
TELEGRAPHS

TELEGRAPHS.

INTRODUCTION.

The statistics of the fourth census of telegraphs, which are presented in this report, relate to the calendar year 1912. The commercial companies or systems included are those operated in continental United States (the United States exclusive of Alaska and the insular possessions); but the statistics of governmental lines shown in separate tables include land, cable, and wireless systems wherever located. The incidental telegraph business done by telephone companies is not covered by the statistics; nor are any figures given for the traffic of newspapers or press associations carried on over private or leased wires.

The first census of telegraphs, that of 1880, covering the year 1879, did not include ocean cable systems, and the figures are not comparable with the results of the census of 1912. The second census, which related to 1902, embraced both land telegraphs and ocean cable systems, but not wireless telegraphy, as at that time no regular commercial wireless service had been established.

The third census, that of 1907, covered all three kinds of systems—land, ocean cable, and wireless—but

with a separate showing for wireless only. It has been possible, however, to segregate to some extent the statistics for land telegraphs and ocean cables, and they are presented separately in comparison with those for the present or fourth census, that of 1912.

In order to avoid the disclosure of amounts reported by individual companies it has been necessary to combine for the various censuses some items in the balance-sheet parts of the summaries in a manner that may not be in harmony in every instance with up-to-date accounting methods.

The reports for the census of 1912 were made before the accounting system formulated by the Interstate Commerce Commission was in force. This system was inaugurated January 1, 1914, and in future census reports certain changes may be made in the form of presentation, for the sake of conformity with the new system.

COMBINED LAND AND OCEAN TELEGRAPHS.

A summary for land telegraph and ocean cable systems combined, for 1912, 1907, and 1902, is presented in Table 1.

LAND AND OCEAN TELEGRAPH SYSTEMS COMBINED: 1912, 1907, AND 1902.

Table 1	1912	1907	1902	PER CENT OF INCREASE. ¹		
				1902-1912	1907-1912	1902-1907
Number of companies or systems.....	227	226	25	8.0	3.8	4.0
Miles of pole line.....	² 247,528	³ 239,646	³ 237,990	4.0	3.3	0.7
Miles of single wire owned and leased.....	⁴ 1,814,196	⁴ 1,577,961	⁴ 1,318,350	37.6	15.0	19.7
Nautical miles of ocean cable.....	67,676	46,301	16,677	305.8	46.2	177.6
Number of messages.....	109,377,698	103,794,076	91,655,287	19.3	5.4	13.2
Number of telegraph offices.....	30,864	29,110	27,377	12.7	6.0	6.3
Income, total.....	\$64,762,843	\$51,583,868	\$40,930,038	58.2	25.5	26.0
Telegraph traffic.....	\$60,403,009	\$45,255,187	\$35,300,569	71.1	33.5	28.2
All other sources.....	\$4,359,834	\$6,328,681	\$5,629,469	-22.6	-31.1	12.4
Net income.....	\$6,383,891	\$9,704,255	\$9,982,004	-36.0	-34.2	-2.8
Expenses, total.....	\$58,378,952	\$41,879,613	\$30,948,034	88.6	39.4	35.3
General operation and maintenance, including salaries and wages and legal expenses.....	⁵ \$46,780,041	\$34,057,298	\$24,455,511	91.3	37.4	39.3
Interest and taxes.....	\$3,955,381	\$3,436,690	\$2,539,008	55.8	15.1	35.4
All other expenses.....	\$7,643,530	\$4,385,625	\$3,953,515	93.3	74.3	10.9
Balance sheet:						
Assets, total.....	\$298,288,906	\$261,807,899	\$195,503,775	52.6	13.9	33.9
Construction and equipment.....	\$222,046,746	\$210,045,959	\$161,679,579	37.3	5.7	29.9
Stocks and bonds of other companies.....	⁶ \$3,933,679	⁶ \$36,486,446	\$25,939,944	30.8	-7.0	40.7
Cash and current assets, including supplies and sundries.....	⁷ \$42,308,481	\$15,275,494	\$7,884,252	436.6	177.0	93.7
Liabilities, total.....	\$298,288,906	\$261,807,899	\$195,503,775	52.6	13.9	33.9
Capital stock.....	⁸ \$163,645,810	\$155,089,575	\$117,053,525	39.8	5.5	32.5
Funded debt.....	\$62,741,000	\$65,204,000	\$45,893,000	36.7	-3.8	42.1
Reserves.....	\$20,803,780	\$8,257,963	\$7,859,648	164.7	151.9	5.1
Accounts payable ⁹	\$19,755,480	\$10,411,379	\$6,244,585	216.4	89.7	66.7
Dividends, interest, and taxes due and accrued, and sundries.....	¹⁰ \$15,492,888	\$2,519,043	\$373,976	4,042.7	515.0	573.6
Net surplus.....	\$15,849,948	\$20,325,939	\$18,079,041	-12.3	-22.0	12.4
Capitalization:						
Capital stock outstanding, par value.....	\$163,645,810	\$155,089,575	\$117,053,525	39.8	5.5	32.5
Dividends on stock.....	\$6,180,061	\$7,477,083	\$6,256,693	-1.2	-17.3	19.5
Funded debt outstanding, par value.....	\$62,741,000	\$65,204,000	\$45,893,000	36.7	-3.8	42.1
Employees and salaries and wages:						
Average number.....	¹¹ 37,295	28,034	27,627	35.0	33.0	1.5
Salaries and wages.....	\$24,964,994	\$17,808,249	\$15,039,673	66.0	40.2	18.4

¹ A minus sign (-) denotes decrease.

² Commercial Cable Company of Cuba (not reporting in 1902) counted as a separate company in both 1912 and 1907.

³ Exclusive of pole line wholly owned and wholly operated by railway companies.

⁴ Exclusive of wire wholly owned and wholly operated by railway companies. This in 1912 amounted to 314,329 miles; in 1902 included mileage operated outside of the United States by Western Union Telegraph Co.

⁵ Includes charges for depreciation.

⁶ Includes treasury stock and "other permanent investments."

⁷ Includes sinking funds and stock and bond discounts.

⁸ Includes assumed stock of subcompanies.

⁹ Includes floating debt and cash investments (for unincorporated companies).

¹⁰ Includes deferred noninterest-bearing obligations payable only on determination of leases (not reported at previous censuses) and real-estate mortgages.

¹¹ Number employed Sept. 16, 1912.

The total expenses show a higher rate of increase, both for the decade 1902-1912 and for the two five-year periods, than the total income, there being no very marked differences between the figures for the two periods. The number of employees and the amount paid in salaries and wages, however, increased much more rapidly between 1907 and 1912 than between 1902 and 1907. The rate of increase in salaries and wages for the decade was greater than the rate of increase in income, but less than the rate of increase in total expenses.

The reduction between 1907 and 1912 in total dividends paid and that in profit and loss surplus are accounted for, respectively, by the reduced rate of dividend declared by the Western Union Telegraph Co. and the large increase in the reserves reported by the Western Union Telegraph Co. and the Commercial Cable Co.

