DEPARTMENT OF COMMERCE
U.S. BUREAU OF THE CENSUS
SAM. L. ROGERS, DIRECTOR

CENSUS OF ELECTRICAL INDUSTRIES: 1917

CENTRAL ELECTRIC LIGHT AND POWER STATIONS

WITH

SUMMARY OF THE ELECTRICAL INDUSTRIES

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CENSUS OF ELECTRICAL INDUSTRIES: 1917.

CENTRAL ELECTRIC LIGHT AND POWER STATIONS.
STREET AND ELECTRIC RAILWAYS.
TELEGRAPHS AND MUNICIPAL ELECTRIC FIRE-ALARM AND POLICE-PATROL SIGNALING SYSTEMS.
TELEPHONES.

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DEPARTMENT OF COMMERCE,
BUREAU OF THE CENSUS,
Washington, D. C., December 16, 1919.

SIR:

I transmit herewith the report on the census of Central Electric Light and Power Stations for 1917. This report is a part of that on electrical industries, which in its entirety also covers electric railways, telephones, telegraphs, and municipal electric fire-alarm and police-patrol signaling systems.

This is the third report on these industries that has been taken in conformity with the requirements of the act of Congress of June 7, 1906. The work of obtaining the data for the report was done by employees detailed from the permanent force of the bureau and by correspondence, and the statistics were secured during the year 1918 and relate in general to the year ending December 31, 1917.

The statistics were collected and the report prepared under the supervision of Eugene F. Hartley, chief statistician for manufactures. Acknowledgment is also made of the services of Edmond E. Lincoln, expert special agent, who compiled the text and outlined the analytical tables, and of Frank L. Sanford, expert special agent, who assisted in the assembling and preparation of the material for the report.

Respectfully,

SAM. L. ROGERS,
Director of the Census.

HON. JOSHUA W. ALEXANDER,
Secretary of Commerce.

SUMMARY OF THE ELECTRICAL INDUSTRIES.

GENERAL STATISTICS.

The special census of 1917 covers five distinct electrical industries, as follows: (1) Central electric light and power stations; (2) Electric railways; (3) Telephones; (4) Telegraphs; and (5) Municipal electric fire-alarm and police-patrol signaling systems.

These industries resolve themselves into two groups of a similar character, electric light and power stations and electric railways constituting one group, and telephones and telegraphs, together with fire-alarm and police-patrol signaling systems, the other. The statistics for the first two industries named are presented in this report, while the data for the last three are collected in a separate report. The accompanying table summarizes the more important statistics for the first four industries, both separately and combined, for 1917, 1912, 1907, and 1902. In the table are shown for the several items and for the successive years the per cent which each industry forms of the total, and also the percentages of increase in number of plants or systems, employees, salaries and wages, capitalization, income, expenses, and net income, for each five-year period, for the decade 1907–1917, and for the entire period 1902–1917.

As municipal electric fire-alarm and police-patrol signaling systems are not operated commercially, and as the statistics relating thereto have little in common with the other industries, they have been excluded from this combined summary.

THE ELECTRICAL INDUSTRIES: [1] 1917, 1912, 1907, AND 1902.

