroit	.....	50	.....	50	50	730	.....	730
Flint	.....	1	.....	1	1	10	.....	10
Grand Rapids	6	2	6	2	9	51	.....	51
Ionia	.....	1	.....	1	.....	1	1	.....
Lansing	.....	1	.....	1	1	3	.....	3
Mt. Clemens	.....	2	.....	2	.....	4	4	.....
Port Huron	.....	1	.....	1	.....	4	4	.....
Saginaw	.....	.....	.....	.....	.....	1	.....	1
Minnesota	4	28	4	32	35	489	.....	489
Crookston	.....	1	.....	2	1	2	.....	2
Duluth	.....	1	.....	2	2	37	.....	37
Minneapolis	4	18	4	18	22	300	.....	300
St. Paul	.....	8	.....	10	10	150	.....	150

[1] Not reported.

TABLE 27.—ELECTRIC FIRE ALARM SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907—Continued.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cables.
Nebraska	.....	3	.....	3	3	12	.....	12
Omaha	.....	3	.....	3	3	12	.....	12
Nevada	.....	1	.....	1	1	2	.....	2
Reno	.....	1	.....	1	1	2	.....	2
New Hampshire	.....	1	.....	1	3	13	.....	13
Keene	.....	.....	.....	.....	.....	1	.....	1
Nashua	.....	1	.....	1	3	12	.....	12
New Jersey	.....	42	.....	39	32	296	23	273
Atlantic City	.....	4	.....	4	4	42	.....	42
Cape May	.....	7	.....	7	.....	14	14	.....
East Orange	.....	6	.....	6	.....	9	9	.....
Elizabeth	.....	1	.....	1	1	11	.....	11
Glen Ridge	.....	1	.....	1	1	2	.....	2
Long Branch	.....	.....	.....	.....	.....	1	.....	1
Montclair	.....	1	.....	1	2	5	.....	5
Morristown	.....	.....	.....	.....	.....	1	.....	1
Newark	.....	18	.....	18	20	193	.....	193
Paterson	.....	1	.....	1	1	11	.....	11
Plainfield	.....	.....	.....	.....	.....	1	.....	1
Princeton	.....	3	.....	.....	3	6	.....	6
New York	63	97	68	94	209	2,515	300	2,215
Albany	.....	7	.....	7	7	25	.....	25
Auburn	.....	1	.....	1	1	2	.....	2
Buffalo	4	8	4	8	12	224	.....	224
Canandaigua	.....	.....	.....	.....	.....	1	.....	1
Cazenovia	.....	.....	.....	.....	.....	1	.....	1
Geneva	1	.....	1	.....	1	2	.....	2
Kingston	.....	2	.....	2	2	5	.....	5
New Rochelle	.....	2	.....	2	2	15	.....	15
New York city[1]	57	65	62	68	137	1,510	300	1,210
Port Chester	.....	4	.....	2	4	9	.....	9
Rochester	1	.....	1	.....	34	673	.....	673
Syracuse	.....	2	.....	.....	2	20	.....	20
Tarrytown	.....	2	.....	.....	2	5	.....	5
Troy	.....	2	.....	2	2	4	.....	4
Watertown	.....	2	.....	2	3	19	.....	19
Ohio	2	27	2	45	81	2,323	.....	2,323
Akron	.....	2	.....	3	3	33	.....	33
Canton	.....	2	.....	2	2	72	.....	72
Cincinnati	.....	9	.....	1	9	180	.....	180
Cleveland	.....	7	.....	32	39	1,000	.....	1,000
Columbus	2	.....	2	.....	2	204	.....	204
Dayton	.....	1	.....	1	1	84	.....	84
Toledo	.....	6	.....	6	25	750	.....	750
Oregon	.....	15	.....	15	21	78	.....	78
Portland	.....	15	.....	15	21	78	.....	78
Pennsylvania	4	1	57	1	4	57	.....	57
Altoona	.....	1	.....	1	1	30	.....	30
Erie	2	.....	2	.....	2	4	.....	4
New Castle	2	.....	55	.....	1	22	.....	22
Phoenixville	.....	.....	.....	.....	.....	1	.....	1
Rhode Island	.....	29	.....	29	29	583	.....	583
Newport	.....	6	.....	6	6	72	.....	72
Narragansett	.....	2	.....	2	2	3	.....	3
Providence	.....	13	.....	13	13	496	.....	496
Woonsocket	.....	8	.....	8	8	12	.....	12
South Carolina	.....	6	.....	6	4	13	.....	13
Charleston	.....	4	.....	4	2	6	.....	6
Columbia	.....	2	.....	2	2	7	.....	7
Tennessee	.....	5	.....	5	15	45	.....	45
Memphis	.....	5	.....	5	15	45	.....	45
Texas	.....	7	.....	7	6	15	1	14
El Paso	.....	1	.....	1	1	3	.....	3
Galveston	.....	3	.....	3	3	5	.....	5
Paris	.....	1	.....	1	.....	1	1	.....
San Antonio	.....	2	.....	2	2	6	.....	6
Utah	.....	5	.....	5	.....	20	20	.....
Salt Lake City	.....	5	.....	5	.....	20	20	.....
Virginia	.....	13	.....	13	4	58	34	24
Lynchburg	.....	1	.....	1	1	8	.....	8
Norfolk	.....	3	.....	3	3	16	.....	16
Roanoke	.....	9	.....	9	.....	34	34	.....

[1] New York city has 4 separate systems, but all are treated as 1 system.

TABLE 27.—ELECTRIC FIRE ALARM SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907—Continued.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cables.
Washington	.....	1	.....	1	1	2	.....	2
Bellingham	.....	1	.....	1	1	2	.....	2
West Virginia	.....	2	.....	2	.....	2	2	.....
Huntington	.....	2	.....	2	.....	2	2	.....
Wisconsin	49	3	56	3	22	439	14	425
Appleton	.....	.....	.....	.....	.....	1	.....	1
Eau Claire	1	.....	1	.....	1	3	.....	3
La Crosse	.....	2	.....	2	2	10	.....	10
Milwaukee	47	.....	51	.....	17	397	14	383
Racine	.....	1	.....	1	1	10	.....	10
Sheboygan	1	.....	4	.....	1	18	.....	18

TABLE 28.—COMBINED AND INTERCHANGEABLE ELECTRIC FIRE ALARM AND POLICE PATROL SIGNALING SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cables.
United States	194	206	938	225	500	12,007	76	11,931
California	15	11	30	11	26	428	25	403
Oakland	.....	1	.....	1	1	153	.....	153
San Francisco	15	10	30	10	25	275	25	250
Colorado	.....	3	.....	3	3	41	.....	41
Pueblo	.....	3	.....	3	3	41	.....	41
District of Columbia	16	60	16	60	76	3,091	.....	3,091
Washington	16	60	16	60	76	3,091	.....	3,091
Illinois	75	15	225	19	88	1,952	6	1,946
Aurora	.....	2	.....	6	.....	6	6	.....
Chicago	75	.....	225	.....	75	1,904	.....	1,904
Elgin	.....	7	.....	7	7	14	.....	14
Kankakee	.....	5	.....	5	5	10	.....	10
Springfield	.....	1	.....	1	1	18	.....	18
Massachusetts	.....	30	.....	32	35	205	37	168
Chelsea	.....	2	.....	4	2	11	.....	11
New Bedford	.....	5	.....	5	11	49	.....	49
Newton Center	.....	17	.....	17	18	95	12	83
Quincy	.....	1	.....	1	.....	19	19	.....
Waltham	.....	4	.....	4	4	25	.....	25
Wellesley	.....	1	.....	1	.....	6	6	.....
Missouri	.....	20	.....	26	26	455	.....	455
St. Louis	.....	20	.....	26	26	455	.....	455
Nebraska	.....	2	.....	2	1	12	8	4
South Omaha	.....	2	.....	2	1	12	8	4
New Jersey	.....	1	.....	2	10	264	.....	264
Trenton	.....	1	.....	2	10	264	.....	264
New York	.....	2	.....	2	2	9	.....	9
Poughkeepsie	.....	2	.....	2	2	9	.....	9
North Dakota	.....	1	.....	1	1	2	.....	2
Fargo	.....	1	.....	1	1	2	.....	2
Pennsylvania	88	55	667	60	225	5,350	.....	5,350
Allegheny	.....	10	.....	10	10	311	.....	311
McKeesport	.....	4	.....	4	4	60	.....	60
Philadelphia	88	.....	667	.....	164	4,281	.....	4,281
Pittsburg	.....	40	.....	45	45	646	.....	646
Scranton	.....	1	.....	1	2	52	.....	52
Virginia	.....	6	.....	7	7	198	.....	198
Richmond	.....	6	.....	7	7	198	.....	198

In common with electric lighting, telephone, and telegraph wire, the wire used in fire alarm and police patrol systems is increasingly being placed under ground, especially in the larger cities. This results in most cases from municipal legislation in the public interest. As shown by Table 24, there were 1,164 miles of subways or conduits in 1907 as compared with 859 in 1902, a gain of 305 miles, or 35.5 per cent. The number of miles of single wire in subways or conduits increased during the same period from 11,433 to 22,657, or 98.2 per cent.

In considering overhead and underground line construction and the wire mileage in the various tables of this report, this distinction should always be borne in mind, that while the wire mileage reported for fire alarm and police patrol is separate and distinct for each class of systems, practically all of the pole line and conduit mileage is common to both, and consequently the police patrol line and conduit mileage, which is the smaller as a rule, is almost entirely duplicated in the tables presenting the statistics for fire alarm systems. There are, however, exceptions to this, where the police mileage exceeds that of fire alarm, a notable exception being Worcester, Mass., in which city the police mileage was 44 and the fire alarm mileage 10. This is not the case with the mileage of conduits reported for combined or interchangeable systems, as the cities reporting such systems are of course not included in the other class of tables. Since the amount of duplication as between fire alarm and police patrol systems is uncertain, it is impossible to state exactly the total mileage of conduits devoted to each of these public purposes. Also, it perhaps should be made clear at this point that since the municipalities use the ducts of the telephone and telegraph companies in practically all cases when they are available, the same duplication occurs in that connection.

The statistics giving miles of cable in subways or conduits are affected by the same limitations as to duplication between the 2 systems as those described in the foregoing. It is clear, however, that the gain between 1902 and 1907 is considerable, since the mileage of single wire in underground cable increased from 10,907 at the former census to 21,578 at the latter.

