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Production during the American Business Cycle of 1927-1933

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I. INTRODUCTION

EVERY business cycle of which we have definite knowledge presents features that are peculiar to itself and features that are common to its species. The American cycle of 1927-33 exemplifies this rule. It resembled its predecessors in being different from all other cycles as well as in being similar to them.

This intermixture of differences with similarities constitutes the greatest difficulty in dealing with business cycles. In so far as a cycle develops unique features the statistician's forecasts are likely to go wrong, the business man's plans may miscarry, and the economist's explanations need supplements or revisions. The more anyone's expectations are based upon the notion of a 'normal' cycle, the more trouble will deviations from that norm make for him. Also, the more a given cycle deviates from expectations based upon past experience, the more mistakes are men likely to make.

Hence it is important both for economic practice and for economic theory to study not only the usual course followed by business cycles but also the ways in which and the degree to which individual cycles diverge from that course. Crude observations suffice to show that these cycles differ in duration and in the intensity of their phases. For example, almost every American is painfully aware that the depression that began in 1929 was unusually long and exceedingly severe. But to give these impressions the definiteness that business planning and scientific analysis require, it is necessary to measure cyclical behavior. Since a business cycle consists of interrelated fluctuations in many economic processes, these measures must be numerous. They must show the direction, the timing, the duration and the amplitude of the cyclical movements in different processes in a fashion that will give a clear picture of the total movement.

A method of making measures of this sort developed by the National Bureau was explained and illustrated last year in *Bulletin 57*.¹ The method consists of a detailed analysis of what we call the 'specific cycles' and 'reference cycles' of time series. We get the former by marking off the high and low points of the cyclical movements peculiar to individual series. We get the latter by breaking each series into segments that coincide with the cycles in general business activity in the country. In this bulletin the method is applied to show in what ways and how far the American cycle of 1927-33 resembled and differed from its predecessors, primarily with respect to the physical volume of production.

To put this cycle in the proper perspective we must recall the dramatic cyclical record of American business in post-War years. The contraction of September 1918 to April 1919 was unusually brief and far less severe than many expected. Patriotism and governmental action had combined to restrict the output of many commodities that could be dispensed with during the War. When the need for practicing severe economy was past, a wave of consumer buying swept the markets and put an early end to the contraction. Extensive speculation in commodities and a violent rise of prices followed. As the more insistent demands were met and prices reached high levels, consumer buying declined; prices fell even more rapidly than they had risen; the highly speculative ventures of 1919 were drastically liquidated, and the volume of business contracted spasmodically. This contraction was as brief as it was violent and a revival

¹ July 1, 1935, price fifty cents. A fuller explanation of the National Bureau's measures, supplemented by statistical tests of their representative value, is given in Chapters I to III of the forthcoming volume on *Business Cycles: Analysis of Cyclical Behavior*. Copies of the three chapters in mimeographed form may be had for one dollar.

began in the autumn of 1921. The subsequent expansion lasted until the spring of 1923, and, like most advances from a deep trough, registered fairly large gains. Also the contraction that followed in 1923-24 was a substantial movement, though it lasted only a little more than a year. Judged by the National Bureau's measures of the amplitudes of cyclical swings in many economic activities over considerable periods, the cycle of 1921-24 must be regarded as of full average severity. With the cycle of 1924-27 we deal in greater detail later on. Suffice it to say here that the expansion from the summer of 1924 to the autumn of 1926 approximated pre-War averages; but that the contraction from the autumn of 1926 to the end of 1927 was distinctly mild, and so also was the following expansion of 1928-29.²

It is possible to treat the whole period from the contraction of 1920-21 to the contraction of 1929-33 as a single unit of business experience, and to regard the contractions of 1923-24 and 1926-27 as minor interruptions of the rising tide of activity. That view is proper for students of 'long' cycles and for those interested primarily in severe depressions. But we believe that we shall get clearer insights into the complicated rhythm of economic activity by breaking the long cycle into segments and making intensive studies of the developments that characterized each one. For we think that the violence of convulsions such as occurred in 1907-08, 1920-21 and 1929-33 is due largely to the partial character of the liquidations effected during mild contractions, a shift from confidence to recklessness, and, in general, the gradual cumulation of stresses within the economic system to the point where tension forces a disruptive break. Our mode of approach does not imply that business cycles are alike in all respects or that their single phases can be explained by their immediate predecessors; on the contrary it is designed to throw the differences among business cycles into high relief and to provide materials for learning more than we now know about the way in which the peculiarities of business cycles influence their successors. This bulletin presents a part of the results that the National Bureau is obtaining by making systematic measurements of business cycles. Our chief aim here is to describe the behavior of American production during the cycle of 1927-33 and to compare that behavior with its analogues during preceding cycles.

II. THE TURNING DATES AND DURATION OF THE CYCLE

Table 1 shows the dates on which the specific cycles of 40 significant time series representing a considerable range of economic activities reached cyclical troughs in 1927-28, cyclical peaks in 1928-29, and cyclical troughs in 1931-33. The rough concurrence of the specific cycles in these series

² For some of the statistical evidence on which the statements about the cycles of 1919-27 are based, see *Recent Economic Changes*, Vol. II, pp. 890-909 (National Bureau of Economic Research, 1929).

indicates the existence of a business cycle from 1927 to 1933.

Seventeen series show a cyclical trough in November and five in December 1927. Five more series reached their lowest point in this movement before November, four after December. This sample of the evidence suggests that November 1927 is the best date to choose as the initial trough of the cycle; but we had chosen December at an earlier stage of the investigation and a shift of one month would affect our results so little that recomputation seems unjustified. It should be noted that 9 of the 40 series have no entries in the column under consideration; that is, the processes represented 'skipped' the mild contraction of 1926-27. One of these series is an index of the prices of industrial stocks, and four are banking series that were influenced in considerable measure by the prolonged stock exchange boom. Construction was approaching the climax of one of its characteristic 'long cycles' and seemed to be little affected by the slackening of business activity. The three remaining series represent two industries with rapidly rising secular trends and an index of the output of consumers' goods, excluding automobiles.

All 40 series reach a cyclical peak in 1928 or 1929. There is a definite concentration of the peaks around June 1929. Twelve series have peaks in that month, another seventeen within three months of June, and eight more within five months. In no series does the peak lag more than five months after June and in only three series does it lead more than that. The building boom reached its highest point in February 1928 according to the Dodge data, wholesale prices in September according to the Bureau of Labor Statistics, and the production of consumers' goods in November according to the Federal Reserve Bank of New York.

While the initial trough and the peak of the cycle in question are easy to date, the terminal trough presents some difficulty. Seventeen series touched cyclical bottoms in March 1933, four in February or April, and three in January or May. Thus 24 series out of 40, among them some of the most significant in the sample, indicate that March 1933 should be taken as the terminal trough. But there is a secondary concentration in the summer of 1932. Four series reached cyclical troughs in June, three in July, and five in August. Again the list includes some series of high diagnostic value. This cyclical trough is one of the not infrequent cases of a 'double bottom'. Closer inspection shows that this double bottom appears in 23 of the 40 series in Table 1: namely, the four indexes of 'business activity', the three indexes of 'general' industrial production, eight of the nine group indexes of production, factory employment and payrolls, the production of pig iron, steel, paper and electricity, total imports and the prices of industrial stocks. In seven of these series the summer trough of 1932

TABLE 1
DATA BEARING ON TURNING DATES OF LATEST AMERICAN BUSINESS CYCLE
LEADS (-) OR LAGS (+), IN MONTHS, ARE SHOWN IN PARENTHESES

Dates of cyclical troughs and peaks¹
corresponding to selected reference dates
of latest business cycle

Series	Reference trough December '27	Reference peak June '29	Reference trough March '33
INDEXES OF BUSINESS ACTIVITY			
Ayres	Nov. '27 (-1)	June '29 (0)	July '32 (-8)
American Telephone and Telegraph Co.	Dec. '27 (0)	Aug. '29 (+2)	Mar. '33 (0)
Axe-Houghton	Nov. '27 (-1)	July '29 (+1)	Mar. '33 (0)
Persons	Nov. '27 (-1)	June '29 (0)	Mar. '33 (0)
INDEXES OF 'GENERAL' INDUSTRIAL PRODUCTION			
Babson's Statistical Organization	Nov. '27 (-1)	June '29 (0)	Mar. '33 (0)
Federal Reserve Board	Nov. '27 (-1)	June '29 (0)	July '32 (-8)
Standard Statistics Co.	Nov. '27 (-1)	June '29 (0)	Mar. '33 (0)
INDEXES OF PRODUCTION FOR INDUSTRIAL GROUPS			
Manufactures (Leong)	Nov. '27 (-1)	June '29 (0)	Mar. '33 (0)
Producers' goods (Leong)	Nov. '27 (-1)	May '29 (-1)	June '32 (-9)
Producers' goods (F.R.Bk. of N. Y.)	Dec. '27 (0)	June '29 (0)	June '32 (-9)
Consumers' goods, including automobiles (Leong)	Dec. '27 (0)	Mar. '29 (-3)	Mar. '33 (0)
Consumers' goods, excluding automobiles (Leong)	...	June '29 (0)	Mar. '33 (0)
Consumers' goods (F.R.Bk. of N. Y.)	July '28 (+7)	Nov. '28 (-7)	Mar. '33 (0)
Durable goods (Leong)	Nov. '27 (-1)	June '29 (0)	Aug. '32 (-7)
Transient goods (Leong)	Dec. '27 (0)	June '29 (0)	Mar. '33 (0)
Mining (F.R. Board)	July '28 (+7)	Sept. '29 (+3)	June '32 (-9)
IMPORTANT 'SINGLE SERIES' INDICATORS			
Pig iron production	Nov. '27 (-1)	July '29 (+1)	Mar. '33 (0)
Steel ingot production	Nov. '27 (-1)	July '29 (+1)	Aug. '32 (-7)
Passenger car production	Nov. '27 (-1)	Jan. '29 (-5)	Oct. '32 (-5)
Truck production	Nov. '27 (-1)	June '29 (0)	Aug. '32 (-7)
Paper production	...	May '29 (-1)	Jan. '33 (-2)
Electric power production	...	Oct. '29 (+4)	Mar. '33 (0)
Bituminous coal production	Nov. '27 (-1)	Feb. '29 (-4)	July '32 (-8)
Total construction contracts (Dodge)	...	Feb. '28 (-16)	Apr. '33 (+1)
Machine tool orders	Apr. '27 (-8)	Feb. '29 (-4)	Mar. '33 (0)
Freight car loadings	Nov. '27 (-1)	June '29 (0)	Aug. '32 (-7)
Factory employment	Jan. '28 (+1)	Aug. '29 (+2)	Mar. '33 (0)
Factory payrolls	Nov. '27 (-1)	May '29 (-1)	Mar. '33 (0)
Department store sales	Sept. '27 (-3)	Sept. '29 (+3)	Mar. '33 (0)
Total imports	Dec. '27 (0)	May '29 (-1)	Feb. '33 (-1)
Wholesale prices (B.L.S. index)	June '27 (-6)	Sept. '28 (-9)	Feb. '33 (-1)
Industrial stock prices (Dow-Jones index)	...	Sept. '29 (+3)	June '32 (-9)
Call money rates	Sept. '27 (-3)	Mar. '29 (-3)	(May '31) ²
Commercial paper rates	Nov. '27 (-1)	Aug. '29 (+2)	(Sept. '31) ²
Bank debits outside N. Y.	...	Aug. '29 (+2)	Mar. '33 (0)
Clearings (F.R.Bk. of N. Y. index)	...	Oct. '29 (+4)	May '33 (+2)
Deposits activity (F.R.Bk. of N. Y. index)	...	Oct. '29 (+4)	Jan. '33 (-2)
Total loans, reporting member banks	...	Nov. '29 (+5)	Apr. '33 (+1)
Commercial business failures, number (inverted)	Oct. '28 (+10)	Mar. '29 (-3)	Aug. '32 (-7)
Commercial business failures, liabilities (inverted)	Apr. '27 (-8)	Feb. '29 (-4)	Apr. '32 (-11)

¹The turning dates correspond to the highest or lowest points of the cycles in the original data adjusted only for seasonal variations, except in the following instances. (a) Machine tool orders and the indexes of wholesale and stock prices are not adjusted for seasonality. (b) The indexes by the Federal Reserve Bank of New York of the output of producers' and consumers' goods, clearings, and deposits activity are adjusted for secular trend; so also is Ayres' index of 'business activity' and Persons' index of 'industrial production and trade'. (c) In five cases we have taken a point other than the absolute high or low as marking better the 'true' cyclical turn: in total imports December instead of February 1927, in machine tools April instead of September 1927, in the index of mining September instead of February 1929, in both steel and the index of durable goods August 1932 instead of March 1933.