The number of messages sent by the commercial land and ocean telegraph companies in continental United States during the calendar year 1912 was 114 for each 100 of the population estimated for July 1, 1912. These figures may be compared with 203 per 100 for Great Britain and Ireland, 163 for France, 91 for Germany, 75 for Austria, and 52 for Italy. The calculations of foreign averages are based upon censuses of population taken in 1911, except for Germany and Austria, for which countries the latest figures relate to 1910.

LAND TELEGRAPHS.

Commercial systems.—Statistics for the following companies are included in this report:

Adirondack, Lake George & Saratoga, of Albany, N. Y.
 Angels, of Angels Camp (San Andreas), Cal.
 Bridgton, of Portland, Me.
 California & Oregon, of Susanville, Cal.
 Chicago & Milwaukee, of Chicago, Ill.
 Colorado & Wyoming, of Denver, Colo.
 Continental, of Montana.
 Great Northwestern, of Toronto, Canada. (Lines in the United States.)
 Louisburg, of Franklinton, N. C.
 Martha's Vineyard, of Woods Hole, Mass.
 Mountain, of Denver, Colo.
 North American, of Minneapolis, Minn.
 Northern, of Bangor, Me.
 Pittsboro, of Pittsboro, N. C.
 Philadelphia, Reading & Pottsville, of Philadelphia, Pa.
 Postal Telegraph Cable Co., of Texas.
 Postal Telegraph Cable System.
 Sierra, of Jamestown, Cal.
 Stock Quotation, of New York City.
 Vermont International, of St. Johnsbury, Vt.
 Western Union.

Included in the list of companies just given are eight that did not report in 1907, while seven of those reporting in 1907 were no longer in business in 1912. Of the companies reporting for the first time in 1912, one was a Canadian company operating in part in the United States. Only its business in the United States is included, however, and as the balance-sheet items could not be segregated, they have been omitted.

The Western Union Telegraph Co. and the Postal Telegraph Cable Co. were each enumerated as one system. Complete separate reports were secured for the ocean cable companies and the land telegraph companies controlled by the Mackay companies and constituting the Postal System. The Western Union Telegraph Co., however, made separate reports for its land and cable lines only with respect to the number of messages and the number of miles of wire or cable. For this reason, all the financial statistics for the Western Union System, as well as the total number of employees and the total amount paid for salaries and wages, are included in the statistics for land-telegraph systems.

Some of the companies reporting are subsidiary to railway companies, yet they do a commercial business and are therefore included.

The following summary presents statistics for the commercial land telegraphs for 1912 and 1907:

Table 2	LAND TELEGRAPH SYSTEMS.		
	1912	1907	Per cent of increase. ¹
Number of companies or systems.....	21	20	5.0
Miles of pole line.....	² 247,528	² 239,646	3.3
Miles of single wire owned and leased.....	³ 1,814,196	1,577,961	15.0
Number of messages ⁴	106,532,530	101,424,759	5.0
Number of telegraph offices.....	30,781	29,056	5.9
Income, total.....	\$56,293,469	\$43,912,168	28.2
Telegraph traffic.....	\$52,337,211	\$37,916,907	38.0
All other sources.....	\$3,956,258	\$5,995,261	-34.0
Net income.....	⁵ \$3,431,044	\$5,675,181	-39.5
Expenses, total.....	\$52,862,425	\$38,236,987	38.2
General operation and maintenance, including salaries and wages and legal expenses.....	⁶ \$42,771,823	\$31,852,359	34.3
Interest and taxes.....	\$2,740,827	\$2,246,382	22.0
All other expenses.....	\$7,349,775	\$4,138,246	77.6
Balance sheet:			
Assets, total.....	\$190,705,751	\$166,183,007	14.8
Construction and equipment.....	\$143,910,631	\$132,607,620	8.5
Stocks and bonds, including "other permanent investments" ⁷	⁷ \$17,122,592	\$23,514,882	-27.2
Cash and current assets, including supplies and sundries.....	⁸ \$29,672,528	\$10,060,505	194.9
Liabilities, total.....	\$190,705,751	\$166,183,007	14.8
Capital stock.....	⁹ \$108,156,410	\$102,289,575	5.7
Funded debt.....	\$34,741,000	\$37,204,000	-6.6
Reserves.....	\$5,254,329	\$1,876,858	180.0
Accounts payable ¹⁰	\$18,295,683	\$7,916,138	131.1
Dividends, interest, and taxes due and accrued.....	\$1,460,733
Sundries.....	¹¹ \$13,444,926	\$66,692
Net surplus.....	\$9,352,670	\$16,829,744	-44.4
Capitalization:			
Capital stock outstanding, par value.....	\$108,156,410	\$102,289,575	5.7
Dividends on stock.....	\$3,139,861	\$4,944,042	-36.5
Funded debt.....	\$34,741,000	\$37,204,000	-6.6
Employees and salaries and wages:			
Average number.....	¹² 35,639	26,827	32.8
Salaries and wages.....	\$23,797,980	\$16,893,166	40.9

¹ A minus sign (-) denotes decrease.

² Exclusive of pole line wholly owned and used by railway companies.

³ Does not include 22,816 nautical miles of ocean cable operated by the Western Union Telegraph Co. Exclusive also of 314,329 miles of wire wholly owned and operated by railway companies for their own business.

⁴ Does not include land messages sent over its 207 miles of leased land wire by a wireless company in 1912, nor ocean cable messages except those reported by the Western Union Telegraph Co.

⁵ Less all expenses, including charges for depreciation.

⁶ Includes charges for depreciation, which were not included in expenses in 1907.

⁷ Includes treasury stock.

⁸ Includes sinking fund and stock and bond discount.

⁹ Includes assumed stock of subcompanies.

¹⁰ Includes floating debt and cash investments (for unincorporated companies).

¹¹ Includes deferred noninterest-bearing obligations payable only on determination of leases, and real-estate mortgages.

¹² Number employed Sept. 16, 1912.

The number of wage earners does not include operators employed in telegraph offices at railway stations and doing work for both the railway and the telegraph company. But the telegraph companies claim that these operators, although paid by the railway com-

panies, are constructively the employees of the telegraph companies in the receipt and dispatch of their messages. In payment for the services of many of these operators the railways have the benefit of telegraphing without charge.

The number of offices operated solely by the companies reporting was 4,534, these being included in the total of 30,781 shown in the table. The inquiries concerning this feature of the census in 1907 were worded thus: "Total number of telegraph offices, including railway offices, whether operated solely or only in part for the business of the telegraph company," and "Total number of telegraph offices in railway stations." In 1912 the first inquiry remained the same, but the second was phrased thus: "Total number of telegraph offices operated solely by the respondent."

