CANADA

DOMINION BUREAU OF STATISTICS

THE VOLUME OF UNEMPLOYMENT SINCE ~~1933~~ ~~1921~~ 1921

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THE VOLUME OF UNEMPLOYMENT SINCE 1921.

In the annexed diagram No. 1, the results of a calculation are shown: (a) of the number of employed in Canada from month to month and from year to year over the past twelve years; and (b) the number of workers available for employment during the same period. The space between the two lines indicates the volume of unemployment in its variations from time to time.

The method in which these calculations have been made is briefly as follows:

(a) The lower line, illustrating the numbers employed, begins in 1921 with the number shown to be employed on the date of the Census in that year (June 1). This figure is projected from month to month up to the similar figure as shown by the Census of June 1, 1931, and from the latter date until the present. In projecting the figure, monthly returns relating to numbers of employees received at the Dominion Bureau of Statistics from concerns in Canada employing over fifteen hands (approximately 8,000 in number) were taken as basis. The numbers of employees thus reported were regarded as a sample of the whole volume of employment, the number of firms reporting being used to calculate variations in the sample. The results of this calculation correspond to the actual figures of change disclosed by the Censuses of 1921 and 1931.

(b) The upper line, that indicating the total number of workers or "employables", similarly starts with the number of such workers reported on the Census date, June 1, 1921. It was obtained from month to month thereafter by calculating the most probable total number during the preceding year that would make the monthly variation in the number of employed possible - the results being verified by the known facts of natural increase, immigration and emigration.

It should be pointed out that the definition of "workers", namely, the number of persons who were in employment for any period during the preceding year, has altered somewhat under the abnormal conditions prevailing during the past two years--particularly since the stoppage of emigration to the United States, and the initiation of relief, the effects of which have been to increase the number of persons idle more than one year, and therefore included in the definition under more normal conditions.

An explanation in full detail of the methods by which the two calculations above-mentioned were made is published in Appendix I.

Chart No. 2 represents an attempt to reduce the conditions portrayed in Chart No. 1 to a "norm" or statement of probable contingencies. In more detail it illustrates the probable percentages unemployed each month over an indefinite period - say 100 months - and under conditions similar to those of the decade 1921-31. To render it more intelligible the percentages unemployed are read vertically although they really represent the base of the chart. If the chart is turned so that its percentages form the base line, the heights represent the number of months out of 100 in which the per cent unemployed as indicated occurs, while the areas from right to left represent the number of months in which percentages unemployed are less than those indicated. There are only 9.4 months out of 100 or 1.08 months out of a year in which we can expect the per cent unemployed to be less than 4.5. The chart may also be understood as follows:-

In	90.2	months	out	of	100	or	roughly	11	months	a	year	80	p.c.	at least	are	at work.
"	70.3	"	"	"	"	"	"	8	"	"	"	86.6	p.c.	"	"	"
"	60.3	"	"	"	"	"	"	7	"	"	"	87.9	p.c.	"	"	"
"	49.1	"	"	"	"	"	"	6	"	"	"	89.3	p.c.	"	"	"
"	43.5	"	"	"	"	"	"	5	"	"	"	90.1	p.c.	"	"	"
"	32.5	"	"	"	"	"	"	4	"	"	"	91.4	p.c.	"	"	"
"	27.3	"	"	"	"	"	"	3	"	"	"	92.1	p.c.	"	"	"
"	19.2	"	"	"	"	"	"	2	"	"	"	93.5	p.c.	"	"	"
"	9.4	"	"	"	"	"	"	1	"	"	"	95.5	p.c.	"	"	"

Chart № 1

Estimated Number employed in each Month from Dec. 1921 to Oct. 1932
and Estimated Total Number of Wage Earners during the Year ended each month of the same Period