²The two interest rate series show an extra cycle. The dates entered are for the terminal troughs of the first cycle. The terminal troughs of the second cycle cannot be determined as yet.

is the lower, in sixteen series the spring trough of 1933 is the lower. Ten more series have V-shaped bottoms, half of them in 1932 and half in 1933. The troughs of the remaining seven series do not fall neatly within either of these two classes. It is clear, however, that a deep trough was reached in the summer of 1932, that business revived substantially in the autumn, that this revival faded late in the year, and that a fresh contraction reduced the volume of business to another low point in the early spring of 1933. Of the two troughs, that in the spring was the lower in a majority of the series in our sample. This fact, reenforced by a general rule that in cases of doubt we accept the later date as marking the end of a cyclical expansion or contraction, leads us to select March 1933 as the close of the cycle in question.

According to the dates selected, this latest complete cycle is the longest in American experience since 1885 and the fourth longest since 1855. Table 2, which presents the National Bureau's chronology of American business cycles, provides materials for numerous comparisons of this sort. Perhaps the most instructive concerns the durations of the phases of expansion and contraction. The expansion of December 1927 to June 1929 is well below the average—only a year and a half as compared with about two years. Yet two earlier expansions were shorter and two more were no longer. On the other hand, the duration of the contraction of June 1929 to March 1933 was more than twice the average drawn from earlier experience. It is exceeded

in duration only by the contraction that followed the 'panic' of 1873. But in no other cycle have we had a very short expansion followed by a very long contraction. Table 2 shows that expansions have been as long or longer than the following contractions 13 times out of 20 and as long or longer than the preceding contractions 15 times out of 19. In the average cycle expansion covers about 55 per cent and contraction about 45 per cent of the full cycle; the corresponding figures for the cycle of 1927-33 are 29 and 71 per cent. The closest approach to this division is found in the short cycle of 1919-21 and the sharpest contrast in the war-time cycle of 1915-19. It is noteworthy that contractions have been more variable in duration than expansions; the average deviation from the mean of 20 cycles being 9.6 months for contractions, 7.7 months for expansions.

The peculiar division of the latest cycle between the phases of expansion and contraction is less striking when we take note of the rapid upward movement in American business from 1921 to 1929. As previously suggested, an intermixture of business cycles and longer cyclical movements is not a post-War development. For example, the period from 1897 to 1906 was in many ways similar to that from 1921 to 1929. In both periods business experienced a protracted boom interrupted only by relatively mild contractions; in both periods the idea that a 'new era' had dawned gained wide currency. One reason why business cycles differ from one another is that they occupy different

TABLE 2
TURNING DATES AND DURATIONS OF AMERICAN BUSINESS CYCLES, 1855-1933

Expansion		Contraction		Duration in months			Per cent of duration of full cycle	
Revival	Peak	Recession	Trough	Expansion	Contraction	Full cycle	Expansion	Contraction
Jan. 1855	to June 1857	July 1857	to Dec. 1858	30	18	48	62	38
Jan. 1859	to Oct. 1860	Nov. 1860	to June 1861	22	8	30	73	27
July 1861	to Apr. 1865	May 1865	to Dec. 1867	46	32	78	59	41
Jan. 1868	to June 1869	July 1869	to Dec. 1870	18	18	36	50	50
Jan. 1871	to Oct. 1873	Nov. 1873	to Mar. 1879	34	65	99	34	66
Apr. 1879	to Mar. 1882	Apr. 1882	to May 1885	36	38	74	49	51
June 1885	to Mar. 1887	Apr. 1887	to Apr. 1888	22	13	35	63	37
May 1888	to July 1890	Aug. 1890	to May 1891	27	10	37	73	27
June 1891	to Jan. 1893	Feb. 1893	to June 1894	20	17	37	54	46
July 1894	to Dec. 1895	Jan. 1896	to June 1897	18	18	36	50	50
July 1897	to June 1899	July 1899	to Dec. 1900	24	18	42	57	43
Jan. 1901	to Sept. 1902	Oct. 1902	to Aug. 1904	21	23	44	48	52
Sept. 1904	to May 1907	June 1907	to June 1908	33	13	46	72	28
July 1908	to Jan. 1910	Feb. 1910	to Jan. 1912	19	24	43	44	56
Feb. 1912	to Jan. 1913	Feb. 1913	to Dec. 1914	12	23	35	34	66
Jan. 1915	to Aug. 1918	Sept. 1918	to Apr. 1919	44	8	52	85	15
May 1919	to Jan. 1920	Feb. 1920	to Sept. 1921	9	20	29	31	69
Oct. 1921	to May 1923	June 1923	to July 1924	20	14	34	59	41
Aug. 1924	to Oct. 1926	Nov. 1926	to Dec. 1927	27	14	41	66	34
Jan. 1928	to June 1929	July 1929	to Mar. 1933	18	45	63	29	71
Average duration, 20 cycles (1855-1933)				25	22	47	55	45
Average duration, 19 cycles (1855-1927)				25	21	46	56	44

positions in longer economic movements. Some of the peculiar features of the cycle from 1927 to 1933, notably its duration and amplitude, are closely connected with the fact that its expansion phase came on the crest of a longer cycle.

II. THE AMPLITUDE OF THE CYCLE IN PRODUCTION INDEXES

Except for one early effort, the making of index numbers of production did not begin in this country before the World War. Attempts to carry monthly indexes backward are balked by paucity of data. The longest monthly index of production covering a wide enough range of industries

to possess much value is that constructed by Babson's Statistical Organization. Even this index is more representative after than before 1919, for the War greatly stimulated the collection of data concerning the physical output of commodities. The several indexes available from 1919 to date have many series in common, but no two are identical in industrial coverage or in method of construction. Special interest attaches to the indexes made by Dr. Y. S. Leong because he classified his commodities in two ways, first as producers' and consumers' goods, second as durable and transient goods.⁸ Table 3 gives the average amplitude of the specific cycles before 1927 in the leading American in-

TABLE 3
AMPLITUDES OF THE LATEST SPECIFIC CYCLES IN PRODUCTION INDEXES
COMPARED WITH AVERAGE AMPLITUDES FOR PRECEDING CYCLES¹

Index	Period covered by specific cycles	Amplitude of specific cycle corresponding to business cycle of 1927-33			Average amplitude of preceding specific cycles			
		Rise	Fall	Rise and fall	No. of preceding cycles	Rise	Fall	Rise and fall ²
Physical volume of business activity (Babson)	Oct. 1904-Mar. 1933	25	65	90	7	30	18	48
Industrial production (Standard Stat. Co.)	May 1919-Mar. 1933	22	74	96	3	35	24	58
Industrial production (Federal Reserve Bd.)	Mar. 1919-July 1932	23	67	90	3	30	22	53
Production of manufactures (Leong)	May 1919-Mar. 1933	24	68	92	3	31	23	53
Production of producers' goods (Leong)	May 1919-June 1932	24	85	109	3	33	26	59
Production of consumers' goods (Leong)	Mar. 1919-Mar. 1933	20	42	62	3	27	15	42
Production of durable goods (Leong)	May 1919-Aug. 1932	40	117	157	3	44	37	81
Production of transient goods (Leong) ³	Mar. 1919-Mar. 1933	11	29	40	3	25	16	41

¹We measure amplitudes of specific cycles by expressing the rise and fall of a cycle as percentages of the average monthly value of the series during the cycle. The rise and fall are computed from three-month averages centered on the troughs and peaks of the specific cycles. For a full explanation of the measures in this table and in the following tables and charts, see the sources given in the note at the beginning of this bulletin.

²On account of rounding of decimals, entries in this column are not always exactly equal to the sum of entries in the two preceding columns.

³See text, p. 9.

dexes of production and the amplitude of the specific cycle that corresponds to the business cycle of 1927-33. The figures in Chart 1 compare the reference-cycle patterns of the indexes for 1927-33 with their average reference-cycle patterns for earlier cycles.

Looking first at the average amplitudes of the specific cycles preceding 1927, we see that the three general indexes agree well with one another. Babson's index, which gives the lowest amplitudes, would still do so if we included only the three cycles of 1919-27; for that shift changes the figures merely from +30, -18, 48 to +30, -19, 49. All the indexes show that the average cyclical rise was substantially larger than the average decline; for American pro-

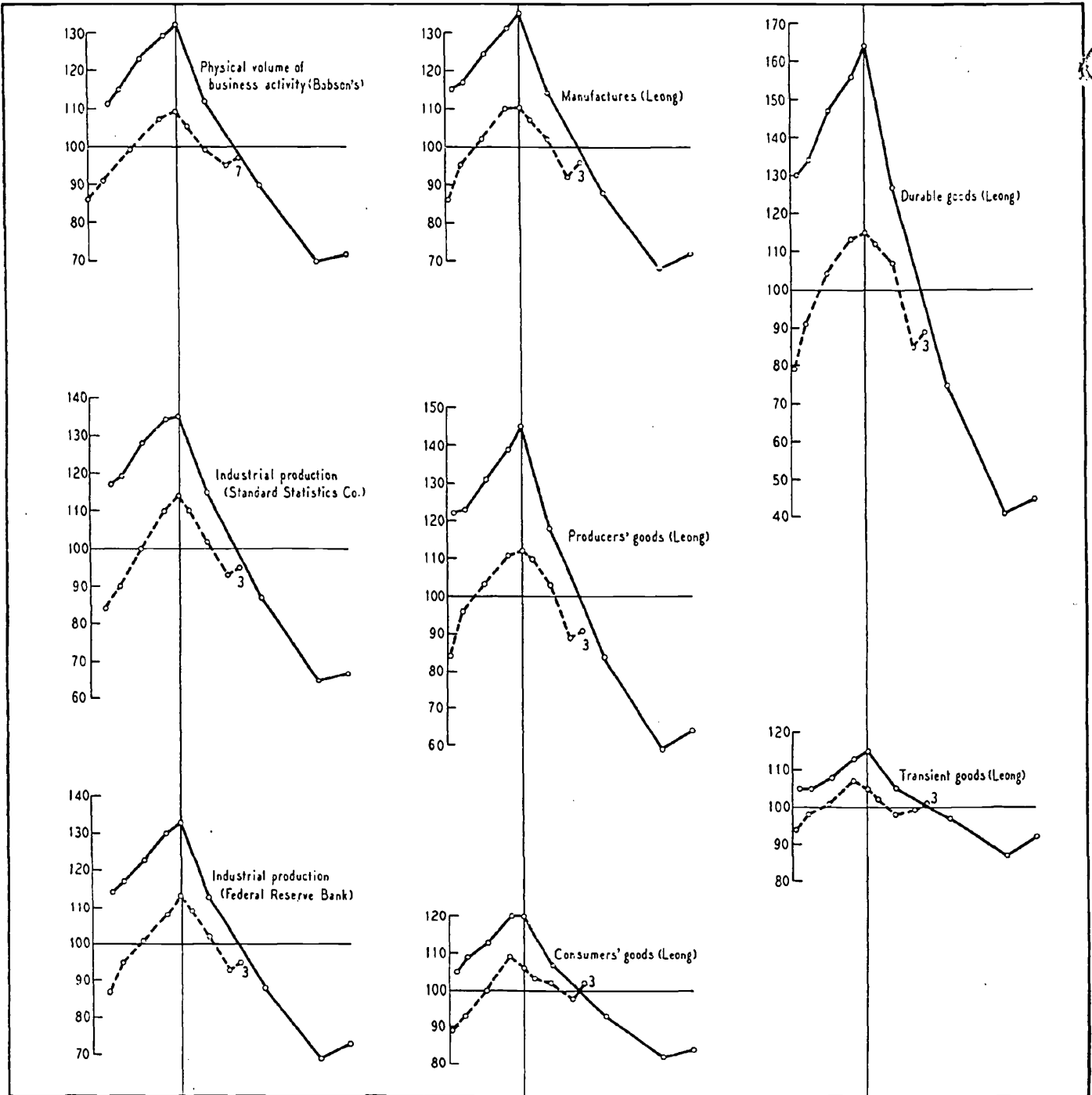
duction was expanding vigorously in this period and our technique includes in the amplitudes the portion of the secular trend that falls within the limits of an average cycle. Leong's breakdown of manufactured goods on two bases indicates that this characteristic of the amplitudes prevailed in the industries catering to consumers as well as in those catering to business enterprises, in those making transient as well as in those making durable goods. But there is a sharp contrast between moderate fluctuations in the output of consumers' goods and vigorous fluctuations in the output of producers' goods, a contrast that becomes sharper still when all the transient goods are collected in one group and all the durable goods in another.