If it be assumed that all telegraph offices operated solely by the respondent companies were outside of railway stations in 1912, a comparison can be made with the 1907 figures:

Total number of offices, 1912.....	30,781
Total number of offices, 1907.....	29,056
Number in railway stations, 1912.....	26,247
Number in railway stations, 1907.....	22,282

In accepting these figures, however, the different wordings of the second inquiry must be given due consideration.

Some of the most important telegraph companies stated that it was impossible to furnish statistics of the number, and salaries and wages, for the different classes of employees; therefore only the totals for all employees are given in comparison with similar totals for prior censuses. The combined total shows a considerable increase over that for 1907, and the amount paid for salaries and wages represents a still greater relative increase.

The difference in the systems of accounting employed in 1907 and 1912 to some extent invalidates comparison of the expense accounts. No statement was made in 1907 of charges for depreciation or for sinking fund. The net income shown for the year 1912 is the gross income less all expenses, including charges for depreciation. The effect of the difference in methods at the two censuses is shown in the apparent reduction of the net income by over one-third.

A number of the companies could not furnish separate figures for messages sent free or at reduced rates and those at full commercial rates, but 11 of the land systems, including the Western Union, reported 21,930,329 messages free or at reduced rates and 56,460,500 messages sent at full commercial rates during 1912.

The comparable items of the balance sheet indicate a considerable decrease in the holdings of stocks and bonds and a great increase in the reserves reported

as liabilities. The material reduction in net surplus is due in part to the growth of the reserves. The cost shown for construction and equipment of lines was greater in 1912 in proportion to capital outstanding than in 1907; and while the capital stock increased, the amount paid in dividends decreased because of the Western Union Telegraph Co.'s reduction in rates.

Progress in the telegraph industry for 1912 was in the reinforcement of operating equipment and in standardization of apparatus and line materials, while there was apparently an improved supervision and regulation of the traffic.

While the Wheatstone Automatic, the Buckingham-Barclay, and the Morkrum telegraph printers are already in considerable use in the actual transmission of messages over the telegraph wires of this country, it remains a noteworthy fact that approximately 90 per cent of the traffic is still handled by Morse operators on simplex, duplex, and quadruplex circuits. The original Morse telegraph system, after half a century of use, still exists as the most general means of handling telegraph business virtually the world over.

This report takes no recognizance of the enormous number of messages sent over the wires owned by telegraph companies and leased to the various newspaper press associations. While the miles of leased wire used for this service are included in the statistics, no attempt was made at this or prior censuses to collect data concerning the number of messages. This branch of the telegraph business was inaugurated in 1874, and with the great increase in the newspaper interests of the country it has developed very rapidly. The class of the service, however, precludes very largely the possibility of collecting accurate statistics concerning it.

That there was a substantial increase in net earnings from operation and in gross and net income from all sources, is shown by the details of the revenue and income account, presented in Table 3.

ACCOUNT.	1912		Per cent of increase. ¹
	1912	1907	
Gross receipts from operation.....	\$52,337,211	\$37,916,907	38.0
Operating expenses.....	45,527,564	34,205,745	33.1
Net earnings from operation.....	6,809,647	3,711,162	83.5
Income from other sources.....	3,956,258	5,995,261	-34.0
Interest on bonds and dividends on stock of other companies.....	375,903	1,081,619	-65.2
Leased telegraph lines, wires, and conduits.....	2,419,065	4,430,245	-45.4
Real-estate rentals.....	191,154	210,014	-9.0
Miscellaneous ²	970,136	273,383	254.9
Gross income less operating expenses.....	10,765,905	9,706,423	10.9
Deductions from income (fixed charges).....	7,334,861	4,031,242	82.0
Taxes.....	1,132,234	753,378	50.3
Interest.....	1,608,593	1,493,004	7.7
Payments for use of leased lines.....	4,594,034	1,784,860	157.4
Net income.....	3,431,044	5,675,181	-39.5
Dividends on stock.....	3,139,861	4,944,042	-36.5
Surplus.....	291,183	731,139	-60.2

¹ A minus sign (—) denotes decrease.

² Including interest.

While receipts from operation increased by nearly two-fifths, the income from other sources, chiefly from leased telegraph lines, wires, and conduits, decreased by more than one-third; but the increase in total income was \$12,381,301, or 28.2 per cent.

The increase in expense of operation, although considerable, was not so large as the increase in receipts; therefore the gross income, less operating expenses, shows a gain of nearly 11 per cent. Fixed charges, however, were swelled by larger payments for leased lines, due to the leasing in 1911 of the lines and ocean cables of the Anglo-American Telegraph Co. and the Direct United States Cable Co., and to a still greater extent by the annual reserve for depreciation and sinking funds, not included in 1907. A considerable decrease is therefore shown in net income. It is notable that the amount paid in dividends was less than in 1907; this is due to a reduction in the Western Union Telegraph Co.'s rate. Within the five-year period, however—in 1908—stock dividends amounting to \$2,447,100 were paid by this company.

Table 4 gives statistics pertaining to the operating expenses of land telegraph systems for 1912 and 1907.

ACCOUNT.	LAND TELEGRAPH SYSTEMS—OPERATING EXPENSES.		
	1912	1907	Per cent of increase. ¹
Total.....	\$45,527,564	\$34,205,745	33.1
General operation and maintenance.....	42,771,823	31,852,359	34.3
Salaries and wages.....	23,797,980	16,893,166	40.9
Operation and maintenance, including legal expenses.....	15,269,031	14,959,193	2.1
Charges for depreciation.....	3,704,812
Rentals of offices and other real estate.....	2,247,311	1,596,456	40.8
Rentals of conduits and underground privileges.....	101,035	5,920	1,606.7
Payments for telegraph traffic made to other companies.....	228,907	667,501	-65.7
Miscellaneous.....	178,488	83,509	113.7

¹ A minus sign (-) denotes decrease.

The proportion of the operating expenses represented by payments for salaries and wages increased from 49.4 per cent of the total in 1907 to 52.3 per cent in 1912.

The greater payments to other companies for the use of leased lines, shown in the revenue and income account, explain in part the decrease shown here in payments to other telegraph companies for traffic over lines operated by them.

Table 5, the first of the three given below, shows the mileage of line and of single wire along railroad right of way in 1912, as compiled from the reports to the Interstate Commerce Commission. Table 6 names the principal commercial companies owning lines along railroad right of way, with the mileage reported. Table 7 compares the totals, 1912 and 1902, for all telegraphs along railroad right of way, whether owned by railways, jointly by railways and commercial companies, or by commercial companies alone. These figures are reported by the railways and not by the

telegraph companies or other owners; it is possible, therefore, that the data may not be complete.