In making a comparison of the underground wire mileage reported for the different cities, the large proportion of such wire reported for a few cities is noteworthy. There were 14,262 miles, or about two-thirds of the whole, reported by 8 cities, distributed as follows: Philadelphia, 4,281; Washington, D. C., 3,091; Chicago, 1,904; New York, 1,510; Boston, 1,349; Cleveland, 1,000; Detroit, 730; and Milwaukee, 397. It is probably unfair to compare the number of miles of wire for the different cities without bringing the figures to the same basis. The foregoing statistics for Philadelphia, Washington, and Chicago include police patrol wire, as the systems are combined or interchangeable. Adding the police patrol wire to the figures for the other cities increases their totals as follows: New York, 2,830; Boston, 1,844; Cleveland, 1,250; Detroit, 1,105; Milwaukee, 1,097.

The schedule used in the census contained the following inquiry:

> If the poles or conduits are not owned by the city, state arrangement under which used; state also if the city has perpetual right of way, without cost, covered by city ordinance.

It was very generally reported that according to the terms of the ordinances granting franchises to telephone or electric lighting or other companies engaged in operating electric wires in streets, the right to string wires for fire alarm or police patrol purposes on the poles or in the conduits of such companies, without cost, was perpetually reserved to the municipalities. However, in many instances the privilege of stringing wires without cost was a voluntary concession on the part of the companies to the municipalities. In a very few cases compensation was exacted, usually a nominal amount, presumably for the purpose of asserting a right or principle rather than for the sake of receiving a suitable return for the privilege. In some instances, too, the agreement as to the privilege was merely verbal, no written instrument being drawn to make it binding or ordinance passed to make it perpetual. Usually the top arm on poles or one duct in conduits is reserved for municipal use. In order that the term "leased" as applied to pole line and subways or conduits may not mislead, it is explained that whenever the wires of the fire alarm system were strung on the poles or in the conduits of telephone or telegraph companies, under whatever terms, they were required to be reported as "leased."

It will be noted that Table 27 includes several cities for which underground wire mileage is reported, but for which no underground construction appears. Each of those cities reported less than one mile, and as it was impracticable to express the mileage decimally in Table 27, the figures are shown in Table 29. While the total is very small, to make a true total of underground construction in the United States, the figures in Table 29 should be added to those in Table 27, which results in showing 531 miles of subways or conduits leased; 534 miles of single duct leased; and 739 miles of underground cable. The practice followed at the census of 1902 in treating such cases was to raise the mileage to one if it was but a fractional part of a mile.

TABLE 29.—*Electric fire alarm systems—underground construction in cities reporting less than one mile: 1907.*

CITY.	LEASED.		Miles of cable.
	Street miles of subways or conduits.	Miles of single duct.	
Total	5.6	5.2	6.1
California	.5	.5	.5
Fresno	.5	.5	.5
Delaware	.1	.....	.8
Wilmington	.1	.....	.8
Iowa	.5	.5	.5
Keokuk	.5	.5	.5
Massachusetts	2.0	2.0	2.0
Fitchburg	.5	.5	.5
Manchester	.5	.5	.5
Marblehead	.5	.5	.5
Needham	.2	.2	.2
Swampscott	.2	.2	.2
Walpole	.1	.1	.1
Michigan	.3	.3	.3
Charlotte	.1	.1	.1
Saginaw	.2	.2	.2
New Hampshire	.3	.3	.3
Keene	.3	.3	.3
New Jersey	1.0	.7	1.0
Long Branch	.3	.....	.3
Morristown	.5	.5	.5
Plainfield	.2	.2	.2
New York	.5	.5	.3
Canandaigua	.3	.3	.3
Cazenovia	.2	.2	.....
Pennsylvania	.3	.3	.3
Phoenixville	.3	.3	.3
Wisconsin	.1	.1	.1
Appleton	.1	.1	.1

One of the inquiries on the schedule called for the "number of fire alarms of all kinds received during the year." This inquiry was intended to elicit only the number of alarms received over the wires of the electric fire alarm systems, excluding those received by telephone and "still alarms." An examination of the returns offers convincing evidence that this was not generally understood by those who made the reports, many giving all alarms, and in a large number of such cases no segregation of the different kinds was made; consequently the figures given do not represent the exact number of alarms received over electric fire alarm systems, but are in some degree excessive. Whenever telephone or "still alarms" were shown separately it was possible to correct the figures. As such alarms in the larger cities are comparatively few in number, it is believed that these statistics are not greatly in excess of what they should be. There were reported 96,516 alarms by exclusive fire alarm systems and 24,203 by combined systems, a total of 120,719, which, when compared with the total number of alarms reported in 1902, or 85,070, shows an increase of 35,649, or 41.9 per cent.

The schedule of inquiry called for information in regard to employees engaged in the operation of these systems and the salaries and wages paid. As no special object can be gained by presenting the figures of employees and wages for fire alarm and police patrol systems in separate tables, they are combined in Table 30. The employees included in the table are such as were at work, either a part or the whole of their time, during the census year, in the administration, operation, or maintenance of the systems, and were paid expressly for such services, and the number reported is the average number on the basis of continuous employment for the whole year. The table does not include employees connected directly with the fire or police department and receiving stated compensation from such departments when their duties were merged with some attention to the fire alarm and police patrol systems, unless they were paid specifically for the latter services. Even when the operation and maintenance of these systems are in the sole charge of the electrical departments of municipalities, it is not always possible to properly segregate the employees and wages, for the reason that the electrical department, in addition to having control of the fire alarm and police patrol systems, has charge of the inspection of wires, street lighting, and the care and repair of all bell work and lighting in schoolhouses and other city buildings. The same men do the various lines of work, and consequently it is impossible to separate the salaries and wages properly pertaining to these systems from those pertaining to the rest of the department work.

In the report on this subject at the census of 1902 the statistics of employees in cities with less than 100,000 inhabitants were omitted chiefly on account of their comparative unimportance, but also because there was some doubt as to the accuracy of the figures reported—that is, as to whether only such employees were included as properly pertained to the systems.

That the economic importance of these systems is comparatively insignificant in this particular respect the figures in Table 30 clearly indicate. Only 687 salaried employees and 1,491 wage-earners were reported for fire alarm, police patrol, and combined systems in cities of all classes, and these employees received $540,275 and $1,376,702, respectively; the total number of employees, therefore, was 2,178, and the total amount paid them in salaries and wages was $1,916,977. For the group of cities with a population of 100,000 and over each item shows a considerable increase over the corresponding statistics reported in 1902. One noticeable feature of the statistics is the much smaller proportion the salaried employees form of the total number of employees in cities having at least 100,000 inhabitants than in cities having less than 100,000. This is explained by

the much larger number of systems in the latter group and by the fact that in the smaller cities the "manager" or "superintendent" frequently is the only person employed in the operation of the system.

TABLE 30.—ELECTRIC FIRE ALARM AND POLICE PATROL SIGNALING SYSTEMS—EMPLOYEES AND WAGES, BY SYSTEMS, IN CITIES HAVING A POPULATION OF 100,000 AND OVER, AND IN CITIES OF LESS THAN 100,000: 1907.

	Aggregate.	IN CITIES HAVING A POPULATION OF—							
		100,000 and over.				Less than 100,000.			
		Total.	Fire alarm exclusively.	Police patrol exclusively.	Combined fire alarm and police patrol.	Total.	Fire alarm exclusively.	Police patrol exclusively.	Combined fire alarm and police patrol.
Number of systems	685	63	29	26	8	622	528	66	28
Salaried officials and clerks:									
Total number	687	120	51	29	40	567	485	51	31
Total salaries	$540,275	$186,533	$78,803	$43,322	$64,408	$353,742	$277,007	$43,114	$33,621
General managers, superintendents, etc.—									
Number	658	102	50	28	24	556	478	50	28
Salaries	$511,492	$165,383	$77,891	$42,322	$45,170	$346,109	$273,354	$42,414	$30,341
Clerks and bookkeepers—									
Number	29	18	1	1	16	11	7	1	3
Salaries	$28,783	$21,150	$912	$1,000	$19,238	$7,633	$3,653	$700	$3,280
Wage-earners:									
Average number	1,491	1,067	357	224	486	424	295	78	51
Total wages	$1,376,702	$1,103,852	$375,287	$247,570	$480,995	$272,850	$173,180	$60,707	$38,963
Operators—									
Average number	639	514	145	139	230	125	[1] 54	56	[2] 15
Wages	$669,383	$571,565	$166,162	$158,173	$247,230	$97,818	$39,841	$45,457	$12,520
All other employees (including foremen, inspectors, linemen, wiremen, and batterymen)—									
Average number	852	553	212	85	256	299	241	22	36
Wages	$707,319	$532,287	$209,125	$89,397	$233,765	$175,032	$133,339	$15,250	$26,443

[1] Includes 2 female operators.

[2] Includes 1 female operator.

Table 31 presents data for cities in the outlying dependencies of the United States. These statistics are not included in any of the other tables in this report.

TABLE 31.—*Electric fire alarm and police patrol signaling systems in outlying dependencies of the United States: 1907.*

	Electric fire alarm system, Christobal, Canal Zone.	Electric police patrol signaling system, Hilo, Hawaii.	Electric fire alarm and police patrol signaling systems, Honolulu, Hawaii.
Year of establishment	1907	1904	1901
Leased pole line, miles	6	8	50
Single wire, miles	11	8	100
Boxes or signaling stations on poles or posts, number	10	10	152
Signaling	10	10	52
Telephoning	.....	.....	100
Fire alarms received, number	9	.....	113
Central office equipment:			
Manual transmitters, number	.....	1	.....
Receiving registers, number	1	1	2
Circuits, number—			
Receiving	1	.....	4
Transmitting	2	.....	4
Single	.....	1	.....
Telegraph switchboards—			
Number	1	.....	1
Total capacity, number of circuits	2	.....	4
Telephone switchboards—			
Number	.....	.....	1
Total capacity, number of drops or jacks	.....	.....	150
Battery cells, number—			
Primary	.....	26	265
Secondary	74	.....	360

The system in Honolulu, which is a combined fire alarm and police patrol system, was in operation in 1902 and the statistics were included in the report at that census. A comparison of the statistics at the two censuses shows that in the interval a considerable extension of the system was made, the signaling stations having increased in number from 100 to 152, and the central office equipment having been enlarged. The source of energy, namely, the battery cells, increased from 290 storage cells in 1902 to 265 primary and 360 storage cells in 1907. The system in Christobal was established in 1907 and was used solely for fire alarms. Even if it had been in operation in 1902 it would not of course be included in the electrical census of the United States for that year, since the Canal Zone was not a possession of the United States at that time. The figures reported are quite meager, but are the best that could be secured by correspondence.