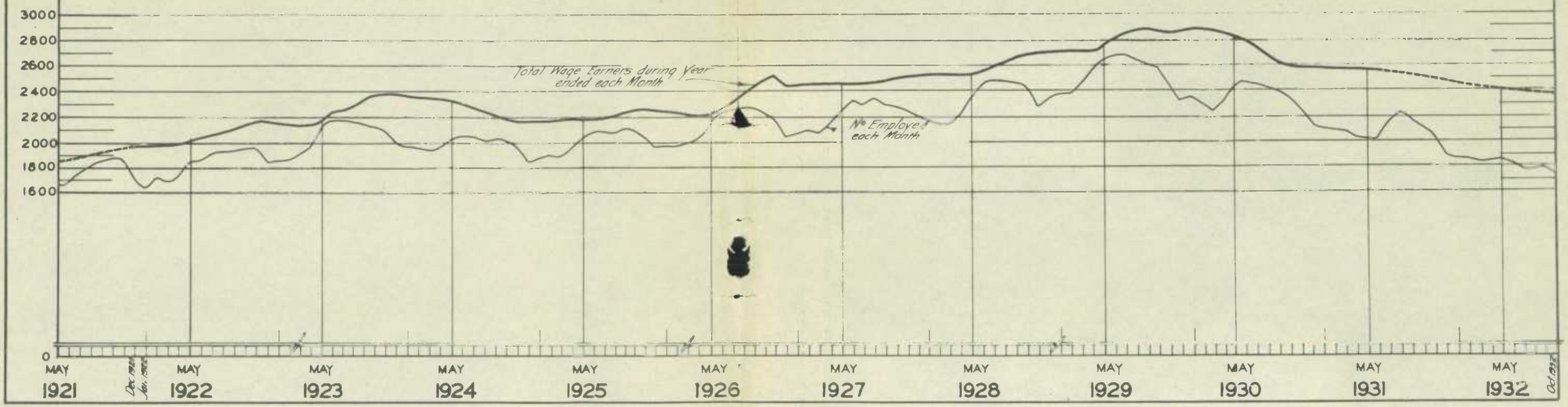
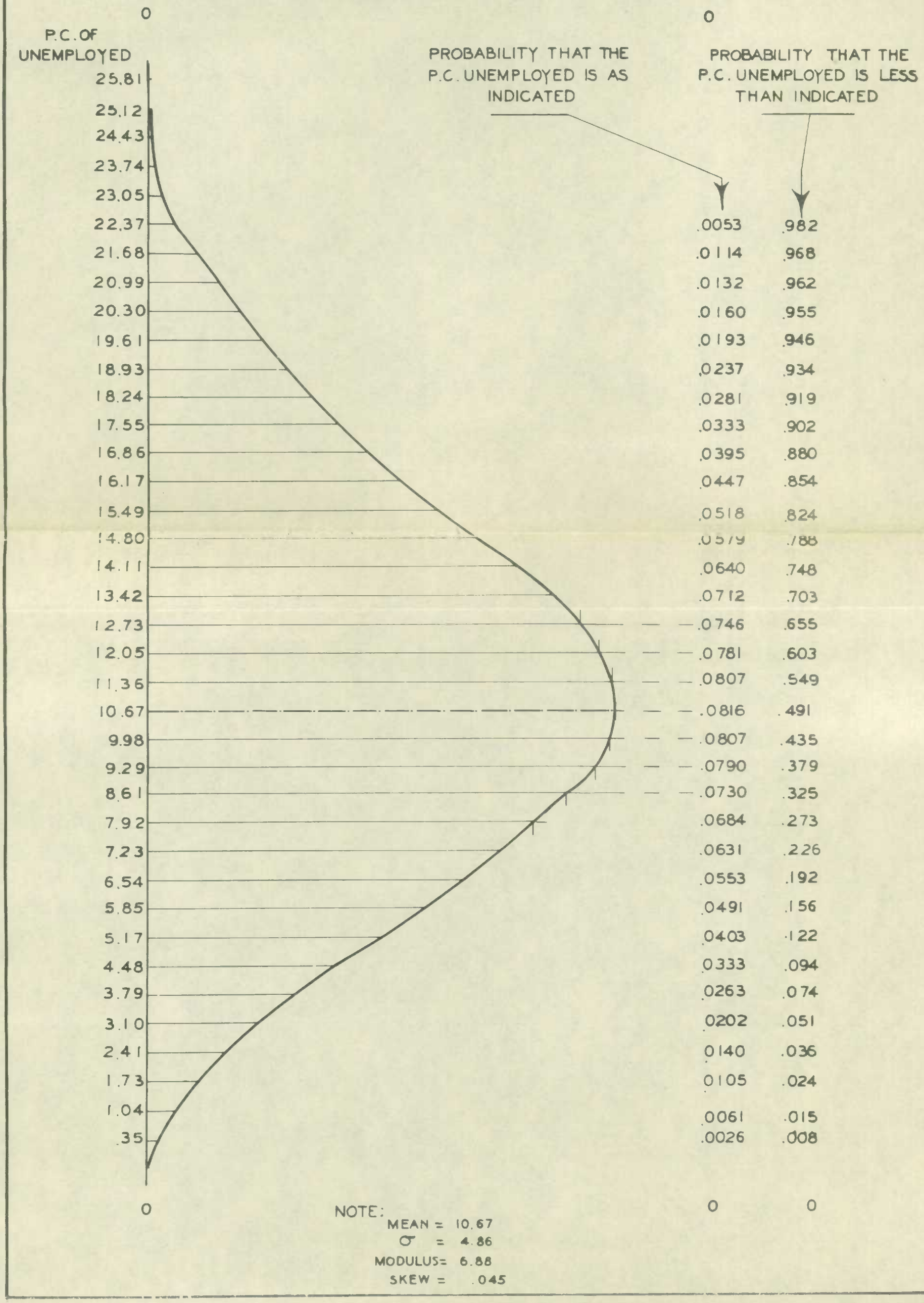


Chart No 2

Normal Frequency of the Monthly Percentages Unemployed in Canada under Conditions similar to those of 1921 – 1931



NOTE:

MEAN = 10.67
σ = 4.86
MODULUS = 6.88
SKEW = .045

The Trend of Unemployment in Canada from 1921 to 1931.

The calculated figures of wage earners, number not at work, and per cent not at work month by month, as well as the averages for the year ended each month from May, 1921 to May, 1931, are shown in Tables 1 and 2. Tables 3 and 4 contain data by which the validity of the calculations may be investigated.

A summary of the results for each of the ten years: (1) as in the month of May (the nearest to the date June 1, on which the Census is taken); (2) for the year ended May 31, is as follows:-

Canada, All Wage Earners: Number of wage earners, Number not at work, Per cent not at work and Per cent lacking work in the month of May from 1921 to 1931.
(000's omitted)

Month	Number of wage earners	Number not at work	Per cent not at work	Per cent lacking work
May 1921	1,854	192	10.35	7.66
May 1922	2,004	165	8.23	6.09
May 1923	2,142	38	1.77	1.31
May 1924	2,316	271	11.70	8.66
May 1925	2,180	153	7.01	5.19
May 1926	2,195	39	1.77	1.31
May 1927	2,422	182	7.51	5.56
May 1928	2,500	154	6.16	4.56
May 1929	2,675	62	2.31	1.71
May 1930	2,841	429	15.10	11.17
May 1931	2,604	491	18.85	13.95

Canada, All Wage Earners: Number of wage earners, Average number not at work, Per cent not at work, and Per cent lacking work for the years ended May 31, 1921 to 1931.
(000's omitted)

Year ended	Number of wage earners	Average number not at work	Per cent not at work	Per cent lacking work
May 1921	1,854	184	9.92	7.34
May 1922	2,004	247	12.32	9.12
May 1923	2,142	221	10.31	7.63
May 1924	2,316	270	11.65	8.62
May 1925	2,180	220	10.09	7.47
May 1926	2,195	155	7.06	5.22
May 1927	2,422	257	10.61	7.85
May 1928	2,500	272	10.88	8.05
May 1929	2,675	238	8.89	6.58
May 1930	2,841	392	13.79	10.20
May 1931	2,604	365	14.01	10.37

The last column in each of the above tables shows the per cent idle through lack of work, as distinguished from those idle from all causes. The number idle through want of work was calculated as being on an average 74 per cent of the number idle from all causes. This average is adhered to in 1931, notwithstanding the higher Census percentage, for the reason that it is believed to hold true as a norm; for if the Census percentage unemployed through "no job" and "temporary lay-off" had had jobs they would probably have lost work from causes such as illness, accident, other causes and the personal equation; consequently, there was no good reason to depart from the average determined for 120 monthly calculations over the ten year period.

The difference between 74 and 100 per cent, viz., 26 per cent, would seem to be a quantity irreducible by volume of employment. The average per cent not at work over the period was 10.7 and 26 per cent from this leaves 7.9. If we take the average per cent lost time as representing 1.28 months in the year for all wage-earners, this 26 per cent of this is 0.33 months which are independent of the volume of employment. If we take a representative figure of those not losing any time as 60 per cent of all wage earners, which was the figure obtained for 100 industries in 1921, and seems to hold approximately good in 1931, then on an average 40 per cent of wage earners lose some time; the average number of months lost by these is 3.2 and the average number of months lost through causes not connected with employment conditions is 26 per cent of this, viz., 0.83 months. This figure is regarded as totally disconnected from the question of cycles of employment.