	Railway telegraphs—Line and wire along railway right of way: 1912.
Number of lines or systems reporting.....	619
Miles of single track.....	1,256,162
Miles of line, total.....	221,887
Owned—	
By railway companies.....	66,797
Jointly by railway and telegraph companies.....	20,596
By telegraph and other companies not railway.....	134,494
Operated—	
By railway companies.....	85,084
Jointly by railway and telegraph companies.....	41,754
By telegraph and other companies.....	95,049
Miles of single wire, total.....	1,295,873
Owned—	
By railway companies.....	395,493
Jointly by railway and telegraph companies.....	78,810
By telegraph and other companies.....	821,570
Operated—	
By railway companies.....	429,483
Jointly by railway and telegraph companies.....	153,520
By telegraph and other companies.....	707,870
Wholly owned and wholly operated by railway companies.....	314,329
Telegraph operators and dispatchers:	
Number.....	42,548
Wages.....	\$34,890,615

¹ Trackage in the United States of all roads reporting to the Interstate Commerce Commission in 1912.

COMPANY.	RAILWAY TELEGRAPHS—LINE AND WIRE OWNED BY COMPANIES OTHER THAN RAILWAY: 1912.	
	Miles of line.	Miles of single wire.
Total.....	134,494	821,570
Western Union Telegraph Co.....	124,559	752,935
Postal Telegraph-Cable Co.....	4,209	44,164
North American Telegraph Co.....	461	8,592
Great Northwestern Telegraph Co.....	936	3,834
Philadelphia, Reading & Pottsville Telegraph Co.....	491	2,447
Great Northern Telegraph Co.....	670	2,115
Other companies (Pipe line, coal, "other telegraph companies," municipalities, etc.).....	3,168	7,483

	RAILWAY TELEGRAPHS.		
	1912	1902	Per cent of increase. ¹
Number of lines or systems reporting.....	619	684	-9.5
Single-track miles.....	256,162	204,503	25.3
Miles of single wire.....	1,295,873	1,127,186	15.0
Owned by company reporting.....	395,493	242,837	62.9
Owned by another company.....	2,900,380	884,349	1.8
Telegraph operators and dispatchers:			
Number.....	42,548	30,338	40.3
Wages.....	\$34,890,615	\$20,040,730	74.1

¹ A minus sign (-) denotes decrease. ² Including wire owned jointly.

At the census of 1907 the Bureau of the Census collected directly from the railways certain statistics concerning telegraphs. This in a measure duplicated the statistical work of the Interstate Commerce Commission, and it was decided at the census of 1912 to use only the statistics collected by the commission. A similar arrangement had been made for 1902. Therefore the statistics for 1907 are not comparable with those for the other censuses, and they are omitted from Table 7, which presents comparable data for 1902 and 1912.

The figures show that the railways in 1912 operated more telegraph wire than they owned, and that a greater mileage was operated jointly than was owned jointly. There is no way of ascertaining from the

returns whether the wire wholly owned and wholly operated by railways in 1912 was greater or less than in 1902; but the proportion of wire thus owned and operated in 1912 was nearly one-fourth (24.3 per cent) of the total mileage reported.

The mileage of line and wire owned by the different telegraph companies along railroad right of way is of much public interest. It is not surprising that the figures show that the Western Union Telegraph Co. owns by far the greatest mileage. Of the total mileage of line reported owned by telegraph and other companies, not railway, the Western Union is credited with 92.6 per cent, and of the total wire mileage, 91.6 per cent. It is an interesting fact that among the other corporations not shown by name in the table—pipe-line companies, coal companies, etc.—the city of Cincinnati is included, having 336 miles of pole line and 1,068 miles of single wire along the Cincinnati, New Orleans & Texas Pacific Railway. This line is operated by the railway.

The most notable fact about the comparative showing, 1902-1912, is the increase in miles of single wire reported owned by railways—152,656 miles, or 62.9 per cent. This mileage can not be compared with that shown for 1907 in the census report covering that year, the bases of the calculations being different, as already stated. The wire mileage owned by companies other than the railway companies reporting includes that owned jointly by railway and telegraph companies. The increase during the decade was small.

Among interesting developments in railway telegraphy is the use of the telautograph—a writing or copying telegraph for reproducing writings or drawings at a distance to give notice of arrival and departure of trains, train numbers, and time. The notices are written by the towermen and dispatchers and transmitted simultaneously to various parts of the stations.

Train dispatching by telephone.—A special effort was made by the Bureau of the Census to secure statistics relative to train dispatching by telephone from railways known to dispatch trains in this manner. The results of these returns are given in Table 8.

	Railway telephones—Train dispatching: 1912.
Number of lines and systems reporting.....	42
Miles of pole line.....	56,850
Miles of single wire.....	129,856

The telephone circuits are almost altogether metallic, and therefore the mileage of single wire is double the mileage of single line covered. Some pole lines carry more than one circuit. These 42 lines or systems, statistics for which are shown in Tables 8 and 9, are the principal ones in the United States.

Of the wire mileage, 17,837 miles was used jointly for telephone and telegraph purposes. In addition, 3,243 miles of pole line and 5,704 miles of wire were

used for "blocking" trains only, but part of this wire was reported by a railway not included with the 42 lines or systems, all line and wire reported by it being used for blocking purposes only.

Also, in addition, 6,659 miles of pole line and 20,006 miles of wire were reported used for messages, reports, and conversations only.

One railway reported that it dispatched no trains by telephone in 1912, but that in 1913 it had three telephone dispatching circuits, covering 379.5 miles. Another reported that since the close of 1912 it had added to its telephone dispatching circuits 330 miles of line or 660 miles of wire.

The Telegraph and Telephone Age of May 16, 1913, published a statement showing the mileage of railways in the United States and Canada, over which trains were operated by telephone. The total mileage represented was 186,479; over 63,960 of this trains were telephonically dispatched. The deduction of the Canadian mileage reduces the latter figure to 56,602. The census figure for the mileage of line operated by telephone (56,850) represents substantially this amount.

At the census of 1907 statistics were secured for telephone lines used in the operation of railways. While some of the pole mileage and much of the wire mileage were doubtless used for purposes other than the dispatching of trains, the figures may be considered fairly comparable with those for 1912. This comparison is made in Table 9.

	RAILWAY TELEPHONES—TRAIN DISPATCHING.		
	1912	1907	Per cent of increase.
Pole line, miles.....	56,850	8,249	589.2
Owned.....	50,581	6,896	666.8
Leased.....	6,269	1,653	279.2
Single wire, miles.....	129,856	52,518	147.3
Owned.....	119,079	47,433	151.0
Leased.....	10,777	5,085	111.9

The increase shown for the five years was not unexpected. The pole-line mileage reported for 1912 is nearly seven times as great as that reported for 1907. The real increase in wire mileage is much more than that here shown, as the figures for 1907 included wire used, doubtless, for all kinds of telephoning, in addition to that used for train dispatching only.

GOVERNMENTAL TELEGRAPHS AND TELEPHONES.

The commercial business over the governmental military and commercial telegraph and telephone land and cable lines shows a considerable growth in Panama and the Philippines during 1907-1912. The Alaskan lines, introduced of necessity by the War Department to control scattered military posts, have also continuously served commercial purposes. Table 10 summarizes the statistics for certain governmental lines in Panama, Porto Rico, Alaska, and the Philippine Islands for 1912 and 1907.