As previously explained, the census includes only those systems in which the boxes and wire mileage are used exclusively for sending signals or messages to a central office. These systems vary in completeness from the elaborately equipped systems of the large cities to the simpler types in small towns. Those in large cities usually have several receiving and transmitting circuits consisting of many miles of line construction in open wire and cables, strung both overhead and in underground conduits. The number of miles of single wire reported runs up into the thousands. The signaling boxes, too, located as they are at all points of advantage for quick response to alarms, number several hundreds. There usually are in the central office both manual and automatic transmitters, and generally one or more receiving registers and telegraph or telephone switchboards. In the larger systems the source of energy is in the form of both primary and storage battery cells, several hundreds in number, although, as elsewhere noted, storage bat-

teries are rapidly superseding the primary type in up-to-date systems. The generating power, if current is not drawn from outside sources or supplied by primary batteries, may be in the form of engines, dynamos, or motors operated on the premises, although this is not often found as a feature of these systems.

The simplest form of fire alarm system, frequently found in small towns, consists of but one single circuit with only a few signaling boxes on the line; while in fire headquarters the only equipment may be an annunciator with a bell striker attached, and, it may be, a further connection with a tower bell for alarming the voluntary firemen who are not at headquarters, and the people generally.

A few words descriptive of some of the essential features of fire alarm systems may not be out of place at this point.

A fire alarm signaling box embraces a clockwork mechanism which, when operated, revolves a character wheel and causes the normally closed circuit to be successively opened and closed at regular intervals. This character wheel is either toothed or notched to correspond to the signal which it is desired to transmit. Thus the character wheel for signal 234 would have two teeth (or notches), a space, three teeth, a space, four teeth, and a longer space. A circuit opening device is so arranged that as the wheel revolves the circuit is successively opened and closed as described, causing the proper signal to be transmitted. These boxes, too, are often provided with a telephone jack, which enables communication to be carried on between the boxes and the office by using a hand microphone equipped with a suitable plug.

A manual transmitter is a device used in large city central fire alarm offices for sending out alarms to engine companies. These transmitters are of two general types, the dial type and the button type. Both machines operate the alarm gong circuits which reach the various engine houses. In the dial transmitter it is necessary to set various dials until the signal number desired to be sent is displayed. The machine is then started and that particular signal is transmitted. This machine, by a manipulation of its dials, will send any combination of three or four numbers, depending upon the number of controlling plates in its construction. The button transmitter is a machine in which the signal transmitted is determined by a wheel termed a "button" which is placed upon it. In this machine it is necessary to have a separate wheel, or button, for each signal box in the system. These wheels are kept in drawers, properly located and accessible to the machine. When it is desired to transmit signal 239, for example, to the engine companies, wheel 239 is placed on the machine, which is then started.

Some cities, which do not have central offices at which operators are stationed at all times, have in the offices of their fire alarm departments a machine called an automatic repeater, the functions of which are to repeat automatically over all circuits any signal received from any one circuit.

A receiving register is absolutely necessary in every manual central office system, as that device is the only one which will visually show an incoming signal. The reason for this will be apparent when it is remembered that in such offices operators are stationed whose duty it is to transmit incoming signals (through the transmitters described) to the engine companies. In this report annunciators with a bell attached are treated as receiving registers. In automatic central offices, where there are no operators on duty and where the automatic repeater above described takes care of the transmission of signals throughout the entire system, a receiving register would not be absolutely necessary as an operating proposition, but would be very desirable as a machine for making a permanent record of every signal received. The number of receiving registers reported increased from 452 in 1902 to 2,046 in 1907, the gain being 1,594. This abnormal increase points to no other conclusion than that some classes of machines which have been treated as receiving registers in 1907 were not so regarded at the census of 1902.

The primary battery is the common type of wet or dry gravity battery. The number of these battery cells, primary or storage, is not at all uniform, even in systems of apparently equal requirements in this respect, as circuits vary in length and consequently in resistance. The common practice in fire alarm telegraphy is to employ sufficient battery to secure for the circuits a continuous flow of current of one-tenth of an ampere.

Other types of fire alarm systems.—Many communities, instead of installing electric fire alarm systems such as are covered by the census, depend almost entirely upon the telephone as a means of alarm in case of fire. The operations of such systems were not required to be reported to the Census Office. Kansas City, Mo., is the largest city which is wholly dependent upon a telephone alarm system. The system, which has been in use in this city since 1882, consists of a telephone switchboard located in the headquarters of the fire department and so arranged as to carry all fire circuits and trunk lines. There are 2 telephone companies, and the wires of both are connected on the same switchboard at the central fire station. This board is similar in principle to an ordinary switchboard, but is arranged for the particular purpose for which it is designed. All of the lines are metallic circuits connecting with long distance telephones in all fire stations, and are constructed of insulated copper wire carried in cables on the top arms of the poles of the local telephone companies, or through their underground conduits. The local telephone companies are required by their franchises from the city to furnish and maintain the service throughout the city up to the terminal board in fire

LATEST TYPE OF ENGINE HOUSE FIRE-ALARM EQUIPMENT.

headquarters. Each branch telephone office has a fire trunk line which is connected direct to the switchboard and is used for fire alarms only. These circuits are supplemented by direct lines from fire headquarters to theaters, public halls, and many of the larger business houses. In addition, the 2 telegraph companies have call boxes in some of the principal buildings, which are connected to the switchboard by a direct trunk line, and when a box is "pulled" for a fire the alarm is at once transmitted from the telegraph office to the central fire station.

Many small communities are supplied with electric bell strikers or whistle blowers connected with the telephone exchanges, and while such systems are in reality electric fire alarms, on account of the fact that they have no central office equipment they are not included in this report.

The following is a description of a simple form of fire alarm, which is well adapted to the needs of the small town in which it is used: The apparatus consists of a small 10-inch water motor, which is used to compress air in a receiver about nine feet long and three feet in diameter. Mounted on this compressed air cylinder is a solenoid, connected electrically with the two telephone exchanges, and attached to the solenoid is a whistle. When an alarm is received at the telephone exchange, a button is pressed by one of the operators and the electric current actuates a small magnet in the solenoid, which allows the air to escape from the cylinder to the whistle, and thus the alarm is given to the town and the fire department.

The detailed statistics, by states and territories, for fire alarm and combined and interchangeable fire alarm and police patrol signaling systems are presented in Tables 35 and 36, respectively.

POLICE PATROL SYSTEMS.

In the cities of the United States there were 178 systems operated for police patrol purposes solely in 1907 as compared with 125 in 1902. When the systems which were used interchangeably for police and fire purposes are included, the actual numbers of systems employed for police patrol signaling were 226 in 1907 and 148 in 1902. The statistics for all systems are shown in Table 32.

The schedule required that the date of the establishment of each system be reported, and as supplemental to information of that character published in the report for 1902, the number installed each year since that time is given as follows: 1903, 15; 1904, 11; 1905, 13; 1906, 13; 1907, 18. There is a discrepancy here similar to that shown in the corresponding figures for fire alarm systems. According to Table 32, there was a gain of 78 systems between 1902 and 1907. This list accounts for only 70. These statistics seem to show, however, that the usefulness of these systems in police administration is fully recognized.

The same qualifications as to duplication of certain items attach to these statistics as were described on page 28 in discussing the data for fire alarms. The schedule of inquiry called for the number of police calls received or sent, and that is the only item which can be said to pertain strictly and solely to police matters. These statistics are omitted from the tables in this report for the reasons given below. The total number reported for 1907 was 41,961,650 as compared with 40,626,505 for 1902, a gain of 1,335,145 only, or 3.3 per cent. The increase in telephone calls was considerable, being from 23,393,812 to 29,946,757, but in "all other" calls there was a loss of 5,217,800, or 30.3 per cent. This decrease may be attributed to the fact that at both censuses the numbers of these calls were largely estimated, and as a result there was undoubtedly an element of error in the statistics at both enumerations.

TABLE 32.—*Electric systems used exclusively for police patrol signaling, and systems used interchangeably for police patrol and fire alarm purposes: 1907 and 1902.*

	1907	1902
Number of systems	226	148
Line construction, miles:		
Pole line for wires or cables	4,987	4,016
Owned	735	829
Leased	4,252	3,187
Overhead cables	313	(1)
Subways or conduits (street miles)	1,075	773
Owned	364	271
Leased	711	502
Duct	1,851	(1)
Owned	1,118	(1)
Leased	733	(1)
Cables in underground subways or conduits	1,232	(1)
Single wire, miles	35,475	26,350
Overhead	18,109	17,339
Open wire on pole or roof line	17,182	14,296
In cables	927	3,043
In underground subways or conduits	17,366	9,011
Open wire	325	264
In cables	17,041	8,747
Boxes or signaling stations, number	21,607	10,046
Signaling	17,720	9,476
On poles or posts	14,864	6,747
All other	2,856	2,729
Telephoning	3,887	1,170
On poles or posts	2,791	1,060
All other	1,096	110
Special telephones, number	1,694	1,998
Central office equipment:		
Transmitters, number	229	113
Manual	123	83
Automatic	106	30
Receiving registers of all kinds, number	708	439
Circuits, number—		
Receiving	1,460	1,272
Transmitting	719	983
Single	17	28
Telegraph switchboards—		
Number	144	70
Total capacity, number of circuits	1,314	578
Telephone switchboards—		
Number	237	187
Total capacity, number of drops or jacks	4,869	3,055
Battery cells, number—		
Primary	20,385	24,477
Storage	25,198	11,317
Gas engines—		
Number	2	(1)
Horsepower	6	(1)
Dynamos—		
Number	7	(1)
Horsepower	12	(1)
Electric motors—		
Number	12	(1)
Horsepower	34	(1)
Motor generators and dynamotors—		
Number	32	18
Horsepower	25	18

[1] Not reported.

In many instances no records were kept of these calls and it was necessary to resort to estimates or omit the information from the reports. A comparison of the individual returns at the two censuses for several of the more important cities disclosed several discrepancies, serious enough in themselves, apparently, to vitiate these statistics, and these discrepancies appeared to be unexplainable. For example, the number of police calls reported for Philadelphia in 1902 was 5,627,038 and in 1907, 1,025,126, a decrease so large as to be explained only on the assumption that a serious error was made at one census or the other. The most reasonable explanation, apparently, of this difference is that ordinary duty calls were not reported in 1907. The same is probably true of New York city, the total number of calls in 1907 being only 906,186, which, when compared with the number of police calls given for Chicago, 5,090,874, or for Boston, 3,490,434, or even Jersey City, 1,967,100, shows plainly that the statistics were not uniformly reported.