Table 1

	Census year.	Total.	Central electric light and power stations.	Electric railways.	Telephones.[2]	Telegraphs[3] (land and ocean).	PER CENT OF TOTAL. Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
Number of companies, stations, or systems.	1917	10,076	6,542	1,307	2,200	27	64.9	13.0	21.8	0.3
	1912	8,424	5,221	1,260	1,916	27	62.0	15.0	22.7	0.3
	1907	7,612	4,714	1,236	1,636	26	61.9	16.2	21.5	0.3
	1902	7,789	3,620	987	3,157	25	46.5	12.7	40.5	0.3
Per cent of increase [4]	1902–1917	29.4	80.7	32.4	−30.3	8.0				
	1907–1917	32.4	38.8	5.7	34.5	3.8				
	1912–1917	19.6	25.3	3.7	14.8	0.0				
	1907–1912	10.7	10.8	1.9	17.1	3.8				
	1902–1907	−2.3	30.2	25.2	−48.2	4.0				
Employees, salaries, and wages: Average number	1917	696,431	105,541	294,826	244,490	51,574	15.2	42.3	35.1	7.4
	1912	582,452	79,335	282,461	183,361	37,295	13.6	48.5	31.5	6.4
	1907	428,765	47,632	221,429	131,670	28,034	11.1	51.6	30.7	6.5
	1902	277,474	30,326	140,769	78,752	27,627	10.9	50.7	28.4	10.0
Per cent of increase	1902–1917	151.0	248.0	109.4	210.5	86.7				
	1907–1917	62.4	121.6	33.1	85.7	84.0				
	1912–1917	19.6	33.0	4.4	33.3	38.3				
	1907–1912	35.8	66.6	27.6	39.3	33.0				
	1902–1907	54.5	57.1	57.3	67.2	1.5				
Salaries and wages	1917	$571,781,197	$95,241,858	$267,240,362	$169,655,066	$39,643,911	16.7	46.7	29.7	6.9
	1912	383,034,528	61,161,941	200,867,052	96,040,541	24,964,994	16.0	52.4	25.1	6.5
	1907	269,220,021	35,420,324	150,991,099	65,009,349	17,808,249	13.2	56.1	24.1	6.6
	1902	160,152,151	20,646,692	88,210,165	36,265,021	15,030,073	12.9	55.1	22.6	9.4
Per cent of increase	1902–1917	257.0	361.3	203.0	367.9	163.6				
	1907–1917	112.4	168.9	77.0	161.0	122.6				
	1912–1917	49.3	55.7	33.0	76.6	58.8				
	1907–1912	42.3	72.7	33.0	47.7	40.2				
	1902–1907	68.1	71.6	71.2	79.3	18.4				
Capitalization	1917	$9,991,164,215	[5] $3,060,392,141	$5,532,223,818	$1,169,460,470	$229,087,786	30.6	55.4	11.7	2.3
	1912	8,081,223,659	[5] 2,175,678,266	4,708,568,141	970,590,442	226,386,810	26.9	58.1	12.2	2.8
	1907	5,830,667,500	[5] 1,096,913,622	[6] 3,774,772,096	738,688,207	220,293,575	18.7	64.5	13.0	3.8
	1902	3,324,000,034	[5] 504,740,352	[6] 2,308,282,099	348,031,058	162,946,525	15.2	69.4	10.5	4.9
Per cent of increase	1902–1917	200.5	506.3	139.7	236.0	40.6				
	1907–1917	71.4	179.0	46.6	58.3	4.0				
	1912–1917	23.6	40.7	17.5	20.5	1.2				
	1907–1912	38.6	98.3	24.7	31.4	2.8				
	1902–1907	76.0	117.3	63.5	117.8	35.2				
Income	1917	$1,739,664,159	[7] $526,894,240	$730,564,691	$372,501,800	$109,703,428	30.3	42.0	21.4	6.3
	1912	1,200,138,640	[7] 302,273,398	579,208,430	253,893,969	64,762,843	25.2	48.2	21.2	5.4
	1907	829,877,604	[7] 175,042,338	426,900,952	175,750,446	51,583,868	21.1	51.4	21.3	6.2
	1902	463,982,821	[7] 85,700,605	250,526,642	86,825,536	40,930,038	18.5	54.0	18.7	8.8
Per cent of increase	1902–1917	274.9	514.8	191.6	329.0	168.0				
	1907–1917	109.6	200.0	71.1	111.9	112.7				
	1912–1917	45.0	74.3	26.1	46.7	69.4				
	1907–1912	44.6	72.1	35.7	44.5	25.5				
	1902–1907	79.0	104.9	70.4	103.5	26.0				

(See footnotes at end of table.)

THE ELECTRICAL INDUSTRIES: [1] 1917, 1912, 1907, AND 1902—Continued.

Table 1—Continued.

