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1897

TENTH ANNUAL REPORT

OF THE

BUREAU

OF

Industrial and Labor Statistics

FOR THE

STATE OF MAINE.

1896.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1897.

STATE OF MAINE.

OFFICE OF COMMISSIONER OF
INDUSTRIAL AND LABOR STATISTICS,

AUGUSTA, December 31, 1896.

To his Excellency, HENRY B. CLEAVES, *Governor of Maine:*

SIR: I have the honor to present the report of the Bureau of Industrial and Labor Statistics for 1896.

Very respectfully,

SAMUEL W. MATTHEWS,
Commissioner.

INTRODUCTION.

The Tenth Annual Report of the Bureau of Industrial and Labor Statistics comprises the compilation of data collected from manufacturing establishments in the State. The blanks prepared and issued through the mails and by special agents, contained the following interrogatories:

Name of firm or corporation.....
Location .....
Kind of goods manufactured.....
Capital invested.....
Cost of material used for the year ending June 30, 1895.....
for year ending June 30, 1896.....
Value of production for year ending June 30, 1895.....
for year ending June 30, 1896.....
Number of weeks in operation during the year ending June 30, 1895.....
during the year ending June 30, 1896.....
Average number of hands employed during the year ending June 30, 1895 .....
during the year ending June 30, 1896.....
Average number of men....., women.....,
children under 16 years old.....employed during the year ending June 30, 1895.
Average number of men....., women.....,
children under 16 years old..... employed during the year ending June 30, 1896.
Average weekly wages paid men....., women.....,
children under 16 years old.....during the year ending June 30, 1895.
Average weekly wages paid men....., women.....,
children under 16 years old.....during the year ending June 30, 1896.

Total amount paid in wages during the year ending June 30, 1895.....
Total amount paid in wages during the year ending June 30 1896.....

The following circular letter accompanied the papers containing the questions asking for information:

STATE OF MAINE.

BUREAU OF INDUSTRIAL AND LABOR STATISTICS,

Augusta,.....1896.

GENTLEMEN:

Chapter 69 of the Laws of 1887, entitled "An Act to provide for a Bureau of Industrial Statistics," provides as follows:

Section 2. It shall be the duty of this department to collect, assort, systematize, and present in annual reports to the governor, to be by him transmitted biennially to the legislature, statistical details relating to all departments of labor in the State, especially in its relations to the commercial, industrial, social, educational, and sanitary condition of the laboring people, and to the permanent prosperity of the productive industries of the State.

In pursuance of the requirements of the law, the commissioner is now engaged in compiling a statement of the manufacturing industries of the State. You are earnestly requested to fill out the accompanying blank form and return the same to this office at your earliest convenience.

In case there should be any apprehension on the part of those receiving this form that answering any of the questions in the blank may be prejudicial to their personal or business interests, the commissioner desires it to be distinctly understood that the Bureau will preserve the strictest confidence with all supplying information, and no names of persons, except by express permission, will appear in the report, or be otherwise given to the public.

Your prompt compliance with this request will much facilitate the labors of this Bureau in accomplishing the objects contemplated by the law.

Respectfully yours,

S. W. MATTHEWS,

Commissioner.

The responses to these blanks issued through the mails proving incomplete and unsatisfactory, the Commissioner found himself compelled to limit the field of investigation, on the ground that a comparatively thorough canvass of a few of our larger towns and cities would give more satisfactory results than any other within the means and capacity of the Bureau.

Accordingly, special agents were employed for limited periods of time, whose efforts were confined, mainly, to Portland, Biddeford, Saco, Lewiston, Auburn and a few other important places. Partial canvasses of a number of other cities and towns were made. The compilations included in the tabular work are almost entirely the results of the investigations made by agents in the sections of the State above mentioned. While it is true that reports made to this Bureau are *voluntary*, there being no legislation *compelling* manufacturers to make them, it is to be regretted that so many corporations and firms fail to comply with the requests of the Commissioner for information which might be of great value to themselves as well as of interest to all our citizens. The *spirit* of the law if not the *letter*, calls for a liberal response to the inquiries made. The business depression which has existed during the past few years, causing suspensions and diminutions in operations and productions, is doubtless largely responsible for the short-comings of manufacturers in making returns.

Extended investigations and descriptions of several special industries are given in this report, in articles which, it is believed, will be found of interest and value. These industries are the iron ship building, starch, and tannery. Brief descriptions are given of the stone pottery and the ax and scythe manufactures. Other features of the report are, factories and workshops

erected, enlarged and completed during the year; a compilation from report of the commissioner of the United States department of labor on "Strikes and Lock-outs" in Maine, and a brief article on the railroads and railroad employes in the State.

At the national convention of officials of Bureaus of Labor Statistics in the United States, held at Albany, N. Y., in June last, acting on a recommendation of the executive committee, the question of investigating the municipal ownership of water, gas, and electric light plants; "this investigation not to be considered for or against municipal ownership, but for the purpose of ascertaining all facts bearing upon this question," was considered and discussed at considereable length. Several prominent gentlemen delivered addresses or presented papers imparting much practical information upon the question. Copious extracts from these papers and addresses are published in this report, which deserve public attention and consideration. For "good and sufficient reasons," however, the proposed investigation has been postponed to a future time. When made, it is expected that the United States department will co-operate with the State bureaus. The commissioner again acknowledges his indebtedness for the faithful services of those who have for shorter or longer periods, been in his employ during the year, Maj. C. J. House, the able clerk of the Bureau, and special agents, A. I. Brown, E. M. Blanding, W. A. Newcomb and Francis Wiggin.

MANUFACTURING INDUSTRIES.

This investigation covers twenty-five different industries. No thorough investigation of any one industry was undertaken, but a sufficient number of returns were obtained in each to show their general condition as compared with one year ago.

The woolen industry is still in an unsatisfactory condition. Eight mills show a fall off in production of nearly fifteen per cent. Twelve mills show a fall off in wages paid of $22,546 and a shortening of average running time of one week and two days from last year. The working force has decreased but the rate of wages has not materially changed.

The cotton industry shows a healthier condition. Six mills with an output of $5,044,494 for the year ending June 30, 1895, show an increase in product of about five and three-fourths per cent. There has been a slight fall off in the number of hands employed, but the rate of wages has ranged about two per cent. higher than in 1895.

The six establishments reported where agricultural implements and tools are manufactured, show a fall off of about five per cent. in the output, also a decrease in time run and number of hands employed, though the old rate of wages has been maintained.

Seven bakeries reported, in several of which confectionery is also manufactured. An increase of one and one-half per cent. in output is shown, a small addition to the number of hands employed and amount of wages paid, but the rate of wages remains the same.

Two blank book manufacturers made returns, but the business remains substantially the same as one year ago. No change is noted either in running time, hands employed or rate of wages, and but a very slight decrease in product and amount of wages paid.

In the manufacture of blocks and pumps, although no change has been made in rate of wages, the output has decreased over sixteen per cent. and the amount paid out in wages in nearly the same ratio.

In boiler making, but slight change is noted. Though there was a small decrease in number of hands employed, the product remains substantially as in 1895.

Eleven shoe factories with an output of $2,299,668 in 1895, show an increase of $51,962 or a little over two and one-fourth per cent. An increase of three days in average running time is noted, and about one per cent. in working force. The rate of wages shows a change of a small fraction of one per cent. increasing the wages of men one cent per week and decreasing that of women four cents a week.

Box making, shows a decrease all along the line except that the old rate of men's wages is maintained.

Returns from three brick yards have been received. The output, which in 1895 was $51,490, shows an increase of two and one-half per cent. The old rate of wages is maintained but a slight decrease in running time and working force reduces the total amount paid in wages.

Four carriage manufactories with an output of $65,000 in 1895, show an increase of two per cent. No change in rate of wages or working force, but a small increase in running time and total wages paid.

Three establishments, manufacturers of chewing gum, which it is believed substantially covers this industry in the State, with an output in 1895 of $68,756, show an increase of about ten per cent. or a product to the value of $75,606 in 1896. The average running time was shortened four days, but an increase of twenty per cent. in working force is shown, confined to women and children whose wages are much lower than that of men, hence the small increase in total wages paid. No change is noted in the rate of wages.

In six cigar factories the decrease in value of product amounted to three and two-thirds per cent., or a fall off from

$61,500 in 1895 to $59,250 in 1896. The average running time was reduced one week and one day, a small reduction in working force is shown, and consequently a considerable fall off in amount of wages paid. No change in the rate of wages.

Six clothing establishments with a product of $154,800 in 1895, show a fall off of about ten per cent. in this year's output. No change in the rate of wages is noted and only a small decrease in working force, but the average running time was shortened two weeks and one day. The total amount of wages paid was seven per cent. less than in 1895.

From confectionery establishments, four returns were received. Their output in 1895 amounted to $22,400, but this shows a fall off for 1896 of thirteen per cent. The rate of wages and working force remain substantially the same as in 1895, but a considerable shortening in the running time is noted.

The two creameries making returns, show no change whatever from last year except a little increase in amount of wages paid, which would indicate less of lost time to the employes.

Nine returns were received from manufacturers of doors, sash and blinds. The product, which in 1895 was a little over half a million dollars, shows a fall off of about three and three-fourths per cent. This is brought about by a reduction in running time and of working force, as no change is noted in the rate of wages paid.

In fish curing, the fall off in the output amounts to nearly eight per cent. brought about principally by a reduction in working force, as there is a slight increase in average running time. No change is made in the rate of wages paid.

The two leather-board establishments reporting show a fall off in product of nearly fifteen per cent., in working force over twelve per cent., and a very slight decrease in the rate of wages paid to men. The total wages paid decreased over thirteen per cent.

Seven lumber mills with an output in 1895 of $321,423, show a fall off of over six per cent. in product, and about the same in working force. The rate of wages shows an advance of a little over two per cent. No change is noted in running time.

Returns have been received from seven establishments where machinery of various kinds is manufactured, turning out a product in 1895 of $154,355. This industry shows a fall off of five per cent. in value of product, brought about by a reduction in working force as the running time and rate of wages remain the same.

Four establishments running on monumental work, show only a slight decrease, affecting product, running time, total wages paid and hands employed. No change is noted in rate of wages.

Four pulp and paper mills with an output in 1895 of $656,856, show an increase in value of product of nineteen per cent. without any corresponding increase in running time or working force, but this is explained by the fact that in one large mill a large part of the crew were kept at work on repairs for about six months in 1895, otherwise the figures would not indicate any material change in the business of the mills reporting. The business no doubt has increased during the year by enlargements and new mills but no material change in those which have been running for several years. The rate of wages in the four mills show an increase of about two and one-fourth per cent. for men.

Three establishments manufacturing silver plated ware which did a business of $74,300 in 1895, show a fall off in product of about eleven per cent. The decrease extends to total wages paid, running time and working force, the rate of wages remaining the same.

Two soap factories doing a business of $11,760 in 1895, show a decline of eight and one-half per cent. in product. No change is noted in rate of wages, but the working force is reduced and average running time shortened, and consequently the amount paid out in wages is less.

Table of Manufacturers' Returns.

WOOLEN

Number of return.	Capital invested.	Cost of material used for year ending June 30.		Value of production for year ending June 30.		Weeks in operation for year ending June 30.		Hands employed for year ending June 30.	
		1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	$120.000	$ 79,736	$95,750	$118,313	$135,808	50	48	82	93
2	100,000	125,000	130,000	221,000	255,000	52	52	125	140
3	200,000	333,300	200,000	500,000	300,000	52	52	339	290
4	150,000	191,607	129,780	253,918	204,678	52	44	140	140
5	100,000	197,471	140,676	258,117	207,151	52	52	106	106
6	84,800	210,000	190,000	275,000	250,000	50	50	160	150
7	50,000	36,000	33,600	72,000	70,000	52	52	55	55
8	80,000	111,000	112,000	152,000	154,000	50	50	97	97
9	50,000	-	-	-	-	48	48	45	45
10	300,000	-	-	-	-	49	51	160	140
11	160,000	68,680	71,776	-	-	52	52	108	98
12	22,500	30,000	22,000	-	-	52	46	46	36

COTTON

1	1,000,000	500,843	562,380	841,146	947,365	48	49	1,010	1,105
2	798,500	251,018	223,087	544,367	476,911	50	44	797	777
3	500,000	101,500	116,000	188,000	206,500	52	52	262	258
4	2,400,000	1,012,232	1,117,881	1,625,406	1,790,835	52	50	1,835	1,831
5	2,000,000	804,460	863,556	1,305,575	1,390,765	52	50	1,501	1,470
6	100,000	200,000	190,000	540,000	520,000	51	50	780	780
7	200,000	350,000	350,000	-	-	52	52	1,500	1,493
8	200,000	310,000	290,000	-	-	50	50	1,215	1,125
9	1,200,000	475,268	584,724	-	-	44	49	1,698	1,678
10	1,500,000	291,160	332,218	-	-	50	52	918	955

AGRICULTURAL IMPLI

1	50,000	21,000	24,360	50,000	54,125	52	52	55	60
2	35,500	18,000	16,000	34,000	30,000	50	46	22	18
3	15,000	8,000	6,500	17,000	13,870	52	52	13	10
4	15,000	9,000	6,500	17,500	14,340	52	52	12	8
5	6,000	5,000	5,000	10,000	10,000	40	40	6	6
6	2,875	3,000	3,000	7,000	7,000	52	52	3	3

BAKE

1	3,000	11,000	9,000	18,000	16,000	52	52	7	8
2	10,000	14,858	15,147	20,830	21,360	52	52	8	10
3	1,500	4,100	4,100	7,200	7,300	52	52	3	4
4	175,000	200,000	190,000	275,000	282,000	52	52	125	133
5	2,500	4,000	4,000	8,000	8,000	52	52	5	5
6	2,000	8,000	8,000	14,000	14,000	52	52	8	8
7	9,000	25,000	26,100	43,000	43,220	52	52	11	11

BLANK

1	10,000	5,600	5,440	10,800	10,566	40	40	12	12
2	16,000	8,000	8,000	16,000	16,000	52	52	10	10

BLOCKS AND

1	4,000	4,000	3,000	7,000	6,000	52	52	8	6
2	3,000	4,900	4,812	8,300	8,143	52	52	3	3
3	4,000	5,000	3,800	9,000	6,200	52	52	4	2

MILLS.

Number of return.	Average number employed.						Average weekly wages.						Total wages paid.	
	Men.		Women.		Children.		Men.		Women.		Children.			
	1895	1896	1895	1896	1895	1896	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	52	56	30	37	–	–	$9 75	$9 75	$7 00	$7 00	–	–	$35,850	$38,640
2	75	85	45	50	5	5	9 50	9 50	7 50	7 50	$4 50	$4 50	53,600	59,600
3	218	174	96	95	25	21	7 50	7 50	5 40	5 40	3 30	3 30	95,036	93,700
4	75	75	60	60	5	5	8 25	8 25	6 50	6 50	5 00	5 00	53,838	46,992
5	79	79	26	26	1	1	8 50	8 50	6 25	6 25	5 10	5 10	50,000	44,000
6	140	130	18	18	2	2	8 50	8 50	5 00	5 00	3 00	3 00	55,000	53,000
7	28	28	27	27	–	–	10 00	10 00	8 50	8 50	–	–	21,000	22,400
8	55	55	42	42	–	–	8 25	8 25	6 00	6 00	–	–	31,776	32,463
9	30	30	15	15	–	–	9 48	9 48	8 10	8 10	–	–	18,500	18,000
10	100	90	60	50	–	–	9 00	9 00	7 00	7 00	–	–	66,953	59,112
11	64	62	44	36	–	–	6 96	7 96	5 34	5 84	–	–	33,000	31,000
12	31	23	15	13	–	–	10 50	10 50	6 00	6 00	–	–	21,900	15,000
MILLS.														
1	410	423	490	560	110	122	7 98	8 20	5 10	5 30	2 10	2 40	287,288	328,706
2	352	378	365	338	80	61	7 80	7 56	5 58	5 40	2 80	2 69	234,657	205,094
3	124	124	108	108	30	26	9 69	10 07	6 26	6 76	2 10	2 10	82,434	86,081
4	842	816	903	908	90	107	6 50	7 23	4 87	5 45	2 60	3 40	525,380	561,292
5	665	678	756	693	80	99	6 52	7 24	4 85	5 38	2 51	2 78	426,625	444,925
6	460	460	320	320	–	–	8 00	8 00	6 00	6 00	–	–	300,000	290,453
7	810	808	651	646	39	39	8 10	8 10	6 00	6 00	3 00	3 00	334,200	333,916
8	780	780	375	310	60	35	8 25	8 25	6 00	6 00	3 00	3 00	444,750	420,900
9	727	693	863	885	108	100	8 10	8 10	6 36	6 30	3 00	3 00	473,367	515,415
10	307	320	540	560	71	75	7 77	7 15	4 50	4 38	4 11	3 92	262,795	293,472
MENTS AND TOOLS.														
1	55	60	–	–	–	–	9 00	9 00	–	–	–	–	24,640	25,786
2	22	18	–	–	–	–	9 75	9 75	–	–	–	–	10,700	8,500
3	13	10	–	–	–	–	9 00	9 60	–	–	–	–	6,000	4,675
4	12	8	–	–	–	–	10 00	10 00	–	–	–	–	6,135	4,915
5	6	6	–	–	–	–	9 50	9 50	–	–	–	–	2,175	2,211
6	3	3	–	–	–	–	10 50	10 50	–	–	–	–	1,800	1,800
RIES.														
1	4	5	3	3	–	–	10 00	10 00	5 00	5 00	–	–	2,060	2,400
2	7	9	1	1	–	–	10 00	10 00	7 00	7 00	–	–	3,640	4,060
3	2	3	1	1	–	–	15 00	15 00	5 00	5 00	–	–	1,040	1,050
4	67	65	58	68	–	–	11 00	11 00	4 50	4 50	–	–	40,300	41,600
5	4	4	1	1	–	–	9 00	9 00	6 00	6 00	–	–	2,120	2,196
6	7	7	1	1	–	–	9 00	9 00	4 00	4 00	–	–	3,952	3,952
7	10	10	1	1	–	–	10 00	10 00	5 00	5 00	–	–	4,800	4,800
BOOKS.														
1	6	6	6	6	–	–	10 00	10 00	5 00	5 00	–	–	4,500	4,421
2	4	4	6	6	–	–	9 00	9 00	5 00	5 00	–	–	3,300	3,300
PU MPS.														
1	8	6	–	–	–	–	10 00	10 00	–	–	–	–	4,270	4,135
2	3	3	–	–	–	–	10 50	10 50	–	–	–	–	1,638	1,630
3	4	2	–	–	–	–	9 50	9 50	–	–	–	–	2,000	1,000

BOILER MAKING

Number of return.	Capital invested.	Cost of material used for year ending June 30.		Value of production for year ending June 30.		Weeks in operation for year ending June 30.		Hands employed for year ending June 30.	
		1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	$6,000	$11,000	$11,000	$22,000	$21,000	50	50	12	10
2	13,000	11,533	10,914	21,451	20,913	50	50	9	9
3	5,000	18,000	18,462	28,000	29,554	52	52	9	9

BOOTS AND

1	100,000	200,000	200,000	275,000	275,000	50	50	140	140
2	29,300	79,619	80,557	130,742	142,200	52	52	70	76
3	250,000	400,000	400,000	600,000	600,000	51	50	400	400
4	65,000	150,000	163,125	230,000	263,970	52	52	160	175
5	50,000	65,000	54,875	90,000	81,162	45	42	50	50
6	75,000	42,000	35,000	85,000	69,000	50	48	100	100
7	50,000	60,000	45,000	110,000	90,000	50	46	60	50
8	125,000	63,500	119,095	100,000	215,600	37	52	100	125
9	50,000	45,000	50,000	82,000	89,455	48	51	75	75
10	50,000	176,077	212,614	329,545	360,778	52	52	146	168
11	84,000	175,000	110,000	267,381	164,465	51	50	127	82

BOX

1	5,000	3,800	2,500	5,800	4,000	45	38	4	2
2	6,000	2,910	2,745	7,233	8,802	43	52	10	9
3	6,000	8,000	8,000	19,000	19,000	52	52	20	20

BRICK

1	10,000	18,000	20,000	23,000	26,000	30	33	10	9
2	10,000	8,963	7,340	16,490	14,780	40	37	12	12
3	6,000	8,000	8,000	12,000	12,000	30	30	6	6

CARRIAGE

1	5,000	6,500	6,200	11,500	11,000	38	36	3	3
2	7,500	8,430	8,430	16,000	16,810	50	50	14	14
3	9,000	8,244	7,125	19,000	18,462	52	52	12	12
4	25,000	11,000	12,000	18,500	20,000	48	52	10	10

CHEWING

1	88,000	22,368	25,405	45,293	52,434	50	48	30	40
2	12,000	7,000	7,000	14,000	14,000	45	45	16	16
3	7,500	4,980	4,770	9,463	9,172	46	46	6	6

CIGAR

1	4,800	5,600	3,800	9,000	7,000	52	46	6	4
2	4,600	4,000	4,000	9,500	9,500	47	47	8	8
3	8,600	10,500	9,000	22,000	18,000	52	47	11	10
4	3,000	3,500	3,500	7,000	7,000	50	50	3	3
5	3,850	3,000	4,500	6,000	8,500	44	48	5	6
6	5,000	4,500	4,845	8,000	9,250	45	45	8	8

ESTABLISHMENTS.

Number of return.	Average number employed.						Average weekly wages.						Total wages paid.	
	Men.		Women.		Children.		Men.		Women.		Children.			
	1895	1896	1895	1896	1895	1896	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	12	10	–	–	–	–	$12 00	$12 00	–	–	–	–	$7,000	$6,000
2	9	9	–	–	–	–	10 50	10 50	–	–	–	–	4,624	4,415
3	9	9	–	–	–	–	10 50	10 50	–	–	–	–	5,000	5,128

SHOES.

1	85	85	55	55	–	–	12 00	12 00	$7 00	$7 00	–	–	51,000	50,890
2	50	52	20	24	–	–	10 00	10 50	6 25	6 75	–	–	33,037	38,837
3	275	275	115	115	10	10	10 50	10 50	6 00	6 00	$3 50	$3 50	144,375	137,750
4	110	121	50	54	–	–	11 55	11 55	7 00	7 00	–	–	65,000	87,650
5	30	30	20	20	–	–	10 00	10 00	6 00	6 00	–	–	18,900	13,580
6	50	45	46	55	4	–	10 00	10 00	6 00	6 00	3 50	–	36,000	32,000
7	25	20	25	25	10	5	9 00	9 00	6 00	6 00	3 50	3 50	20,500	15,900
8	65	75	35	50	–	–	10 00	10 00	6 00	6 00	–	–	36,876	52,507
9	30	30	35	35	10	10	10 00	10 00	6 00	6 00	3 50	3 50	25,000	25,000
10	86	98	60	70	–	–	11 25	11 25	7 00	7 00	–	–	74,920	80,764
11	80	51	47	31	–	–	10 56	10 13	7 84	6 87	–	–	61,877	36,487

FACTORIES.

1	4	2	–	–	–	–	8 50	8 50	–	–	–	–	1,500	650
2	9	8	1	1	–	–	9 00	9 00	7 60	7 50	–	–	4,043	4,105
3	20	20	–	–	–	–	10 00	10 00	–	–	–	–	8,200	8,300

YARDS.

1	10	9	–	–	–	–	10 50	10 50	–	–	–	–	3,780	3,200
2	12	12	–	–	–	–	10 50	10 50	–	–	–	–	5,120	4,116
3	6	6	–	–	–	–	10 50	10 50	–	–	–	–	1,900	1,900

FACTORIES.

1	3	3	–	–	–	–	9 00	9 00	–	–	–	–	1,000	900
2	14	14	–	–	–	–	10 00	10 00	–	–	–	–	7,000	7,106
3	12	12	–	–	–	–	11 50	11 50	–	–	–	–	7,000	7,000
4	10	10	–	–	–	–	9 00	9 00	–	–	–	–	4,300	4,680

GUM.

1	5	5	20	25	5	10	12 00	12 00	4 00	4 00	2 75	2 75	7,545	7,835
2	6	6	10	10	–	–	9 50	9 50	5 00	5 00	–	–	5,000	5,000
3	2	2	2	2	2	2	9 00	9 00	4 00	4 00	2 50	2 50	1,456	1,411

FACTORIES.

1	2	1	4	3	–	–	17 50	17 50	7 00	7 00	–	–	3,210	2,307
2	3	3	5	5	–	–	15 00	15 00	7 50	7 50	–	–	3,800	3,753
3	3	3	8	7	–	–	15 00	15 00	7 00	7 00	–	–	5,200	4,342
4	–	–	3	3	–	–	–	–	6 00	6 00	–	–	945	945
5	2	2	3	4	–	–	14 00	14 00	7 00	7 00	–	–	2,100	2,700
6	2	2	6	6	–	–	15 00	15 00	7 50	7 50	–	–	3,500	3,500

Number of return.	Capital invested.	Cost of material used for year ending June 30.		Value of production for year ending June 30.		Weeks in operation for year ending June 30.		Hands employed for year ending June 30.	
		1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
CLOTH									
1	$2,500	$6,800	$5,000	$11,800	$9,700	46	40	13	13
2	15,000	15,500	15,500	30,000	30,000	52	52	40	40
3	8,500	9,000	9,000	28,000	28,000	48	48	50	50
4	8,500	20,000	15,000	34,000	27,000	45	40	25	20
5	5,000	8,000	8,000	15,000	15,000	52	52	6	6
6	20,000	16,000	13,000	36,000	30,000	46	44	56	52
CONFEC									
1	4,500	3,800	4,000	6,700	6,900	52	52	4	4
2	3,500	800	800	2,000	2,000	50	50	3	3
3	6,800	4,600	3,200	9,500	6,100	52	46	5	4
4	3,000	1,800	2,000	4,200	4,500	52	52	3	4
CREAM									
1	40,000	40,000	40,000	45,000	45,000	50	50	6	6
2	50,000	60,000	60,000	70,000	70,000	52	52	8	8
DOORS, SASH									
1	40,000	22,895	28,619	40,000	49,163	50	50	31	33
2	10,000	25,000	18,000	38,000	35,000	50	50	18	15
3	15,000	20,000	20,000	39,000	35,000	52	52	10	10
4	60,000	50,000	51,827	78,000	80,192	52	52	70	70
5	18,000	35,000	35,000	60,000	60,000	52	52	40	40
6	75,000	40,000	34,000	75,000	68,000	50	42	60	60
7	50,000	48,000	40,000	70,000	62,000	50	50	48	43
8	50,000	40,000	35,000	68,000	60,000	52	52	50	40
9	6,500	18,000	18,000	35,000	34,900	52	52	8	8
FISH									
1	6,000	16,000	16,000	28,000	28,000	40	40	8	8
2	15,000	5,000	4,000	12,000	10,000	32	36	12	10
3	4,000	5,000	5,000	8,985	7,100	40	38	6	5
LEATHER									
1	200,000	74,759	86,819	202,807	172,803	52	52	95	83
2	4,000	2,850	2,400	5,800	4,700	36	36	4	4
LUMBER									
1	11,500	7,558	7,134	18,553	17,751	50	50	9	9
2	40,000	34,910	35,716	75,119	77,675	50	50	56	56
3	50,000	35,185	32,163	59,105	57,320	52	52	32	32
4	60,000	50,000	50,000	75,000	75,000	52	52	45	45
5	8,000	10,000	8,532	18,000	16,322	50	50	14	10
6	8,000	7,229	9,345	13,556	17,053	52	52	7	8
7	25,000	40,000	25,000	62,000	40,000	52	52	30	20

ING.

Number of return.	Average number employed.						Average weekly wages.						Total wages paid.	
	Men.		Women.		Children.		Men.		Women.		Children.			
	1895	1896	1895	1896	1895	1896	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	1	1	12	12	–	–	$10 50	$10 50	$5 00	$5 00	–	–	$3,250	$ 2,600
2	8	8	32	32	–	–	8 50	8 50	5 00	5 00	–	–	12,000	11,690
3	10	10	36	34	4	6	10 00	10 00	5 00	5 00	$3 00	$3 00	14,000	14,000
4	6	4	19	16	–	–	9 00	9 00	5 00	5 00	–	–	6,715	5,560
5	–	–	6	6	–	–	–	–	6 00	6 00	–	–	4,000	4,000
6	8	8	48	44	–	–	10 00	10 00	5 00	5 00	–	–	14,500	12,750
TIONERY.														
1	1	1	2	2	1	1	9 50	9 50	5 00	5 00	3 00	3 00	1,125	1,125
2	2	2	1	1	–	–	8 00	8 00	5 00	5 00	–	–	900	900
3	1	1	4	3	–	–	9 00	9 00	5 00	5 00	–	–	1,560	1,125
4	3	4	–	–	–	–	9 00	9 00	–	–	–	–	1,561	2,216
ERIES.														
1	6	6	–	–	–	–	9 00	9 00	–	–	–	–	3,000	3,000
2	8	8	–	–	–	–	9 00	9 00	–	–	–	–	3,600	3,600
AND BLINDS.														
1	31	33	–	–	–	–	8 10	8 10	–	–	–	–	12,500	13,100
2	18	15	–	–	–	–	9 50	9 50	–	–	–	–	8,026	6,174
3	10	10	–	–	–	–	9 70	9 70	–	–	–	–	4,890	4,900
4	70	70	–	–	–	–	8 10	8 10	–	–	–	–	17,693	18,111
5	40	40	–	–	–	–	9 00	9 00	–	–	–	–	18,750	18,125
6	60	60	–	–	–	–	8 10	8 10	–	–	–	–	24,840	26,115
7	48	43	–	–	–	–	9 00	9 00	–	–	–	–	21,500	19,300
8	50	40	–	–	–	–	9 10	9 10	–	–	–	–	19,000	17,641
9	8	8	–	–	–	–	10 50	10 50	–	–	–	–	5,000	5,000
CURING.														
1	8	8	–	–	–	–	9 00	9 00	–	–	–	–	3,000	3,000
2	12	10	–	–	–	–	9 00	9 00	–	–	–	–	3,500	3,250
3	6	5	–	–	–	–	9 00	9 00	–	–	–	–	2,200	1,800
BOARD.														
1	87	75	8	8	–	–	10 50	10 50	6 50	6 50	–	–	44,977	38,833
2	4	4	–	–	–	–	9 00	9 00	–	–	–	–	1,290	1,290
MILLS.														
1	9	9	–	–	–	–	10 50	10 50	–	–	–	–	4,596	4,563
2	56	56	–	–	–	–	9 00	9 00	–	–	–	–	27,000	26,118
3	32	32	–	–	–	–	9 10	9 00	–	–	–	–	14,450	13,952
4	45	45	–	–	–	–	8 10	8 10	–	–	–	–	17,963	18,120
5	14	10	–	–	–	–	10 30	10 30	–	–	–	–	7,200	5,155
6	7	8	–	–	–	–	9 00	10 50	–	–	–	–	3,276	4,368
7	30	20	–	–	–	–	10 00	10 00	–	–	–	–	15,756	10,296

MACHIN

Number of return.	Capital invested.	Cost of material used for year ending June 30.		Value of production for year ending June 30.		Weeks in operation for year ending June 30.		Hands employed for year ending June 30.	
		1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
1	$25,000	$20,000	$26,000	$45,000	$45,000	52	52	10	10
2	20,000	8,195	6,918	21,915	15,417	50	50	17	11
3	10,000	7,600	7,285	13,540	13,000	52	52	8	8
4	17,500	6,500	6,500	13,000	13,000	40	40	8	8
5	18,000	8,000	8,000	15,000	15,000	40	40	8	8
6	25,000	15,840	15,844	38,900	38,914	50	50	18	18
7	4,800	3,860	3,000	7,000	6,300	35	35	3	3
									MONUMENTAL
1	3,800	5,660	5,750	9,000	9,200	50	50	3	3
2	3,000	8,500	7,800	13,000	12,000	52	52	4	3
3	5,000	6,700	6,700	13,500	13,500	52	52	5	5
4	2,000	6,000	6,000	10,000	10,000	48	47	3	2
									PULP AND
1	100,000	65,168	77,188	108,554	124,862	52	52	71	71
2	200,000	235,312	298,792	295,302	367,148	52	52	152	152
3	250,000	21,500	21,400	172,000	212,000	52	52	100	100
4	75,000	24,916	22,819	81,000	79,453	50	50	120	120
									SILVER PLATED
1	4,000	8,000	6,530	16,300	13,041	42	40	10	8
2	10,000	16,000	16,000	28,000	28,000	48	50	10	12
3	10,000	11,400	9,000	30,000	25,000	46	41	13	11
									SOAP
1	4,000	3,800	3,000	5,960	5,100	38	32	6	5
2	4,900	3,000	2,800	5,800	5,650	40	40	4	4

ERY.

Number of return.	Average number employed.						Average weekly wages.						Total wages paid.	
	Men.		Women.		Children.		Men.		Women.		Children.			
	1895	1896	1895	1896	1895	1896	1895	1896	1895	1896	1895	1896	1895	1896
1	10	10	–	–	–	–	$12 00	$12 00	–	–	–	–	$6,900	$6,900
2	17	11	–	–	–	–	9 00	9 00	–	–	–	–	7,426	4,955
3	8	8	–	–	–	–	9 50	9 50	–	–	–	–	4,000	4,000
4	8	8	–	–	–	–	9 00	9 00	–	–	–	–	3,000	3,000
5	8	8	–	–	–	–	9 50	9 50	–	–	–	–	3,000	3,000
6	18	18	–	–	–	–	10 50	10 50	–	–	–	–	9,250	9,250
7	3	3	–	–	–	–	9 00	9 00	–	–	–	–	1,000	790
WORKS.														
1	3	3	–	–	–	–	12 00	12 00	–	–	–	–	2,000	2,123
2	4	3	–	–	–	–	12 00	12 00	–	–	–	–	2,348	1,993
3	5	5	–	–	–	–	13 40	13 40	–	–	–	–	3,300	3,215
4	3	2	–	–	–	–	12 00	12 00	–	–	–	–	1,728	1,348
PAPER.														
1	71	71	–	–	–	–	8 34	8 34	–	–	–	–	25,483	28,972
2	125	125	27	27	–	–	8 70	9 60	$5 10	$5 10	–	–	45,995	54,210
3	95	95	5	5	–	–	12 00	12 00	6 00	6 00	–	–	51,500	54,400
4	120	120	–	–	–	–	8 00	8 00	–	–	–	–	48,916	45,963
WARE.														
1	10	8	–	–	–	–	12 00	12 00	–	–	–	–	5,000	3,941
2	10	12	–	–	–	–	9 00	9 00	–	–	–	–	4,320	4,500
3	13	11	–	–	–	–	10 00	10 00	–	–	–	–	6,000	4,617
FACTORIES.														
1	6	5	–	–	–	–	9 00	9 00	–	–	–	–	2,052	1,710
2	4	4	–	–	–	–	9 00	9 00	–	–	–	–	1,500	1,500

ANALYSIS.

WOOLEN MILLS.

Number mills tabulated	12
Capital invested	$1,417,300
Cost of material used (10 mills) 1895	1,377,794
Cost of material used (10 mills) 1896	1,125,582
Decrease	252,212
Value of product (8 mills) 1895	1,850,348
Value of product (8 mills) 1896	1,576,637
Decrease	273,711
Total wages paid, 1895	536,453
Total wages paid, 1896	513,907
Decrease	22,546
Average number weeks in operation, 1895	51 w.
Average number weeks in operation, 1896	49 w. 4 d.
Decrease	1 w. 2 d.
Total number hands employed, 1895	1,463
Total number hands employed, 1896	1,390
Decrease	73
Men, 1895	947
Men, 1896	887
Decrease	60
Women, 1895	478
Women, 1896	469
Decrease	9
Children, 1895	38
Children, 1896	34
Decrease	4
Average weekly wages paid men, 1895	$8 85
Average weekly wages paid men, 1896	8 85
Women, 1895	6 55
Women, 1896	6 59
Increase	.04
Per cent increase	.006
Children, 1895	4 18
Children, 1896	4 18

COTTON MILLS.

Number mills tabulated	10
Capital invested	$9,898,500
Cost of material used 1895	4,296,481
Cost of material used 1896	4,629,846
Increase	333,365
Value of product in (6 mills) 1895	5,044,494
Value of product in (6 mills) 1896	5,332,376
Increase	287,882
Total wages paid, 1895	3,371,496
Total wages paid, 1896	3,480,254
Increase	108,758
Average number weeks in operation, 1895	50 w.
Average number weeks in operation, 1896	49 w. 5 d.
Decrease	1 d.
Total number hands employed, 1895	11,516

Total number hands employed, 1896	11,472
Decrease	44
Men, 1895	5,477
Men, 1896	5,480
Increase	3
Women, 1895	5,371
Women, 1896	5,328
Decrease	43
Children, 1895	668
Children, 1896	664
Decrease	4
Average weekly wages paid men, 1895	$7 87
Average weekly wages paid men, 1896	7 99
Increase	.12
Per cent. increase	.015
Women, 1895	5 55
Women, 1896	5 70
Increase	.15
Per cent. increase	.027
Children, 1895	2 80
Children, 1896	2 92
Increase	.12
Per cent. increase	.043

AGRICULTURAL IMPLEMENTS AND TOOLS.

Number establishments tabulated	6
Capital invested	$124,375
Cost of material used, 1895	64,000
Cost of material used, 1896	61,360
Decrease	2,640
Value of product, 1895	135,500
Value of product, 1896	129,335
Decrease	6,165
Total wages paid, 1895	51,450
Total wages paid, 1896	47,887
Decrease	3,563
Average number weeks in operation, 1895	49 w. 4 d.
Average number weeks in operation, 1896	49 w.
Decrease	4 d.
Total number hands employed, 1895	111
Total number hands employed, 1896	105
Decrease	6
Men, 1895	111
Men, 1896	105
Decrease	6
Women	0
Children	0
Average weekly wages paid, 1895	$9 62
Average weekly wages paid, 1896	9 62

BAKERIES.

Number establishments tabulated	7
Capital invested	$203,000
Cost of material used, 1895	266,958
Cost of material used, 1896	256,347
Decrease	10,611

Value of product, 1895	386,030
Value of product, 1896	391,880
Increase	5,850
Total wages paid, 1895	57,912
Total wages paid, 1896	60,058
Increase	2,146
Average number weeks in operation, 1895	52 w.
Average number weeks in operation, 1896	52 w.
Total number hands employed, 1895	167
Total number hands employed, 1896	179
Increase	12
Men, 1895	101
Men, 1896	103
Increase	2
Women, 1895	66
Women, 1896	76
Increase	10
Average weekly wages paid men, 1895	$10 57
Average weekly wages paid men, 1896	10 57
Women, 1895	5 21
Women, 1896	5 21

BLANK BOOKS.

Number establishments tabulated	2
Capital invested	$26,000
Cost of material used, 1895	13,600
Cost of material used, 1896	13,440
Decrease	160
Value of product, 1895	26,800
Value of product, 1896	26,566
Decrease	234
Total wages paid, 1895	7,800
Total wages paid, 1896	7,721
Decrease	79
Average number weeks in operation, 1895	46 w.
Average number weeks in operation, 1896	46 w.
Total number hands employed, 1895	22
Total number hands employed, 1896	22
Men, 1895	10
Men, 1896	10
Women, 1895	12
Women, 1896	12
Average weekly wages paid men, 1895	$9 50
Average weekly wages paid men, 1896	9 50
Women, 1895	5 00
Women, 1896	5 00

BLOCKS AND PUMPS.

Number of establishments tabulated	3
Capital invested	$11,000
Cost of material used, 1895	13,900
Cost of material used, 1896	11,612
Decrease	2,288
Value of product, 1895	24,300
Value of product, 1896	26,343
Decrease	3,957

Total wages paid, 1895	7,908
Total wages paid, 1896	6,765
Decrease	1,143
Average number weeks in operation, 1895	52 w.
Average number weeks in operation, 1896	52 w.
Total number hands employed, 1895	15
Total number hands employed, 1896	11
Decrease	4
Men, 1895	15
Men, 1896	11
Decrease	4
Average weekly wages, paid men, 1895	$10 00
Average weekly wages, paid men, 1896	10 00

BOILERS.

Number establishments tabulated	3
Capital invested	$24,000
Cost of material used, 1895	40,533
Cost of material used, 1896	40,376
Decrease	157
Value of product, 1895	71,451
Value of product, 1896	71,467
Increase	16
Total wages paid, 1895	16,624
Total wages paid, 1896	15,543
Decrease	1,081
Average number weeks in operation, 1895	50 w. 4 d.
Average number weeks in operation, 1896	50 w. 4 d.
Total number hands employed, 1895	30
Total number hands employed, 1896	28
Decrease	2
Men, 1895	30
Men, 1896	28
Decrease	2
Average weekly wages paid, 1895	$11 60
Average weekly wages paid, 1896	11 00

BOOTS AND SHOES.

Number establishments tabulated	11
Capital invested	$928,300
Cost of material used, 1895	1,456,196
Cost of material used, 1896	1,470,266
Increase	14,070
Value of product, 1895	2,299,668
Value of product, 1896	2,351,630
Increase	51,962
Total wages paid, 1895	567,485
Total wages paid, 1896	571,365
Increase	3,880
Average number weeks in operation, 1895	49 w.
Average number weeks in operation, 1896	49 w. 3 d.
Increase	3 d.
Total number hands employed, 1895	1,428

Total number hands employed, 1896	1,441
Increase	13
Men, 1895	886
Men, 1896	882
Decrease	4
Women, 1895	508
Women, 1896	534
Increase	26
Children, 1895	34
Children, 1896	25
Decrease	9
Average weekly wages paid men, 1895	$10 44
Average weekly wages paid men, 1896	10 45
Increase	.01
Women, 1895	6 46
Women, 1896	6 42
Decrease	.04
Children, 1895	3 50
Children, 1896	3 50

BOXES.

Number establishments tabulated	3
Capital invested	$17,000
Cost of material used, 1895	14,710
Cost of material used, 1896	13,245
Decrease	1,465
Value of product, 1895	32,033
Value of product, 1896	31,802
Decrease	231
Total wages paid, 1895	13,743
Total wages paid, 1896	13,055
Decrease	688
Average number weeks in operation, 1895	46 w. 4 d.
Average number weeks in operation, 1896	47 w. 2 d.
Increase	4 d.
Total number hands employed, 1895	34
Total number hands employed, 1896	31
Decrease	3
Men, 1895	33
Men, 1896	30
Decrease	3
Women, 1895	1
Women, 1896	1
Average weekly wages paid men, 1895	$9 17
Average weekly wages paid men, 1896	9 17
Women, 1895	7 60
Women, 1896	7 50
Decrease	.10

BRICKS.

Number establishments tabulated	3
Capital invested	$26,000
Cost of material used, 1895	34,963
Cost of material used, 1896	35,340
Increase	377
Value of product, 1895	51,490

Value of product, 1896	52,780
Increase	1,290
Total wages paid, 1895	10,800
Total wages paid, 1896	*9,216
Decrease	1,584
Average number weeks in operation, 1895	35 w. 2 d.
Average number weeks in operation, 1896	33 w. 2 d.
Decrease	2 w.
Total number hands employed, 1895	28
Total number hands employed, 1896	27
Decrease	1
Men, 1895	28
Men, 1896	27
Decrease	1
Average weekly wages paid, 1895	$10 50
Average weekly wages paid, 1896	10 50

CARRIAGES.

Number establishments tabulated	4
Capital invested	$46,500
Cost of material used, 1895	34,174
Cost of material used, 1896	33,755
Decrease	419
Value of product, 1895	65,000
Value of product, 1896	66,272
Increase	1,272
Total wages paid, 1895	19,300
Total wages paid, 1896	19,686
Increase	386
Average number weeks in operation, 1895	47 w.
Average number weeks in operation, 1896	47 w. 3 d.
Increase	3 d.
Total number hands employed, 1895	39
Total number hands employed, 1896	39
Men, 1895	39
Men, 1896	39
Average weekly wages paid, 1895	$9 87
Average weekly wages paid, 1896	9 87

CHEWING GUM.

Number establishments tabulated	3
Capital invested	$107,500
Cost of material used, 1895	34,348
Cost of material used, 1896	37,175
Increase	2,827
Value of product, 1895	68,756
Value of product, 1896	75,606
Increase	6,850
Total wages paid, 1895	14,001
Total wages paid, 1896	14,246
Increase	245
Average number weeks in operation, 1895	47 w.
Average number weeks in operation, 1896	46 w. 2 d.
Decrease	4 d.
Total number hands employed, 1895	52

Total number hands employed, 1896	62
Increase	10
Men, 1895	13
Men, 1896	13
Women, 1895	32
Women, 1896	37
Increase	5
Children, 1895	7
Children, 1896	12
Increase	5
Average weekly wages paid men, 1895	$10 17
Average weekly wages paid men, 1896	10 17
Women, 1895	4 33
Women, 1896	4 33
Children, 1895	2 62
Children, 1896	2 62

CIGARS.

Number establishments tabulated	6
Capital invested	$29,850
Cost of material used, 1895	31,100
Cost of material used, 1896	29,645
Decrease	1,455
Value of product, 1895	61,500
Value of product, 1896	59,250
Decrease	2,250
Total wages paid, 1895	18,755
Total wages paid, 1896	17,547
Decrease	1,208
Average number weeks in operation, 1895	48 w. 2 d.
Average number weeks in operation, 1896	47 w. 1 d.
Decrease	1 w. 1 d.
Total number hands employed, 1895	41
Total number hands employed, 1896	39
Decrease	2
Men, 1895	12
Men, 1896	11
Decrease	1
Women, 1895	29
Women, 1896	28
Decrease	1
Average weekly wages paid men, 1895	$15 20
Average weekly wages paid men, 1896	15 20
Women, 1895	7 00
Women, 1896	7 00

CLOTHING.

Number establishments tabulated	6
Capital invested	$59,500
Cost of material used, 1895	75,300
Cost of material used, 1896	65,500
Decrease	9,800
Value of product, 1895	154,800
Value of product, 1896	139,700
Decrease	15,100
Total wages paid, 1895	54,465
Total wages paid, 1896	50,600
Decrease	3,865

Average number weeks in operation, 1895	48 w. 1 d.
Average number weeks in operation, 1896	46 w.
Decrease	2 w. 1 d.
Total number hands employed, 1895	190
Total number hands employed, 1896	181
Decrease	9
Men, 1895	33
Men, 1896	31
Decrease	2
Women, 1895	153
Women, 1896	144
Decrease	9
Children, 1895	4
Children, 1896	6
Increase	2
Average weekly wages paid men, 1895	$9 60
Average weekly wages paid men, 1896	9 60
Women, 1895	5 17
Women, 1896	5 17
Children, 1895	3 00
Children, 1896	3 00

CONFECTIONERY.

Number establishments tabulated	4
Capital invested	$17,800
Cost of material used, 1895	11,000
Cost of material used, 1896	10,000
Decrease	1,000
Value of product, 1895	22,400
Value of product, 1896	19,500
Decrease	2,900
Total wages paid, 1895	5,086
Total wages paid, 1896	5,366
Increase	280
Average number weeks in operation, 1895	51 w. 3 d.
Average number weeks in operation, 1896	50 w.
Decrease	1 w. 3 d.
Total number hands employed, 1895	15
Total number hands employed, 1896	15
Men, 1895	7
Men, 1896	8
Increase	1
Women, 1895	7
Women, 1896	6
Decrease	1
Children, 1895	1
Children, 1896	1
Average weekly wages paid men, 1895	$8 87
Average weekly wages paid men, 1896	8 87
Women, 1895	5 00
Women, 1896	5 00
Children, 1895	3 00
Children, 1896	3 00

CREAMERIES.

Number establishments tabulated	2
Capital invested	$90,000
Cost of material used, 1895	100,000
Cost of material used, 1896	100,000
Value of product, 1895	115,000
Value of product, 1896	115,000
Total wages paid, 1895	3,000
Total wages paid, 1896	3,600
Increase	600
Average number weeks in operation, 1895	51 w.
Average number weeks in operation, 1896	51 w.
Total number hands employed, 1895	14
Total number hands employed, 1896	14
Men, 1895	14
Men, 1896	14
Average weekly wages paid, 1895	$9 00
Average weekly wages paid, 1896	9 00

DOORS, SASH AND BLINDS.

Number establishments tabulated	9
Capital invested	$324,500
Cost of material used, 1895	298,895
Cost of material used, 1896	280,446
Decrease	18,449
Value of product, 1895	503,000
Value of product, 1895	484,255
Decrease	18,745
Total wages paid, 1895	132,199
Total wages paid, 1896	122,466
Decrease	9,733
Average number weeks in operation, 1895	51 w.
Average number weeks in operation, 1896	50 w. 1 d.
Decrease	5 d.
Total number hands employed, 1895	335
Total number hands employed, 1896	319
Decrease	16
Men, 1895	335
Men, 1896	319
Decrease	16
Average weekly wages paid men, 1895	$9 01
Average weekly wages paid men, 1896	9 01

FISH CURING.

Number establishments tabulated	3
Capital invested	$25,000
Cost of material used, 1895	26,000
Cost of material used, 1896	25,000
Decrease	1,000
Value of product, 1895	48,985
Value of product, 1896	45,100
Decrease	3,885
Total wages paid, 1895	8,700
Total wages paid, 1896	8,050
Decrease	650

Average number weeks in operation, 1895	37 w. 2d.
Average number weeks in operation, 1896	38 w.
Increase	4 d.
Total number hands employed, 1895	26
Total number hands employed, 1896	23
Decrease	3
Men, 1895	26
Men, 1896	23
Decrease	3
Average weekly wages paid men, 1895	$9 00
Average weekly wages paid men, 1896	9 00

LEATHER BOARD.

Number establishments tabulated	2
Capital invested	$204,000
Cost of material used, 1895	77,609
Cost of material used, 1896	89,219
Increase	11,610
Value of product, 1895	208,607
Value of product, 1896	177,503
Decrease	31,104
Total wages paid, 1895	46,267
Total wages paid, 1896	40,123
Decrease	6,144
Average number weeks in operation, 1895	44 w.
Average number weeks in operation, 1896	44 w.
Total number hands employed, 1895	99
Total number hands employed, 1896	87
Decrease	12
Men, 1895	91
Men, 1896	79
Decrease	12
Women, 1895	8
Women, 1896	8
Average weekly wages paid men, 1895	$10 46
Average weekly wages paid men, 1896	10 43
Decrease	.03
Women, 1895	6 50
Women, 1896	6 50

LUMBER.

