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THE EXPLOSIVES INDUSTRY
IN CANADA IN 1918

Advance Chapter of
"Chemicals and Allied Products in Canada in 1918"

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1921

44-38861-10

DOMINION BUREAU OF STATISTICS

MINING, METALLURGICAL
and CHEMICAL Division,

EXPLOSIVES, FIREWORKS AND MATCHES

in

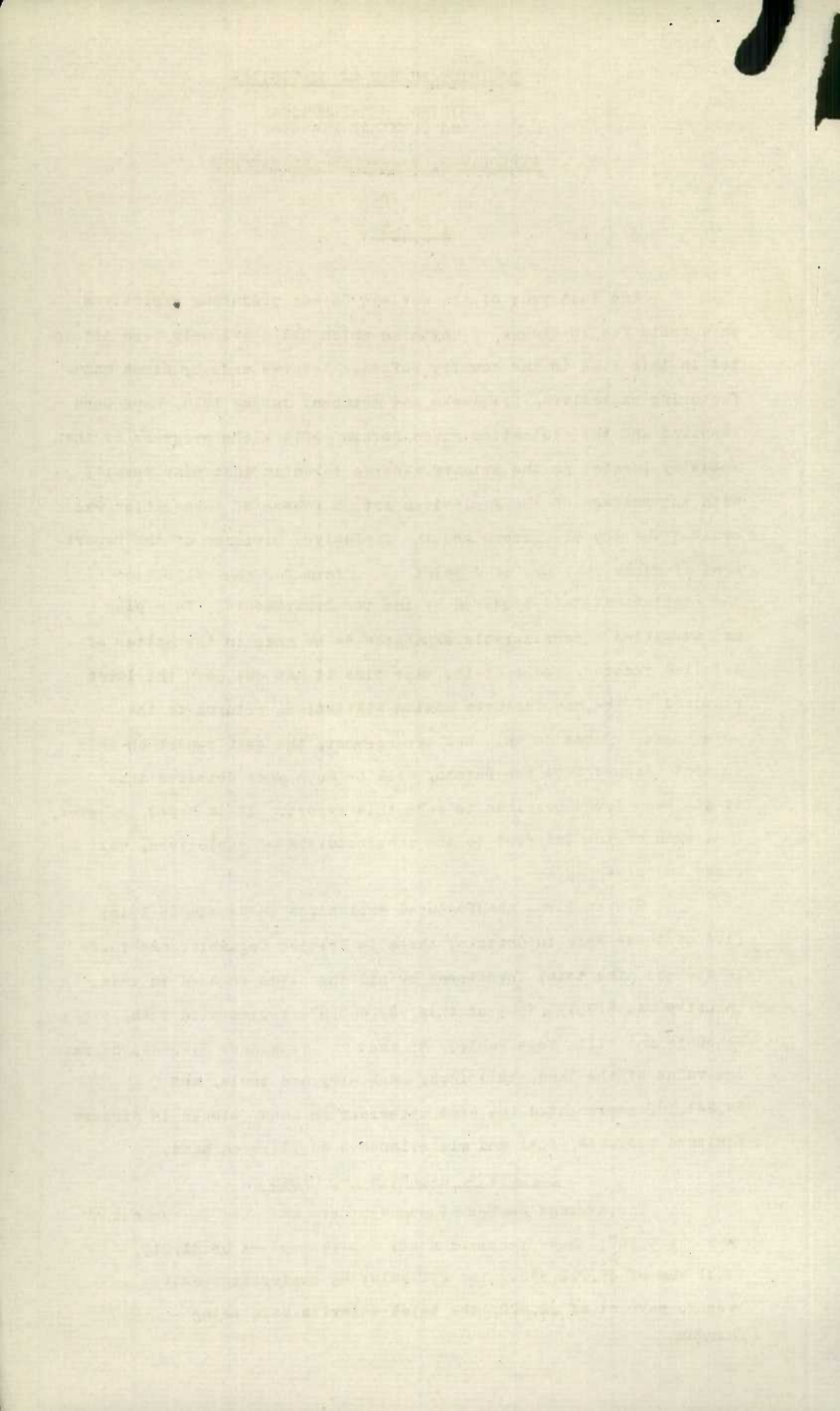
1918

The last year of the war saw Canada producing explosives on a scale far in excess of anything which had previously been attempted in this line in the country before. Returns made by firms manufacturing explosives, fireworks and matches, during 1918, have been compiled and the statistics given herein reflect the progress of the industry insofar as the primary records taken in that year permit. With the passage of the Explosives Act, a scheme of cooperation was evolved whereby the Bureau and the Explosives Division of the Department of Mines make use of a joint form for the collection of the statistical data required by the two Departments. This plan has permitted a considerable expansion to be made in the matter of detailed records, while at the same time it has cut down the labor required of the manufacturer making statistical returns to the Government. Based on this new arrangement, the next report on this subject, issued from the Bureau, will be much more detailed than it has been found possible to make this report. It is hoped, however, that much of the interest to the manufacturers of explosives, will be found in these pages.

Eleven firms manufactured explosives in Canada in 1918; five of these were in Ontario; three in British Columbia; and three in Quebec. The total investment by all the firms engaged in this industry was \$19,172,539; of this, \$2,486,572 represented cash, trading accounts and bills receivable. Of the remainder \$12,444,785 was the value of the land, buildings, machinery and tools, and \$4,241,182 represented the cost materials on hand, stocks in process finished products, fuel and miscellaneous supplies on hand.

EMPLOYEES, SALARIES AND WAGES

The average number of wage-earners employed throughout the year was 4,708; these received a per capita payment of \$1,213, or a total sum of \$5,712,542. The 251 salaried employees received an average payment of \$2,822, the total salaries paid being \$708,305.