	Census year.	Total.	Central electric light and power stations.	Electric railways.	Telephones.[2]	Telegraphs[3] (land and ocean).	PER CENT OF TOTAL. Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
Expenses—total, including salaries and wages, interest, taxes, and fixed charges.	1917	$1,480,337,159	$426,568,307	$648,794,633	$313,103,060	$91,871,159	28.8	43.8	21.2	6.2
	1912	987,077,419	234,577,277	491,553,546	202,567,644	58,378,952	23.6	50.1	20.5	5.9
	1907	668,715,140	134,196,911	358,113,401	134,525,215	41,879,613	20.0	53.5	20.2	6.3
	1902	366,764,240	68,081,375	202,570,060	65,164,771	30,948,034	18.6	55.2	17.8	8.4
Per cent of increase	1902–1917	303.6	526.6	220.3	380.5	196.9	.....	.....	.....	.....
	1907–1917	121.4	217.9	81.2	132.7	119.4	.....	.....	.....	.....
	1912–1917	50.0	81.8	32.0	54.6	57.4	.....	.....	.....	.....
	1907–1912	47.6	74.8	37.3	50.6	39.4	.....	.....	.....	.....
	1902–1907	82.6	97.1	76.8	107.9	35.3	.....	.....	.....	.....
Net income	1917	$259,327,000	$100,325,933	$81,770,058	$59,398,740	$17,832,269	38.7	31.5	22.9	6.9
	1912	213,001,221	67,696,121	87,654,884	51,326,325	6,383,891	32.7	39.4	24.8	3.1
	1907	161,162,464	41,445,427	68,787,551	41,225,231	9,704,255	25.7	42.7	25.6	6.0
	1902	97,218,681	17,619,230	47,956,582	21,660,765	9,982,004	18.1	49.3	22.3	10.3
Per cent of increase [4]	1902–1917	166.7	469.4	70.5	174.2	78.6	.....	.....	.....	.....
	1907–1917	60.9	142.1	18.9	44.1	83.8	.....	.....	.....	.....
	1912–1917	21.7	48.2	−6.7	15.7	179.3	.....	.....	.....	.....
	1907–1912	32.2	63.3	27.4	24.5	−34.2	.....	.....	.....	.....
	1902–1907	65.8	135.2	43.4	90.3	−2.8	.....	.....	.....	.....

[1] Not including *municipal electric fire-alarm and police-patrol signaling systems.*
[2] Exclusive of systems reporting an annual income of less than $5,000, except in 1902, when all systems operated primarily for revenue were included.
[3] Includes the Commercial Cable Co. of Cuba in 1917, 1912, and 1907 (not reported in 1902).
[4] A minus sign (−) denotes decrease.
[5] Value of plant and equipment.
[6] Six companies in 1907 and 30 companies in 1902 failed to furnish this information.
[7] In addition, $59,629,985 in 1917, $36,500,030 in 1912, $20,093,302 in 1907, and $7,703,574 in 1902 was reported by electric railway companies as income from sale of electric current for light and power or from sale of current to other public service corporations.