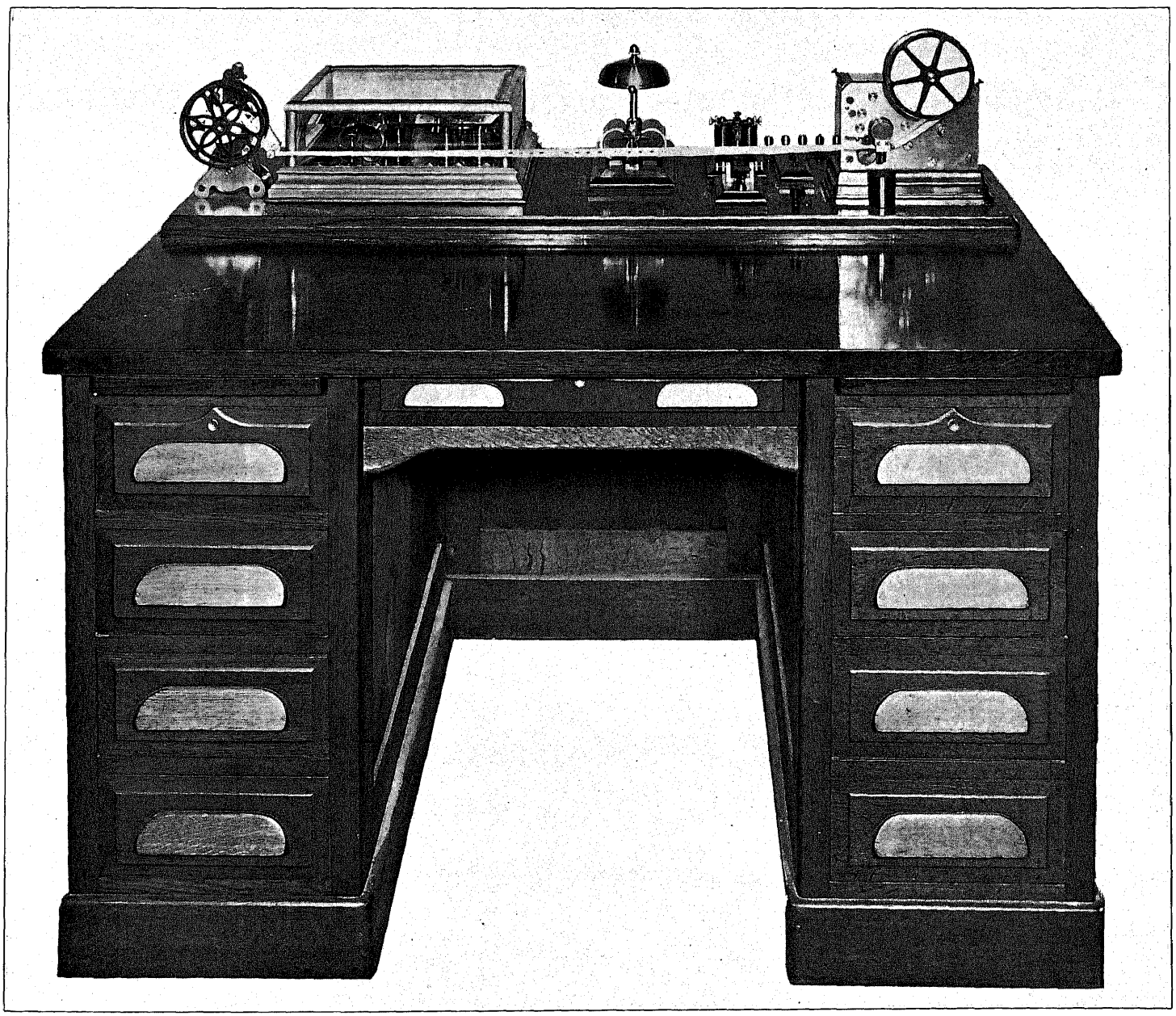
Equal confusion seemed to surround the question of the classification of police calls—whether they should be reported as telephone or "all other;" the manner of reporting boxes or signaling stations also was frequently a doubtful question. It seems evident from the statistics that where a combined signaling and telephoning box was used it was reported in most cases as a signaling box, while the calls were classified according as they were transmitted through a telephone attachment or a signaling attachment. Thus a box might be reported as a signaling station while the majority of the calls through that box would be classified as telephone calls.

As to other items in Table 32, it is difficult if not impossible to make accurate comparisons of conditions at the two census periods by reason of the difference in the numbers of combined systems reported.

The officials, boards, or departments charged with the administration of these systems are shown in Table 22.

TABLE 33.—ELECTRIC POLICE PATROL SIGNALING SYSTEMS, GROUPED ACCORDING TO POPULATION OF CITIES, AND THE PER CENT EACH GROUP IS OF TOTAL: 1907.

	POPULATION GROUPS.						PER CENT OF TOTAL.				
	Total.	100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.	100,000 and over.	50,000 to 100,000.	25,000 to 50,000.	10,000 to 25,000.	Less than 10,000.
Number of systems	178	27	29	39	52	31	15.2	16.3	21.9	29.2	17.4
Line construction, miles:											
Pole line for wires or cables	3,105	1,203	621	669	419	193	38.7	20.0	21.6	13.5	6.2
Owned	265	121	19	87	22	16	45.7	7.2	32.8	8.3	6.0
Leased	2,840	1,082	602	582	397	177	38.1	21.2	20.5	14.0	6.2
Overhead cables	274	182	7	15	45	25	66.4	2.6	5.5	16.4	9.1
Subways or conduits (street miles)	675	435	77	37	91	35	64.4	11.4	5.5	13.5	5.2
Owned	170	121	28	3	14	4	71.2	16.5	1.8	8.2	2.3
Leased	505	314	49	34	77	31	62.2	9.7	6.7	15.3	6.1
Duct	688	480	81	37	60	30	69.8	11.8	5.4	8.7	4.3
Owned	180	127	32	3	14	4	70.5	17.8	1.7	7.8	2.2
Leased	508	353	49	34	46	26	69.5	9.6	6.7	9.1	5.1
Cable in underground subways or conduits	732	551	47	26	72	36	75.3	6.4	3.6	9.8	4.9
Single wire, miles	13,578	8,788	1,543	1,601	1,148	498	64.7	11.4	11.8	8.4	3.7
Overhead	8,219	4,330	1,212	1,357	920	400	52.7	14.7	16.5	11.2	4.9
Open wire on pole or roof line	7,420	3,813	1,192	1,308	763	344	51.4	16.1	17.6	10.3	4.6
In cables	799	517	20	49	157	56	64.7	2.5	6.1	19.7	7.0
In underground subways or conduits	5,359	4,458	331	244	228	98	83.2	6.2	4.5	4.3	1.8
Open wire	249	137	71	17	23	1	55.0	28.5	6.8	9.3	0.4
In cables	5,110	4,321	260	227	205	97	84.6	5.1	4.4	4.0	1.9
Boxes or signaling stations, number	8,694	4,812	1,314	1,173	987	408	55.3	15.1	13.5	11.4	4.7
Signaling	6,999	3,758	1,204	1,020	761	256	53.7	17.2	14.6	10.9	3.6
On poles or posts	5,699	2,752	1,056	917	721	253	48.3	18.5	16.1	12.7	4.4
All other	1,300	1,006	148	103	40	3	77.4	11.4	7.9	3.1	0.2
Telephoning	1,695	1,054	110	153	226	152	62.2	6.5	9.0	13.3	9.0
On poles or posts	721	165	109	118	190	139	22.9	15.1	16.4	26.3	19.3
All other	974	889	1	35	36	13	91.3	0.1	3.6	3.7	1.3
Special telephones, number	843	626	112	56	14	35	74.3	13.3	6.6	1.7	4.1
Central office equipment:											
Transmitters, number	174	107	12	21	31	3	61.5	6.9	12.1	17.8	1.7
Manual	92	54	11	16	8	3	58.7	11.9	17.4	8.7	3.3
Automatic	82	53	1	5	23	.....	64.6	1.2	6.1	28.1	.....
Receiving registers of all kinds, number	381	197	47	50	57	30	51.7	12.3	13.1	15.0	7.9
Circuits, number—											
Receiving	888	358	117	181	136	96	40.3	13.2	20.4	15.3	10.8
Transmitting	491	191	75	120	76	29	38.9	15.3	24.4	15.5	5.9
Single	15	.....	2	1	7	5	.....	13.3	6.7	46.7	33.3
Telegraph switchboards—											
Number	90	33	15	22	15	5	36.7	16.7	24.4	16.7	5.5
Total capacity, number of circuits	527	263	81	106	59	18	49.9	15.4	20.1	11.2	3.4
Telephone switchboards—											
Number	161	67	19	27	26	22	41.6	11.8	16.8	16.1	13.7
Total capacity, number of drops or jacks	2,556	1,398	295	287	346	230	54.7	11.6	11.2	13.5	9.0
Battery cells, number—											
Primary	12,861	7,695	1,889	1,203	1,295	779	59.8	14.7	9.3	10.1	6.1
Storage	8,163	2,486	2,330	1,942	1,188	217	30.5	28.5	23.8	14.5	2.7
Gas engines—											
Number	1	.....	.....	.....	.....	1	.....	.....	.....	.....	100.0
Horsepower	1	.....	.....	.....	.....	1	.....	.....	.....	.....	100.0
Dynamos—											
Number	2	.....	.....	1	1	.....	.....	.....	50.0	50.0	.....
Horsepower	2	.....	.....	1	1	.....	.....	.....	50.0	50.0	.....
Electric motors—											
Number	3	2	.....	.....	1	.....	66.7	.....	.....	33.3	.....
Horsepower	7	5	.....	.....	2	.....	71.4	.....	.....	28.6	.....
Motor generators and dynamotors—											
Number	11	11	.....	.....	.....	.....	100.0	.....	.....	.....	.....
Horsepower	10	10	.....	.....	.....	.....	100.0	.....	.....	.....	.....



POLICE PATROL TELEGRAPH DESK.