Turning now to the amplitude of the specific cycle corresponding to the business cycle of 1927-33, the reader will find his general expectations borne out by the figures. (1) In every comparison the cyclical rise in 1927-29 was less

⁸See his article on "Indexes of the Physical Volume of Production of Producers' Goods, Consumers' Goods, Durable Goods and Transient Goods", *Journal of the American Statistical Association*, June 1935.

CHART I
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN PRODUCTION INDEXES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33 PATTERN - - - AVERAGE PATTERN



Our practice is to break each reference cycle into nine stages. Stage I is the initial revival, stages II-IV represent successive thirds of expansion, stage V the recession, stages VI-VIII successive thirds of contraction, and stage IX the terminal revival. The standings of a series during these nine stages we call its 'reference-cycle pattern'. The vertical line drawn through the patterns is at stage V. The horizontal distances between successive points of the patterns are proportional to the intervals between the midpoints of successive cycle stages; in the case of the average patterns, the distances are proportional to the average intervals between the midpoints. The number of cycles on which the average patterns are based is shown at their right. The vertical scale is in percentages of the average monthly value of a series during a reference cycle. For a full explanation we must again refer the reader to the sources cited at the beginning of this bulletin.

than the average cyclical rise in preceding cycles. (2) In every comparison the cyclical fall from 1929 to 1932 or 1933 was greater than the average cyclical fall in preceding cycles. (3) In every comparison except one (transient goods) the increase in the magnitude of the fall was so much greater than the decrease in the magnitude of the rise as to make the total swing much larger.

Aside from transient goods, the decline in output according to these indexes was about three times as great in the contraction from 1929 to 1932 (or 1933) as it had been on the average in the three preceding cycles; and, if Babson's index may be trusted, the three cycles of 1919-27 give averages close to those of four cycles in 1904-19. Detailed examination of the figures from which the averages are made shows that no single cycle covered by these indexes had nearly so large a decline in the physical volume of production. This latest contraction may well have been the most violent in the country's history; lack of data concerning the great depressions of 1873-79 and 1893-94, not to speak of earlier possible rivals, bars a more positive statement.

Exceptional as the cycle of 1927-33 was in amplitude, it followed precedent in many respects, two of which stand out in Table 3. As a group, the industries that manufacture consumers' goods have usually expanded less during the rising phase of a business cycle and shrunk less during the falling phase than the industries that manufacture producers' goods. That rule held in 1927-33. So too did the similar rule about transient as compared with durable goods. Consumers' goods and transient goods are overlapping categories in large part. They are made largely from raw materials grown on farms. They serve to a considerable extent as foods. The supply of farm products is much influenced by natural processes that are independent of business conditions. The demand for them is less influenced by business conditions than the demand for producers' or for durable goods. However hard the times, families cannot stop buying food as for a while they can stop buying motor cars, household furnishings and even clothing. Thus the forces of supply and demand conspire to make the response to business cycles of the consumers' goods and still more of the transient goods industries somewhat irregular and rather moderate. Indeed, the transient goods index really has two specific cycles in 1927-33: one running from December 1927 to January 1931, the second beginning with a six-month rise in 1931 and ending in March 1933. In Table 3 we disregard this double swing and count only one cycle; otherwise the contrast between the amplitudes of the index for transient and that for durable goods would be even greater than the table shows.

IV. THE AMPLITUDES OF SPECIFIC CYCLES IN DIFFERENT INDUSTRIES

It has often been said that production indexes overstate the amplitudes of cyclical fluctuations, because the data available to compilers represent the highly variable heavy industries more fully than the relatively stable industries catering to consumers. Whether weighting is an adequate safeguard against this bias is questionable. We may add that our technique is biased toward overstatement of amplitudes when applied to a cycle like that of 1927-33, though it has an opposite bias when applied to a cycle like that of 1915-19. When a contraction is very severe and very long, the average monthly standing of a production series during the full cycle is relatively low; consequently, the percentages of rise and fall computed on this base, which serve as our measures of amplitude, are relatively high. But a third factor must be reckoned with. The series used in making an index number do not reach their troughs and peaks on the same dates. If they did, the amplitudes of the specific cycles in a weighted index would equal the similarly weighted average of the amplitudes of the specific cycles in the constituent series. In practice the non-coincidence of the turning dates usually makes the cyclical amplitude of the index substantially lower than the average of the cyclical amplitudes of the series from which the index is constructed. Thus index numbers of production understate the average cyclical fluctuations experienced by their components, though they may overstate the cyclical fluctuations in the goods produced by all enterprises of the nation, considered as a single system. For certain problems the latter is the more important; for example, in considering the adequacy of a nation's transportation system to carry peak loads. But when one is concerned with the fortunes of wage earners, employers and investors, the important matter is the cyclical fluctuation of single industries. We should go further and recognize that the record for an industry understates the average cyclical hazards encountered by single enterprises; for it is as unlikely that all shoe factories, for example, will reach their maximum or minimum output in the same month as it is unlikely that different industries will do so. At present we must content ourselves with showing how widely certain industries differed in the amplitudes of their cyclical fluctuations in 1927-33, and to what extent these amplitudes exceeded those shown by the indexes we have been examining.

Table 4 provides cyclical measures for 73 individual production series similar to the measures given in Table 3 for production indexes. As before, the table is supplemented by charts comparing the reference-cycle patterns for 1927-33 with the average reference-cycle patterns for preceding cycles.

Leong's index of the production of transient goods is based on 42 series. Twenty-five series in Table 4 cor-

TABLE 4

AMPLITUDES OF THE SPECIFIC CYCLES OF 73 PRODUCTION SERIES, CLOSEST IN TIME TO THE BUSINESS CYCLE OF 1927-33, COMPARED WITH AVERAGE AMPLITUDES FOR PRECEDING CYCLES

Series ¹	Lead (—) or lag (+), in months, of turning points of specific cycles at reference turns ²			Amplitude of specific cycle closest in time to business cycle of 1927-33 ³			Average amplitude of preceding cycles ⁴				
	Reference trough Dec. 1927	Reference peak June 1929	Reference trough March 1933	Rise	Fall	Rise and fall	Period covered	No. of cycles	Rise	Fall	Rise and fall ⁵
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
I. FOODSTUFFS											
Wheat flour production	(-32)	-5	+5	(24)	30	(54)	1915-1925	3	37	34	71
Corn grindings	+8	+3	-8	28	47	75	1917-1928	6	40	31	70
Rice shipments	<i>i</i> (-79)	<i>i</i> (-47)	<i>i</i> -16	<i>i</i> (85)	<i>i</i> (53)	(138)	1917-1921	1	<i>i</i> 70	<i>i</i> 107	177
Potato shipments	(-20)	+13	-5	(26)	49	(75)	1920-1926	1	65	29	94
Apple shipments	+3	-10	+27	78	106*	184*	1921-1928	2	56	62	118
Citrus fruit shipments	+6	0	+5	39	35*	94*	1922-1928	2	56	37	92
Sugar meltings (4 ports)	+5	-2	+9	24	47	71	1890-1928	11	44	38	82
Index of animal slaughter	(-31)	(-33)	-3	(5)	(14)*	(19)*	1910-1925	4	20	15	36
Hogs slaughtered (commercial)	<i>i</i> +2	<i>i</i> +24	<i>i</i> +3	<i>i</i> 30	<i>i</i> 30	60	1880-1928	12	<i>i</i> 37	<i>i</i> 48	85
Cattle slaughtered (Fed. insp.)	(-72)	(-36)	-3	(36)	(36)	(72)	1907-1921	2	45	42	88
Calves slaughtered (Fed. insp.)	(-84)	(-47)	-3	(42)	(27)*	(69)*	1908-1920	3	39	20	59
Sheep and lambs slaughtered (Fed. insp.)	<i>i</i> (-80)	<i>i</i> (-86)	<i>i</i> -14	<i>i</i> (24)	<i>i</i> (71)	(95)	1914-1921	2	<i>i</i> 50	<i>i</i> 42	92
Poultry receipts (5 markets)	-8	+4	-8	24	20*	44*	1920-1927	2	50	22	72
Egg receipts (5 to 7 markets)	+14	+18	-3	25	25	50	1914-1929	4	49	41	90
Raw milk receipts (N. Y. market) ⁶	.....	+31	+17	.....	15	.....	.....	.....	.....	.....	.....
Cream and condensed milk receipts (N. Y. market)	(-29)	0	+23	(35)	35*	(70)*	1896-1925	5	45	13	59
Ice cream production	-11	+8	-5	19	54	73	1921-1927	2	26	8	34
Cheese production	-3	+13	+8	26	31	57	1918-1927	2	30	15	44
Butter production (factory)	<i>i</i> -7	<i>i</i> (-21)	<i>i</i> +5	<i>i</i> (6)	<i>i</i> (21)	(27)	1919-1927	2	<i>i</i> 10	<i>i</i> 38	49
Oleomargarine production	(-16)	+2	-8	(51)	66	(117)	1908-1926	5	57	41	98
Fresh fish landed (2 to 4 ports)	(-80)	+7	-17	(95)	49	(144)	1898-1914	5	40	36	76
II. TOBACCO PRODUCTS											
Cigar shipments	+4	-2	0	9	47	56	1918-1928	3	17	18	36
Cigarette shipments	(-70)	+4	-11	(86)	24	(110)	1920-1922	1	33	23	56
Manufactured tobacco and snuff shipments	(-42)	(-39)	-1	(7)	(29)*	(36)*	1919-1924	2	28	24	52
III. TEXTILES AND SHOES											
Cotton consumption	+4	-1	-8	20	52*	72*	1914-1928	4	39	35	74
Cotton spindles active	+9	-3	-8	8	38*	46*	1914-1928	4	10	12	22
Finished cotton goods—billings	+4	+1	-8	22	81*	103*	1921-1928	2	46	28	74
Knit underwear production	-13	-1	-8	25	28*	53*	1920-1926	2	59	24	84
Raw wool consumption	+4	+2	-10	20	75*	95*	1919-1928	4	47	40	87
Silk deliveries to mills	(-19)	+2	+7	(34)	49*	(83)*	1920-1926	3	55	26	81
Shoe production	+9	+4	-8	10	29*	39*	1921-1928	3	24	12	36
IV. PAPER AND BOOKS											
Total paper production	(-51)	-1	-2	(38)	41	(79)	1919-1923	2	42	28	71
Newsprint paper consumption	(-51)	+3	0	(41)	42	(83)	1921-1923	1	23	7	30
Writing paper production	(-40)	+7	-9	(58)	50	(108)	1919-1924	2	49	41	90
Book paper production	+1	+4	-8	29	62	91	1918-1928	2	50	30	80
Book publication	0	-5	+13	26	36*	62*	1912-1927	5	30	30	60
V. FUELS											
Anthracite coal production	(-37)	(-36)	-9	(23)	(86)	(109)	1880-1924	12	48	40	88
Bituminous coal production	-1	-4	-8	23	68	91	1908-1927	6	39	34	73
Coke production	-1	+1	-7	38	102	140	1913-1927	4	60	51	112
Petroleum production	+5	+2	-3	21	34*	55*	1914-1928	5	31	8	38
Gasoline production	(-77)	+6	-6	(109)	26*	(135)*	.....	.....	.....	.....	.....
Electric power production	(-42)	+4	0	(50)	23	(73)	1919-1924	2	27	7	34
VI. METALS											
Pig iron production	-1	+1	0	51	150	201	1879-1927	14	63	48	111
Steel ingot production	-1	+1	-7	57	131	188	1900-1927	8	66	53	118
Steel sheet production	-3	-1	-7	50	127	177	1919-1927	3	72	52	124
Copper production	-6	-2	-2	37	100	137	1914-1928	4	58	51	110
Lead ore shipments (Joplin)	+3	-2	-9	90	209	299	1896-1928	8	56	43	98
Zinc ore shipments (Joplin)	+10	-3	-7	58	164	222	1900-1928	6	50	43	92
Tin imports	0	-5	-15	55	94	149	1869-1927	14	100	88	188
Tin- and terne-plate production	0	-5	0	34	71	105	1922-1927	2	42	31	74
VII. MOTOR VEHICLES											
Passenger car production	-1	-5	-5	90	139	229	1913-1927	4	108	85	193
Truck production	-1	0	-7	95	139	234	1914-1927	5	83	39	121
Inner tube production	-2	-7	0	26	93	119	1920-1927	2	86	31	116
Solid and cushion tire production	0	-8	-2	38	179	217	1920-1927	3	73	63	136