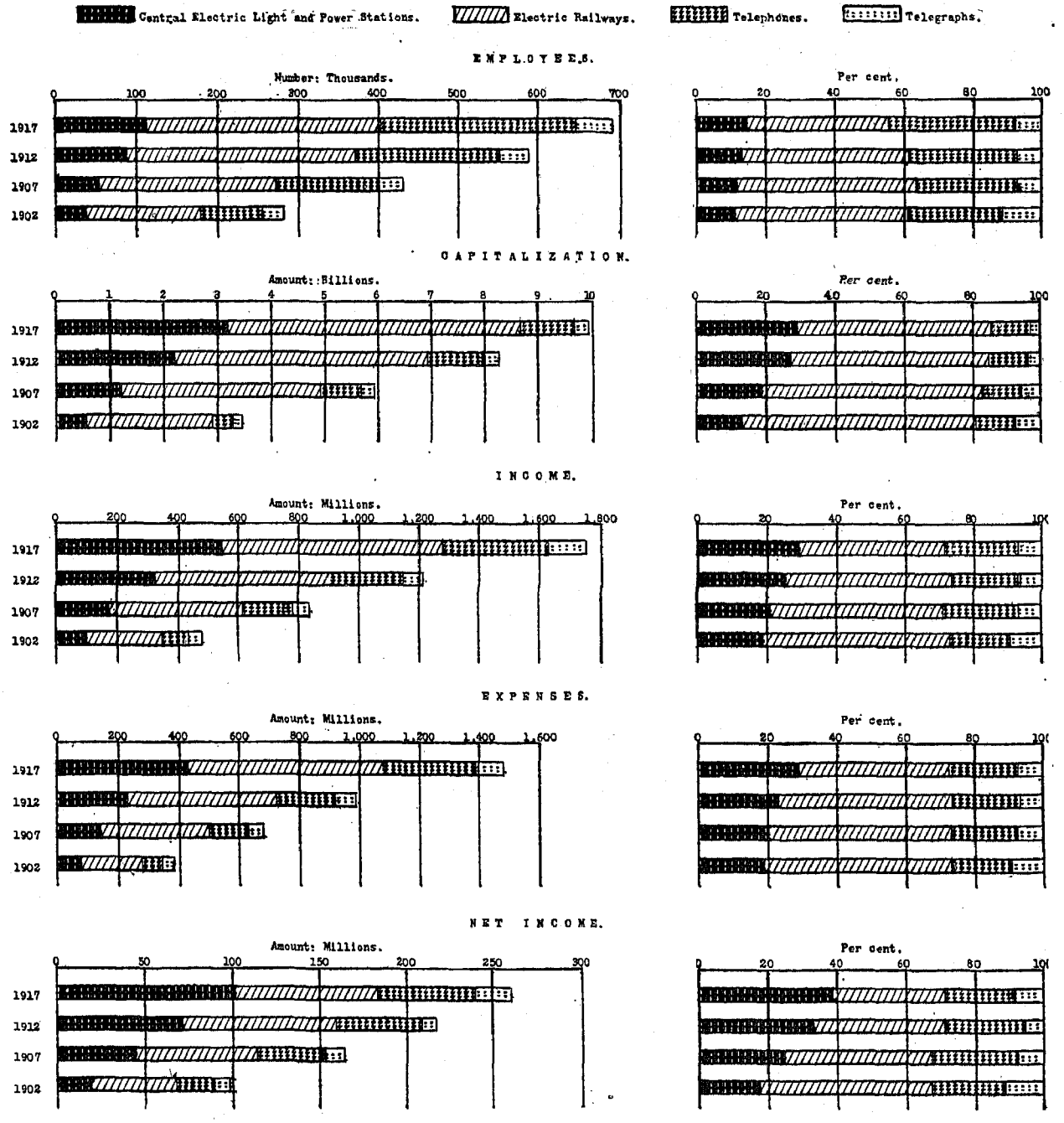
The opposite group of diagrams presents graphically the most important data contained in the preceding table for the group of industries comprising (1) "Central electric light and power stations," (2) "Electric railways," (3) "Telephones," and (4) "Telegraphs." They show for each of the census years 1917, 1912, 1907, and 1902 the relative number or amounts for employees, capitalization, income, expenses, and net income, and the per cent distribution of the totals for the specified years.

The central electric light and power industry includes both commercial and municipal central electric stations, but does not include 160 electric light and power stations operated in conjunction with electric railways, the statistics for which could not be separated from the railroad reports. The "value" of plant and equipment is given in this table in place of capitalization, because the municipal plants included do not issue capital stock. The electric railway industry covers both operating and nonoperating, or lessor, companies, together with a few municipal systems. The nonoperating lessor companies did not report the number and compensation of employees, so that the statistics pertaining to employees and salaries and wages relate to operating companies only, but the employees of the lessor companies are usually of the salaried class and relatively few in number. All organization and maintenance expenses of the lessor companies are included under expenses. In view of the fact that the rentals paid to the lessor companies by the operating companies for leased roads would indicate an income which, in the commercial sense, does not exist, the proper adjustments have been made, in order to eliminate the duplication arising therefrom through the combination of income and expense accounts of both classes of companies.

The telephone statistics for 1917, 1912, and 1907 are confined to companies or systems having an annual income of $5,000 or more, whereas the statistics for 1902 cover all systems operated primarily for revenue, and include a large number of small organizations and rural lines. These minor systems, though numerous and affecting the statistics for employees and salaries and wages, represented in 1902 a comparatively small part of the capitalization, income, and expenses for the telephone industry. The number of these systems increased from 21,335 in 1907 to 51,034 in 1917. In the latter year they represented less than 4 per cent of the *total* value of "plant and equipment" reported for all telephone systems, and transmitted about 10 per cent of all messages.