Table 10

	GOVERNMENTAL TELEGRAPH AND TELEPHONE SYSTEMS.							
	Panama Canal Zone.		Porto Rico.		Alaska.		Philippine Islands.	
	¹ 1912	1907	¹ 1912	1907	¹ 1912	² 1907	³ 1912	² 1907
Miles of line construction.....	82	65	405	484	1,069	1,403	4,599	6,438
Miles of single wire.....	3,234	2,204	1,137	774	4,090	2,524		1,437
Miles of submarine cable.....					2,646			
Employees and salaries and wages:								
Number.....	⁵ 168	60	143	132	⁶ 259			
Salaries and wages.....	(7)	\$43,800	\$53,620	\$41,101	\$177,203			
Expenses, total, including salaries and wages.....	\$67,070	\$50,988	\$69,566	\$51,945	\$350,000	\$179,000		
Income.....	\$1,731	\$7,818	\$71,628	\$59,226	\$183,769	⁸ \$236,912	\$236,679	
Number of messages.....	(9)	91,401	247,860	216,489	¹⁰ 140,343	¹¹ 310,000	657,404	472,418

¹ Year ending June 30, 1913.² From report of Chief Signal Officer, United States Army, for year ending June 30, 1907.³ From report of secretary of commerce and police for year ending June 30, 1912.⁴ Includes cable, not segregated in report.⁵ From report of the Panama Railroad Co., June 30, 1913.⁶ Includes 124 enlisted men, United States Army.⁷ Salaries and wages not reported separately.⁸ Exclusive of Government business to the value of \$135,746.⁹ Figures not available.¹⁰ Includes 87,729 commercial messages.¹¹ Includes 260,000 commercial messages.

Panama Canal Zone.—The land telephone and telegraph facilities for the United States Government are all maintained or operated by the Panama Railroad Co. Some details for the year concerning these enterprises can be found in the annual report of the railroad company for the fiscal year ending June 30, 1913, pages 20-23, and Exhibit P, opposite page 60; also in various numbers of the Canal Record, published weekly at Ancon under the authority of the Isthmian Canal Commission. An article by W. F. Henkel, published in the Telephone Review and reproduced by the Telegraph and Telephone Age, December 16, 1912, page 823, is of value. Table 10 shows the few statistics that can be utilized from the information sent the Bureau of the Census by the Panama Railroad Co. The expenses during the year were divided as follows:

Maintenance.....	\$7,626
Dispatching trains.....	49,721
Telephone and telegraph operation.....	9,723

The small income of \$1,731 shows the smallness of the commercial traffic handled, most of it in connection with business beyond the lines. No distinction is made between telegraph and telephone accounts.

In addition to the telephone system operated for the Government work, there are two independent telephone companies on the isthmus. The Isthmian Telephone Co. operates exchanges at Colon and at Panama city. The other company is in Panama city and furnishes local service only.

Porto Rico.—The government telegraph and telephone system in Porto Rico in 1912 extended to 65 municipalities, according to the report of the governor. During 1912 much of the pole line was reconstructed with creosoted pitch pine and iron. A metallic circuit was substituted for the grounded telephone line between Caguas and Humacao, and arrangements were in progress for the compositing of several telegraph lines so that they could be used for both telegraphing and telephoning. The sum of \$15,395.50 was expended for reconstruction and extension of all lines during the fiscal year ending June 30, 1912. The figures in Table 10, which include also those for telephones, show an increase over 1907 in all items except mileage of line. The total number of messages

handled in 1912 (fiscal year ending June 30, 1913) was 247,860, an increase of 14.5 per cent over the number (216,489) reported for 1907.

Washington-Alaska Military Cable and Telegraph system.—The Alaskan system of telegraphs is connected with the United States proper by a cable from Sitka to Seattle, Wash. It was established in 1900 by the Signal Corps of the Army as a military measure in order to connect the scattered posts. Later, by means of a cable to Seattle, it enabled the Government to avoid the necessity of sending orders and instructions over a telegraph line through foreign territory—that is, by the Canadian line from Ashcroft to Dawson.¹

The development of wireless telegraphy has made these lines of little worth for military purposes, and the War Department has requested the Post Office Department to take over the system, with the consent of Congress.

The decrease in the number of commercial messages in 1912 from the number reported for 1907, shown in Table 10, may be charged in part to the interruption of cables and to the increased use of wireless, the Signal Corps having adopted the plan of routing a certain amount of business each day by way of radio, to keep the system in trim.

Philippine Islands.—The mileage of telegraph lines and cables operated by the United States Government in the Philippine Islands decreased from 6,438 to 5,599, or 13 per cent, between 1907 and 1912, by reason of deterioration. Many of these lines were constructed by the military authorities and intended for temporary use only; the place of others has been taken by the new wireless stations; and nongovernmental telephone lines have furnished means of communication in some localities. The necessity for new cable and land telegraph construction has thus in many cases been obviated. The number of messages sent over the governmental telegraph and cable lines increased from 472,418 in 1907 to 657,404 in 1912, or by 39.2 per cent.

Military lines in the United States.—“Military telegraph lines in the United States have been reduced to almost nothing,” writes the Chief Signal Officer,

¹ Report of Chief Signal Officer of the United States Army, 1913, p. 7.

United States Army, in his report for the year ending June 30, 1912. The length is not given. In his report for the year ending June 30, 1913, this officer states that the abandonment of the former military telegraphline from Fort Huachuca to Huachuca Siding and Lewis Springs, Ariz., and the substitution of a Western Union line, leaves but one military telegraph, that between Fort Apache and Holbrook, Ariz. The distance between these places is about 75 miles. During 1912 the total receipts for commercial messages over military land telegraphs in the United States amounted to \$2,302, of which sum \$1,683 was paid to commercial companies as charges for messages over their connecting lines.

Weather Bureau.—The telegraph division of the United States Weather Bureau during the fiscal year ending June 30, 1912, audited accounts for telegraph and telephone service amounting to more than a quarter of a million dollars, this being in part rendered by the various commercial companies. The lines owned by the Government include the cable extending from Block Island to Narragansett Pier, and the Port Crescent-Tatoosh line, which continues to be of great benefit to the shipping and fishing interests on Puget Sound. The opening of the new salmon industries at Neah Bay, where about 2,000 fishermen, manning 350 or 400 fishing launches, make their headquarters during the salmon season, has largely increased the commercial business handled over the last-named line.

OCEAN CABLE TELEGRAPHS.

Commercial systems.—Only ocean cable companies incorporated in the United States and doing business directly with this country are included in this report. These companies are as follows:

- Central & South American Telegraph Co.
- Commercial Cable Co. of Cuba.
- Commercial Cable Co. of New York.
- Commercial Pacific Cable Co.
- Mexican Telegraph Co.
- United States & Haiti Telegraph & Cable Co.