Series ¹	Lead (—) or lag (+), in months, of turning points of specific cycles at reference turns ²			Amplitude of specific cycle closest in time to business cycle of 1927-33 ³			Average amplitude of preceding cycles ⁴				
	Reference trough Dec. 1927	Reference peak June 1929	Reference trough March 1933	Rise	Fall	Rise and fall	Period covered	No. of cycles	Rise	Fall	Rise and fall ⁵
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VIII. MACHINERY AND INDUSTRIAL EQUIPMENT											
Vacuum cleaner shipments	(—43)	—1	—4	(58)	96	(154)	1919-1924	2	84	62	146
Industrial pump shipments	0	+4	—1	38	117	155	1919-1927	3	57	51	109
Woodworking machinery shipments	—2	—2	0	68	200	268	1919-1927	3	59	52	111
Machine tool orders	—8	—4	0	129	213	342	1919-1927	3	104	101	205
Locomotive orders	+2	+2	—7	218	258	476	1875-1928	16	181	175	356
Passenger-train car orders	—7	—10	+8	386	477	863	1872-1927	16	184	179	363
Freight-train car orders	+2	+5	—1	245	334	579	1870-1928	17	182	175	357
IX. CONSTRUCTION											
Total construction contracts (27 to 37 states)	(—81)	—16	+1	(107)	137	(244)	1912-1921	3	91	73	164
Residential building contracts (27 to 37 states)	—7	—16	0	42	203	245	1917-1927	3	102	51	153
Commercial building contracts (27 to 37 states)	+3	+5	—5	18	143	161	1919-1928	3	77	43	120
Industrial building contracts (27 to 37 states)	—6	—9	—4	90	169	259	1919-1927	3	135	119	254
Public works and utilities contracts (27 to 37 states)	(—82)	+7	+1	(110)	143	(253)	1919-1921	1	36	47	83
Concrete pavement contracts	+14	+21	+1	84	152*	236*	1919-1929	4	78	46	124
Federal-aid roads under construction	<i>i</i> (—42)	<i>i</i> —1	<i>i</i> 0	<i>i</i> (57)	<i>i</i> 55*	<i>i</i> (112) ⁶	.....	....	....	....	....
Vessels under construction	+6	+27	+3	142	171	313	1911-1928 ⁷	3	64	80	143
X. CONSTRUCTION MATERIALS											
Lumber (Douglas fir) production	—11	(—21)	—9	(13)	(142)	(155)	1917-1927	3	45	30	75
Oak flooring production	+1	—7	0	18	163*	181*	1918-1928	2	119	54	172
Portland cement production	(—78)	—6	+7	(61)	92	(153)	1911-1921	3	34	24	58
Structural steel orders	(—15)	—3	—14	(39)	101	(140)	1910-1926	7	83	75	159

i Indicates that the series is treated on an inverted basis; that is, the peak of the series is compared with the reference trough and the trough with the reference peak. In these series, the entry in column (5) shows the fall, not the rise; and so on.

* Indicates that an extra cyclical movement falls within the stated phase or cycle. The extra movements are ignored in making the amplitude measures of this table.

¹ All series are monthly except the following five which are quarterly: vacuum cleaner shipments, vessels under construction, and the three series on railway equipment. All series are expressed in physical units, except machine tools, woodworking machinery, industrial pumps, and the first five series listed under construction. The measurements of this table are based on seasonally-adjusted data, except in a few cases where the seasonal factor seemed to be absent or could not be eliminated. On account of limitations of space, we do not give details concerning the sources and composition of the series. However, the more important changes in composition are briefly indicated by the titles of the series, except for anthracite coal and copper production. For the former the figures prior to 1919 refer to shipments. For the latter the figures for the latest cycle refer to the combined output of refined copper of the United States, Chile and Canada; earlier figures are for mine output of the United States.

² Entries in italics indicate close correspondence of timing; which we define to mean that the lead or lag is no more than half as long as the reference phase within which the cyclical turn of the series falls. Not knowing the high point of the next cycle, we arbitrarily place lags of 20 months or less at the trough of March 1933 in italics.

Entries not italicized and without parentheses indicate rough correspondence in timing; that is, the lead or lag is more than half the reference phase within which the cyclical turn falls, but is shorter than the reference phase itself.

Entries in parentheses indicate that there is no correspondence in timing. They serve merely to identify the turns of the specific cycles.

Some of the timing entries in column (4) are tentative and subject to later revision.

³ When the low and high points of a series correspond closely to the reference turns, the rising phase of the series corresponds closely to the reference expansion. Hence it is placed in italics. Similar extension of the rules for single turns determines which entries are not to be italicized and which are to be placed in parentheses. Concerning our method of measuring amplitudes, see Table 3, note 1.

⁴ The entries in columns (10)-(12) are italicized when each of the preceding cycles of a series bears a one-to-one correspondence to business cycles.

⁵ See Table 3, note 2.

⁶ This series begins in 1893. Its first cyclical decline commenced in January 1932 and lasted until August 1934. The entry in column (6), indicating a fall of 15 points, is obtained by expressing the decline as a percentage of the average value of the series from January 1928 to August 1934; the first date marking the reference revival and the second the specific-cycle trough in the series.

⁷ The period 1913-22 is omitted.

respond to Leong's list, carrying a weight of 83 per cent in the index. On our basis of measurement the index fell 29 points between June 1929 and March 1933. Measured from their own turning points, the cyclical fall is as large or larger in 18 of the 25 series. Applying Leong's weights, the average fall of the 25 series is 38 points, or a third more than the fall of the index. There are 15 series in Table 4 that carry a weight of 77 per cent⁴ in Leong's in-

⁴ This figure and the corresponding figure for transient goods apply, strictly, only to the three years 1923, 1925 and 1927, taken as a whole. In averaging the amplitudes of decline in single industries, we used Leong's weights (*Journal of the American Statistical Association*, June 1935, pp. 375-6) in adjusted form; that is, these weights were raised or lowered on the basis of the ratio of the average monthly standing of each series during the specific cycle in the relevant index (as indicated in Table 1 of this bulletin) to the average monthly standing of the series during 1923, 1925 and 1927.

dex of the production of durable goods, based on 20 series. This index fell 117 points between June 1929 and August 1932. Eleven of our 15 series experienced a greater cyclical decline. The average fall of the 15 series, weighted on Leong's scheme, is 132 points, or one-eighth larger than the fall of the index. These comparisons of weighted averages of the amplitudes of single industries with the amplitudes of weighted indexes are rough,⁵ but they suffice to indicate how index numbers understate the average cyclical amplitudes of the country's industries taken one by one. We may add that the differences between the declines shown by the indexes and the declines shown by a majority of the industries are less than usual in the cycle of 1927-33; for the severity of the depression forced an exceptional degree of uniformity upon the direction and timing of cyclical fluctuations.

We can make fuller use of Table 4 if we break away from the particular series and classification used by Leong. Taking foodstuffs, tobacco products, fuels, newsprint and writing paper, as transient goods, we have 32 individual series in Table 4 to represent that class. Of these, 19 show a cyclical fall exceeding that of Leong's index. Taking book paper, books, metals, motor vehicles, machinery, industrial equipment, construction and construction materials, as durable goods, we have a second set of 31 series, 22 of which show declines exceeding that of the index. As representing goods that are more durable than foods and fuels but less durable than books, metals and building, we take the 9 series for textiles, shoes, tires and tubes. The declines in textiles and shoes are much smaller than in the index for durable goods, but larger than the decline in the index for transient goods in 5 series and practically equal to it in the other 2 series. The decline in inner tubes is somewhat smaller than in the index for durable goods, while the decline in solid tires is much greater.

By using Table 4 and the accompanying diagrams of Chart 2, supplemented at need by our measures for earlier cycles, we can elaborate at will upon the simple sketch of production during the cycle of 1927-33 drawn above from index numbers. To avoid getting lost in a tangle of details, we make the skeleton of what we say as prominent as may be.

V. THE EXPANSION OF 1927-1929

1. This expansion followed an unusually mild contraction.

The contraction of 1926-27 was the mildest since the late 1870's according to pig iron production; it was surpassed in mildness only by the contractions of 1887-88 and

⁵The series in Table 4 do not overlap fully on Leong's list; several industries are represented by different series in the two lists; and there is some question whether it is proper to include, in the average amplitude of the specific cycles corresponding to a single business cycle, series with turning points that depart widely from the turns of the business cycle.

1900 and equalled only by the contraction of 1910-11 according to the American Telephone and Telegraph Company index. Further, this contraction was limited in industrial scope. It was felt most in the production of metals, industrial equipment, motor vehicles, coal, textiles, sugar, and some branches of construction work. Twenty-four of the 73 series in Table 4 did not participate in the contraction. Fifteen of the 24 series represent transient goods, and 5 relate to construction work or materials. Seven of the 24 series, notably total construction contracts, had 'skipped' also the contraction of 1923-24.

2. Beginning in the durable-goods industries, the revival of 1927-28 spread to other depressed branches of production.

First came an upturn in the production of lumber and copper, orders for machine tools and passenger-train cars, and contracts for residential and industrial buildings. Steel sheet production, and shipments of woodworking machinery soon followed. In November 1927 the production of pig iron, steel, coke, bituminous coal, passenger automobiles and trucks joined the procession. The production of textiles and shoes lagged behind; so also did a majority though not all of the food-manufacturing industries that conformed to the general expansion.

3. The expansion remained moderate in degree.

In the metals, motor vehicles and industrial equipment groups the increases of output ran fairly close to the averages for preceding cycles. Sub-average increases occurred in textiles and shoes, paper and books, and in the majority of foodstuffs and of tobacco products. Meats, except sheep slaughter, declined; so too did the output of manufactured tobacco and anthracite coal. The construction group reveals sharp contrasts; but the main fact is that total construction contracts shrank unsteadily after February 1928. Declines or sub-average expansions ruled also in the production of construction materials.

4. The differences among individual industries during the expansion were of the usual sort in respect both of participation in cyclical movements and of relative amplitude.