Number establishments tabulated	7
Capital invested	$202,500
Cost of material used, 1895	184,882
Cost of material used, 1896	167,890
Decrease	16,992
Value of product, 1895	321,423
Value of product, 1896	301,121
Decrease	20,302
Total wages paid, 1895	90,241
Total wages paid, 1896	82,572
Decrease	7,669
Average number weeks in operation, 1895	51 w. 1 d.
Average number weeks in operation, 1896	51 w. 1 d.
Total number hands employed, 1895	193

Total number hands employed, 1896	180
Decrease	13
Men, 1895	193
Men, 1896	180
Decrease	13
Average weekly wages paid men, 1895	$9 43
Average weekly wages paid men, 1896	9 63
Increase	.20
Per cent. increase	.021

MACHINERY.

Number establishments tabulated	7
Capital invested	$120,300
Cost of material used, 1895	69,995
Cost of material used, 1896	67,547
Decrease	2,448
Value of product, 1895	154,355
Value of product, 1896	146,631
Decrease	7,724
Total wages paid, 1895	34,576
Total wages paid, 1896	31,895
Decrease	2,681
Average number weeks in operation, 1895	45 w. 3 d.
Average number weeks in operation, 1896	45 w. 3 d.
Total number hands employed, 1895	72
Total number hands employed, 1896	66
Decrease	6
Men, 1895	72
Men, 1896	66
Decrease	6
Average weekly wages paid men, 1895	$9 79
Average weekly wages paid men, 1896	9 79

MONUMENTAL WORKS.

Number establishments tabulated	4
Capital invested	$13,800
Cost of material used, 1895	26,860
Cost of material used, 1896	26,250
Decrease	610
Value of product, 1895	45,500
Value of product, 1896	44,700
Decrease	800
Total wages paid, 1895	9,376
Total wages paid, 1896	8,679
Decrease	697
Average number weeks in operation, 1895	50 w. 3 d.
Average number weeks in operation, 1896	50 w. 1 d.
Decrease	2 d.
Total number hands employed, 1895	15
Total number hands employed, 1896	13
Decrease	2
Men, 1895	15
Men, 1896	13
Decrease	2
Average weekly wages paid men, 1895	$12 35
Average weekly wages paid men, 1896	12 35

PULP AND PAPER.

Number establishments tabulated	4
Capital invested	$625,000
Cost of material used 1895	346,896
Cost of material used 1896	420,199
Increase	73,303
Value of product, 1895	656,856
Value of product, 1896	783,463
Increase	126,607
Total wages paid, 1895	171,859
Total wages paid, 1896	183,545
Increase	11,651
Average number weeks in operation, 1895	51 w. 3 d.
Average number weeks in operation, 1896	51 w. 3 d.
Total number hands employed, 1895	443
Total number hands employed, 1896	443
Men, 1895	411
Men, 1896	411
Women, 1895	32
Women, 1896	32
Average weekly wages paid men, 1895	$9 26
Average weekly wages paid men, 1896	9 48
Increase	.22
Per cent increase	.023
Average weekly wages paid women, 1895	$5 55
Average weekly wages paid women, 1896	5 55

SILVER PLATED WARE.

Number establishments tabulated	3
Capital invested	$24,000
Cost of material used, 1895	35,400
Cost of material used, 1896	31,530
Decrease	3,870
Value of product, 1895	74,300
Value of product, 1896	66,041
Decrease	8,259
Total wages paid, 1895	15,320
Total wages paid, 1896	13,058
Decrease	2,262
Average number weeks in operation, 1895	45 w. 2 d.
Average number weeks in operation, 1896	43 w. 4 d.
Decrease	1 w. 4 d.
Total number hands employed, 1895	33
Total number hands employed, 1896	31
Decrease	2
Men, 1895	33
Men, 1896	31
Decrease	2
Average weekly wages paid men, 1895	$10 33
Average weekly wages paid men, 1896	10 33

SOAP.

Number establishments tabulated	2
Capital invested	$8,900
Cost of material used, 1895	6,800
Cost of material used, 1896	5,800
Decrease	1,000
Value of product, 1895	11,760
Value of product, 1896	10,750
Decrease	1,010
Total wages paid, 1895	3,552
Total wages paid, 1896	3,210
Decrease	342
Average number weeks in operation, 1895	39 w.
Average number weeks in operation, 1896	36 w.
Decrease	3 w.
Total number hands employed, 1895	10
Total number hands employed, 1896	9
Decrease	1
Men, 1895	10
Men, 1896	9
Decrease	1
Average weekly wages paid men, 1895	$9 00
Average weekly wages paid men, 1896	9 00

FACTORIES, MILLS AND SHOPS BUILT DURING 1896.

In response to the following inquiries: "How many and what kinds of factories, mills or shops for manufacturing purposes, have been enlarged, completed, or are in process of erection during 1896?" "Estimated cost of same?" "Probable number of hands they will employ?" answers have been returned by the officers of nearly every city and town. Sixty-two cities, towns and plantations report building in this line as follows:

ANDROSCOGGIN COUNTY.

Towns.	Buildings.	What done.	Cost.	Help.
Lewiston	Cotton mill	Additional	$40,000	30
Poland	Saw and box mill	New	3,000	6
Turner	Two saw mills	New	5,000	15
Turner	Grist mill	New		
Turner	Apple evaporator	New		

AROOSTOOK COUNTY.

Ashland	Lumber mill	Enlarged	6,000	
Blaine	Shook mill	New	20,000	40
Bridgewater	Saw and shingle mill	New	2,000	8
Fort Fairfield	Shingle mill	Enlarged	1,000	
Fort Fairfield	Electric light plant	Enlarged		
Limestone	Cooperage	Addition	500	4
Madawaska	Carding mill	New	1,500	10
Masardis	Saw and shingle mill	New	5,000	20
New Limerick	Tannery	Enlarged	3,500	
New Sweden	Shingle mill	New	500	5
Washburn	Starch factory	Enlarged	2,500	1
Washburn	Shingle mill	Enlarged		
Washburn	Blacksmith shop	New		
Washburn	Wood working shop	New		
Caswell Pl	Starch factory	New	3,000	12
St. Francis Pl	Saw mill	New	1,000	3

CUMBERLAND COUNTY.

Brunswick	Cotton mill	Enlarged	30,000	
Gray	Box mill	New	1,000	8
Portland	Cold storage establishment	New	10,000	
Pownal	Saw mill	New	1,500	4
South Portland	Bicycle factory	Enlarged	1,800	75
Yarmouth	Shoe factory	New	13,000	75
Yarmouth	Pulp dry house	New	10,000	

FRANKLIN COUNTY.

Towns.	Buildings.	What done.	Cost.	Help.
Jay	Pulp mill	New	$200,000	30
Jay	Pulp mill	Enlarged		
Phillips	Spool mill	New	15,000	25
Temple	Saw mill	Enlarged	300	
Wilton	Two saw mills	New	5,000	15

HANCOCK COUNTY.

Bluehill	Granite working plant	Completed	*75,000	200
Bluehill	Medicine manufactory	Remodeled	500	3
Eden	Carpenter shop	Enlarged	2,500	15
Eden	Carpenter shop	New		
Gouldsboro	Sardine factory	Enlarged	3,000	50
Mariaville	Hard wood manufactory	Enlarged	300	5

KENNEBEC COUNTY.

Albion	Feed mill	Completed	1,500	2
Farmingdale	Lumber mill	Repaired	3,000	
Monmouth	Wood working job shop	New	600	
Winthrop	Butter factory	Enlarged	2,000	3

KNOX COUNTY.

Friendship	Canning factory	New	2,000	25
Washington	Stave mill	Repaired	500	

LINCOLN COUNTY.

Nobleboro	Heel factory	New	1,500	5
Whitefield	Lumber and feed mill	New	4,000	10

OXFORD COUNTY.

Denmark	Wheel manufactory	New	3,000	25
Mexico	Toothpick factory	Enlarged	2,000	10
Paris	Match factory	Part new	10,000	30
Paris	Bicycle rim manufactory	Remodeled		
Rumford	Lumber mill	New	8,000	20

PENOBSCOT COUNTY.

Brewer	Paper mill	New	150,000	45
Brewer	Foundry, bicycle work	New	50,000	65
Hampden	Lumber mill	New	5,000	15
Stacyville Pl	Starch factory	New	800	6

PISCATAQUIS COUNTY.

Abbot	Woolen mill	Enlarged	500	5
Brownville	Lumber mill	New	5,000	20
Milo	Moulding & planing machinery	Additional	1,000	5

*Commenced in 1895 and $50,000 expended. Not reported till 1896.

SAGADAHOC COUNTY.

Towns.	Buildings.	What done.	Cost.	Help.
Bath	Oil cloth factory	New	$ 50,000	*100
Bath	Cordage manufactory	New		
Bath	Foundry	Commenced		
Topsham	Pulp mill	New	250,000	100

SOMERSET COUNTY.

Harmony	Grist mill	New	700	1
Ripley	Butter factory	New	800	2
Brighton Pl	Shook mill	New	1,000	10

WALDO COUNTY.

Belmont	Lumber mill	Addition	500	3
Brooks	Blacksmith shop	New	400	3
Brooks	Wood working job shop	Enlarged	200	
Palermo	Saw mill	New	400	2

WASHINGTON COUNTY.

Calais	Box mill	New	4,000	15
Charlotte	Shook mill	New	500	2
Columbia Falls	Brick factory	New	15,000	80
Eastport	Sardine factory	New	6,000	150
Lubec	Sardine factory	New	500	15
Perry	Carriage and blacksmith shop	New	100	3

YORK COUNTY.

Kennebunk	Paper mill	New	12,000	10

*All idle at present.

RECAPITULATION.

Counties.	Number of towns.	Number of buildings.	Total cost.	Hands employed.
Androscoggin	3	5	$48,000	51
Aroostook	12	16	46,500	117
Cumberland	6	7	67,300	162
Franklin	4	5	220,300	80
Hancock	4	6	81,300	273
Kennebec	4	4	7,100	5
Knox	2	2	2,500	25
Lincoln	2	2	5,500	15
Oxford	4	5	23,000	85
Penobscot	3	4	205,800	131
Piscataquis	3	3	6,500	30
Sagadahoc	2	4	300,000	200
Somerset	3	3	2,500	13
Waldo	3	4	1,500	8
Washington	6	6	26,100	263
York	1	1	12,000	10
Total	62	77	$1,055,900	1,470

TOTALS FOR SIX YEARS.

Years.	Number of towns.	Number of buildings.	Total cost.	Hands employed.
1891	86	110	$3,023,850	4,278
1892	89	114	2,128,000	4,312
1893	81	108	841,725	2,526
1894	48	55	663,700	1,039
1895	75	102	1,367,800	2,797
1896	62	77	1,055,900	1,470

STRIKES AND LOCKOUTS IN MAINE

1887-1894

From the Tenth Annual Report United States Bureau of Labor

Summary of Strikes in Maine

Marginal number.	Years.	Total strikes.	Ordered by labor organizations.		Establishments.			
			Yes.	No.	Number.	Number closed.	Aggregate days closed.	Average days closed.
1	1887	12	4	8	16	8	54	6.8
2	1888	7	5	2	12	9	150	16.7
3	1889	8	4	4	11	7	93	13.3
4	1890	28	20	8	39	4	69	17.3
5	1891	6	2	4	11	1	28	28.0
6	1892	6	5	1	6	1	122	122.0
7	1893	10	6	4	33	19	986	51.9
8	1894	2	1	1	5	4	60	15.0
	Total	79	47	32	133	53	1,562	29.5
	Industries.							
1	Boots and shoes	17	13	4	27	8	319	39.9
2	Building trades	6	4	2	19	10	120	12.0
3	Cotton goods	10	1	9	12	2	12	6.0
4	Lumber	3	-	3	6	5	73	14.6
5	Machines and machinery	1	-	1	1	-	-	-
6	Metals and metallic goods	1	1	-	1	1	5	5.0
7	Public ways, construction	1	-	1	1	1	8	8.0
8	Public works, construction	1	-	1	1	-	-	-
9	Shipbuilding, etc	8	5	3	11	3	33	11.0
10	Stone quarrying and cutting	22	20	2	36	11	717	65.2
11	Telegraphy	1	-	1	2	-	-	-
12	Tobacco	4	2	2	7	6	149	24.8
13	Transportation	1	1	-	6	6	126	21.0
14	Woolen and worsted goods	2	-	2	2	-	-	-
15	Miscellaneous	1	-	1	1	-	-	-
	Total	79	47	32	133	53	1,562	29.5

by Years, and by Industries.

Days until strikers were re-employed, or places filled by others.		Establishments in which strikes			Employes'		Loss of employers.	Marginal number.
Aggregate.	Average.	Succeeded.	Succeeded partly.	Failed.	Wage loss.	Assistance.		
164	10.3	5	-	11	$15,256	$1,231	$8,100	1
165	13.8	2	1	9	17,713	-	4,100	2
131	11.9	-	-	11	23,500	800	480	3
688	17.6	13	12	14	37,851	7,178	15,117	4
106	9.6	3	-	8	5,001	237	1,400	5
179	29.8	3	-	3	8,997	2,162	16,350	6
1,155	35.0	11	1	21	359,144	6,500	121,693	7
62	12.4	4	-	1	748	-	426	8
2,650	19.9	41	14	78	$468,210	$18,108	$167,666	
629	23.3	9	1	17	$344,764	$8,825	$136,230	1
255	13.4	5	-	14	4,864	-	2,169	2
84	7.0	2	-	10	31,377	-	12,650	3
88	14.7	-	1	5	12,111	100	1,000	4
14	14.0	-	1	-	300	-	75	5
5	5.0	-	-	1	640	-	-	6
8	8.0	-	-	1	3,500	-	-	7
2	2.0	1	-	-	39	-	50	8
60	5.5	4	4	3	14,030	-	100	9
1,192	33.1	18	7	11	41,382	7,252	13,242	10
14	7.0	-	-	2	160	-	400	11
163	23.3	1	-	6	5,594	1,931	700	12
126	21.0	-	-	6	9,000	-	1,000	13
9	4.5	-	-	2	274	-	-	14
1	1.0	1	-	-	175	-	50	15
2,650	19.9	41	14	78	$468,210	$18,108	$167,666	

Summary of Strikes in Maine by

Marginal number.	Years.	Employes before strike.			Employes for whom strike was undertaken.		
		Male.	Female.	Total.	Male.	Female.	Total.
1	1887	3,988	1,957	5,945	744	205	949
2	1888	2,040	573	2,613	575	–	575
3	1889	1,489	175	1,664	1,171	51	1,222
4	1890	3,824	276	4,100	1,349	50	1,399
5	1891	1,720	500	2,220	228	16	244
6	1892	1,386	324	1,710	318	–	318
7	1893	7,093	2,545	9,638	1,664	1,743	3,407
8	1894	224	45	269	25	–	25
	Total	21,764	6,395	28,159	6,074	2,065	8,139
	Industries.						
1	Boots and shoes	7,444	2,514	9,958	968	677	1,645
2	Building trades	418	–	418	330	–	330
3	Cotton goods	7,769	3,783	11,552	1,516	1,375	2,891
4	Lumber	531	–	531	433	–	433
5	Machines and machinery	20	–	20	11	–	11
6	Metals and metallic goods	80	–	80	40	–	40
7	Public ways, construction	400	–	400	400	–	400
8	Public works, construction	130	–	130	15	–	15
9	Shipbuilding, etc.	1,554	–	1,554	679	–	679
10	Stone quarrying and cutting	2,729	–	2,729	1,282	–	1,282
11	Telegraphy	46	–	46	31	–	31
12	Tobacco	47	24	71	46	–	46
13	Transportation	160	–	160	155	–	155
14	Woolen and worsted goods	276	74	350	18	13	31
15	Miscellaneous	160	-	160	150	–	150
	Total	21,764	6,395	28,159	6,074	2,065	8,139

Years and by Industries--CONCLUDED.

Strikers.			Employes thrown out of employment by strike.			New employes after strike.			Brought from other places.	Marginal number.
Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.		
783	259	1,042	1,160	480	1,640	82	8	90	52	1
743	121	864	784	121	905	-	-	-	-	2
985	51	1,036	1,179	51	1,230	14	10	24	12	3
1,145	69	1,214	1,282	70	1,352	195	5	200	136	4
228	14	242	231	14	245	50	14	64	9	5
318	-	318	318	2	320	16	-	16	4	6
1,637	1,743	3,380	3,429	1,763	5,192	1,033	310	1,343	1,275	7
61	3	64	61	3	64	-	-	-	-	8
5,900	2,260	8,160	8,444	2,504	10,948	1,390	347	1,737	1,488	
976	696	1,672	2,768	714	3,482	1,092	248	1,340	1,243	1
303	-	303	303	-	303	13	-	13	-	2
1,723	1,529	3,252	2,060	1,750	3,810	73	98	171	65	3
239	-	239	433	-	433	20	-	20	20	4
11	-	11	11	-	11	-	-	-	-	5
40	-	40	80	-	80	-	-	-	-	6
400	-	400	400	-	400	-	-	-	-	7
15	-	15	15	-	15	3	-	3	-	8
679	-	679	715	-	715	50	-	50	50	9
1,078	-	1,078	1,218	-	1,218	102	-	102	82	10
31	-	31	31	-	31	5	-	5	-	11
46	19	65	46	24	70	32	1	33	28	12
155	-	155	160	-	160	-	-	-	-	13
54	16	70	54	16	70	-	-	-	-	14
150	-	150	150	-	150	-	-	-	-	15
5,900	2,260	8,160	8,444	2,504	10,948	1,390	347	1,737	1,488	

Summary of Lockouts in Maine

Marginal number.	Years.	Total lockouts.	Ordered by organizations.		Establishments.			
			Yes.	No.	Number.	Number closed.	Aggregate days closed.	Average days closed.
1	1889	1	-	1	1	-	-	-
2	1892	2	1	1	30	22	2,662	121.0
3	1894	1	-	1	1	-	-	-
	Total	4	1	3	32	22	2,662	121.0
	Industries.							
1	Boots and shoes	1	-	1	1	-	-	-
2	Clothing	1	-	1	1	-	-	-
3	Stone quarrying and cutting	1	1	-	29	22	2,662	121.0
4	Woolen and worsted goods	1	-	1	1	-	-	-
	Total	4	1	3	32	22	2,662	121.0

by Years and by Industries.

Days until employes locked out were re-employed, or places filled by others.		Establishments in which lockouts			Employes'		Loss of employers.	Marginal number.
Aggregate.	Average.	Succeeded.	Succeeded partly.	Failed.	Wage loss.	Assistance.		
15	15.0	1	–	–	$ 7,000	$ 800	$ 600	1
4,776	159.2	21	6	3	380,837	58,838	143,950	2
44	44.0	–	–	1	4,000	–	–	3
4,835	151.1	22	6	4	$391,837	$59,638	$144,550	
49	49.0	1	–	–	$1,500	$250	$300	1
15	15.0	1	–	–	7,000	800	600	2
4,727	163.0	20	6	3	379,337	58,588	143,650	3
44	44.0	–	–	1	4,000	–	–	4
4,835	151.0	22	6	4	$391,837	$59,638	$144,550	

Summary of Lockouts in Maine by

Marginal number.	Years.	Employes before lockout.			Employes locked out.		
		Male.	Female.	Total.	Male.	Female.	Total.
1	1889	50	35	85	18	–	18
2	1892	2,598	90	2,688	2,254	–	2,254
3	1894	375	325	700	60	40	100
	Total	3,023	450	3,473	2,332	40	2,372
	Industries.						
1	Boots and shoes	310	90	400	65	–	65
2	Clothing	50	35	85	18	–	18
3	Stone quarrying and cutting	2,288	–	2,288	2,189	–	2,189
4	Woolen and worsted goods	375	325	700	60	40	100
	Total	3,023	450	3,473	2,332	40	2,372

Years and by Industries—Concluded.

Employes thrown out of employment by lockout.			New employes after lockout.			Brought from other places.	Marginal number.
Male.	Female.	Total.	Male.	Female.	Total.		
18	-	18	14	-	14	-	1
2,271	-	2,271	1,387	-	1,387	1,341	2
60	40	100	5	-	5	-	3
2,349	40	2,389	1,406	-	1,406	1,341	
65	-	65	50	-	50	20	1
18	-	18	14	-	14	-	2
2,206	-	2,206	1,337	-	1,337	1,321	3
60	40	100	5	-	5	-	4
2,349	40	2,389	1,406	-	1,406	1,341	

Summary of Causes, Etc., of Strikes by Years.

Year and Cause or Object.	Establishments.	Succeeded.	Succeeded partly.	Failed.
1887.				
Against employment of non-union men	1	1		
Against introduction of machinery	4	-	-	4
For fortnightly payment	1	1		
For increase of wages	8	3	-	5
For reduction of hours on Saturday	1	-	-	1
For reinstatement of discharged employes	1	-	-	1
1888.				
Against lasters furnishing their own tacks and pegs	1	-	-	1
Against reduction of wages	1	1		
For increase of wages	8	1	1	6
For regular payment	1	-	-	1
For reinstatement of discharged employes	1	-	-	1
1889.				
Against employment of non-union men	1	-	-	1
Against introduction of machinery	1	-	-	1
Against reduction of wages	2	-	-	2
Against working on job with non-union employes under another contractor	1	-	-	1
For increase of wages	2	-	-	2
For reduction of hours	4	-	-	4
1890.				
Against acceptance of firm's terms on new article of manufacture	1	1		
Against change from pay by the day to pay by the hour	2	-	-	2
Against change from piece to day work	1	-	-	1
Against McKay stitchers being compelled to furnish their own needles	1	-	-	1
Against poor quality of material	2	-	-	2
Against reduction of wages	2	-	-	2
Against system of measuring work	1	1		
For adoption of union scale	1	1		
For increase of wages	9	3	3	3
For increase of wages and reduction of hours	9	3	6	
For increase of wages and reduction of hours on Saturday	2	-	2	
For pay for extra work	1	-	-	1
For recognition of union	1	-	-	1
For reduction of hours	4	*3	1	
For regular payment	1	1		
In sympathy with strike elsewhere	1	-	-	1
1891.				
Against employment of additional apprentices	1	-	-	1
Against employment of non-union men	3	3		
Against reduction of wages	1	-	-	1
For increase of wages	6	-	-	6
1892.				
Against introduction of machinery	1	-	-	1
Against working on job with non-union employes under another contractor.	1	-	-	1
For increase of wages	4	3	-	1
1893.				
Against adoption of prposed scale	6	-	-	6
Against employment of non-union men	7	6	-	1
Against introduction of machinery and reduction of wages	1	-	1	
For discharge of foreman	1	-	-	1
For increase of wages	4	1	-	3
For reduction of hours	14	4	-	10
1894.				
For reduction of hours	4	4		
For reinstatement of discharged employes	1	-	-	1

* But wages were reduced in two establishments.

Summary of Causes, Etc., of Strikes by Industries.

Industries and Cause or Object.	Establishments.	Succeeded.	Succeeded partly.	Failed.
Boots and Shoes.				
Against adoption of proposed scale	6	–	–	6
Against change from piece to day work	1	–	–	1
Against employment of non-union men	8	7	–	1
Against introduction of machinery	2	–	–	2
Against introduction of machinery and reduction of wages	1	–	1	
Against lasters furnishing their own tacks and pegs	1	–	–	1
Against McKay stitchers being compelled to furnish their own needles	1	–	–	1
Against reduction of wages	2	–	–	2
For increase of wages	4	2	–	2
For pay for extra work	1	–	–	1
Building Trades.				
Against change from pay by the day to pay by the hour	2	–	–	2
Against working on job with non-union employes under another contractor	1	–	–	1
For fortnightly payment	1	1		
For increase of wages	4	–	–	4
For reduction of hours	11	4	–	7
Cotton Goods.				
Against reduction of wages	1	–	–	1
For increase of wages	9	2	–	7
For reinstatement of discharged employes	2	–	–	2
Lumber.				
For increase of wages	1	–	1	
For reduction of hours	4	–	–	4
For reduction of hours on Saturday	1	–	–	1
Machines and Machinery.				
For increase of wages	1	–	1	
Metals and Metallic Goods.				
For increase of wages	1	–	–	1
Public Ways Construction.				
For increase of wages	1	–	–	1
Public Works Construction.				
For increase of wages	1	1		
Shipbuilding, Etc.				
Against employment of non-union men	1	–	–	1
Against reduction of wages	2	1	–	1
Against working on job with non-union employes under another contractor	1	–	–	1
For increase of wages	5	3	2	
For increase of wages and reduction of hours on Saturday	2	–	2	

Summary of Causes, Etc., of Strikes by Industries—Concluded.

Industries and Cause or Object.	Establishments.	Succeeded.	Succeeded partly.	Failed.
Stone Quarrying and Cutting.				
Against acceptance of firm's terms on new article of manufacture	1	1	-	-
Against employment of additional apprentices	1	-	-	1
Against employment of non-union men	3	3	-	-
Against poor quality of material	2	-	-	2
Against reduction of wages	1	-	-	1
Against system of measuring work	1	1	-	-
For adoption of union scale	1	1	-	-
For increase of wages	2	1	-	1
For increase of wages and reduction of hours	9	3	6	-
For recognition of union	1	-	-	1
For reduction of hours	11	*1	1	3
For regular payment	2	1	-	1
In sympathy with strike elsewhere	1	-	-	1
Telegraphy.				
For increase of wages	2	-	-	2
Tobacco.				
Against introduction of machinery	4	-	-	4
For discharge of foreman	1	-	-	1
For increase of wages	2	1	-	1
Transportation.				
For increase of wages	6	-	-	6
Woolen and Worsted Goods.				
For increase of wages	1	-	-	1
For reinstatement of discharged employes	1	-	-	1
Miscellaneous.				
For increase of wages	1	1		

* But wages were reduced in 2 establishments.

Summary of Causes, Etc., of Lockouts by Years.

Year and Cause or Object.	Establishments.	Succeeded.	Succeeded partly.	Failed.
1889.				
To enforce reduction of wages	1	1		
1892.				
To enforce change of date for ending of yearly scale	29	20	6	3
To enforce reduction of wages	1	1		
1894.				
To enforce reduction of wages	1	-	-	1

Summary of Causes, Etc., of Lockouts by Industries.

Industries and Cause or Object.	Establishments.	Succeeded.	Succeeded partly.	Failed.
Boots and Shoes.				
To enforce reduction of wages	1	1	-	
Clothing.				
To enforce reduction of wages	1	1	-	
Stone Quarrying and Cutting.				
To enforce change of date for ending of yearly scale.	29	20	6	3
Woolen and Worsted Goods.				
To enforce reduction of wages	1	-	-	1

In 1887 the United States Labor Commissioner made an investigation of strikes and lockouts, covering a period of six years, ending December 31, 1886, and that part which related to the State of Maine was published in the first report of this Bureau in 1887. In the following table of comparisons the first column relates to the investigation of 1887, while the second relates to the recent investigation covering the period from 1887 to 1894 inclusive.

It must be borne in mind that the former investigation covered a period of six years, while the latter covers a period of eight years.

	For six years ending Dec. 31, 1886.	For eight years ending Dec. 31, 1894.
Total number of strikes	73	79
Number ordered by labor organizations	22	47
Number not ordered by labor organizations	51	32
Number of establishments affected	73	133
Number of establishments closed	50	53
Aggregate days closed	1,612	1,562
Average days closed	32.2	29.5
Duration of strike, aggregate days	2,295	2,650
Duration of strike, average days	31.4	19.9
Establishments in which strikes succeeded	43	41
Establishments in which strikes succeeded partly	6	14
Establishments in which strikes failed	24	78
Employes' loss in wages	$162,218	$468,210
Assistance rendered to employes	$3,547	$18,108
Employers loss	$109,303	$167,666
Number employes before strike, male	8,796	21,764
Number employes before strike, female	7,122	6,395
Number employes before strike, total	15,918	28,159
Total number strikers	3,368	8,160
New employes after strike, male	389	1,390
New employes after strike, female	50	347
New employes after strike, total	439	1,737
Number brought from other places	46	1,488

THE TANNERY INDUSTRY.

HISTORY.

Originally the larger part of the State of Maine was well timbered with hemlock, and from the early days of its settlement the business of converting raw hides into leather has been carried on to a considerable extent. As early as 1810 there were, in the then District of Maine, 200 tanneries where 55,153 hides and skins were tanned and dressed, producing $231,174 worth of finished leather. This would give an average of 275 hides and skins tanned, and a value of $1,155.87 to each tannery. In those early days tanneries must have been more of a neighborhood accommodation than an industry to give employment to labor. At most, only a few hides were purchased, for a considerable part of the year's operation was custom work. Home slaughtered hides and skins were brought in to be tanned for home use, and the shoemaker made his rounds from house to house among the farmers to work up this stock of finished leather into a year's supply of foot wear for the female as well as the male portion of the family.

In 1820, the number of tanneries had increased to 248, with a capital of $99,200 and an output of finished leather amounting to $308,000. This would give an average capital of $400 and an output of $1,241.94 to a tannery, an average increase in the output of only $86.07 in ten years.

The following table will give the location of tanneries in the different counties in 1840:

Counties.	Number of tanneries.	Capital invested.	Number of hands employed.	Number sides of sole leather produced.	Number sides of upper leather produced.
Aroostook	2	$ 1,300	2	760	150
Cumberland	45	59,825	213	7,201	8,835
Franklin	20	21,000	28	2,110	3,160
Hancock	21	18,410	32	2,409	5,986
Kennebec	43	151,570	99	53,902	11,271
Lincoln	47	38,055	53	5,685	6,068
Oxford	26	9,600	23	1,697	1,781
Penobscot	21	135,150	67	5,566	19,215
Piscataquis	9	2,000	13	537	777
Somerset	20	16,775	31	3,339	4,520
Waldo	26	52,425	71	32,819	8,569
Washington	14	11,400	20	1,441	4,785
York	101	54,283	102	6,281	10,739
Total	395	$571,793	754	123,747	85,856

This brings the number of tanneries in the State in 1840 up to 395, an increase in twenty years of 147. The average capital invested per tannery had increased from $400 to $1,447.58, while the number of hands employed, 754, averaged less than two to an establishment. The table shows 123,747 sides of sole leather and 85,856 sides of upper leather produced, or a total of 209,603 sides or 104,802 hides tanned, an average per tannery of 265, being a fall off in thirty years of ten, the average number showing 275 in 1810. Thus it will be seen that up to this time, and in fact for several years later, that the tanneries in the State of Maine were generally of very moderate dimensions, in fact such large establishments as have existed in eastern Maine since the days of the war were then unknown. Prior to 1860 several tanneries of quite respectable proportions had been built, but the war and the prosperous times which followed stimulated this industry, and the next fifteen years saw a score or more of immense sole leather plants established in the eastern part of the State. As the hemlock was cut off and bark became scarce in the older settled counties, the small tanneries, which had existed from the early days, dropped out of existence one after another, and where we had at one time over 400 in the State, to-day less than forty of all descriptions exist, and where formerly the annual output barely averaged $1,000, at the present time the same item ranges from $65,000 to $70,000.

Taking the figures of 1860 we find the number had fallen off to 144, a decrease in the number in twenty years of 251. These had an invested capital of $851,975, an average of $5,916 per tannery; 735 hands were employed, being an average crew of five, while the output amounted to $2,188,904 or an average of $15,200 to each establishment. The cost of material used amounted to $1,495,049 and wages paid $222,484 for the year.

In 1870 the number of tanneries were reported at 123, being twenty-one less than ten years before. In the census of this year the business of tanning and currying are separated. Seventy-six establishments are reported as being engaged in currying leather, but doubtless all or nearly all were engaged in tanning as well, and are included in the number above given. The capital invested in the tannery business is given as $1,606,740, while but $2,400 additional is given on account of currying establishments. The value of the product of the tanneries is $3,779,227. Deducting from this, $853,073, the value of the tanned hides and skins curried, and adding $1,082,554, the value of the product of the currying establishments, would give $4,008,708 the actual value of all the finished product whether curried or simply rolled. In tanning, 781 hands were employed, receiving for the year $285,882 in wages, while in currying, 219 hands are reported but no item of wages is given. Of hemlock bark, 63,470 cords were used, valued at $428,467, an average of $6.75 per cord. During the year, 864,600 sides and 669,850 skins were tanned. Out of this, 62,135 skins and 200,713 sides of leather were curried. The skins before currying were valued at $143,780, an average of $2.31 each, and the sides of leather at $709,293, an average of $3.53 each.

The census of 1880 again separates the business of tanning and currying, but by combining the figures and eliminating such as are duplicated the volume of the business is fairly shown. This census reports eighty-three tanneries, being forty less than in 1870. Thirty-four of these are also engaged in currying leather. The following figures are given:

	Tanning.	Currying.	Total.
Number establishments	83	34	117
Capital invested	$2,459,700	$510,900	$2,970,600
Hands employed	1,393	274	1,667
Wages paid	$464,904	$99,094	$563,998
Material used	$5,535,427	$2,290,310	$7,825,737
Value of product	$7,100,967	$2,612,350	$9,713,317

The above totals give an excess of the actual business in the items "Number of establishments," "material used," and "value of product." In the first instance the thirty-four currying establishments are doubtless included in the number of tanneries, hence this total should be eighty-three. The value of the tanned hides and skins used by the curriers is not given in this census, but reckoning on the basis of 1870, where actual values are given, this item would amount to $2,183,784, and, as this is duplicated in the cost of material and also in the value of product, it should be deducted from both items. Taking the business as a whole this would give the actual cost of material used $5,641,953 and the value of the product $7,529,533.

Coming now to the census of 1890, which is given as a whole, and comparing with the corrected figures of 1880, we find the following showing:

	1880.	1890.
Number establishments	83	51
Hands employed	1,667	911
Wages paid	$ 563,998	$ 411,791
Cost of material	5,641,953	2,307,343
Value of product	7,529,533	3,363,672

The following table, though imperfect in some of its details, will show the volume of business at different periods, and the rise and decline of this industry in our State:

Years.	Number of establishments.	Hands employed.	Capital invested.	Value of product.
1810	200	–	–	$231,174
1820	248	–	$99,200	308,000
1840	395	754	571,793	
1860	144	735	851,975	2,188,904
1870	123	1,000	1,609,140	4,008,708
1880	83	1,667	2,970,600	7,529,533
1890	51	911	–	3,363,672

It will be noticed that the number of tanneries rapidly increased up to 1840 or later, since which time there has been

a marked decrease, while the volume of business continued to increase up to 1880, but during the next ten years the fall off in the value of product amounted to fifty-four per cent. The figures indicate a marked increase in the capacity of these establishments. In 1840, York county alone contained 101 tanneries, an average of four to each town, giving employment to 102 men, while the State showed 395 tanneries, producing 209,603 sides of leather. Now a single tannery in the county of Aroostook approximates that amount, returning 200,000 sides as the annual output. But tanning with hemlock bark as an important industry is rapidly declining in the State of Maine. The immense tracts of hemlock which have been stripped during the last forty years with such a reckless hand can never be reproduced, and the area yet remaining will, in a very few decades at most, be left barren of this valuable growth, when other material for tanning purposes must be sought or else the industry will disappear from our midst.

PRESENT CONDITION OF THE BUSINESS.

The tanning and finishing of leather may still be classed as one of Maine's important manufacturing industries and in 1890 was exceeded only by cotton goods, lumber, boots and shoes and woolen goods, in the order of the value of their product. All the various kinds of leather are here produced but at the present time the manufacture of sole leather is by far the most important. The sole leather tanneries are, with hardly an exception, located in the four eastern counties, Penobscot, Aroostook, Hancock and Washington. There are, however, located in various parts of the State, quite a large number where the various kind of harness, wax and upper leather are produced as well as several large sheep skin and moccasin leather tanneries. In one establishment 1,000,000 sheep skins are annually tanned.

An investigation of the tannery business was undertaken by the Bureau the present season, and blanks sent to all tanneries in the State, but in many instances the returns were unsat-

isfactory. A special agent visited several of the sole leather establishments, taking copious notes, and so the investigation has been confined principally to that branch of the business.

SOLE LEATHER TANNERIES.

There are, as near as can be ascertained, thirteen sole leather tanneries in the State. Five of these, located at Vanceboro, Brookton, Forest City, Princeton and Grand Lake Stream, are owned and operated by the International Leather Company; three, located at Lincoln, Lowell and Medway, by the United States Leather Company; one, at Bridgewater, by C. P. Church; one, at New Limerick, by Willis I. Shaw; one, at Kingman, by L. B. Clark & Company; one at Island Falls, by Frank W. Hunt, and one in Township Number 39, in Hancock county, by Buzzell & Rice, but no return from the latter has been received. Three important tanneries have in recent years been destroyed by fire: one at Beddington, owned by E. E. Church & Company, burned last September, and a few years ago one at Amherst, owned by Buzzell & Rice, and one at Winn, owned by H. Poor & Son. From six sole leather tanneries full returns were received, and from six others partial returns. From these, and also from notes taken, the following facts are compiled:

Six tanneries give the amount of bark consumed during the year at 12,000, 10,000, 4,500, 2,750, 3,000 and 2,500 cords respectively. This would make a total of 34,750, and an average per tannery of 5,792 cords.

At the same establishments, the price of bark is given at $5.00, $6.50, $5.50, $6.00, $6.00 and $5.50, being an average of $5.75 per cord. The number of skilled workmen is given as 4, 12, 10, 14, 12 and 12, a total of 64, and the number of unskilled as 66, 63, 20, 16, 23 and 13, a total of 201, making in all, both skilled and unskilled, at the six tanneries, 265, an average crew of 44.

The rates of wages per day for skilled workmen are given at $2.00 to $3.00, $1.50 to $2.50, $1.50, $1.50, $1.40, and $1.50, and for unskilled at $1.00 to $1.25, $1.25, $1.00 to $1.15, $1.25, $1.20,

and $1.25. The workmen generally receive their board in addition to wages.

The same establishments return the number of sides of leather produced during the year at 200,000, 150,000, 67,500, 53,000, 69,000 and 49,000, making a total of 588,500 sides, an average of 98,083 per tannery, or an average daily production of 314 each. Six others give their daily capacity at 400, 500, 200, 500, 400 and 300 sides respectively, a total of 2,300, or an average of 383, but as several of these were shut down for a considerable time, the actual production would be considerably less, yet the output of sole leather for the year in the thirteen tanneries must have been from 800,000 to 900,000 sides. The prices quoted for dry hides range from 10 to 17 cents, and the market price of finished leather from 14½ to 17 cents per pound.

In all our sole leather tanneries, both foreign and domestic hides are used. The domestic hides come from the South and West, Texas, California, New Mexico and Arizona being the particular states and territories mentioned. Foreign hides from all the hide-producing countries find their way to these Maine tanneries, the particular localities mentioned from which they are imported being River Platte, Buenos Ayres, South America, Mexico, Calcutta, China, East Indies and Africa. The finished leather is principally marketed in Boston, or rather the selling agents are located there. The larger part is consumed in this country, yet a portion is shipped to London and other European cities.

TANNERY AT BRIDGEWATER.

In 1880, George W. Collins built and nearly completed a tannery at Bridgewater, but it remained idle until 1884, when it was bought by Charles P. Church, the present proprietor, who operated it till July, 1886, when it was consumed by fire. Mr. Church at once rebuilt on a somewhat larger scale, and was ready to resume operations in October of the same year, since which time it has been run continuously, yet on account of the

NOTE—Mr. Charles P. Church died suddenly at Houlton, December 23, 1896, while this article was in press.

depression in business and fluctuations in the market, but little has been done the present season.

Ordinarily this tannery uses from 4,000 to 5,000 cords of bark, and produces from 60,000 to 75,000 sides, or from 500 to 600 tons of non-acid hemlock sole leather annually. About 10 skilled workmen are usually employed, and 20 unskilled. The wages of the former average $1.50 per day, and the latter $1.00 to $1.15 and board furnished. Both domestic and foreign hides are used, the domestic coming from the southern and western states, and the foreign largely from South America, though some come from Calcutta and from ports in China. It is noticeable that the Chinese hides are very much smaller than those from any other section.

It is a fact, perhaps not generally known, that the northern part of Aroostook county contains but very little hemlock, and the tannery at Bridgewater marks the northern limit of this industry in eastern Maine. This vicinity, though, is well timbered with hemlock, and the tannery is well situated for obtaining bark from along the line of the Bangor and Aroostook Railroad, and considerable is also brought by teams from the New Brunswick side of the line, this being one of the border towns. A spur track from the main line of the railroad facilitates the unloading of bark and hides and the shipping of the finished leather; while the express, as well as the recently established telegraph and telephone lines, adds greatly to the dispatch of business of this well-equipped tannery.

TANNERY AT NEW LIMERICK.

The tannery at New Limerick was built by C. and W. I. Shaw in 1875, and has been run continuously since. Mr. C. Shaw, the senior partner and father of the present proprietor, died a few years ago. The business is now conducted by Willis I. Shaw. The yard has contained 250 vats with a capacity of 750 tons of finished leather annually, but during the past season the capacity has been increased to 1,000 tons annual production. The buildings are located about one-half mile from the

railroad station and during the season of 1896 a spur track was built, which, when the necessary buildings are completed at the tannery, will permit the unloading of bark from the cars directly to the bark mills. Some 6,000 cords of hemlock bark have been used annually, and during the past year some 2,500 cords were brought by rail while the remainder was hauled in by teams. The hides come principally from the western states and South America. A crew of fifty men are employed.

Mr. Shaw has given a great deal of attention and study to the matter of leaching or extracting the strength from ground bark and has perfected a process by means of which it is claimed that a much larger per cent. is obtained than by the old methods.

TANNERY AT ISLAND FALLS.

In 1893, Proctor & Hunt built a tannery at Island Falls, and on July 1, 1896, Frank W. Hunt, whose home office is at No. 122 Lincoln street, Boston, became sole proprietor. This is easily the largest establishment of its kind in the State and has a capacity of some 700 sides or nearly five tons of leather daily. The length of the main building is 670 feet and the leach house 180 feet, while the hide house has a storage capacity of 15,000 whole hides. There are thirty-six vats for soaking hides, sixty-four for handling and 300 lay away vats, making a total of 400 vats. Steam is used, two engines, one fifty horse and one eighty horse, furnish the motive power. There are four fifty horse power boilers and one of 150 horse power, but a part of the steam is used for heating and other purposes besides that going direct to the engines.

The facilities for fighting fire at this tannery are most excellent. Water pipes reach every part of the establishment with couplings for hose at convenient points, a large force pump giving the required pressure. The sour liquor process is here used which accounts for the large number of handling vats, as by this process the hides have to remain a much longer time than in the acid process.

TANNERIES OF THE UNITED STATES LEATHER COMPANY.

The United States Leather Company, organized under the laws of New Jersey, have large tannery interests in several states. Their product is wholly hemlock bark sole leather. They have head quarters in New York with a branch office in Boston. On the 10th of May, 1893, they bought of H. Poor & Son, the three large tanneries situated in Lincoln, Medway and Lowell.

The tannery at Lowell was built in 1855 or 1856 by Webb and Cummings, being the pioneer in the long list of large sole leather tanneries since built in northeastern Maine. It was later sold to H. Poor & Son.

William Plaisted & Son, who had exhausted the supply of hemlock bark in the vicinity of their tannery in Stetson, came to Lincoln in 1869, where they erected a large tannery. This, after several years, went into the hands of H. Poor & Son.

The tannery at Medway was built in 1870, by H. Poor & Son, who were also then running a large establishment at Winn. Though not so large as the one at Winn, it was of more modern build and the capacity was nearly the same.

W. F. Lovejoy is general agent for this company, with headquarters at Lincoln. The bark annually consumed at these tanneries amounts to over 8,000 cords, and in the neighborhood of 140,000 sides of leather are produced. Depression in business for the last three or four years has affected the leather trade more or less and the output has been considerably below the full capacity. Several shutdowns have occurred.

TANNERIES OF THE INTERNATIONAL LEATHER COMPANY.

On the 1st of August, 1896, the International Leather Company, which also own tanneries in New York state, came into possession of what had been known as the Shaw tanneries, (F. Shaw & Bros.,) five in number, situated at Vanceboro, Princeton, Grand Lake Stream, Brookton and Forest City. These had been built at different periods from 1868 into the early seventies, some by the Shaws themselves and others by

different parties and were purchased by the Shaws. These establishments have been run for several years by Charles W. Clement, trustee, (business of F. Shaw & Bros.,) and during the past season but little has been done, but under date of October 19, 1896, Charles A. Hunter, agent for the International Leather Company, writes that the tanneries at Vanceboro, Brookton and Grand Lake Stream, were then running and that the prospect seemed good for all five to run on full time the coming winter.

The capacity of the tannery at Vanceboro is 500 sides per day, at Princeton 200 sides, Grand Lake Stream 500 sides, Brookton 400 sides and at Forest City 300 sides, making a total capacity of 1,900 sides or something like thirteen tons of finished leather per day.

TANNERY AT KINGMAN.

The tannery at Kingman was erected some twenty-five years ago by Shaw and Kingman. The place which then contained but few settlers, was known as Independence plantation, but when the town was incorporated in 1873, it was named in honor of R. S. Kingman, one of the tannery firm. A few years later, Mr. Kingman retired, and the tannery became the property of F. Shaw & Brothers. In 1885 it was bought by L. B. Clark & Company, the present proprietors, and has been run continuously since. Two new engines have been put in and many other improvements have been made by the present owners. L. B. Clark, the senior member of the firm, being a thorough machinist, has devoted much time and study to improvements and the perfection of new devices. The bark mills of his invention seem to be nearer perfection than any others in use, and his system of conveying the ground bark from the mills to the leaches, being blown through tubes instead of being carried on belts, is not only economical in the matter of saving nearly all the finer particles but the risk from fire is much reduced, as but little bark dust collects about the building, whereas, in those tanneries where open mills and conductors are used a considerable amount of this dust is thrown into the air and settles on

every projection, sometimes to a depth of several inches. The process of extracting tannin from the bark is claimed to be almost perfect, and the facilities for unloading bark and hides, also of loading the finished leather upon the cars, can hardly be excelled. Connected with this tannery is a repair shop finely equipped with lathes, planers, etc., and where all repairs are made except where new castings are required. About 10,000 cords of bark are annually consumed, the capacity being about 500 sides or three and one-half tons of leather daily. The Boston office, situated at 272 Purchase street, is conducted by W. D. Shaw, a member of the firm.

PROCESS OF TANNING SOLE LEATHER.

The dry hides are first soaked from three to five days in vats filled with water, which softens them sufficiently to be worked in the hide mill. As they are taken out of the vats, one by one, they are split along the back, thus making two sides of each hide. A hide mill is of simple construction, consisting of a shallow box some six feet or more in length, into which are placed, side by side, two short timbers filling the width and about half the length of the box. The tops of the timbers are shorter than the bottoms thus giving a downward slope to the ends which are thickly studded with blunt iron spikes one inch in length. Each of the short timbers is attached to a long upright, the tops of which are hung so that when power is applied they vibrate back and forth, the uprights appearing like two huge legs with the short timbers as feet with their iron toes, which, when a quantity of hides are placed in each end of the box, with water continually dripping from pipes upon them, vibrate back and forth kicking and beating them, the spikes serving the double purpose of turning the hides over and over and further softening them by their constant beating. They are thus milled from one to three hours until pliable enough to handle well, when they are hung in the sweat vaults. The sweat vaults are close, dark, narrow rooms, and of sufficient height for men to work standing. Here the hides are thickly hung

until a vault is filled and the door is closed. They remain from four to eight days, or until the hair and scurf are loosened by a natural heating process which throws off large quantities of ammonia and other gasses. While in the vaults the hides must be carefully looked after, for a little over heating, which is nothing more nor less than the commencement of decomposition, will seriously damage them in a very short time. A thunder shower will very materially hasten this process, and during times of much electrical disturbance in the atmosphere the vaults are often visited during the night and the hides removed, as a delay until morning might cause serious damage. After the sweating process is completed the hides are again milled for several hours, which still further softens them and beats off most of the hair. They are then taken to the beam. Each workman or beamster has his beam or work bench. Its surface is convex from right to left and slopes downward from the workman. On this the hide is spread flesh side up, where, by a dexterous handling of the flesher every particle of flesh adhering to the skin is quickly removed. It is then turned hair side up and with the beam knife all the scurf and hair is removed. This is called graining. The beam knife is of the finest steel and carries an edge like the best razor so that any hair which does not start is smoothly shaven from the skin. The hides, now smooth and clean on both sides, are ready for coloring, which is done by placing them in vats containing the dye or coloring liquor, where they remain about thirty minutes. They are now ready for the acid process. Up to this point the fiber of the hide is too compact to allow the tanning liquor to "take" as it is called, and if the tanning process were proceeded with in this state the tannin would act only on the outer surface. The acid process opens up the pores of the hide and "plumps" or gives it a spongy appearance so that it will take the tanning liquor as a sponge takes water. There are two ways in common practice in bringing about this result, one known as the acid process and the other the sour liquor process. In the former case, a strong acid is diluted to the proper con-

sistency to produce the desired result; in the latter, the hides are placed in a liquor which is allowed to sour or form a natural acid which produces the same result on the hide. Thirty-six hours is sufficient for the acid process, but the sour liquor process takes longer. The hides are now put through a handling process to remove the acid. Being placed in vats containing a weak liquor, they are handled with hooks, being changed from one vat to another until all the acid disappears. Some tanneries have an ingenious way of hastening the process of removing the acid by forcing air, by an air pump, into the bottoms of the vats, which keeps the liquor and hides in a constant commotion like a boiling pot. From two to six days completes the handling process, when they are ready for the yard or lay away vats where the tanning process proper is carried on.

Leaving the hides here all ready for tanning, another branch of the work will be noticed, that of preparing the liquor in which the hides are tanned. The material used in the sole leather tanneries in Maine is almost wholly crude hemlock bark, but little if any hemlock extract, except in upper leather and sheep skin tanneries, being used. The bark is unloaded from railroad cars or from teams in the immediate vicinity of the bark mills or grinders into which it is fed by workmen. In some cases the bark is thrown from the car or team upon an endless chain by which it is carried to a feed table slightly elevated above the mouth of the mill. From one to three mills are used according to the size of the tannery. The ground bark is conveyed to the leaches generally on endless belts, but in some cases it is blown through tubes by a powerful fan. The bark is steeped any where from twenty-four to sixty hours, the time differing at different tanneries or by a variation in the process of extracting the strength from the bark. New processes have been introduced in some tanneries where it is claimed a much larger per cent. of tannin is procured than by the old process. The liquor is then drawn off into cooling vats where it is left for about twenty-four hours to cool, when it is pumped to the yard and into the lay away vats into which the already prepared skins

are immersed and the process of tanning commences. Vats are built of plank, and, ordinarily, are seven by nine feet, by five and one-half feet in depth, and will hold about 150 sides. Sole leather is put through six different liquors, remaining long enough to absorb all the strength from each.