The calculation of this figure was one part of the problem assigned. The main part was to give the representative figure for unemployment from all causes. For this purpose chart 2 is herewith appended, showing the monthly trend for each month from December, 1921 to May, 1931. Instead of using the actual

calculated percentages of unemployment in this chart, it was considered not only more clear, but also more accurate to use the smooth curve to which these percentages were found to conform.

A summary of this chart is as follows, attention being called to the fact that the figures of unemployment used represent all causes. The unemployment through lack of work may be considered in all cases as 74 per cent of the figures quoted.

The percentages of unemployment vary over an indefinite range, but one-half of them are between 7 and 14, i.e., there is an even chance that the percentage unemployed is not greater than 14 and not less than 7. Any percentage outside of these limits may be considered unusual. Any percentage greater than 18 or less than 3 may be considered abnormal. If we reduce this by 26 per cent, we may say that any percentage "out of work" greater than 10 or less than 5 is unusual, and that greater than 13 or less than 2 is abnormal. Tables 1 and 2, and Chart 1, will show the months and the years during which the unusual and the abnormal happened.

Summary of the Sources of Unemployment

It will be seen on consulting the accompanying figures and charts that though unemployment over the period investigated was caused in part by contraction of the number employed and by seasonal causes, (the latter looming very large), it was also caused in part by expansion of the number of available workers. In years of expansion the number of applicants for positions increased, largely through immigration, out of proportion to the increase in available jobs. The result was that the worst periods of unemployment occurred shortly after the years of greatest expansion. On the other hand the best periods occurred shortly after the years of least expansion, the reason being that after a period of depression the workers either left the class of wage earners to work on their own account or emigrated. This was true of normal times, especially when emigration to the United States was

unrestricted. It is doubtful whether it any longer holds true, especially since the initiation of relief. Consequently, any calculation for present employment may be regarded as less reliable than the calculation over the period 1921-1931.

The figures of immigration show a heavy movement in the years ended March 31, 1920 and 1921, to which should be added the men returned from Overseas; then a drop in 1922; a rise in 1923; then another drop with a low in 1926 until 1927, when immigration rose rapidly. The United States figure of immigration from Canada show rises and drops roughly corresponding to the drops and rises of Canadian figures of immigration. We do not know the extent of Canadian emigration to other countries than Great Britain and the United States, but it is probable that it may be quite considerable, especially as emigration from Canada to such countries as Italy, etc., may include not only Italian born but also Canadian born children of Italian parents. The above rises and drops in immigration would seem to furnish corroboration for the accuracy of the calculations in the accompanying tables and charts. The importance of the point that unemployment may be due to expansion in the numbers of workers as well as contraction in the volume of employment is once more emphasized. If we consider as significant the amount of employment per capita of the population, we find that in 1921 it was .189, (Census figures), while in 1931 it was .207 (also Census figures). This means that the greater unemployment in 1931 was due not to the contraction of employment alone, but to the abnormal number of workers who were drawn from abroad and from "own account" occupations by the expansion of 1927-29, and who were left in the country after employment contracted from the high point of 1929. Besides, there is a natural normal tendency for wage earners to increase at the expense of "own accounts" and "employers". According to the Census figures of 1921 and 1931, taken by themselves, the number of wage earners increased in the period almost twice as fast as the population. According to the accompanying tables it will be seen that by 1929 they increased more than twice as fast as the population.

This leads to the suggestion that discussion of remedial measures for unemployment in the present day should take into consideration the factor represented in the number and distribution of "employables", instead of concentrating entirely on the factors represented in the volume of employment, - in other words, regulations of the supply of as well as of the demand for labour. Perhaps the most cardinal fact in the existing situation as brought out in the present inquiry is that in 1931 there was more actual employment per unit of the population than in 1921; yet there was a much larger number also percentage of the unemployed.

Table 1. - Canada, All Wage Earners: Number of Persons not working in each Month from December 1921 to October 1932, and Per cent not at Work in each Month of the Total Number of Wage Earners during the year ended that month.
(000's omitted)

Year ended		Number of wage earners	Number of Persons not working	Per cent not at work
December	1921	1,974	289	14.64
January	1922	1,972	331	16.78
February		1,969	262	13.30
March		1,971	291	14.76
April		1,968	253	12.85
May		2,004	165	8.23
June		2,007	154	7.67
July		2,031	121	5.95
August		2,072	140	6.75
September		2,104	163	7.74
October		2,113	177	8.37
November		2,143	184	8.58
December		2,132	324	15.19
January	1923	2,114	258	12.20
February		2,114	249	11.77
March		2,076	170	8.80
April		2,050	74	3.60
May		2,142	38	1.77
June		2,215	53	2.39
July		2,215	45	2.03
August		2,253	95	4.21
September		2,338	206	8.81
October		2,357	243	10.30
November		2,365	295	12.47
December		2,365	447	18.90

Table 1. - Canada, All Wage Earners: Number of Persons not working in each Month from December 1921 to October 1932, and Per cent not at Work in each Month of the Total Number of Wage Earners during the year ended that month. - Cont'd.
(000's omitted)

Year ended		Number of wage earners	Number of Persons not working	Per cent not at work
January	1924	2,345	394	16.80
February		2,332	384	16.46
March		2,328	408	17.52
April		2,325	363	15.61
May		2,316	271	11.70
June		2,291	227	9.90
July		2,258	220	9.74
August		2,219	222	10.00
September		2,187	159	7.27
October		2,150	146	6.79
November		2,131	200	9.38
December		2,171	357	16.44
January	1925	2,180	315	14.44
February		2,183	286	13.10
March		2,187	299	13.67
April		2,181	233	10.68
May		2,180	153	7.01
June		2,180	104	4.77
July		2,180	121	5.55
August		2,221	155	6.97
September		2,230	124	5.56
October		2,247	171	7.61
November		2,256	218	9.66
December		2,236	291	13.01
January	1926	2,221	264	11.88
February		2,212	240	10.84
March		2,195	208	9.47
April		2,176	163	7.49
May		2,195	39	1.77
June		2,272	58	2.55
July		2,321	97	4.17
August		2,381	122	5.12
September		2,414	163	6.75
October		2,434	234	9.61
November		2,495	327	13.10
December		2,407	373	15.49
January	1927	2,422	349	14.40
February		2,422	333	13.74
March		2,422	352	14.53
April		2,422	259	10.69
May		2,422	182	7.51
June		2,428	117	4.81
July		2,449	163	6.65