As is their wont, most foodstuffs conformed irregularly to the expansion; but ice cream and oleomargarine, which usually conform to the fluctuations of general business, conformed closely also in this instance. Tobacco products, textiles, shoes and books have conformed more faithfully than most food products in the past, and they did so in 1927-29. Close conformity is characteristic of the production of paper, fuels, metals, motor vehicles and industrial equipment; again the rule held. Such irregular movements during the expansion as occurred in the output of anthracite coal and orders for passenger-train cars are typical of these activities. Except for the production of lumber, residential

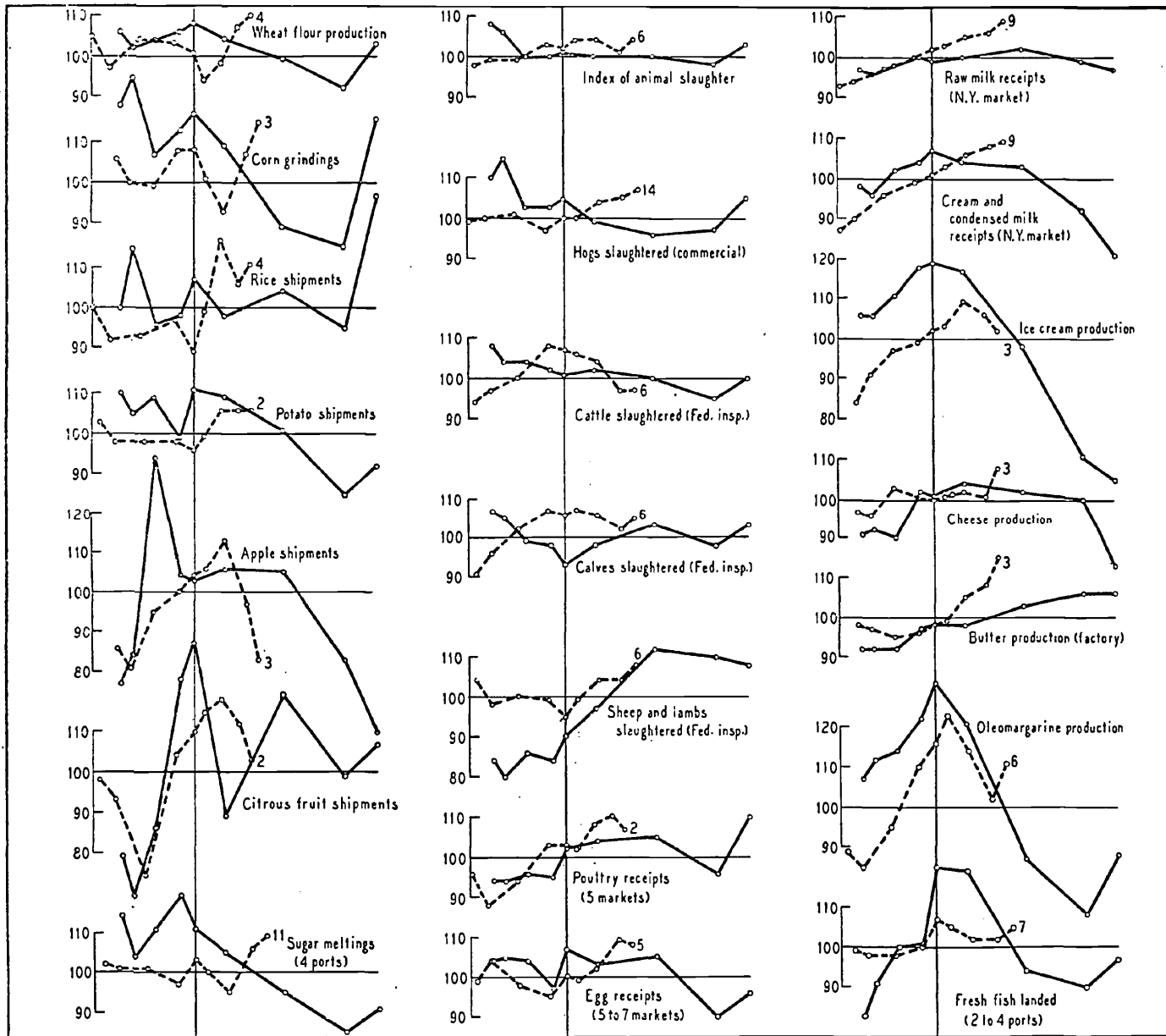
CHART 2
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

(See explanatory note at the foot of Chart 1)

— 1927-33 PATTERN

--- AVERAGE PATTERN

I. FOODSTUFFS



II. TOBACCO PRODUCTS

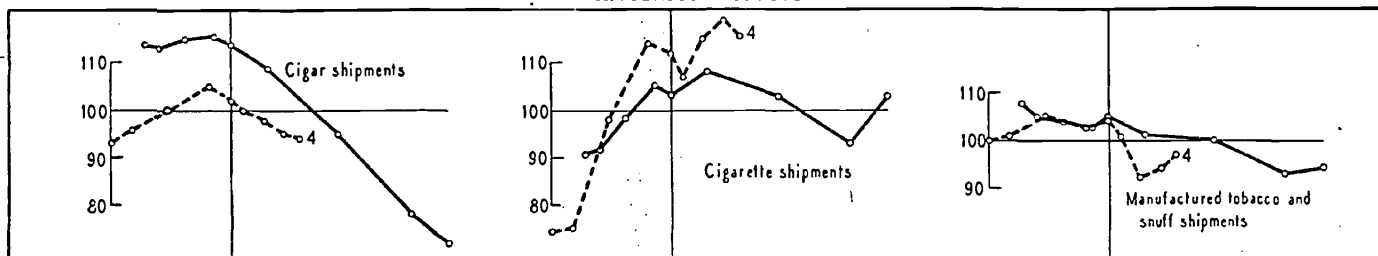
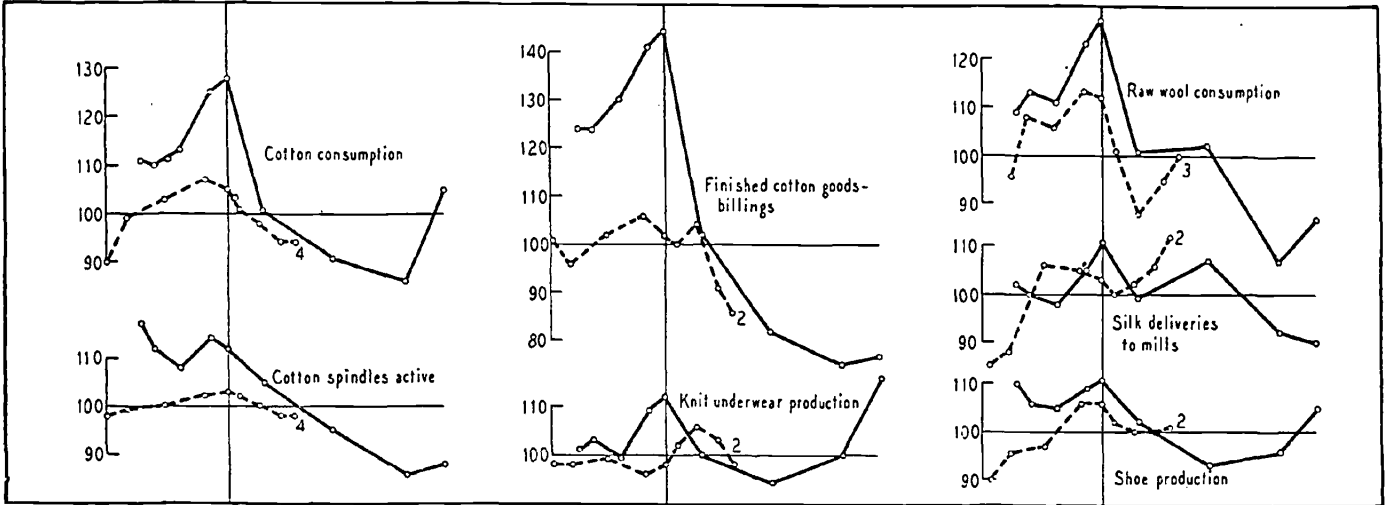