Attention should be called to some of the more important developments indicated by Table 1. The proportion which the different items for the telephone and telegraph systems bear to the total for the electrical industries is surprisingly constant throughout the period. On the other hand, there has been, in practically every case, a steady increase in the relative importance of the central electric light and power business, and just as certain a decrease in the relative importance of practically all items pertaining to the electric railway industry.

THE ELECTRICAL INDUSTRIES—EMPLOYEES, CAPITALIZATION, INCOME, EXPENSES, AND NET INCOME: *1917, 1912, 1907, AND 1902.*



In spite of the frequent consolidations, the number of central electric stations has steadily increased, whereas since 1907 the number of electric railways and telegraphs has remained practically stationary. The increase in the number of telephone systems since 1907 has been less marked.

Further, while the number of employees of electric stations and telephone and telegraph companies increased at substantially the same rate between 1912 and 1917, the employees of the electric railways have remained practically unchanged in number. The total salaries and wages paid have in all cases and for every period increased much more rapidly than the number of employees. For the period 1912–1917 the percentage of increase in the aggregate wage bill was greatest for the telephone industry (76.6 per cent), followed by the telegraph companies (58.8 per cent), electric light and power stations (55.7 per cent), the electric railways coming last, with a 33 per cent increase. Accurate averages as to number and salaries and wages can not fairly be determined from the answers made to the inquiry as placed on the schedules, which in 1917, for the electric light and power stations and electric railways, for instance, called for the number of employees on September 29, 1917, or some other representative day, as per pay roll, and the total salaries and wages paid during the year. However, the figures in Table 2, based upon the reports, indicate a significant increase in average salaries and wages.

Table 2 — AVERAGE SALARIES AND WAGES: 1917, 1912, 1907, AND 1902.

CENSUS YEAR.	Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
1917	$902	$906	$694	$769
1912	771	711	524	669
1907	744	682	494	635
1902	681	627	460	544
	PER CENT OF INCREASE.			
1902–1917	32.5	44.5	50.9	41.4
1912–1917	17.0	27.4	32.4	14.9
1907–1912	3.6	4.3	6.1	5.4
1902–1907	9.3	8.8	7.4	16.7

It will be seen from Table 2 that the rate of increase in average salaries and wages during the last five-year period was most rapid for telephone employees, 32.4 per cent, and this industry was closely followed by the electric railways at 27.4 per cent. At all census dates until 1917 the average for the electric light and power stations was considerably in the lead, while at all periods the wages in the telephone industry had lagged behind. In 1917, however, the average was practically the same for both central electric stations and for electric railways. The lower scale of wages, which still maintains in the telephone and telegraph industries, can readily be explained by the fact that young women, girls, and boys are largely employed, and also there is not the same need for a large number of highly trained technical experts, whose services are indispensable in connection with electric light and power stations and electric railways. Further, the actual number who must be highly trained is no doubt relatively greater in the electric light and power business even than in the electric railway industry. The rapid increase in average salaries and wages for the latter since 1912 is probably in considerable measure the result of a better organization of labor in this field.

Table 3 — PER CENT OF TOTAL EXPENSES INCURRED FOR SALARIES AND WAGES: 1917, 1912, 1907, AND 1902.

CENSUS YEAR.	Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
1917	22.3	41.2	54.2	43.2
1912	26.1	40.9	47.4	42.8
1907	26.4	42.2	48.3	42.5
1902	30.3	43.5	55.6	48.6

It is further interesting to note, as shown in Table 3, that the relative amount of total expenses incurred for salaries and wages has remained surprisingly constant for the electric railways, has tended to decrease for the telephones until 1912, has remained practically stationary for telegraphs since 1907, but has constantly decreased for the central electric stations since 1902, until now, for the latter industry, the proportion of expenditure under this head (22.3 per cent) is little more than half what it is for the electric railways and the telegraph industry, while for the telephone systems the ratio is highest (54.2 per cent). These relations are of significance in that they show to what extent a slight change in wages paid may, in the case of most electrical industries, affect the net income of the business.