Table 1. - Canada, All Wage Earners: Number of Persons not working in each Month from December 1921 to October 1932, and Per cent not at Work in each Month of the Total Number of Wage Earners during the year ended that month. - Concluded.
(000's omitted)

Year ended		Number of wage earners	Number of Persons not working	Per cent not at work
August	1927	2,469	155	6.27
September		2,481	190	7.65
October		2,492	216	8.66
November		2,504	260	10.38
December		2,505	437	17.44
January	1928	2,505	379	15.12
February		2,505	363	14.49
March		2,500	366	14.64
April		2,500	304	12.16
May		2,500	154	6.16
June		2,530	124	4.90
July		2,587	93	3.59
August		2,600	132	5.07
September		2,643	178	6.73
October		2,673	259	9.68
November		2,675	411	15.36
December		2,675	332	12.41
January	1929	2,675	305	11.40
February		2,675	316	11.81
March		2,675	211	7.88
April		2,675	95	3.55
May		2,675	62	2.31
June		2,751	92	3.34
July		2,781	132	4.74
August		2,828	212	7.49
September		2,842	248	8.72
October		2,860	283	9.89
November		2,823	371	13.14
December		2,823	520	18.42
January	1930	2,840	527	18.55
February		2,860	574	20.06
March		2,880	658	22.84
April		2,866	562	19.60
May		2,841	429	15.10
June		2,811	349	12.41
July		2,766	326	11.78
August		2,727	331	12.13
September		2,661	272	10.22
October		2,577	251	9.74
November		2,565	331	12.90
December		2,565	448	17.46
January	1931	2,565	466	18.16
February		2,565	473	18.44
March		2,570	482	18.75
April		2,604	491	18.85
May		2,604	491	18.85
October	1932	2,384	646	27.09

Table 2. - Canada, All Wage Earners: Average Number and Per cent not working during the year ended May 31, 1921, and During the Year ended each month from December 1921 to May 1931.
(000's omitted)

Year ended		Number of wage earners	Average number not working	Per cent not working
May	1921	1,854	192	10.35
December		1,974	223	11.29
January	1922	1,972	232	11.76
February		1,969	232	11.78
March		1,971	235	11.92
April		1,968	225	11.43
May		2,004	247	12.32
June		2,007	235	11.70
July		2,031	246	12.11
August		2,072	277	13.36
September		2,104	301	14.30
October		2,113	305	14.43
November		2,143	326	15.21
December		2,132	307	14.39
January	1923	2,114	269	12.72
February		2,114	256	12.10
March		2,076	199	9.58
April		2,050	152	7.41
May		2,142	221	10.31
June		2,215	279	12.59
July		2,215	247	11.15
August		2,253	266	11.80
September		2,338	335	14.32
October		2,357	339	14.38
November		2,365	338	14.29
December		2,365	329	13.91
January	1924	2,345	301	12.83
February		2,332	281	12.04
March		2,328	276	11.85
April		2,325	274	11.78
May		2,316	270	11.65
June		2,291	253	11.04
July		2,258	231	10.23
August		2,219	206	9.28
September		2,187	182	8.32
October		2,150	155	7.20
November		2,131	145	6.80
December		2,171	194	8.93
January	1925	2,180	210	9.63
February		2,183	218	9.98
March		2,187	224	10.24
April		2,181	218	9.99
May		2,180	220	10.09
June		2,180	219	10.04

Table 2. - Canada, All Wage Earners: Average Number and Per cent not working during the year ended May 31, 1921, and During the Year ended each month from December 1921 to May 1931. - Continued.
(000's omitted)

Year ended		Number of wage earners	Average number not working	Per cent not working
July	1925	2,180	217	9.95
August		2,221	252	11.34
September		2,230	255	11.43
October		2,247	266	11.83
November		2,256	268	11.87
December		2,236	237	10.59
January	1926	2,221	214	9.63
February		2,212	199	8.99
March		2,195	169	7.69
April		2,176	150	6.89
May		2,195	155	7.06
June		2,272	221	9.72
July		2,321	260	11.20
August		2,381	300	12.59
September		2,414	321	13.29
October		2,434	332	13.64
November		2,495	381	15.27
December		2,407	285	11.84
January	1927	2,422	290	11.97
February		2,422	281	11.60
March		2,422	275	11.35
April		2,422	262	10.81
May		2,422	257	10.61
June		2,428	256	10.54
July		2,449	270	11.02
August		2,469	285	11.54
September		2,481	294	11.85
October		2,492	300	12.03
November		2,504	305	12.18
December		2,505	303	12.09
January	1928	2,505	298	11.89
February		2,505	293	11.69
March		2,500	283	11.32
April		2,500	280	11.20
May		2,500	272	10.88
June		2,530	294	11.62
July		2,587	334	12.91
August		2,600	334	12.84
September		2,643	363	13.73
October		2,673	381	14.25
November		2,675	381	14.24
December		2,675	358	13.38

Table 2. - Canada, All Wage Earners: Average Number and Per cent not working during the year ended May 31, 1921, and During the Year ended each month from December 1921 to May 1931. - Concluded
(000's omitted)

Year ended		Number of wage earners	Average number not working	Per cent not working
January	1929	2,675	338	12.63
February		2,675	320	11.96
March		2,675	293	10.95
April		2,675	261	9.75
May		2,675	238	8.89
June		2,751	293	10.65
July		2,781	310	11.14
August		2,828	345	12.19
September		2,842	349	12.28
October		2,860	353	12.34
November		2,823	300	10.62
December		2,823	303	10.73
January	1930	2,840	325	11.44
February		2,860	351	12.27
March		2,880	391	13.62
April		2,866	400	13.95
May		2,841	392	13.79
June		2,811	378	13.44
July		2,766	354	12.79
August		2,727	330	12.10
September		2,661	281	10.55
October		2,577	218	8.45
November		2,565	224	8.73
December		2,565	239	9.31
January	1931	2,565	257	10.01
February		2,565	273	10.64
March		2,570	290	11.28
April		2,604	340	13.05
May		2,604	365	14.01
18 Months ended October	1932	2,384	449	18.83

Table 3. - Number of Persons Reported as Employed in each Month reduced to the Sample Dimension ascertained for May 1921 (i.e., Total Number at Work on June 1, divided by 2,785) Calculated by Correction for the Square Root of the Index of the Number of Firms reporting).