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

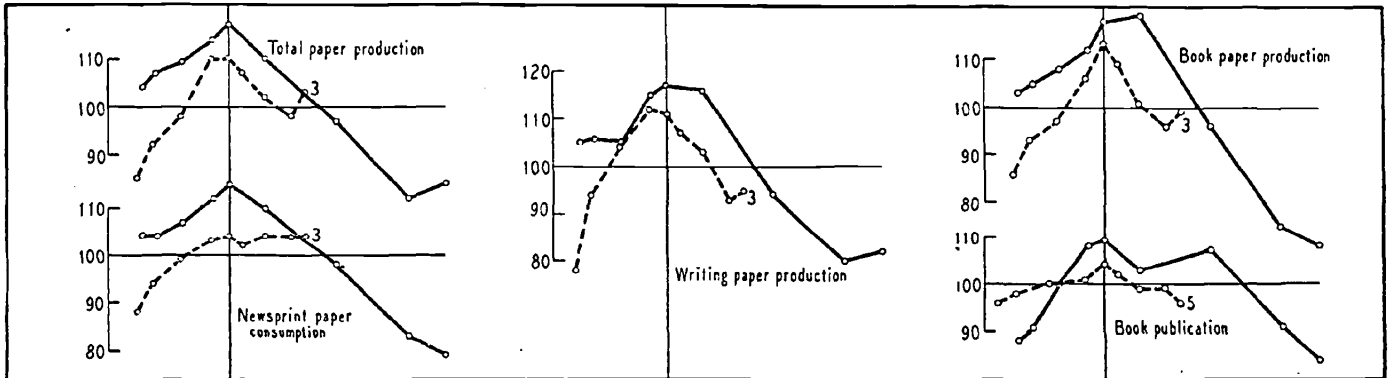
— 1927-33 PATTERN

--- AVERAGE PATTERN

III. TEXTILES AND SHOES



IV. PAPER AND BOOKS



V. FUELS

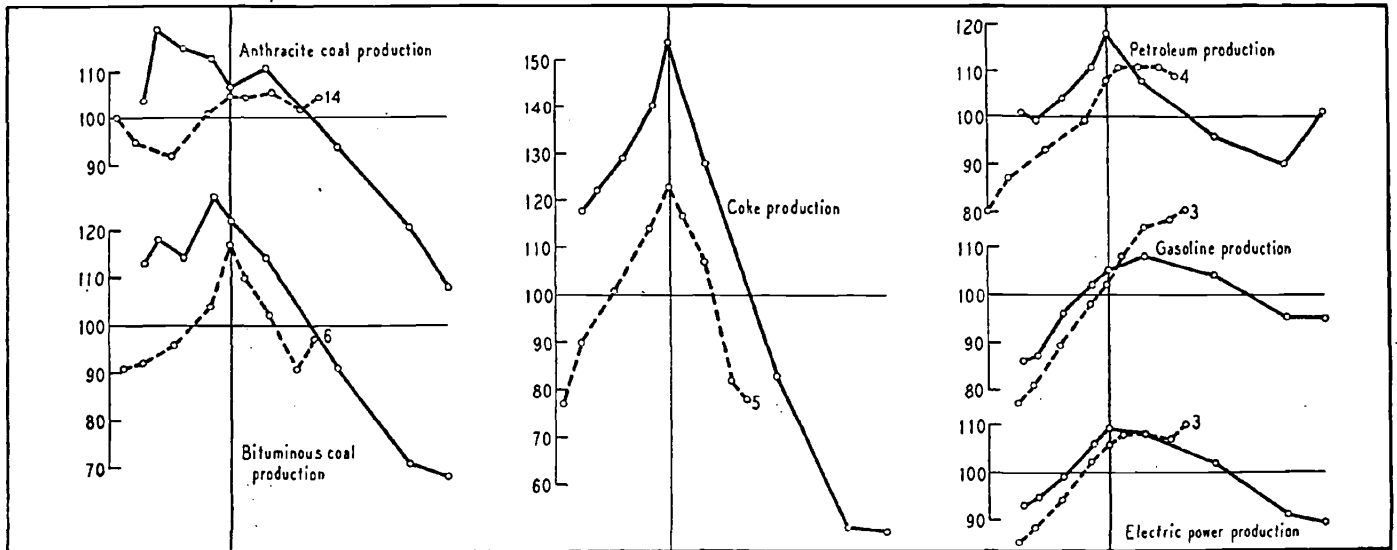


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33 PATTERN

--- AVERAGE PATTERN

VI. METALS

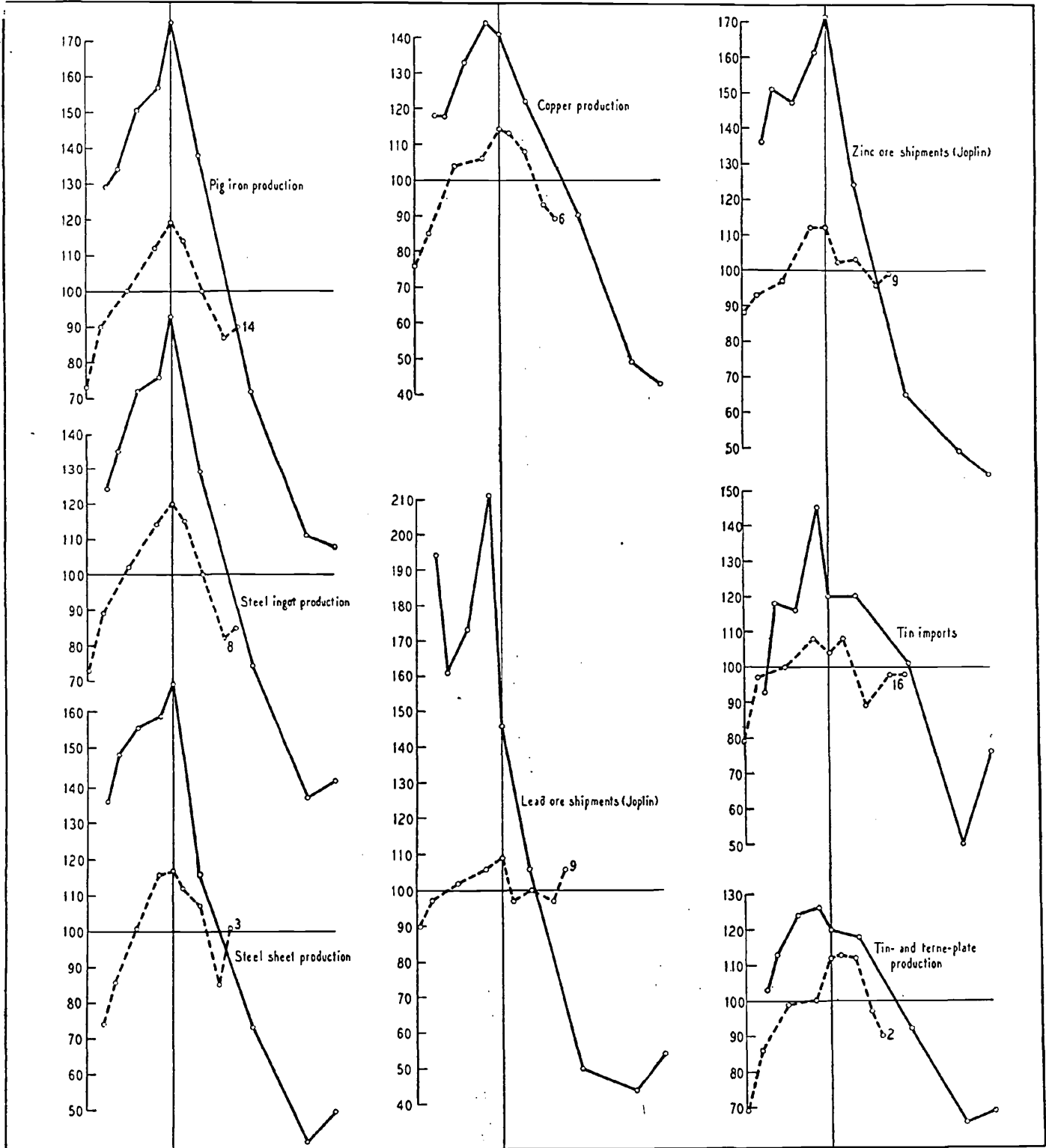
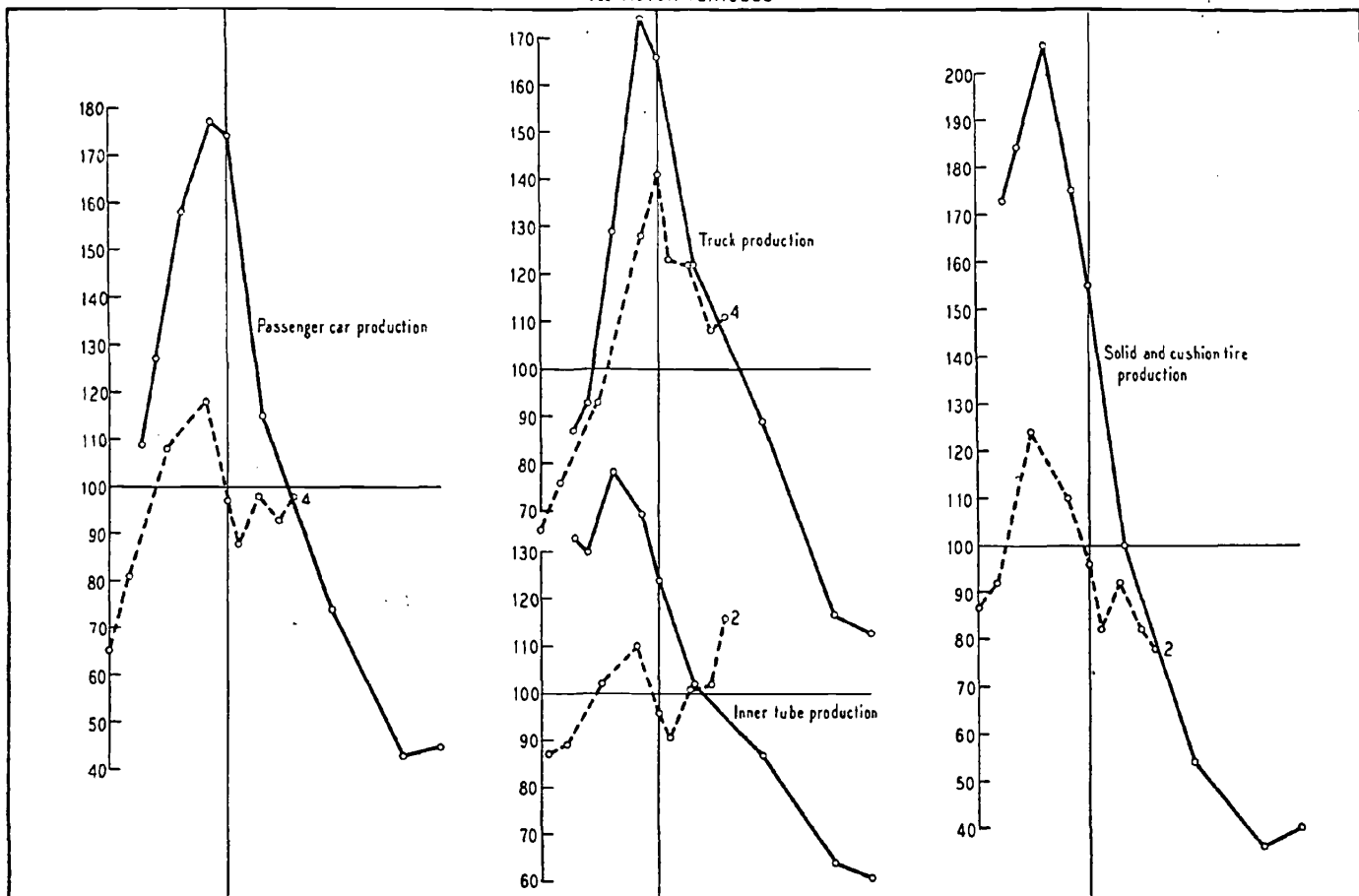


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33. PATTERN - - - AVERAGE PATTERN

VII. MOTOR VEHICLES



VIII. MACHINERY AND INDUSTRIAL EQUIPMENT

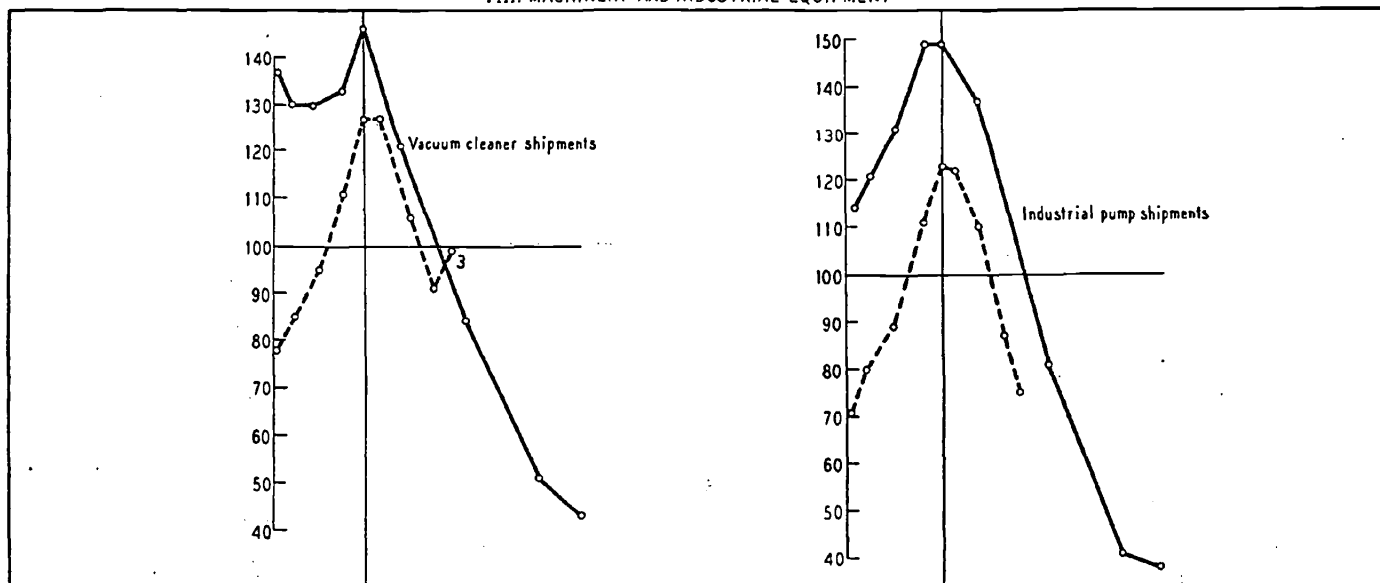


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33 PATTERN - - - AVERAGE PATTERN