The statistics for these six companies are presented in Table 11.

The Western Union Telegraph Co. could furnish separate statistics only for the miles of wire and number of messages for its cable business; therefore the table does not include statistics for this company. As the ocean cable business of the company is very large, it is hoped that by the time of the next census, which will cover 1917, separate data will be available.

The figures do not include the business of two other companies, namely, the French Telegraph Cable Co., of Paris, and the German Atlantic Telegraph Co., of Cologne, incorporated abroad, but doing business in the United States. The lengths of Atlantic cables owned and operated by these two companies are, respectively, 11,216 and 8,507 nautical miles, and the total number of messages sent from the United States by the two companies during the year was 406,302. If these figures be added to those in the summary and

footnotes, the total number of nautical miles of cable, including that of the Western Union Telegraph Co., becomes 87,399 and the total number of messages 6,247,582.

Table 11

ACCOUNT.	OCEAN CABLE TELEGRAPH SYSTEMS— REVENUE AND INCOME ACCOUNTS.		
	1912	1907	Per cent of increase. ¹
Number of companies or systems ²	6	6
Nautical miles of ocean cable ²	44,860	40,572	10.6
Number of messages ²	2,845,168	2,369,317	20.1
Number of cable offices ²	83	54	53.7
Income, total.....	\$8,469,374	\$7,671,700	10.4
Telegraph traffic.....	\$8,065,798	\$7,338,280	9.9
All other sources.....	\$403,576	\$333,420	21.0
Net income.....	\$2,952,847	\$4,029,074	-26.7
Expenses, total.....	\$5,516,527	\$3,642,626	51.4
General operation and maintenance, including salaries and wages and legal expenses.....	\$4,008,218	\$2,204,939	81.8
Interest and taxes.....	\$1,214,554	\$1,190,308	2.0
All other expenses.....	\$293,755	\$247,379	18.7
Balance sheet:			
Assets, total.....	\$107,583,155	\$95,624,892	12.5
Construction and equipment.....	\$78,136,115	\$77,438,339	0.9
Stocks and bonds of other companies, treasury stock, and "other permanent investments" ³	\$16,811,087	\$12,971,564	29.6
Cash and current assets, including supplies ⁴	\$12,635,953	\$5,214,989	142.3
Liabilities, total.....	\$107,583,155	\$95,624,892	12.5
Capital stock.....	\$55,489,400	\$52,800,000	5.1
Funded debt.....	\$28,000,000	\$28,000,000
Reserves.....	\$15,549,451	\$6,381,105	143.7
Accounts payable.....	\$1,459,797	\$2,495,241	-41.5
Dividends due and sundries.....	\$587,229	\$2,452,351	139.5
Surplus.....	\$6,497,278	\$,496,195	85.5
Capitalization:			
Capital stock outstanding, par value..	\$55,489,400	\$52,800,000	5.1
Dividends on stock.....	\$3,040,200	\$2,533,041	20.0
Funded debt.....	\$28,000,000	\$28,000,000
Employees and salaries and wages:			
Average number.....	1,656	1,207	37.2
Salaries and wages.....	\$1,167,014	\$915,083	27.5

¹ A minus sign (-) denotes decrease.

² Does not include returns for Western Union Telegraph Co., as no segregation of financial statistics or employees could be made for the cable business of this company. The number of nautical miles of ocean cable owned and leased by this company was, in 1912, 22,816 miles, and in 1907, 5,729 miles. The number of ocean messages reported by the company for 1912 was 2,996,112, and as estimated by it for 1907, 3,500,000.

³ Includes sinking and other special funds and sundries for 1912 and sundries only for 1907.

⁴ Includes floating debt.

⁵ Includes interest due and accrued.

⁶ Number employed Sept. 16, 1912.

Only three of the ocean cable systems, not including the Western Union, reported free or reduced-rate messages, the total number being 171,982.

Mr. E. C. Sweeney, of New York, manager in the United States of the French company, in a communication from New York City to the Bureau of the Census, giving a list of the company's Atlantic cables and the mileage of its land lines in this country, writes as follows:

The 1,170 miles of land lines on 310 miles of pole line are the regular connections from our cable station at Cape Cod, Mass., to our head office in New York City, carrying cablegrams from our trans-Atlantic cables to this city for delivery and distribution. The cable from Cape Cod to New York, 325 miles in length, is an emergency means of communication between these points, when the land lines are temporarily interrupted through storm or accident. No land messages—that is, telegrams between points in the United States—are transmitted by us.

Mr. Sweeney also refers to lines leased from the New York Telephone Co., connecting branch offices in New York City and the cable house at Manhattan Beach, Long Island, with the cable company's head office in Broad Street.

The cable systems between the United States and Europe are either owned or controlled as follows: The

Anglo-American Cable Co., five cables; the Direct United States Cable Co., one cable; and the American Telegraph & Cable Co., two cables (making a total of eight cables controlled and operated by the Western Union Telegraph Co.); the Commercial Cable Co., controlled by the Mackay (Postal) companies, five cables; the German Atlantic Co., two; and the French Cable Co., two; making in all 17 cables operated between the United States and Europe.

The Commercial Pacific Cable Co., controlled by the Mackay companies, has a submarine cable from San Francisco to Manila, touching at Honolulu, Midway, Guam, and the Bonin Islands, and extending also from Manila to Shanghai.

During 1912 John Gott, chief electrician of the Commercial Cable Co., invented a device by which direct Morse dot and dash signals can be used on long submarine cables. Up to that time it had been necessary, when working cables of over 500 miles in length, to use a reversing key, sending two elements of signals by changing the direction of the current. For instance, in ordinary cable working, the letter *s*, indicated by a dot, was represented by a positive impulse, and the letter *t*, indicated by a dash, was designated by a negative impulse, the galvanometer, or the siphon recorder, at the receiving station indicating these impulses by appropriate deflections of the mirror or moving coil. Now no such device is necessary; the ordinary Morse operator can send the conventional signals with the usual type of key.

One of the latest developments in ocean cable telegraphy, following the Gott invention, is the practical utilization of a cable relay, whereby submarine cables and land lines may be connected and worked as one continuous circuit.

The capitalization has increased slightly during the five years. The apparent increase in dividends is due in part to the fact that some of the reports for 1907 were made before all the dividends were actually paid. The profit and loss surplus is much greater than in 1907, notwithstanding the fact that a large amount was reported as set aside for reserves.

The particulars relating to revenue and income for 1912 and 1907 are set forth in detail in Table 12.