The following table shows the distribution of salaried employees and wage-earners on December 15th. The works sub-total in the table (2,407) is much less than the average number of wage-earners for the year (4,708) due to the fact that several plants ceased normal operation before the end of the year. The greatest number of employees on wages was in May, when 5,710 were on the pay-rolls of the various firms.

DISTRIBUTION OF WORKING STAFF, Dec. 15, 1918

	<u>1918</u>	<u>1918</u>
SALARIED EMPLOYEES:	<u>Male</u>	<u>Female</u>
Officers, superintendents and managers.....	29	...
Clerks, stenographers, salesmen and other salaried employees.....	137	35
OFFICE SUB-TOTAL.....	<u>216</u>	<u>35</u>
 <u>WAGE EARNERS, receiving per week:</u>		
Less than \$10.....	211	4
\$10 but less than \$15.....	160	53
\$15 but less than \$20.....	508	36
\$20 but less than \$25.....	409	13
\$25 and over.....	1,013	...
Works sub-total.....	<u>2,301</u>	<u>106</u>
 TOTAL.....	 2,517	 141

F U E L

The total cost of fuel used in the industry during the year was \$1,047,175 of which \$976,124 were spent for 154,169 tons of coal of various kinds, and \$70,416 for 927,729 gallons of fuel oil. The following table gives the source, kind, quantity and cost at the plants of all the fuel used during the year, exclusive of any supplied to employees.

KIND	Unit of Measure.	CANADIAN	FOREIGN
		Quantity	Quantity
		Cost at Works	Cost at Works.
Bituminous Coal Slack	Tons		29,000 \$173,575
Bituminous Coal, run of mine	"	17,191	\$68,991
Anthracite Coal Lump	"		3,452 \$ 29,222
Anthracite Coal, dust or slack	"		648 \$ 5,972
Lignite.....	"		20,882 \$114,433
Gasoline.....	Gals	1,703	\$ 510
Oil (fuel).....	"	2,720	\$ 410
Wood.....	Cord	31	\$ 125
 TOTAL			 \$70,036 \$977,139

The following table shows the results of the survey conducted in 1954 and 1955. The data is presented in two columns, one for each year. The first column shows the number of respondents, and the second column shows the percentage of respondents who answered 'Yes' to the question 'Do you believe that the government should control the economy?'.

Year	Number of Respondents	Percentage of 'Yes' Answers
1954	100	65
1955	100	70
Total	200	67.5

MATERIALS USED

The cost of all the principal materials used during the year in making explosives was \$23,125,839. The following table gives the quantity used, and the cost values at the factories, of these materials.