The time occupied in tanning varies according to circumstances from four to six or eight months, and if in no hurrry for the finished leather, it sometimes remains in the vats a whole year. The object is to give the skin all the tannin it will take not only to thoroughly preserve and make it firm, but to give it weight as well, as sole leather is always sold by weight. For this reason sole leather is always tanned where bark is comparatively cheap, while upper leather and such others as are sold by the square foot, where weight is of no object, may, by using a much less quantity of bark, be profitably tanned where bark is much more expensive.

As the prepared skins take the tannin much more rapidly at the commencement of the process, the time they are allowed to remain materially increases in each succeeding liquor in which they are placed. In the first liquor they remain from four to seven days, in the second from nine to twelve days, in the third from fourteen to seventeen days, in the fourth from twenty to thirty days, in the fifth from thirty to thirty-five days, and in the sixth from thirty-five to forty days, though they may remain with some benefit for a longer period. As the hides, divided along the back into halves or sides, as before stated, and which are now gradually assuming the appearance of sides of leather, are thrown one by one into the vat, a man with a shovel throws a small quantity of leached tan bark upon each, not on account of any virtue remaining in the bark but to hold the sides apart so as to allow a free access of the liquor to all parts, as otherwise they would make a compact mass that no liquor could fully penetrate.

When the tanning process is fully completed the leather is taken from the vats and placed in an open-work cylinder upon which water is copiously showered as the cylinder revolves, thus washing off the great bulk of tan bark or any other substance

which may adhere to it. It is then removed to a table where each side is carefully gone over with a scrub brush to remove any foreign substance remaining, after which it is hung up and allowed to drain for twenty-four hours when it is ready for oiling. Cod oil is applied to the grain side of the leather, and as it goes from the oiling table it is laid in piles four or five feet high and covered with canvas where it remains from three to six days or until the oil is thoroughly absorbed. It is then hung up for drying, where it remains, according to the state of the weather, from four days to two weeks. The next process is to prepare the leather for rolling. This is done by dampening it with water and allowing it to remain in large piles for about four days or until the moisture is evenly distributed throughout the mass, after which workmen go over it piece by piece and with proper tools straighten out all wrinkles, more or less of which will be found along the legs and head of every skin, then the grain side is lightly sprinkled with water when it is ready for rough rolling. This work is done on a large continuous table, built along one side of the building, well lighted by windows, each table accommodating from two to six workmen, according to the size of the tannery and amount of leather produced. The implement for rolling consists of a metallic truck or roller fixed on the lower end of an upright beam which is made to vibrate immediately over a plate fixed in the table top, the plate being slightly concave to correspond with the line of vibration of the roller. The side of leather is placed grain side up between the roller and plate, when with a lever managed by the foot of the rollman the plate is brought firmly up giving the desired pressure, and as one part becomes sufficiently rolled, he eases up on the lever which relieves the pressure, another part is brought under the roller, the pressure is again applied and the work continued until the whole surface of the side is rolled. The leather being damp, this rolling simply compacts the fiber and lays the grain, leaving the surface still in a comparatively rough and unfinished state. It is hung up for about twenty-four hours or until the outer surface becomes sufficiently dry to receive the final rolling,

which gives the smooth glossy appearance to the finished leather. Each beamster and rollman has his own private mark which is required to be cut or stamped on every side of leather they handle so that any defects in their work are readily detected. The leather is then thoroughly dried, when it is weighed and the name of the tannery and weight are stamped upon each piece, when it is ready for shipment.

UPPER LEATHER, HARNESS LEATHER, MOCCASIN LEATHER, SHEEP SKINS, ETC.

The information obtained from the upper leather and sheep skin tanneries is so meagre that no definite figures as to the bulk of the business can be given. Some general facts, however, gleaned from the few imperfect returns received, may be of interest.

The upper leather tanneries are, as a rule, when compared with those that are devoted to the manufacture of sole leather, inferior in size and amount of business done, yet some are large and well equipped, employing from 25 to 30 men and in one instance 100 hands are employed in all the departments and 100,000 sides of leather are produced annually while the output of another is 20,000 sides and over 100,000 splits. The yearly consumption of bark varies from five cords to 3,000 cords, the price of which runs from $5.00 to $6.00, except at a few localities where a very small amount is used it is obtained at a lower rate. In addition to bark one establishment uses annually about $4,000 worth of hemlock extract brought from the West. The rates of wages do not vary materially from that paid by sole leather manufacturers. The range is from $1.00 per day for the poorer grades of laborers to $3.00 for the higher grades of skilled workmen. At the smaller tanneries the slaughtered hides and skins in the immediate vicinity are generally sufficient to supply the needed stock, but the large establishments use principally southern and western hides, but occasionally a few are imported from Great Britain. Some complaint is made that hides from the United Kingdom outside of England are poorly cured and of an inferior quality. Both light and heavy hides

are worked, and while calf, kip and the lighter cow hides are simply tanned and dressed, many of the thick and heavy ones are worked into splits. Finely adjusted machines have been devised by which a side of tanned leather may be split once or twice, as required, and these splits in turn are worked into all the fancy grades of light leather. The custom among men of wearing shoes instead of legged boots as formerly has wrought a great change in kinds of leather produced and modes of finishing. Upper leather, wax and harness leather, belting and some others are sold by the square foot. Measurements were formerly made by a frame checked off like a window sash, each square covering the surface of one square foot. This was laid on the side of leather to be measured, the whole feet counted off and the fractions along the margin were estimated and added, but now a very ingenious machine has been constructed for this purpose. The side of leather is fed between rollers and as it passes through, the hand on a disc moves, and as the side drops out, the hand indicates on the disc the exact measurement in feet and fractions.

There are several well equipped sheep skin tanneries in the State and the total output is probably somewhere from 2,000,000 to 3,000,000 skins annually. Some Maine skins are used, yet more come from the Western states, but the great bulk of stock is imported, coming principally from Australia, New Zealand, South America and Europe. The finished skins are sold principally in Boston and New York.

Quite a quantity of moccasin leather is tanned at Bangor. This is worked up into the various styles of moccasins which are sold throughout the lumber regions of the northern and western states. E. A. Buck & Co., The Sawyer Boot & Shoe Co., both of Bangor, and M. L. Getchell & Co., of Monmouth, are the principal moccasin manufacturers of the State. Buck & Co., have for several years had a government contract for furnishing for the western Indians a large lot of moccasins, and the present season the Sawyer Company have secured a similar contract.

LIST OF TANNERIES.

The following list contains the greater part of the tanneries in the State now in active operation. Doubtless there are some others but repeated requests by mail failed to bring any responses from such. The tannery at Bristol has been in operation since 1815, but at the present time is doing a very small business, turning out only about forty sides of heavy upper leather and fifty calf skins annually. The one at Burlington is also a small affair producing some 300 sides of moccasin leather annually which are worked up by the proprietor into moccasins, but the most of the others are large and well equipped tanneries. The name of the proprietors, the town or place where located and the kind of leather produced are given:

Frank W. Hunt, Island Falls, sole leather; L. B. Clark & Co., Kingman, sole leather; Charles P. Church, Bridgewater, sole leather; Willis I. Shaw, New Limerick, sole leather; United States Leather Co., Lincoln, sole leather; United States Leather Co., Lowell, sole leather; United States Leather Co., Medway, sole leather; Buzzell & Rice, No. 39 Hancock Co., sole leather; International Leather Co., Vanceboro, sole leather; International Leather Co., Princeton, sole leather; Internationl Leather Co., Grand Lake Stream, sole leather; International Leather Co., Brookton, sole leather; International Leather Co., Forest City, sole leather; Casco Tanning Co., Portland, upper leather; E. J. Ervine, Bristol, slaughtered upper leather and calf; William G. Smiley, Bangor, upper leather; J. O. Ashton, Wilton, wax, kip, calf, harness, grain, split and strap leather; J. D. & W. B. Russell, Hanover, harness and wax leather; Frank Cary, Brewer, oil grain, boot and plow grain, collar, glove, wax upper, finished split leather, etc.; Frank L. Besse, Clinton, sheep skin russet shoe linings; Lyman W. Smith, Canton, sheep skins; George Blodgett, Bucksport, sheep skins; Hunt, Walker & Co., Liberty, sheep skins; D. Milliken & Son, Bangor, moccasin leather; C. W. White, Burlington, moccasin leather.

PEALING, YARDING AND HAULING HEMLOCK BARK.

When it is considered that some of our largest Maine tanneries consume from 10,000 to 12,000 cords of bark annually, it will be seen that the all important thing in their location is a plentiful supply of hemlock, easily accessible, and as the most of these works are pushed out into the forests years in advance of the advent of railroads the bark must be hauled in by teams, and as long hauls are very expensive the greater part of the bark comes from within a radius of twenty miles. A territory of this size well timbered with hemlock will, however, supply a large tannery from twenty-five to thirty years. A tannery company, when locating, usually secures by purchase such tracts of hemlock land as they can buy at a reasonable price in their vicinity but have to depend on outside parties for a considerable part of their supply, yet with a large amount of their own stumpage to fall back on they can regulate the price and prevent a combination of other land owners, great and small, from making a corner on bark. Bark is largely purchased from outside parties at a fixed price delivered at the tannery, the average price at our tanneries in eastern Maine not varying much from $6.00 per cord; though many of the larger land owners sell their stumpage outright, the price of which has increased somewhat as the supply decreases, and in fair locations is now held at from $2.00 to $ 2.25 per cord. The work of pealing, yarding and hauling bark, and incidentally the cutting up, hauling and driving of the pealed hemlock lumber gives employment to a large number of men and teams and puts a large amount of money in circulation, yet it is a transient business, for, unlike spruce, when once cut over, hemlock does not readily reproduce itself, and when the bark supply is exhausted, unless it can be brought from a distance by rail at a reasonable price, the site is abandoned and the buildings left to decay. Such has been the fate of nearly all the large tanneries in the older settled sections of the State.

Bark peeling is carried on generally by a large crew under a competent foreman or boss, the number of men varying ac-

cording to the size of the job or number of cords of bark to be pealed. From one thousand to two thousand cords are often covered in a single contract. The pealing season begins in May and lasts for about three months, or, as it is generally reckoned among bark peelers, "from the full moon in May to the full moon in August." As the work is all done in warm weather expensively built camps are not necessary. Rough board camps covered with coarse sheathing paper are often constructed for the shelter of the men but often large tents are used instead. This is probably the more economical camp as a tent well cared for will last for several years and can be moved at pleasure from place to place. Wages the present season for bark crews will average about $20.00 per month and board. Men are well fed with wholesome and hearty food and are furnished four meals a day, breakfast and supper at the camp and forenoon and afternoon luncheons in the woods in the immediate vicinity of their work. A man cook is employed, with a sufficient number of assistants called cookees. The cook has full charge of his department and attends directly to bread making and in fact the cooking generally, while the cookee chops wood, brings water, washes dishes, carries the luncheons and does such other work and renders such assistance as the cook may direct. A good cook always commands good wages, and a man who can satisfy the crew with well cooked food and understands the art of economy is a very valuable man to his employer, for some cooks will waste more food material than their wages would amount to. The time worked amounts to eleven hours per day, beginning at half past five and ending at half past six, allowing an hour each for the two luncheons.

The gang of men are divided into crews of four; a chopper, a knotter, a ring and splitter and a spudder. The first three use the common ax while the fourth uses an implement called a spud. The spud in its general make up is somewhat like a carpenter's chisel, though the neck between the socket and blade is much longer and the blade much shorter and not so thick as the chisel. The blade is some two and one-half inches broad, rounded somewhat on the edge and ground thin, and

curved a little downward so as to follow the convex surface of the log when it is forced under the bark. In the socket is fitted a wooden handle making the whole tool, including handle, some three feet in length. With an ax a ring is cut around the tree near the roots and again four feet up, then the bark is split down one side from ring to ring, when the spudder inserts his spud into the slit and forces the bark from the tree. The chopper then fells the tree and then the knotter trims it of all its branches. Formerly, when bark was plenty, but few limbs were removed and the top left unpealed, but the present practice is to trim and peal, as the saying goes, "to the top bud." Ringing and splitting, both done by one man, is simply dividing the bark into four feet lengths by cutting a ring around the now fallen tree, and splittng it along the top of the log, when it is ready for the spudder who follows closely with his spud and the tree is soon peeled. With thick, coarse bark and drying weather the day's peeling is piled on skids the last thing before quitting work at night, but in damp weather it is left flesh side up until the weather clears and dries the moisture. Thick bark can be piled in a greener state than thin without damage by moulding, as the coarse ross or outer coating which gives the bark its rough appearance, admits a free circulation of air, while on thin bark the ross is fine and makes too compact a mass for drying readily. On the other hand, bark should not be allowed to dry too much before piling, for as soon as the drying process commences the flesh side begins to contract, and, if left for a few days, the flake of bark would be drawn up into a close roll, and, becoming hardened, could not again be flattened out. A crew of bark peelers will average about three-fourths of a cord, peeled and piled, to a man, though some extra good men may go as high as a cord per day.

As the bark is put up in small piles near the trees from which it has been stripped, irregularly scattered over the whole territory covered, it must needs be collected in larger piles along roads, so as to be convenient for loading on teams when the time for hauling to the tannery arrives. For this purpose parallel roads are cut some thirty to forty rods apart, and all converging

to a single main road, leading often to some highway. Upon these parallel roads the bark is yarded during the fall months. A yarding crew consists of three men; a swamper, a teamster, and a jumper tender with a horse and jumper. The swamper cuts out a narrow road, not necessarily straight, but winding in and out among the logs and brush, so as to get near the small piles of bark scattered here and there; the teamster drives or leads the horse, and the jumper tender, as his name indicates, tends the jumper or sled on which the bark is hauled out. As the jumper has no thills, but is drawn by a chain attached to the whiffletree, it must necessarily be turned and lifted about by hand, hence the jumper tender. The jumper is of simple and rustic construction, and is generally made at the camp where it is to be used. Two spruce saplings are hewn out of the required length, four two-inch holes are bored through each, and the two connected by hard-wood saplings or bars, some four feet in length. This makes the top or frame-work of the sled. A hard-wood sapling, evenly split, makes a pair of runners or shoes, which are bent on by inserting one end into an auger hole, bored diagonally in the forward end of the sill, and held in place by uprights inserted in corresponding holes bored in the sill and shoe. With stakes fitted into holes bored in the top of the sills, the jumper is complete and ready for use. Should the shoes wear out, as they often do, by being dragged over logs, gravel, and often jagged rocks, it is but a short job to split out, bore and bend on another pair, and the sled is good as new.

With this outfit the bark is gathered in small loads, varying from one-fourth to three-fourths of a cord, and hauled out to the nearest parallel road, where it is deposited in long piles along the roadside. In this way the men work from day to day until the whole lot is yarded. The bark is generally surveyed on the yards, before being hauled.

Midges, mosquitos, black flies, and one or two kinds of larger flies, are very annoying to bark peelers, though they are not very troublesome after the middle of July. Various preparations have been used to ward off these pests, but a mixture of tar and lard, rubbed thickly over the face, hands, neck, or any ex-

posed part of the person, is now very generally used, and with good effect.

Bark hauling commences as soon as there is snow enough to make good sledding, and wagon sleds, that is, sleds with two pairs of runners, are almost invariably used. The rack, fixed on the runners, is usually sixteen feet long, and at each corner of the bottom frame-work is a flattened stake made fast to the sill, the upper end of which is bored with small holes for a distance of one or two feet. Two long poles or binders, one on each side, morticed at the ends so as to slip down on the stakes, serve to keep the bark in place when loaded. When a sufficient amount of bark has been put on for a load, the binders are slipped on to the stakes and sprung down closely, and held in place by a wooden pin put through one of the holes in the stake above the binder. Should the load settle on the road, the binder may be sprung down a peg and the pin inserted in a new hole. Two cords of bark is about the average load with a pair of horses of medium weight in fair sledding. Much of the bark, as before stated, is hauled direct from the yard to the tannery, but since the European & North American Railroad was built into northern Penobscot and Washington counties, and the Bangor & Aroostook road into Aroostook county, large quantities of bark are landed near the railroad at convenient points, where a temporary spur track is laid to facilitate the loading, and thus the bark is conveyed by cars to the tannery more cheaply than by teams. This, of course, benefits only those who are located on the line of the railroads. Considerable bark is shipped by rail from this eastern section to the sheepskin and upper-leather tanneries in other parts of the State.

Bark haulers, that is, a man and team of two horses, ordinarily receive from thirty-five to forty dollars per month and board, sometimes, for an extra good team, a little higher.

EARTHEN WARE MANUFACTURE.

The plant of what is known as the Bangor Stone Ware Company, situated in the city of Bangor, is owned and operated by A. Persson, who, some seventeen years ago, purchased the land and erected the buildings at an original cost of $10,000 to $12,000. A description of this plant becomes the more interesting as it is the only one of its kind in the State, while there are but two now in operation in all New England, the other being situated in Taunton, Mass.; whereas, at the time this Bangor plant was established, there was one in Gardiner, Me., two in New Hampshire, two in Vermont, five in Massachusetts, and four in Connecticut, making in New England fifteen of these potteries in successful operation; but within the last six years, and mostly within four years, all of them except the two first above specified, have, one after another, closed up and gone out of business on account of the great fall-off in the demand for stoneware. The cause of this decline of something like eighty-six per cent of the former output in New England, is not readily apparent. Potteries in the Middle States may have encroached somewhat on the territory formerly supplied by eastern manufacturers, yet the same ground as formerly is still covered by this Bangor plant, which includes Maine, New Hampshire, Vermont, and portions of the Province of New Brunswick, supplied both directly to the trade and through jobbers. It is very evident, however, that other, and for the time being, lower-priced goods, have largely superseded stoneware, brought about, it is alleged, by the depression in business and consequent scarcity of money among the people. No doubt, in the progress of industrial events, new lines of household utensils, and old as well, are now made from other material more cheaply than from clay, which are permanently displacing this

old-time ware; yet the manufacture of stoneware will certainly hold a place among our industries, though on a smaller scale than formerly; for certain lines of these goods are here to stay, and will never be replaced by those of other material.

Mr. Persson at the age of twenty-seven, came to this country from old Sweden, where he had learned his trade, having borrowed, to pay his expenses hither, ten dollars each from his three sisters, who were working on farms at the rate of twelve dollars per year, but in six weeks' time he had earned enough to repay the borrowed money, and also to send eight dollars to his wife. After working fourteen months in Worcester, Mass., he came to Gardiner, Me., where he soon after became associated with William Wood, under the firm name of Wood & Persson, in the pottery business, remaining in Gardiner about eleven years, and having accumulated capital sufficient to establish a business on his own account, he came to Bangor, and established this plant as above stated. His main building is 60x170 feet, three stories and a basement. The new storage building, just completed, is 25x106 feet. The plant is well-equipped with all necessary machinery and furnaces, though, compared with the complex machines used in most lines of manufacturing, the interior of a pottery presents a very tame appearance in this regard. The simply constructed foot-power "wheel," appears to be all that is required, as the rapid production of goods depends almost wholly upon the skill and quickness of motion of the hand, rather than in the rapid revolution of the wheel. The material used in the manufacture of stoneware is what is known as potter's clay, and comes from the clay banks in South Amboy, N. J., and Great Neck on Long Island, N. Y., and is shipped in schooners direct to Bangor. At present, from 500 to 600 tons are annually used. Much better results are obtained by mixing the two clays than from either alone. Our native blue clay is used in very limited quantities, and then only in the cheaper grades of work, where strength and toughness are not required. Among leading articles here made may be mentioned, cream pots, butter jars, cake and preserve jars, jugs, churns, bean pots, pudding pots, flower pots, pitchers, batter

pails, water kegs, garden vases, hanging vases, milk pans, soap dishes and spittoons, besides an almost endless variety of small and fancy articles of utility and ornament. The rapid transformation of a lump of clay into an article of beauty and of household utility, is always interesting. The work is commenced in the basement where the clay is stored. The two kinds are mixed, then placed with water in a water-tight box, where it is allowed to remain until the whole mass is thoroughly saturated and softened. It is then finely ground, after which it is screened, to remove any coarse particles or foreign substance. It is then carried to the turning room above, being somewhat of the consistency of putty, and is now ready for the wheel. A workman pulls a lump from the mass, kneads it for a moment, and places it on a piece of circular board on top of the wheel, which is run by foot power. Then, dipping his hands in water, he presses the lump of revolving clay until it is in a perfectly circular form, and of the size of the article he wishes to make. Then, by placing one hand on the centre of the clay, while the other remains on the side, and giving a gradual downward pressure, it begins to take form, and in a surprisingly short time a perfectly formed vessel appears. A sharp instrument is then held so as to plane off the top and give the edge a perfectly smooth surface, so the cover may fit closely, and the thing is done. This makes a butter jar or any article of a similar form, but if a jug is desired, after the sides are formed, a pressure with both hands, near the top, brings it into the required shape, while one finger inside forms the hole for the cork; then the sharp instrument gives the final finish at the top, and it is set off on the board to dry. The side handles to a jar, the jug handle, or any other attachment which is not made with the article itself, is formed by kneading and pulling out a piece of clay of the required length and size, and simply sticking it on, generally the next day after the article is made, and when it has become partially dried. During the baking process, the union between jug and handle becomes perfect. Ten dozen one-gallon jugs is considered an ordinary day's work, though occasionally a man will make fifteen dozen, and sometimes even twenty dozen have been

made by a rapid and ambitious workman. All the ordinary articles manufactured are formed by the hand on the wheel, though in making some fancy articles, such as hanging vases and flower pots, a plaster of Paris mould is used, instead of the board.

After the articles have become thoroughly dried, they are taken to the glazing room, where the material for the inside glazing is applied. The apparatus and material are very simple. A set tub is partially filled with water, and a quantity of blue clay stirred in. A small force pump is fixed to the tub, and the article to be glazed is placed upside down on two narrow strips across the top of the tub; the force pump is worked by hand, and a few strokes suffice to throw a sufficient spray of the water evenly over the inside of the article, the water being absorbed, leaving a thin coating of clay covering the inner surface. Potter's clay fuses or melts at a point of temperature four times greater than that required to fuse blue clay; hence, during the baking process, this blue clay coating fuses, and forms the inside or dark-colored glazing, while the same degree of heat only bakes and hardens the potter's clay of which the article is made. After the clay treatment with the force pump, the immense ovens or kilns are packed with various articles placed in an inverted position, the ovens are closed and the heat applied. When the temperature of the kiln is raised to a certain degree of heat, a quantity of Liverpool salt is shoveled in, a space being left for it when the kiln is packed. The intense heat changes this salt to a gaseous form, and, during the cooling process which follows the baking, it gradually again takes on a solid form, depositing itself, particle by particle, on the outside or exposed parts of the ware, giving it the outside, or light-colored glazing. After the baking is completed, the kiln is allowed to stand for four or five days to cool off before being opened. As the ware is taken from the kiln, all rough places are rubbed down with emery stone or sand paper, and the work is complete.

Even with nearly all the New England potteries closed, this Bangor plant has been very materially affected by the late de-

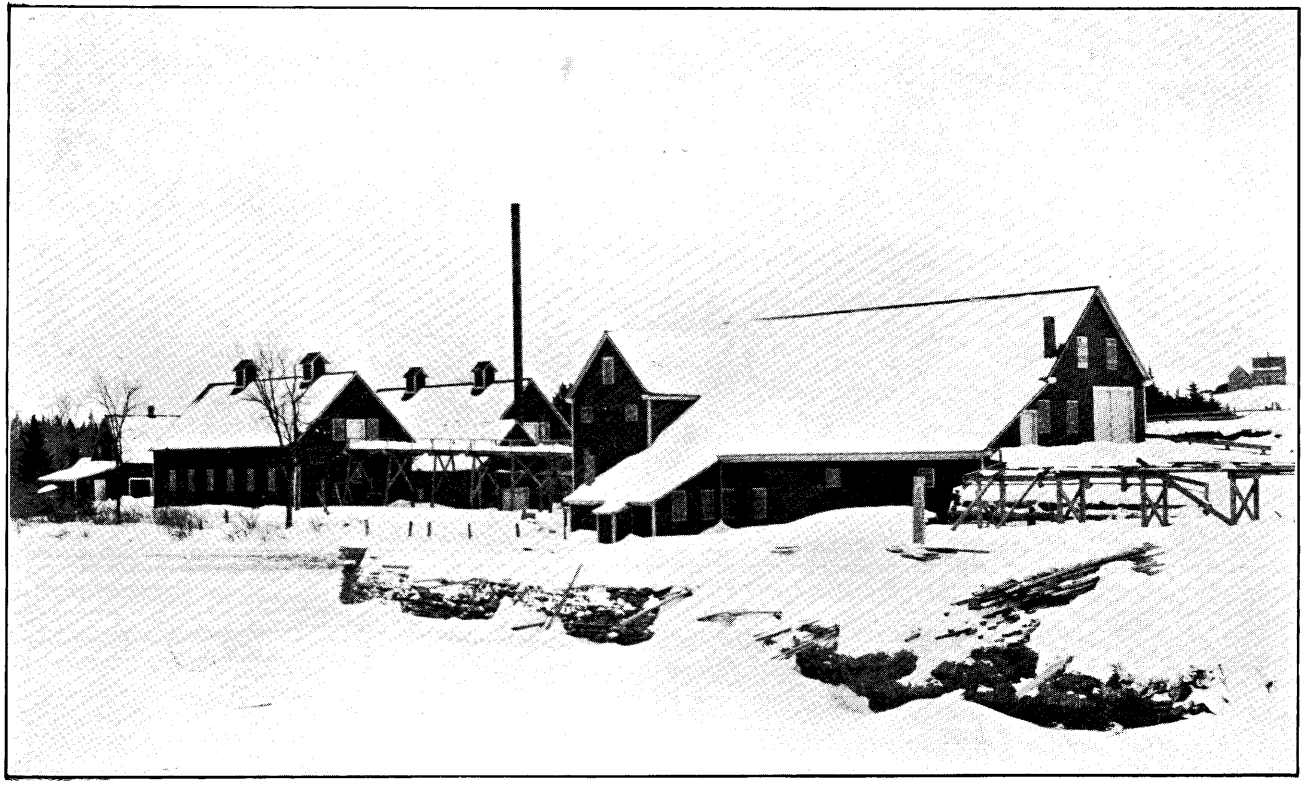
pression in business, but Mr. Persson feels confident, with the returning tide of industrial prosperity throughout the country that the stoneware business will feel the impetus in a marked degree.

Usually, in this establishment, a crew of sixteen or seventeen men have been employed, keeping thirteen wheels in motion, with an average product of $33,000, but at the present time the crew is reduced to ten men, with only six wheels in running order, and those not always at their full capacity, with an output of $18,000 to $19,000; and where formerly the constant demand kept the shop cleared of manufactured goods, now a large amount has accumulated, and the large store-house above alluded to has been built during the past season for its accommodation. The men employed are of different nationalities, principally Americans, Swedes, Danes, and Irish. They are generally of superior intelligence and first-class citizens.

In addition to stoneware, Mr. Persson manufactures from $3,000 to $4,000 worth of high grade emery wheels annually. The emery used in this establishment is imported from Turkey, and his samples, from which he makes up his orders, are of various degrees of fineness, from the finest flour to the size of kernels of wheat, but usually only the medium grades are used in the manufacture of wheels, such grades being selected as are appropriate to the kind of work the wheels are to be used for. The emery is mixed with such other substances as will give the wheel the proper strength and hardness, one important point being to give them such strength as to prevent all danger of bursting by the rapid revolutions to which they are subjected when in use. After mixing, the mass is rolled to the required thickness, bored in the center then subjected to a hardening process, and finally turned in a lathe.

There are other works in the State where goods are manufactured of clay, but as they run on entirely different lines such as drain pipe, tile, fire brick, etc., no allusion to them is intended in any comparisons or statements made in this article.

Mr. Persson is one of those genial, whole souled men whom one delights to meet, and this quality in his make up doubtless has contributed a share in making him successful in a business which many have been obliged to abandon.



JOHN WATSON'S STARCH FACTORY, Monticello—The Largest in the U. S.

THE STARCH INDUSTRY IN AROOSTOOK COUNTY.

The starch industry in Aroostook county has assumed such magnitude, that it must be classed with the pulp, granite, lime, ice and other great industries of the State. It has developed to its present proportions within the past twenty-five years and has resulted from the ease with which potatoes are raised in the county, and the excellent quality of the crop.

Aroostook county nearly equals in area the state of Massachusetts. It contains 4,352,000 acres of land, of which only about 325,000 acres have as yet been improved. Nearly the whole western part of the county is still in a wilderness state, and hundreds of square miles in this section are still covered by the primeval forest. The improved portion of the county is mainly along the eastern border and here we find the beautiful and productive farms which have caused Aroostook to be called "The Garden of Maine." In the year 1838, Prof. Charles T. Jackson, who was at that time making a geological survey of the State, spent a portion of that year in surveying the valley of the upper St. John, the Allagash, the Aroostook and the Mattawamkeag rivers. He was much impressed with the wonderful fertility of the soil, and in his report he uses this language: "In the course of a few years a large number of people will take up their residence in that section, and the region will become, as it is designed by nature to be, the granary of the north. The potatoes raised there are equal in quality and quantity to those raised anywhere. The climate and soil seem particularly congenial to this root." The Aroostook war, so called, resulted in making the region better known, and after the adjustment of the boundary difficulties, many who had come in as soldiers, returned later as settlers, bringing their friends with them. The liberal policy pursued by the State, also induced settlers to come in

rapidly, and when the civil war broke out, the whole eastern section of the county was dotted here and there with the log cabins of the "Pioneers." In the early days of the county, potatoes were not the leading crop. Farmers raised as many as they wished to use, but the distance from market, and the lack of railroad communication precluded them from raising potatoes for the outside world. Wheat, buckwheat, oats and hay were the leading crops in those days, and it might be well for the future prosperity of the county, if those early staples should be raised in greater abundance hereafter. The county was almost at a standstill during the war, there being but little development and but slight gain in population during that trying period. By the year 1870, however, the county was again on the high tide of development and prosperity. From that date a gradual change began to take place in the farming operations of the county. Less wheat was raised, and potatoes were forging ahead as the leading crop. We might remark incidentally, that up to the year 1870, the settlers had supposed that apples could not be raised in the county, at least, north of Houlton. But they began to experiment, by setting out a few trees yearly, and soon found that not only apples, but plums and other small fruits could be produced successfully, sixty miles north of Houlton. The people of Aroostook had long hoped for a railroad, to connect them with Bangor and the rest of the State, but, despairing of obtaining direct railroad communication with the outside, they had made overtures to the New Brunswick Railway Company, which was extending its line northward from St. Andrews towards Grand Falls, to build branches into Houlton, and also to Fort Fairfield and up the Aroostook river valley. The building of these branches, and the connection of the New Brunswick system with what is now the Maine Central system, at Vanceboro, gave railroad communication to the eastern part of Aroostook county, with Bangor and points westward, and the shipping of Aroostook potatoes to the Boston market began. Farmers began to raise them more abundantly and the fame of Aroostook potatoes began to be noised abroad. In the year 1870, the idea of manufacturing a portion of the

potato crop into starch was broached, and soon the project took definite form. The pioneers of the potato starch industry in Aroostook county came from New Hampshire. Albe Holmes of Caribou, was one of these pioneers. He was born in Colebrook, N. H., and was a manufacturer of potato starch in his native state as early as 1854. He went to Aroostook county in 1871, and concluded to settle down at Caribou. He bought a location the same year, and in 1872, built a starch factory, one of the first built in the county. In 1871, two brothers, Elmer and George Hibbard, came from New Hampshire and built a starch factory in New Limerick. In 1871, Wheeler Hale, of Littleton, N. H., built a starch factory at Presque Isle. In 1874, a starch factory was built in the part of Presque Isle then called Maysville. In 1875, two brothers by the name of Gathercole, came from Colebrook, N. H., and built a starch factory in Fort Fairfield, and in 1877, Alfred Lovering of New Hampshire, built a factory in Limestone. In those early years of starch making in the county, the manufacturers received from five to six cents a pound for their product. The price paid for potatoes was usually twenty-five cents a bushel. The potatoes which the farmer sells for starch are hauled directly from the field to the factory, and are sold by weight, sixty pounds making a bushel. They may include the small and unmerchantable potatoes, and since Aroostook potatoes have been in so great demand for food, the farmer has, for the most part saved his best potatoes for shipment, and sold only the small and partially decayed potatoes for starch. It will be seen by the above statement, that the money received for starch potatoes may be considered as all profit to the farmer, after deducting the cost of hauling to the factory, for in most cases the small and partially decayed potatoes would be left in the field, were it not for the starch manufacturers. The starch industry has grown rapidly from 1871 to the present time. There are now forty-nine starch factories in Aroostook county, located and owned as follows: Ashland, G. R. Ketchum & Co.; Blaine, Fred C. Robinson; Bridgewater, A. L. Chandler; Caribou, Albe Holmes, Caribou Starch Co., H. E. Jones, Caribou Produce Co., A. M.

Hill & Co.; Easton, T. H. Phair; Fort Fairfield, B. & J. Gathercole, Aroostook Valley Starch Co., Cutts & Parsons, Ambrose Foss, A. M. Hill & Co., J. Lundy, Turner & Bard; Fort Kent, Page & Mallett; Frenchville, Israel Ouellette & Co., M. M. Gagnon, Israel Ouellette; Hersey, Shaw & Morse; Houlton, R. M. Mansur & Sons, John Watson, (two factories), Aroostook Produce Co.; Limestone, Limestone Starch Co., J. M. Noyes, John Ward; Mapleton, T. H. Phair; Mars Hill, Nelson Parsons, (two factories), York & Luce, H. G. Richards; Masardis, G. R. Ketchum & Co.; Monticello, John Watson; New Sweden, New Sweden Starch Co., Jacob Hedman; Presque Isle, T. H. Phair, (three factories); Sherman, Mrs. G. M. Frye; Smyrna, John Watson; Van Buren, Henry A. Gagnon, Joseph Martin & Son; Washburn, T. H. Phair; Weston, Thomas S. Gilpatrick; Woodland, George O. Goodwin; Cary Plantation, Cleveland & Ludwig; Perham Plantation, Phair & Stevens.

The amount of starch manufactured at any of the above factories varies from year to year, the average being about two hundred tons each per year. In 1895, the whole amount manufactured in the county was ten thousand tons. Of this enormous amount, Hon. T. H. Phair of Presque Isle, manufactured thirty-three hundred tons in the fall of 1895, in his seven factories, and owing to the low price of potatoes, he opened his factories last spring, and manufactured eleven hundred tons more, making forty-four hundred tons in one year. John Watson of Houlton, is the next heaviest manufacturer, and last year, in his four factories, made over two thousand tons.

The amount of starch, that a bushel of potatoes will furnish, varies from year to year, as potatoes vary in quality and richness from one year to another. The average number of pounds of starch to a bushel of potatoes is about eight, but in some years, ten pounds are obtained. The season for making starch commences in the early part of September and lasts usually about six weeks. It corresponds, of course, with the potato digging season. When a large crop of potatoes has been raised and the price of starch is such, that it gives a fair profit to the manufacturer, Aroostook county presents a scene of activity, that

astonishes the quiet farmer from the great "Outside," who has the good fortune to visit the "Garden of Maine" during starch making. He will see a large number of two and four horse teams on the roads leading to the starch factories, each hauling from ten to twenty barrels of potatoes. These teams line up as they approach the factory, as the potatoes must be weighed, scales for that purpose being placed near the entrance to the factory, and each team awaits its turn, in the order of their coming. In a busy season, a line of teams extending more than one-fourth of a mile, and numbering from one hundred to two hundred, is not an infrequent sight near a starch factory. The last comers are frequently obliged to spend the whole day in waiting, before they reach the scales. Each load is weighed, and the number of bushels, by weight, recorded, settlement generally being deferred till the end of the season, although in some cases, the cash is paid down, as each load is weighed. The capacity of the different factories varies, as we have said in another place, some factories turning out ten tons of starch daily, others not more than two or three tons. It would require two thousand five hundred bushels of potatoes to make ten tons of starch, and that number of bushels would have to be ground daily in a factory making that number of tons of starch. To make forty-four hundred tons of starch would require over one million bushels of potatoes, yet last year, Hon. T. H. Phair of Presque Isle, manufactured that number of bushels of potatoes into starch. To make 10,000 tons of starch would require 2,500,000 bushels of potatoes, and last year that enormous quantity was made into starch in Aroostook county. The starch industry gives employment to a great number of men during the starch season, a factory, whose product is two hundred tons, requiring the labor of from fifteen to twenty men, for a period of six weeks. The wages paid range from $1.25 to $1.50 per day, the foremen receiving from $2.50 to $3.00 per day. One hundred and forty thousand dollars have been paid out in a single year for potatoes and for labor, in the starch industry in Aroostook county. For the past two or three years the prices paid for starch potatoes have been very low, on account of the abun-

dance of the crop, and the low price of starch. Probably not more than 5000 tons of starch were made in Aroostook in 1896. Some factories were not opened at all. The price of starch is at this time a little less than two cents a pound, and manufacturers thought best to reduce their stock on hand, rather than to accumulate more.

A visit to a starch factory is one full of interest to all observing persons. We give a description of the process of making starch as it is done at the fine starch factory of John Watson at Monticello, although the process is essentially about the same in all starch factories. The potatoes are received from the team and dumped into the hopper, passing on from that to a revolving tube twenty-eight inches in diameter at one end, thirty-three inches at the other end, and making about seventy-five revolutions a minute. A stream of water under pressure is applied to this tube, which removes the rough dirt from the potatoes as they pass on to the washer, which is supplied with streams of water by the pumps, and here the potatoes are washed much cleaner than they could be by hand. From the washer they pass on to an elevator which carries them to the grater. The grater is made of wood, with iron heads, and is covered with grater iron. It is twenty-six inches in diameter, four feet long, and makes 500 revolutions per minute. The grated potatoes fall onto a fine brass wire sieve, the starch being washed out by streams of water, and falling through the sieve into a tank below while the pumice passes over the end of the sieve, and so onward into the stream. The contents of the tank are pumped into the settling vats where they are allowed to remain six or eight hours in order to settle, according to the temperature of the water. The starch settles to the bottom and the water is drawn off. The starch is then shovelled over into vats provided with large stirrers. Fresh water is pumped in, the whole thoroughly mixed, and then pumped up into settling vats again. Here it is allowed to remain twenty-four hours to settle. The water is then drawn off, the good starch having settled to the bottom. On top there is an impure starch which is called grains. This impure starch is put into a vat called the grain vat. Fresh water

is applied and the whole thoroughly mixed, and then the contents are allowed to settle. The portion that does not settle is run off into another vat, which is provided with a stirrer and which has vents, one above the other.

The pure starch will settle towards the bottom, and is found and drawn off by means of the vents. All the starch is then allowed to remain till the following day so that the water still mixed with it may separate and rise to the surface. The water being drawn off the starch is shovelled out, thoroughly pulverized, and then distributed on the racks in the dry house. After a batch of starch is put onto the racks, the kilns are closed, the ventilators are opened, the steam is turned on, and the process of drying the batch goes on rapidly. For the first twelve hours the temperature is kept at about 160 degrees of heat; the balance of the time the heat is increased to 190 or 200 degrees. The process of drying requires about twenty-four hours. The tables beneath the racks, on which the starch falls, are made of indurated fibre board, and are not affected by heat or moisture. The starch as it leaves the dry house should not contain above fifteen per cent of moisture. The starch is next conveyed to the storehouse, the lower part of which is in one large tightly sealed room, and dumped in, where it is allowed to cool. It is then put into casks holding from 650 to 700 pounds net, each. These casks are made of spruce and fir, the heads being made of spruce generally. They are manufactured in the county and furnish employment to quite a number of men. Potato starch is used mainly for sizing cloth in the cotton factories and bleacheries of this and other countries. Potato starch is not used for laundry purposes, corn starch being preferred. It follows then, of course, that it is in greater demand when our cotton mills are all running on full time. The manufacturers of starch do not, as a general thing, sell their product directly to consumers, but through commission merchants.

Our starch manufacturers have to compete with starch made in Europe, especially with that of Germany. Not only is labor much lower in Germany than in the United States, but the Germans save and make use of the pumice and all of what in this

country is denominated waste, and can therefore sell their starch at a much lower price than Americans can afford to sell for. The German manufacturer is satisfied with one cent and one-half per pound for his starch, a price that would not pay the cost of production in this country. It will be seen, therefore, that the present duty of one and one-half cents per pound is too low, for the moment that starch rises in price to three cents per pound, the foreign product is rushed into the country in great quantities. Dextrine is a product of starch and it is used also in the cotton mills and the bleacheries. It takes two pounds of starch to make one of dextrine, the price of which is at present three and one-half cents per pound. The duty is only one and one-half cents per pound, the same as the duty on starch. Under this duty, large quantities of dextrine are imported into the country from Germany, and but little, if any, is made in the United States. The present low duty on dextrine works an injustice to American starch producers.

Still another cause for the present low price of starch lies in the fact that many cotton factories are using corn starch for sizing, instead of potato starch. Several years ago there was a scarcity of potato starch, and corn starch was substituted. Different machinery is required, and, although potato starch is now much lower than corn starch, many manufacturers of cotton cloth hesitate to incur the expense of changing their machinery. Some, however, have done so, and it is hoped that others will follow their example. It must also be remembered that a great many cotton factories have been closed altogether during the last two years, and that others have run on half or three-fourths time, so that the production of cotton cloth has been very much diminished in this country. With a return of prosperity the price of starch will rise and manufacturers and farmers will reap the benefit of an increased demand. The production of potatoes in Aroostook county has steadily increased since the introduction of the starch industry. In 1890, fully 3,500,000 bushels of potatoes were raised in the county, and of these, about 1,000,000 bushels were made into starch. It is estimated that 2,000,000 bushels of potatoes were shipped out of the county for food,

and that the farmers of Aroostook in 1890 received $1,500,000 in cash for their potato crop. In 1895, the potato crop was in the neighborhood of 10,000,000 bushels, and the production of starch was the largest ever known. It may be safely said that in ordinary years, Aroostook county realizes about $2,000,000 for its potato crop, although last year, it probably did not realize one-half that amount. The influence of the starch industry on the development and prosperity of the county can hardly be over-estimated. The industry is about twenty-five years old, and if we contrast the Aroostook of to-day with the Aroostook of 1870, we shall find a most marvelous change. There is no section of this State or of New England that has handsomer farms, finer farm buildings, or neater looking villages than the Aroostook of to-day. The houses are as well furnished in every respect, as they are in any section of our country. There are more organs and pianos in the homes of Aroostook people, than in an equal number of homes in the remainder of the State. The farmers of Aroostook have good horses, good carriages and the latest and most improved agricultural implements. While it must be admitted that potato raising has led many farmers to neglect other crops and to neglect the making of butter and cheese, yet we must also admit that the starch industry and the selling of such vast quantities of potatoes has advanced the county materially as nothing else has done or could do. Farmers are now quite ready to acknowledge that they have given undue prominence to the potato crop, to the neglect of other crops, for Aroostook soil and Aroostook climate are adapted to the successful cultivation of every product of the eastern or western sections of our country, with the exception of Indian corn. The low prices of potatoes in 1895, and the low price of starch at the present time, have emphasized the lesson taught, and we may confidently look forward to a greater diversity of crops hereafter. The starch industry is permanent, however, and new factories will probably be added yearly. In 1896 several farmers combined and built a fine factory near the railroad station in Houlton. If this venture should prove successful, it will probably lead to similar enterprises in other

towns. Many people have predicted that the production of such large quantities of potatoes would soon exhaust the fertility of the soil to such an extent that the industry would have to be abandoned. On the contrary, after twenty-five years of potato raising, during which the business has increased with each succeeding year, the crop in 1895 was the largest ever raised, and the average crop per acre was also the largest. That potatoes can be raised successfully without the use of phosphate is proved by the fact that in 1896 Newell D. Smith of Masardis, raised 420 barrels, or 1145 bushels of potatoes on three acres of land, without the use of phosphate, using only dressing from the barn yard. The yield of potatoes per acre on Aroostook farms sometimes almost surpasses belief, but the following yields are amply vouched for, as the producers entered into the contest for the prize offered by the American Agriculturist in 1889, and the prizes offered in 1890 for the best twenty acres of potatoes. In 1889, the first prize was secured by Charles B. Coy of Presque Isle, who raised on one acre, 738 bushels. In 1890, of the twenty best acres in the United States, thirteen were in Aroostook county. These thirteen acres produced an aggregate of 7000 bushels, or an average yield of 538 bushels per acre. Philo H. Reed of Fort Fairfield, raised on his acre 745 and 25-60 bushels. A. M. Dudley of Castle Hill, raised 605 and 27-60 bushels on his acre. The above figures show the capability of Aroostook soil when carefully cultivated.

The shipping of such large quantities of potatoes and starch out of Aroostook county had a most important bearing on the transportation question, which finally resulted in building the Bangor and Aroostook Railroad, which was completed to Houlton in 1893, to Presque Isle, Caribou and Fort Fairfield in 1894, and to Ashland in 1895. This magnificent railroad system affords a much shorter and more direct outlet, wholly over American soil, from Aroostook county to Bangor and points westward. A car load of potatoes usually consists of 500 bushels, and during six months in the year long freight trains are conveying Aroostook's staple product, over the new road, to its connections with the Maine Central and other systems. The

influence of the Bangor and Aroostook Railroad on the future prosperity and development of the county cannot be over-estimated.

The potato raising states in this country are Maine, New York, Pennsylvania, Ohio, Michigan, Illinois, Wisconsin, Minnesota, Iowa and Missouri. Notwithstanding the great quantities raised, there has hardly been a year when we have not imported from 1,000,000 to 5,000,000 bushels of potatoes. The most of the imported potatoes come from Canada, especially from New Brunswick, Nova Scotia and Prince Edward's Island. In travelling through Aroostook county one is impressed by the great number of spacious potato houses near the railroad stations. These houses vary in number, according to the extent of country from which they draw, the largest number being found, probably, at Caribou. They have capacities varying from two thousand barrels of potatoes to as high as twenty-five thousand barrels each. Here Aroostook's staple product can be stored till such time as they can most profitably be shipped to market. Last spring the price of potatoes was so low that a number of starch manufacturers started up their factories and ground up large quantities of potatoes into starch, as starch does not deteriorate by age, and can be stored till the price becomes satisfactory. The price of potato starch may never be so high again as it has been in the past, but it is an industry well established in this State, and as long as the magnificent soil of Aroostook county continues to produce such great quantities and so rich in starch, the industry will live and flourish, and the great county of Aroostook will continue to prosper.

THE AX AND SCYTHE MANUFACTURE.

It is a well known and accepted fact that wherever iron and steel manufacturing is carried on there is prosperity and enterprise. The working of iron in any form has ever been a source of strength and influence whether confined to a community or extended to a nation. What has made England an overshadowing power among the nations of the earth has been in a large measure due to the cunning of her artificers in iron and her natural resources in this metal, with an accompanying abundant supply of coal. Maine has no coal or iron mines and she is obliged to look elsewhere for these indispensable materials, being thus somewhat handicapped. Manufacturing in this line thus cannot be carried on to the extent which it is in sections of the country more favorably located. But the State is endowed with a magnificent water power, an advantage which enterprising citizens have availed themselves of, the fruit of which is seen in the numerous flourishing manufactories located upon our rivers and larger streams. To an excellent and never failing water power is due in a great degree, the thriving scythe and ax manufacturing industry of the State, which is confined almost wholly to Kennebec county. To turn the grind stones and move the hammers in the production of these implements, a large amount of never failing power is required.

In the town of Oakland this is found. Situated at the gateway of Messalonskee lake, through it pour the surplus waters of a drainage shed of 185 square miles, one-fourth of which area is covered by magnificent reservoir lakes, ponds and connecting streams, their combined length being over fifty miles. This outlet, long known as Emerson's stream is remarkable for its volume, its constancy and its temperature. No equal area in Maine furnishes so much surplus water in dry seasons, and its

flood tide raises the stream but three feet. Valuable as these qualities are, the grandest value is that this stream, compactly held by banks and a floor of rock, has a fall of nearly one hundred feet in one mile, which reaches one hundred and ten feet in two miles. At one single plunge the stream drops forty-four feet. By general concession this is, of its magnitude, the finest water power in the State, if not in New England. Among the primal necessities of civilization are axes and scythes. The pioneer must have the former to clear away the forests, and the latter to mow his grass. These tools were as indispensable a century ago as they are to-day. Back in 1836 when the larger portion of the State which is now settled was comparatively new, there was a pressing demand for axes and scythes. Two men noted the want, they had a splendid water power at their command, and forming a partnership under the firm name of Larned & Hale commenced the manufacture of scythes by power on the Emerson stream. From this beginning the business grew, new concerns sprang up, and at the present time the output of scythes and axes from the Oakland factories is larger than that of any other city or town in the United States. The business has been conducted by men who were thoroughly conversant with it, and to their enterprise, pluck and foresight, is due its success.

In manufacturing on an extensive scale, a liberal capital is required. Buildings, water privileges, dams, water wheels and machinery are requisite. The factories are constructed of wood, usually one story in height and substantially constructed with commodious interiors. As a rule the various departments are each located in a separate room or building. For instance there is a hammer room, and one where the grinding is done, etc. Coal is required for the forges. A company manufacturing three thousand dozen scythes and twenty-four hundred dozen axes annually, will consume three hundred tons of anthracite coal, and wear out forty grindstones of two and one-half tons each, besides using seventy tons of iron and soft steel, and sixteen tons of edge steel. The iron is a very tough enduring material and all the metal used is presumed to be of the best

quality obtainable. It is all American product, none being imported. When business is good, ax manufacturing is continuous, but in several of the shops there is a lull in scythe working for a month or two after the haying season.