The rate of increase in capitalization during the periods studied has been, as might be expected, much more rapid for the central electric stations than for any of the other electrical industries. Aside from the development of new territory in this business, every increase in population in the district already served makes possible and usually imperative the extension of service and calls for a higher investment. This principle holds true to a somewhat less degree in the telephone business, but is relatively of much less importance in connection with electric railways, while it is practically nonexistent so far as telegraphs are concerned. In studying the financial statistics, however, attention should be particularly called to the

fact that for every census period the expenses of electric railways increased more rapidly than the income, and during the period 1912–1917 the expenses for all electrical industries, except the telegraph companies, also increased much more rapidly than the income. The latter, on account of the unusual activities of the year resulting from our entry into the war, a condition which makes quick communication an absolute essential, reaped a very substantial and unforeseen increase in net return (179.3 per cent).

The net income has, for every electrical industry except the telegraph, increased less rapidly from year to year. The figures for the telegraph business are anomalous because of the fact already mentioned and because the expenses were computed in a different manner in 1912 from that used at preceding dates.[1] In this year depreciation and sinking-fund charges were for the first time included under expenses; hence the net income showed an abnormal decrease between 1907 and 1912. The *total* net income of the electric railways actually decreased by an appreciable amount—nearly $6,000,000, or 6.7 per cent—between 1912 and 1917. This unsatisfactory state of affairs, which, beyond a doubt, has grown worse since these statistics were collected, has been partially due to the increased costs of material, higher wages, higher taxes, higher interest rates, etc., while few increases were made in fares before 1918. Further, jitneys and private automobiles have probably taken much of the business which would otherwise have gone to the electric railways. It is highly significant that, while there was between 1912 and 1917 merely a 19.5 per cent increase in the number of passengers carried, expenses increased by 32 per cent.

The relations which exist between capitalization, gross income, and net income are shown in Table 4. Until the last census period, 1912–1917, total income increased less rapidly than capitalization in the electric light and power industry. In the case of the electric railways the income has increased with slightly greater rapidity at all periods, while the relations have been relatively constant for the telephone and telegraph companies.

[1] Bulletin 123, Bureau of the Census, Telephones and Telegraphs, 1912, p. 23.

Table 4 PERCENTAGE RELATION BETWEEN CAPITALIZATION, GROSS INCOME, AND NET INCOME: 1917, 1912, 1907, AND 1902.

CENSUS YEAR.	Central electric light and power stations.	Electric railways.	Telephones.	Telegraphs (land and ocean).
	PER CENT GROSS INCOME IS OF CAPITALIZATION.			
1917	17.2	13.2	31.9	47.9
1912	13.9	12.3	26.2	28.6
1907	16.0	11.3	23.8	23.4
1902	17.0	10.9	25.0	26.1
	PER CENT NET INCOME IS OF CAPITALIZATION.			
1917	3.3	1.5	5.1	7.8
1912	3.1	1.9	5.3	2.8
1907	3.8	1.8	5.6	4.4
1902	3.5	2.1	6.2	6.1

The relations between *net* income and capitalization, however, tell a somewhat different story. There has, upon the whole, been a tendency to decrease in all of the industries studied. So far as the telegraph systems are concerned, the figures, as above explained, must be taken with reservation, particularly the rapid increase from 1912 to 1917. In the central electric stations, also, the change has not been clearly marked, but for telephone companies the proportion has slowly but surely fallen. The drop has been most marked, however, not only from 1912 to 1917, but also for the entire period since 1902, in the electric railway industry, so that the ratio which the net income now bears to the capitalization (1.5 per cent) is relatively about 30 per cent less than in 1902 (2.1 per cent). So far as financial returns in the electrical industries are concerned, the electric railways have constantly been in by far the worst position, followed by the central electric stations. A much better showing is made by the telephones, which, from the nature of their business, do not require so large an investment in proportion to the amount of service rendered. From these simple analyses it would appear that the frequent assertion to the effect that public utilities are operated under conditions of increasing returns is hardly borne out by the facts, at least so far as electrical industries in general are concerned.