<u>MATERIALS USED IN THE MANUFACTURE OF EXPLOSIVES</u>				
Kind	Unit of Measure	Quantity	Cost Value	Cost per Unit
Sulphur or brimstone.....	Tons (2000 lbs)	487	\$ 19,858	\$ 40,776
Nitrate of soda.....	" "	35,680	\$ 3,188,878	\$ 89,374
Mixed acids.....	Lbs	46,500,958	\$ 2,276,195	\$ 0.049
Grain alcohol.....	"	5,787,368	\$ 725,715	\$ 0.125
Charcoal.....	Tons	94	\$ 9,821	\$ 104,478
Sulphuric acid.....	"	52,918	\$ 1,200,697	\$ 22,689
Nitric Acid.....	"	7,487	\$ 1,519,014	\$ 202,887
Benzol.....	Lbs	81,796	\$ 5,621	\$ 0.068
Caustic soda.....	"	110,320	\$ 8,830	\$ 0.080
Diphenylamine.....	"	71,683	\$ 67,296	\$ 0.938
Pyro.....	"	7,058,193	\$ 2,738,791	\$ 0.388
Soda Ash.....	"	334,000	\$ 11,413	\$ 0.034
Sodium Sulphite.....	"	1,171,309	\$ 53,124	\$ 0.045
Oleum.....	"	52,915,745	\$ 1,009,294	\$ 0.019
Toluol.....	"	5,057,131	\$ 1,055,971	\$ 0.204
Linters.....	"	13,168,430	\$ 1,626,368	\$ 0.124
Calcium Chloride.....	"	58,000	\$ 2,503	\$ 0.043
All other miscellaneous materials			\$ 7,626,452	
Total.....			\$23,125,839	

PRODUCTS

In the next table are given the quantity and selling value at the factory of all the products and by-products manufactured during the year in this industry.

Kind	Unit of Measure	Quantity	Value
Blasting powder.....	Lbs.	795,225	\$ 106,694
Dynamite.....	"	21,674,046	\$ 4,881,871
Smokeless powder.....	"	8,664,800	\$ 5,046,368
Mercury Fulminate.....	"	119,671	\$ 433,254
Permissible explosives.....	"	1,655,518	\$ 310,225
All other explosives.....	"	64,650,061	\$ 30,603,395
Acid recovered and sold.....	"	4,394,646	\$ 25,443
Ether.....	"	105,820	\$ 19,894
Nitre Cake.....	Tons	3,161	\$ 6,323
Sulphuric acid.....	"	2,218	\$ 44,361

Total.....\$ 41,477,828
Includes T.N.T. Pyro and N.C.T. made by British Chemical Co., Trenton