(000's omitted)

Year ended		Correction for number of Firms	Corrected Sample of employees	Estimated Total employed
January	1921	.98	6,367	1,773
February		.99	6,225	1,734
March		.99	6,080	1,693
April		.99	5,940	1,654
May		1.00	5,967	1,662
June		1.00	6,007	1,673
July		1.00	6,289	1,751
August		.98	6,499	1,810
September		1.02	6,648	1,851
October		1.03	6,720	1,872
November		1.04	6,675	1,859
December		1.0	6,052	1,685
January	1922	1.07	5,891	1,641
February		1.08	6,128	1,707
March		1.08	6,034	1,680
April		1.10	6,157	1,715
May		1.11	6,605	1,839
June		1.11	6,653	1,853
July		1.10	6,859	1,910
August		1.09	6,937	1,932
September		1.10	6,969	1,941
October		1.13	6,951	1,936
November		1.11	7,036	1,959
December		1.09	6,493	1,808
January	1923	1.10	6,665	1,856
February		1.11	6,695	1,865
March		1.05	6,843	1,906
April		1.06	7,094	1,976
May		1.06	7,553	2,104
June		1.05	7,763	2,162
July		1.07	7,791	2,170
August		1.06	7,750	2,156
September		1.07	7,656	2,132
October		1.07	7,591	2,114
November		1.06	7,431	2,070
December		1.06	6,887	1,918

Table 3. - Number of Persons Reported as Employed in each Month reduced to the Sample Dimension ascertained for May 1921 (i.e., Total Number at Work on June 1, divided by 2.785) Calculated by Correction for the Square Root of the Index of the Number of Firms reporting). - Con'td.
(000's omitted)

Year ended		Correction for number of firms	Corrected Sample of employees	Estimated Total employed
January	1924	1.07	7,004	1,951
February		1.07	6,995	1,948
March		1.07	6,893	1,920
April		1.08	7,044	1,962
May		1.07	7,343	2,045
June		1.06	7,410	2,064
July		1.06	7,319	2,038
August		1.07	7,170	1,997
September		1.06	7,282	2,028
October		1.06	7,196	2,004
November		1.07	7,007	1,951
December		1.06	6,514	1,814
January	1925	1.06	6,697	1,865
February		1.05	6,811	1,897
March		1.06	6,778	1,888
April		1.07	6,994	1,948
May		1.07	7,280	2,027
June		1.07	7,453	2,076
July		1.07	7,394	2,059
August		1.07	7,417	2,066
September		1.07	7,562	2,106
October		1.07	7,456	2,076
November		1.07	7,317	2,038
December		1.05	6,983	1,945
January	1926	1.06	7,027	1,957
February		1.06	7,082	1,972
March		1.05	7,135	1,987
April		1.07	7,229	2,013
May		1.07	7,743	2,156
June		1.07	7,950	2,214
July		1.07	7,987	2,224
August		1.06	8,110	2,259
September		1.07	8,084	2,251
October		1.07	7,900	2,200
November		1.07	7,783	2,168
December		1.07	7,305	2,034

Table 3. - Number of Persons Reported as Employed in each Month reduced to the Sample Dimension ascertained for May 1921 (i.e., Total Number at Work on June 1, divided by 2,785) Calculated by Correction for the Square Root of the Index of the Number of Firms reporting). Con

(000's omitted)

Year ended		Correction for number of firms	Corrected Sample of employees	Estimated total employed
January	1927	1.06	7,442	2,073
February		1.06	7,502	2,089
March		1.07	7,436	2,070
April		1.07	7,765	2,163
May		1.09	8,044	2,240
June		1.09	8,299	2,311
July		1.10	8,210	2,286
August		1.09	8,310	2,314
September		1.10	8,226	2,291
October		1.10	8,174	2,276
November		1.10	8,058	2,244
December		1.10	7,425	2,068
January	1928	1.10	7,633	2,126
February		1.10	7,691	2,142
March		1.10	7,663	2,134
April		1.12	7,884	2,196
May		1.12	8,422	2,346
June		1.13	8,638	2,406
July		1.12	8,956	2,494
August		1.13	8,862	2,468
September		1.13	8,850	2,465
October		1.13	8,688	2,414
November		1.13	8,131	2,264
December		1.11	8,414	2,343
January	1929	1.11	8,511	2,370
February		1.11	8,469	2,359
March		1.12	8,849	2,464
April		1.13	9,264	2,580
May		1.14	9,383	2,613
June		1.15	9,546	2,659
July		1.15	9,510	2,649
August		1.16	9,392	2,616
September		1.17	9,313	2,594
October		1.17	9,253	2,577
November		1.18	8,804	2,452
December		1.17	8,269	2,303

Table 3. - Number of Persons Reported as Employed in each Month reduced to the Sample Dimension ascertained for May 1921 (i.e., Total Number of Work on June 1, divided by 2,785) Calculated by Correction for the Square Root of the Index of the Number of Firms reporting). Con.

(000's omitted)

Year ended		Correction for number of firms	Corrected Sample of employees	Estimated total employed
January	1930	1.17	8,306	2,313
February		1.17	8,209	2,286
March		1.18	7,978	2,222
April		1.18	8,273	2,304
May		1.18	8,661	2,412
June		1.18	8,841	2,462
July		1.19	8,762	2,440
August		1.19	8,602	2,396
September		1.19	8,577	2,389
October		1.19	8,351	2,326
November		1.20	8,023	2,234
December		1.20	7,603	2,117
January	1931	1.20	7,536	2,099
February		1.20	7,513	2,092
March		1.20	7,499	2,088
April		1.22	7,587	2,113
May		1.24	7,588	2,113
June		1.23	7,644	2,129
July		1.23	7,774	2,165
August		1.23	7,907	2,202
September		1.23	7,689	2,141
October		1.23	7,549	2,102
November		1.23	7,333	2,042
December		1.23	6,797	1,893
January	1932	1.22	6,715	1,870
February		1.22	6,637	1,848
March		1.23	6,511	1,813
April		1.23	6,503	1,811
May		1.24	6,581	1,833
June		1.25	6,496	1,809
July		1.25	6,333	1,764
August		1.24	6,365	1,773
September		1.24	6,421	1,788
October		1.25	6,242	1,738