To make a finished scythe, without blemish and perfect in its temper and cutting qualities, is, by no means a simple process. From the bar metal to packing, it passes through the hands of no less than nine different workmen, all of whom must be skilled and experienced operatives. For a scythe of ordinary size a bar of what is known as soft steel, the dimensions of which are two inches by one-half an inch, is used, and a section ten inches in length cut off which is placed under the trip-hammer and slightly drawn out in the center, when it is bent over so that the ends nearly meet. This process gives a piece of iron about five inches in length and an inch in thickness, with a narrow lateral opening in the center. Into one side of this opening is dropped a small rod of edge steel, one-half by five-eighths inches, and five inches long, which will form the cutting edge of the scythe. On the other side is inserted in a similar manner a piece of back steel one-fourth by one inch, and five inches long. This will form the back of the scythe. This somewhat complex arrangement of iron and steel is heated to a welding temperature and drawn out to a length of about forty inches, the extent depending necessarily upon the weight and size of the instrument. It will average forty inches long, three-fourths of an inch wide, and one-fourth of an inch thick. The edge and the back meanwhile retain their proper positions. This makes what is called the scythe rod.

The plater takes this rod and plates it right out about two and one-fourth inches wide, leaving it thicker on the back than the edge. It then goes to another workman who places the steel under a die, turns up the back and gives it shape and curve. But the scythe is without a heel. It accordingly moves on to an operative who turns up the heel in a machine and hammers the point. The temperer takes it next. He first hardens it and then draws the temper which will yield that keen cutting edge so satisfactory to the mower. As a rule the temper is

harder than that of an ax. Thence the scythe falls into the grinder's hands who first straightens up the edge, then the back, and finally the polisher takes it, smoothes off the rough surfaces on emery wheels and gives the steel lustre and polish. The painter and labeller give the finishing touches and the scythe comes from him complete and prepared for the market. Scythes are packed in wooden boxes, a dozen in a box. Some twenty of different style, pattern and finish are made; grass scythes running from thirty to forty-eight inches in length usually. One firm makes a scythe fifty-two inches long which is sold to the sturdy farmers over in New Brunswick. Then there are bush, bramble and weed scythes, and corn hooks.

The process of making an ax, while perhaps not as intricate as that of a scythe is, nevertheless, a very exact one and necessitates the employment of skilled and adroit workmen. Both scythes and axes are made in the same shop but not by the same workmen. To complete an ax requires the services of six or seven men. The beginning is a bar of soft steel, seven-eighths of an inch in thickness by three inches in width. This is cut into patterns of the proper weight which is regulated according to the size of the tool to be made. One of these patterns is slightly drawn out, turned over a pin, and, the ends being lapped, they are welded together, the poll thus being formed. A piece of edge steel of the right width and containing a slot, is slipped over these joined ends, welded on under the trip-hammer, drawn out and becomes the bit of the ax. The next step is to put the ax under a hammer where it passes through a refining process to improve the texture of the metal. In welding on the steel the head was necessarily driven out of form and to give it shape and outline the metal passes on to the head hammerer. Now it goes to a workman who puts the ax through a process known as "scribing" which consists of giving it a special shape on a grindstone. And another grindstone operation which follows is that of "pumping," the ax being placed in a machine with lever power and given a thorough grinding. Finally the bit grinder takes it, smoothes up the tool and grinds the bit sharp. So it will be seen that the manufacture of an ax

as well as its existence afterwards has much to do with grindstones. The ax must be tempered and this is a very particular process. A perfect implement must be just that temper where it will neither break nor bend so that the temperer should be an honest man, have a good eye and know how. He first hardens and then draws the temper to just the proper point. The ax is polished on emery wheels, painted or bronzed, labelled and boxed when it is ready for shipment. As many as twenty different kinds, styles and finish are manufactured. The wedge ax, so called, is a great favorite with choppers, especially in Maine, and the Wisconsin and Minnesota forests. One firm manufactures what they call an African ax. It is extra heavy and goes to the Carolinas. Maine firms confine their production almost exclusively to chopping axes. They wholesale at from seven to ten dollars per dozen. The market for Maine axes is found throughout the United States and Canada, as for scythes, and everywhere they bear a reputation for their superior cutting quality and durability which is a credit to our manufacturers, and is the source of a never failing demand. Located in the neighborhood of an extensive lumbering region, Maine ax makers realize better than they otherwise could, what is needed, and are not behind hand in supplying goods to fill the wants of their customers. Wages paid in the scythe and ax shops vary but little, if any. The work is performed by the piece largely, a stated price per dozen being paid for hammering, grinding, tempering, polishing, etc. Each hammer man employs his own heater at such wages as are agreed upon between them, and pays him, the firm having nothing to do with the transaction. Sometimes work will be let out by the job to a workman, he contracting for the labor on a quantity of scythes or axes at a fixed sum. A hammer man will average from $15 to $18 per week and he pays his helper from $7.50 to $10. Welders average about $2 a day; grinders from $2 to $2.50; temperers, $2.50; polishers, $2. As can be seen these are very satisfactory wages. The workmen are mostly American born, intelligent, and save their earnings. Consequently many of them are prosperous. Many of them own their homes, besides having a snug

bank account. Oakland, which is the headquarters of scythe and ax manufacturing in Maine, is one of the most flourishing and thrifty towns in the State and it is largely due to this industry. The regular disbursing of wages to well paid operatives furnishes them with ready money, and consequently, at Oakland, the farmers residing adjacent find a ready market for their products. The business is a healthy one. Men are employed sixty years of age who have worked in the shops all their days and have throughout enjoyed the best of health. Strikes are unknown in the Oakland shops.

The first scythe factory in Oakland was built in 1836, where the woolen mill now stands, by Larned & Hale. They made scythes three years and were succeeded by Samuel and Eusebius Hale until Joseph E. Stevens purchased E. Hale's interest in 1845. Hale & Stevens ran eight years, when William Jordan bought out Mr. Stevens and Mr. Hale sold to R. B. Dunn and finally Mr. Jordan sold to the Dunn Edge Tool Company. This, the most extensive manufacturing corporation in Oakland, is a perpetual memorial to its founder, Reuben B. Dunn, who, in 1857, established and organized the business which has since attained a world wide reputation. Beginning at North Wayne in 1840, he brought to the town his capital and seventeen years of invaluable experience. Able capitalists eagerly joined in the incorporation. The directors in 1857, were Mr. Dunn, N. G. H. Pulsifer and J. H. Drummond, and in 1864, Mr. Dunn, T. W. Herrick and John Ayer. In 1864, Mr. Dunn and John Ayer bought all interests held by other parties in the company and became sole owners of this fine water power and the most extensive scythe factory in New England. Mr. Ayer, who had been travelling agent for the company, then assumed the duties of treasurer and general manager. R. B. Dunn, the first president, was succeeded at his death in 1889, by his son, R. W. Dunn. The annual output of the company is now 12,000 dozen scythes and 8,000 dozen axes, valued at about $100,000. From seventy-five to one hundred men are employed, five of whom are travelling salesmen. The monthly pay roll is $3200.

There are two other scythe and ax manufacturing establishments at Oakland, in successful operation, each of which has been doing business for a long term of years. Jonathan Coombs built a dam, a saw mill and a grist mill about the year 1800. It was kept in operation over half a century, and run by Jonathan and David Coombs, sons of the pioneer. About 1860, the mill passed into the hands of Hubbard, Blake & Co., who enlarged the shops and made axes, scythes and hatchets. In 1865, the firm was joined by Luther D. Emerson and Charles E. Folsom, which made axes and scythes for five years. In 1870, this firm was dissolved by the withdrawal of L. D. Emerson and Mr. Folsom. Hubbard & Blake with the addition of Cyprian Roy, Charles H. Blaisdell and Nathaniel Meader, reorganized in 1877, under a charter obtained in 1875, as the Hubbard & Blake Manufacturing Company. Nathaniel Meader was president, and John U. Hubbard, treasurer. Two years later a part of their works was burned, which they rebuilt and continued to make scythes, axes and hatchets until 1889 when this property, together with a large factory on the upper dam which the company had owned for several years, was sold to the American Ax & Tool Company and is designated as No. 16 by the new owners. The company, which was chartered at Newport, Ky., owns and operates numerous tool shops located in various sections of the country. Last year the company manufactured 13,000 dozen scythes at their Oakland shops, but the present year, owing to the general depression in business, which has prevailed, their output has been limited to 8,000 dozen.

Thirty men are employed, but, when running at full capacity, the number is fifty. The pay roll amounts to $2,000 per month. Last year it was $3,000. Cyprian Roy is manager. The goods are disposed of through the New York headquarters. Ten different patterns of scythes are made. The valuation of the plant is not far from $50,000.

In 1870, when the firm of Hubbard, Blake & Co., dissolved, L. D. Emerson, Joseph E. Stevens, William R. Pinkham and George W. Stevens, formed the present Emerson & Stevens Manufacturing Company, which purchased the property at the

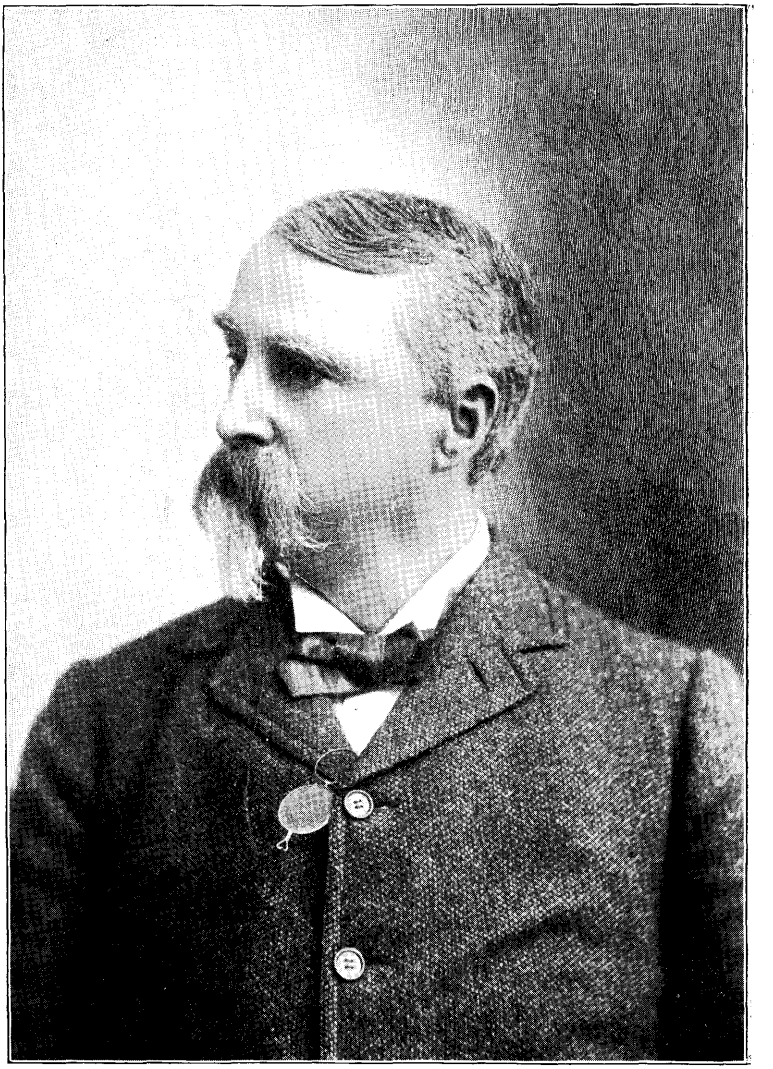
west end of the Coombs' dam, erected shops and established the manufacture of scythes and axes which is still continued. Mr. Emerson and J. E. Stevens have since died, the business now being under the efficient management of Mr. Pinkham. When running at full capacity they make some 4,000 dozen scythes and 3,000 dozen axes annually, but for the same causes which have affected other manufacturers they have turned out less than that the year past, their production amounting to 3,000 dozen scythes and 2,400 dozen axes, the number of men employed being forty, five of whom are travelling salesmen. The company sells entirely to the retail trade, a market being found in the middle and western states, New England and the province of New Brunswick. The value of their sales will reach $30,000 a year. The pay roll is $300 a week, and their plant is valued at $24,000.

Almost simultaneously with the beginning of edge tool manufacturing in Oakland, a similar industry was started at North Wayne. As early as 1837, a stock company was formed and commenced operations. But the venture proved a financial failure. The first factory, a building seventy by forty feet, was of brick, and stood on the west side of the stream. It was burned about 1842. Not far from 1842, R. B. Dunn, who founded the Dunn Edge Tool Company of Oakland, purchased all the property of the Wayne company and other interests in contiguous real estate, and two years later organized the North Wayne Scythe Company, to which he relinquished a controlling interest of the stock. The business was conducted by this company until 1861, when it failed, and for one year it was managed by the assignees. The opening of the rebellion was an opportune event for the management, and in the short space of twelve months they established the business on a firm financial basis. A new company was organized as the North Wayne Tool Company, which was controlled by the Ames brothers of Boston, proprietors of the Ames Plough Works. At the end of twelve years the business was suspended, and until 1880, when the existing company was formed, the works lay idle. The present official organization consists of Joseph F. Bodwell,

president; Gen. C. W. Tilden, secretary and treasurer; and Williston Jennings, superintendent; Mr. Bodwell succeeding his father, Hon. J. R. Bodwell, who was elected to the first position in the corporation in 1880. The annual production of the company is 4,000 dozen scythes, 2,000 dozen axes, and 2,500 dozen corn hooks. Thirty men are given employment. The factory is located several miles from the railroad, making the trucking of material and goods necessary.

The manufacture of axes in Gardiner began in 1881, when Henry M. Foster went there from Skowhegan, and bought James Walker's box factory on Dam No. 3, which he converted into an ax and ice tool factory. After running a year, the Foster Edge Tool Company was formed, which, after two years, was changed to the present Gardiner Tool Company, of which Fuller Dingley is president; J. B. Dingley, treasurer; and Henry M. Foster, agent. When running at their full capacity, they manufacture anywhere from 500 to 1,200 dozen axes per annum, but for a year or two past they have made but from 500 to 660 dozen. They employ four men on an average, while their monthly payroll is $150. Their annual output amounts to from $4,000 to $5,000. The value of their plant is $5,000. No scythes are made.

The Nolin Manufacturing Company of Skowhegan, G. Nolin, president and manager, F. A. Nolin, secretary and treasurer, manufacture scythes, grass-hooks, and hay knives, their annual output being valued at $7,000. Fifteen men are employed. Their shops are operated by water power.



GEN. THOMAS W. HYDE.

THE STEEL SHIPBUILDING PLANT OF THE BATH IRON WORKS.

Shipbuilding has from the earliest times been one of Maine's prominent industries. The sails of her vessels have kissed the breezes of every sea, and there is not a port in the world that has not been visited by some craft from the shipyards of the "Sunrise state." Great changes have, however, been wrought in this industry, and on the water as well as on land transportation has undergone a revolution. The advent of steam has led to a decline in the prominence of sailing vessels in some branches of the ocean carrying trade and the growing use of steel instead of wood in marine architecture is already very noticeable, while in the immediate future this will be even more strikingly apparent than to-day. Maine has held a foremost place in the realm of wooden shipbuilding, and now that through the enterprise of Gen. Thomas W. Hyde of Bath, steel shipbuilding has been so successfully inaugurated in our midst, the proud motto of "Dirigo" on the State's escutcheon has been vindicated, and Maine's supremacy in the shipbuilding industry should be maintained for all time.

The banks of the fair Sagadahoc, now the Kennebec, were the first of any river of North America to echo the sound of the shipbuilders' axes and mauls. It is a noteworthy fact that within twelve miles of the site of Bath, now universally known as the "Shipbuilding City," was constructed the first vessel built in America, it being the first year of the Popham colony. The carpenters built a pretty pinnace from lumber sawed from the trees along the Kennebec, the chief shipwright being one Digby, of London. This was in 1607-8 and the vessel was named the Virginia in honor of the virgin queen. Along the banks of the Kennebec, and indeed throughout the State of Maine, where

depth of water and favorable conditions allow, the example of the Popham carpenters has not been allowed to go unheeded, but the pretty pinnaces of three centuries ago have yielded to the dashing and magnificent coasters and the flying clipper ships which now ply the waters of old ocean. The first ship of North America of thirty tons has been followed by the Rappahannock of 3,053 83-100, the Shenandoah of 3,253 47-100, and the Roanoke of 3,400 43-100 tons. As the shipping interests of Bath developed, the town saw some of its palmiest days, and the presence of its ships on all the waters of the globe has given it an extended fame.

A large chart prepared by a former secretary of the Bath Board of Trade shows at a glance a list of the vessels built at Bath in any and each year from 1781 to 1887 inclusive, a period of 107 years, with the tonnage of each. In 1781 a single schooner of 22 tons was launched, while in 1890 there entered the water from Bath three ships, one bark, two barkentines, two steamers and thirty-three schooners, with a net tonnage of 36,348 78-100. Bringing these figures down to the census year, a summary for the 110 years from 1781 to 1890 inclusive, gives the total number of vessels built in Bath during that time as 3,421, with a tonnage of 1,332,851 15-100. The total number of vessels classified as to their rig is as follows: Ninety-six steamers aggregating 31,408 57-100 tons, 893 ships with an aggregate of 749,773 98-100 tons, 288 barks aggregating 136,430 61-100 tons, 673 brigs aggregating 128,089 tons, 1337 schooners aggregating 275,343 23-100 tons, 156 sloops aggregating 8,355 44-100 tons, and eight barges aggregating 3,450 32-100 tons. In the years that have elapsed since 1890 wooden shipbuilding has shown a decline, the record in the Bath district being 24,001 tons for 1891, 11,660 for 1892, 7,518 for 1893, 11,627 for 1894 and 9,888 for 1895.

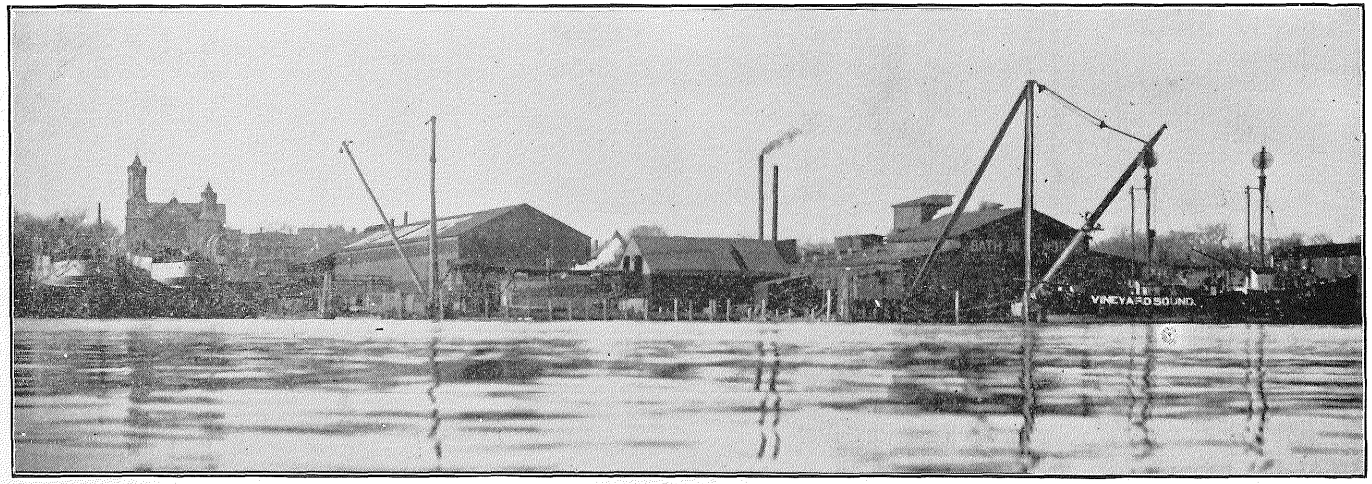
It is of some interest historically that the first naval vessel launched from a Bath shipyard bore the name Katahdin and was launched in 1863. Larrabee and Allen were the builders, and the contract was received by them on July 4, 1861. Work soon commenced on her and the early part of the following winter

she was launched. Her tonnage was 560 and she was a wooden vessel of clipper build and equipped as a gunboat. Her armament consisted of 11 guns, and her first commander was Lieut. Preble, son of Commodore Preble of Portland. The Katahdin joined Admiral Farragut's fleet on the Gulf and participated in the capture of New Orleans. A few years later, in 1864, there was built in Portland an iron clad vessel for the government. She was a single turreted monitor, being of the following dimensions, length over all 225 feet; beam forty-five feet; and depth six and one-half feet. G. W. Lawrence was the builder and she was christened the Wassuc. She could not, like those of the modern navy, be called an iron vessel, but she was an iron clad, the iron being laid in plates outside of the heavy oak planking. There is no record that the Wassuc ever saw active service, and as the war of the rebellion was over about the time she was completed, she probably had no opportunity to display her fighting qualities.

In 1881 when it was clear that Bath, if she would maintain her high place among the shipbuilding cities of the world, must be able to produce machinery as well as hulls for steam vessels, the people met together in consultation and the result was soon made manifest in a subscription of $100,000 for the establishment of shops for the production of marine engines and boilers. In the fall of 1882 work upon the foundation was begun and the middle of December saw the large buildings of the Goss Marine Iron Works standing where before were the neglected ruins of a burnt sawmill. February 22, the engines started and in 1883 the entire plant was in full operation. Two years later these works passed into the hands of the New England Shipbuilding Company, to be in 1888 transferred by them to their present owners, the Bath Iron Works, Gen. Thomas W. Hyde, President. The entire business life of this gentleman has been devoted to the development of that industry which has now made his name so well known throughout the country. Gen. Hyde is 55 years of age having been born in Florence, Italy, in 1841. His father was a native of Bath and it is in this city the General has lived since his infancy. He graduated from Bow-

doin College in '61, and later from the Chicago University, in the first graduating class from that institution. In 1861 he went to the front as Major of the Seventh Maine Volunteers, a mere youth of twenty years. During the last year of the war he commanded a brigade, and Congress has awarded him a medal for his acts of exceptional bravery. "Following the Greek Cross" is the title of a very interesting work on memories of the Sixth Army Corps from the pen of Gen. Hyde, and published by Houghton, Mifflin & Company of Cambridge, Mass. He was president of the Maine Senate in 1876-77 and Mayor of Bath in 1878-79. Gen. Hyde has been a director of the Eastern and Maine Central Railroads, and one of the board of managers of United States Soldiers' Homes. He has six children, two of his sons being associated with him in business, one as Superintendent and the other as Treasurer. His home, Elmhurst, is one of the most charming and picturesque to be found in this city of beautiful and inviting residences.

In the fall of 1865, having returned from the Civil War where in the volunteer service he had bravely won that military title, Gen. Hyde leased for a term of years the Bath Iron Foundry, established by William and Oliver Moses in 1833. This plant at the time was a very modest one, having one furnace where casting was done twice a week. There was a small pattern shop in connection with it and the work of the place was almost wholly confined to the making of iron castings for vessels. At the expiration of his lease Gen. Hyde purchased this establishment and made large additions, in 1878 adding a machine shop to manufacture windlasses, capstans, etc. When Gen. Hyde took the plant the crew comprised seven men, but the numerous additions and improvements steadily made under his enterprising management resulted in such an extension of the business that the manufacture of windlasses, capstans, pumps and heavy castings of brass and iron required a force of eighty men at the time that the Goss Marine Iron Works were bought by Gen. Hyde. In 1884 the business was incorporated under the name of the Bath Iron Works, the name it at present bears.



BATH IRON WORKS FROM KENNEBEC RIVER.

Immediately on the acquirement of the Goss Marine property in 1888, Gen. Hyde began making improvements and enlargements and in the summer of 1889 he felt ready to have the place inspected by the government officials of the Navy Department, with the view of learning its fitness for building Government vessels, and the report rendered by Naval Constructor Hichborn, who was sent by Secretary Tracy to examine the place, was highly complimentary. At once General Hyde put himself among the bidders for Government work, secured two contracts, and put crews of men at work erecting the necessary buildings, constructing cradles and adding new machinery. Meanwhile, he had contracted for and built the steamer Cottage City, the New England Company building the hull, and the new steamer was so satisfactory to her owners, the Maine Steamship Company, that they shortly placed with the Bath Iron Works an order for a duplicate of that craft, the Manhattan, and she was duly built. The fine steamer Frank Jones was also built here for the Maine Central Railroad, her route being between Rockland, Castine, Bar Harbor and Machias.

The elaborate and extensive plant of the Bath Iron Works has a water frontage of 608 feet, and a depth of 441 feet. A portion of the works was destroyed by fire on February 13, 1894, but they were in due time replaced by steel buildings of most approved design. The plant includes an office building, machine shop, boiler shop, pattern shop, power plant, store house, brass foundry, smith shop, plate shop with moulding loft in second story, paint shop, pipe shop, tin shop, foreman's office, stable, Government office, store houses and coal shed. There are two large draughting rooms on the second floor of the office, one devoted to the hull and the other to the machinery of vessels. The yards have ample room for five vessels to be set up at the same time, and can accommodate the largest vessels built. The cradles can accommodate ships of ten thousand tons, and can be lengthened as may be required. In fitting the establishment with machinery, the same idea of accommodating large work has prevailed. Everything supplied is of the most modern type, and as steel shipbuilding has made great strides during

recent years, the significance of these facts is apparent. The machinery includes a complete hydraulic riveting, flanging, punching and shearing plant, together with hydraulic cranes for operating. The equipment includes one 10x10x26 feet planer, a 16-feet bore mill, and other tools in proportion. A derrick, with a boom one hundred feet long, and operated by double steam engines, has been located on the wharf, and has a capacity of seventy-five tons. The plant is lighted throughout by electricity, having two dynamos, thirty arc lights, and 220 incandescents.

In location, the Bath Iron Works are especially fortunate, the natural facilities being unexcelled, if, indeed, they are equalled anywhere. Situated twelve miles from the sea and fifteen miles from any water where a stranger would care to venture without a pilot, these works in time of war would be absolutely secure. No damage could be done them from the sea, and the high bluffs of rocks which guard the winding channel would make it simply impossible for any hostile vessel to make her way up to the yards where American war vessels might be building. Here, absolutely secure, vessels can be built and repaired at any time, while the natural fortifications at the mouth of the Kennebec, would make the stay of blockading craft in this vicinity exceedingly unpleasant. The harbor is one of the finest in the world. Reached by a channel which can float not only the largest ship now in existence, but the largest which in any likelihood will ever be built, this grand sheet of water, more than three miles long and three-fourths of a mile wide opposite the "Works," can offer secure and easy anchorage when the highest gales are raging. Freshened by the Kennebec, the water of the harbor prevents the iron hulls from fouling, while preserving the metal from that corrosion which comes from the salt sea.

It is a noteworthy fact that the first triple expansion engine built on the Atlantic seaboard, was produced here in Bath at these works. This engine was designed by Charles E. Hyde, who has held the responsible position of designing engineer of the plant ever since it was first established as the Goss Marine

Iron Works. Work was commenced on this engine in May, 1884, and it was completed on October 31st of that year. This engine has shown excellent economy, has been in constant service since that time, and is now in good condition. It was built for the domed steamer Meteor, owned at one time by ex-Commodore Bateman, and known as the Golden Rod. The successful performance of this engine, and that of its successors from the same establishment, had much favorable influence in hastening the general use of that type of engine in this country.

General Hyde has, during the present year, organized the Hyde Windlass Company, and the manufacture of windlasses, capstans, and general ship machinery, will henceforth be separated from that of the shipbuilding plant of the Bath Iron Works. The Hyde Windlass Company is officered as follows: President, Gen. Thomas W. Hyde; Treasurer, E. W. Hyde; and Agent, J. R. Andrews. About a thousand feet south of the extensive plant of the Bath Iron Works, and located at the corner of Washington and Federal streets, the establishment of the Hyde Windlass Company is being rapidly pushed to completion. The plant includes a foundry 150x100 feet, with wing 40 x80; a machine shop 150x80 feet; pattern shop 60x40; pattern storehouse, 100x80, and office building 30x50. The buildings are of brick and steel, fitted with every appliance for economical production. The steel comes from the Wrought Iron Bridge Company, of Canton, Ohio, the home of the next president. The equipment of the foundry includes a twenty-ton electric travelling crane, by the Morgan Engineering Works, and in the machine shop there will be a fifteen-ton Shaw electric travelling crane. The product of the plant will include windlasses, capstans, hoisting engines, steerers, and ship machinery generally. It is expected the Hyde Windlass Company will be in full operation by February 1, 1897, in their new and commodious quarters, and then the foundry at the north end of the city, where General Hyde thirty years ago embarked in business, will be abandoned.

The officers, heads of the departments and foremen of the Bath Iron Works, are as follows: Gen. Thomas W. Hyde, President

and General Manager; Edward W. Hyde, Treasurer; Charles R. Hanscom, N. A., Superintendent Shipyard Department; Charles E. Hyde, M. E., Designing and Constructing Engineer; John S. Hyde, Superintendent Engineering Department; J.R. Andrews, Superintendent Ship Machinery Department; J. L. P. Burke, Purchasing Agent, William C. Besselievre, Chief Draughtsman Shipyard Department; W. K. Stiles, General Foreman Iron Workers; William H. Melcher, Foreman Joiner; I. J. Shuman, Foreman Marine Mechanical Department; Hugh T. Madden, Foreman Boiler Makers; W. S. Hanscom, Foreman Ship Fitters; John Stantial, Foreman Carpenter; John Stevens, Foreman Blacksmith; Edwin P. Hyde, Foreman Machinists (outside); Henry Turner, Foreman Painter and Decorator; Herbert Hopkins, Foreman Ship Machinery Department; Enoch Reed, Foreman Rigger and Caulker; George Dean, Foreman Iron Foundry; L. A. Ellison, Leading Plumber and Piper; Wm. Dean, Leading Brass Moulder; Robert Philbrick, Leading Tin and Sheet Iron Worker; James Purrington, Leading Engine Pattern Maker; George P. Squire,, Leading Hull Pattern Maker; Benj. A. Frates, Electrician.

GUNBOATS MACHIAS AND CASTINE.

The first government contracts secured by the Bath Iron Works were for gunboats Nos. 5 and 6, they being the lowest bidders, the figures being $637,000 for the two vessels. The contract with the government was delivered upon the 12th of April, 1890, upon plans and specifications furnished by the United States Naval Department. The contract required that the vessels should be ready for sea within two years from the above date. The keels for the gunboats were laid at once and on December 11, 1891, one of the vessels was launched and the second was ready within a few weeks. Vessels of this class were never built in less time or in a more thorough manner.

The principal dimensions are as follows: Length on water line, 190 feet; extreme breadth, 32 feet; depth, about 28 feet, and draft 13 feet of water when ready for sea, with her crew, guns, ammunition and other supplies on board. The Machias

is a small twin-screw gunboat of the cruiser type, carrying on a small displacement, a powerful battery of rapid fire and machine guns, and manned with a crew of 150 men and officers. The coal capacity of her bunkers is 250 tons, which is very large for a vessel of her size. Upon this amount of fuel she can steam 2,452 knots at the rate of fourteen knots per hour, or 4,668 knots at the rate of ten knots per hour. She has the rig of a two masted schooner, with a foreyard and square foresail, and spreads about 6,500 square feet of canvas. The armament consists of eight four-inch rapid fire guns for the main battery. From each gun ten shots can be aimed and fired per minute. They are a destructive and murderous instrument for naval warfare, and when turned upon torpedo-boats, and aimed with precision, will quickly exterminate these little wasps of the sea. Six of these guns are mounted in armor-plated sponsons, three on each side, and one on the poop deck aft, and one on the forecastle deck forward. Those on the forecastle and poop decks have large steel shields on them to give protection to the gun crew when in action. The secondary battery consists of small machine guns. There are four six-pounders and two one-pounders of the Hotchkiss make, and two Gatling guns. A constant shower of small shot can be poured upon the enemy from this battery. In the bow of the vessel is a torpedo tube from which torpedos will be launched when in close quarters with the enemy.

The model of the vessel is very sharp forward and aft. The cutwater terminates in a ram bow under water and sloping backward above water. This type is known as the swan breast bow, and is generally adopted for war vessels. The general appearance of the gunboat under water, is like the belly of the swordfish. The rudder is below the water line and operated by a steam steering gear. There are four different ways for steering the vessel, so that in an engagement with the enemy the control of the vessel may not be lost by a fatal shot.

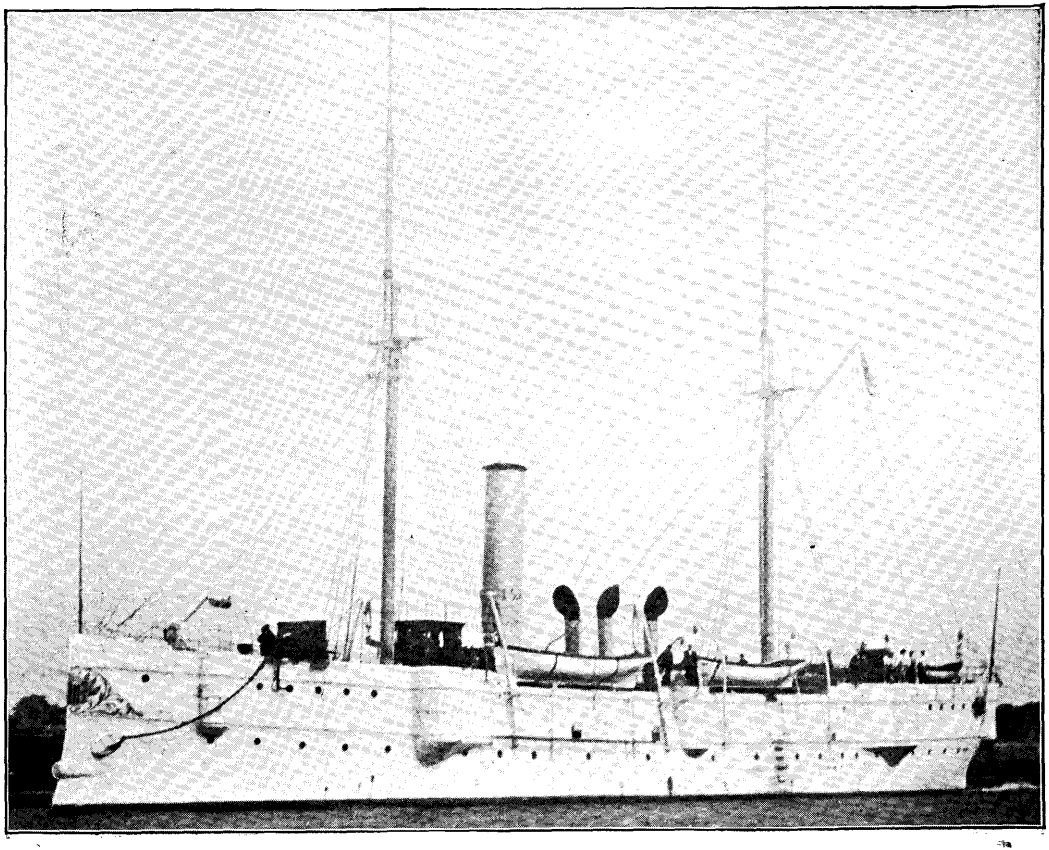
The propeller screw wheels that drive the boat are down near the rudder post, one under each quarter. They are made of composition. The gunboat does not have a keel like a wooden

vessel but has a bilge keel on each side to prevent rolling in a sea way. The hull is made of iron and steel and weighs about 450 tons including the machinery. The iron ribs or frames are bolted onto the keelson and the steel plates are riveted upon them in large sheets running in streaks about three feet wide around the hull. The decks consist of a thin iron plating covered with white pine planks two and three-fourths inches by five inches. There are four decks, water tight deck, spar deck, berth deck and gun deck. Under the water tight deck are the engines, boilers, coalbunkers, magazines and ship stores. There are two tanks, one forward and one aft, that can be filled with water and are used to trim the vessel.

The coal is arranged to give the greatest protection possible to the machinery. The propelling power consists of two engines of the vertical inverted triple expansion type. There are four boilers for generating the steam and they develop about 1,600 horse power. At the water line around the inside of the hull a row of plates is bolted, and between them and the outside skin it is filled with woodite. If this substance is perforated by a shot and exposed to the action of the water, it will swell and stop the passage of that liquid at once. There are about fifty apartments in the vessel and they can be closed by doors that have water tight joints.

Under the poop deck is the captain's cabin, stateroom, pantry and office. Forward of this cabin is the ward room, and on the deck below is the armory and offices for the executive officers and navigator. On the berth deck are water closets, staterooms and an enclosure for the junior officers which open into the lavatory and pantry. The cabins are furnished in mahogany and other rich woods. The crew's quarters are on the forward berth deck under the forecastle. They have a washroom and lavatory. The galley, distiller and refrigerator room are situated here. The vessel is lighted with electricity and has windlass, pumps, etc., and below the water line is painted red, and above, lead color.

Gunboat No. 5 received the name Machias to commemorate the event of the first naval engagement of the revolution, which



GUNBOAT CASTINE.

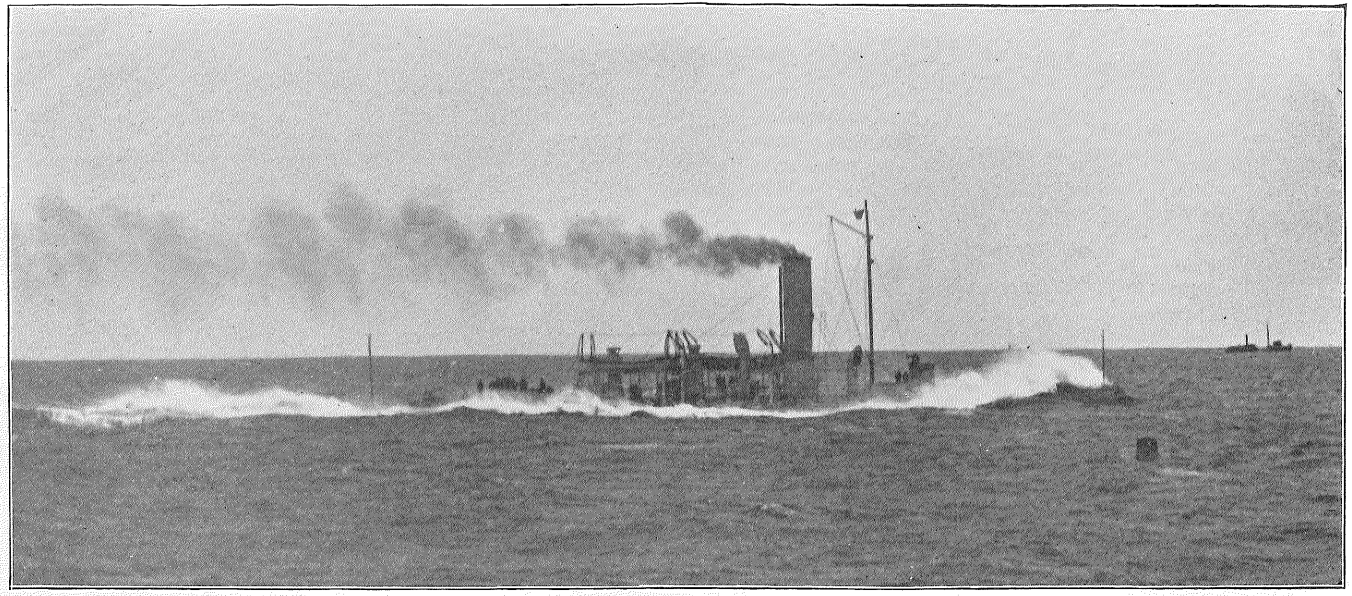
was fought near Machias, this State, in May, 1775, but a few days after the battle of Lexington. The British armed schooner, Margaretta, convoyed a sloop from Boston to Machias to obtain a cargo of wood and lumber for the army. While in that port the inhabitants erected a liberty pole which the British commander, Lieut. Moore, ordered to be taken down, and threatened to bombard the town if his orders were not obeyed. The citizens held a meeting and voted not to take down the pole, and an attempt was made to capture Lieut. Moore while at church, but he escaped on board his vessel and dropped down the harbor after firing a few shots over the settlement. A party of men armed with guns, axes and pitchforks seized the wood sloop, and in company with another sloop sailed down the river and attacked the British schooner of-war the next day, and after a sharp and desperate fight captured the Margaretta. Several men were killed on each side, and among the enemy was the British commander. The Massachusetts legislature passed the heroes of this fight a vote of thanks on the 28th of June. This engagement is well entitled to the name it has received—"The Lexington of the Seas." The Margaretta was the first British vessel captured by the Americans in the war for independence.

Gunboat No. 6 is a duplicate of the Machias and was appropriately christened Castine in honor of the historic town on the east shores of Penobscot bay. On December 28, 1894, the United States gunboat Castine, visited Castine where she was presented with a fine silver service by citizens of the town. The Machias and Castine both developed speed considerably in excess of the contract amount, in fact exceeding the contract requirements more than any war vessels yet built for this government, and the Bath Iron Works were awarded a bonus on the two vessels of $95,000. After they had been in service for a time the claim was put forward that they were top heavy, but the builders were in no way responsible for this, the vessels having been constructed according to the plans submitted by the government designers. The vessels were finally docked at

the Brooklyn Navy Yard where they were cut in two amidships and lengthened, a fourteen foot section being added to it. The Machias and Castine are both in active service to-day.

AMMEN RAM KATAHDIN.

The ram Katahdin, designed for harbor defence purposes, is perhaps the most unique craft in the United States Navy. There is but one naval vessel that bears even a slight resemblance to the Ammen ram, and that is the Polyphemus of the British Navy, a craft designed for torpedo service. The points of similarity between this vessel and the Ammen ram, are the general shape of the hull, and the method of submersion by means of filling compartments in the double bottom with water. The Ammen ram is in no way planned from the British vessel, and in fact, antedates her as far as the design goes. She is entirely the fruit of American ingenuity, the original idea having been conceived by Admiral Daniel Ammen, prior to his being placed on the retired list in 1878. The design was worked out and improved by the Bureau of Construction and Repairs, and elaborated from time to time, until January, 1891, when the contract was let for building the vessel. The construction of the Katahdin was authorized by the act of March 2, 1889, but it was fully a year and a half later that bids upon her were called for. They were opened on December 20, 1890, and as there was but one bidder, the Bath Iron Works, the contract for the construction of the ram was given to that one, being signed on January 28, 1891. The bid was $930,000 for the hull and machinery, the speed to be seventeen knots, with a premium of $15,000 for each quarter knot in excess of that rate shown in a trial of two consecutive hours with an air pressure in the fire room not exceeding two and one-half inches of water, and with the vessel weighted to a mean draft of fifteen feet. But instead of the usual similar deductions for not coming up to requirements, which in this case would be a forfeit of $15,000 for each quarter knot below seventeen, the vessel was to be rejected altogether. Thus there were some unusual



RAM KATAHDIN.

stipulations in this contract. One, a trial trip of two hours instead of four, as is usually the case; two, complete rejection for not reaching the contracted speed of seventeen knots, and a third, in the fact that even the premiums fixed upon were to be subject to approval of Congress.

The original design called for a vessel of a length of 243 feet, and a displacement of 2,050 tons. The contractors, however, added about eight feet to her length with the approval of the navy department. This change gave considerable additional space for the reception of coal, and the crew greater berthing space. At the same time this change was authorized, one even more inportant was authorized. This was the substitution of a solid steel casting for the stem instead of a casting with a removable head. This change was made because it was believed that it would make the ram proper more powerful, besides improving the maneuvering abilities of the vessel. The height of the conning tower was also increased. The designs were furnished by Rear Admiral Ammen.

The Katahdin finished, is 250 feet and nine inches long; forty-three feet and five inches inside at her widest part, with fifteen feet main draft and having a displacement of 2,155 tons. She is a twin-screw, steel and armor plated. Her engines are of the vertical triple expansion type, and are designed for 4,800 maximum indicated horse power. The normal coal supply is 175 tons with 192.70 as her bunker capacity. With her bunkers full and ready for sea the maximum draft aft is sixteen feet. She is designed when preparing for an engagement to be partly submerged by the use of fourteen eight-inch Kingston valves, one in each transverse compartment, with sluice valves in the vertical keel and also in the longitudinals of her compartments.

By the peculiar construction of her frame, this vessel is given tremendous strength and power of resistance. She is framed on the longitudinal system, and has eleven "longitudinals," or keels, two feet high and laid five feet apart, running the whole length of her, and focusing like a bundle of sticks behind her steel prow. This gives the ram's weapon of attack the strongest possible backing, and the force of a blow is distributed by this

means, all over the ship instead of being borne by the stem alone. The transverse frames of the vessel are spaced four to six feet apart, and her inner shell or hull is further sub-divided by bulkheads that are water tight, giving great strength to the ship, as well as rendering her practically unsinkable.

The bottom of the ram, which is of half-inch plate weighing twenty pounds to the square foot, is solidly bolted to the longitudinals, there being an extra heavy strip of plate under each keel. The inner shell is laid on the top of the longitudinals, the space between the two shells being two feet. This space is divided into seventy-two water tight compartments, connected with sluice valves that can be opened and shut at will from the hold of the vessel. In certain of these compartments there are set Hitchcock valves, there being forty in all, that pump water into the shell through holes eight inches in diameter made for the purpose, several feet below the water line. The water can be forced out of these compartments almostly as quickly as it is let in. With all the compartments full the ram will settle until her deck is entirely covered to the depth of from six inches to a foot. It is not intended that all the compartments shall be used at once, but that the vessel shall be trimmed when ready for action, so that the "knuckle" shall be under water about a foot. In addition to her water tight compartments the ram has two large tanks, one in the bow and the other in the stern, that will be filled with water as needed to keep her on an even keel. With this plan of submersion it has been necessary to introduce an element of buoyancy, and for this purpose bulkheads have been built on either side of the vessel, making air tight wing passages 100 feet long and about four feet wide that will contain air enough to prevent the vessel from settling too low in the water should all her compartments and the trimming tanks besides be filled at once.

Above the rounding deck only the conning tower, with eighteen-inch armor, the smoke pipe, ventilators and skid beams for the boats will show. As a means of defense against light craft, such as torpedo boats, the Katahdin will carry four six-pounder rifles. She will probably suffer but little should she

ever enter an engagement, for she offers but a poor target, being so nearly all under water as she is and with the part exposed so shaped that a square impact of a shot is impossible. The outside stroke of the deck armor is six inches thick, and the next inboard tapers from five and one-half to two and one-half, which last is the thickness for the remainder, including the lower course of plating. The side armor is two strakes in depth, the upper six inches thick and the lower one three inches. The hatches have armored plates, and the smoke pipe and ventilator have six inches of armor.

The Katahdin's engines are in separate compartments and each is wholly independent of the other. The cylinder diameters are twenty-five, thirty-six and fifty-six inches, with a common stroke of thirty-six inches. The boilers are intended for a working pressure of 160 pounds to the square inch, and besides two double-ended Scotch boilers, twenty-two and one-half feet long and thirteen and one-half feet in diameter, there is a single-ended boiler of the same diameter and eleven and one-half feet long. The force draft is on the closed fire room system. The propellers are three-bladed and of manganese bronze, ten feet and six inches in diameter. The quarters for officers and men are in the stern of the ram and everything possible has been done to give the men good conditions, although the space is small. Blowers in the engine and fire room will exhaust the foul air, and fresh air is supplied from the main ventilator through air ducts led along the under side of the deck. Any apartment can be pumped out by the steam pumps and the electric lighting will be arranged in duplicates, so as to provide for accidents.

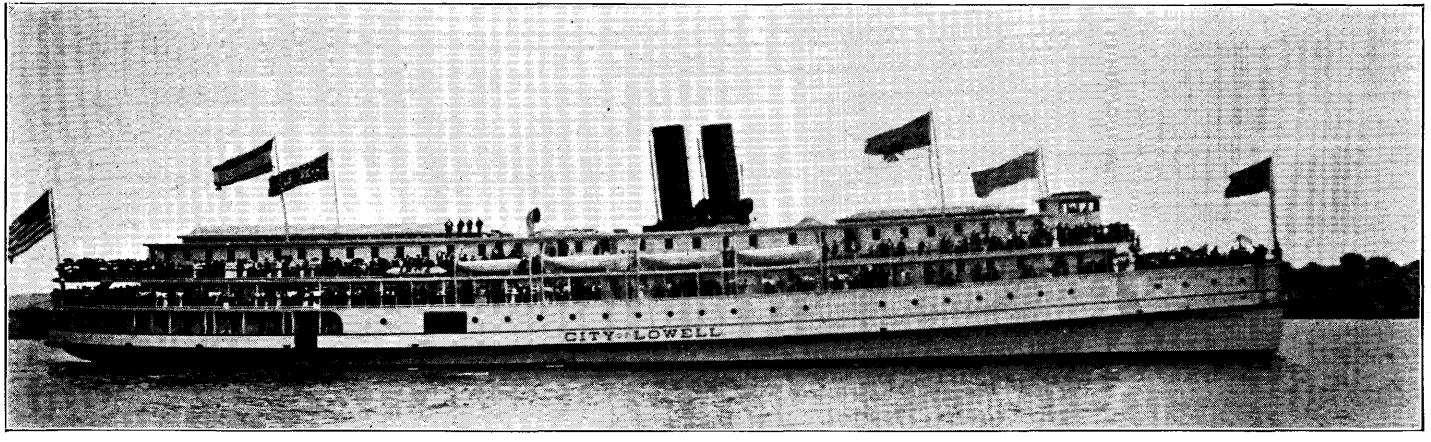
The Katahdin was in due time completed, and throughout the naval world there was widespread curiosity as to whether a vessel on such original lines would be a success. Her trial trips developed she had no defects excepting in the line of speed, and for this her builders were not responsible, as they had constructed the craft strictly in accordance with the specifications of the government named in the contract. Her engines were to be of 4,800 horse power, and have shown nearly 6,000

horse power. They were to sustain 150 revolutions, and have a record of 166. It was only by a fraction of a mile that the ram failed to come up to the contract requirements of seventeen knots, and Congress by special act authorized the Katahdin's acceptance.

STEAMSHIP CITY OF LOWELL.

The palatial steamship City of Lowell, running between New London, Conn., and New York, and universally recognized as the speediest passenger steamer on Long Island sound, was built at the Bath Iron Works. She was the first steel passenger steamship to be constructed in New England, and is the largest steamer ever built in Maine. The City of Lowell was built for the Norwich and New York Transportation Company, being launched, November 21, 1893, and her dimensions are as follows: Length over all, 336 feet; length on water line, 320 feet; extreme breadth over guards, 66 feet; beam moulded, 44 1-2 feet; load draft, 13 feet; depth of hold, 17 1-2 feet; displacement, 2,400 tons; registered net tonnage 1,817.28 tons; gross registered tonnage 2,975.04 tons. The hull of the vessel is staunchly built, the material and workmanship being of the best.