VIII. MACHINERY AND INDUSTRIAL EQUIPMENT (CONT.)

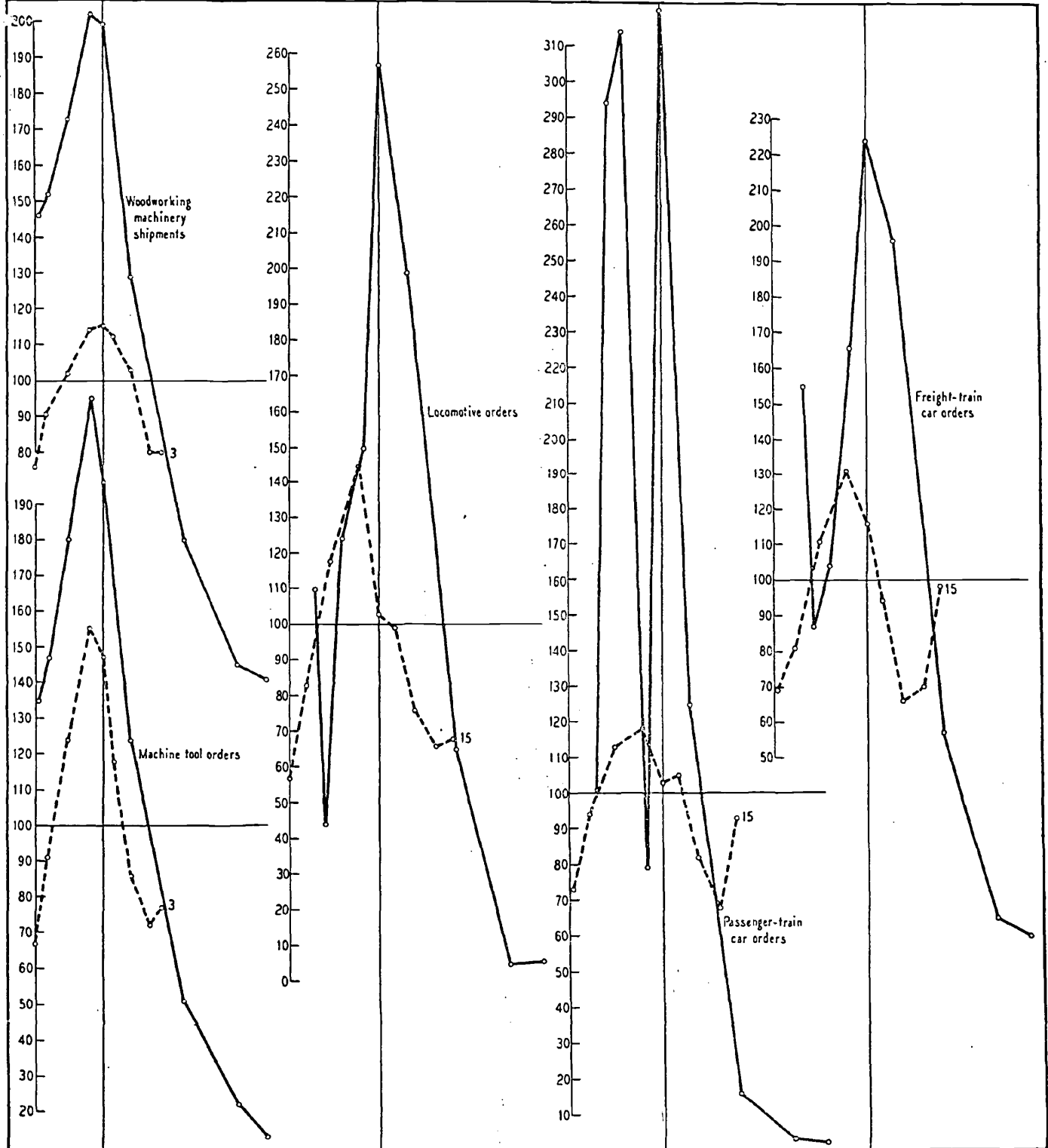


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33 PATTERN

--- AVERAGE PATTERN

IX. CONSTRUCTION

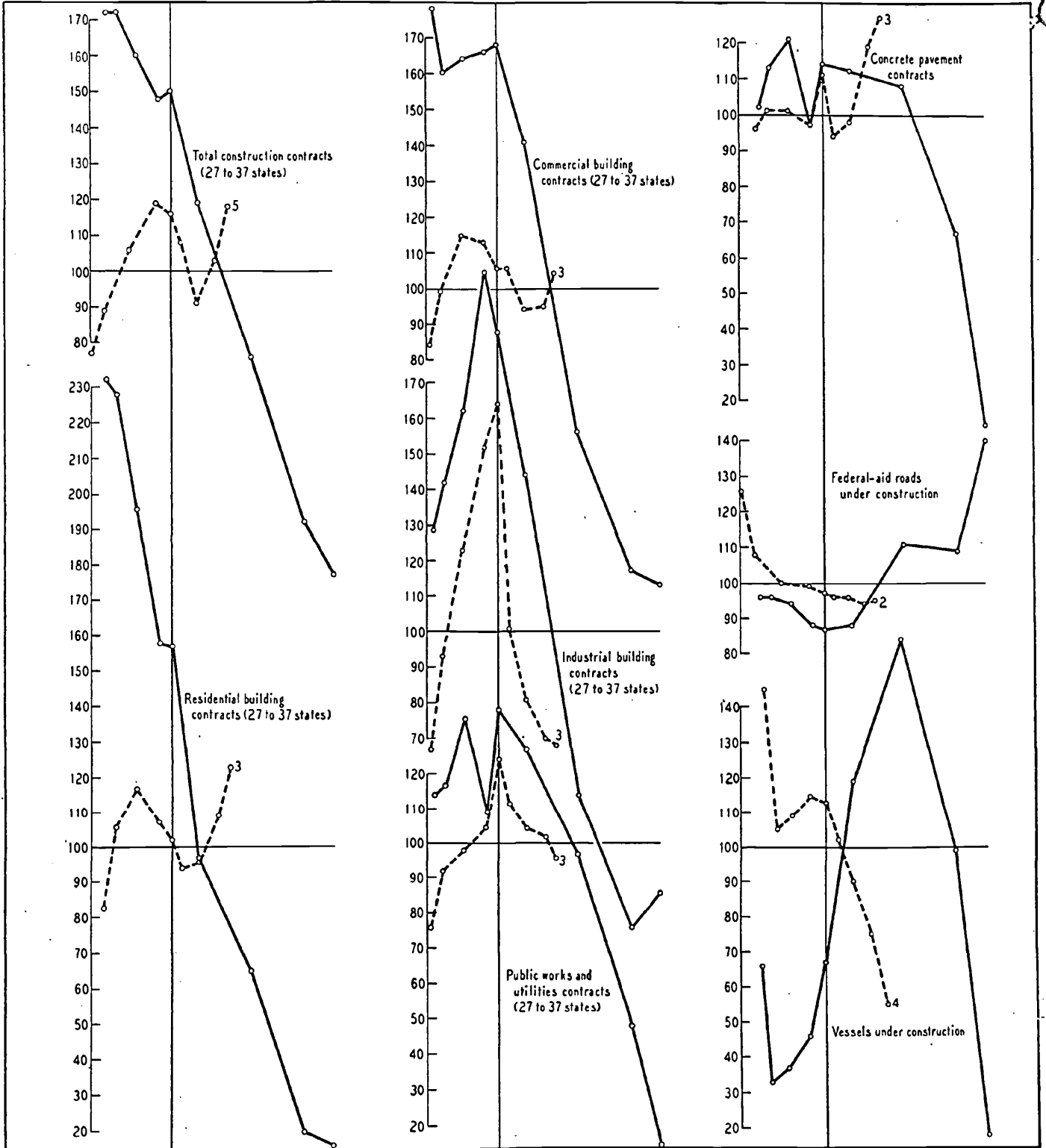
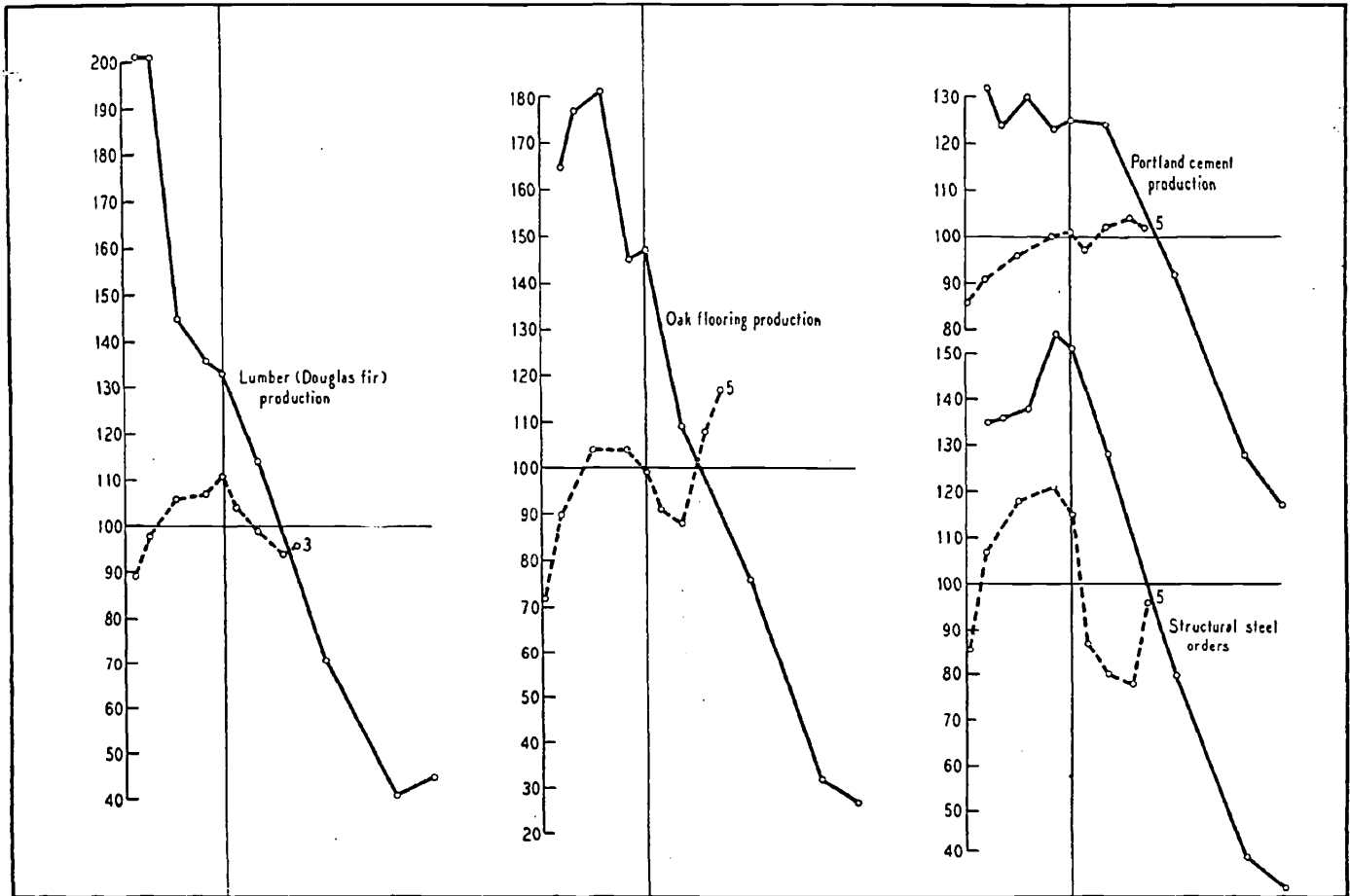


CHART 2 (CONT.)
 REFERENCE-CYCLE PATTERNS OF 1927-33 IN 73 PRODUCTION SERIES COMPARED WITH
 AVERAGE REFERENCE-CYCLE PATTERNS FOR PRECEDING CYCLES

— 1927-33 PATTERN - - - AVERAGE PATTERN

X. CONSTRUCTION MATERIALS



building, and roads built with Federal aid, the construction industries conformed to precedent in sharing the upswing. Inverted movements in rice shipments, hog slaughter and roads built with Federal aid appear in this as in earlier expansions.

As for the relative amplitudes of the expansion in different branches of industry, durable goods increased more than transient goods, producers' goods more than consumers' goods, railway equipment more than machine tools or motor vehicles, the latter products more than metals and metals more than fuels, industrial buildings more than other types of buildings, passenger automobiles more than inner tubes and motor trucks more than solid tires, bituminous coal more than petroleum, coke more than bituminous coal, iron more than coke, steel more than iron, textiles more than shoes, paper more than tobacco, and total tobacco products more than total foodstuffs. All these relations repeat earlier experience.

5. The expansion was more uneven than usual.

When an industry does not fall into a cyclical trough,

it is unlikely to show a vigorous cyclical rise in the following expansion. In view of the mildness of the contraction of 1926-27 and of the numerous industries that maintained high levels of output, it is not surprising to find that 10 of the 73 series in Table 4 declined in 1928-29. This list includes four construction series, one of them being total contracts, four series representing animal slaughter, one tobacco series and anthracite coal output. Several of these series have conformed irregularly or inversely to earlier business cycles. Certainly in most, probably in all, periods of general expansion industries can be found that fail to share in the movement. It is, however, a striking and important reversal of experience to find total construction contracts declining over nearly the entire period of a general business expansion. The Dodge data, which run back to 1900 for the New England states and cover the greater part of the country since 1910, show no precedent for such behavior.