Table 4. - Calculations of Employment made by Calculating Proportionate Size of Sample from the number of firms.
(000's omitted)

Year ended		Mean	σ	Probable Total
May	1921	1,662	-	1,854
June				
July				
August				
September				
October				
November				
December		1,751	79.7	1,974
January	1922	1,740	82.7	1,972
February		1,737	82.8	1,969
March		1,736	83.8	1,971
April		1,743	80.4	1,968
May		1,757	85.1	2,004
June		1,772	81.2	2,007
July		1,785	84.9	2,031
August		1,795	97.3	2,072
September		1,805	104.8	2,104
October		1,808	107.0	2,113
November		1,817	116.6	2,143
December		1,825	109.8	2,132
January	1923	1,845	94.5	2,114
February		1,858	84.8	2,114
March		1,877	66.4	2,076
April		1,898	50.8	2,050
May		1,921	72.9	2,142
June		1,936	93.4	2,215
July		1,968	79.8	2,215
August		1,987	88.6	2,253
September		2,003	129.0	2,538
October		2,018	130.5	2,357
November		2,027	130.1	2,365
December		2,036	117.6	2,365
January	1924	2,044	107.5	2,345
February		2,051	98.6	2,332
March		2,052	96.7	2,328
April		2,051	97.9	2,325
May		2,046	96.6	2,316
June		2,038	90.4	2,291
July		2,027	81.1	2,258
August		2,013	70.9	2,219
September		2,005	61.7	2,187
October		1,995	51.6	2,150
November		1,986	48.2	2,131
December		1,977	65.7	2,171

Table 4. - Calculations of Employment made by Calculating Proportionate Size of Sample from the number of firms. - Cont'd.
(000's omitted)

Year ended		Mean	σ	Probable Total
January	1925	1,970	72.5	2,180
February		1,965	75.0	2,183
March		1,963	77.2	2,187
April		1,963	75.1	2,181
May		1,960	75.9	2,180
June		1,961	77.3	2,180
July		1,963	74.9	2,180
August		1,969	90.0	2,221
September		1,975	90.9	2,230
October		1,981	95.0	2,247
November		1,988	95.6	2,256
December		1,999	81.7	2,236
January	1926	2,007	72.5	2,221
February		2,013	66.2	2,212
March		2,026	56.3	2,195
April		2,026	50.1	2,176
May		2,040	51.7	2,195
June		2,051	78.9	2,272
July		2,061	92.9	2,321
August		2,081	107.0	2,381
September		2,093	116.7	2,414
October		2,102	119.9	2,434
November		2,114	120.4	2,495
December		2,122	95.0	2,407
January	1927	2,132	103.5	2,422
February		2,141	92.0	2,422
March		2,147	82.9	2,422
April		2,160	72.7	2,422
May		2,165	76.5	2,422
June		2,172	85.4	2,428
July		2,179	90.0	2,449
August		2,184	95.2	2,469
September		2,187	98.2	2,481
October		2,192	100.3	2,492
November		2,199	101.9	2,504
December		2,202	97.6	2,505
January	1928	2,207	92.9	2,505
February		2,212	88.1	2,505
March		2,217	81.3	2,500
April		2,220	79.9	2,500
May		2,228	87.2	2,500
June		2,236	98.1	2,530
July		2,253	128.4	2,587
August		2,266	134.2	2,600

Table 4. - Calculations of Employment made by Calculating Proportionate Size of Sample from the number of firms.- Concluded.
(000's omitted)

Year ended		Mean	σ	Probable Total
September	1928	2,280	145.2	2,643
October		2,292	149.4	2,673
November		2,294	149.4	2,675
December		2,317	133.3	2,675
January	1929	2,337	120.6	2,675
February		2,355	106.5	2,675
March		2,382	85.2	2,675
April		2,414	81.6	2,675
May		2,437	94.9	2,675
June		2,458	113.1	2,751
July		2,471	123.9	2,781
August		2,483	130.3	2,828
September		2,493	131.7	2,842
October		2,507	133.1	2,860
November		2,523	113.1	2,823
December		2,520	118.4	2,823
January	1930	2,515	125.7	2,840
February		2,509	134.5	2,860
March		2,489	155.9	2,880
April		2,466	158.5	2,866
May		2,449	157.2	2,841
June		2,433	142.2	2,811
July		2,412	126.5	2,766
August		2,397	110.6	2,727
September		2,380	93.8	2,661
October		2,359	73.3	2,577
November		2,341	74.8	2,565
December		2,326	107.3	2,565
January	1931	2,308	115.5	2,565
February		2,292	129.8	2,565
March		2,280	140.6	2,570
April		2,264	147.8	2,604
May		2,239	145.9	2,604
18 Months ended October	1932	1,935	1,605	2,384

APPENDIX I.

METHOD USED IN CALCULATING UNEMPLOYMENT IN CANADA FROM 1921 TO 1932.

The problem described in the following pages was the calculation of an average that might be considered as truly representative of unemployment conditions in Canada during a reasonably long period. Since the decade 1921 to 1931 included good, bad and moderately normal conditions, an average calculated for this period might be expected to be fairly representative of conditions in general.

A. - The Number Unemployed.

The first task undertaken was to estimate the number of persons employed from month to month and year to year during the decade. As the basis for this calculation use was made of the Dominion Bureau of Statistics record of employment as a sample, being the number employed from month to month by establishments employing more than fifteen persons in industries other than agriculture and finance. The total number employed reported by these establishments was about 36 per cent of the total number of wage earners in all occupations working on June 1, 1921. The question is, whether the number thus reported may be considered a fair sample of all wage earners in Canada working during any month or of workers in industrial establishments only. If we regard the reported wage earners as a sample of all wage earners, the sample increased from 36 per cent in 1921 to 43 per cent in 1931, so that allowance must be made for this increase in the sample before calculating the total number working. If we regard them as a sample merely of industrial workers, then we have nothing to go on with; for even if we could calculate the total employed in industrial establishments exactly, we would have to guess at the remaining wage earners and we have nothing on which to base this guess; moreover, a guess involving any considerable proportion of the whole is inadmissible.