The vertical keel is contiuous, consisting of 20 pound plate 30 inches in depth. It rises 6 inches above the floors and is fastened to 24 inches by 15-pound keelson plates by two 6 inches by 4 inch angle bars, and two 4 by 4 inches angle bars secure the lower edge of the vertical keel to the flat keel plate, which is 30 inches by 27 1-2 pounds. The frames are spaced 24 inches between centers and are composed of a 4x3 inch frame angle a 20 pound floor plate and a 3x3 inch reverse bar. Belts are worked on every sixth frame except in the engine room where they are at every frame. A continuous longitudinal plate of 17 1-2 pounds per square foot, and an intercostal plate of same thickness are worked on each side of ship 6 feet and 13 feet respectively from center line. They each rise 5 inches above floors and are well secured by double 5x3 inch angle bars. There are two bilge keelsons on each side, each consisting of two 6x4 inch angles riveted back to back. The lower deck is 11 feet 1 inch above the base line. The beams are 5x3 inch



STEAMER CITY OF LOWELL.

angle bars 48 inches apart, secured at ends to frames by 15 pound brackets. Midway between the lower and main decks is worked a continuous stringer plate 18 inches by 15 pounds secured at each extremity to breast hooks, and to frame and outside plating by 3x3 inch angles. The main deck beams are 9x3 1-2 inch bulb angle bars spaced 48 inches between centers. They are each in one piece, collars being worked around them for water tightness where they cut the shell. At the guards they are supported by 2 inch solid iron stanchions. Three rows of 3 inch stanchions are worked in the hold and three rows of 5 inch extra heavy pipe stanchions are worked on main deck in freight space. Fore and aft I shaped beams are worked for longitudinal strength under both the main and saloon decks, and three rows of double 4x3 inch angle bars stiffen the lower deck longitudinally. The outside plating or shell, is composed of eight strakes on each side of from 17 1-2 to 22 1-2 pound plating, the total number of plates in shell being 254.

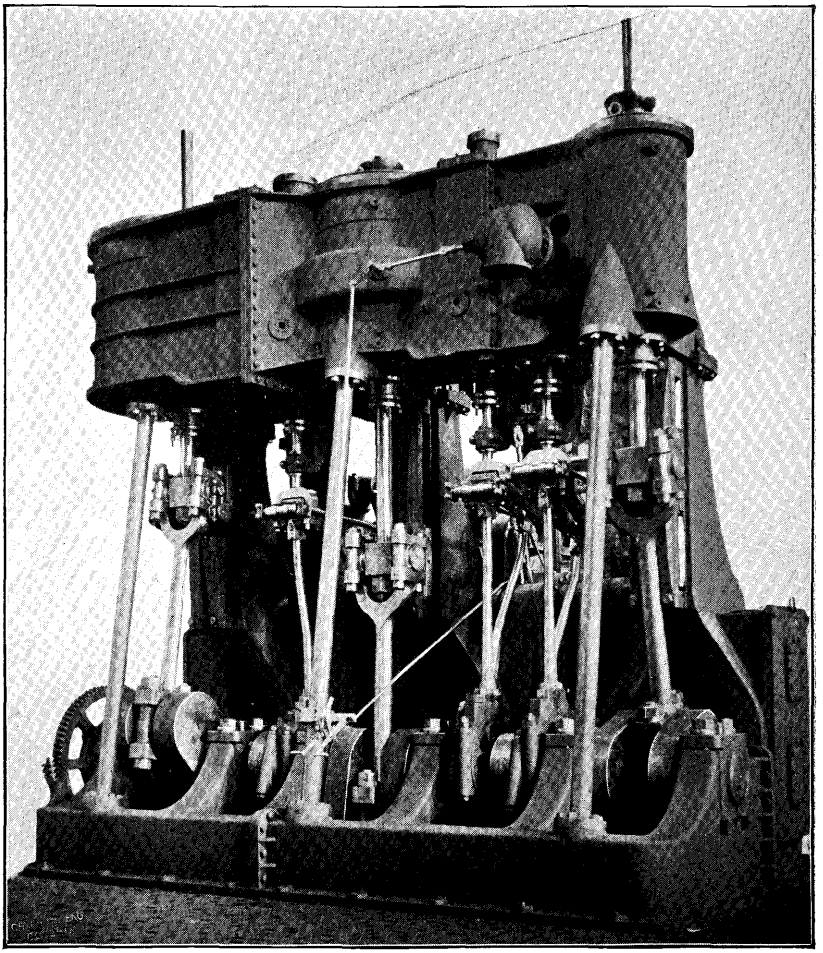
The vessel has six complete bulkheads, four of them being made thoroughly water-tight. All the bulkheads are well stiffened horizontally and vertically by 4x3 inch angle bars, and the plates are 10 and 12 1-2 pounds per square foot. At various frames aft, partial bulkheads, or belt frames, are worked, the object being to do away with vibration as much as possible. The lower deck has a stringer 18 inches wide by 15 pounds per square foot worked all around, and the planking is yellow pine 2 1-4x3 1-2 inches finished size. On the main deck the guard stringer is of 15 pound plate 18 inches wide. The deck stringer is 22 1-2 pounds 38 inches wide diminishing at ends. A steel deck of 10 pound plating is worked over the machinery space, tie plates 12 inches wide by 15 pounds running forward and aft of them. The stem and stern post are of steel, the former being 38 feet long and 8x2 1-2 inches, shaped so as to offer the least resistance to the water, whilst the latter is 9x3 inches.

To support the shafting after it leaves the ship, two steel struts are worked on each side, the arms being 20x2 1-2 inches, and the bearing 3 1-2 inches diameter outside. The engine hatch is cased up in steel to the saloon deck, whilst the boiler casement extends above the hurricane deck, thus preventing fire to a great extent. These casings are of 10 pound plate,

stiffened by 3x2 1-2 inch angle bars spaced 24 inches apart. For the engine foundation, the floors are heightened and four longitudinals worked on each side of the center line; the bed-plate being of 25 pound plate.

The main deck plank is of white pine 4 inches in thickness, sheathed with seven-eighth inch spruce boards, and the plank sheer is 5x14 inches. The saloon deck beams are of white pine 2 3-4 inches by 5 1-2 inches, space 24 inches apart, and decked with seven-eighth inch by 2 1-2 inches pine. The galley and hurricane deck beams are 2 inches x 4 1-2 inch pine, the deck being seven-eight inches by 2 1-2 inch. All the decks, tops of domes, etc., which are exposed to the weather, are covered with canvas, painted, and well bedded in French yellow. The lower deck is straight, 11 feet 3 1-4 inches above base line. The main deck, spring of 11 inches in 66 feet, 20 feet 8 inches above base line. The saloon deck, spring of 15 inches in 66 feet, 31 feet 1 1-8 inch above base line. The gallery deck, spring of 15 inches in 66 feet, 40 feet 9 inches above base line. The hurricane deck spring of 15 inches in 66 feet, 48 feet 5 1-2 inches above base line. The top of aft dome is 51 feet 1 1-2 inches above base line. The highest point, top of smoke stack, is 80 feet above the base line.

On the lower deck are accommodations for the crew, and also the forward cabin, which contains ninety free berths and likewise the after cabin with 102 free berths, these cabins being comfortably fitted up. On the main deck some 200 feet are entirely devoted to freight, the carrying capacity of the freight space being upwards of 100,000 cubic feet. Aft of this space comes the handsome social hall, the joiner work being especially fine and well ornamented. The ladies' cabin, forty-one feet long and the full width of the deckhouse, is handsomely fitted up, the whole room furnishing a magnificent appearance. The saloon deck is devoted entirely to the accommodation of first class passengers. There are on this deck 106 state rooms, 24 of them being bridal state rooms, and fitted with brass bedsteads. The main saloon is 262 feet long, the forward and aft parts of which form very handsome observation rooms. The commodious dining room, 65 feet long and the full width of the deck, is on the upper deck, instead of in the hold as usual. A



ENGINE OF STEAMER CITY OF LOWELL.

handsome dome 50 feet long adds considerably to its appearance. A magnificent circular skylight, 8 feet 6 inches in diameter with cathedral stained glass, is placed just over the stairs which lead below to the main saloon. There is considerable deck room with promenades outside for passengers, and everything that can conduce to rapid and comfortable travelling is provided.

The passenger capacity of the vessel can be best judged from the following figures: She has 160 state rooms, all told, of which 147 are for passengers. She has first-class sleeping accommodations for 632 passengers, and her crew number 107. When necessary, the forward and after lower cabins could be made to accommodate two or three hundred more passengers comfortably, as at present there is only a single row of berths around the sides. The propelling power of the City of Lowell consists of two independent sets of vertical inverted direct acting triple expansion engines, driving twin screws. The cylinders are 26, 40, and 64 inches in diameter respectively, with a stroke of 36 inches, the high pressure being fitted with a piston valve and the intermediate and low pressure cylinders with double ported slide valves. The total indicated horse power is 4,600 including all auxiliaries, when the main engines are making 125 revolutions per minute a piston speed of about 750 feet. The cylinders are supported by heavy wrought iron columns in front and cast iron columns behind. The piston rods are of steel, while the connecting and all working rods generally, are of wrought iron. The air pumps are worked from the low pressure cross-head, and are of 27 inches diameter with 12 inches stroke. The condensers form part of the framing at the back of the engine and have each a cooling surface of 3,387 square feet. The crank-shaft is 11 3-4 inches diameter and is made of wrought iron with steel crank pins. The thrust bearings are of the horse shoe type. The propelling wheels are of polished manganese bronze, with 11 feet diameter and 16 feet 8 inches pitch.

Steam is supplied by six steel single ended Scotch return tubular boilers, each having a length of 12 feet 10 inches, and a diameter of 13 feet 6 inches. They have each three corrugated furnaces of 43 inches internal diameter, and are designed

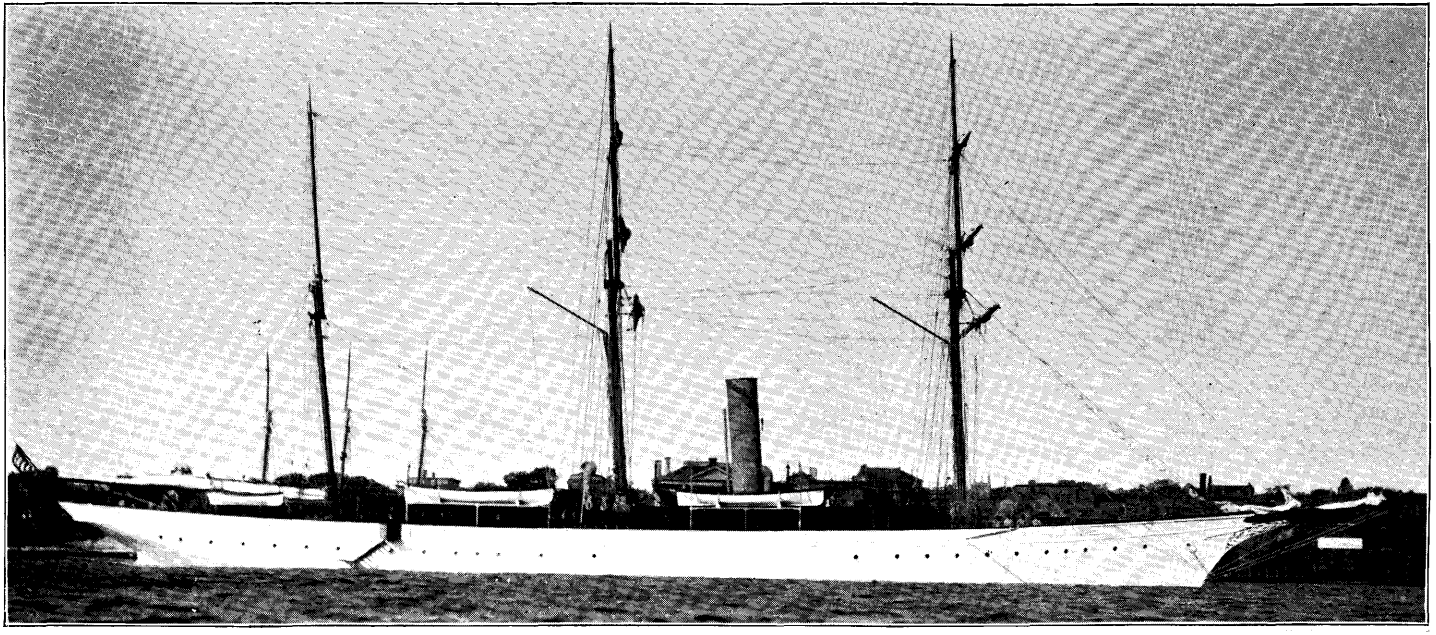
for a working pressure of 165 pounds to the square inch. The boilers are placed, three on the starboard, and three on the port side of a boiler room the width of the boat and 44 feet long. Two tall smoke pipes 9 feet by 7 feet 6 inches carry off the refuse gas and smoke. The engines, boilers and coal take up 74 feet of the vessel's length amidships, the total coal bunker capacity being 90 tons. The hull was designed by A. Cary Smith of New York and the machinery by C. E. Hyde of the Bath Iron Works. At a trial test when the steamship was in regular service the City of Lowell on May 30, 1895, on Long Island Sound in slack water, developed 4,350 horse power and a speed of 22.19 miles per hour, the test being made by Prof. James E. Denton of the Stevens Institute of Technology of Hoboken, N. J.

STEAM YACHT ELEANOR.

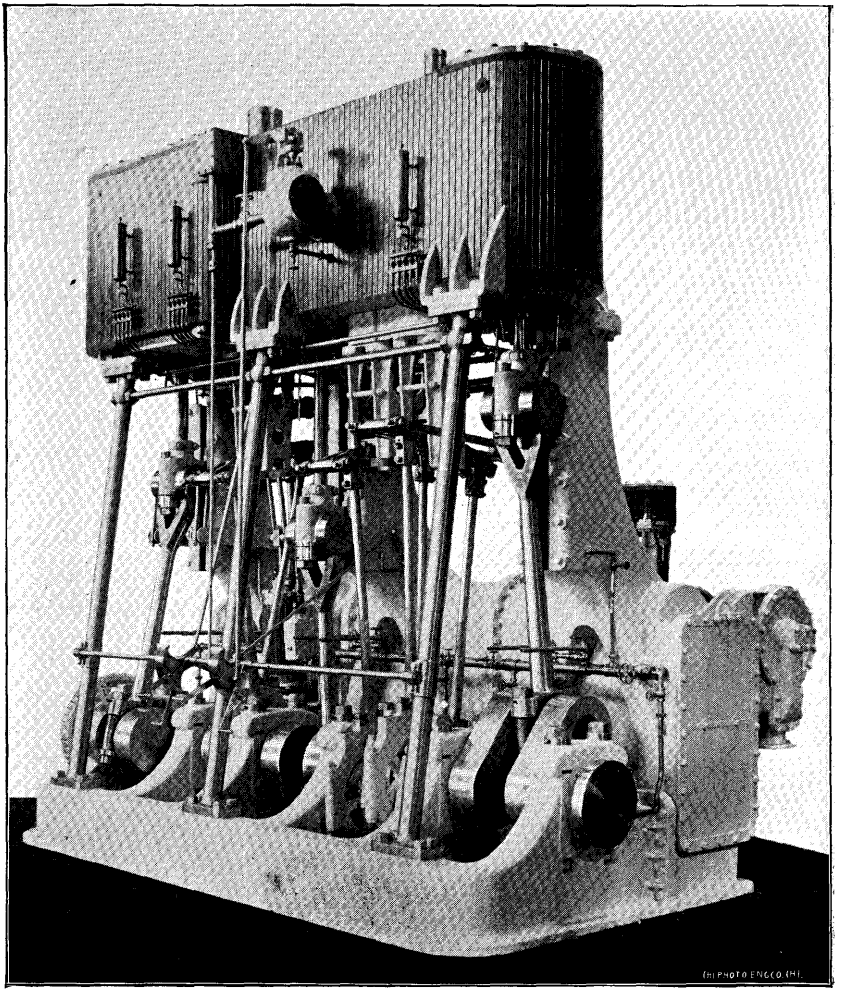
The steam yacht Eleanor, the finest vessel for pleasure ever constructed in Amercia, was built at the Bath Iron Works for William A. Slater, a millionaire of Norwich, Conn., at a cost of $300,000. The principal dimensions of the Eleanor are as follows: Length over all, 232 feet; length of water line, 208 feet; length of keel, 105 feet; beam, 32 feet; depth of hold, 17 feet 5 inches; mean draught, 13 feet 4 inches; displacement, 1,136 tons; tonnage, 803.81 gross; tonnage, 401.91 net.

She is constructed of steel throughout, with water ballast tanks forming a double bottom forward and aft of the machinery spaces. The hull is minutely subdivided by transverse and longitudinal bulkheads into a large number of watertight compartments, and no doors are cut in the bulkheads below the water line unless absolutely necessary. Her mahogany house and its exquisitely carved oak and dark and white mahogany interior finish and luxurious appointments, are admired by all.

For motive power, the Eleanor has a vertical inverted direct acting triple expansion engine with cylinders 18, 28 and 45 inches diameter by 30 inches stroke. Steam is supplied by two steel Scotch boilers, each 12 feet 6 1-2 inches long and 12 feet 5 inches diameter. The total heating surface is 4,016 square feet, total grate surface 120 square feet and the working pres-



YACHT ELEANOR.



ENGINE YACHT ELEANOR.

sure 165 pounds. The propeller is four bladed, 10 feet 4 1-2 inches in diameter and 11 feet 6 inches to 12 feet pitch. The yacht is also provided with a Hyde patent steam windlass, a Williamson steam steerer, and a distiller and ice machine.

The vessel is bark-rigged, the total sail area being 13,215 square feet. The Eleanor carries seven boats, as follows: One steam launch, 28 feet long, one naphtha launch 25 feet long, two 29 feet life-boats with a capacity of 28 persons each, one six-oared gig 28 feet long, one dinghy 20 feet long, and the catboat Willie 19 feet, 11 inches in length, the latter being built for racing and pleasure sailing. The complement of the vessel is as follows: Captain, first and second officers, physician, three engineers, carpenter, four quartermasters, boatswain, fifteen seamen, four firemen, two messmen, three oilers, six stewards, four cooks, barber, two Chinese laundrymen and two boys.

The yacht has two separate electric light plants, so that in case of an accident to one, the other can be used. There are 235 lights on the vessel, and a powerful 13 inch search light. Besides the ordinary signal and other lights, the decks will be illuminated by electricity and everything done for the convenience of the owner, his guests, the officers and crew. The Eleanor is the highest type of deep sea steel yacht ever built in this country and, of her size, is the equal of any afloat.

The Eleanor upon her completion steamed away to New London, Conn., where she was fitted up for a two years' cruise abroad. She has a crew of about forty men in command of Capt. C. W. Scott, and as Mr. Slater and his family were accompanied by a party of lady and gentlemen friends, the Eleanor had on board nearly seventy persons on her trip around the globe. She is what might almost be called a modern little cruiser and in case she should get into trouble in foreign waters, could undoubtedly make quite a plucky resistance before she could be taken. She carries four rapid firing guns capable of doing great execution if necessary. She will also have her crew armed with revolvers, carbines and sabres, and so drilled that they will be able to look after her in case of trouble. She will use but one of the two boilers with which she is furnished, except in case of an accident to one she would use the other until the disabled one could be repaired. She also has a double electric light plant which can be used as the owner desires.

She will carry 400 tons of coal on her cruises, and has both steam and naphtha launches, besides other small boats. The engine in her steam launch will be taken out and the boat rigged with a sail on long cruises as in case of an accident, far out at sea, the launch could not carry enough coal to travel many miles and a sail in that case would be far preferable. It is believed that her average running speed will be about fifteen knots per hour.

STEAM YACHT PEREGRINE.

The elegant steam yacht, built at the Bath Iron Works for R. H. White, Boston's merchant prince, was christened Peregrine in honor of the first child born of white parentage in America, Mr. White being a descendant. The dimensions of the craft are as follows: Length over all, 158 feet 3 inches; length of water line, 131 feet; beam, extreme, 23 feet; depth of hold, 13 feet; mean draft, 10 feet; extreme draft, 10 feet 9 inches. The accommodation comprises every requisite to insure comfort and convenience, and all the decorations and fittings are designed to be elegant, efficient and tasteful. The principal feature of the main deck is a large mahogany deck house 72 feet long, with an average width of about 13 feet.

At the forward end of this house is the captain's stateroom, about 8 feet long, finished in handsome panel white mahogany, with white enamel ceiling, and furnished with large berth, desk, washstand, wardrobe, sofa and convenient lockers. Abaft this room on the port side is a stairway leading below to the officers' quarters. Then comes the pantry, 5 feet long and the width of the house, and this room is finished in ivory white, with mahogany trimmings and fitted with all necessary dish racks, dressers, sinks, etc. A dumb waiter has been arranged between this room and the officers' mess-room. The galley is directly aft of the pantry, and is a commodious and well arranged room 10 feet long, with red tile floor and white tiled sides, the ceiling being finished in ash. A passage 30 inches wide, on the starboard side, leads from the galley to the dining room aft, thus maintaining communication with the forward and after part of the vessel without exposure to the weather. Between the boiler and engine hatches is a room 4 feet by 6 feet for the stowage of

deck chairs, rugs, etc., on the starboard side, and a large deck toilet room on the port side.

Abaft the engine hatch is the dining room, 12 feet long and the width of the house. This room is finished in select paneled oak, and a handsome large sideboard and dish closet occupies the forward end. The height in the clear is 6 feet 6 inches, and a large circular skylight is placed directly over the dining table. There is seating accommodation at the table for ten people. Connected with the dining room by large sliding doors is the social hall. This room is 11 feet long, and a mahogany stairway of elaborate design leads below to the main saloon. The owner's desk is at the forward end, and transom seats are fitted on each side. The finish is in harmony with the dining room. Large circular sliding lights or air ports, 16 inches in diameter, give light and air to the living compartments of this deck house, and these lights have proved of great improvement over the ordinary swinging ones. Hand rails are on the outside of the house for convenience in rough weather. The galley and machinery hatches are completely cased in with steel as a safeguard against fire. The top of the deck house forms a clear promenade for the owner and his guests, the smokestack and skylights to the dining room, engine room and galley being the only obstructions.

There is a bridge at the forward end, also the steering stand, binnacle, chart table, search light, etc. Brass rail stanchions are worked around the top of the house, and awnings placed forward and aft. Abaft the deck house is a large mahogany skylight which gives light and ventilation to the main saloon below. There is a large transom seat directly aft and a Hyde patent hand screw steerer. A raised forecastle deck is placed forward, of the height of the rail. The compartment forward of the collision bulkhead on the lower deck is to be used as a lamp and oil room. Then comes the crew's quarters, which are quite roomy and have excellent accommodations for nine men. Abaft the crew's space are the officers' quarters. Three staterooms are located on the starboard side, the forward one for the chief engineer, then one for the cook and steward, while the third is fitted up for the mate and assistant engineer. The mess room is on the port side, also the lavatory and dish lockers, and

the transom seat is fitted so as to make beds for two boys. An ice room occupies the aft end of the mess room.

Abaft the machinery spaces are the owner's and guests' quarters. At the forward end are the toilet and bath rooms, handsomely and conveniently appointed. These rooms are wainscoted with white tile four feet high and paneled in white mahogany to ceiling. Directly aft are two large staterooms for the owner. These rooms are finished in paneled white enameled pine with a little gold leaf decoration. The beds are extra large and the rooms are well furnished with sofas, bureaus, wardrobes, etc. Aft of these staterooms and communicating with them is the main saloon, a beautiful roomy compartment 17 feet long and the full width of the boat. The height of the clear is nearly 7 feet and this room is furnished in handsome selected mahogany with ivory white ceiling, and fitted up in the most modern and artistic style. A staircase of carved mahogany leads from this saloon to the social hall above. A piano, table, bookcase, shelves and lockers are located in this room to the best advantage. At the aft end of the saloon are two guests' staterooms finished in white mahogany with bird's-eye maple-panels, and leading from these rooms is the guests' toilet room.

In the forward hold is located the cold storage room and large compartments for stores, and in the after hold are the engineer's stores, wine room and three fresh water tanks with a capacity of about 2,500 gallons of water. A large tank is also located amidships with a capacity of 3,500 gallons of water, and small tanks are fitted in the engine room for hot and cold, salt and fresh water. The ventilation and plumbing systems are most complete and efficient. A donkey boiler is placed in the boiler room for steam heating and auxiliary purposes. A Williamson steam steerer and a Hyde patent steam windlass are also fitted. The vessel is lighted throughout by electricity, the dynamo being in the engine room, and a 12-inch search light and display lights for the rigging are fitted. There is also an efficient telephone and electric bell communication between various parts of the boat. She has two pole masts, each being 64 feet long above deck, and is rigged as a two-masted schooner, the total sail area being about 3,500 square feet.

The motive power consists of a vertical triple expansion engine, with cylinders 14, 21 and 34 1-2 inches diameter respectively, and a stroke of 22 inches. Piston valves are used throughout, and the high pressure cylinder is placed in the center, the intermediate forward and the low aft. The condenser forms part of the framing at the back of the engine, and the cylinders are well supported and braced by steel columns. The propeller is of manganese bronze, four-bladed, with a diameter of 8 feet 3 inches and a pitch of about 10 feet. The designed indicated horse power is 800, and this gives the vessel a speed of over 14 knots.

STEAM YACHT ILLAWARRA.

For Eugene Tompkins of the Boston Theatre the fine steam yacht Illawarra was built by the Bath Iron Works. She is 130 feet long with a length on water line of 110 feet. Her hull is of steel and she is finished in mahogany, quartered oak and gilt. Her rig is that of a two masted schooner, and her engines of triple expansion type make her very speedy. She is built and fitted throughout in elegance, and is a match for anything. afloat for her size. On her trial trip in May 1896, she proved a speedy craft. She ran from the Bath Iron Works down the Kennebec to the sea and thence to Boothbay, covering this distance in quick time, with an average speed of over thirteen knots, exceeding the required speed by more than one knot. The owner was aboard and expressed himself delighted with the Illawarra. The hull of the Illawarra, as well as the Peregrine and Eleanor, was designed by C. R. Hanscom, and the machinery of all three of these yachts was designed by C. E. Hyde.

UNITED STATES LIGHTSHIP NO. 66.

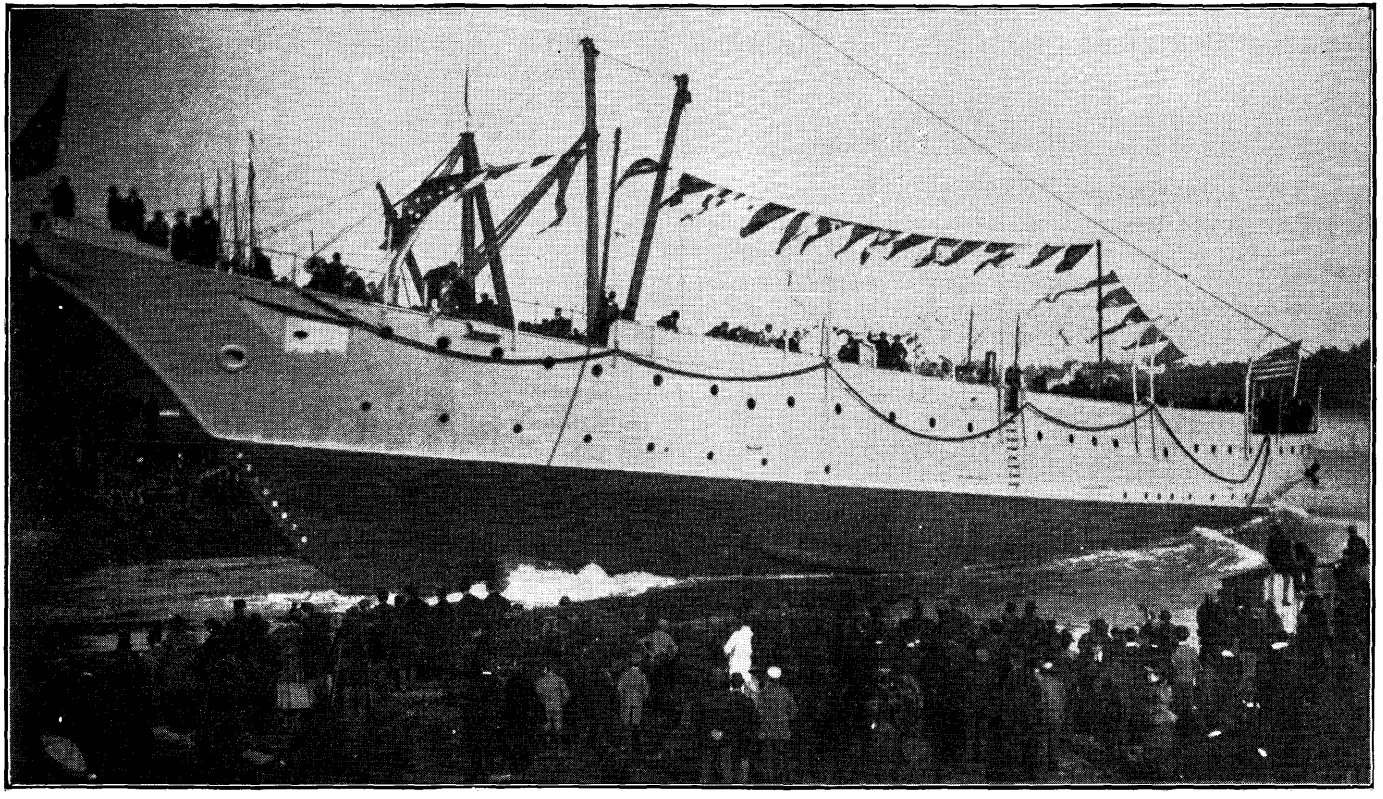
The Bath Iron Works were the successful bidders for the construction of the Lightship No. 66 and she was built by them, being commenced in the last half of 1895 and being finished in 1896. The vessel is 112 feet long on the water line, 28.6 feet beam and 13 feet deep, being designed for a great buoy and not for sailing purposes, her destination being Woods Hole, where she rides at anchor. To especially fit her for her business, she has very high sides, it being about 23 feet from her rail to her keel, while the ends rise up to still greater height.

The craft is not only a novelty in shape, but also in build, being the first composite craft to be built in Maine. This means that she has frames of steel angle irons, bilge keels, stringer plates, rider plates and sheer strakes of the same metal, but is planked with wood from keel to water line, having steel plate covering from water line to rail. The plank is about four inches in thickness. She carries two pole masts for lights, but no sails. These lights are of the powerful electric flash pattern and operated by a double electric light plant, so that one generating plant can be entirely disabled and yet the lights run without any trouble. For fog purposes she carries a big time whistle, similar to those used in lighthouses, for this craft is really a floating lighthouse. She has a flush deck, the living accommodations being all below, four large staterooms for the officers and quarters for the crew of ten men. The finish is plain but substantial.

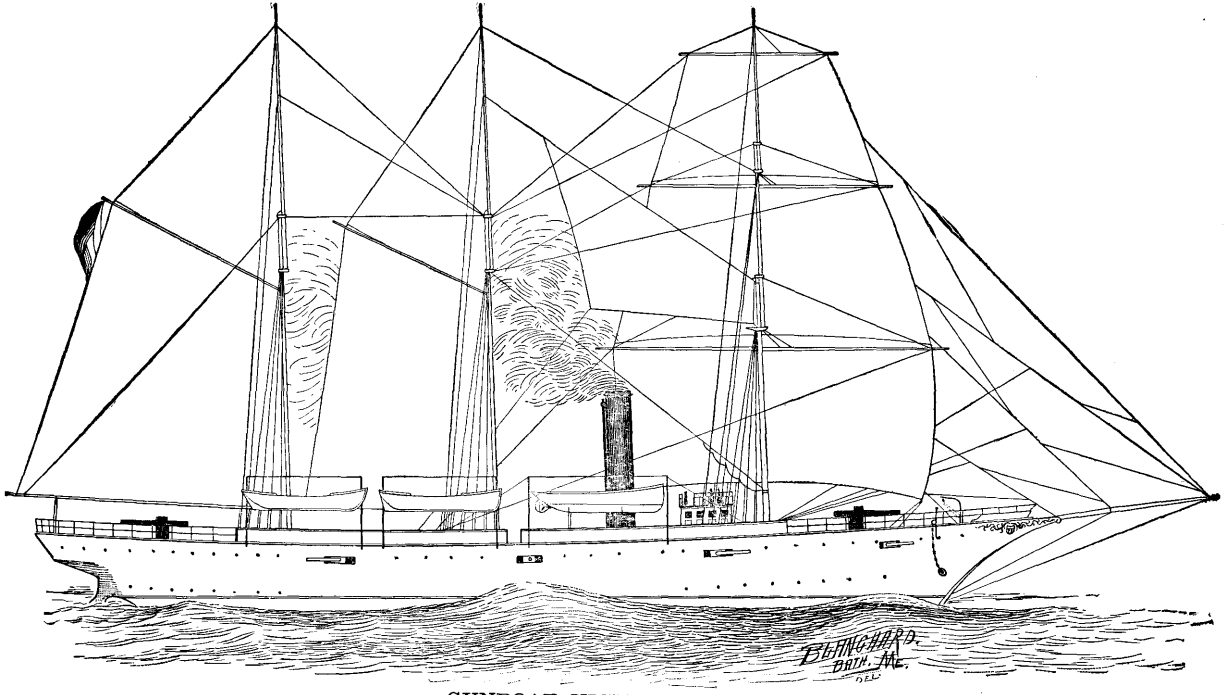
To move the vessel about and handle her should she break adrift there is provided an engine of about 800 horse-power, but the power of the boiler is much greater on account of the steam using auxiliaries. The riding cable is an unusually heavy one and runs through a hawse-pipe set in the middle of the vessel's stem, so as to make her ride even, the windlass being twisted to one side to permit of this unusual arrangement. The main anchor is very heavy, but she carries a smaller one in the ordinary manner to use when necessary. A steam hoister handles this ground tackle. The total cost of the vessel, with all her equipments ready to go on the station, was about $70,000.

COMPOSITE GUNBOATS NEWPORT AND VICKSBURG.

The two composite gunboats Newport and Vicksburg now being built by the Bath Iron Works, were both launched in December 1896. These vessels are duplicates, and promise to be novel and useful additions to the country's fleet. Each has a length of water line of 168 feet, length over all of 204 feet extreme breadth of 36 feet, draft of 12 feet, and displacement of about 1100 tons. These vessels have a steel frame, stringers, deck frame and outside skin plating, above water while below the water they are of wood, planked and coppered, the wood



LAUNCHING OF THE GUNBOAT NEWPORT.



GUNBOAT VICKSBURG AT SEA.

used being all fire proof. They are intended for use in Asiatic waters and are of the composite type with the view of being able to keep at sea longer. They are to have a speed of twelve knots, the engines having an indicated horse power of 800, and there being two boilers. The stem, stern post, rudder and propeller are to be of Hyde manganese bronze.

The armament will be identical in both vessels. Each will carry six four-inch, four six-pounder and two one-pounder guns, all of the rapid-fire character. The guns will be disposed in this order: Four four-inch guns will be mounted in two batteries, port and starboard, on the gundeck amidships. The two other four-inch guns will be placed on the main deck, one at the bow and the other at the stern. Each will have a wide arc of fire. The six-pounder guns will be carried on the gundeck, too well forward, one on either bow, and two amidships between the four inch guns respectively in the port and starboard batteries. The one pounder guns will be disposed where most advantageous on the hammock berthing. For use in the four-inch guns each vessel will carry 900 rounds of ammunition, for use in the six-pounder guns, 2,000 rounds, and for use in the one-pounder guns, 1,200 rounds. The normal coal supply of the vessels, will be 100 tons, with a total bunker capacity of 238 tons. When going under sail alone the screw may be uncoupled, thus allowing the shafting and screw to revolve simply by the action of the passing water. So slight will be the retarding influence of the screw thus disengaged, that there is every reason to expect a sailing speed fully equal to the possibilities of the steam power.

It is said at the navy department that the essential reasons for the construction of vessels of the composite type are that they are largely independent of docking facilities, and economical in the use of fuel. The exfoliation of the copper causes the barnacles, grass and other marine growth to be released just as soon as the vessel is put in motion, and the bottom is made comparatively clean, permitting the boat to maintain her designed speed with a minimum consumption of coal. The docking expenses, whether at home or abroad, and the cost of fuel, are two important questions of naval economy, and the new vessels are counted upon to minimize expenses, while their

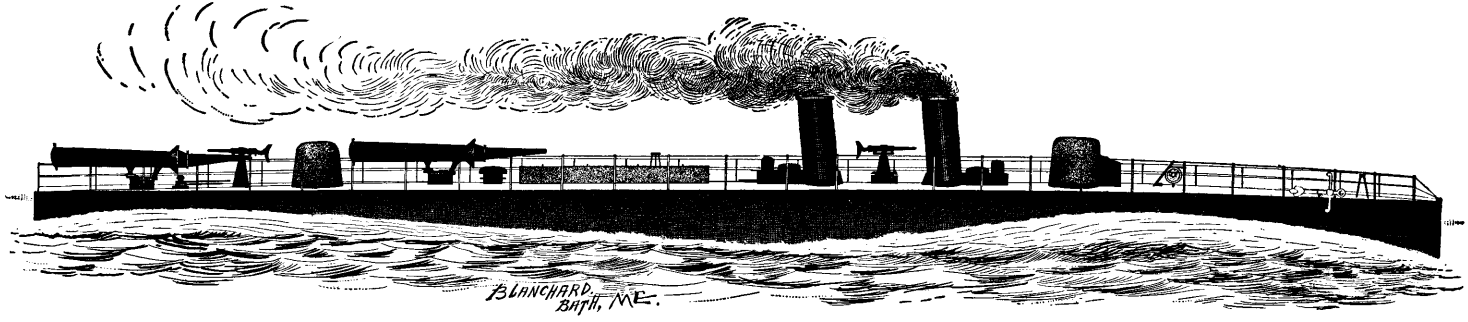
activity, range of action and general efficiency are greatly increased. The character of the service for which the gunboats are particularly designed is such that they may be exposed to musketry fire, and the housing of the principal part of the battery by an unbroken deck, besides adding materially to the stiffness and strength of the vessels, gives suitable protection to the gun crews in action. The necessarily exposed position of the bow and the stern guns is justified only by their arc of fire and usefulness in a running action, while for river service, for which the gunboats are particularly well fitted, the disposition of the gundeck battery is all that could be desired.

THE TORPEDO BOATS.

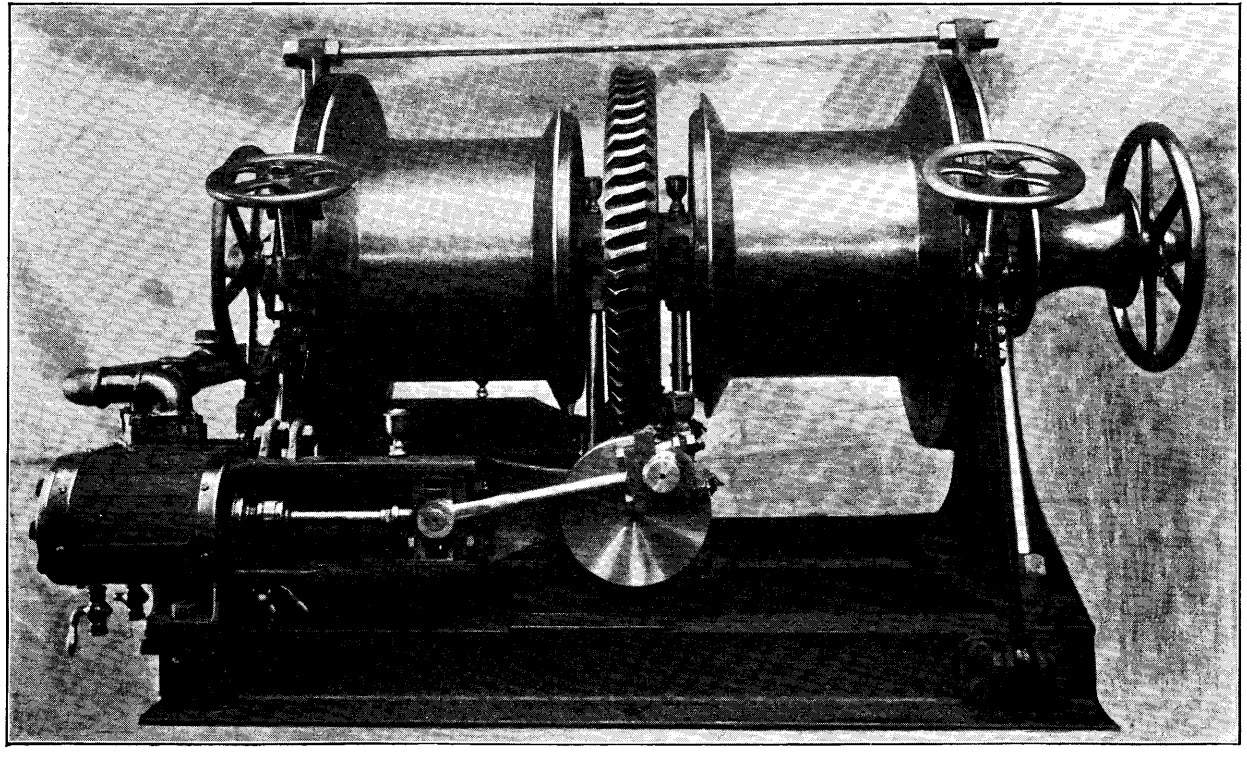
The Bath Iron Works were, on October 6, 1896, awarded contracts for building two torpedo boats. Work on the preparation of the plans for these boats was made early in the year, and General Hyde has been twice to Europe to secure the latest and best ideas. The vessels for which the Bath Iron Works have just contracted will be practically copied after the Cyclone, the new torpedo boat about to be begun by M. Normand for the French government, which has very graciously consented to allow the use of his plans by the United States.

The Bath Iron Works have contracted to give a speed of thirty and one-half knots for the two boats, but confidently hope to produce a knot more than this. Thirty-one knots and a small fraction is the highest speed yet attained, and was reached by M. Normand in the celebrated Forban, on which vessel Cyclone is expected to be an advance. Two English torpedo boat destroyers, now being built in England by Messrs. Thompson of Glasgow, and Thorneycroft of London, are guaranteed to reach thirty-two knots.

The two torpedo boats, the contract for which has just been closed, are to have a guaranteed speed of thirty and one-half knots, equivalent to between thirty-five and thirty-six miles. They are to be of nickel steel of very high tensile strength and eighteen months are allowed for their completion. Each of these vessels will have a length on the water line of 147 feet, extreme breadth 16 feet, draft 10 feet, and displacement of 146 1-2 tons. The indicated horse-power will be 4,200, and the



TORPEDO BOAT.



TORPEDO BOAT WINDLASS.

radius of action 630 knots. Each boat will be fitted with three torpedo tubes and four one-pounder rapid fire machine guns. They will be lighted by electricity and each will have a coal bunker of a capacity of nine tons. The engines are to be direct acting inverted triple expansion with surface condensers, the diameter of the cylinders being 17 1-4, 24 3-4 and 37, and the stroke 21 inches. The boilers are to be of Normand type capable of a pressure of 230 pounds to the square inch.

The vessels will be divided into nine distinct compartments by transverse watertight bulk heads. The second compartment contains the fresh water tanks; third, crew space, chain locker, torpedo room etc.; fourth, quarters for crew, steering gear and magazines; fifth, boilers and ventilating fans; sixth, engines, air compressers, evaporator, circulating pumps, dynamo and distiller; seventh, staterooms for captain and chief engineer, with mess room, pantry, toilet room, etc.; eighth, quarters for machinist and petit officers and fitted with seats converted into berths, washstands, lockers etc.; ninth, storeroom.

At the present time widespread interest is being taken in the subject of torpedo boats and the following extract from the report of Chief Constructor Hichborn and Engineer-in-Chief Melville, United States Navy, who examined the plans and recommended the building of the boats will be interesting reading.

"The object of a torpedo boat is to destroy large vessels such as cruisers and battleships—preferably battleships—by means of automobile torpedos. It is necessary to give them much greater speed than the vessels which they wish to attack, and desirable to make them as small as possible, in order that they may offer a small mark to the fire of the vessel attacked and be less conspicuous, and hence less easily detected while approaching large vessels.

"Since their prime object is to attack with the torpedo vessels of vastly greater power, it is unnecessary to give them any large battery power, and indeed undesirable, since any increase in weight carried necessarily means increased displacement, with all its concomitant disadvantages from the point of view of torpedo attack. The torpedo boat as we find it everywhere is then a small, light, simple, necessarily vulnerable structure, relying entirely upon its speed and power of avoiding notice to enable it to attack large vessels and upon its speed to escape from them.

"Since torpedo boats have been built in numbers, the problem of defence against them has necessarily presented itself to all nations liable to be attacked by them. Of foreign nations, England has been for years the nation to which the solution of this problem has been of most importance, for the reason that the nations which were her possible enemies, though much weaker at sea, on the whole have been stronger proportionately in torpedo boats—the torpedo boat being essentially the weapon of the weak against the strong. For a number of years England built vessels called 'torpedo catchers,' the first of which was the Rattlesnake of about 525 tons displacement, built in 1885-6. Experience had shown, as was to be expected, that torpedo boats could not maintain their speed at sea except in smooth water, and that their effectiveness was very much reduced the moment the water became somewhat rough. The idea of the torpedo catcher, then, was that of a vessel much larger than the torpedo boat, which, while not quite so fast in smooth water, would maintain its speed better in a seaway and be largely superior to the torpedo boat under ordinary service conditions.

"These torpedo catchers, so called, were also provided with torpedo tubes (as have been practically all vessels of war for many years now up to the largest battle ship), the idea being that they might be used, upon a pinch, for torpedo service.

"The experience with the English torpedo catchers, which were built in large numbers, was not altogether satisfactory. Their maximum speed generally fell short, even in smooth water, of that desired, and was so much less than the maximum speed of the torpedo boats that the latter were at a disadvantage only in water much rougher than the average. Thus, while the torpedo catchers were valuable as scouts, lookouts, despatch vessels, etc., they were practical failures as an antidote to the torpedo boats; hence a few years ago the English developed another type of small vessel to which was given the name of 'torpedo boat destroyers.' These vessels were only of about twice the displacement of the large torpedo boats, but by reducing weights as much as possible and increasing their power they were given speed in smooth water equal to or exceeding that of the torpedo boat. Being larger they would always have a greater speed than the torpedo boats, and were a natural and logical boat to build for the purposes indicated by their name. They were fitted with torpedo tubes, so that they could be used for torpedo attack when necessary, but attention was given primarily to their battery, since torpedos would be of little use against torpedo boats, and the prime object of these boats was to destroy torpedo boats.

"Our information indeed is that the latest and fastest torpedo boat destroyer being built for the English government will

not carry torpedos, but will be armed with guns alone. This is a natural development, and in this connection we recall that the first design of the torpedo cruiser, which was authorized by Congress some years ago, but never built by the navy department owing to the limit of cost being too low, did not provide for any torpedo tubes, the vessel being armed with guns alone.

"In examining the plans submitted by bidders for the thirty-knot torpedo boats, we find two distinct types, torpedo boats proper and torpedo boat destroyers. Comparing the 143-ton boat, for which plans were submitted by the Bath Iron Works, with the 240-ton boat submitted by the Union Iron Works, we find that the former is armed with three torpedo tubes and four one-pounder guns. This armament is identical with that of the three torpedo boats of 180 tons displacement now under construction for the United States. The 240-ton boat proposed by the Union Iron Works is armed with two torpedo tubes and six six-pounder rapid fire guns. While, because of her armament, she would be very much more effective against torpedo boats, we are of the opinion that, for the purpose of torpedo attack, that is, a torpedo boat pure and simple, she is unquestionably inferior to the 143-ton boat. With the same speed, she is larger and hence less active in manoeuvring. She carries two torpedo tubes instead of three, is equally vulnerable if struck, presents a larger mark, and from her greater size she is more readily detected than the smaller boat.

"The question arises, however, whether larger boats would be more valuable for all-around work; that is to say, whether, for the navy, one torpedo boat destroyer is better than one torpedo boat. The torpedo boat destroyer would be more valuable as a scout and despatch boat. She would have a larger radius of action, she might be used under favorable circumstances for torpedo attack, and she would be very useful against the enemy's torpedo boats, it being noted that we have at present no vessel especially suitable to cope with the latter."

The Bath Iron Works have just received contracts for building two government lightships and one lighthouse tender. The lightships are duplicates, very similar in all respects to lightship sixty-six recently built at these works. The lightships are of the composite type, 113 feet long, propelled by steam and lighted by electricity. The tender will be entirely of steel, her dimensions being 164 feet over all, 30 feet beam and 11 feet depth of hold. She will have twin screws driven by two simple vertical engines. These three contracts aggregate $225,000.

RAILROADS.

Table Showing the Number of Employes (excluding general officers) in the employ of Steam Railroads in Maine, Wages Paid, etc., for years ending June 30, 1895 and 1896.

Name of road.	Number employes, 1895.	Wages paid, 1895.	Number employes, 1896.	Wages paid, 1896.	Average Daily Compensation. 1895.	Average Daily Compensation. 1896.
Bangor and Aroostook Railroad,	460	$224,032 65	712	$295,103 66	$1 55	$1 55
Boston and Maine Railroad	373	216,903 23	576	279,344 28	1 82	1 80
Bridgton and Saco River Railroad	32	13,903 56	34	15,209 86	1 46	1 49
Canadian Pacific Railway	252	122,152 73	399	174,106 04	1 65	1 59
Franklin and Megantic Railroad,	18	7,222 94	19	8,515 44	1 35	1 46
Georges Valley Railroad	11	5,098 70	10	4,033 95	1 46	1 00
Grand Trunk Railway	400	204,600 00	577	296,965 26	1 65	1 68
Kennebec Central Railroad	12	5,696 03	10	5,331 54	1 60	1 60
Lime Rock Railroad	20	9,944 53	21	10,730 12	1 71	1 71
Maine Central Railroad..... .	2,564	1,255,741 36	2,710	1,388,897 52	1 59	1 69
Monson Railroad	12	4,057 80	11	3,670 07	1 54	1 56
Phillips and Rangeley Railroad..	61	18,396 25	55	16,586 51	1 30	1 33
Portland and Rochester Railroad	197	100,208 13	252	104,089 57	1 66	1 59
Portland and Rumford Falls R. R.	103	36,993 90	190	64,172 72	1 40	1 47
Rockport Railroad	3	1,780 00	3	1,815 50	1 90	1 93
Rumford Falls and Rangeley Lakes Railroad.....	.....	....	69	16,509 11	.....	1 43
Sandy River Railroad	41	14,366 69	39	15,433 17	1 40	1 42
Sebasticook and Moosehead R. R.	9	3,638 00	9	3,638 00	1 59	1 42
Somerset Railway	55	24,611 00	54	24,340 85	1 40	1 44
St. Croix and Penobscot Railroad	27	10,466 96	30	10,937 86	1 40	1 38
Wiscasset and Quebec Railroad..	18	7,283 30	28	12,869 60	1 40	1 40
York Harbor and Beach Railroad	25	11,235 90	32	11,053 30	1 74	1 75
	4,693	$2,268,357 86	5,792	$2,763,353 93		

A careful examination of the returns made to the Board of Railroad Commissioners of the different railroad companies doing business in this State, so far as relates to the employment of labor and wages paid, clearly indicates a return to a more prosperous condition of things in our State. Railroads are among the first great business interests that feel the effect of prosperous or adverse conditions of business. When the railroads increase their volume of traffic, the hands of labor are busy in conducting the industries of the country. When labor becomes idle the resources which keep up the business of the common carriers rapidly decrease.