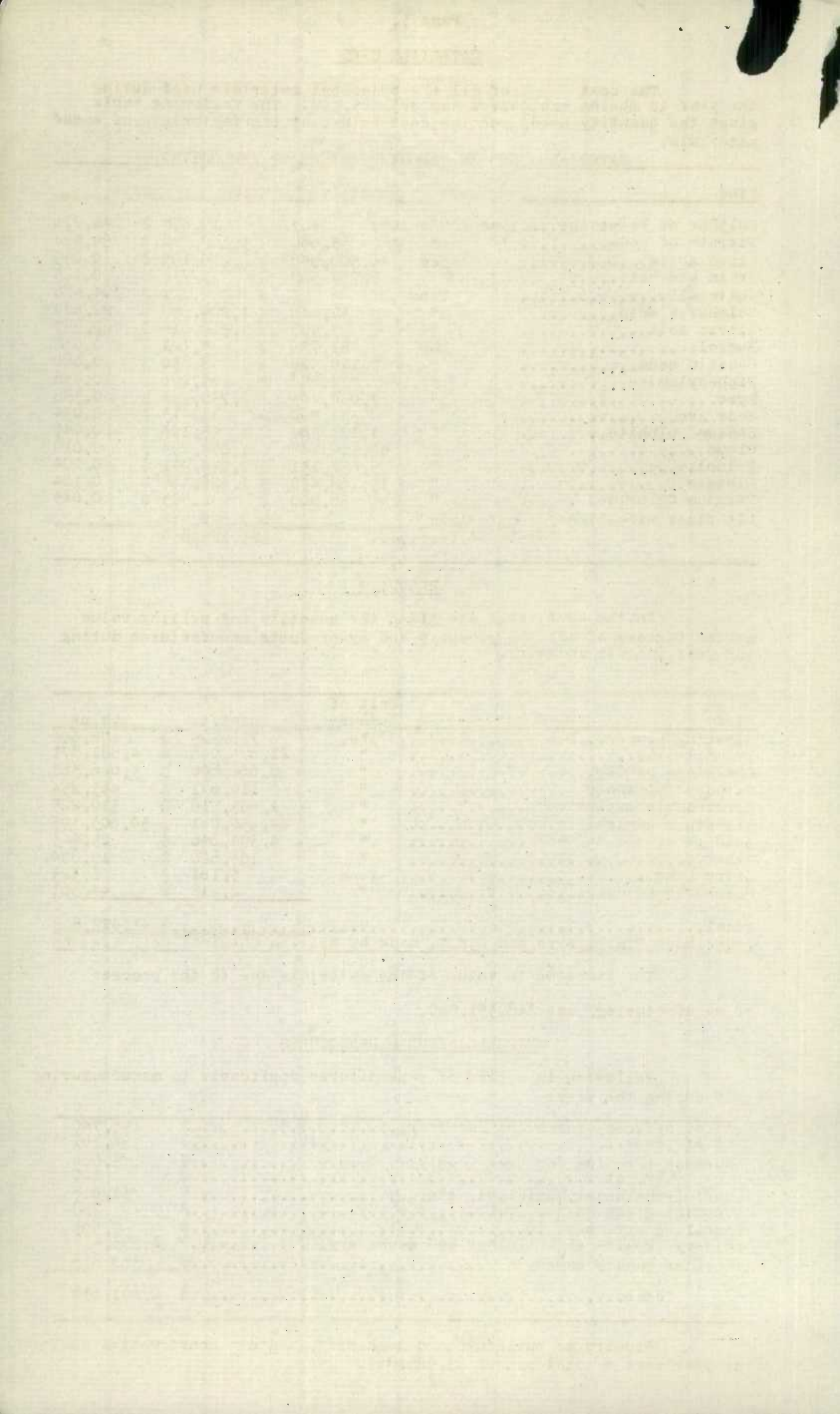
The increase in value of the materials due to the process of manufacturing, was \$18,351,989.

MISCELLANEOUS EXPENDITURES

Following is a list of expenditures applicable to manufacturing made during the year:

Rent of offices, works and machinery.....	\$ 195,740
Rent of power.....	\$ 96,361
Insurance (Premium for year only.....)	\$ 3,064
(War, etc.....)	\$ 600
Taxes: (Provincial, Municipal, etc.....)	\$ 31,668
Advertising expenses.....	\$ 288
Travelling expenses.....	\$ 9,563
Ordinary repairs to buildings and machinery.....	\$ 1,393,477
All other sundry expenses.....	\$ 360,878
Total.....	\$ 2,091,639

Repairs to buildings and machinery, and new construction during the year cost a total sum of \$3,925,064.



MATCHES AND FIREWORKS.

Three establishments made matches and two made fireworks in Canada in 1918. The total assets of the five firms were \$2,364,289, of which \$96,114 represented cash, trading accounts, and bills receivable. Of the remainder, \$1,373,989 was the value of the land, buildings, machinery and tools; leaving a balance of \$894,186 assigned to materials on hand, stocks in process, finished products, fuel and miscellaneous supplies on hand.

EMPLOYEES, SALARIES AND WAGES

The average number of persons engaged in the manufacture of matches and fireworks was 617 and the total wages paid amounted to \$368,468, an average per capita payment of \$597. The average payment to 47 salaried employees was \$1570 and to 570 wage-earners \$517.