Unlike Table 32, Table 33 does not include the statistics for combined and interchangeable systems which are used for both fire alarm and police patrol purposes. To ascertain the actual number of systems in the cities of the several groups, the figures in Tables 26 and 33 should be combined. At the census of 1900 there were 38 cities in the United States included in the group having a population of 100,000 and over, of which 35 reported electric police patrol systems. Of the 3 cities without such systems in 1907, New Orleans, La., and Louisville, Ky., depended entirely on the local telephone companies for transmitting police messages to headquarters, while Toledo, Ohio, at the time of the census, was installing an improved police patrol signaling system.

Of the 40 cities containing a population of at least 50,000 but less than 100,000, 33 cities operated electric signaling systems, and the cities of Evansville, Ind., Des Moines, Iowa, and Nashville, Tenn., depended upon the telephone companies. Kansas City, Kans., Troy, N. Y., and San Antonio, Tex., reported no police patrol systems. In Salt Lake City, Utah (another city in this class), a system was installed in 1889, but through neglect it fell into decay and was abandoned, and at the time of the census police messages were transmitted through the public telephone exchange.

For cities of smaller population the proportion of police patrol systems was much less extensive.

A notable advance in the equipment of the system in the Borough of Manhattan, New York city, has been made since the electrical census of 1902. In 1902 the system comprised 156 sets of telephones on private police lines connecting with police stations and police headquarters. In 1907 there were 864 telephone stations reported. The system in use in this borough is simply a telephone system with no automatic appliances in central offices.

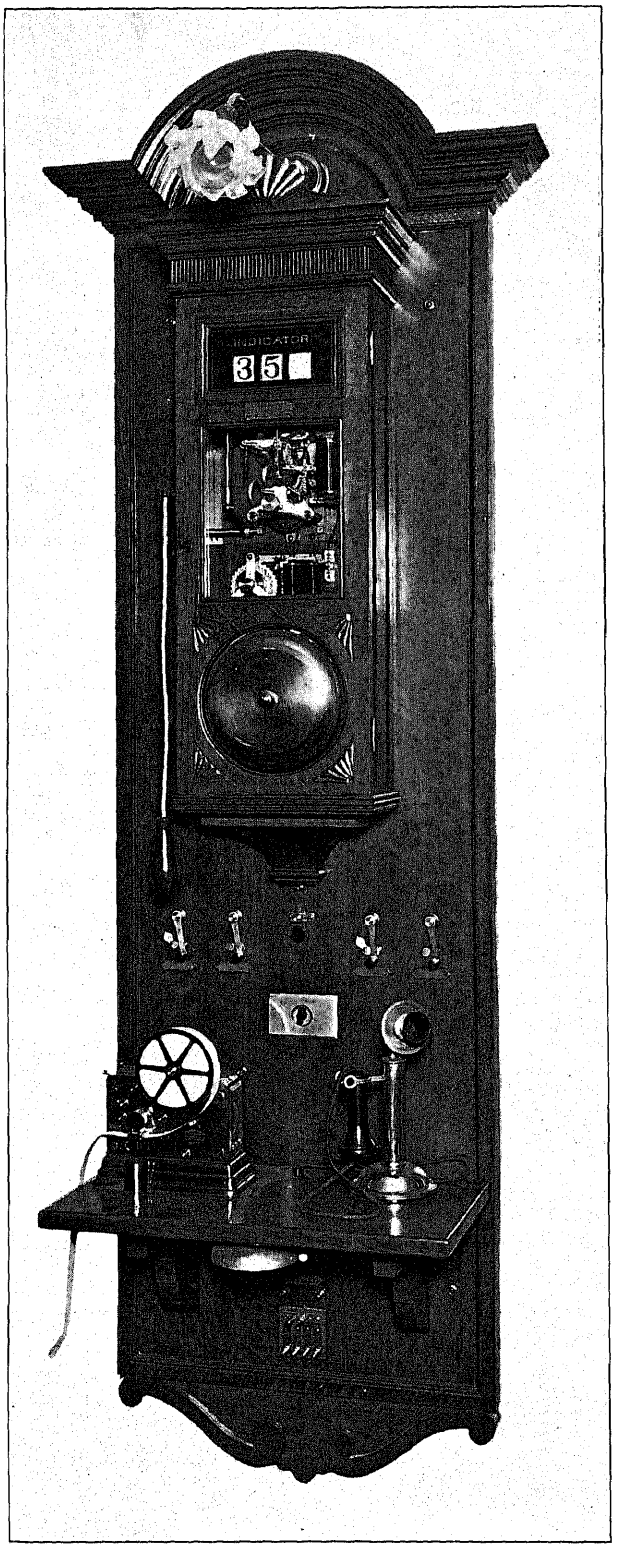
TABLE 34.—ELECTRIC POLICE PATROL SIGNALING SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cable.
United States	170	505	180	508	732	5,359	249	5,110
Colorado	.....	1	.....	2	3	18	.....	18
Denver	.....	1	.....	2	3	18	.....	18
Connecticut	54	2	58	.....	3	88	70	18
Greenwich	.....	2	.....	.....	2	8	.....	8
Hartford	20	.....	24	.....	.....	10	10	.....
New Britain	1	.....	1	.....	.....	1	1	.....
New Haven	33	.....	33	.....	1	69	59	10
Delaware	.....	.....	.....	.....	1	2	.....	2
Wilmington	.....	.....	.....	.....	1	2	.....	2
Georgia	.....	8	.....	8	8	32	.....	32
Atlanta	.....	8	.....	8	8	32	.....	32
Illinois	9	10	9	10	16	83	.....	83
Evanston	9	.....	9	.....	6	12	.....	12
Joliet	.....	2	.....	2	2	6	.....	6
Peoria	.....	8	.....	8	8	65	.....	65
Indiana	2	10	2	10	12	37	.....	37
Fort Wayne	1	.....	1	.....	1	5	.....	5
Indianapolis	.....	10	.....	10	10	25	.....	25
South Bend	1	.....	1	.....	1	7	.....	7
Maine	4	7	4	7	10	46	.....	46
Bangor	4	.....	4	.....	3	5	.....	5
Portland	.....	7	.....	7	7	41	.....	41
Maryland	30	.....	30	.....	30	100	.....	100
Baltimore	30	.....	30	.....	30	100	.....	100
Massachusetts	7	119	11	119	128	852	150	702
Arlington	.....	2	.....	2	2	5	.....	5
Boston	3	.....	7	.....	71	495	.....	495
Boston (Blue Hills Division of Metropolitan Park Commission)	4	.....	4	.....	4	8	.....	8
Boston (Revere Beach Division of Metropolitan Park Commission)	.....	13	.....	13	13	26	.....	26
Brookline	.....	10	.....	10	2	13	8	5
Clinton	.....	2	.....	2	2	4	.....	4
Fall River	.....	10	.....	10	11	57	.....	57
Haverhill	.....	4	.....	4	4	17	.....	17
Hyde Park	.....	3	.....	3	3	6	.....	6
Lowell	.....	1	.....	1	7	50	.....	50
Lynn	.....	3	.....	3	3	24	10	14
Malden	.....	1	.....	1	1	3	.....	3
Manchester	.....	1	.....	1	.....	1	1	.....
Medford	.....	2	.....	2	2	5	.....	5
Milton	.....	2	.....	2	2	5	.....	5
North Adams	.....	1	.....	1	.....	1	1	.....
Pittsfield	.....	2	.....	2	.....	2	2	.....
Springfield	.....	18	.....	18	.....	50	50	.....
Worcester	.....	44	.....	44	1	80	78	2

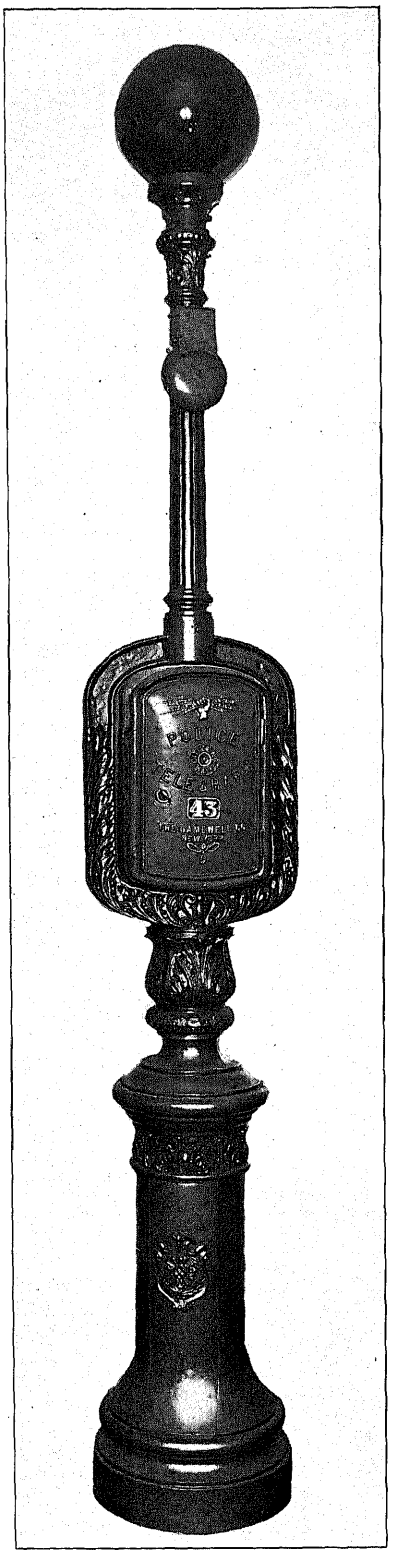
TABLE 34.—ELECTRIC POLICE PATROL SIGNALING SYSTEMS—UNDERGROUND CONSTRUCTION AND WIRE MILEAGE, BY STATES AND CITIES: 1907—Continued.