The foregoing table gives the number of men employed by all the steam railroads doing business in Maine, (general officers excluded), for the years 1895 and 1896. In our report of 1895, attention was called to the falling off of the number of laborers employed in the different kinds of railroad work in 1894 as compared with that of 1893, (the great railroad year), and the further fact that in 1895, so far as the employment of labor was concerned, the roads had recovered very largely and were employing ninety-eight per cent. as many men in 1895 as in 1893.

As will be seen by the table mentioned there were 4,693 employes, (excluding general officers), in 1895 and wages amounting to $2,268,357.86. The returns for 1896, give 5,792 as the number of employes and the wages paid $2,763,353.93, an increase of 1,101 men employed and $504,996.07 increase in wages paid over 1895. This is a very encouraging condition of things, an increase of more than a thousand laborers and more than half a million of dollars additional—paid out in wages.

It is evident from these facts that between twenty-three and twenty-four thousand of our people are supported by means of employment upon the steam railroads in the State. Not only did the number of laborers increase but it will be seen that there has been a restoration of wages in many places where they were reduced in 1894.

These are some of the direct improvements in our industrial field, but beyond this, and closely allied, come the many thou-

sands of persons whose employment depends upon the construction and operation of railroads, in carrying the products of labor to the markets of the world.

The increase of the pay roll of the Bangor and Aroostook Railroad shows a gain of 252 employes over that of 1895. If we consider the many enterprises which the building of that road has developed, rendering necessary the employment of a small army of workmen, we can more fully realize the importance of the benefit of a healthy and prosperous condition of railroad traffic.

The Maine Central Railroad not only increased its number of workmen, but considerably increased the pay, restoring in a considerable measure the reductions required by the loss of business in 1894.

The street railways have made a considerable gain over the number employed in 1895, and, so far as can be determined, have about six hundred upon their pay rolls. This means an additional number of persons receiving their support from railroad business. It is safe to say that on June 30, 1896, there were 25,000 persons receiving their entire support directly from railroad employment in this State, or nearly one in twenty-five of the entire population of the State.

Every mile of new railroad means not only better accommodations for doing what business already exists, but an increase of business and a corresponding increase of work for the people of the State and a larger circulation of money. It is gratifying to observe what points unmistakably to a better condition of affairs, for the employment of our citizens dependent upon the prosperity of business for their maintenance and happiness.

EXTRACTS FROM THE REPORT OF PROCEEDINGS OF THE NATIONAL ASSOCIATION OF OFFICIALS OF BUREAUS OF LABOR STATISTICS.

The twelfth annual convention of the National Association of Officials of Bureaus of Labor Statistics met in the Senate Chamber of the State Capitol at Albany, N. Y., June 23, 1896.

The Secretary reported the following states and territories having Bureaus of Labor Statistics, or kindred offices or departments. For each state or territory there is given the title of the office, the date of its establishment, the method of publishing its regular reports (annually or biennially), the title of the executive officer in charge, the name of the present incumbent and his post office address:

United States Department of Labor—Established as Bureau of Labor, January 31, 1885; made a Department of Labor June 13, 1888. Annual reports. Commissioner of Labor, Carroll D. Wright, Washington, D. C.

Massachusetts Bureau of Statistics of Labor—Established June 23, 1869. Annual reports. Chief of the Bureau of Statistics of Labor, Horace G. Wadlin, Boston, Mass.

Pennsylvania Bureau of Industrial Statistics—Established April 12, 1872. Annual reports. Chief of Bureau of Industrial Statistics, James M. Clark, Harrisburg, Pa.

Connecticut Bureau of Labor Statistics—Established July 12, 1873. Abolished July 23, 1875. Re-established April 23, 1885. Annual reports. Commissioner of Labor, Samuel B. Horne, Hartford, Conn.

Kentucky Bureau of Agriculture, Labor and Statistics—First established March 20, 1876, as a Bureau of Agriculture, Horticulture, and Statistics; the duties of the bureau were enlarged and present name adopted April 2, 1892. Biennial

reports. Commissioner of Agriculture, Labor and Statistics, Lucas Moore, Frankfort, Ky.

Missouri Bureau of Labor Statistics and Inspection—Established March 19, 1879; enlarged March 23, 1883. Annual reports. Commissioner of Labor, Lee Meriwether, Jefferson City, Mo.

Ohio Bureau of Labor Statistics—Established March 5, 1877. Annual reports. Commissioner of Labor, William Buehrwein, Columbus, Ohio.

New Jersey Bureau of Statistics of Labor and Industries—Established March 27, 1878. Annual reports. Chief of the Bureau of Statistics of Labor and Industries, Charles H. Simmerman, Trenton, N. J.

Illinois Bureau of Labor Statistics—Established May 29, 1879. Biennial reports. Secretary of the Bureau of Labor Statistics, George A. Schilling, Springfield, Ill.

Indiana Bureau of Statistics—Established March 29, 1879. Biennial reports. Chief of the Bureau of Statistics, Simeon J. Thompson, Indianapolis, Ind.

New York Bureau of Labor Statistics—Established May 4, 1883. Annual reports. Commissioner of Labor, John T. McDonough, Albany, N. Y.

California Bureau of Labor Statistics—Established March 3, 1883. Biennial reports. Commissioner of Labor, E. L. Fitzgerald, San Francisco, Cal.

Michigan Bureau of Labor and Industrial Statistics—Established June 6, 1883. Annual reports. Commissioner of Labor, Charles H. Morse, Lansing, Mich.

Wisconsin Bureau of Labor Statistics—Established April 3, 1883. Biennial reports. Commissioner of Labor, Halford Erickson, Madison, Wis.

Iowa Bureau of Labor Statistics—Established April 3, 1884. Biennial reports. Commissioner of Labor, W. E. O'Bleness, Des Moines, Iowa.

Maryland Bureau of Industrial Statistics—Established March 27, 1884. Annual reports. Chief of the Bureau of Industrial Statistics, Chas. H. Meyers, Baltimore, Md.

Kansas Bureau of Labor Statistics—Established March 5, 1885. Annual reports. Commissioner of Labor, W. G. Bird, Topeka, Kan.

Rhode Island Bureau of Labor Statistics—Established March 29, 1887. Annual reports. Commissioner of Labor, Henry E. Tiepke, Providence, R. I.

Nebraska Bureau of Labor and Industrial Statistics—Established March 31, 1887. Biennial reports. The Governor, ex-officio Commissioner. Deputy Commissioner of Labor and Industrial Statistics, J. H. Powers, Lincoln, Neb.

North Carolina Bureau of Labor Statistics—Established February 28, 1887. Annual reports. Commissioner of Labor, B. R. Lacy, Raleigh, N. C.

Maine Bureau of Labor Statistics—Established March 7, 1887. Annual reports. Commissioner of Labor, Samuel W. Matthews, Augusta, Me.

Minnesota Bureau of Labor—Established as a Bureau of Labor Statistics March 8, 1887; enlarged and changed to Bureau of Labor, April, 1893. Biennial reports. Commissioner of Labor, L. G. Powers, St. Paul, Minn.

Colorado Bureau of Labor Statistics—Established March 24, 1887. Biennial reports. Commissioner of Labor, W. H. Klett, Denver, Colo.

West Virginia Bureau of Labor—Established February 22, 1889. Annual reports. Commissioner of Labor, John M. Sydenstricker, Charleston, W. Va.

North Dakota Department of Agriculture and Labor—Established October 1, 1890. Biennial reports. Commissioner of Labor, A. H. Laughlin, Bismarck, N. D.

Utah Bureau of Statistics—Established March 13, 1890. Annual reports. Territorial Statistician, Joseph P. Bache, Salt Lake City, Utah.

Tennessee Bureau of Labor Statistics and Mines—Established March 23, 1891. Annual reports. Commissioner of Labor, A. H. Wood, Nashville, Tenn.

Montana Bureau of Agriculture, Labor and Industry—Established February 17, 1893. Annual reports. Commissioner of Labor, James H. Mills, Helena, Mont.

New Hampshire Bureau of Labor—Established March 30, 1893. Biennial reports. Commissioner of Labor, Julian F. Trask, Concord, N. H.

FOREIGN BUREAUS OF STATISTICS OF LABOR.

In Belgium the Office du Travail (Ministere de l'Industrie et du Travail) was established in 1895 at Brussels, the official head of the office being entitled "Chef." A superior council of labor (conseil superieur du travail), which made investigations and reports on matters relating to labor, has been in existence since April 7, 1892. November 12, 1894, a separate labor bureau, similar to the American and French type, was created under the Department of Agriculture, Industry, and Public Works. But in 1895 this department was separated into two departments, known as Department of Agriculture and Public Works and Department of Industry and Labor, and the newly created labor bureau was made a division under this latter department.

In France the Office du Travail (Ministere du Commerce, de l'Industrie, des Postos, et des Telegraphes) was established July 21, 1891, at Paris, the official head of the office being entitled "directeur." The publications of the bureau consist of special reports on particular subjects, of which a number are issued each year, and since January 1, 1894, a monthly bulletin, "Bulletin de l'Office du Travail."

In Germany the Kommission fuer Arbeiter Statistik was established June 1, 1891, at Berlin. This is a permanent commission, which issues special reports from time to time on particular questions and reports of the minutes of its meetings. The material collected by it is compiled by the Imperial Statistical Bureau.

In Great Britain the labor department of the board of trade was established in 1893 at London, the official head of the office being entitled "commissioner." A service for the collection and publication of statistics of labor has been in existence under the board of trade since March 2, 1886. In 1893 this service was greatly enlarged and given its present name. Its reports, therefore, date from 1886-7, and consist of annual reports of operations and statistical abstracts, annual reports on strikes and lockouts, annual reports on trade unions, annual reports on wages (contemplated), special reports, and, since May, 1893, a monthly "Labor Gazette."

In Switzerland the Secretariat Ouvrier Suisse was constituted Dec. 20, 1886, at Berne. The "secretariat" is an officer of the federation of labor organizations, but is subsidized by the government, which directs him to make certain reports. His publications consist of annual and special reports.

In Ontario, Canada, a bureau of industries was organized under the commissioner of agriculture, March 10, 1882, the official head of the bureau being styled secretary. Annual and occasional special reports are issued.

In New Zealand a bureau of industries was created in 1892. In the following year the designation of the bureau was changed to that of department of labor. Its publications consist of annual reports and a monthly journal commenced in March, 1893, under the title "Journal of Commerce and Labor," which after the issue of a few numbers was changed to that of "Journal of the Department of Labor."

We have been informed unofficially that an office for the collection of labor statistics has recently been established in Spain.

The above statement is believed to include information concerning all bureaus of foreign governments especially created for the collection and publication of statistics relating to labor. It is not a statement, however, of the extent to which foreign governments publish labor statistics, as a great deal of valuable information on this subject is contained in the publications of the central statistical bureaus or other offices of foreign governments.—*Bulletin of the United States Department of Labor, November, 1895.*

The convention proceeded to the consideration of reports on current work.

THE UNITED STATES DEPARTMENT OF LABOR.

Mr. Wright said: The work of the Department of Labor this year is practically a continuation and completion of the work outlined at Minneapolis, with the exception that we have entered upon an investigation, under the authorization of Congress, relating to the economic aspects of the liquor traffic. This investigation is now under good headway, and is being carried on successfully. We are taking up separate lines of work relative to the economic aspects of the liquor traffic, the

first relating to the revenues of the states, counties, and municipalities in the United States. This involves an inquiry in all the states and the collection of data relative to the revenue received by each government, respectively. Of course the result will be reported for the governments to which the revenue applies. Second, we are taking up the question of cost, of the absorption of raw materials in the production of liquors, the proportionate consumption of liquors for the arts and as beverages, and all the fiscal relations of the subject, these points being considered as emphatically among the economic aspects of the traffic. There have been various estimates, made in accordance with the views of the party making them, relative to these points, but so far as I know there has been no systematic collection of data relating to the production and consumption of the various kinds of liquors. The arguments of the temperance reformers and the arguments of those opposed to the temperance reformers are usually constructed to answer the argument which is met; in other words, these arguments are as thoroughly partisan as any line of arguments put before the public. The object of the Department of Labor, under this authorization of Congress, will be to ascertain as accurately as may be the truth in regard to these features. All of you know how difficult it is to chase a fact down and put your finger on it and be able to say "That is so," and I anticipate that in this particular feature of our investigation the ordinary obstacles that rise in front of the statistician every time he moves will be emphasized and exaggerated, even; but with the data at hand, through the census, through the work of the Internal Revenue Bureau at Washington, and through our original inquiries, we are in hopes of securing information which will be of absolute value in determining these questions, quite free from the vicious element of estimate or of partisan argument. Another line of this investigation, which is perhaps the most interesting one, relates to a series of inquiries propounded to manufacturers, and to great employers everywhere, whether manufacturers or not. We have already sent out about 30,000 schedules of inquiry, and so far something over twenty-five per cent. have come back well answered. That is a pretty good proportion,—very satisfactory, indeed. This line of inquiries relates to the

individual,—first, as to what great corporations and great employers are doing everywhere toward the regulation of the liquor habit. Railroads almost everywhere now prohibit the use of intoxicants by their employes, and very many private corporations are following the same rule. We are also observing the effect of the use of liquor upon the man himself,—how it affects his skill, his attention to duty, his productiveness, and all these matters; furthermore, how far overwork induces the liquor habit, and how far the close attention required by highly-specialized machinery induces it, if at all; how the frequency of payment of wages affects the question of liquor drinking—whether frequent payments induce it or prevent it being one of the most serious questions along industrial lines. All these questions and more along the same line are being treated seriously and candidly by the great employers of labor in this country; so that, take it all in all, I believe this investigation, which Congress so generously ordered a year ago, will prove of very great value in sociological studies,—in fact the evidences all show that it will be so.

We are completing the work of the investigation relating to machinery in its relation to cost of production, etc., but this report is an exceedingly tedious one to make, and the results will not be forthcoming for another year.

The other report to which I referred at Minneapolis relates to the question as to how far women in their employments have superseded men, if at all, and what the relation of their wages is to the wages of men when performing the same work. This investigation was also ordered by Congress, and the report is about completed and probably will go forward as our next annual report to Congress.

These investigations, together with the work of preparing the bi-monthly bulletin, keep the Department fairly busy and represent its most important current work.

One of the most valuable features of our current, everyday work is not seen by the public at all, and this I know is true of every one of our offices. This the public does not realize, and if we can in some way bring it out and let the public understand that a very large proportion of the time of the head of a bureau of statistics of labor is occupied in such a way as completely to

subordinate his own existence to his official work, it would be doing ourselves justice, to say the least, and this lies in the constant labor of furnishing specific information to correspondents. I think that every one of you will testify that a very large proportion of your time is devoted to answering correspondents who want specific information along certain lines, and which it is in your province to supply. All this work does not appear in our reports. Our legislators, when they are contemplating appropriations for us, do not realize that a considerable clerical force is essential for this work in addition to preparing and analyzing tables for our annual reports. If you can manage to let your public know of this feature of the work of your bureaus you will be doing yourselves justice. Every question that comes up must be argued from a statistical basis, and the men who wish to make the arguments, or the writers who wish to prepare them, appeal at once to the statisticians of their respective governments for specific information, and it is here that the chiefs and commissioners of bureaus of labor statistics have it in their power to do, perhaps, their best service, after all, because the facts which they contribute to individual legislators, to the governor of the State for incorporation in his annual message, to the members of the House and Senate for use in making their speeches upon the affairs of their respective bodies, and to the writers for the magazines constitute in many respects the most effective work they do. I speak of this under the head of current work of the Department because we have so much of it to do and because I wish to call your attention to the subject so that you may do yourselves justice.

It is customary to give the facts in regard to our appropriations. Congress has increased our appropriation this year something like $6,000 or $7,000, so that we have, instead of $175,000, the amount appropriated last year, about $182,000 for the fiscal year beginning July 1.

The Secretary: I would like to ask a question or two in relation to the investigation of the liquor traffic. First, Does the investigation take into account the relative increase or decrease in the consumption of liquors during the last twenty, thirty, or more years; and, second, does it take into account the relation of such increase or decrease to the changing financial

ability of the working people, the masses, to purchase liquors, so as to give us a correct idea as to whether there has been an increase or decrease of what might be called drunkenness among the people?

The President: I would state, in answer to the inquiry of the Commissioner from Minnesota, that the investigation will show, so far as the official facts are obtainable, the relative proportion of consumption of liquors, both as a beverage and in the arts, for as long a term of years as the records of the Internal Revenue office will admit. We cannot take a census of the consumption of liquors to ascertain this point. We must depend upon the data already in existence, but which has not been utilized to the fullest extent. The consumption of liquors each year is rather a difficult subject to handle because of the necessity of following pretty closely the annual production. Some years the great whiskey distilleries—factories, as they call them in Peoria,—stop work for a long time, in order to shorten the supply of stock on hand, like other manufacturing establishments, and then, again, they will push their plants to their fullest capacity when there is a market; so that the production one year hardly represents the consumption for that year. Then there is difficulty in adjusting importations and exportations with the view of ascertaining the quantity that remains in the country and is consumed. But so far as the facts will allow we will go into that question deeply. It has been studied carefully by Hon. David A. Wells, and it has been studied by others while the Internal Revenue Bureau has placed all of its books and records at our disposal.

The other question is one which can be answered by facts to be drawn from different reports; for instance, if the investigation now going on shows that there has been a constant increase in the consumption of liquors from a personal point of view, the student can find from other reports an answer to his question as to whether the remuneration for labor or services of any kind has increased during the same period of years. That is a philosophical study which I would hardly feel called upon to bring out unless I were discussing suggested legislation. Of course there are difficulties in this investigation which will hamper us at every point; as, for instance, how far different

methods of regulating the sale of liquors enter into the question. Our friend from Maine (Mr. Matthews), I suppose, would insist that prohibition prohibits,—

Mr. Matthews: Sometimes.

The President: But it has been doubted sometimes; while, on the other hand, some people from license states will insist that there is less drunkenness under a license system than under prohibition. If the convention will bear with me a moment, I can give an illustration on this point. A few years ago, in Massachusetts, I undertook to gather the statistics of arrests under license and prohibition regimes, and collaterally we found, paradoxical as it may seem on the face of it, that under prohibition there was a great deal more drunkenness than under the license system. I think that proves true wherever such an inquiry is made. The point is this: We satisfied ourselves, in the investigation some years ago to which I have referred, that the municipal officers, especially the police, are usually opposed to a prohibitory law, and consequently, when the prohibitory law is in operation everybody that can possibly be arrested for drunkenness is arrested, and when the license system is in operation, the police officers, who are usually in favor of a license system, tell a drunken man to move on, instead of running him in, the consequence being that all these statistics which show an increase of drunkenness under prohibition and a decrease under license are the results of the enforcement or non-enforcement of the law by the local police authorities. This has been proven time and again, not only in Massachusetts, but in other states; so that any conclusion drawn from a study of the statistics of the operation of prohibition and license laws relative to the amount of drunkenness is to a certain extent quite vicious, and cannot be sustained. So the statistical method, in this particular direction, fails very largely in determining the real state of facts. These are some of the obstacles we shall meet in our investigation; yet, on the whole, along the lines which we have attacked, which are the practical ones, and I believe it should be the policy of statistical offices not to attack lines that we cannot carry to success,—never voluntarily to meet failure. I believe we shall satisfy the public of the truth underlying the investigation.

STATE BUREAUS OF LABOR STATISTICS.

Massachusetts—Mr. Wadlin: Mr. President and Gentlemen: So short a time has elapsed since our convention at Minneapolis that the work of the Massachusetts bureau has not materially changed.

I find that I reported last year the special investigation ordered by the legislature of Massachusetts respecting the effect of intemperance upon pauperism, insanity and crime. That investigation is conducted under a special appropriation, and is intended to bring together all the data that can be obtained relating to the subject. Twelve months were assigned to the collection of material, and the period closed last August. We have since been engaged in tabulating results, and in completing incidental inquiries relating to the matter. The material is now in my hands for analysis, and forms, of course, a part of the current work of the bureau. It will soon be ready for the press and published immediately. This has proved an exceedingly interesting investigation, and will, I think, form the basis of a valuable report. The collection of data has required extensive personal investigation by specially selected agents. We have not relied upon official records, but have secured our information by direct personal interviews with the criminals and paupers in the different institutions of the State, our agents having visited those who have been committed from week to week during twelve months, so that we have the individual replies of the persons directly concerned. We have brought out the particular form of intemperance to which these persons have been addicted, if intemperate at all. We have covered, to some extent, the influence of heredity upon the drinking habit, and altogether have secured a great deal of interesting material.

As to the insane, who were incapable of giving personal testimony, we have endeavored to ascertain something of their personal history, and have obtained much important evidence respecting the use of liquor by the defective classes and its effect incidentally upon industrial conditions. Of course whatever injuriously affects social conditions, whatever leads to pauperism, crime or insanity, has a direct relation to the welfare of society; and such an inquiry as I have outlined, although undertaken in this instance by special legislative mandate, falls

appropriately within the province of a bureau whose work is the collection and presentation of statistical data, respecting the social, economical and sanitary conditions surrounding the industrial classes.

Of course the question will occur to you, as it did to us, whether in putting these inquiries to the defective classes we obtain truthful replies. Can we depend upon their answers? In reply I may say that our experience leads us to believe that we may, and that our fears to the contrary have been entirely overcome during the progress of the work. Without exception, so far as I know, the authorities in charge of the different institutions, who were at first inclined to the opinion that the statements which we might receive would not be trustworthy, now agree with us that we have been able to get at the truth,—that the people who have given the information have stated facts, thus bearing out a theory which I have for some time held, as the result of my experience, that the average man, when he understands the purpose of sociological inquiry, is willing to reply truthfully, so far as he can. I may say in passing that I have especially found that to be true of the manufacturers to whom we have put very many personal questions in the course of industrial investigation.

We have in Massachusetts a local option law; that is to say, in a given town it may be a crime to sell liquor this year, and next year it may be legitimate to sell it. A town may change its policy from year to year. This, of course, affects the administration of law respecting the offenses which grow out of the sale of liquor. It affects also the specific liquor crimes, such as drunkenness. It is sometimes alleged that crime in license towns is increased by the arrest therein of residents of no-license towns who have come for the purpose of obtaining liquor. In tabulating the facts as to liquor crimes we shall be able to show, for the first time, the number of such crimes committed by non-residents, the comparative number under license and no-license in towns which have changed their policy during the year, and in the license and no-license towns.

The remaining part of our current report will give the first installment of the census of wages, to which I alluded at Minneapolis last year, wherein we have placed in comparison, as

an historical record merely, Massachusetts wages for a series of years and those of other states and countries.

We are of course making our usual collection of statistics of manufactures.

Apart from these lines of investigation, the great work of the department during the year has related to the decennial census of Massachusetts, which we are now bringing to completion. The first volume, devoted to population, social statistics, etc., is practically ready for the press, and will be issued soon. We have collected during the year the information regarding agriculture, and are now obtaining that relating to manufactures, trade, commerce and the fisheries.

I trust I shall have the opportunity on Friday, during your visit to Boston, to show you the methods we pursue in our office work. It is an exceedingly opportune time to visit our department. We have at present about 150 clerks engaged in tabulating the results of the census, and we shall take great pleasure in showing you the practical details of the work.

Our appropriation remains the same as reported last year. We have a contingent fund of $5,000, and in addition to that an annual appropriation of $6,500 for the collection and tabulation of the statistics of manufactures. Of course these amounts are separate from the census appropriation and do not include the salaries of the executive officers. The Chief receives $2,500, the First Clerk $1,800, and the Second Clerk $1,500.

The President: Do the appropriations which you have mentioned cover the cost of printing?

Mr. Wadlin: They do not. The printing is done under a general contract covering the printing of all State documents. We have nothing to do with that. We simply send the manuscript to the printer, and the work is paid for out of a general appropriation for the entire public printing.

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Maine—Mr. Matthews: Mr. President: The work of the bureau in Maine is of an extremely practical character. We have not the time nor the money at our disposal to enable us to indulge in theoretical matters. At the present time I am engaged in an investigation of certain special industries that

have not been reported upon heretofore. One is our tannery industry, another is our starch industry, and another is the iron ship-building industry of the State. We have in Maine some forty tanneries, and quite a number of them are large and important establishments. In the starch industry we have, in the single county of Aroostook, some fifty establishments, which use for that product about 2,500,000 bushels of potatoes. This potato starch is not used for laundry purposes nor for food, but is used for manufacturing purposes in our mills and factories. Our ship-building plant is at Bath, under the direction of General Hyde, who has acquired a national reputation as a government contractor. Those three industries are the special subjects of the present investigation. Beyond that I propose during the season to investigate the general features of our manufacturing interests,—our woolen and cotton industries, etc. At the same time, I am very much interested in the question that it has been proposed to discuss at this convention. As I understand it, it is proposed to consider the matter of municipal ownership of water, gas, and electric-light plants, and how best to investigate that subject. It having been announced in my State that we propose to investigate that matter, I find that great interest is being taken in it. It is a difficult question, it seems to me, to investigate, and it should be judiciously treated. I start out with no theories. It is a mere matter of fact whether it is better that these branches of the service should be managed by the municipalities or by private companies. I have no theories whatever to advance, but I desire and hope that we can devise some way of getting at the facts in regard to this matter in a judicious manner, without being controlled and influenced in advance by any theories, and enter upon the investigation of the subject candidly, honestly, and fearlessly. I trust that I may obtain some information here as to how that should be done. The matters that we are considering in connection with the work of our bureau are all practical questions.

Our distinguished president made a suggestion to-day in regard to the work we accomplish with which the world is not familiar, and there has been some reference to employment agencies. I can say, personally, that there is hardly a day

passes that I do not receive a letter from some one in my State, where I have quite an acquaintance among the working people, who wishes to obtain employment upon a railroad, in a granite quarry, or something of the kind, and I have been enabled, without any employment bureau, to secure work for many worthy men through my own personal efforts. This involves a good deal of labor outside of the ordinary work of the bureau. My feeling, gentlemen, is this, that we should make our bureaus a practical, useful, beneficial thing to the public. I have been connected with our bureau since 1887. I have had the honor and the privilege of participating with you in your deliberations. I have attended every convention held since my appointment, with the exception of the one in Minneapolis. I am sure that these bureaus accomplish an enormous amount of good for the people. We should make them practical, and we should avoid matters that are theoretical and accomplish nothing for the good of the people. Let us come right down to bare matters of fact. Let us deal with the people as they should be dealt with. Theory is a very good thing, if good common sense goes with it.

I trust I may be excused for making these additional comments upon the work.

In regard to our appropriation, I will say that our provision is $7,000 for two years, that is, $3,500 a year, and salaries and all other expenses are paid out of that, with the exception of the printing, postage, and so on, which are paid for out of the special appropriations. We have, then, for clerk hire and for the employment of special agents, some $2,000.

Minnesota—Mr. Powers: Mr. President: In reporting upon the current work of the Minnesota bureau, I will begin by reversing the order, and will state the amount of our appropriation and the purposes for which it is used. We have a total appropriation of $12,200, besides printing. The printing includes all the stationery and office supplies of the bureau. This $12,200 per annum pays the salaries and all incidental expenses, other than the printing and office supplies, but it involves the performance of duties of a double nature, not only statistical work such as is done by most of your bureaus, but likewise factory inspection, and not only factory inspec-

tion, but an oversight and inspection of railroad tracks and the enforcement of quite a wide range of laws that are not entrusted to the average factory inspection department of most of our states. We have three factory inspectors, who, with their expenses, take out not far from $5,500, leaving something less than $7,000 per annum to pay the salaries and incidental expenses that are connected with the work of statistics, which is here represented.

In our statistical work we are carrying on at the present time two leading series of investigations. The one which is most nearly completed relates largely to the prices of agricultural products and live stock in the United States. The problem which we set before ourselves in this investigation may be briefly stated as follows: There are two great factors that have operated in the world in affecting prices. Down to a time preceding this century, or about a century ago, outside of the temporary causes such as changing crops, varying supply and demand, etc., there had been but one great cause affecting prices, and that was the various fluctuations in the medium of exchange. In this century we have the changes that have come with invention,—the changes in methods of production and transportation. As the summing up of all these results and the workings of these two great forces in this generation, there can be no question, according to all other investigations, that there has been a decline in average prices, or, in other words, an appreciation of gold. So far as I know, there have been no investigations that have sought to separate these two factors, the one which was the distinguishing characteristic of all past centuries and the one which is the distinguishing characteristic of this,—currency or invention changes. This investigation which we are carrying on seeks to separate, so far as it is possible, these two forces, first, by taking out from the problem the amount of these price variations that are due to invention, if you may use that term to sum up all the fluctuations that come from various local causes, and other forces that are changing with to-day, apart from that which comes with the currency, and thus leave, so far as it is practicable from a purely statistical point of view, the changes that can properly be charged to a change in the

supply of the currency operating in the United States. I have sought, in conducting this investigation, to bring out all possible facts that might bear upon this question, to make every possible tabulation that will throw any light upon this question, from any standpoint. I have made not only those which have been suggested to my own mind by my study, but I have appealed to differing minds, students of economics representing the divergent schools of thought, in regard to suggestions concerning how to tabulate the data at command so as to bring out any thought or any principle that has been operating to affect prices. I shall have this present week in Boston a meeting with a number of distinguished economists, some of them representing the school of scientific bimetallism, and some representing monometallism, with a view of discussing the methods involved in this investigation. The object is simply so to treat the facts, if possible, as to bring out all that is in them that may throw light upon each possible trend of prices as they are affected by the invention of our day and by the possible effect of the changing supply of precious metals in the present generation and the use of those metals and the changing currencies of the world.

The second investigation which we are carrying on relates to taxation and the relative burden of taxation in the several counties and cities of the State. In connection with this we tabulate every real estate transfer made in the year 1895 in every county in the State. We also tabulate every mortgage foreclosure in the State, and for a portion of the State we shall also tabulate every mortgage recorded, and from these three tabulations we seek, by varying calculations, to determine the relative burden of taxation in the several counties of the State. We shall ascertain the amount of assessment and the taxes for each piece of propery represented in the three tabulations mentioned. For the lands sold by warranty deeds we shall ascertain the percentage which the assessed value bears to the selling price shown in the deeds. In the case of the lands mortgaged we shall obtain this percentage indirectly as follows: We shall take what the real estate men or the loan agents say is the relative amount of money that they would place as a loan upon the real estate. It is said in Minneapolis,

for example, that the loan agents calculate to place a loan on mortgage of forty per cent. of what the real estate man states to be the actual value of the property. As showing how close two calculations, the one from warranty deeds and the other from mortgages may agree, I will say that we find from the tabulation of several thousand distinct real estate transfers that the taxation, as assessed by the assessors, equalized, is fifty per cent. of the actual selling value, while if we allow forty per cent. to represent the amount of property or value that is covered by the mortgage, we realize fifty-two per cent. The two wholly different investigations thus practically agree in showing that for Minneapolis the assessed value of real estate is about fifty per cent. of its selling value. We also follow up these two lines of investigation by a third—that by means of our tabulation of mortgage foreclosures. This shows the relative value at forced sale of a large amount of real estate. By it we reach parallel conclusions. This investigation shows that the burden of taxation in Minnesota is far larger in the cities,—larger in St. Paul than in Minneapolis, and larger in both cities than in the country. It shows further that which may surprise some others, that there is far more of dishonesty in taxation in the country than in the city; thus, in one of our counties we find that over one-third of the pieces of land sold were never on the tax list, and that there has been in that county, and some others, a concerted effort on the part of large numbers of persons to keep down the amount of land that is assessed, as well as to reduce the rate of assessment in those counties as compared with other counties. There are many other such facts that are being disclosed, although we have carried this investigation over only a portion of the State. We expect, however, to cover the whole State with this data,—the transfers of real estate by warrantee deeds, the real estate mortgages, and mortgage foreclosures.

I might mention in this connection, although it in part comes under our factory inspection work, one class of work that we have been doing. Since I have been in the Minnesota bureau I have striven in all possible ways to make the bureau of practical use to the people along the line that has been pointed out by our friend from Maine (Mr. Matthews). One

of the duties which we have had to perform in connection with factory inspection during the past year is the enforcement of a child labor law. There had been a compulsory education act upon the statute books of Minnesota for ten years, but that law had been an absolute dead letter. The educational authorities and all others concerned had felt that it was an absolute impossibility to enforce it. We are making an inquiry to see whether that law, as it stands, is enforceable, and if not enforceable in what respects the statutes of Minnesota need to be amended in order to make that law a practical force, and I am inclined to believe that we shall demonstrate to the educational authorities of the state of Minnesota, with whom we are co-operating and whom we have got to co-operate with us in the larger towns, that the law as it is and has stood for ten years need not be a dead letter, if they will only take hold of it with a spirit that involves tact and good judgment and a regard for the rights of others so far as it involves the question of religion, which has been a perplexing question in many of our western states touching compulsory education. I believe that this law and the child labor law can be made, what they have not heretofore been in more than a very few states, a factor for the uplifting of our people.

I think this constitutes a fair resumé of our work so far as it touches the work of statistics. Although we have in our factory inspection work more or less of statistics, I have covered all that can properly be considered here.

Mr. Schilling: I would like to ask the commissioner from Minnesota whether he considers it an advantage to the statistical branch of his bureau to have the factory inspection department connected with his office; in other words, is it not a seeming advantage to the statistical department to have the other department as a part of the bureau? I would also like to inquire whether the assessors in Minnesota, in making up their field-books, assess the land values separate from the improvement values.

Mr. Powers: To answer the last question first, the law requires the assessors to assess the buildings and other improvements separate from the land itself, and in tabulating the results we shall separate all the sales of lands upon which

there is no record of assessment of improvements from those on which there are improvements. I will state here, however, that I do not look upon this possible tabulation as having any great amount of value. It will be of some value in such counties as Hennepin and Ramsey, in which the cities of Minneapolis and St. Paul are situated, where there is, as I believe, a tolerably honest and fair taxation along the letter of the law; but there are counties which we have already traversed, in which we have learned that there is a large amount of land that has been improved, but which appears on the tax books as unimproved. Thus, in one county a man who was acting as our agent, and who was familiar with the affairs of that county, found the record of the sale of a farm for $12,500,—a farm which he knew had upon it improvements aggregating $5,000,—for which the assessor's book does not show one dollar of improvements. Under these circumstances, while we separate those lands which, according to the record, are unimproved from those which are improved, I may say in advance, what I shall be forced to say in the report, that this portion of the report cannot be considered of any very great value, owing to the fact that in so many counties that part of the law is wilfully violated. Of course our agents are instructed to make inquiry in each and every county as to how far there is an observance of the law, and whether the transcript of the assessors' books is a transcript of fact or not. I am sorry to say that in many counties it is not a statement of fact. Of course if the data which we collect along that line is not reliable our conclusions cannot be worth very much, as far as that point goes.

Concerning the first question, that relating to the use of our factory inspectors in gathering statistics, I hardly know what to say. I have felt from the first that it was a dangerous experiment to combine factory inspection with statistical work. The theory of factory inspection involves the enforcement of penalties, and the enforcement of penalties means oftentimes ill-will. Our statistics, so far as manufacturers and private firms are concerned, cannot be worth anything, in my opinion, if they are gathered under compulsion. To be valuable, they must be the result of earnest co-operation on the

part of those who furnish them. My experience in statistical work leads me irresistibly to this conclusion. I have accomplished much, however, through our factory inspectors, but in order to do so I have kept the moral force to the front, and not the legal force, which has been and must be the general rule in factory inspection. I have been able to do this, as but few factory inspectors can for this reason: I began the work of the bureau at a time when the problem of factory inspection was before the State. The State legislature had refused to pass a factory inspection law. I instructed my men in gathering data in regard to the benefits of factory inspection, to recommend safety devices in the various factories of the State. I sought to organize the moral forces of the community, in connection with the bureau, in favor of the adoption of those safety devices, and I believe that I was able, as the result of that effort, in two years, without any law requiring the adoption of such devices, but by organizing moral forces, to get as many safety devices introduced as were ever introduced during the first two years through the operation of any factory inspection law in the country. That gave me and the bureau a moral advantage in the community which passed the factory inspection bill at the next session of the legislature without a dissenting vote, exactly as I prepared it, and made, on the one hand, all the manufacturers of the State say, "We will submit to factory inspection provided it comes under the Bureau of Labor," and it made the laboring people of the State, on the other hand, say substantially the same thing; so while my own opinion was against having factory inspection placed under the bureau, it stood in this shape, that all the manufacturers of the State and all the organized labor of the State would support a bill that brought factory inspection into the bureau, but both forces would fight the creation of an independent department. We therefore consented to have that work placed in our bureau, and in order to avoid the friction between two rival and seemingly contradictory forces, I have in the one line sought continuously to depend upon the moral forces of the community that could be organized, rather than upon legal compulsion, and I believe I have avoided in a large degree the friction I had anticipated, and have been able to

secure certain advantages. I still question whether we can continue in the future to secure along all lines the development and extension of the laws for the protection of the working people that must come from the work of a factory inspection department, and yet be left free to take up all phases of statistical investigation that ought to be treated in our statistical work.

Mr. Wadlin: I would like to ask Mr. Powers whether he means by the term, "improved land," simply land having buildings upon it, or whether he applies the term also to land without buildings, but otherwise improved in the ordinary sense.

Mr. Powers: In the contemplation of the law, the word "improvements" means fences and buildings, and that is what the assessors understand by the term.

Mr. Wadlin: My object in asking the question was to bring out that point. Of course the term "improvements" may have a wider significance than that, and it seems to me, especially in the consideration of systems of taxation which shall bear upon land with improvements or upon land without improvements, that there ought to be a wise discrimination in the use of such terms so that there may be no misunderstanding as to what is meant.

I want to add a word in hearty indorsement of what Mr. Powers has said as to combining the functions of a statistical bureau with those of factory inspection. My observation, of course, is confined to my own State largely, where we have a very efficient force of inspectors, perhaps as well organized as in any State in the country. I am fully convinced that both departments do better work along separate lines than could possibly be achieved if they were combined. The two functions are not identical, as Mr. Powers has very well said. One has to do with the enforcement of law, which sometimes involves controversy, and the other is confined to inquiries into economic conditions,—inquiries about which there ought not to be any controversy. By separating these functions excellent results have been achieved in Massachusetts. The establishment of our inspection department was largely due to the investigation of industrial questions by the statistical

department. Hardly any of the laws whose enforcement is in charge of the inspection department would have been enacted originally if it had not been for such investigations previously. Since the original enactments, however, the legislature has constantly extended the scope of factory inspection, with a view to improving the law and providing for its better enforcement. When we take up an investigation of social conditions which involves entrance upon a new field, the results of which may finally be embodied in legislation, I think such preliminary investigation can be more successfully conducted by a department that has nothing to do with the enforcement of law. It is much wiser, generally speaking, to keep the two functions separate. Of course, if the two departments are combined, the factory inspectors, if the equipment of the statistical department is limited, can be of some assistance in collecting information along certain lines; but if the inspectors visit a factory and ask questions touching the private interests of the establishment, and the proprietors fear that the same officers may possibly use the answers in the enforcement of law, I do not believe that information would be easily obtained or would be of much value. I think that Mr. Powers is entirely right in his general view upon the subject.

Mr. Powers: I might say, Mr. President, that I have been deterred from undertaking certain lines of statistical investigation because I wished to avoid the conflict which might possibly arise on account of the double functions devolving upon us under our present organization. I have felt that during this stage when the two branches of work are together there is but one way to avoid trouble, and that is by confining our statistical studies, so far as practicable, to questions that would not raise controversy. Our investigation in regard to prices does not touch the subject of factory inspection at all, and the same thing may be said of our investigation of taxation. By confining our work to separate, independent subjects, that do not trench upon the interests of those to whom we are occasionally obliged to say harsh things, we avoid all possible friction, and I confess that at the present time I would not dare to undertake certain lines

of investigation that I believe are fraught with the promise of great results,—investigations that my friend Wadlin could undertake and carry forward with great success, but in which I could not hope to obtain anywhere near the measure of success in Minnesota that he could in Massachusetts, simply because the conditions which prevail in Minnesota are less favorable than those in Massachusetts.

The President: I would like to inquire, Mr. Powers, what you mean by "actual value" of land.

Mr. Schilling: While Mr. Powers is answering that question, I would be glad to have him give me some information along the same line.

The President: What is your question, Mr. Schilling?

Mr. Schilling: I wish to know whether Mr. Powers, in his investigation, has discovered that the assessors are in the habit of assessing land values separately from improvement values. In the reply he made to my question a few minutes ago he did not seem to comprehend the full force of my inquiry. I asked the question for the purpose of learning the common practice of the assessors in his state. For instance, in the cities of Minneapolis and St. Paul the greater part of the property is improved. Now the question arises, does the assessor, when he goes into those improved communities with his field-book, note down in one column that the land of a certain piece of property is worth, say $10,000, and the improvements $5,000; in other words, does he separate in his field-book the land values and the improvement values by using three columns, placing the assessed value of the land in one column, the assessed value of the improvements in another column, and then make a total of those values in the third column? I ask this question because, in our investigation in Illinois, we discovered that, in the city of Chcago, the assessors separate in their field-books, land values from improvement values, and the practice has always been to assess land values at less than improvement values; that is to say, an assessor would come along and find a certain piece of property worth $4,000, of which the lot was valued at $3,000, and the building at $1,000. Now he would assess the land at about seven per cent. of the total value, and the

improvement value at about twelve or fourteen per cent. of the total value. This practice has been uniformly applied between the rich and poor, and when one first considers the matter it seems perfectly innocent and equitable, as long as the same system is applied to all classes alike; but a careful examination will show that it results in great discrimination against property holders whose improvement value exceeds the land value. That is the reason I asked the question.

Mr. Powers: I will state the law again, as it seems I did not make myself clear. The law requires the assessor to assess the full value, both of the land and of the improvements. These are to be stated and entered upon the books separately, the land at its full value and the buildings, etc., at their full value, and then the amounts are carried out and totalled. Where there is an honest assessment, and I believe there is an honest effort in most counties to this end, the buildings and other improvements, including fences, etc., and the land are entered at the same proportional rate. In some counties there is undoubtedly an attempt made to decrease the relative burden of taxation from what it should be in those particular counties, and wherever there is that effort they make use of this law in regard to buildings and improvements as one of the main instrumentalities for accomplishing their dishonest purpose; for example, if the real estate in a particular county was worth $1,000,000 and the improvements were worth $500,000, they would doubtless enter the land at $1,000,000 (I am now giving relative figures) and the improvements at $100,000, for the reason that the reduction, if placed on the improvements, would be less liable to detection than it would be if placed on the land. So while the law requires that there shall be carried out in tabular form—first, the value of the land apart from improvements; second, the value of the improvements (buildings, fences, etc.); and third, the total value; and while this is done in certain counties honestly and with as much accuracy as faithful, careful assessors can do it, in other counties it is not done.

In regard to the term "actual value," I will confess that it has been very perplexing in this investigation, as well as in all others of a similar nature that we have undertaken, to

arrive at what is meant by "actual value" as contemplated by the law. The general interpretation is that value which the property would sell for under an ordinary sale,—not a forced sale, but an ordinary sale, under favorable conditions, and yet not under "boom" conditions. How to ascertain that actual value is a difficult problem. If we ascertain it by means of the real estate sales recorded, provided the amount stated in the deed expressed the actual consideration, they would doubtless show something above the actual value in normal times, and if there is a large number of mortgage foreclosures, they would represent forced sales, giving us something below that average which is contemplated by the law-makers in fixing the assessment system. So we take these two lines of investigation, the one expressing the actual real estate sales by warrantee deeds, and the other by mortgage foreclosures, one leading us to a conclusion one side of this line, and the other to the other side. It is only in this way that we can hope to get something like an approximation of what the law contemplated in directing the assessment to be made at the actual value. Of course I have defined merely what I understand to be the meaning of the law-makers in the use of the phrase, "actual value."

Mr. Morse: I should like to ask the commissioner from Minnesota a question. I understand him to say that a larger percentage of property was left off the books in the country than in the cities, and that remark would lead to the natural inference that some property is left off in the cities. I would like to inquire whether he has taken note of the amount of property left off.

Mr. Powers: We tabulate that which we find in every county. We cannot ascertain in every county or in every city the amount that is left off the books. We can only approximate it in this way: If we find a mortgage foreclosure or a sale by transfer under warrantee deed, and we do not find that particular piece of property taxed, then we look up two questions: first, Is this a sale of a piece of land that is in any way properly exempt by law? There are sales of land, such as church property, that are exempt from taxation, and then there are a larger amount of sales of land from the United

States government, which, until the government makes a deed, is exempt from taxation. All of those sales will be tabulated by themselves. Then there will be left only those pieces of land that ought to have been on the tax list, but were not, owing either to an error of the assessor or to fraud of some kind. We shall tabulate all of those. One set of tabulations will show the pieces of land that have been sold during the time under consideration by warrantee deed from the government of the United States, and which of course had not been on the tax list because exempt, the sales of church property, the sale of school lands, and all such lands that are exempt by law, and under the other tabulations comes the other class of property that ought to be on the tax list but is not.

Mr. Morse: Of course I do not know very well the tax laws of Minnesota, but as I understand it, in all of the western states the government surveys the land into townships of thirty-six sections, each section being one mile square and containing 640 acres. That makes in round numbers about 23,000 acres in a township. Now I am sure, so far as Michigan is concerned, that if an assessor left off very many pieces of property in a township, he would get into trouble right away with the people who were assessed, and furthermore, I believe he would be hauled up short for vitiating the tax roll. The point I wish to bring out is whether Commissioner Powers is certain whether the omissions to which he has referred occurred through the wilful negligence of the assessors or whether they were the result of accident. It certainly seems to me that if there are many omissions they are not the result of accident.

Mr. Powers: There are some counties in Minnesota that have 25,000 acres less on the rolls than were returned twenty years ago. That may give you some idea of the extent of the omissions.

Mr. Horne: I would like to inquire of Commissioner Powers whether there is a penalty attached to the non-performance of duty by an assessor in Minnesota.

Mr. Powers: There is a penalty in Minnesota, as I presume there is in all other states.

Mr. Morse: I would like to ask the gentleman from Minnesota one more question, and that is whether his observation leads him to believe that more real estate escapes taxation in the country than is the case with regard to personal property in our cities and villages. Now I have no hesitation in making the assertion, without knowing the figures, that there is in this city of Albany at least $50,000,000 worth of personal property that goes clear of taxation. My theory of taxation is that it is the property of a township or city or county or state, no matter whether it is real or personal, that should bear the burden of taxation; but my observation is that where the people in the country escape taxation in any degree, the people in the cities see them and go them several better in that respect.

Mr. Powers: I think our friend from Michigan is raising a point that he ought not to raise as a statistician. We are not privileged, as statisticians, to answer questions that we have not investigated, and that we have no means of investigating. If the commissioner from Michigan can give me a suggestion as to how to investigate the subject and get an answer to the question he raises, I promise him that I shall be only too glad to follow that suggestion and endeavor to give an answer to his inquiry. I cannot here give any answer to his question, because I confess my absolute inability to formulate a plan for obtaining definite information relating to that subject. I would say, in behalf of the people of Minnesota, that the commissioner from Michigan will confer a favor, not alone upon the people of Minnesota, but upon the commissioner from that state if he will give us a suggestion that will lead to a practical investigation along the line of his inquiry. Until we receive such a suggestion we must be content to confine ourselves to the investigation we have attempted, the question of real estate taxation.

Mr. Matthews: I dislike to trespass upon the time of this convention, but this question of taxation is such an interesting one that I cannot refrain from briefly stating the condition in the State of Maine. We have three kinds of taxes, —our State tax, our county tax, and our town tax. Our State tax amounts to about 2.25 mills upon the dollar of valuation,

so that a farm worth $2,000 would pay $4.50 to the State. In the towns the tax depends upon the indebtedness of the towns. If they are extravagant and put up a town house, or run in debt for any other purpose, then the town taxes are increased accordingly; so the result is that while the State tax amounts to very little, the local or town tax may be burdensome, but in all cases where the tax rate is burdensome it is because the people of the towns have brought the condition upon themselves. While our law requires that the valuation of property shall be at the full cash value, until within a few years, when we changed our system from the ten-year valuation to a perpetual board, which we have in session all the time, the rate varied, and it would be one-quarter, one-half, or two-thirds of the equitable valuation of the property. We have a State mill tax for school purposes, which is assessed upon the valuation of the property, and our wealthier places, such as Portland, Bangor, and other cities, are assessed and pay to 230 towns (we have about 520 towns, cities and plantations) more for the support of their schools than they receive from those towns in State taxes; so that practically the property of the State is assessed for the benefit of the poorer portions of the State in the support of their schools. What I mean, and hope I make myself clear, is this: That when the State taxes are paid by these 230 towns, instead of a balance coming from them, there is a balance going to those towns for the support of their schools, which balance is paid by the wealthier sections of the State. We do not feel in Maine that our wealthy towns or capitalists are disposed to do anything out of the way, because they are supporting the poorer sections of the State, and I repeat, that we have 230 towns in our State which actually receive more from the wealthier sections of the State, through this mill tax for the support of their schools, than they pay into the State treasury.