DISTRIBUTION OF WORKING STAFF

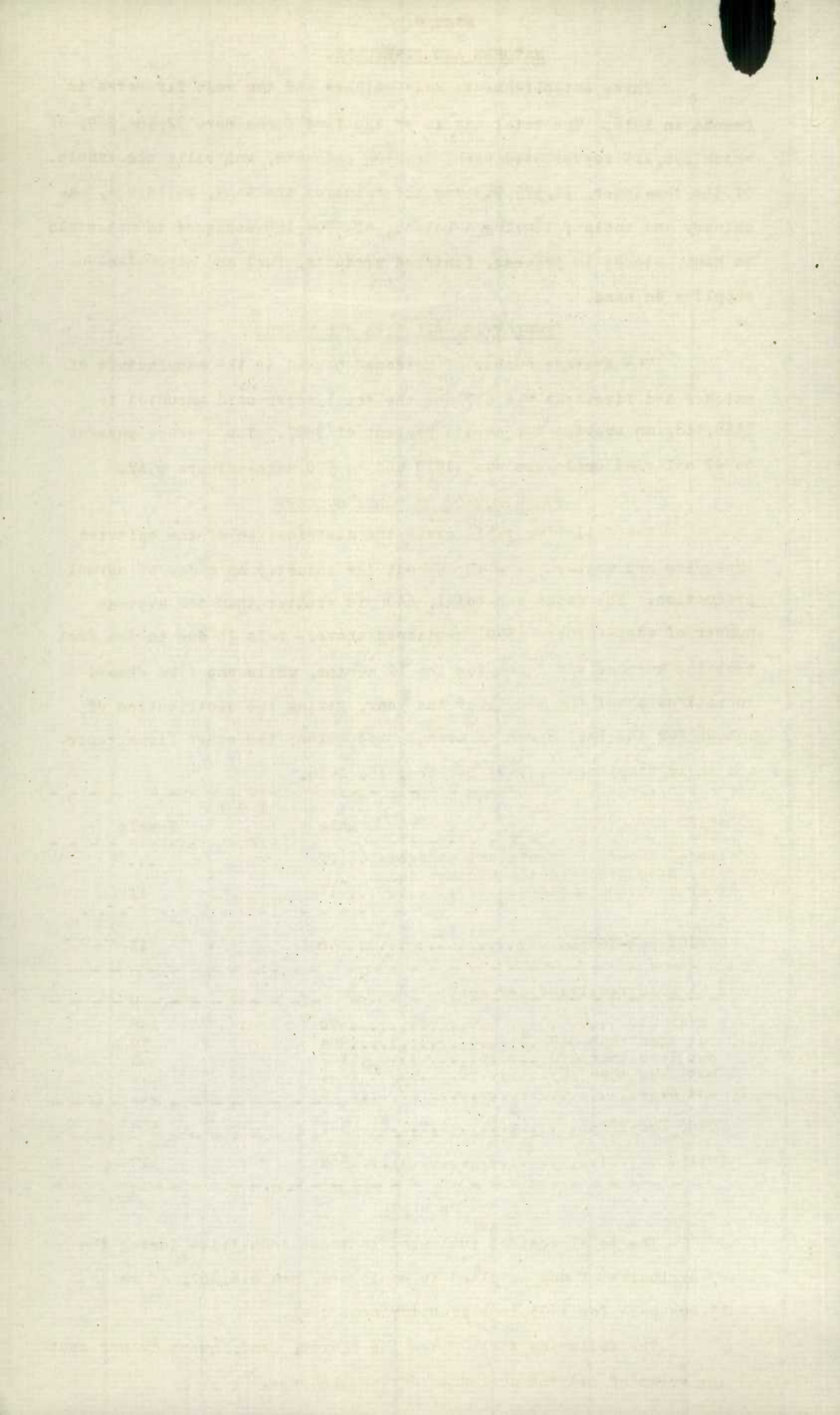
The following table gives the distribution of the salaried employees and wage-earners throughout the industry on a day of normal production. The works sub-total, 640, is greater than the average number of wage-earners (570) mentioned above. This is due to the fact that the average was taken for the 12 months, while one firm ceased operations about the middle of the year, giving the distribution of labour for the last month of normal production; the other firms reported their complements as of December 15, 1918.