STATE AND CITY.	STREET MILES OF SUBWAYS OR CONDUITS.		MILES OF SINGLE DUCT.		Miles of cable.	MILES OF SINGLE WIRE.		
	Owned.	Leased.	Owned.	Leased.		Total.	Open wire.	In cable.
Michigan	21	1	21	1	23	412	1	411
Detroit	15	.....	15	.....	17	375	.....	375
Grand Rapids	6	.....	6	.....	6	36	.....	36
Kalamazoo	.....	1	.....	1	.....	1	1	.....
Minnesota	.....	35	.....	35	124	258	.....	258
Minneapolis	.....	10	.....	10	10	30	.....	30
St. Paul	.....	25	.....	25	114	228	.....	228
Missouri	.....	25	.....	25	25	51	.....	51
St. Joseph	.....	25	.....	25	25	51	.....	51
Nebraska	.....	3	.....	3	3	52	.....	52
Omaha	.....	3	.....	3	3	52	.....	52
New Hampshire	.....	3	.....	3	3	6	.....	6
Concord	.....	2	.....	2	2	4	.....	4
Nashua	.....	1	.....	1	1	2	.....	2
New Jersey	1	32	1	32	28	239	11	228
Atlantic City	.....	7	.....	7	7	104	.....	104
Camden	.....	1	.....	1	1	3	1	2
East Orange	.....	5	.....	5	.....	10	10	.....
Elizabeth	.....	1	.....	1	1	2	.....	2
Newark	.....	10	.....	10	10	101	.....	101
Plainfield	1	.....	1	.....	1	3	.....	3
South Orange	.....	8	.....	8	8	16	.....	16
New York[1]	.....	153	.....	119	147	1,534	16	1,518
Buffalo	.....	3	.....	3	3	29	.....	29
Elmira	.....	6	.....	6	.....	12	12	.....
Irvington	.....	2	.....	.....	2	5	.....	5
Larchmont	.....	1	.....	.....	1	6	.....	6
Mt. Vernon	.....	23	.....	.....	23	46	.....	46
New Rochelle	.....	6	.....	.....	8	44	.....	44
New York city	.....	102	.....	102	102	1,320	.....	1,320
Rochester	.....	1	.....	1	1	30	.....	30
Syracuse	.....	3	.....	3	3	12	.....	12
White Plains	.....	2	.....	.....	4	26	.....	26
Yonkers	.....	4	.....	4	.....	4	4	.....
Ohio	.....	63	.....	101	101	669	.....	669
Akron	.....	3	.....	3	3	33	.....	33
Canton	.....	2	.....	2	2	4	.....	4
Cincinnati	.....	22	.....	60	60	290	.....	290
Cleveland	.....	33	.....	33	33	250	.....	250
Columbus	.....	1	.....	1	1	65	.....	65
Dayton	.....	1	.....	1	1	5	.....	5
Newark	.....	1	.....	1	1	22	.....	22
Pennsylvania	2	2	2	2	4	28	.....	28
Altoona	.....	1	.....	1	1	20	.....	20
Erie	2	.....	2	.....	2	5	.....	5
Norristown	.....	1	.....	1	1	3	.....	3
Rhode Island	.....	16	.....	16	17	73	.....	73
Newport	.....	10	.....	10	11	22	.....	22
Providence	.....	6	.....	6	6	51	.....	51
South Carolina	.....	3	.....	3	4	14	.....	14
Charleston	.....	1	.....	1	2	6	.....	6
Columbia	.....	2	.....	2	2	8	.....	8
Tennessee	.....	5	.....	5	5	30	.....	30
Memphis	.....	5	.....	5	5	30	.....	30
Vermont	.....	1	.....	1	.....	1	1	.....
Burlington	.....	1	.....	1	.....	1	1	.....
Virginia	.....	4	.....	4	4	24	.....	24
Lynchburg	.....	1	.....	1	1	4	.....	4
Norfolk	.....	3	.....	3	3	20	.....	20
Wisconsin	40	2	42	2	33	710	.....	710
Eau Claire	.....	1	.....	1	1	2	.....	2
Milwaukee	40	.....	42	.....	31	700	.....	700
Racine	.....	1	.....	1	1	8	.....	8

[1] New York city has 4 separate systems, but all are treated as 1 system.



OUTFIT IN A POLICE STABLE, SHOWING PATROL WAGON ORDERED TO STATION 35.



POLICE PATROL SIGNAL BOX, SHOWING FLASH LIGHT ON TOP OF POST AND SIGNAL BELL BELOW.

In considering the statistics in Table 34 the same limitations as to duplications described in the discussion of Table 27 should be borne in mind. The underground construction for Wilmington, Del., is not shown in this table, as the amount reported was less than five-tenths of a mile.

The statistics reported for the system in Hilo, Hawaii, are shown in Table 31. There were 2 electric police patrol systems reported for the outlying dependencies of the United States, both in Hawaii—1 in Hilo, used only for police purposes, and the other in Honolulu, a combined and interchangeable system.

A very complete equipment for police patrol telegraphing purposes is shown in the illustration. The equipment at police headquarters consists of a police telegraph desk, which is a complete board for the control and charging of storage batteries for the system, for the receipt of police signals, for telephoning between the central and stations on the street, for sending a call to the patrol wagon to respond to a street station, and for operating flash light and bell on street station posts to call patrolmen there to communicate with the office.

The street signaling box is also illustrated. The post shows the flash light on top, as well as the signal bell. Both the light and the bell shown are controlled from the central office in such a manner that they can be made to continuously burn and ring, or made to flash and ring at regular intervals. Any desired code signal can thus be sent. A steady light burning over all of the boxes on any particular signal circuit would mean that all of the officers whose beats were on that circuit were desired to report at their respective boxes. A signal number flashed would mean that some particular officer was desired at a particular box.

The detailed statistics, by states, for electric fire alarm and police patrol signaling systems are presented in Tables 35, 36, and 37.

TABLE 35.—ELECTRIC FIRE ALARM SYSTEMS,

	STATE OR TERRITORY.	Number of systems.	MILES OF LINE CONSTRUCTION.								MILES OF SINGLE WIRE.					NUMBER OF BOXES OR SIGNALING STATIONS.					
			Pole line for wires or cables.		Overhead cables.	Street miles of subways or conduits.		Duct.		Cable in underground subways or conduits.	Total.	Overhead.		In underground subways or conduits.		Signaling.			Telephoning.		
			Owned.	Leased.		Owned.	Leased.	Owned.	Leased.			Open wire on pole or roof line.	In cables.	Open wire.	In cables.	Total.	On poles or posts.	All other.	Total.	On poles or posts.	All other.
1	United States	931	1,915	11,587	93	233	[1]531	302	[1]534	[1]739	35,337	23,794	893	1,003	9,647	40,401	36,529	3,872	496	288	208
2	Alabama	7	2	100							155	155				267	266	1			
3	Alaska	2		8							14	14				25	25		3	3	
4	Arizona	1	6								8	8				16	16				
5	Arkansas	2		21	2		2		5	5	42	26	4		12	62	55	7			
6	California	37	51	346			9		9	3	569	518		6	45	1,113	756	357			
7	Colorado	12	4	66			1		2	3	195	177			18	406	385	21			
8	Connecticut	29	56	337		54	1	58	1	2	911	723		120	68	1,317	1,097	220	10		10
9	Delaware	1	11	8		[2]		[2]		1	38	36			2	83	76	7			
10	Florida	8	7	60							117	117				243	241	2			
11	Georgia	10	4	155		1	10	1	10	15	353	257			96	431	429	2			
12	Idaho	4		25							39	39				80	80				
13	Illinois	32	41	497	3	10	8	10	8	16	795	700	6		89	999	874	125	50	50	
14	Indiana	40	176	436		2	8	2	8	10	1,064	1,020			44	1,528	1,410	118	11	3	8
15	Iowa	19	19	270	1		4		4	12	397	364	2		31	605	569	36	8		8
16	Kansas	6	32	43							90	90				128	126	2			
17	Kentucky	15	12	180							365	365				705	551	154	7	7	
18	Louisiana	7	6	101	5						496	456	40			376	319	57	21	2	19
19	Maine	36	22	264			17		17	17	513	407		3	103	772	705	67			
20	Maryland	4	215	12		27		27		27	730	550			180	688	688		13	13	
21	Massachusetts	119	165	1,831	10	10	118	10	102	82	5,661	3,570	80	471	1,540	5,507	4,858	649	18	8	10
22	Michigan	52	182	473	3	7	61	7	61	70	2,050	1,182	8	9	851	2,205	2,104	101			
23	Minnesota	22	116	224	11	4	28	4	32	35	1,343	827	27		489	1,031	943	88	1		1
24	Mississippi	6	2	43							54	54				142	137	5	10	10	
25	Missouri	3		37							55	55				93	87	6			
26	Montana	6	17	39							60	60				108	104	4			
27	Nebraska	2	8	35	4		3		3	3	91	71	8		12	148	143	5			
28	Nevada	2		22			1		1	1	25	23			2	57	56	1			
29	New Hampshire	27	14	244			1		1	3	392	379			13	585	528	57			
30	New Jersey	61	170	704	3		42		39	32	1,426	1,119	11	23	273	2,268	2,137	131	8		8
31	New Mexico	2		9							14	14				41	41				
32	New York	[3]88	266	1,518	31	63	97	68	94	209	7,298	4,194	589	300	2,215	6,865	5,804	1,061	250	106	144
33	North Carolina	12	7	109	2						146	138	8			289	284	5			
34	North Dakota	3	3	11							15	15				46	45	1			
35	Ohio	52	86	906	3	2	27	2	45	81	4,769	2,370	76		2,323	3,580	3,286	294			
36	Oklahoma	2		25							30	30				46	45	1			
37	Oregon	5		93			15		15	21	190	112			78	239	207	32			
38	Pennsylvania	78	90	673	6	4	1	57	1	4	1,100	1,027	16		57	2,114	2,056	58	38	38	
39	Rhode Island	11	8	222	6		29		29	29	956	361	12		583	771	735	36	8	8	
40	South Carolina	10		80			6		6	4	138	125			13	226	226		18	18	
41	South Dakota	1	1	10							11	11				18	18				
42	Tennessee	8	11	116	1		5		5	15	221	174	2		45	420	414	6			
43	Texas	10	1	243	1		7		7	6	389	372	2	1	14	704	687	17	20	20	
44	Utah	2		29			5		5		51	31		20		97	72	25			
45	Vermont	15	5	113							166	166				288	286	2	2	2	
46	Virginia	10	28	74			13		13	4	234	176		34	24	331	309	22			
47	Washington	11		162			1		1	1	255	253			2	613	608	5			
48	West Virginia	4		84			2		2		119	117		2		185	179	6			
49	Wisconsin	31	71	508	1	49	3	56	3	22	1,161	720	2	14	425	1,501	1,424	77			
50	Wyoming	4		21							26	26				39	38	1			

[1] The total exceeds the sum of the items for the reason that the underground construction in cities reporting less than 1 mile (shown in Table 29) is included in the total for the United States, but not in the figures for the states.

BY STATES AND TERRITORIES: 1907.