There are many reasons why the returns mentioned cannot be considered a sample of industrial workers. In the first place they represent only establishments employing more than fifteen persons, and employment conditions in large establishments are obviously quite different from the conditions in small establishments. The chief argument against so considering them, however, is to be seen in the Census of gainfully employed in 1921. This Census showed 91,511 labourers not stating a connection with any specific industry. Some, perhaps a large proportion, of these were casual labourers, but some no doubt were labourers connected with establishments of the kind reported in the monthly figures of employment. The existence of these labourers unconnected with any specific industry would at once make it impossible to use these monthly figures as a sample of industrial establishments, since no denominator exists on which to base the relative size of the sample. On the other hand, if the monthly figures be regarded as a sample of all wage earners, these labourers would tend to balance conditions as between workers in industrial establishments and other workers. There would seem to be no reason to regard the industries not reporting their employees as "protected industries". These casual labourers are certainly not in protected industries, nor are the labourers in Civic governments, (as proved by the Census figures of 1921) nor temporary employees in government services, nor such people as travelling salesmen, actors, musicians, etc. The managers and other officials of industrial establishments would seem to be as fully protected as persons in professions outside these establishments and their

numbers would not be far different. Consequently there would seem to be no good reason why the figures returned by these establishments should not be regarded as a sample of all wage earners working during the month reported. As will be seen further on, this procedure has the argument behind it that it works.

The monthly figures being therefore considered as a sample of all wage earners, the next problem was to determine a factor by which the monthly figures could be multiplied to obtain the total employed in that month. At first it seemed sufficient to graduate this factor from 1921 to 1931 by making use of the end years (it was a 36 per cent sample in 1921 and a 43 per cent sample in 1931). Increases of equal increments from month to month between these two percentages would seem to make allowance for the gradual increase in the size of the sample. Although apparently reasonable results were obtained by this method, and although it is a method that is very often used, it was set aside as unsatisfactory, chiefly for the reason that there was no criterion by which to judge the results. If there were a way in which the number employed on June 1, 1931 could be estimated without making any use whatever of these Census figures, this would furnish evidence whether the method used was right.

Now there was seen in the monthly reports of employment a good reason, if not the only reason, why the percentage sample increased from 36 in 1921 to 43 in 1931, viz., the varying number of establishments reporting. Clearly the reason for a fluctuation (up and down) from month to month in the number of firms was not the coming into and going out of existence of these firms, but their failure to report in some months, and the inclusion of new firms in the record. Use could, therefore, be made of the increase in the number of firms to correct the sample. A good method would have been to consider half the fluctuation in the number of firms as spurious, and correct the reported number employed by this method. If we regard the index of firms and employed as geometric, not arithmetic, then a correction by the square root of the number of firms would have the same significance. However, the relationship from month to month between the variation in the number of firms and the number reported as employed was determined and it was found that the number employed increased as the square root of the increase (geometric) in the number of firms, but not as the other square root. The square root of the index of the number of firms was then calculated as in Table 3 and the number reported as employed from month to month was divided by this result, thus placing each month's figures on the same sample base as in 1921. (See Table 3). The result was then multiplied by the common factor 2.785; this being the relationship between the employed reported for the month of May, 1921, and the number reported by the Census of 1921 as being employed on June 1. The resulting figures were considered as an estimate of the number employed from month to month from June 1921 to October 1932. It will be noticed that while no use whatever was made of the Census of 1931 to obtain these results, the number thus calculated for May 1931, was 2,113 thousand as compared with the Census figures of 2,093 employed on June 1. The estimate was so close that it was decided not to make any changes in view of the Census figures, for in any case the whole month of May cannot be expected to correspond exactly to the fixed day June 1.

B. - The Number of Wage-Earners.

Once we have the figures of employed the real problem remains, viz., to calculate the number of wage earners and thus estimate the number and proportion of unemployed. Clearly there is no way of doing this directly except by a Census,

or by an actual count taken in certain districts as a sample of the whole. An estimate made by using a few known factors and guessing at the rest is clearly dangerous. We could calculate the increase in population at certain ages, the number of immigrants, etc., etc., but even if we had also the number of emigrants, we could not in this way obtain reasonably close figures of the number of wage earners; for there is a shifting in the ages at which persons begin and leave work; a shifting between sexes; a shifting between wage earners and persons working on their own account or living on income; to say nothing of marriages of females. There are altogether too many unknowns for any calculation by means of integrating a number of partially known elements. Least of all can we assume that the number of wage earners remained stationary or increased in smooth progression, this being contrary to experience. We can use the few knowns as corroborative evidence of what we calculate, but we cannot use them as a basis of calculation, except when they may be considered representative samples.

Now is it possible that the figures of employment themselves contain all the evidence that is needed? There are two pieces of evidence in the monthly figures that place the total number of wage earners within limits which amount to certainties. The number who worked at any time during the year cannot be less than the number reported in the heaviest month of the year; and the number of persons who worked every month in the year cannot be greater than the number reported in the lightest month. There are certainties, and if we were to take the number reported in the heaviest month as the total number of wage earners who worked at any time during the year it would be an approximation to the truth,—much better than a guess. But there is also a probability, so strong as to amount almost to certainty, that the number of wage earners was greater than the largest number appearing in the monthly figures, e.g., the largest number appearing in 1929 was in June, when it was 2,659,000, while the next was in July with 2,649,000. Now the only way we can assume that the total of wage earners in 1929 was only 2,659,000 is by assuming that certain persons worked in that month who did not work in any other month during the year, e.g., 10,000 worked in June who did not work in July or any other month; for if some of these 10,000 worked in July then a corresponding number must have been absent during both June and July and these would be in addition to the 2,659,000. Since it is extremely improbable that some of the 10,000 did not work in July it is also extremely improbable that 2,659,000 is as large as the total number of different persons employed in that year. We have thus certain criteria to go on. We have fixed an inside limit that is a certainty and we can call upon the aid of probability for fixing the outward limit. If the fluctuations from month to month obey certain laws of probability then we have a means of fixing the most probable number of wage earners during the year. This is much better than a guess, or a calculation that pieces together a number of factors partially known and ends with a guess at the unknowns.

The conditions under which variations obey the laws of probability are that they are due to a large number of approximately equally important causes. Now on a priori grounds this applies to the monthly variations in the figures of employment. We can make a list of some of the causes as follows:

(1) Seasonal.
(2) Coming into employment for the first time.
(3) Leaving employment.
(4) Illness.
(5) Strikes, etc.

(6) Accident.
(7) The personal equation of workers.
(8) Growth in industries (which may be different or at different times for different industries).
(9) Contraction in industries (to which the same applies as in 8).