SALARIED EMPLOYEES	1918	
	Male	Female
Officers, superintendents and managers...	22	...
Clerks, Stenographers and salesmen and other salaried employees.....	14	11
OFFICE SUB-TOTAL.....	36	11
<u>WAGE EARNERS receiving per week:</u>		
Less than \$10.....	70	248
\$10 but less than \$15.....	94	59
\$15 but less than \$20.....	102	1
\$20 but less than \$25.....	41	...
\$25 and over.....	25	...
WORKS SUB-TOTAL.....	332	308
TOTAL.....	368	319

FUEL

The total cost of fuel used in these industries during the year, exclusive of any supplied to employees, was \$16,867, of which \$9513 was paid for 1203 tons of bituminous coal.

The following table gives the source, kind, quantity and cost at the works of all the fuel used during the year.



FUEL USED

Kind	Unit of Measure	CANADIAN		FOREIGN	
		Quantity	Cost at works	Quantity	Cost at works
Bituminous coal, slack.....	Short tons			1,200	\$ 9,480
Bituminous coal, lump.....	"	3	33	..	..
Anthracite coal, lump.....	"	3	39	30	255
Wood.....	Cord	3,058	6,916	..	..
Gas (natural).....	1000 cu.ft.	664	144	..	..
			\$7,132		\$9,735

MATERIALS USED

The following table gives the quantities and cost value of the materials used in these industries in 1918.

Kind	Unit of Measure	Quantity	Cost Value	Cost per Unit
Lumber.....	M. bd. ft.	7,177	\$271,977	\$ 37.395
Potassium Salts.....	lbs.	578,732	239,629	0.414
Glue.....	"	229,000	58,479	0.255
Starch.....	"	20,000	1,400	0.070
Ground Glass.....	"	100,000	1,419	0.014
Rosin.....	"	90,000	2,052	0.023
Scale Wax.....	"	570,000	45,600	0.080
Ground quartz.....	"	125,000	1,375	0.011
Sesqui-sulphide of phosphorus	"	47,250	24,082	0.509
Amorphous phosphorus.....	"	15,750	12,705	0.806
Oxide of Zinc.....	"	37,500	7,500	0.200
Phosphate of ammonia.....	"	8,125	1,553	0.191
Gums.....	"	37,500	3,874	0.103
Other Chemicals.....	"	..	5,245	..
All other materials.....	"	..	111,292	..
<u>TOTAL</u>			\$ 788,182	

PRODUCTS

From the materials itemized above fireworks and matches were made having a value at the factory of \$1,583,007. The matches were valued at \$1,545,660 and the fireworks at \$37,327. Other products and by-products had a value of \$21,335, making the total value of production \$1,604,342. The excise paid on matches amounted to \$1,314,403 during the year. This latter sum is added to the selling price of the matches, and is paid by the consumer, as part of the cost to him.

MISCELLANEOUS EXPENDITURES

The miscellaneous expenditures made during the year amounted to \$161,795. These are listed in the following table:

Rent of Offices, works and machinery.....	\$ 2,611
Rent of power.....	\$ 5,987
Insurance (premium for the year only).....	\$ 13,852
(Internal revenue, war, etc.....)	\$ 59,684
Taxes:(Provincial, Municipal, etc.....)	\$ 17,295
Royalties, use of patents, etc.....	\$ 500
Advertising expenses.....	\$ 7,500
Travelling expenses.....	\$ 5,423
Repairs to buildings and machinery.....	\$ 10,953
Other sundry expenses.....	\$ 38,230
<u>TOTAL</u>	\$161,795

The following table shows the results of the survey conducted in 1978. The data is presented in a tabular format with columns for various categories and rows for different groups.

TABLE 1

The following table shows the results of the survey conducted in 1978. The data is presented in a tabular format with columns for various categories and rows for different groups.

Category	Group 1	Group 2	Group 3
1	100	200	300
2	150	250	350
3	200	300	400
4	250	350	450
5	300	400	500
6	350	450	550
7	400	500	600
8	450	550	650
9	500	600	700
10	550	650	750
11	600	700	800
12	650	750	850
13	700	800	900
14	750	850	950
15	800	900	1000

The data indicates a steady increase in the values across all groups, with Group 3 consistently showing the highest values and Group 1 the lowest. The overall trend is positive and linear.