Special telephones (number).	Fire alarms received (number).	CENTRAL OFFICE EQUIPMENT FOR SIGNALING PURPOSES ONLY.																				
		Transmitters (number).		Receiving registers of all kinds (number).	Circuits (number).			Telegraph switchboards.		Telephone switchboards.		Battery cells (number).		Engines.				Dynamos.		Electric motors.		Motor generators and dynamotors.		
														Steam.		Gas.								
		Manual.	Automatic.		Receiving.	Transmitting.	Single.	Number.	Total capacity (number of circuits).	Number.	Total capacity (number of drops or jacks).	Primary.	Storage.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	
2,143	96,516	164	286	1,719	2,809	1,470	241	439	3,603	76	2,706	36,179	74,640	6	54	1	3	23	63	26	80	86	91	1
9	1,240	1	4	12	28	3	2	2	12	.....	.....	60	585	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
.....	12	.....	.....	2	2	.....	1	1	2	.....	.....	24	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
.....	100	1	.....	2	1	1	.....	.....	.....	.....	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
2	176	.....	1	5	7	.....	.....	.....	.....	.....	.....	250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
62	2,481	6	12	57	85	44	11	14	99	2	7	689	3,470	.....	.....	.....	.....	4	3	1	1	3	3	6
34	1,402	1	1	13	26	16	3	3	16	3	53	313	540	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
85	1,842	3	12	49	110	66	4	22	123	1	25	1,082	3,285	.....	.....	.....	.....	.....	.....	2	10	3	4	8
.....	70	.....	1	1	6	6	.....	.....	.....	.....	.....	.....	280	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
18	588	3	2	12	12	7	5	3	17	.....	.....	293	266	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
10	1,716	3	5	21	31	17	1	9	44	.....	.....	50	1,097	.....	.....	.....	.....	.....	.....	.....	.....	2	1	11
.....	145	.....	1	6	8	6	1	3	8	.....	.....	49	108	.....	.....	.....	.....	.....	.....	.....	.....	2	3	12
65	1,721	5	8	68	67	20	9	14	112	2	12	582	1,611	1	2	.....	.....	.....	.....	.....	.....	1	1	13
60	3,213	9	11	72	120	60	11	17	81	1	10	1,925	1,563	.....	.....	.....	.....	.....	.....	.....	.....	1	1	14
44	2,295	5	6	36	42	27	9	8	36	2	70	360	1,484	.....	.....	.....	.....	.....	.....	1	1	1	2	15
2	419	.....	2	7	7	1	3	1	2	.....	.....	377	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
39	2,111	3	2	25	41	20	2	4	49	2	57	512	568	.....	.....	.....	.....	.....	.....	.....	.....	2	6	17
61	958	2	2	9	33	24	.....	3	10	2	102	127	1,722	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18
4	1,470	1	4	42	62	44	4	6	54	.....	.....	1,614	1,140	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19
68	1,728	2	.....	11	41	15	.....	2	782	1	180	114	598	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20
387	11,747	18	49	214	413	233	29	73	404	9	167	2,985	15,791	4	47	.....	.....	8	38	5	25	45	22	21
158	4,100	10	13	145	142	61	15	25	144	8	207	1,579	3,798	.....	.....	.....	.....	.....	.....	2	5	.....	.....	22
84	2,678	3	4	35	64	26	10	11	93	4	120	837	2,578	.....	.....	.....	.....	1	1	.....	.....	1	1	23
53	590	2	4	15	17	8	.....	4	18	.....	.....	136	278	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24
11	314	.....	.....	8	8	4	.....	1	4	.....	.....	.....	210	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
5	289	.....	1	9	7	4	1	5	10	.....	.....	162	194	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26
22	459	.....	2	4	8	5	.....	.....	.....	1	5	170	330	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
2	81	.....	.....	3	5	.....	.....	2	9	.....	.....	.....	90	.....	.....	.....	.....	1	1	2	2	.....	.....	28
1	805	.....	5	46	58	52	3	5	24	.....	.....	793	1,356	.....	.....	.....	.....	.....	.....	.....	.....	3	4	29
76	4,764	6	17	116	164	124	14	34	181	5	127	2,554	3,840	.....	.....	.....	.....	1	8	.....	.....	2	2	30
2	91	.....	1	2	2	2	1	.....	.....	.....	.....	12	76	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31
109	21,775	22	34	174	368	176	26	49	590	15	879	8,520	7,919	.....	.....	1	3	1	1	4	25	8	26	32
15	804	3	7	23	31	25	.....	6	22	.....	.....	302	626	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
.....	108	.....	.....	3	4	4	2	.....	.....	.....	.....	85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34
286	7,738	10	21	120	259	104	4	32	174	7	328	2,994	3,683	.....	.....	.....	.....	3	5	2	6	2	2	35
2	330	1	.....	9	6	9	.....	1	8	.....	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
4	339	1	3	18	9	7	3	3	24	1	33	514	542	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
125	2,982	10	12	123	147	74	35	19	95	.....	.....	2,133	3,295	.....	.....	.....	.....	.....	.....	.....	.....	1	3	38
7	1,436	4	6	11	43	22	6	5	66	1	20	407	2,208	.....	.....	.....	.....	.....	.....	1	1	.....	.....	39
2	496	7	1	16	14	5	3	4	16	.....	.....	236	474	.....	.....	.....	.....	1	1	1	1	.....	.....	40
.....	63	.....	.....	1	.....	.....	1	.....	.....	.....	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41
25	1,349	1	2	13	29	20	3	3	19	2	54	319	458	.....	.....	.....	.....	.....	.....	2	1	2	1	42
29	2,105	7	5	21	45	21	1	6	41	2	66	20	1,765	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
2	151	8	2	4	6	11	.....	3	11	2	20	450	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44
1	306	1	3	18	31	14	4	6	21	.....	.....	254	528	.....	.....	.....	.....	.....	.....	2	1	.....	.....	45
17	1,013	1	3	17	36	17	3	3	24	1	10	519	831	1	5	.....	.....	1	3	.....	.....	1	1	46
28	1,944	.....	6	21	51	15	.....	9	34	.....	.....	93	2,003	.....	.....	.....	.....	2	2	1	1	.....	.....	47
16	529	.....	1	9	12	4	.....	1	2	.....	.....	106	168	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48
111	3,295	4	10	65	96	44	9	16	119	2	154	1,324	3,172	.....	.....	.....	.....	.....	.....	.....	.....	6	8	49
.....	148	.....	.....	6	5	2	2	1	3	.....	.....	96	60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50

[2] Underground construction for Delaware is less than five-tenths of a mile.
New York city has 4 separate systems, but all are treated as 1 system.

TABLE 36.—COMBINED AND INTERCHANGEABLE ELECTRIC FIRE

	STATE.	Number of systems.	MILES OF LINE CONSTRUCTION.							MILES OF SINGLE WIRE.					NUMBER OF BOXES OR SIGNALING STATIONS.					
			Pole line for wires or cables.		Overhead cables.	Street miles of subways or conduits.		Duct.		Total.	Overhead.		In underground subways or conduits.		Signaling.			Telephoning.		
			Owned.	Leased.		Owned.	Leased.	Owned.	Leased.	Cable in underground subways or conduits.		Open wire on pole or roof line.	In cables.	Open wire.	In cables.	Total.	On poles or posts.	All other.	Total.	On poles or posts.	All other.
1	United States	48	470	1,412	39	194	206	938	225	500	21,897	9,762	128	76	11,931	10,721	9,165	1,556	2,192	2,070	122
2	California	3	84	66	1	15	11	30	11	26	1,386	945	13	25	403	528	526	2	239	239	
3	Colorado	1	14				3		3	3	69	28			41	85	85				
4	Connecticut	1		12							12	12				26	26				
5	District of Columbia	1	(1)	(1)	(1)	16	60	16	60	76	3,091	(1)	(1)	(1)	3,091	739	656	83			
6	Georgia	1		15							52	52				119	119				
7	Illinois	13	158	450	22	75	15	225	19	88	5,465	3,464	49	6	1,946	3,378	2,510	868	45	45	
8	Kansas	1	18		6						54	42	12			64	40	24	24	24	
9	Kentucky	1	9								16	16				17	16	1	16	16	
10	Massachusetts	7	4	167	3		30		32	35	730	498	27	37	168	731	605	126	4	3	1
11	Michigan	3		50							82	82				149	149		10	10	
12	Missouri	1		80	2		20		26	26	2,479	2,010	14		455	1,184	1,126	58	468	468	
13	Montana	1		26							47	47				90	84	6			
14	Nebraska	1	6		2		2		2	1	25	6	7	8	4	12	12		9	9	
15	New Jersey	2		28			1		2	10	326	62			264	195	195				
16	New York	1		5	1		2		2	2	17	6	2		9	35	34	1			
17	North Dakota	1		8	1		1		1	1	12	8	2		2	23	20	3			
18	Ohio	1		15							30	30				35	35		20	20	
19	Pennsylvania	5	153	400		88	55	667	60	225	7,610	2,260			5,350	2,962	2,678	284	1,317	1,224	93
20	South Dakota	1		4							4	4				15	15				
21	Virginia	1	4	86	1		6		7	7	290	90	2		198	195	95	100	40	12	28
22	Wisconsin	1	20								100	100				139	139				

[1] Not reported.