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The President: The convention will now proceed to the discussion of the topic, "How best to investigate the subject of the municipal ownership of water, gas and electric-light plants." You will remember that at the convention held in Minneapolis it was voted, "That the executive officers of this

association be authorized to invite to our next annual meeting some of the leading representatives of the economic schools of thought, at their own expense, to appear before us and give their views as to what fields of investigation the bureaus of labor might best exploit for the benefit of the social and economic advancement of our American life." In accordance with this vote of the convention, the Executive Committee, at a meeting held in Harrisburg in midwinter, passed the following resolution: "That the Executive Committee recommend to the convention the question of investigating the municipal ownership of water, gas, and electric-light plants; this investigation not to be considered for or against municipal ownership, but for the purpose of ascertaining all facts bearing upon this question." The question before the convention for discussion, therefore, is, as stated, "How best to investigate the subject of the municipal ownership of water, gas, and electric-light plants," and I wish to state that unless the convention orders otherwise the chair will rule in the course of the debate that discussion or argument for or against municipal ownership is not in order, the question being simply as to methods and the practicability of making an investigation. It is for the convention to decide, by its vote, after the discussion, whether it will commit itself to the investigation, and not to commit itself to the question for or against municipal ownership, this not being within the province of the convention. The first speaker on our programme who will address the convention is Prof. Walter F. Wilcox, of Cornell University, and I take pleasure in presenting that gentleman to you.

ADDRESS OF PROF. WALTER F. WILCOX.

Mr. President and Gentlemen of the Convention:

Before proceeding to the question of the morning, allow me briefly to thank you for the honor conferred upon me. If I had consulted my own inclination, I should have followed the example of Prof. Ely and Mr. Atkinson and suggested the names of experts upon the question, who could aid you as I cannot hope to do. For while my work as a teacher has led me to consider certain theoretical aspects of the question

of municipal ownership, it has not forced me to make such a careful investigation as to entitle me, upon that ground, to a hearing before a body like this. I should prefer to listen rather than to speak. But my point of view and my experience are so different from yours, that perhaps they may have in them something of suggestion, and if I can offer you anything in return for what you have given me, I shall be well satisfied. For I am deeply indebted to the officers of the bureau of my native state of Massachusetts and of the national bureau, and especially to your honored president, not merely for many personal kindnesses, but yet more for their illustrations of that rare scientific spirit that patiently seeks for the truth as for hid treasure. I am confident that a closer relation and a better understanding between the teachers of social science and the scientific investigators, would help the teachers; I have never been so sure of it as now, after spending a day in this convention, what we teach may seem to some of you like theories not based on facts, an airy, unsubstantial structure. What you teach the public in your reports may seem to some of us like facts not linked together by any theory, a mass of stones, or at best, a mere foundation, and not a building. I am certain that the two belong together, and that either alone is sure to be one-sided, if not wrong. Your president, before the last convention at Minneapolis, pleaded for the same conclusion when he said: "A statistician should recognize the relation of the facts which he collects to other facts, and be able to see something of the philosophy and the economic and ethical forces underlying the facts which he presents, thus making his analyses vital." Both in the natural world and in the world of social action it is forces that link facts together and facts that reveal forces. We who are primarily interested in forces or principles are finding that to discover them we need a firmer grip of the facts; you who are primarily interested in the facts are finding, I take it, that to bring your facts together, you need theories, or at least hypotheses. If I did not think so, I should not be here this morning, for I have no new facts to contribute, but only a few theoretical considerations to submit.

And this brings me to the topic of the day, the municipal ownership of water, gas and electric-light plants, one of the more important questions now before our cities and towns, and apparently destined to attract yet more public attention in the immediate future. I can hardly think of a subject on which light is more needed by the public, and I hope the investigation projected will be taken up and carried through to a successful conclusion. At the same time, such a step should be taken only after great deliberation and full debate. My best service to you would be by aiding to start such a debate, and that, it seems, may be done most successfully by a frank statement of certain difficulties that present themselves to me, as likely to interfere with your entire success.

It may interest this body to know that nearly ten years ago a committee of the American Economic Association, including in its membership such familiar names as Prof. Adams, of the University of Michigan, Statistician to the Interstate Commerce Commission; Prof. Dewey, of the Institute of Technology, the Secretary of the American Statistical Association; and Prof. Goodnow, of Columbia University, undertook an investigation into the facts pertaining to municipal public works in the United States, and were obliged to abandon the work after making an incomplete but valuable report. I quote a few sentences from the letter of the chairman transmitting the report: "A full and complete portrayal of the facts, they soon discovered, was impossible. To say nothing of the time which such a task would have required for its satisfactory completion, the money at the disposal of the committee was not adequate to the needs of so extended an investigation."

If this convention shall decide upon a co-operative attempt to investigate the municipal ownership of water, gas and electric-light plants, it is possible the members of that committee might be able to offer both encouragements and warnings.

Before entering upon the discussion, it is desirable to note the wording of the question. When your Secretary, Mr. Powers, wrote to me upon the subject, he transmitted, in addition to the two resolutions printed upon the program, a further reso-

lution of the Executive Committee asking for an address upon "the practicability of such an investigation and the best method to be employed in ascertaining the facts," and further requesting the speeches "not to argue either for or against the system of municipal ownership." There are, thus, two questions before the convention.

1. Is the investigation practicable?
2. If so, what are the best methods to follow?

Now, on questions of this character, the opinion of a college teacher is not entitled to great weight. He has had little experience in deciding what investigations are practicable. The methods he regarded as the best might be found inapplicable or misleading. Furthermore, had I not been requested to discuss these questions, I should feel it almost an impertinence to do so. I have no more right to advise you what investigations are practicable or how they should be carried on than you have to advise me how to teach my classes. But as through your Executive Committee you have asked for suggestions, I am sure you will take them in good part.

It seems convenient to group what I have to say under three heads: first, certain theoretical considerations; secondly, some reasons for doubting the practicability of the investigation; and thirdly, assuming it to be practicable, some general suggestions regarding the methods.

In the first place, I understand that the proposed investigation is to be conducted by statistical methods. I believe substantially all the bureaus here represented are statistical bureaus. Twenty-seven of the thirty-four, or about four-fifths use the word statistics in the official name of the bureau, and in the others I believe that the methods employed are dominantly statistical. The question then arises, Is the statistical method adapted to the investigation of questions of municipal ownership? To this inquiry an affirmative answer may be made without hesitation. But when the further question is put, May the statistical method grapple with all the facts involved? more consideration is needed. It seems doubtful whether all the relevant facts could ever be obtained by any statistical inves-

tigation, however painstaking and thorough. For example, it is often said by opponents of the increase of governmental functions that such an increase tends to decrease the opportunities for individual initiative and to undermine that self-confidence and self-reliance which are among the highest products of civilization. This statement may or may not be correct, but it will be obvious that the statistical method is not adapted to testing it. The amount of self-reliance in the country cannot be measured by any statistical criterion. On the other hand it is alleged that private control of water, gas and electric-light works increases social discontent, but this statement, also, is not to be tested by statistics.

The question, then, of the relative advantages of private and municipal ownership of these plants may be illuminated by statistics, it cannot be finally answered by that method alone. Many considerations also, of theoretical political economy and of practical politics are involved.

There is one phase of the subject, however, to which the statistical method seems especially adapted, viz., the question of the relative economy of private and municipal plants. Which costs the community more for the same service, a plant of a private corporation or a municipal plant? This question is hotly argued by the two sides and the evidence of impartial experts like the labor bureaus is sorely needed. I assume that this is the main question proposed by the Executive Committee. In the light of what has been said, however, it is clear that municipal plants might be shown to be more economical, and yet for other reasons, not susceptible of statistical measurement, might be deemed on the whole less desirable.

The production of gas and electricity, and to a less degree the distribution of a water supply are subject to what economists call the law of increasing returns. This law affirms that an increase of the capital and labor devoted to the production of manufactured articles usually results in a more than proportionate increase of output. Thus, if the amount of capital and labor employed in a gas-plant be doubled, while other conditions remain the same, the output of gas would probably be

more than doubled. Now when the law of increasing returns governs production, competition is an ineffective means of regulating price. It is likely to be superseded either by combination or by the triumph of one competitor and the downfall of the others. It is mainly for this reason, I take it, that society is now groping for some effective means of regulating price and securing the best service within the field of these co-called natural monopolies.

The selfish interests of private individuals are ever on the watch to take advantage of any social change or the development of a new social force, and these interests, while mainly beneficial, have often at the start pushed their self-assertion so far as to work harm to the community. Gradually the co-operation of individuals, expressed through social ethics and legal enactments, has controlled and checked their excesses by the assertion of the demands of the general welfare. So it was with the evils attending the rise of the factory system or the development of mines in England, and with the evils of unrestrained railway competition in both countries. So it has been in a large measure with the growth of large cities themselves. At first, cities were mainly the arena on which the conflicts of individual interests were fought out, and only tardily have the social feelings come to cluster about them.

There can be little doubt that in the past at least, as Mr. Bryce said in 1888, "the government of cities is the one conspicuous failure of the United States." While in the late Middle Ages the cities of Europe were nurseries of corporate freedom and of the resistance to oppression, they have been in this country centers of misgovernment and of tyranny. But now we are in the midst of a great revival of municipal pride and a great purification of municipal politics. If this be true, the arguments against the expansion of municipal activities, derived from the corruption of city politics, are losing their force.

The opponents of municipal ownership of such services frequently attempt to arouse prejudice and obscure the issues involved, by charging the advocates of municipal ownership

with communism or socialism. While such charges will have little weight with thoughtful persons, it may be in place to point out that John Stuart Mill, perhaps the most well-known representative of the traditional political economy, and not regarded as favorably disposed to socialistic measures, or to the widening of the sphere of government, says, in his careful chapter on Laissez Faire and its Limits, "In the case of gas and water companies, the reasons preponderate in favor of their being performed, like the paving and cleaning of the streets, not certainly by the general government of the state, but by the municipal government of the town." I cite this, not in the interest of either side, but in the interest of legitimate investigation and argument and in opposition to all appeals to prejudice.

Let me pass now from these general remarks to the problem more particularly before us, and weigh a few considerations against the practicability of such an investigation.

A moment ago it was suggested that the cost of the same service could be well measured by statistics. Yet, on consideration, it appears that public and private plants do not render the same service except by accident, and hence assuming that the true cost can be obtained, it would be the cost of different services. The aims of public plants and of private plants are different. The aim of a municipal plant is primarily to satisfy the voters, and in subordination to that to be self-supporting or remunerative. The aim of a private plant is primarily to earn money for the corporation and in subordination to that to please the patrons. Hence, the management of a public plant is tempted to make it appear that the plant is remunerative, by twisting the figures, if necessary, and at the same time be lavish with the light, as a means of securing the favor of the voters. On the other hand, the management of a private plant is tempted to keep its financial condition secret, or to represent it unfavorably to the public, in order to prevent competition or municipal interference. Hence, I believe that in a large proportion of instances the facts will be difficult or impossible to ascertain. In confirmation of this opinion I may cite the fact that the eleventh census failed to get returns from over one-

fourth of the gas companies of the country, and this one-fourth, we are told, included many large establishments. The census figures for electric lighting were yet more incomplete. If that was true of the census, it seems probable that a larger proportion of the companies would refuse to answer your inquiries, knowing that the results of your investigation might affect the permanence or the value of their franchises.

Even if both private and municipal companies should answer, their replies would be deemed untrustworthy by the other side. As evidence of this fact I cite the following from a strenuous opponent of municipal ownership: "Committees unacquainted with the business, and with no practical experience in electrical affairs, are appointed by city councils to investigate and ascertain the cost of producing light in cities owning plants. This is done with a view of purchasing a plant. The committees go to the officials of other cities who have no knowledge of the science of electricity or its practical application, and whose information regarding the working of their own city's plant has been obtained from employés who owe their appointment to the influence of some political wire puller whose interest it is to show a minimum of expense. Statements of this kind are used as authority regarding the cost of municipal lighting, notwithstanding the fact that they are discredited by men who have made it a study for years, have thoroughly tested every branch of the business, and are not beholden to a political boss for their position."*

It has been said that private and public plants render different services. The service to a municipality is only a part, and often only a small part of the total service rendered. Frequently, perhaps usually, five-sixths of the service is rendered to private parties. A municipal plant seldom renders as much service to the citizens as a private plant, yet all these services should be included in the investigation.

To take the case of a water supply. How much weight should be given to the quality of the water furnished by public

* M. J. Francisco, in Engineering Magazine, vol. 9, p. 43.

and by private agencies? How much to the health of the community under the two systems? It is practically impossible to obtain, in most of our cities, accurate statistics of deaths. Yet if municipal water service results on the average in a supply of better water than private service, the difference must be recognized, or your figures of cost will not cover the ground.

Finally, and this seems to me the gravest difficulty, is it true that cities on the one hand, or private companies on the other, keep their accounts by any approximately common method? Is it not true, on the contrary, that they differ from one another much more widely than the bureaus of statistics of labor do in their accounts as indicated in the reports of yesterday, and when, in addition to these differences you have the desire to conceal or mislead, will it be possible, even with expert help, to unravel the facts and present them in a form admitting comparisons?

Such are some of the difficulties I see in the way of making the investigation successful.

The second point I am asked to consider is the methods to be employed. Now it is a statistical commonplace with which you all are familiar, that the success of any investigation is largely dependent upon the knowledge and care with which it is planned. The plan cannot be made at once, or in a few days. It cannot be handed to you by any one outside your offices. You, yourselves, must formulate it after long and careful consideration of all the conditions. You know these, as I cannot. Hence, I have no plan of the investigation to submit. It may be that in private conversation or by informal discussion, some suggestions may result from our meeting, some new points of view come to both of us, but the burden of forming a plan is yours and I dare not assume it.

Yet on this subject, also, a few suggestions may be made. The three topics should, I believe, be kept sharply distinguished in your investigation. I should prefer even to see three investigations rather than one, provided such a method is equally practicable from the administrative side. My reasons are that the technology of the three subjects is so different that different

experts would be needed, and also that the arguments regarding municipal ownership are extremely different in the various cases. Water works owned by the municipality are practically universal in Germany, are found in about half the English municipal boroughs, and are found in the great majority of our large cities. Apparently no special grant of power by the legislature is required under ordinary circumstances for the authorization of municipal water works. The right to establish them is incident to the right to safe-guard the public health. Furthermore the supplying of water does not involve so many industrial complications as the supplying of light, either by gas or electricity, and hence is better adapted for municipal management. I should suppose, also, that the difficulties in the way of ascertaining the facts would be less in the case of water works than in other cases.

If statistical investigations in this field are to reach definite results, certain units of measurement should be fixed at the start. They should be popular enough to be intelligible and accurate enough to be trustworthy. A ton of coal is a popular unit, but inaccurate, because its gas yielding power, the quality of gas, and the character of the residuals are variable elements. A thousand cubic feet of gas, presumably under the standard pressure and at the standard temperature, is another popular unit, but this unit assumes that all illuminating gas is of equal quality, a false assumption. So the investigation must begin with a determination of the best practicable units of measurement. These will not be the most scientific units, but it is to be hoped that some improvement on such popular units as those just mentioned will be found possible.

One difference I have noted between the best statistical investigations made by other countries and yours, is that in presenting their results, the European statisticians are somewhat more likely to begin with a definition of the most important terms used in the subsequent discussion, the meaning of which can be at all ambiguous. The practice is worthy of more general introduction.

In attempting to fix the cost of producing a standard gas or electric street light (and what such a standard light is would call for careful definition), it must be remembered that the cost varies not merely with the cost of the materials, but also with the number of lights, and so the cost of distribution, with the manner in which the lights are put up, with the length of the contract entered into by the city, and with the other forms of municipal or private service made possible by the contract.

The influence of municipal ownership of gas and electric lighting plants, upon the price of light and power to private consumers must be carefully investigated. The corporate interest of the municipality cannot be so separated from the sum of the individual interests of its citizens, as that an arrangement which secures cheap and good service to the municipality, but entails dear or poor service to the citizens is to be desired. The income of gas companies from municipal lighting is on the average perhaps about one-sixth of their total income from lights. It should be ascertained whether municipally owned gas works render this service to citizens as cheaply and well as private companies do.

A careful investigation of the working of private companies would seem to be the best starting point. The advantages and disadvantages of the system of private ownership as free as possible from regulation or control by governmental authority, might first be ascertained and stated. Then the various methods which have been tried for regulating or controlling these private companies in the interests of individual citizens, as consumers, or in the interests of the city itself, as a consumer, should be studied, and their effects traced so far as statistics make it possible. I think it is fair to hold that the American people have at present an aversion to governmental ventures into the industrial field, and at the same time do not believe in the results of unrestricted freedom in the field of natural monopolies. Hence the alternative is either some form of governmental control or governmental ownership.

The arguments in favor of municipal ownership, other things equal, probably increase with the size of the city.

Certainly in the case of water works in which the system of municipal ownership is most widely extended, we find that the larger the city the greater the probability that the municipality owns the works. From Census Bulletin, 100, of the last census, I learn that in 1890, of all the people in cities of over 100,000 inhabitants, about nine-tenths (89.4 per cent.) were supplied with water from municipal works. Of the people in cities of 50,000—100,000 inhabitants, about three-fourths (75.8 per cent.) were supplied by the city. Of the people in cities of 15,000—50,000 inhabitants, about three-fifths (61.3 per cent.); and of the people in cities of 10,000—15,000 inhabitants, only two-fifths (41.0 per cent.) got supplies from municipal water works. This may indicate either a difference in the arguments according to the size of the city, or that we are passing from private ownership to municipal ownership of water works, and that the transition has occurred first in the large cities where water works have been longest in existence.

This suggests a further line of investigation. The condition at the present time is of less importance than the changes now in progress. Municipally owned water works now have a history in this country, and it might be profitable to investigate that history, to ascertain when water works were introduced into each municipality, what changes in the form of ownership or administration have been introduced, and what were the causes of such changes. A similar investigation into the various forms of public control or supervision of gas and electric lighting plants would also be of much value to students of the subject.

It is possible that specialists in one or another of these fields might aid in your work, by contributing notes or suggestions, or answering questions that arise in the course of your investigations. If the investigation is to be carried on under a common plan, but with complete freedom of action on the part of each bureau, as I suppose, it might be feasible for some committee of correspondence to be arranged for, to which difficulties calling for expert knowledge might be submitted and they

might obtain the opinion of persons engaged in the business and in sympathy with the investigation. Of course the teachers of economics are not experts in any of these fields, and this suggestion is not made on their behalf.

In electric lighting plants you may frequently find both water power and coal employed, the latter to supplement the former. To separate those two sources of power will be difficult and yet necessary to the completeness of the investigation.

It is often alleged that the condition of laborers employed by a municipality is better in many ways than the condition of laborers employed by a private corporation to render the same services. This claim has been of weight in favor of the recent considerable extension of municipal functions abroad. On the other hand, it is asserted that even if the wages, the hours of labor and the conditions of employment are more attractive, the tenure of position is much less secure. Your investigation should not overlook these contentions.

In conclusion, I may venture to say that even if your results should prove to be mainly negative they will be found of value. It is certainly highly desirable that the community should know what system produces the best results, and if you should find, as you may, that no definite answer to the question can be obtained, this fact would stimulate the demand for more uniform bookkeeping by the cities and by private companies holding quasi-public franchises and might lead to legislation upon the subject.

The President: The next speaker on this subject is Edward W. Bemis, late of the University of Chicago, and now of the university of the world. I have the honor of introducing to you Professor Bemis.

ADDRESS OF PROF. EDWARD W. BEMIS.

Mr. President and Gentlemen:

Your association has asked for a paper upon the propriety of an investigation by you of municipal and private ownership of gas, electric light, and water, and more especially of the methods to be pursued in such a study. The investigation is most germane to the work of your bureaus, since the wage-worker, in whose interest you are especially working, is most deeply concerned in cheapening these necessaries of life, and equally concerned in securing such a relation to them on the part of our municipalities as will best develop civic pride and good government. Both results are likely to follow a wide dissemination of the actual facts on this much discussed subject. Further, it is only, I believe, through state bureaus organized and controlled in some measure by the forces of organized labor and the masses of the people, that a thorough publicity can be given to the facts regarding our municipal monopolies.

It might be supposed by anyone, and in fact has been supposed by the opponents of municipal ownership, that state gas commissioners, created ostensibly to regulate through publicity and supervision, would throw the necessary light upon the subject. Surely the only alternative to public ownership is the fullest publicity as a basis for wise public regulation. Publicity is also important in furnishing data from which to judge whether public or private ownership gives the best results. To that end we have in this country the most ambitious law on the subject, and the most famous commission in the world. I refer, of course, to the Massachusetts Gas and Electric Commission, now in its eleventh year. This commission, whose chairman is present to-day, will of course greatly aid you in your work, while its refusal hitherto to reveal even averages of cost of gas and electric light of companies having substantially the same output greatly emphasizes the necessity of your taking up the subject. No private investigation can take the place of a public one, since we not only need to know the facts about present city-owned monopolies, but we ought to be able to compare the

various items of cost, such as labor, salaries, raw material, etc., in these with corresponding items in private plants, of similar size or at least with the average of a few such plants. The facts for such a comparison can only be secured by a public statistical bureau that has already gained the confidence of business men by its suppression of the names of reporting corporations when it gives details. A state bureau has in other ways also a prestige that may help it in gathering information.

The easiest subject of investigation will be water works, for the business is a simple one, and in many states there is a nearly equal division between public and private management. But here, as in every other case, mistakes are easily made. Municipal book-keeping is often poorly done or does not reveal all the desired facts, while private companies are secretive. Personal visitation is absolutely essential to success. Too much emphasis cannot be placed upon this point. In all of the writer's efforts to get at the truth in these matters, he has found that even the fullest written report from an official would not dispense with the necessity of one and often several personal visits in order to observe or accidentally fall upon important points and facts that would never be secured by correspondence.

In the case of water works, such items as number of taps and gallons of water used per family, the number of hydrants, the estimated amount of total private consumption, the receipts of the same per gallon, and per family and tap, number of miles of main, sizes of main, and effect on consumption of any change from private to public ownership, will furnish data for many interesting comparisons. In all this, due regard must of course be had to comparing only where such conditions as natural difficulties in securing the water supply, cost of coal where pumping is necessary, population, etc., are nearly equal. The number of employés and their wages and salaries for similar work in public and private companies must be carefully studied, as also their permanency of tenure. Three or four items here, as in the other cases soon to be considered, may occasion difficulty.

First—Taxes. These are usually omitted from items of cost in public companies, but must of course be included in comparing with private. The average tax rate of private companies in the State per thousand gallons of water or per consumer can be computed and applied to the private companies. It will not do to apply to the cost of the public plants the local rate of taxation, since this method overlooks the customary undervaluation for taxation purposes of all property, not the least being the property of powerful corporations.

A second difficulty is the method of treating interest. The bonds of a public plant usually bear a lower rate of interest than those of a private company. The only question is whether to include in the real cost of a public plant interest on the entire cost or only on the portion still unpaid for, *i. e.*, uncovered by any existing indebtedness. It might be well to present the figures in both ways, but if a choice must be made there seems no sufficient reason for including interest on such portion of the plant as has been paid for out of net earnings.

A third and greater difficulty is a proper allowance for depreciation. Provided a plant is kept in good repair and a considerable sum, say 5 per cent. of the value of plant in the case of electric light and gas, and perhaps three in the case of water, is yearly spent on extensions and reckoned as part of the running expenses, there is usually no need of further allowance for depreciation. A more accurate but not always more practicable way is to secure from unbiased engineers estimates of the yearly depreciation of different parts of a plant, and apply those figures as depreciation instead of the amount spent for extensions. It must be borne in mind, however, that while a private company must yearly collect a depreciation fund, a public plant belonging to the taxpayer, may let this rest in the hands of the consumer, where it can be put to more profitable use until such time as it may be needed, when it can be raised by taxation.

In all the study of water works, the data in the hands of M. N. Baker, of the Engineering News, New York City, and

Prof. John R. Commons, of Syracuse University, Syracuse, N. Y., will be found invaluable.

With regard to electric light, investigation will prove more difficult, because the youth of the industry causes uncertainty on some items of depreciation and cost, but there are about 200 cities that own electric light plants, and from them, with some effort, can be secured valuable data. From W. J. Buckley's "Electric Lighting Plants: Their Cost and Operation," published in 1894, and from Prof. Frank Parson's Arena Articles in 1895, some suggestive data for this investigation can be had, although it is hardly necessary to state to this assemblage of experts that only so far as your own original investigation may confirm, should the statements of other investigators be published by you as authoritative. Let me add that valuable suggestions of the data to be sought in electric lighting will be found in the blanks sent out by the Massachusetts Gas and Electric Light Commission and in Special Schedule No. 15, of Statistics of Manufacture, Eleventh census, entitled The Electrical Industry. The latter schedule, however, was too minute, and should be used only in connection with the special report of the eleventh census on the electrical industries in the state of New York, and merely as a supplement to the schedule of the Massachusetts commission just referred to. This investigation of electrical lighting by the last census, it should be added, was found impossible of prosecution without special visitation of the cities, and as that seemed impracticable, the investigation was abandoned.

An illustration of how not to investigate may here be cited. In the Electrical Engineer for September 5, 1894, a distinguished electrical engineer compares the cost of electric light in certain New York cities under private ownership with the cost in certain other cities under public ownership, to the disadvantage of the latter, but includes in the latter list of cities Alameda, Cal., Lewiston, Me., Fairfield, Iowa, and Little Rock, Ark., where the cost of coal is probably much higher than in the New York cities. Omitting the four cities mentioned, the compari-

son shows less cost in the public than in the private managed plants.

When Dunkirk, N. Y., several years ago, constructed a public electric-light plant, she only had to add $10 a month to the wages of the firemen and engineers previously employed at the water plant, and now employed on both plants. Although it may be fair to apportion to the lighting plant such proportion of the wages of firemen and engineers as is the proportion of labor used on the electric plant, yet it is necessary to a fair judgment of such consolidated plants that all the facts be clearly stated.

Again, many public-owned plants, by reason of legal hindrances, or of the desire of the people,—at least of those owning private plants,—do not do commercial lighting, where charges are often higher than for street lighting, and hence comparison with private companies is difficult.

Many allowances must also be made for public plants in small places in view of the conclusion of the electrical engineer just quoted, that of thirty-four public plants studied by him, one-half were in places "where it is very doubtful if a private commercial plant could be made to pay under any circumstances."

In the matter of electric-light depreciation we may note the view of one of the ablest electricians in this country, Mr. Alex Dow, superintendent of the Detroit public plant. He finds the usual depreciation to be nothing on land, about 2 per cent. on buildings and iron lamp-posts, 2 to 2 1-2 on conduits, 4 per cent. on towers and arc lamps, 5 per cent. on steam machinery, foundations, etc., 7 per cent. on pole lines and overhead construction, and 10 per cent. on electrical machinery. In case of the large Detroit plant this averages only 4.75 per cent. depreciation on the entire plant.

Inasmuch as a large part of a gas or electric-light plant works nearly as well the tenth year as the first, if kept in thorough repair, and only after fifteen to twenty-five years has to be renewed, we may rightly hold that, if the average yearly

depreciation is 5 per cent., 4 per cent. a year is sufficient allowance for depreciation, for this sum left to fructify in the pockets of the taxpayer, even if worth only 4 per cent. interest to him, will enable an entire plant to be replaced at the end of twenty years.

We come now to the gas monopoly. Despite many prophecies to the contrary, the increase of electric-light has not hindered the growing use of gas, either in America or Europe. With every displacement of gas for street and office or even home there has gone an increased use of it for cooking and heating, while the introduction of the Welsbach burner and the cheapening of gas manufacture have vastly increased the demand for gas as an illuminant. When the price shall fall to 75 cents for illumination and 50 cents for fuel, as seems possible, especially after the necessity for interest payments under city ownership ceases, with the cancellation of bonded indebtedness, gas will prove as profitable in the poor man's kitchen as is coal and vastly more convenient and cleanly in preparing the early breakfast and late supper that distance of home from work requires.

Although some previous knowledge of the industry to be investigated is of aid to the investigator, he need not be an engineer in order to fill out schedules or make an all around study of the subject. Indeed, it is almost impossible to get much help from professional engineers, especially in gas, where the number of plants and consequently their importance in the business world is small. In a recent famous gas case, where a city attempted at much expense to get expert testimony as to the cost of gas-making, only one gas engineer could be secured, but several of the many who appeared for the private company admitted on the witness stand that it was not considered good form for a gas engineer to testify for a city. The head of a large gas construction company has been warned by his business associates never again to give information to the speaker of the cost of gas making or of gas apparatus. Not long ago I applied to the able editor of a large paper devoted to the gas

business for suggestions as how to persuade private companies to prove statistically the truth of their oft-repeated claim that the labor cost as much less in private-owned than in public-owned companies. The reply was to the effect that private companies did not propose to be so foolish, fearing that, even if they could prove their claim, they would thus merely stimulate public companies to greater efficiency.

In studying private and public gas works, you will naturally consider not only the cost of coal, oil, and other materials and the price of residuals, the candle power, number of consumers per mile of main and per thousand inhabitants, but also the number and pay of employés per thousand feet of coal, water, oil or mixed gas, their tenure of office, the leakage, the degree to which the works are kept up to date, and taxes, depreciation and original cost less depreciation or cost of duplication of plant by items as compared with present capitalization. It may here be mentioned that a prominent gas engineer estimates the following as the common weight and cost of laying pipe in ordinary streets where the paving is comparatively inexpensive:

Diameter of pipe.	Weight per foot.	Cost of laying per foot
2 inch	10.0 lbs	
4 inch	16.5 lbs	11.0c.
6 inch	25.0 lbs	12.5c.
8 inch	40.0 lbs	15.0c.
10 inch	50.0 lbs	18.0c.
12 inch	67.0 lbs	22.0c.
14 inch	75.0 lbs	26.0c.
16 inch	85.0 lbs	31.0c.

An American gas engineer has estimated the depreciation on a gas plant as nothing on the land, 1 1-2 per cent. on the buildings, five per cent. on street lamps, seven per cent. on machinery, apparatus and tools, eight per cent. on services and ten per cent. on meters and other property, or about four per cent. on the entire plant. If this estimate be correct, three per cent. a year of the cost of the plant invested each year at four

per cent., which would duplicate the entire plant every twenty years, would be sufficient allowance for depreciation.

No gas investigator can afford to be without John W. Field's invaluable yearly "Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland and Ireland."* The minuteness of this comparison is a model. I may be permitted to say that the analyses for 1894 and for 1895 show slightly lower labor, salary, legal, and total costs of the public companies, despite their higher candle power.

In closing, let me urge you not to undertake this investigation in your respective states unless able to give to the work the services of an unbiased investigator, not necessarily nor even preferably an engineer, but one familiar with the subject in hand, and who can be given the means to visit the typical plants selected for study. In the case of gas, most of the work will have to be done by the National Department, unless you investigate, as you well might, private-owned plants in your states, for nearly half of the few public gas plants are in Virginia, which has no state bureau of labor statistics. However, the great and typical fields of water and electric-light are open to the study of every bureau, and many of the suggestions in the latter part of this paper relative to the investigation of gas will apply equally well to water and electric-light.

The President: The next gentleman invited to address the convention on the subject under consideration is Mr. M. N. Baker, Associate Editor of the Engineering News, of New York city. Mr. Baker is not present, but he has sent his paper, and it will be read by the Secretary.

* Published by Eden, Fisher & Co., 7 Clements Lane, Lombard, E. C., London, 12s. 6d.

PAPER OF MR. M. N. BAKER.

In order to discuss intelligently the best method of investigating the municipal ownership of water, gas and electric-light plants, it seems desirable first to consider the object of these plants, more especially as to what constitutes a satisfactory service in each case, and the relation of each undertaking to municipal government.

The first object to be attained by the operation of water and lighting plants is efficient service, and the second, minimum cost to private and public consumers. There must also be considered the effect of ownership, be it public or private, or municipal administration, and on the people at large. Does either system more than the other tend to uplift or debase city government?

Let us first consider the function of water works and the measure of their efficiency. Such plants are built to supply water for domestic and industrial, or private purposes, and for fire protection, street sprinkling and sewer flushing, or public purposes. The efficiency of the service as a whole depends upon quality, quantity and pressure.

Quality is of the greatest importance, by far. It is to be considered first in its relation to health, and second, as to the fitness of water for household and manufacturing purposes. Quantity has heretofore been given much more attention than quality, so much so as to even encourage wastefulness. The amount actually needed depends on the number, character and occupation of the population, while local conditions materially effect the amount available at reasonable cost. Pressure is more easily governed than either quality or quantity. It is of great importance for adequate fire protection, but no rash conclusions should be drawn where a low pressure is found, for reliance is often placed on fire steamers. Pressure is also an element of quantity in the case of individual consumers, where a low pressure may fail to deliver water to the required elevation and thus yield but a dribbling stream from house faucets.

Cost of service is to be considered from both the private and public standpoint. How much the householders, the merchant

and the manufacturer pay for water for their own use, and how heavy is the expense upon the taxpayers for water consumed by the city. Are the rates for public and private service so adjusted in relation to each other and the total cost of the service, as to bring an undue burden upon either water consumers or taxpayers, while the burden of the other class is proportionately lightened? This is a grave danger in the case of these and other similar undertakings.

From the above it appears that the four main points which constitute the efficiency of a water-works plant, using efficiency in a broad sense, are:

(1) Quality of the water.
(2) Quantity.
(3) Pressure.
(4) Cost of service.

These are the essentials to be investigated in studying public ownership of water works, and in addition there must be considered:

(5) The relation of the water supply service in all its bearings to the city government.

Exactly the same points are involved in investigating gas and electric-lighting plants; but, of course, with some modifications of detail. Thus, water and gas may be deteriorated in quality by the admixture of foreign matter, while electricity cannot—quality here pertaining to the service as a whole. Again, the quality of water, beside being of importance in other ways, has a most marked relation to health, for water is the great disseminator of typhoid fever, being none the less pleasing to eye and palate even when carrying the typhoid bacillus. The quality of gas relates more to its illuminating powers, and although poor gas may give rise to large quantities of deleterious products of combustion, yet it does not cause fearful epidemics which lay low large portions of the population of a city.

The environments of water supply sources, analysis of the water, the experience of manufacturers, the nature and extent

of purification plants, and typhoid statistics afford means for studying the quality of water. Analysis of gas and actual measurements of the illuminating power of both gas and electric lights establish the quality of these commodities.

Quantity and pressure may be studied in obvious ways.

Cost is in many respects the most difficult element in your proposed investigation. The vagaries of book-keeping, both municipal and private, and the natural desire of private corporations to keep their financial affairs to themselves, are the first difficulties which occur to me. Next are the great divergencies in local conditions, natural and artificial, which make intelligent comparisons almost impossible. Obviously, it is not reasonable to say that because water, for instance, costs $5 per unit here and $7 there, the former place has the most efficient works. With the best possible engineering skill and management, it may cost twice as much to supply water, gas or electricity, in one town as in another. Moreover, the investigator will speedily find that unit cost is often impossible of ascertainment, through lack of records, or unreliability when records do exist. Mere schedules of rates should be compared most continuously. They are formulated on widely different plans, and often are not based on the actual consumption, but on the mere number of fixtures supplied. A high rate per fixture may be accompanied by so great a use and waste as to make the unit cost much less than at other places having a low rate per fixture. Beside this, local conditions must also be considered as affecting fixture rates as well as cost units. And still further, and of great importance, low rates are sometimes made possible in the case of municipally-owned works by having recourse to the general tax levy to make up any deficiency in revenue. On the other hand, municipal works sometimes put the whole burden of their support upon private consumers entirely relieving the taxpayer who is not a consumer of public water or light, from expenses for the provision of fire protection to his own property, or the lighting of the street in front of his house or store.

As to the effect of these undertakings upon municipal government, it can only be said here that this question involves civil service, the corruption of public servants through the opportunities afforded by municipal ownership, and through the lavish expenditure, on the other hand, of franchise companies to secure from city councilmen and other officials, valuable privileges without compensation to the municipality as a whole, it being far cheaper to pay large sums to aldermen once for a given privilege than to cover into the city treasury liberal percentages of gross receipts year after year. There is also to be considered the relative amounts of friction between consumer and provider under the two classes of ownership, and the legal questions involved under the two systems.

Having attempted the merest outline of an investigation, I find I have occupied so much time that I would be a trespasser on that of others should I go far into the details of the inquiries to be made. It does not seem to me that these can be settled here to-day. Much time and thought is necessary for the evolution of the details and forms of inquiry blanks. I shall only say, and that I urge as of the greatest importance, that the final scope of your inquiries, and also their minutest details, should be determined by those who have had experience in such work, and that an attempt be made to harmonize the character of the three proposed lines of investigation.

As to how the desired information should be secured when once its character is determined, I would suggest that the groundwork, at least, would be found in the following publications: Brown's Gas Directory, which I think has now been extended to cover electric lighting; Johnson's Electrical Directory; and the Manual of American Water Works. As editor of the latter work, I am now engaged in collecting information for a fourth edition, which will contain descriptions and statistical matter relating to the water supplies of about 3,000 cities, towns and villages in the United States. The inquiry blank, which is being used for this purpose, accompanies this paper for reference purposes.

The books named will at least furnish lists to work from, officers of the various plants, and in many, if not all cases, the ownership of the works in question. Some indication may also be found of the character and extent of the works.

As to how the desired information shall be collected and studied I must leave to my associates in this discussion, and to the body through whose courtesy I am given a hearing on this important subject. I can say that the country is being flooded with all sorts of inquiries relating to the undertakings in question, and that disappointment is in store for the investigator who expects to receive replies from more than from 20 to 35 per cent. of the inquiries which he sends out.

I would suggest for consideration:

(1) Can the special inquiries which you finally decide upon be coupled with those being made by any other investigators to mutual advantage, in so far as the information is not already available or under collection?

(2) Can the work be done, wholly or in part, by state labor organizations, subject to some central supervisory committee?

(3) Is it a more proper field of inquiry for the United States Department of Labor, especially as some states doubtless lack organizations to conduct the work, while not all the organizations in existence could or would take up such an investigation?

(4) Should not the information secured, however obtained, be compiled, or edited and discussed, by some central body, in order to bring out the salient facts for the whole country in proper relation to each other?

SCHEDULE USED FOR

The Manual of American Water-Works for 1896,

BY

THE ENGINEERING NEWS,

Tribune Building, New York,

Information regarding the Water-Works of.....

Who owns works?..... ....Changes in ownership (private to public or reverse), with date..... .....

For works built since Jan. 1, 1890. { Date put in operation .... { Name and address of designing and constructing engineer..... ....do., contractor .....

For private works only. { Provisions of franchise as to: Length....years from 18..; purchase of works by city..... .. .. Regulation of rates by the city .... Exemption from local taxation..... .... Compensation for public service .... Terms and conditions of contract supplementary to or independent of franchise, including length and date of expiration..... What legal difficulties have there been between the water company and the city? (Please state nature, date and how settled)..... ... .

Source and mode of supply?..... ... .

Pumping machinery: Make, style and daily capacity in gallons of each pump ....

Coal: Kind and average cost per 2,000 lbs. ....

Filters: Kind and daily capacity, gallons ....

Reservoirs: Designate whether impounding, storage or distributing, with location and capacity, in gallons, of each ....

Stand-pipe or tank: Material, size, capacity; character, material and dimensions of trestle or tower..... .. ..

Date last fiscal year closed.....(Please give all figures for this date as far as possible). Mains..... miles.

How is cost of extensions to mains met?..... ....

Taps or service connections: No. in use....; who taps street mains, and what fee is paid to water-works?.....

Service pipe for house connections: Material .....; who pays for same? ....

Meters: No. in use .....; who owns?.....; controls? .....; repairs?..... where consumer does not own meter, what yearly rental is charged? $.....; what classes of consumers are supplied through meters only?.....can you compel use of meters?.....; can any consumer have a meter?. .....

Remarks on meters. ....

Fire hydrants: No. in use, public..... ...; private ....

Daily water consumption, gallons: Average.....; maximum.. .. minimum.....

Remarks on consumption..... .. ..

Pressure: Ordinary.....lbs.; ....fire.....lbs.; are steam fire engines used?....

Cost of construction of works to close of fiscal year..... .. ..

Capital stock, close fiscal year { Common: Authorized, $..; paid up, $..; dividend fiscal year...% Preferred: Authorized,$..; paid up, $..; dividend guaranteed ..%

Amount of floating debt, if any, close fiscal year, with rate of interest.....

Bonded debt, close fiscal year { $.....at.....%; due.....; $.....at.....%; due..... $..... at.....%; due.....; $ ... .at.....%; due.....

Amount of sinking fund, if any, close fiscal year, how invested and rate of interest ....

Expenses, fiscal year { Operating expenses, including maintenance and repairs (not extensions), $.....; Interest, $... . ...; taxes, $.....

Revenue fiscal year, { Private consumers for metered water, $...; unmetered water, $ .. City: { Fire protection, $..... .; street sprinkling, $.....; sewer flushing, $....; public building, $....; other purposes, $..

To what extent are deficits (excess of operating expenses, maintenance, interest and sinking fund charges) met by general taxation, in the case of public works? .. ..

Name and address of: Prest....Secy....Treas.....Supt..... Ch. pump. eng'r.....

What improvements are projected and what steps have been taken towards making them?.....
Has your city a sewerage system for the removal of: Household wastes?.....
storm and surface water .....
Please send us: (1) Schedule of water rates, including meter charges now in force. (2) A copy of your last annual report, if you have not already done so. (3) A copy (in case works are owned by a company) of your franchise.
Date.....Signature.....P. O. address.....

The President: The next gentleman who was invited to address the convention is Mr. Osborne Howes, of Boston, Mass., a writer of some note. Mr. Howes was unable to be present, but he has sent his paper to the Secretary, who will read it to the convention.

PAPER OF MR. OSBORNE HOWES.

Gentlemen of the National Association of Commissioners of Labor:

In considering the question of investigating the municipal ownership of water, gas and electric-light plants, the first question to be asked is, How do these services conform to the conditions which should govern public ownership and control? In other words, are these services of a class which should on general principles be public services, and if so, why? It seems to me that one defect in our present method of reasoning on the subject is, that we have no definitely drawn line separating those services which under the best conceivable conditions properly should be, from those which should not be, public services. The test—and so far as I have been able to examine the question, the only test— to be applied is the test of monopoly. If control by means of monopoly is advantageous, then, other things being equal, public ownership and control is desirable. If, on the contrary, the best results are reached through the instrumentality of competition, then, other things being equal, no matter what the service may be, public ownership is not desirable.

This test I hold to be fundamental, and without going into an extended argument it may be said in support of it, that it has, consciously or unconsciously, determined the line of practical advance that has been made in municipal ownership in the

experience of our own and other countries, although it is quite at variance with the views held in this country by Nationalists, and on the other side of the Atlantic by Socialists. It does not require much explanation to make it evident that if a municipality, as, for example, the city of Fall River, attempted to run the various cotton mills now located within its municipal borders, the result would be not only financially disastrous, but as an outcome of the absence of the ordinary incentives of competition, the improvements in production that now may be confidently counted upon to take place as time goes on, would either not take place or would only be realized in a minor degree. On the other hand, there is good reason on the grounds of experience for thinking, that if the city of Fall River were to establish a new water supply, assuming the field had not already been occupied, it could undertake and put through the work at prices nearly if not quite as satisfactory as those which would attend the work of a private corporation, while it does not need to be said that the municipality would not take an unwarrantable advantage of its entire possession of the field, while it would realize that there might be general gains made to the municipality as a whole by the sale of water at low prices, even though these did not bring in what under the ordinary conditions of private investment would be considered a fair commercial return. The maintenance of two independent sources of water supply and the competitive distribution of water by rival companies would obviously be attended by a waste of capital, and probably in the long run, through a combination of corporate interests, by an increased charge to the consumers. It is desirable in a service such as a water supply that there should be but one system, for in this way mains and pipes of sufficient size to meet the entire demand of the municipality can be put down at much less expense and inconvenience than if two or more systems are installed, even when neither of these is adequate to supply the entire demand. This and a number of other illustrations that could be given bearing upon the economy of a single service, are so elementary that practically every one realizes their force.

But besides this economy in the larger centers of population of this country a monopoly in water supply is essential to the safety of property. The need of an extraordinary supply in the event of a great fire renders it necessary that the reservoirs and mains should be much larger than would be called for to meet the ordinary daily demands for household and manufacturing purposes. Competing water companies would rarely if ever go to the great extra cost which such increased facilities would entail. A water company which possessed a monopoly of the field might do this; but the chances are that even in such a case the provision made to meet an exceptional demand would not be adequate, and even if made it would probably be found that the interest upon the largely increased investment could not be easily collected, and if collected would be secured, wholly or in part not as it should be by a charge upon the property thus safe-guarded, but by an added tax imposed upon the takers of water.

But if, as seems necessary, for the creation of an adequate supply, and the proper allotment of the expenses of construction and maintenance, a water supply system should be a monopoly, then under the general rule I have advanced it should be a public and not a private monopoly. Speaking of local experience—that of the city of Boston—I think I am justified by experience in saying, that while the cost of constructing and maintaining small civic enterprises, or those which in their daily operation call for the employment of a large number of men, is considerably greater under public than under private or corporate control, this adverse difference is not found to exist in the case of large engineering enterprises, especially those in which the work of construction is given out to contractors.

There is, besides this, a simplicity in the problem of a water supply which differentiates it from either a gas or an electric-light service. When once it has been provided, modern invention plays but a small part in the way of reducing its cost of operation. Improvements consist in securing greater purity, in increasing the force, and in diminishing the waste of the water,

but there is apparently no way by which the processes of production can be revolutionized thereby bringing about an enormous saving in expense.

There is in the investigation of public ownership of water plants one possible source of error to be guarded against—and this doubtless holds true of gas and electric plants—that is, the disposition of municipal authorities to understate the costs of construction. An instance of this is found in our Boston experience. In the year 1876, about thirty years after the commencement of the Cochituate water works, a report was prepared by the city auditor giving the cost of the undertaking up to that date. It was therein stated that the net cost of construction, including various additions, was $13,471,812.41. As the city was at that time receiving an annual revenue from the sale of water of approximately $950,000, the inference to be drawn was that as a financial investment the works were a decided success. But having occasion at about that time to go through the municipal expenses in detail, I found that the result given above was not arrived at on the basis upon which an ordinary business investment would be figured. In other words, if the receipts of each year were deducted from the expenditures of all kinds, and an annual interest charge was computed on the sum left, instead of thirteen and half million dollars, the cost would be found to be more than forty million dollars. I found that during a series of years large appropriations were made out of the annual tax levy, to make good deficiencies in income and to pay for new construction, which apparently were ignored in the accounts, and against which no interest charge was made, as would have been the case if a corporation had raised the money and spent it for a similar purpose. It was not on the part of the city auditor an attempt to deceive, but simply an error growing out of the manner in which a city official is inclined to look upon a municipal undertaking. I would not have it inferred from this that I consider the water works owned by the city of Boston as an undesirable public undertaking. On the contrary, I think that they are worth to the city, in the advantages afforded, to say nothing about the appreciation in

the value of land acquired, all that they have cost the people. But the difference in estimates of expense that I have pointed out, in a work where the conditions are as simple as they are in procuring and maintaining a water supply, indicate the great care that has to be taken not to be misled by official statements in endeavoring to ascertain the economic advantage or disadvantage of municipal ownership.

When the field of inquiry is shifted from water to electricity or gas the problem becomes more complicated. In the two last services, particularly in the former, not only is invention constantly changing conditions, but besides this the systems of maintenance are so uncertain and varying that it is almost impossible to be sure that comparative statements of results are to be depended upon. Thus the statements of the cost of public lighting in Chicago by electricity that have been put out by the municipal authorities have been disputed by persons who have made a careful analysis of income and outgo and who, on their side, assert that the cost per light per annum is more than twice as great as the sum given by the municipal officials.

It is unquestionably true that the allowance for depreciation in the value of plant—and this with electric-lighting plants, in view of constant improvements that are being made is exceedingly large—has rarely been given its proper proportions in the statements of municipalities that have adopted this form of public lighting. Thus in the matter of extensions a different method of book-keeping has commonly been adopted by those controlling public services from that followed by private corporations. It is, I believe, the custom of the latter when the generating station and main lines have been constructed, to charge ordinary extensions and enlargements to the maintenance, and not to the construction account, a practice directly the reverse to that pursued by most of the municipalities. While argument might be made in the defence on both sides of this question, it is obvious that where a company adopts one method, and a municipality the other, a simple comparison of the costs of the respective services, which makes no allowance for these differences, is, for economic purposes, absolutely worthless.

Another factor which enters into the calculation in an electric-lighting service is the element of political control. In a public water service the number of persons employed, considering the magnitude of the investment made and the income received, is relatively small. When the plant has once been established it may almost be said, in contrast with other great public services, to run itself. But with an electric-lighting plant the conditions are entirely different. Judged of economically, success or failure may depend upon the skill and good judgment shown in conducting the enterprise. This is the case with private companies, and it may account for the variation in results obtained where the experiment of public control is attempted in different municipalities. On general principles it may be said, that where the control of a public system of electric-lighting rests in the hands of those whose appointments are due chiefly to political influences, the losses resulting from incompetency and the inefficient performance of duty, may fully equal if they do not exceed the loss, which the community not infrequently sustains in having to pay in increased charge for lights to an electric-lighting company, the interest upon bad investments, upon the money spent in purchasing the useless because duplicate property of competing companies, and upon stocks and bonds which have been issued but which represent no actual investment of capital. In a word, no investigation into this field of possible public activity will be of profit, which does not make liberal allowances for the part which good and honest business management plays in producing satisfactory results.

The question of a public gas service occupies, it seems to me, a position midway between the water supply and the electric-lighting services. It is not as simple as the former, but is far less complexed than the latter. The argument can be made in favor of a municipal gas-lighting plant that it comes more nearly than an electric-lighting plant to the classification of a service where the establishment of a monopoly is desirable. Except in the relatively few places, where the electric feed wires are placed in underground conduits, it is questionable

whether there is any special advantage in having the electric-light service of a city under a single control. Where a large area has to be covered it is more economical for an electric-light company having entire possession of the field to maintain several stations than it is to have only one large central station. Besides this every material increase in demand for light or power necessitates additional installations of dynamos and wires; hence there is not in this class of service, after a reasonable expansion has been reached, that saving in expense which commonly attends carrying on business upon a large scale. On these various accounts the merits of monopoly play a less important part in electric-lighting plants than in some other quasi-public services.