ACCOUNT.	OCEAN CABLE TELEGRAPH SYSTEMS— REVENUE AND INCOME ACCOUNTS.		
	1912	1907	Per cent of in- crease. ¹
Gross receipts from operation.....	\$3,035,798	\$7,338,280	9.9
Operating expenses.....	4,214,264	2,373,339	77.6
Net earnings from operation.....	3,851,534	4,964,941	-22.4
Income from other sources.....	403,576	333,420	21.0
Gross income less operating expenses.....	4,255,110	5,298,361	-19.7
Deductions from income (fixed charges) ...	1,302,263	1,269,287	2.6
Taxes.....	54,554	30,308	80.0
Interest.....	1,160,000	1,160,000	-----
Payments for use of leased lines.....	87,709	78,979	11.1
Net income.....	2,952,847	4,029,074	-26.7
Dividends on stock.....	3,040,200	2,533,041	20.0
Surplus.....	(²)	1,496,033	-----

¹ A minus sign (-) denotes decrease.

² Deficit of \$37,353.

The great increase reported for operating expenses in comparison with gross receipts from operation is responsible for the decrease in net income shown. The dividends paid must have come in part from accumulated surplus, for the statistics for the year 1912 indicate that there was a net deficit in the combined total for all companies.

The increase in operating expenses is not so largely in salaries and wages as in the other expenses of operation and maintenance. This is shown in Table 13.

ACCOUNT.	OCEAN CABLE TELEGRAPH SYSTEMS— OPERATING EXPENSES.		
	1912	1907	Per cent of in- crease.
Total.....	\$4,214,264	\$2,373,339	77.6
General operation and maintenance.....	4,008,218	2,204,939	81.8
Salaries and wages.....	1,167,014	915,083	27.5
Operation and maintenance, including legal expenses.....	2,841,204	1,289,856	120.3
Rentals of offices and other real estate.....	104,748	87,896	19.2
Miscellaneous.....	101,298	80,504	25.8

¹ Includes also rentals of conduits and underground privileges and payments for telegraph traffic made to other companies.

At the census of 1912 salaries and wages constituted only 27.7 per cent of total operating expenses, as compared with 38.6 per cent in 1907. It was not intended that the expenses of operation and maintenance should include expenditures for additions or extensions.

Governmental cables.—The Federal Government owns and operates an ocean telegraph cable extending from Valdez to Sitka, Alaska, and from Sitka to Seattle, Wash. No details are separable from those given for the governmental land lines under land telegraph systems, however, except as to the length of the cable, which was 2,646 nautical miles.

WIRELESS TELEGRAPHS, OR RADIOTELEGRAPHY.

Commercial systems.—There has been a decrease in number of companies operating commercial wireless telegraphs since the census of 1907. The active list now comprises the following:

Atlantic Communication Co., New York City.
Federal Telegraph Co., San Francisco, Cal.
Marconi Wireless Telegraph Co. of America, Jersey City, N. J.
United Fruit Co. (wireless department), Boston, Mass.

The Atlantic Communication Co. was in operation only three months in 1912. The wireless department of the United Fruit Co. has been organized since 1912 as the Tropical Radio Telegraph Co., of New Orleans, La.

One company in receiver's hands is not reported here. Its chief business, however, is the manufacture and rental of apparatus and the perfection of inventions.

No account is taken of the newspaper wireless plants, these being used exclusively for news purposes, nor of the large number of amateur and experimental plants.

Table 14 summarizes the principal statistics relating to commercial wireless telegraph systems for 1912 and 1907.

	WIRELESS TELEGRAPH SYSTEMS.		
	1912	1907	Per cent of increase. ¹
Number of companies or systems.....	4	5	-20.0
Number of messages.....	2 285,091	154,617	84.4
Number of tower stations.....	74	117	-36.8
Income, total.....	\$669,153	\$106,791	526.6
Expenses, total.....	\$664,420	\$160,329	314.4
General operation and maintenance, including salaries and wages and legal expenses.....	\$588,712	\$117,480	401.1
Interest and taxes.....	\$7,826	\$5,562	40.7
All other expenses.....	\$67,882	\$37,287	82.1
Net income.....	\$4,738		
Net deficit.....		\$53,538	
Balance sheet:			
Assets, total.....	\$10,377,197	\$32,958,897	-68.5
Construction and equipment.....	\$1,205,770	\$317,614	279.6
Cash and current assets, including supplies ⁴	\$9,171,427	\$32,196,456	-71.5
Net deficit.....		\$444,827	
Liabilities, total.....	\$10,377,197	\$32,958,897	-68.5
Capital stock.....	\$9,602,570	\$32,676,242	-70.6
Floating debt and mortgages.....	\$18,483	\$37,145	-50.2
Accounts payable.....	\$583,160	\$245,510	137.5
Net surplus.....	\$172,984		
Capitalization:			
Capital stock outstanding, par value.....	\$9,602,570	\$32,676,242	-70.6
Employees and salaries and wages:			
Average number.....	6 958	176	444.3
Salaries and wages.....	\$393,606	\$81,771	381.4

1 A minus sign (-) denotes decrease.
 2 Includes 5,013 land messages sent over a leased land wire by a wireless company doing land telegraph business also.
 3 Less all expenses, including charges for depreciation.
 4 Includes stocks, bonds, and sundries.
 5 Includes reserves, cash investments, interest and taxes due and accrued, and sundries.
 6 Number employed Sept. 16, 1912. Includes, in some cases, number of operators on shipboard, who, in addition to wages, receive board and quarters.

The number of messages sent in 1912 was nearly double the number reported for 1907. The total includes a small number of land messages sent over land wires by one wireless company. Only two wireless systems reported free or reduced-rate messages, the number of such messages being 1,154.

The net deficit of 1907 was turned into a net surplus for 1912, and the capital stock was reduced nearly three-fourths, one large company disappearing from the field. No dividends were reported for 1912. The amount given in the summary as total wages paid does not fully show the compensation of the operators, as many of them are on board ship, where they receive food and quarters in addition to wages.

The Marconi Co. of America reports 60 land stations in the United States and equipment on over 450 American merchant steamships.

The Tropical Radio Telegraph Co., which is the wireless department of the United Fruit Co., reported for 1912, operates and controls the radiostations at New Orleans and Burrwood, La., and on 22 steamers belonging to the United Fruit Co.

The Sayville, Long Island, wireless station of the Atlantic Communication Co., equipped with Telefunken apparatus, is among the most powerful commercial wireless stations in operation in the United States. In addition to equipment for local messages and for communicating with ships up to 60 hours out of New York, it has apparatus for communication with ships four or five days out.

The Federal Telegraph Co. of San Francisco, Cal., which uses the Poulsen wireless system, operated wireless stations during 1912 at Honolulu, Hawaiian Islands; San Francisco, Sacramento, Los Angeles, and San Diego, Cal.; Portland and Central Point, Oreg.; Phoenix, Ariz.; El Paso and Fort Worth, Tex.; Kansas City, Kans.; and Chicago, Ill.

On October 6, 1912, the Department of Commerce and Labor promulgated regulations for the enforcement, beginning December 13, of the radiocommunication act, approved August 13, 1912. In this act the wave lengths and the tuning are specified and rigorous restrictions imposed to prevent interference with distress signals, which are given absolute priority in all cases.¹ One of the most important provisions is that all private stations must be licensed and duly inspected by the Government. In this way it is hoped that the annoying interference which has so greatly hampered governmental and proper commercial use of radiotelegraphy may be prevented.