TABLE 37.—ELECTRIC POLICE PATROL

	STATE.	Number of systems.	MILES OF LINE CONSTRUCTION.							MILES OF SINGLE WIRE.					NUMBER OF BOXES OR SIGNALING STATIONS.					
			Pole line for wires or cables.		Overhead cables.	Street miles of subways or conduits.		Duct.		Total.	Overhead.		In underground subways or conduits.		Signaling.			Telephoning.		
			Owned.	Leased.		Owned.	Leased.	Owned.	Leased.	Cable in underground subways or conduits.		Open wire on pole or roof line.	In cables.	Open wire.	In cables.	Total.	On poles or posts.	All other.	Total.	On poles or posts.	All other.
1	United States	178	265	2,840	274	170	505	180	508	732	13,578	7,420	799	249	5,110	6,999	5,699	1,300	1,695	721	974
2	Alabama	3		43							86	86				86	86		10	10	
3	California	4	5	107							277	277				195	84	111	22	20	2
4	Colorado	2	5	15			1		2	3	168	150			18	110	30	80			
5	Connecticut	9	8	74	2	54	2	58		3	270	176	6	70	18	147	144	3	76	48	28
6	Delaware	1	10	8						1	52	50			2	49	46	3			
7	Florida	3		31							98	98				69	69				
8	Georgia	3	2	64			8		8	8	124	92			32	130	125	5			
9	Illinois	8		203	3	9	10	9	10	16	432	342	7		83	162	85	77	67	60	7
10	Indiana	3	37	25		2	10	2	10	12	359	322			37	170	133	37			
11	Iowa	2	2	22	1						33	31	2			31	31		5	5	
12	Kentucky	1		20							20	20				15	15		15	15	
13	Maine	3		13	1	4	7	4	7	10	84	35	3		46	74	68	6			
14	Maryland	1	24			30		30		30	325	225			100	295	266	29			
15	Massachusetts	33	21	375	93	7	119	11	119	128	1,929	734	343	150	702	1,341	1,293	48	65	47	18
16	Michigan	5	43	41	1	21	1	21	1	23	754	340	2	1	411	321	316	5	6	5	1
17	Minnesota	3		122	50		35		35	124	622	264	100		258	255	170	85			
18	Missouri	2	25	111	22		25		25	25	443	340	52		51	162	162		38	38	
19	Nebraska	1		15	20		3		3	3	126	33	41		52	46	10	36			
20	Nevada	1		8							11	11							10	10	
21	New Hampshire	3	14	35	5		3		3	3	84	68	10		6	20	20		57	48	9
22	New Jersey	15	6	224	4	1	32	1	32	28	797	532	26	11	228	526	515	11	93	93	
23	New York	[1] 22	17	471	22		153		119	147	2,818	1,232	52	16	1,518	949	577	372	972	96	876
24	North Carolina	1		5							9	9							6		6
25	Ohio	15	10	362	38		63		101	101	1,773	986	118		669	722	616	106	160	154	6
26	Oregon	1		9							9	9				25		25			
27	Pennsylvania	12		155		2	2	2	2	4	374	346			28	269	265	4	59	38	21
28	Rhode Island	4		65	2		16		16	17	211	135	3		73	203	203				
29	South Carolina	2	1	22	7		3		3	4	97	55	28		14	71	71				
30	Tennessee	1		45			5		5	5	75	45			30	41	40	1			
31	Vermont	1		6			1		1		13	12		1		22	22				
32	Virginia	2		24			4		4	4	97	73			24	89	89				
33	Washington	4		32							54	54				59	55	4	34	34	
34	West Virginia	1		19							38	38				18	18				
35	Wisconsin	6	35	69	3	40	2	42	2	33	916	200	6		710	327	75	252			

[1] New York city has 4 separate systems, but all are treated as 1 system.

ALARM AND POLICE PATROL SIGNALING SYSTEMS, BY STATES: 1907.

Special telephones (number).	Fire alarms received (number).	CENTRAL OFFICE EQUIPMENT FOR SIGNALING PURPOSES ONLY.																			
		Transmitters (number).		Receiving registers of all kinds (number).	Circuits (number).			Telegraph switchboards.		Telephone switchboards.		Battery cells (number).		Gas engines.		Dynamos.		Electric motors.		Motor generators and dynamotors.	
		Manual.	Automatic.		Receiving.	Transmitting.	Single.	Number.	Total capacity (number of circuits).	Number.	Total capacity (number of drops or jacks).	Primary.	Storage.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	
851	24,203	31	24	327	572	228	2	54	787	76	2,313	7,524	17,035	1	5	5	10	9	27	21	15	1
.....	1,280	1	1	22	28	21	.....	2	30	1	20	684	544	1	5	1	4	2	8	.....	.....	2
2	101	.....	1	1	8	8	.....	1	12	.....	.....	.....	340	.....	.....	.....	.....	.....	.....	.....	.....	3
7	46	.....	1	1	5	.....	.....	2	7	.....	.....	20	34	.....	.....	.....	.....	.....	.....	.....	.....	4
11	897	2	2	16	57	14	.....	10	164	1	100	403	1,303	.....	.....	.....	.....	.....	.....	.....	.....	5
.....	274	.....	1	1	9	6	.....	1	8	.....	.....	.....	131	.....	.....	.....	.....	.....	.....	.....	.....	6
441	10,124	17	1	124	186	41	1	6	128	55	541	1,506	3,057	.....	.....	.....	.....	.....	.....	9	1	7
20	37	.....	.....	6	6	1	.....	.....	.....	1	50	180	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
.....	47	.....	.....	2	2	.....	.....	1	4	.....	.....	.....	70	.....	.....	.....	.....	.....	.....	.....	.....	9
40	863	4	4	14	49	41	.....	8	68	1	5	165	2,350	.....	.....	1	1	2	8	2	3	10
5	268	.....	1	12	12	2	.....	2	8	.....	.....	75	245	.....	.....	.....	.....	.....	.....	.....	.....	11
179	3,260	.....	.....	2	42	20	.....	3	80	2	150	1,227	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
.....	214	.....	1	2	4	.....	.....	1	8	1	4	35	150	.....	.....	.....	.....	.....	.....	.....	.....	13
.....	182	.....	.....	4	1	9	.....	.....	.....	1	11	.....	45	.....	.....	.....	.....	.....	.....	.....	.....	14
.....	197	1	1	13	13	6	.....	2	16	2	40	60	793	.....	.....	.....	.....	.....	.....	3	1	15
.....	106	1	.....	2	4	.....	.....	1	4	.....	.....	143	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
5	78	.....	.....	1	2	2	.....	.....	.....	1	5	.....	86	.....	.....	.....	.....	.....	.....	.....	.....	17
.....	31	.....	.....	1	3	1	.....	1	4	1	3	.....	106	.....	.....	.....	.....	.....	.....	.....	.....	18
141	5,751	4	7	91	121	36	.....	12	222	8	1,334	2,786	6,601	.....	.....	3	5	3	6	6	9	19
.....	42	.....	.....	1	.....	.....	1	.....	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	20
.....	315	1	2	1	10	10	.....	1	24	1	50	200	890	.....	.....	.....	.....	2	5	1	1	21
.....	90	.....	1	10	10	10	.....	.....	.....	.....	.....	.....	290	.....	.....	.....	.....	.....	.....	.....	.....	22

SYSTEMS, BY STATES: 1907.

Special telephones (number).	CENTRAL OFFICE EQUIPMENT FOR SIGNALING PURPOSES ONLY.																			
	Transmitters (number).		Receiving registers of all kinds (number).	Circuits (number).			Telegraph switchboards.		Telephone switchboards.		Battery cells (number).		Gas engines.		Dynamos.		Electric motors.		Motor generators and dynamotors.	
	Manual.	Automatic.		Receiving.	Transmitting.	Single.	Number.	Total capacity (number of circuits).	Number.	Total capacity (number of drops or jacks).	Primary.	Storage.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	Number.	Horsepower.	
843	92	82	381	888	491	15	90	527	161	2,556	12,861	8,163	1	1	2	2	3	7	11	10	1
.....	1	.....	3	12	1	.....	.....	.....	3	14	163	48	.....	.....	.....	.....	.....	.....	.....	.....	2
.....	.....	21	6	17	14	.....	4	18	2	67	84	582	.....	.....	.....	.....	.....	.....	.....	.....	3
.....	.....	.....	10	10	2	.....	2	12	1	40	.....	206	.....	.....	.....	.....	.....	.....	.....	.....	4
2	1	.....	10	33	8	1	3	15	10	132	663	183	.....	.....	.....	.....	.....	.....	.....	.....	5
2	.....	.....	2	4	4	.....	1	4	.....	.....	75	142	.....	.....	.....	.....	.....	.....	.....	.....	6
.....	1	1	3	9	5	1	1	4	2	8	92	128	.....	.....	.....	.....	.....	.....	.....	.....	7
3	3	.....	4	16	9	.....	3	17	3	19	350	186	.....	.....	.....	.....	.....	.....	.....	.....	8
12	1	1	12	32	22	1	2	9	6	112	49	419	.....	.....	.....	.....	.....	.....	.....	.....	9
62	.....	.....	7	20	.....	.....	4	20	.....	.....	18	336	.....	.....	.....	.....	.....	.....	.....	.....	10
21	.....	.....	5	5	2	.....	2	6	.....	.....	45	40	.....	.....	.....	.....	.....	.....	.....	.....	11
.....	1	.....	1	2	2	.....	.....	.....	1	3	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
.....	.....	1	3	8	.....	1	2	8	1	4	128	174	.....	.....	.....	.....	.....	.....	.....	.....	13
300	.....	32	11	33	33	.....	1	6	32	64	500	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
159	41	19	71	201	148	1	19	194	17	104	2,819	1,207	.....	.....	.....	.....	.....	.....	.....	.....	15
56	.....	.....	27	37	37	1	.....	.....	5	222	75	810	.....	.....	.....	.....	1	4	2	2	16
19	11	.....	13	16	12	.....	3	16	2	70	112	350	.....	.....	.....	.....	.....	.....	.....	.....	17
25	6	.....	10	18	.....	.....	9	18	3	79	450	360	.....	.....	.....	.....	.....	.....	.....	.....	18
2	.....	.....	6	6	.....	.....	.....	.....	1	20	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	19
.....	.....	.....	1	10	10	.....	.....	.....	1	10	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	20
.....	2	.....	3	10	10	.....	.....	.....	3	15	228	.....	.....	.....	.....	.....	.....	.....	.....	.....	21
20	5	2	29	78	27	.....	9	38	9	163	1,489	244	.....	.....	.....	.....	.....	.....	.....	.....	22
42	5	.....	66	75	63	6	4	27	19	650	3,247	575	1	1	1	1	1	1	5	5	23
.....	.....	.....	1	1	.....	.....	.....	.....	1	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24
56	2	1	32	106	34	.....	6	50	12	300	366	661	.....	.....	.....	.....	.....	.....	1	1	25
.....	.....	.....	1	3	.....	.....	1	4	.....	.....	.....	90	.....	.....	.....	.....	.....	.....	.....	.....	26
11	4	2	14	30	19	2	4	16	9	79	352	556	.....	.....	.....	.....	.....	.....	.....	.....	27
16	1	1	4	15	8	.....	2	7	4	20	1,046	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
.....	1	.....	2	8	1	.....	1	4	2	8	.....	96	.....	.....	1	1	1	2	.....	.....	29
.....	1	.....	1	4	4	.....	.....	.....	1	50	110	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
.....	1	.....	1	4	4	.....	1	4	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	31
3	2	.....	4	15	3	.....	3	16	4	21	180	38	.....	.....	.....	.....	.....	.....	.....	.....	32
3	2	.....	5	10	2	.....	2	8	4	170	12	314	.....	.....	.....	.....	.....	.....	.....	.....	33
2	.....	1	1	1	1	.....	.....	.....	.....	.....	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	34
27	.....	.....	12	39	6	1	1	6	3	102	98	220	.....	.....	.....	.....	.....	.....	3	2	35