But the gas plant problem is of a different character. With this service the best results are obtainable through the creation of a monopoly. To say nothing of digging up the public highways in order to lay mains and pipes, which at a relatively slight additional expense can be constructed of sufficient size to meet all local demands by a single system, the manufacture of all of the gas needed for a large city can be carried on with greater economy at one properly located works, than if the production is sub-divided among a number of smaller establishments. Unlike an electric service, where a large part of the income received has to be paid out in the cost of production and maintenance, a large part of the income received from the sale of gas is needed to pay interest upon the money invested in the plant—the cost of manufacture being much the smaller part of the sum—hence the larger the demand, if the facilities are adequate, the less the cost of production.

Under such circumstances and the existence of a monopoly it may easily happen that the welfare of a community—so far as this is contingent upon a gas supply—will be dependent upon the public spirit shown by those in control of the service—a state of mind which is not always found in those who manage such corporations. A relatively small supply of gas sold at a high price may bring in to a gas company as much net profit as would be obtained by the sale of a large volume of gas at a

low price, and as there would be less trouble in carrying on the former class of business, the tendency of human nature to follow the line of least resistance would induce a company to follow the easier policy. This has proved to be the case in our Massachusetts experience. For several years past the gas company in the city of Lowell has sold its production at a price from 30 to 40 per cent. lower than the prices demanded by the gas companies of other cities of the state which have had equally good facilities for production and sale, depending for its profits on large production and widespread use, while in the other instances the reverse policy has been pursued. The advantage to the community in the case of Lowell is too obvious to need argument, and the method adopted is one which a public service would be much more likely to employ than a private company.

It will be seen from the foregoing that in my opinion the primary question in an investigation of this kind is whether the best results are to be secured by monopoly or by competition, and that in the event of the latter alternative municipal ownership is undesirable. Assuming the general advantages of a monopoly, then while municipal ownership and control should be desirable, it may easily be that local conditions stand as a barrier in the way. It is with municipalities as with individuals, no two are exactly alike. One man may undertake a great enterprise and by foresight, judgment, economy and industry make an unqualified success. Another man, undertaking the same work and with the same opportunities, would end in financial failure. It is impossible to lay down any general rule to be applied to specific cases, and yet every person at this conference must from his own experience know of communities where public enterprises upon a large scale might be judiciously undertaken, and, on the other hand, must know of other communities where the local political conditions are such that any great public work undertaken would almost inevitably entail twice the cost that would come from similar operations if carried on under the direction of a private individual. This and the tendency in official reports to minimize actual expendi-

tures are circumstances which must qualify what might otherwise be obvious conclusions.

The President: Before declaring the question open for general discussion, the chair would like to have the privilege of calling upon two or three gentlemen not connected with the association, but who have given the matter under consideration a great deal of attention, and I would ask Hon. James W. Latta, Secretary of Internal Affairs of Pennsylvania, and ex-officio head of the Bureau of Industrial Statistics of that state, to favor us with some remarks on the subject of municipal ownership.

REMARKS OF HON. JAMES W. LATTA.

Mr. President and Gentlemen:

I am somewhat astonished at being presented to an audience of scientific people as a gas and water expert. I am for the first time informed that I have given this subject a great deal of attention. I can say with much satisfaction that I have learned a vast deal about it this morning, and have been very greatly instructed by the information that has been given to this convention by the able gentlemen who have appeared here to-day, and I am sure that much good will come to the members of this body from this discussion. I have been forcibly impressed, in looking at the portraits which adorn these walls, with the fact that all of the Speakers of the New York Assembly (whom I believe these portraits represent), from the Bald Eagle of Westchester, yonder, all the way around to the latest incumbent of that honorable position, exhibit a remarkable unanimity in the wearing of a moustache. If there be that much unanimity in the opinions of the members of this convention on the subject of the municipal ownership of water, gas, and electric-light plants, there is no necessity of putting an injunction upon the convention that it shall not take one side or the other of the question.

In our city of Philadelphia there has been much discussion in recent years in regard to the water supply. I am told that in a recent paper read in the Engineers' Club of Philadelphia, the

question was raised as to whether is was better to have a source that was pure or to purify the water after it left a source that was impure, and one of the gentlemen present, in discussing the matter, stated that he preferred a pure source to filtration, because he believed in innocence rather than repentance. (Laughter.) I suppose that there is less trouble in securing a pure source and in purifying from an impure source in the case of water than in that of gas, because I fancy that the manufacture of gas, to satisfy the consumer, is almost wholly dependent upon how well the purification shall succeed, for gas at the commencement is a very dirty product, and when it gets to be an illuminant the object of the manufacturer and the hope of the consumer is that very much of that dirt and impurity shall be removed and that the gas shall be clean and pure in order to give satisfaction to those who use and consume it. As has been remarked here, the city of Philadelphia, which has been my home since the day of my birth, owns its gas plant. For a long time the cry in that city used to be for "dollar" gas; for a long time the city of Philadelphia was weighted under the load of gas at $1.80 per 1,000 feet. Now the consumer has reached the goal and acme of his hopes, and Philadelphia supplies its people with gas at $1.00 per 1,000 feet. I was surprised to learn in the city of Washington the other day, where the debate on gas was under way in the Senate of the United States, that we did not have the purest gas in the world, if we did have pretty nearly the cheapest. I suppose Philadelphia was the first city to begin the public manufacture of gas in this country. I do not know whether that is a fact, but it is nearly so. I think in 1796 the question was first agitated there in a small way of the use of gas in halls, theaters, and auditoriums,—what few there were,—and the first private house that ever had gas introduced into it as a matter of private consumption was situated in the city of Philadelphia. This was about 1816. Some of the scientific people of that good old town of ours very persistently and very imperiously commanded the authorities to have nothing to do with the product at all. The most learned men —men of scientific attainments, men of legal attainments, and

men of all professions—signed a protest as late as 1835, in which they urged the people to have no dealings with the gas producers. However, from 1796 up to that time there had been a persistent outcry against municipal ownership, and private, too. It was claimed that gas was as ignitable as gunpowder, and equally as dangerous, and as fatal in its effects. But eventually a gas works was built by subscription, with the option that it might be purchased after a certain number of years had gone by, and I think in 1841 the gas plant of Philadelphia passed into public control, and has been so from that time until now.

The water supply of Philadelphia, when the pump and the well were passing into oblivion for larger communities, found its source of power in the overshot wheel. Then public ownership was almost immediately assumed, and the creation of a loan for this purpose was ordered as early as 1799. It was a non-paying, unresultful operation at first, I think. It cost about $500,000, and it had about 2,000 consumers or renters. The expenses of its maintenance alone, without making any provisions for the interest on the capital invested, was about $10,000 per annum more than the receipts; but it has been a successful enterprise for many years, and it now realizes a handsome income for the city. It is impossible, I suppose, without a good deal more of detail than we are able to secure at the present time, to state just what financial advantages the citizens of Philadelphia receive from the municipal control of our water works; but I think it is a fair estimate to say that the service that costs the consumer in Philadelphia $15.00 per annum would cost the consumer who lives in a town where the enterprise is conducted by private parties about twice that amount, and I do not suppose we can ask anything better than that at the present time.

The question of electric-lighting is one that is creating a good deal of stir in our city at the present time. We had great deal of agitation of that subject in our legislature a year ago, and I suppose we are likely to have agitation on that and other questions as long as men are in competition with each other.

There was no trouble in regard to these matters in the olden time because such enterprises did not exist to the extent they do to-day, and besides there was not very much capital seeking investment. Capital is seeking opportunity for investment now, and when more of it gets into active use, business will be in better shape; but we have been very successful in our end of the state under the condition of affairs as they now prevail. (Applause.)

The President: Prof. John R. Commons, of the University of Syracuse, is with us to-day, and as he has given the subject of municipal ownership a great deal of study, I am sure the convention will be pleased to hear from him.

REMARKS OF PROF. JOHN R. COMMONS.

Mr. President and Gentlemen: I thank you for your kind invitation to address you. I will not say very much, for I can add but little to what has been said. There is only one of the industries under discussion here to-day that I have investigated to any extent. I have paid considerable attention to water works in Indiana and in New York state, and I will make a few remarks on that particular industry, although I do not know that what I may say will prove worthy of your consideration. There is one point upon which I might touch, that has not been mentioned here, and that relates to the starting-point of an investigation of this kind. It has been said here, and in the meeting yesterday especially, that your business as statisticians is to deal solely with facts, and that you have nothing to do with theory. Back of this question of public and private ownership is a theory upon which you must throw light, and that is the problem I am interested in,—what light will a statistical investigation, properly conducted, throw upon certain principles of public economy? For example, these three industries which you take up here are industries in which there is a distributing plant going into the homes and families of the community. These industries, therefore, are to be looked upon, not as ordinary private industries, but as co-operative business of the consumers. The municipal feature being introduced into the

operation of these industries, they must not be conducted as private corporations would be, with the idea of balancing cost and receipts and getting a net result; but the municipality takes them up as the representative of all the consumers,—the homes, the families of the people. So there is a very vital difference, and that difference must be worked out by directing the investigation along fruitful lines. It would have a bearing on the question of interest and of taxes. For example, I found in Indiana a number of small cities and towns which have recently put in municipal water works, and they have from the first adopted the policy of paying the interest and sinking fund out of the taxes of the community, and allowing the receipts from the consumers to meet only the running and operating expenses, paying fixed charges out of the taxes. They seem to take that as a matter of course. Unconsciously, without any elaboration of theories, they had adopted the principle that a water works plant is an agency of the consumers, the working people, not the property owners, but all the people of the community, to furnish a vital necessity. That is the reason why, as a city increases in size, it becomes necessary for the municipality to take over the water works plant. The city of Syracuse, where I reside, has now reached a population of 120,000, and within the last two years the municipality has been compelled to take over the private plant, after considerable litigation. One line of investigation that ought to be carried out, it seems to me, would be to take all these particular localities where they have had at one time private plants and these have been transferred to the municipality, and investigate those plants historically. The city of Syracuse would be an excellent example. I and my students have been working on that to some extent, and the results are very striking indeed,—taking up the various items which the speakers have mentioned here as points for the main investigation. So the question of taxes and the question of interest must be looked upon from that standpoint. I am not prepared to say that I know just what direct bearing that would have on your investigation; but this I do say, that your statistical investigations ought to bring out those facts which would enable us

theorists to reach some conclusion on this very important subject.

While listening to your discussion I made a few notes, and perhaps I may be allowed to dwell for a few minutes on one or two of them. There is first the question of consumption and the extension of mains. For example, in Syracuse, when the municipal plant was acquired they immediately extended the mains into all outlying suburban districts, placing them in all the localities where the people had formerly depended upon wells and cisterns, and that has brought about certain results outside of what I suppose is the legitimate scope of your inquiry, namely, the effect of an undertaking of that kind upon values of property in the municipality, of land values in the suburbs, and the effect upon the building of houses. It has greatly stimulated the building of houses, and it has influenced the rates of insurance. This latter point, the rates of insurance before and after municipal ownership,—a comparison of rates of insurance in different localities under these different conditions,—is of great importance, and it seems to me should be considered by you.

As to the method of investigation, I believe Professor Bemis is perfectly right in saying that it requires a personal investigation of each plant. I have been compelled to depend upon Baker's Water Works Manual and such slight personal investigation as I and my students could make. The results are not satisfactory, as you of course know, but this seems to me to be the proper way, and as you have asked me to give suggestions, I should say, with my experience as a statistical investigator, that the proper way would be for these different subjects to be divided up amongst the different bureaus or commissions. It would be quite proper for the National Department of Labor to take the gas industry in this country and to make the investigation in foreign countries, which certainly ought to be added to the contribution on this subject. Let the National Department take the gas industry, and I believe there is but one state where it would be possible to secure any practical results of electric-lighting under private management, and that is Massa-

chusetts, and that by virtue only of the fact that Massachusetts has a commission which is already legally empowered to secure the information from electric-lighting companies; but even there the electric-lighting plants under municipal control have not been in operation long enough to furnish good results. An investigation of electric-lighting in Massachusetts would be more valuable than in any other state, if my observation is correct. The water works plants should be investigated by each of the bureaus in its own state. That is a simple problem. It is one which would furnish a criterion for future investigations of gas and electric-light as to the methods and as to the principles of co-operation of consumers. It would bring out the theoretical principles adequately, and it does not require expert capacity on the part of special agents. It can be carried out to great advantage by each bureau. It seems to me, in view of the present equipment of the various bureaus, that the three lines of investigation I have indicated are the most fruitful.

I thank you for your attention.

The President: We are exceedingly fortunate in having present with us this morning, a gentleman connected with the only commission in the United States raised by law for the control of gas and electric-lighting. I take pleasure in introducing to you Hon. F. E. Barker, Chairman of the Board of Gas and Electric-Light Commissioners of Massachusetts.

MR. BARKER.

Mr. Chairman and Gentlemen of the Association:

I hardly think I am ready to speak on this subject at this time and in this place. I am very glad to be here, and have listened with much interest to the papers and the discussion upon this topic, but have not prepared myself to talk upon it. Your president, whom I have had the pleasure of knowing for some years, and who comes from the same state, being in a position to realize how little I know about statistics and statistical methods, gave me an invitation to attend this convention to see, I suppose, if I could learn something, and I have come

more to indulge that hope than to assist you in matters with which you are all so familiar.

The subject has been so ably presented in the opening paper and the ground has been gone over so thoroughly that I could in any event add but little.

Moreover, I have heard the merits and demerits of municipal ownership and control so much discussed, and have given this particular topic so much study that I fear it would be nearly impossible for me to speak upon it without the risk of being called down by your vigilant president for some apparent effort to argue in favor of one side or the other of this impotant question. I have found the subject exceedingly interesting, and there is so much to be said upon both sides that I have not yet ventured to take any positive position upon one side or the other, so that if I seem to do so now it must be only seeming.

Having for ten years had to do with the gathering of statistics relating to gas and electric-lighting companies, the dissemination of information about them and the burden of governmental regulation of them, I cannot help thinking that such an investigation as you are now considering would be likely to present serious difficulties. I am confident, however, that such an inquiry, intelligently and successfully prosecuted, would prove of substantial public advantage. Few, if any, subjects of equal importance seem to me so lacking in reliable and detailed data. This is due in part, I believe, to the fact that even the parties engaged in the business do not themselves possess the necessary material. The gas business, up to a comparatively recent period, has been an extremely profitable one. Strict economies of administration were of minor importance, and the necessity for a rigidly accurate system of accounts was therefore but little felt. Although the companies in our own state are among the oldest in the country, the general condition of their accounts when first we began to scrutinize and deal with them, greatly surprised us. A uniform system of accounts is of the highest importance in statistical work, and it may be doubted whether reliable statistics are possible without it. We have succeeded in a great measure in securing this among the gas companies of

Massachusetts, and while I know that many companies outside of our own state have adopted our system of accounts, there is yet, according to my own observation, great lack of uniformity not only through the country at large, but within the limits of single states. The fact that the business has come to be much less profitable than formerly has imposed upon the managers a desire to compare among themselves reliable data, and to this end to seek uniformity of accounts and records, so that the present tendency is strongly in that direction.

The fact that without legislation in your respective states to assist you, the information from private corporations must be entirely voluntary may prove a serious difficulty even where the managers possess accurate and reliable data. The condition of their business and the welfare of their companies may seem to them to make it inexpedient or against their interests to publicly exhibit the information. I have found it necessary to cultivate to some extent the acquaintance of engineers, and to study the workings of many plants throughout the country, but I have found managers, especially in the larger cities, reluctant to disclose even the annual output of their companies. The reason for this, of course, is found in the natural reluctance of business men to exhibit their private affairs, and in the fear that any information may be used to the injury of their corporation, either in the encouragement of a rival enterprise or in some of their other relations with the municipality. The Massachusetts law, which compels companies to exhibit exhaustive data, seems to recognize that this fear has some foundation, because it couples with the power to collect data, the power to protect a company against unreasonable exactions by the municipality and to preserve its territory against the inroads of rival concerns if the board to which the information is given deems such a course to be in harmony with the public interest.

If an attempt be made to collect information respecting the electric-lighting business, one difficulty peculiar to that, I think, will be the failure of the managers to utilize in their records and accounts any common standard or unit. The English Board of Trade some years ago established as a unit for the

measurement of electrical output the kilowatt of energy, or the kilowatt hour, but the use of this, although the best term known, according to my observation, has not been generally adopted in this country. Indeed, I am of the opinion that very few electric-lighting companies make an attempt to determine the quantity of their output except as measured by the dollars which they receive. The gas companies have their unit in the thousand feet of gas, the whole management of the business revolves around that unit, and in well-managed works a careful record of the make and output is kept. Such methods, however, have rarely been adopted by the electric-light companies. Even in our own state we have been unable to secure the keeping of such records by the electric-light companies, over which we have supervision, and we have only just succeeded, after three years of effort, in securing legislative authority to compel such records to be kept, the effort for such authority having been opposed by the companies, who feared it might be against their interests.

Although the unit of output and manufacture in the gas business is well understood and generally adopted throughout the country, other units, such as the ton of coal, the chaldron of coke and the barrel of tar, differ widely in different localities. The ton of coal might seem to be a term of precision, but it varies in different works by nearly 12 per cent., some reckoning the short ton, others the long ton, while in some of the Central and Western states the companies do not reckon coal by the ton at all, but by the bushel. I have found engineers unable to answer the inquiry as to how many of their bushels it would take to make a ton; the question was new to them.

I think too much stress cannot be laid upon the importance of having this information gathered, if it be gathered at all, by persons who are familiar with the business to be investigated, or at least that the bureau under whose immediate supervision the information is gathered may have the active assistance of such persons. No collection of data would be complete without some attention to the matter of depreciation and a consideration of what is a proper charge for this item. It is certainly a part of the cost of operation as much as either coal or

labor, but it is one that is often overlooked, not only by the municipal authorities, but by the companies, and is one about which engineers and managers have only limited data and widely differing opinions. Depreciation should not only account for the actual deterioration of the apparatus due to its use, but should include the reduction in the market price of apparatus, and the loss upon apparatus which becomes commercially useless through the progress of the art, as well as those appliances which may become valueless not because they are worn out or out of date, but because the growth of the business in that particular locality makes it no longer economical to use them and, although in condition to do the work for which they were originally designed, nevertheless become practically useless through the necessity for a reconstruction or rearrangement of the works to meet new conditions. Charges for depreciation by different managers will usually depend upon their view of the relative importance of these items and upon the degree of profit which the business brings.

I ought, perhaps to apologize, Mr. President, for the rambling way in which I have made these suggestions through lack of previous preparation. I am sure this discussion will be of public interest and advantage. I hope to have the pleasure of conferring more directly with some of the gentlemen whom I see here and whom I have known heretofore only through correspondence, and I shall be very glad to give the association and its members, individually or collectively, any information or assistance in my power in a matter of such interest and importance as you are now considering.

The President: The Treasurer of the American Statistical Association, to which I believe many of you belong, is present, and has consented to make a few remarks on one feature of our proposed investigation. I have the pleasure of introducing to the convention, Mr. John S. Clark, Treasurer of the American Statistical Association.

REMARKS OF MR. JOHN S. CLARK.

Mr. President and Gentlemen:

I feel, in rising before such an audience as this, very much as Mr. Mark Twain did on one occasion, when he was called upon to address an association on a subject of which he knew nothing; he thought he could speak from an unprejudiced standpoint, inasmuch as he knew nothing about the subject!

While I am not particularly conversant with the details of your subject, it is one that interests me profoundly, particularly in its broad relation to social well-being. Those of us who are studying the broad social questions of the day, see vast aggregations of people coming under new urban conditions so characteristic of our time, and see that when men come together in these large aggregations, new issues at once confront them,—social issues of the utmost importance. These questions which you are discussing,—the question of water supply and also the illumination of great municipalities,—are not merely questions of immediate physical convenience, of bringing water into the houses so that it may be drawn by means of a faucet and providing an illuminant so that it may be had by turning a screw; they are questions which seriously affect the social well-being of the citizens of those towns or cities and of the nation as a whole. The time has been when the minority of the people lived massed in towns (small towns at that) and the majority under rural conditions. The case is rapidly becoming reversed. We cannot much longer look to genuine country life for the nation's vigor. It behooves us to watch and work for the improvement of urban conditions; to make city life itself thoroughly wholesome and healthy, if we want to keep a sound physical basis for the national life. This question of water supply and illumination has a great influence on the physical health which underlies mental and moral vigor in our great municipalities. As Professor Bemis and Professor Commons have said, it is necessary to look into individual cases in order to get all the bearings of this important question,—the effect the extension of water mains have on the value of property in

various parts of a municipality, the effect upon the health of the inhabitants, all these things are essential parts of the main question and interests us according to the standpoint from which we look at the subject. I have chosen this line of thought, because, as a citizen visiting your association, I feel that this question of water supply and illumination are important to the social well-being. Can those necessities be best supplied by private corporations? I take it that if it can be shown that private corporations can supply our municipalities with water and illumination of the best quality at the cost of 4 or 5 per cent. on the investment necessary for carrying on the enterprises, there will be very little agitation looking to a correction of any abuses that may occur; for we see that when we want to borrow money for municipal purposes on municipal credit, we can get the money for from 3 to 5 per cent., or in extreme cases for 6 per cent. If I remember rightly, Professor Bemis has called down upon his head some very emphatic blessings because he has rather doubted the contention that the private supply of these necessities could *not* be secured at a cost of 3 or 4 per cent. The great question before you, as to how municipalities can best be supplied with these necessities and at the cheapest cost, is one in which we are all intensely interested. I do not suppose that if it can be shown that they can be supplied more cheaply and economically through private enterprise than under the direction of the municipalities there would be anybody disposed to question that line of policy. What you want, and what we all want, is to get the best service at a reasonable cost.

LABOR LAWS OF MAINE

LABOR LAWS OF MAINE.

Act Establishing the Bureau of Industrial and Labor Statistics, as Amended.

SECT. 1. There is hereby established a separate and distinct department, which shall be called the Bureau of Industrial and Labor Statistics.

SECT. 2. It shall be the duty of this department to collect, assort, systematize, and present in annual reports to the Governor, to be by him transmitted biennially to the legislature, statistical details, relating to all departments of labor in the State, especially in its relations to the commercial, industrial, social, educational and sanitary condition of the laboring people; and to the permanent prosperity of the productive industries of the State, and also to inquire into the immediate cause of strikes, lockouts or other disturbances of the relations between employers and employes.

SECT. 3. The Governor shall, with the advice and consent of the Council, appoint immediately after this act goes into effect, and thereafter biennially, on the first Wednesday in February, some suitable person, who is identified with the industrial and labor interests, and who shall be designated commissioner of industrial and labor statistics, with an office in such place as shall be designated by the Governor.

SECT. 4. The commissioner herein named, shall receive an annual salary of fifteen hundred dollars, and to aid in carrying out the provisions of this act, said commissioner is hereby authorized to employ such assistance and incur such expense, not exceeding two thousand dollars per annum, as shall be necessary to carry out the provisions of this act.

SECT. 5. The commissioner shall have power to take and preserve evidence, examine witnesses under oath, and administer the same and in discharge of his duty, may enter any public institution of the State, and at reasonable hours when open for business, any factory, workshop, mine or other place where labor may be employed.

SECT. 6. All State, county, city and town officers are hereby directed to furnish to said commissioner upon his request, all statistical information in reference to labor and labor industries, which shall be in their possession as such officers and said commissioner shall cause to be published and circulated in this State six thousand copies annually of the results of its labors, as to the objects for which commission is created.

SECT. 7. There is hereby appropriated out of any money remaining in the State treasury the sum of seven thousand dollars for the ensuing two years for the purpose of carrying out the provisions of this act; the commissioner herein named shall receive his salary in quarterly installments, and the expenses of the bureau shall be paid on the vouchers presented by the commissioner, after the same shall have been audited and approved by the Governor and Council.

An Act to Regulate the Hours of Labor and the Employment of Women and Children.

SECT. 1. No female minor under eighteen years of age, no male minor under sixteen years of age, and no woman shall be employed in laboring in any manufacturing or mechanical establishment in this State more than ten hours in any one day, except when it is necessary to make repairs to prevent the interruption of the ordinary running of the machinery, or when a different apportionment of the hours of labor is made for the sole purpose of making a shorter day's work for one day of the week; and in no case shall the hours of labor exceed sixty in a week; and no male person sixteen years and over shall be so employed as above more than ten hours a day during minority,

unless he voluntarily contracts to do so with the consent of his parents, or one of them, if any, or guardian, and in such case he shall receive extra compensation for his services; provided, however, any female of eighteen years of age or over may lawfully contract for such labor for any number of hours in excess of ten hours per day, not exceeding six hours in any one week or sixty hours in any one year, receiving additional compensation therefor; but during her minority the consent of her paents, or one of them, or guardian, shall first be obtained.

SECT. 2. Every employer shall post in a conspicuous place in every room where such persons are employed a notice, printed in plain, large type, stating the number of hours' work required of them on each day of the week, the exact time for commencing work in the morning, stopping at noon for dinner, commencing after dinner, and stopping at night; the form of such printed notice shall be furnished by the deputy commissioner of labor hereafter named, and shall be approved by the attorney general; and the employment of any such person for a longer time in any day than that so stated shall be deemed a violation of section one, unless it appears that such employment is to make up for time lost on some previous day of the same week, in consequence of the stopping of machinery upon which such person was employed or dependent for employment.

SECT. 3. Whoever, either for himself, or as superintendent, overseer, or agent for another, employs or has in his employment any person in violation of the provisions of section one, and every parent or guardian who permits any minor to be so employed, shall be punished by a fine of not less than twenty-five dollars nor more than fifty dollars for each offense. A certificate of the age of a minor made by him and by his parent or guardian at the time of his employment shall be conclusive evidence of his age in behalf of the hirer, upon any prosecution for a violation of the provisions of section one. Whosoever falsely makes and utters such a certificate with an intention to evade the provisions of this act shall be subject to a fine of one hundred dollars.

SECT. 4. It shall be lawful for any person, firm or corporation engaged in any manufacturing or mechanical business to contract with adult or minor employes to give one week's notice of intention on such employe's part to quit such employment under a penalty of forfeiture of one week's wages. In such case the employer shall be required to give a like notice of intention to discharge the employe; and on failure shall pay to such employe a sum equal to one week's wages. No such forfeiture shall be enforced when the leaving or discharge of the employe is for a reasonable cause. Provided, however, the enforcement of the penalty aforesaid shall not prevent either party from recovering damages for a breach of the contract of hire.

SECT. 5. No child under twelve years of age shall be employed in any manufacturing or mechanical establishment in this State. Whoever, either for himself, or as superintendent, overseer or agent of another, employs or has in his employment any child in violation of the provisions of this section, and every parent or guardian who permits any child to be so employed, shall be punished by a fine of not less than twenty-five nor more than fifty dollars for each offense.

SECT. 6. No child under fifteen years of age shall be employed in any manufacturing or mechanical establishment in this State except during vacations of the public schools in the city or town in which he resides, unless, during the year next preceding the time of such employment he has for at least sixteen weeks attended some public or private school, eight weeks of which shall be continuous; nor shall such employment continue unless such child in each and every year attends some public or private school for at least sixteen weeks, and no child shall be so employed who does not present a certificate made under or by the direction of the school committee, superintendent of the public schools, or the teacher of a private school, that such child has so attended school. And it shall be the duty of such committee, superintendent or teacher to furnish such a certificate in accordance with the fact, upon request and without

charge. Provided, that this section shall not take effect until January one, eighteen hundred and eighty-eight.

SECT. 7. Any parent or guardian who procures a child to be employed contrary to section six, and any corporation, owner, superintendent, or agent of the owner of such establishment violating the provisions of said section, shall forfeit the sum of one hundred dollars, one-half to the use of the county and one-half to the use of the city or town where the offense is committed. Money so recovered to the use of the city or town shall be added to its school money. It shall be the duties of the school committees and superintendent of public schools to inquire into violations of said section, and report the same to the county attorney, who shall prosecute therefor.

SECT. 8. Every owner, superintendent or overseer of any such manufacturing or mechanical establishment shall require and keep on file a certificate of the age and place of birth of every child under sixteen years of age employed therein, so long as such child is so employed, which certificate shall also state in the case of a child under fifteen years of age the amount of his school attendance during the year next preceding such employment. Said certificate shall be signed by a member of the school committee of the place where such attendance has been had, or by some one authorized by such committee; and the form of said certificate shall be furnished by the State superintendent of schools, and shall be approved by the attorney general. The deputy commissioner of labor hereinafter named, or either of his assistants, may demand the names of the children under sixteen years employed in such establishment, in the several cities and towns of the State, and may require that the certificates of age and school attendance prescribed in this section shall be produced for his inspection, and a failure to produce the same shall be *prima facie* evidence that the employment of such child is illegal.

SECT. 9. The governor, by and with the advise and consent of the council, shall appoint a deputy commissioner of labor, at a salary of one thousand dollars a year, who shall hold office for two years, or until his successor is appointed, unless sooner

removed. It shall be the duty of the deputy commissioner of labor to inquire into any violations of this act, and also to assist in the collection of statistics and other information which may be required for the use of the bureau of industrial and labor statistics; and said deputy commissioner, shall, in addition to his salary provided by law, be allowed his reasonable expenses. Whenever the governor of this state shall be satisfied the deputy commissioner of labor cannot perform all the duties of his said office required by this section, in person, he shall, with the advice and consent of the council, appoint a sufficient number of assistant deputies to assist him in so doing. Said assistants shall hold their office for the term of two years, and act under the direction of said deputy commissioner of labor, and shall receive the sum of two dollars per day and reasonable expenses while actually engaged in duty. Said assistants may, at any time, be removed for cause by the governor. All bills for the expenses of the deputy commissioner of labor, and for the services and expenses of such assistant deputies, shall be audited by the council. For the purpose of inquiring into any violation of the provisions of this act, and enforcing the penalties thereof, such deputy commissioner and assistants may, at all reasonable times, enter any manufacturing or mechanical establishment and make investigation concerning such violations. Such investigation shall be conducted with as little interruption as possible to the prosecution of the business of such establishment. Whoever interferes with said deputy commissioner or his assistants in the performance of their duties as prescribed in this act shall be fined fifty dollars.

SECT. 10. Nothing in this act shall apply to any manufacturing establishment or business, the materials and product of which are perishable, and require immediate labor thereon to prevent decay thereof or damage thereto.

An Act to Change the Official Title of the Deputy Commissioner of Labor.

SECT. 1. The official title of the officer now known as the deputy commissioner of labor is hereby changed to inspector of factories, workshops, mines and quarries.

SECT. 2. Chapter one hundred and thirty-nine of the public laws of eighteen hundred eighty-seven, is hereby amended by striking out the words, "deputy commissioner of labor," wherever they occur in said chapter, and inserting in their place the words 'inspector of factories, workshops, mines and quarries.'

An Act to Provide for the Fortnightly Payment of Wages.

SECT. 1. Every manufacturing, mining, quarrying, stone-cutting, mercantile, horse railroad, telegraph, telephone and municipal corporation, and every incorporated express and water company, any person or firm engaged in any of the above specified kinds of business, having in their employ more than ten persons, shall pay fortnightly each and every employe engaged in its business, the wages earned by such employe to within eight days of the date of said payment; provided, however, that if at any time of payment, any employe shall be absent from his regular place of labor, he shall be entitled to said payment at any time thereafter on demand.

SECT. 2. Any corporation violating any of the provisions of this act, shall be punished by a fine not less than ten nor more than twenty-five dollars on each complaint under which it is convicted, provided, complaint for such violation is made within thirty days from the date thereof.

SECT. 3. When a corporation against which a complaint is made under this act, fails to appear after being duly served with process, its default shall be recorded, the allegations in the complaint taken to be true, and judgment rendered accordingly.

SECT. 4. When judgment is rendered upon any such complaint against a corporation, the court may issue a warrant of

distress to compel the payment of the penalty prescribed by law, together with costs and interest.

SECT. 5. The provisions of this act shall not apply to municipal officers whose services are paid for by the day, or to teachers employed by municipal corporations.

SECT. 6. This act shall take effect May one, eighteen hundred and eighty-seven.

An Act Authorizing and Requiring the Inspector of Factories, Workshops, Mines and Quarries to enforce the Laws Relating to Fortnightly Payments, Sanitary Conditions of Factories, and to Require Him to Report Annually.

SECT. 1. It shall be the duty of the inspector of factories, workshops, mines and quarries, upon complaint, to inquire into, and prosecute for, any violations of chapter one hundred and thirty-four of the public laws of eighteen hundred and eighty-seven.

SECT. 2. It shall be the duty of the inspector of factories, workshops, mines and quarries to examine into the sanitary condition of factories, workshops, mines and quarries, and when any condition or thing is found that, in his opinion, endangers the health or lives of the employes he shall notify the local board of health, and it shall be the duty of said board to investigate the matter.

SECT. 3. It shall be the duty of the inspector of factories, workshops, mines and quarries to enforce the due observance of sections twenty-five and twenty-six of chapter twenty-six of the revised statutes, relating to the swinging of doors in all factories and workshops.

SECT. 4. The inspector of factories, workshops, mines and quarries shall, on or before the first day of December annually, submit his report to the commissioner of industrial and labor statistics which shall be incorporated in, and printed with the annual report of the bureau of industrial and labor statistics.

SECT. 5. All acts and parts of acts inconsistent herewith, are hereby repealed.

SECT. 6. This act shall take effect when approved.

An Act Relating to Employment of Labor, as Amended in 1891.

Any employer, employe, or other person, who by threats of injury, intimidation or force, alone or in combination with others, prevents any person from entering into, continuing in or leaving the employment of any person, firm or corporation, shall be punished by imprisonment not more than two years, or by fine not exceeding five hundred dollars.

Labor's Holiday.

The first Monday in September of each year, being the day celebrated and known as labor's holiday, is hereby made a legal public holiday, to all intents and purposes, in the same manner as Thanksgiving, Fast and Christmas days, the twenty-second day of February, the thirtieth day of May and the fourth day of July, are now by law made public holidays.

REPORT

of the

Inspector of Factories, Workshops,

Mines and Quarries.

STATE OF MAINE.

OFFICE OF INSPECTOR OF FACTORIES,
WORKSHOPS, MINES AND QUARRIES,
OLD ORCHARD, December 1, 1896.

To Hon. Samuel W. Matthews, Commissioner of Industrial and Labor Statistics:

In compliance with the requirements of an act of the legislature, approved March 29, 1893, directing the Inspector of Factories, Workshops, Mines and Quarries to make a report to the Commissioner of Industrial and Labor Statistics on or before December first annually, I have the honor to herewith submit my fourth annual report.

Very respectfully,

RICHARD F. CHALK,

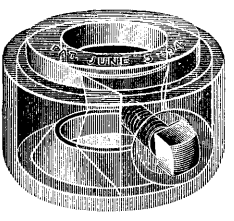
Inspector.

INTRODUCTION.

The work of the Inspector of Factories in 1896 has been of a more practical character than that of any preceding year. The business depression throughout the country and the stringent condition of our banks caused many manufacturing concerns to be at times hard pressed. This caused a failure of quite a number to comply with the fortnightly payment law. This cause not being known by a large part of employes they took recourse to the law and entered many complaints which were all satisfactorily settled. The small appropriation of $500 for expenses was largely used in settling these matters which detracted from the work of inspection. While we have no special law governing dangerous machinery, elevators and fire escapes, which the Inspector can invoke, he finds a marked improvement over former years. There is a decided change in the employment of children in cotton and woolen mills, and an effort to procure older help is continually going on.

DANGEROUS MACHINERY.

It is the duty of every manufacturer or operator of factories and mills to throw around their employes every safeguard of protection. One of the most dangerous and objectionable things upon our machinery is the projecting set screw. However trifling it may appear, fatal and disastrous accidents have happened on dangerous set collars. This can be avoided by the use of one of the many devices upon the market.



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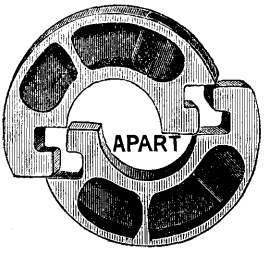

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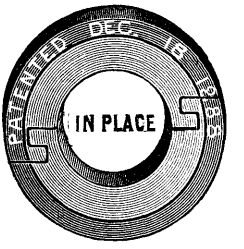

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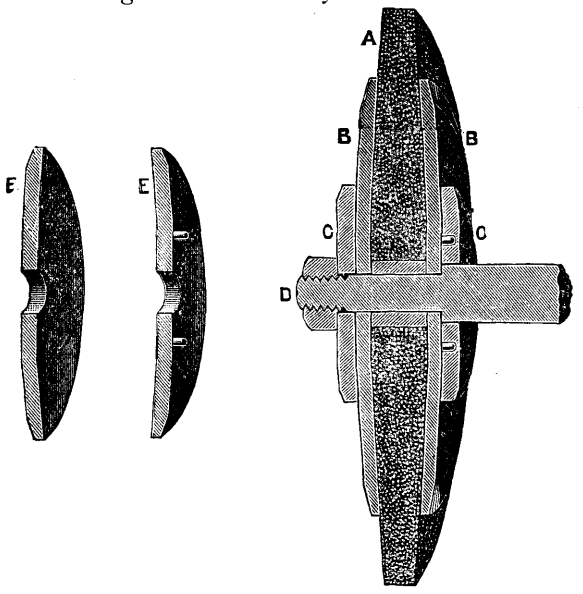
The above illustration shows the solid and split collar, and especial attention is called to the split collar in cut 2 which can be put on the shaft in a moment's time without removing anything, or disturbing the shaft in any respect. The head of the set screw is below the surface of the collar, therefore removing all danger of accident.

GRINDSTONES AND EMERY WHEELS.

Not every one is aware of the high rate of speed at which these machines are driven. The usual speed adopted by many, especially of the emery wheel, is 5,000 to 5,500 feet per minute. This demands proper safety appliances to protect the employe. Accidents are recorded resulting in persons being killed by bursting wheels running at a much lower rate of speed. It is almost impossible to manufacture a safety device that would be positive proof against all accidents, but I believe if the system shown in the following cuts were adopted, 99 per cent. in the number of accidents would be avoided. The cuts were loaned by the Safety Emery Wheel Company of Springfield, Illinois. This system has been endorsed by many of the factory inspectors throughout the country.



"Our system for the safe running of emery wheels is as follows: 'D' represents the spindle wheel is to be used on. 'C' 'C' represents the tight and loose collar on spindle, which are usually from two inches to eight inches in diameter according to size of machine. 'B' 'B' represents our Safety collars, which are made concave to within two inches of center. This leaves a four-inch flat spot at the center which gives a good bearing for our Safety collar against face of the fast collar on machine. Also a good bearing for the loose collar or nut against our loose Safety collar.

"In the collar next to fast collar on machine, there are two pins which fit into two holes that are drilled in the fast collar of machine, thus making a fast collar of our Safety collar.

"The wheel 'A' is made convex on the same taper the collars are made concave. As the wheels are accurately turned in a lathe on each side, they fit the collars when collars are clamped up tight by the nut.

"When wheels are required to be flat on at least one side of wheel or in saw gummers, our wheels are made and collars are furnished that way if so ordered.

"We recommend using from two to four sets of Safety collars with each wheel according to its size. By this means, as the wheel wears away in size, smaller collars can be put on them, holding the wheel from the time it is first put in use until entirely worn out.

"Our illustration shows the wheel mounted with the largest set of collars, and a smaller set 'E' 'E' are shown to be put on when wheel is worn down to the diameter of first pair. By this system of running wheels it is plainly evident to any person that it makes the safest way of using wheels that could possibly be devised.

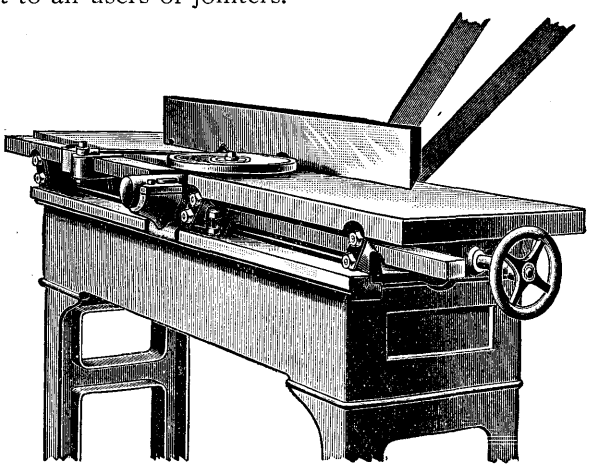
"If a wheel is two and one-half inches thick at center and two inches thick at periphery of collars, any one can easily see that even if the wheel was broken to commence with, the thick part of wheel cannot get through the narrow opening at periphery of collars."

The number of accidents caused by the old system of running emery wheels show a list of 120 men killed during the past two years in the United States.

WOOD JOINTER AND PLANER.

Clippings from the daily papers published in the State, show an average of 300 accidents per year, or one for every working day, caused by the jointer, planer and saw. The larger number of accidents are by the saw, but the most cruel and most destructive is the jointer. Practical protectors for saws, jointers and planer are being rapidly placed upon machines, and in Ohio and Michigan manufacturers are compelled by statutes to have these protectors placed upon every machine. Practical mill men all agree that where these protectors are used the liability of accident is lessened ninety per cent., and more work is accomplished by the workman, as all fear of accident is removed and his time is occupied in his work.

The following cut of the Daly Jointer Guard should be of interest to all users of jointers.



The above cut represents the only automatic guard for a jointing machine that has ever been invented.

First. It is automatic, always covering the knife, being operated by a spring in the block to which the arm is attached,

that keeps it against the rail on back of jointer and allows it to swing back as the block of wood passes over the knife and again into position behind the block as it leaves the knife.

Second. The construction is simple, and is easily applied to any jointer. To the block is attached the arm that holds the wheel, which is made of veneer, consequently will not split; this wheel revolves on an axle as the wood for jointing passes over the machine. It is so low down that it is not in the operator's way, can be adjusted in all ways and never causes loss of time as it never has to be removed.

Third. It guarantees perfect safety to the operator, and if used, will relieve the manufacturer of any liability of an accident to the operator.

FIRE ESCAPES.

The question of a better and more thorough enforcement of the law in reference to fire escapes, and especially upon hotels, has been treated in reports of 1892-3-4-5. Until some terrible calamity overtakes us we will not awake to existing conditions. Very few of our summer hotels are provided with a semblance of protection to guests against fire. Throwing out inducements in many ways to bring people into our State, which is a business project, we should throw around them the protection they pay for. A large majority of our summer houses are frail in structure, and would easily be the prey of fire when started, and that they are as represented can be proven by the high rates of risks taken by our insurance companies. The law in reference to this question is adequate if enforced, and if justice was meted out, $25,000 in fines could be turned into our State treasury. The fire engineers of our towns, upon whose shoulders rest the responsibilities of the enforcement of this important law, hesitate to put their neighbors to extra expense by compelling them to erect fire escapes; hence the open and flagrant disregard of a law that is of vital importance to the thousands of guests from all over the country. But to the insurance business of our State protection is a household word, and is not confined solely to one particular object, but

broad in its interpretation. Trout, deer, caribou, moose and muskrats are protected, while the hotel, standing upon the edge of the lake or pond, is left unprotected for those who come to our State. Not only is it important to protect these visitors, but the employes as well. Many of these hotels employ from twenty-five to forty women. These in a majority of cases, occupy the attic rooms, away from all possible chance of escape in case of fire. Stair ways and elevator wells are conduits through which fire and smoke invariably find their outlet, and in 60 per cent. of our houses the lives of the table girls and waiters are jeopardized.

Many calls have recently been received for the law relating to fire escapes, and to supply this demand it is here introduced. The law touching this matter, as found in chapter 26 of the Revised Statutes, is as follows:

SECT. 26. Every public house where guests are lodged, and every building in which any trade, manufacture, or business is carried on requiring the presence of workmen or other persons above the first story, and all rooms used for public assembly or amusement, shall at all times be provided with suitable and sufficient fire-escapes, outside stairs, or ladders from each story or gallery above the level of the ground, easily accessible to all inmates in case of fire or of an alarm of fire; the sufficiency thereof to be determined as provided in the following section:

SECT. 27. In towns or parts of towns having no organized fire-department, the municipal officers shall annually make careful inspection of the precautions and safeguards provided in compliance with the foregoing requirements, and pass upon their sufficiency as to arrangement and number, and upon their state of repair; and direct such alterations, additions and repairs as they adjudge necessary. In towns, cities and villages having an organized fire-department, the duties aforesaid shall be discharged by the board of fire engineers.

SECT. 28. Such municipal officers or fire engineers shall give written notice to the occupant of such building, also to the owner thereof, if known, of their determination as to the

sufficiency of said precautions and safeguards, specifying in said notice any alteration, addition or repair which they require. Sixty days are allowed for compliance with such notice and order.

SECT. 29. Any owner or occupant who neglects to comply with such order, within the time so allowed, forfeits fifty dollars, besides five dollars for every day's continuance of such neglect; and the building or part of a building so occupied shall be deemed a common nuisance, without any other evidence than proof of its use; and the keeper shall be punished accordingly. Said officers may forbid the use of such building for any public purpose until their order has been complied with. And if the owner or occupant of said building lets or uses the same in violation of such order, he forfeits not less than twenty, nor more than fifty dollars for each offence.

SECT. 30. Whenever the municipal officers or engineers, upon inspection, find that proper safeguards and precautions for escape in case of fire, or of alarm, have been provided, they shall give to the occupant of such building a certificate, under their hands, of such fact; which shall be valid for one year only from its date. Such officers shall return to the clerk's office of their town, monthly, a list of such certificates by them issued, which the clerk shall record in a suitable book.

SECT. 31. Every person receiving such certificate shall pay to such officers two dollars therefor, and shall keep such certificate posted in such building. Such annual certificate, so posted, is prima facie evidence of the inspection of such building, and of the presence of such suitable safeguards and precautions. Every occupant of such building who neglects or refuses to procure such certificate, or to post the same as aforesaid, forfeits ten dollars for every week that he so neglects and refuses.

SECT. 32. Every municipal officer or fire engineer who refuses or neglects to perform the duties imposed upon him by the seven preceding sections forfeits fifty dollars.

SECT. 33. All fines and forfeitures imposed by the four preceding sections may be recovered by the town where the building is located, by an action on the case, or by an indictment.

Many object to putting up a fire escape for the reason, as they claim, that it disfigures the building. The accompanying cut illustrates a ladder made by the Cable Ladder Company of Fairfield, Maine, and the following is a description of the same:

"To those who desire a cheaper and less elaborate fire escape, the following is recommended as possessing much merit. The Cable Ladder and Fire Escape Company, of Fairfield, Maine, manufactures the cheapest and one of the most durable and practical fire escapes on the market.

"They are made in the shape and style of an ordinary ladder, the sides of the ladder being made of wire cable of any dimension and strength required. That in general use with them is three-eighths of an inch in diameter, and has a breaking strength of two and one-half tons, and is practically strong enough to hold all the persons that could be got upon a ladder on any building of three or four stories high.

"The rounds in this ladder are made of three-eighths galvanized iron tubing, and are placed one foot apart, and are fifteen inches in length. They are fastened to the wire cable sides in an ingenious and novel manner, which has been invented and patented, and the patent right of which is owned by the aforesaid company.

"The invention consists in the use of an iron bullet placed at the end of the pipe round, which is screwed into a socket through which the sides of the ladder run, and against which the bullet is pressed by the round being screwed up against it. The thread upon the rounds being cut with a right and left, so that the bullet, when the round is screwed up, fits into the corrugation in the wire cable and makes the round perfectly tight and secure.

"This ladder is of the most durable character, and can be put up at very little expense. The kind above described is manufactured and sold by said company at 30 cents a foot.

"Any ordinary clamp, or hook, is sufficient to fasten the ladder at the top so as to make it perfectly secure, and by the use of a piece of 2 x 3 joist, placed every ten feet down the side of the building, to which with an ordinary staple it would be fast-

CABLE LADDER.

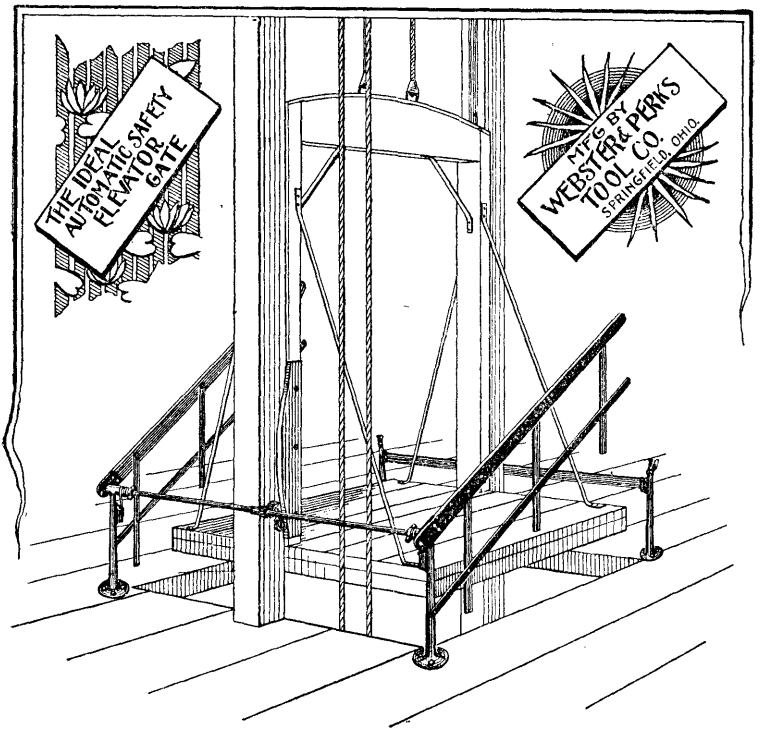
ened to prevent swaying, a person can go up and down this fire escape with perfect ease and safety."

THE RED LIGHT

This light should be placed in all corridors and at the head and foot of stairs in all hotels and all business houses where the building is high and used by other industries. While the first floor may contain a bank, the fourth story may be a hive of industry, employing from fifty to sixty men and women. This should be made compulsory.

ELEVATORS.

There have been several serious accidents from unsafe elevators, during the year, through not having the elevator well properly guarded. It is not only important to have the first,



second and third stories secure, but the attic as well. We have had several accidents from persons unthinkingly walking into the shaft from the attic.

The above cut shows one of the best automatic safety gates upon the market. The Factory Inspectors' convention, held at Providence, R. I., September 3 and 4, 1895, practically endorse the Webster and Peaks' gate, of Springfield, Ohio.

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