These findings suggest that the survey results are consistent and reliable. The data points are well-distributed and show a clear upward trend, which is supported by the statistical analysis performed.

IMPORTS

Table 1, below, gives the imports into Canada of materials of interest in connection with the manufacture of fireworks and matches, itemized as to value and quantity.

TABLE 1. IMPORTS INTO CANADA IN 1918 FOR DOMESTIC CONSUMPTION.

<u>Kind</u>	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Value</u>
Potash, chlorate, not further prepared than ground.....	Lbs.	19,438	\$ 8,653
Potash, bichromate of.....	"	20,844	10,686
Phosphorus.....	"	74,759	34,725
Glue, powdered or in sheets.....	"	928,126	159,606
Starch, including corn starch, potato starch, potato flour and all preparations having the qualities of starch.....	"	2,434,281	144,125
Rosin or rosin in packages of not less than 100 lbs.....	Cwt.	342,552	1,106,145
Gums, amber and arabic, copal, etc.....			1,130,508
TOTAL.....			\$2,594,448

Table 11 gives the imports of materials which are of interest in the manufacture of explosives, itemized as to quantity and value.

TABLE 11 IMPORTS INTO CANADA IN 1918 FOR DOMESTIC CONSUMPTION

<u>Kind</u>	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Value</u>
Nitrate of soda.....	lbs.	103,992,033	\$4,077,903
Dinitrotoluol, trinitrotoluol and ammonium perchlorate for explosives manufacture.....	"	38,724	6,282
Grain alcohol.....	"	10,790	11,145
Charcoal.....	"		143,336
Sulphuric Acid.....	Lbs.	11,907,466	208,288
Nitric Acid.....	"	139,272	20,542
Caustic soda.....	"	12,226,581	612,947
Brimstone, crude in rolls, or flour, and sulphur, in rolls or flour.....	"	194,123,528	2,058,811
TOTAL.....			\$7,139,254

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In Table III are itemized the finished products of the explosives industry imported for consumption in Canada in 1918.

TABLE III. IMPORTS INTO CANADA, 1918

Kind	Unit of Measure	Quantity	Value
Blasting and mining powder.....	Lbs.	25	2
Fireworks, firecrackers and torpedoes all kinds.....		...	31,227
Fuses, non-metallic.....		...	159,250
Giant powder, nitro, nitro-glycerine and other explosives, n.o.p.	Lbs.	277,395	168,212
Gun, rifle, sporting, cannon, musket and cannister powder.....	"	46,088	46,459
Gun, rifle and pistol cartridges, or other ammunition n.o.p.....		...	226,704
Gun-wads, percussion caps, primers and cartridge cases.....		...	2,668
TOTAL.....			\$634,522

In table IV the manufactured goods exported from Canada are given with the quantities and values at the port of export.

TABLE IV - EXPORTS OF CANADIAN PRODUCTS, 1918

Kind	Unit of Measure	Quantity	Value
Cartridges, gun and pistol.....	...	...	\$232,634,973
Explosives and fulminates.....	...	...	40,108,383
Sulphuric Acid.....	Cwt.	111,992	165,579
Charcoal.....	...	...	3,841
TOTAL.....			\$272,912,776

SUMMARY

The manufacture of explosives in Canada in 1918 involved an investment in plant and equipment of over nineteen million dollars; the manufacture of fireworks and matches accounted for an additional capital investment of two and one-third millions, making a total investment in these industries of nearly twenty-two millions of dollars. Expenditure of almost seven million dollars for wages and salaries account gave employment to almost six thousand workers throughout the year in producing from the twenty-four million dollars worth of materials used, finished products having a total selling value of forty-three million dollars. The magnitude of the industry is reflected also by the fact that over five million dollars was spent in the last year of the war by the explosives industry in Canada in the construction of new buildings and repairs to those already built. An expenditure of nearly a million dollars was made in general expenses chargeable to manufacturing operations.



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