Many other causes might be added, and further, each of the above-mentioned causes could be broken up into several parts as suggested in (8) and (9).

It is clear that the number of causes is sufficient to fulfill part of the condition mentioned. Now if the second part is not fulfilled, viz., that the causes should be approximately equal, i.e., if there are a few major causes overshadowing the rest, it is possible that these major causes are compensated and do not appear in the variations. We have evidence that this is so. A month in which a large number are reported "out of work" is certain to have a smaller number reported ill, etc., for if 90 per cent of the number unemployed report "no job" there is only 10 per cent left to report illness. There is no reason to believe that there is less illness among the persons out of work than among the persons with jobs. If the former had jobs then they would report time they lost through illness. In the same way, when they have no job they lose no time through strikes, etc. There is another possibility which obtains remarkable corroboration from the Censuses of 1921 and 1931; viz., that at a time of extreme unemployment, the persons who have jobs lose as little time as possible. In 1931 there was a greater percentage who reported no loss of time during the 52 weeks than in 1921. This, obviously, would be a compensatory cause to "no job". Similarly, persons leaving one industry to work in another would not appear in the variates except during the time idle. It would seem, then, that there is no reason why the monthly variates should not obey the laws of probability. Now is there any evidence that they do? To investigate this the variations of the 121 months from May, 1921 to 1931, were subjected to measurements. The correspondence with probability distribution may be seen in the following table.

σ = 235.4 (000's) or the number employed as among all the months of the 121.

	Expected Number of Months	Actual Number of Months	Difference	Difference Squared	Squared Difference Divided by Expected Number
1.8	4.3	7.0	2.7	5.29	1.23
1.5-1.8	3.7	1.0	-2.7	7.29	1.87
1.2-1.5	6.0	9.0	3.0	9.0	1.50
.9-1.2	8.3	5.0	-2.3	5.29	.64
.6- .9	10.8	11.0	0.2	.04	.00
.3- .6	13.0	11.1	-2.0	4.00	.31
0- .3	14.3) 28.6	10.0) 29.0	-4.3) 0.4	18.49) .16	1.29) 0
0- .3	14.3)	19.0)	4.7)	22.09)	1.54)
.3- .6	13.0	10.0	-3.0	9.00	.69
.6- .9	10.8	15.0	3.2	10.24	.95
.9-1.2	8.3	11.0	2.8	7.84	.94
1.2-1.5	6.0	4.0	-2.0	4.00	.67
1.5-1.8	3.7	3.0	-0.7	.49	.14
1.8-	4.3	5.0	0.7	.49	.11
					11.78

The Chi, or the measure of deviation from normality is 11.78 and the probability resulting is .60, but if we correct for skew it is about .80. This is apparent in the figures after the brackets in the preceding table. The skew is owing to the fact that the year has more light months than heavy, so that the seasonal seems to be the strongest non-compensatory cause. (However, the skew is remarkably small). It is clear that the significant errors are largely due to a skew,—which was to be expected, and that there is no doubt that we have a probability distribution. If we had weekly figures instead of monthly the fit would be seen to be still better. During the year 1921 weekly figures were received, and these figures tested for normality give good results.

It is clear then, since the variations from month to month show a normal distribution, that we have a means of measuring the probable number of different persons who appeared in these monthly figures; i.e., the number of different persons who worked at any time throughout the year. In a theoretical case this would be impossible, since the axis of the probability curve extends to infinity on both sides of the mean, but we can overcome this difficulty by definition. It is reasonable to assume that no one appeared on the pay rolls of establishments who did not work at least one day during the year; also on the other hand, that by persons losing no time during the year we do not mean that these persons worked every instant of time. Once we define our total wage earners as the total number of persons who worked at least one day during the year, we can calculate the probable total number of wage earners meeting this definition. / By means of a probability table and the standard deviation we obtained by trial the number of persons meeting this definition for the years ended each month from December, 1921, to May, 1931. The figure obtained for May, 1931, was 2,604 thousand as compared with the Census figures 2,565 given as the total number of wage earners on June 1, an error of only 39 thousand,—a little over 1 1/2 per cent. It will be noticed in Table 1 that the 2,565 appears in several of the months of 1931. In any case the estimate is close enough. It will be easy on examination of Tables 3, 4 and 5 to see that no use whatever was made of the Census figures of 1931 in making the calculation, and that the estimate could have been made before the Census figures were compiled if this had been required. With such close agreement with the facts in 1931 there is justification for belief that the calculations for the intermediate years are satisfactorily close to what a Census at the end of each month would have revealed.

Care should be taken to bear in mind the definition of the total number of wage earners--- the total number of persons who worked at least one day during the year. By this definition the number of wage earners is purposely kept a little too high, since it is not probable either that a person who worked only one day would appear on the payroll of a firm, nor is it probable that such a person would report himself to a Census enumerator as having worked during the year. However, it was thought best to avoid understating the number of wage earners, since by so doing the number unemployed would be also understated.

/ Greater precision is possible for this calculation by reason of the moderate skew which cuts the frequency abruptly at the heavy end. Consequently it is easier to calculate the total number working at any time during the year than the number idle no time during the year.

The number unemployed from month to month is, of course, the difference between the total number of wage earners and the number working. Care was taken to give these figures, from month to month, the same meaning as they have in the Census. The percentages of unemployment are based for each month on the number of persons working during the year ended that month.

It will be seen that if a person did not work at all during the year he is not counted; in normal or semi-normal years these have not to be reckoned with. Even in 1931 the number of persons who gave 52 weeks not working, was comparatively small, and some of these probably worked a day or two at least. In the abnormal times since the Census of 1931, these have to be reckoned with. Consequently, the method described above is not strictly suited for measuring the present unemployment. In the chart shown elsewhere a calculation was made, and appears in dotted lines, but the definition of wage earners was changed to persons working at any time during the previous 18 months (instead of 12). This gives an estimate of the number of persons not working in October, 1932, as over 650,000 but final reliance is not placed on the figure.

The unemployment mentioned above refers to persons idle from all causes, not merely to persons out of work. It remained to calculate the persons idle through lack of work. For this purpose separate calculations were made of the extent to which the percentage not working was raised by the increase in workers and the amount it was lowered by the increase in volume of employment. This calculation gave an average of 74 per cent of those not working as affected by the incidence of workers and volume of employment. This was taken as the percentage of idle persons who are idle from being out of work. The remainder are idle from sickness, etc.