According to Leong's indexes, the average cyclical rise in the output of durable goods during preceding expansions

had been less than double the rise in transient goods; in this instance the ratio is nearly four to one. On the other hand, the difference between the cyclical rise in Leong's indexes for producers' and consumers' goods is slighter than in preceding cycles. Our sample of production series shows that the rise was nearly if not quite of average size in industrial equipment and buildings, but substantially below average size in perishable and semi-durable consumers' goods. For durable consumers' goods we have only three series: residential construction declined, passenger automobiles rose somewhat less and vacuum cleaner shipments decidedly less than in earlier cycles.

VI. THE CONTRACTION OF 1929-1933

1. The contraction began in the construction industry.

As already noted, total construction contracts declined after February 1928. This decline is due to the drop in residential building, beginning at that date. Orders for passenger-train cars and shipments of apples followed within six months. Late that year contracts for industrial buildings and the production of oak flooring, inner tubes and solid tires turned downward. Portland cement began to decline in January 1929, and five series in February, including passenger automobiles. Thereafter the recession spread rapidly over the industrial field. By the end of the year all but fourteen of the series in Table 4 had joined the procession. By July 1930 this number was reduced to eight, consisting of five food series, and three construction series that reflect the efforts of the government to stem the falling tide of employment.

2. Eventually the contraction engulfed the entire industrial system.

The production of foodstuffs, which had been relatively immune to preceding cyclical contractions, shows the impress of this depression unmistakably. For example, milk receipts in the New York metropolitan area, which have been recorded monthly for forty-four years, show their first cyclical decline in the Great Depression, though it was not until January 1932 that the shrinkage began. Non-food series that had usually responded to earlier contractions by a mere decline in the rate of increase—the shipment of cigarettes, the consumption of newsprint paper, the production of gasoline, electric current and Portland cement—experienced a substantial decline.

3. The long decline was interrupted by three partial and abortive revivals.

Of these the first, in the early months of 1930, was brief and restricted mainly to automobiles, steel, and heavy construction.

The second, in the first half of 1931, had wider scope, lasted longer and went further. It was especially pronounced in the textile, rubber tire, shoe and leather industries.

The revival in the summer and autumn of 1932 was fairly general, as is indicated by the preceding discussion of the 'double bottom' in the terminal trough of this cycle.

4. In some industries one of these abortive revivals lasted long enough and went far enough to produce an 'extra' specific cycle during the depression.

Six food series, manufactured tobacco and snuff, six textile series, shoes, books, petroleum and gasoline, concrete pavements, Federal-aid roads and oak flooring show this phenomenon. In silk deliveries and apple shipments the extra cyclical expansion occurred in 1930; in the two road series in 1932; in the other sixteen series the cyclical expansion was roughly concurrent with the abortive revival of 1931.

The increases in the two road series are accounted for by governmental action. The extra cycle in oak flooring is not very clear and perhaps should not have been recognized. All the remaining series represent consumers' goods, and all except books are goods that perish in a single use or that have relatively brief lives. It is articles of this character that produce the extra specific cycle mentioned above, in Leong's index of the production of transient goods.

One factor responsible for these extra cycles is variation in the supply of raw materials. In many food industries the quantities processed are controlled more by farm output than by business policy. In this respect the petroleum industry resembles the industries that manufacture foodstuffs. The sharp spurt in petroleum production in the first half of 1931 was due almost entirely to the newly discovered East Texas field. The production of gasoline increased with the flow of crude oil to the refineries, though the remarkably sustained demand for gasoline, which did not begin to decline until August 1931, was a contributory influence.

In the textile and shoe industries business enterprises have fuller control over their output. Raw materials can be stored for considerable periods. All the silk and large fractions of the wool and hides used by American factories are imported; presumably the managers buy the quantities they think can be worked up to good advantage. Hence the extra cycle in textiles and shoes must be attributed chiefly to variations in demand. On the whole, families probably had relatively well stocked wardrobes in 1929. Pinched by hard times they could buy sparingly for a while. But after a year or two replacements of worn-out garments and shoes became necessary. Even a decline in the rate at which sales are shrinking will force dealers to order more freely unless they are willing to let their stocks fall well below the customary ratios to sales. Thus there is reason to expect that any contraction prolonged beyond the usual duration of about two years will be diversified by moderate upturns in the production of semi-durable necessi-

ties. What scanty data we possess for other long depressions support this view.

5. The records of individual industries fully confirm the evidence of the indexes of production concerning the unusual length and extreme severity of the depression.

It may suffice to remark that of the fourteen series in Table 4 running back to 1900 or earlier, nine—the production of pig iron and steel ingots, the shipments of lead and zinc ore, orders for passenger and freight cars, metropolitan receipts of milk and cream, and fish landings—show their greatest cyclical fall in the early 1930's. The fall was severe also in tin imports, locomotive orders, anthracite coal production, sugar meltings and hog slaughter; but in each of these series a still greater fall had occurred in some earlier cycle.

6. Contrary to precedent, the durable-goods industries remained at or near their lowest ebb when the contraction ended.

Since the contraction ended in a double bottom, the timing measures are rougher indicators than usual of the sequence of recovery. It is reasonably clear, however, that the construction industry lagged at the revival. It is clear also that the textile and shoe industries were among the earliest to revive and that their recovery was unusually vigorous. Further, except for dairy products, most food-stuffs show an upturn at stage VIII of the 1927-33 reference cycle.

Whatever the sequence of recovery, there are few signs of revival in the production of the principal durable goods, such as are found in the closing stages of contraction in previous business cycles. The significant facts are set out in Table 5. While reference-cycle movements at times are misleading, the picture as a whole is unmistakably clear. Of the 25 series in the table all but 4 turn up before stage IX in the average patterns for preceding cycles. In the 1927-33 cycle as many as 17 reach troughs in stage IX. This comparison understates the difference. There are numerous upturns prior to stage VIII in the average patterns, but none in the 1927-33 patterns. Not a few of the former are vigorous, but virtually none of the latter. Further, the choice of March 1933 as the trough of the latest cycle biases the comparison in favor of the latest cycle; so also does the closing of our analysis at this date.

Going beyond the present evidence, we suggest that the order of recovery tends to differ with the intensity of cyclical contractions. Revival from depression is more likely to start in the capital goods industries when the depression is ordinary than when it is protracted and severe. In an ordinary depression the business man plans for a profitable future. In a severe depression the future appears profitless. In the one case, even modest opportunities for profit-making are exploited energetically. In the other, technical or com-

TABLE 5
STAGES OF REFERENCE CYCLES
DURING WHICH TROUGHS WERE REACHED
IN DURABLE GOODS INDUSTRIES¹

Series	TROUGH SHOWN BY	
	Average pattern for cycles preceding 1927-33 cycle	Pattern for 1927-33 cycle
METALS		
Pig iron production	VIII	IX
Steel ingot production	VIII	VIII
Steel sheet production	VIII	VIII
Copper production	IX	IX
Lead ore shipments	VI	VIII
Zinc ore shipments	VIII	IX
Tin imports	VII	VIII
MOTOR VEHICLES		
Passenger car production	VI	VIII
Truck production	VIII	IX
MACHINERY AND INDUSTRIAL EQUIPMENT		
Vacuum cleaner shipments	VIII	IX
Industrial pump shipments	IX	IX
Woodworking machinery shipments	VIII-IX	IX
Machine tool orders	VIII	IX
Locomotive orders	VIII	VIII
Passenger-train car orders	VIII	IX
Freight-train car orders	VII	IX
CONSTRUCTION		
Total construction contracts	VII	IX
Residential building contracts	VI	IX
Commercial building contracts	VII	IX
Industrial building contracts	IX	VIII
Public works and utilities contracts	IX	IX
CONSTRUCTION MATERIALS		
Lumber (Douglas fir) production	VIII	VIII
Oak flooring production	VII	IX
Portland cement production	VI	IX
Structural steel orders	VIII	IX

¹ See note to Chart 1.

mercial innovations will need to promise prodigious profits before new investment will hesitantly get under way.

7. Though unusual in some respects, the contraction exhibited many of the typical features of a cyclical contraction.

As we have seen, the contraction of 1929-33 was peculiar in numerous respects. (1) It was a violent movement in comparison with the preceding expansion. (2) It became devastatingly deep. (3) Its industrial scope was nearly universal. (4) The declines in individual industries were more concerted than is common. (5) It was unusually long in comparison with preceding contractions. (6) It lasted longer relatively to the preceding expansion than any other contraction at least since the 1850's. (7) The decline in the durable goods industries as a whole relatively to transient goods industries was uncommonly large. (8) It was diversified by extra cycles in many industries making relatively perishable consumers' goods. (9) No real upturn in the durable goods industries occurred in its closing stages. (10) It may be regarded as the contraction phase

of a 'long' cyclical movement beginning in 1921, as well as of the business cycle beginning in 1927.

These differences are important. For certain purposes, such as the devising of economic policies or the investigation of long cycles, the differences may be sufficiently important to be treated as marking a difference in kind. But the student of business cycles may treat them as differences of degree; for we must note again that in many respects the contraction resembled its predecessors.

The industrial response to the cyclical contraction ran true to form, though it engulfed activities usually independent of business cycles. The several departures from conformity consist of series on foodstuffs and Federal-aid roads under construction. The former usually conform irregularly to business cycles. Butter production and sheep slaughter—which rose during the contraction—on the average moved invertedly also in preceding contractions. So, too, the inverted movement of Federal-aid roads is set against an average pattern with a somewhat inverted tendency.

The relative amplitudes of decline of different industries during this contraction also have familiar features. As in

the past, the decline was greater in producers' than in consumers' goods, and in durable than in transient goods; greatest in the railway equipment industry and smallest in the food industry; greater in machine tools than in motor vehicles; greater in metals than in fuels, in textiles than in shoes, in paper than in tobacco; greater in residential and industrial than in commercial buildings; greater in bituminous coal than in petroleum or electricity, in coke than in bituminous coal, in steel than in coke, in lumber than in cement, in woodworking machinery than in lumber, in automobiles than in inner tubes or vacuum cleaners, in apple shipments and oleomargarine production than in most other foodstuffs.

Finally, as in preceding cycles, the decline was greater on the whole in industries that had risen much in the preceding expansion than in those that had risen little. This statement is subject to numerous exceptions if applied to single industries, as must be the case when secular trends, structural changes, and irregular movements are combined with cyclical fluctuations. But apart from the construction trades, it fits accurately broad groups of industries.

Prices in Recession and Recovery
A Survey of Recent Changes

by F. C. Mills

FROM THE INTRODUCTION
BY THE COMMITTEE ON RECENT ECONOMIC CHANGES:

"Prices and price relationships almost completely dominate the economic life of the nation. Fundamental to human welfare as are the activities of production, distribution and consumption of goods, it is prices as a medium of control which, in their ceaseless changes and readjustment, stimulate or retard the very processes by which our industrial and commercial life are carried on, and govern the direction of human effort.

Yet not until recent years have economists and the business community fully realized the basic importance of the role played by prices, or clearly sensed the necessity of studying their behavior and influence in the cyclical course of our economic progress.

The present volume is of particular significance because it is an authentic record of price movements during the course of a serious depression and the following period of revival. It is a revealing picture of the price mechanism as it has been affected by, and in turn has affected, the pattern of our economic life during a period of great stress.

For the scientific competency of the study and the character of the material presented, together with the interpretation placed upon it and the conclusions drawn, the National Bureau of Economic Research is solely responsible,

but it is with real satisfaction that the Committee on Recent Economic Changes joins in presenting so carefully prepared and comprehensive a record as this volume represents. Herein will be found the complete 'working papers' on which the author's inferences and deductions have been based, together with an explanation of the statistical method used. These afford the reader an opportunity to check or challenge for himself the soundness of the interpretation as well as the adequacy and acceptability of the data from which they have been made.

The great value of the work is that it makes available to the producer, the fabricator, the distributor, the consumer, the economist, the leaders of labor and the agencies of government, a factual basis for a more intelligent attack on the fundamental problem of economic stability."

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Owing to unavoidable delays in the printing of Dr. Macaulay's book, announced as Volume 31 in the National Bureau's series, Dr. Mill's volume has taken precedence over it. Volume 32, *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, will appear before the end of the year. 500 pp., 35 charts of which 6 are inserts, \$5.00.