An act of Congress approved June 24, 1910, required operators for radiocommunication on certain classes of ocean steamers. This act went into effect July 1, 1911, and was amended by an act of Congress approved July 23, 1912, which in general terms extended the requirements already made with respect to ocean-going vessels as to the number of operators, the provision of auxiliary apparatus, and other important points.

Railway wireless.—The Delaware & Lackawanna Railroad has wireless stations of the ordinary sort at Scranton, Pa., and Binghamton, N. Y., cities about 65 miles apart, with a working radius of about 300 miles. Certain trains are equipped with very low aerials—quadrangles of wire supported at a height of only 18 inches above the roofs of the cars. Four quadrangular aerials are mounted on the roofs of four adjoining cars of the train, each quadrangle being connected to its neighbor by a special attaching plug. The wireless operator's station is installed in a booth in the third car of the group, so as to bring the lead from his apparatus to the middle of the fourfold aerial. The regular Marconi system is employed, except that the power is furnished by a special motor-generator set driven from the regular train-lighting dynamo, and the ground connection is made to the rails by a wire to one of the car trucks. The aerial is of heavy copper wire, and is insulated for the high sending voltage (between 8,000 and 9,000 volts) by large porcelain insulators mounted on wire posts at the corners of the car.

It has been found possible to maintain communication between a station and a train running at 55 miles an hour, at first, direct to the last station it has left, and later, when it is too far away for its short aerials to work to this station, to the next station ahead, the messages in each case being relayed to their des-

¹ Report of Chief Signal Officer of the United States Army.

tinuation if necessary. In addition to railroad messages, news and other communications have been sent in this way to trains.

Trial installations of wireless railway-train control apparatus have also been placed on the Pennsylvania lines west, and the New York, New Haven & Hartford Railroad.

GOVERNMENTAL WIRELESS.

Panama Canal Zone.—In accordance with Congressional authority the large wireless station at Colon was opened to commercial business during the month of January, 1913. Messages are transmitted for 8 cents a word to ships two and three days out of port, delivery not being guaranteed to vessels farther north than Kingston. The station has been connected by wire direct to the Panama Railroad Co.'s telegraph office, and radiomessages to be dispatched to sea may be filed at any of the railroad offices open to commercial business.

Alaska.—The old radiostations at Nome and Port Gibbon have been supplied with new 10-kilowatt installations, and the old apparatus removed from Nome has been installed at Nulato. The Chief Signal Officer of the United States Army, in his report for 1912, states that these installations complete a "chain of radiostations across Alaska from the Canadian boundary to Norton Sound, which can be depended on to maintain communication when accidents interrupt communication on land lines." Upon the completion of stations at Anadyr, Siberia, and Nome, about 500 miles apart, direct wireless communication was established between America and Asia.

Philippine Islands.—On June 30, 1912, the Bureau of Posts had in operation wireless stations at Davao, Jolo, Malabang, and Zamboanga, all in the Moro Province. There were also stations at Cuyo, San Jose, and Pourto Princess, Palawan. The Signal Corps of the United States Army was operating stations at Manila, Corregidor Island, Fort William McKinley (Rizal), Grande Island, Carabao, El Fraile, and Caballo, while there were naval wireless stations at Cavite and Olongapo.

Naval stations.—The Secretary of the Navy, in his report for 1913, states that the new radioservice has become an important part of the naval service and that 23 radiostations have been established and opened for public business.

According to the following list of radiostations of the United States, issued by the Bureau of Navigation, for July 1, 1913, the naval wireless stations on land in the United States proper numbered 28.

There were also stations on the Diamond Shoals Lightship (off Cape Hatteras, N. C.); at Frying Pan Shoals, N. C. (off Cape Fear); and on the Nantucket Shoals Lightship (off Newport, R. I.).

In addition to the naval wireless stations in the insular possessions, already mentioned under their respective heads, there are four stations located, re-

spectively, at Guam, at Honolulu, at Guantanamo Bay, Cuba, and at Peking, China.

Annapolis, Md.	New Orleans, La.
Arlington, Va.	Newport, R. I.
Beaufort, N. C.	New York, N. Y.
Boston, Mass.	Norfolk, Va.
Bremerton, Wash.	North Head, Wash.
Cape Blanco, Oreg.	Pensacola, Fla.
Cape Cod, Mass.	Philadelphia, Pa.
Charleston, S. C.	Point Arguello, Cal.
Eureka, Cal.	Portland, Me.
Farallons, Cal.	Portsmouth, N. H.
Fire Island, N. Y.	St. Augustine, Fla.
Jupiter, Fla.	San Diego, Cal.
Key West, Fla.	Tatoosh, Wash.
Mare Island, Cal.	Washington, D. C. (navy yard).

The ships of the Navy are provided with wireless apparatus. The equipment, although capable of receiving messages without relay at a 3,000-mile radius, has a sending range of only about 400 miles in in the daytime and 1,000 miles at night.

The Arlington station.—The Government wireless station at Arlington, Va., consists of three steel towers, one of them 600 feet high and 150 feet square at the base (45 feet higher than the top of the Washington Monument) and two of them 450 feet high and 120 feet square at the base. The antennæ in 3 sections are strung from the tallest tower to the two others. Communication from this station will eventually be had at all times with ships in the North Atlantic Ocean, with the station at Colon, and, through the station to be erected on the Pacific coast, with Pearl Harbor in Hawaii, Tutuila Island in the Samoas, Guam, and the Philippine Islands. Other naval vessels, whether near the African coast or in Chinese waters, will also be under direct control from Washington by aerial communication, and the San Francisco operator will be able to talk with the numerous small stations in Alaska. The United States will thus compass over half the globe with wireless and will become independent of commercial telegraph and cable companies.

The station has been used in conjunction with the Eiffel Tower Station in Paris, in determining the difference of longitude between the latter and our Naval Observatory by means of radiosignals.

Other governmental radiostations.—The radiostations installed in the United States proper by the Signal Corps of the United States Army number 18, none of which is open to public service. They are at the following places:

Fort Andrews, Mass.	Fort Totten, N. Y.
Fort Hancock, N. J.	Fort Wood, N. Y.
Fort H. G. Wright, N. Y.	Fort Worden, Wash.
Fort Leavenworth, Kans.	San Francisco, Cal. (Fort Winfield Scott).
Fort Levett, Me.	Signal Corps Laboratory, Washington, D. C.
Fort Monroe, Va.	Bureau of Standards, Washington, D. C.
Fort Monroe, Va. (Coast Artillery School).	Fort Leavenworth, Kans. (Army Signal School).
Fort Omaha, Nebr.	
Fort Riley, Kans.	
Fort Sam Houston, Tex.	
Fort Stevens, Oreg.	