CROP and BUSINESS CONDITIONS

NINTH FEDERAL RESERVE DISTRICT

REPORT OF

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TO THE

FEDERAL RESERVE BOARD

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110th Report | MINNEAPOLIS, MINN. | March 28, 1924

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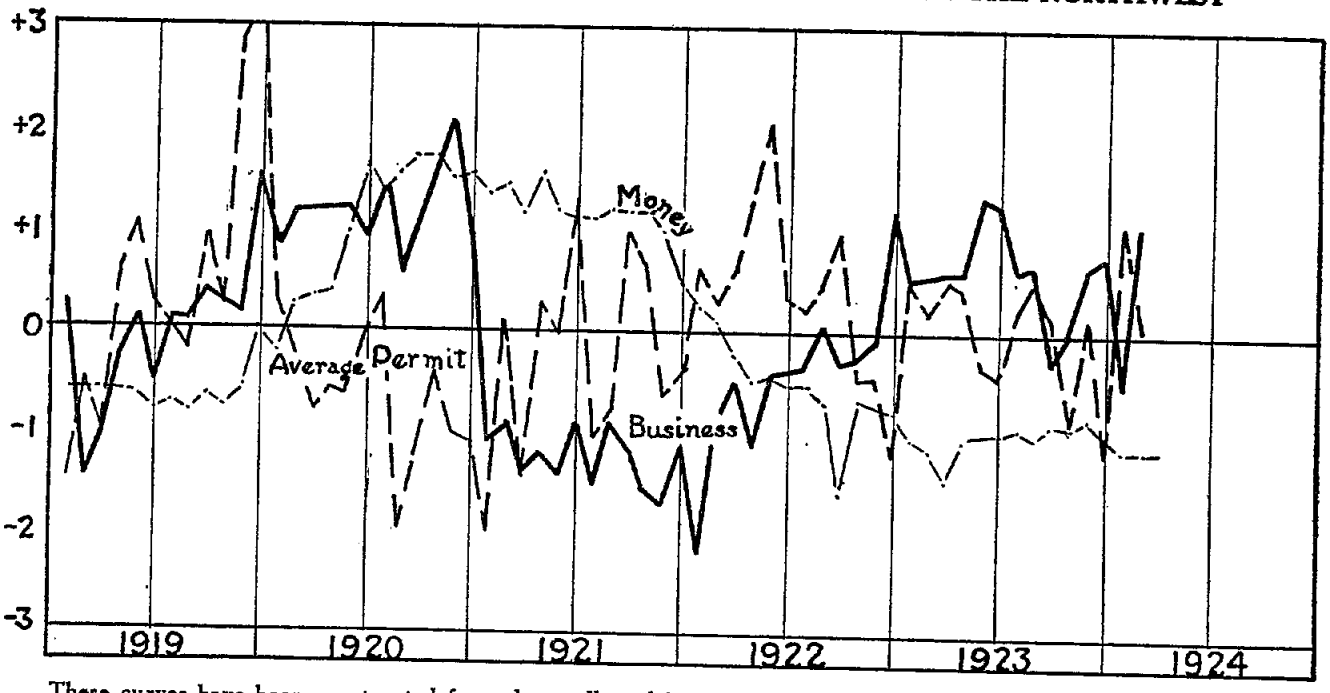
GRAPHIC SUMMARY OF URBAN BUSINESS CONDITIONS IN THE NORTHWEST

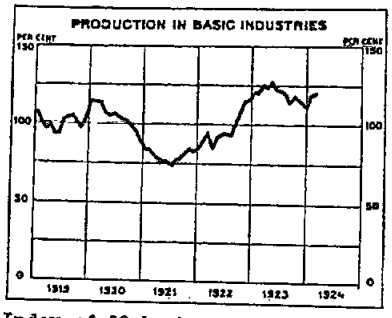


These curves have been constructed from data collected by this office and adjusted to eliminate seasonal influences. Adjustment for secular trends has been made except for the money curve.

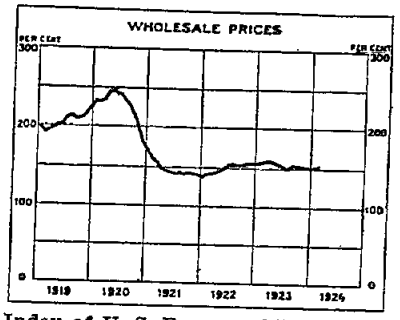
BUSINESS: The best single available index of general business is individual debits. These represent the aggregate dollar value of all payments made by bank checks, and therefore reflect both the volume of business and the prevailing prices. Allowance for secular trend is in the main an allowance for price changes which have been downward. Nine representative cities for which we have consecutive figures are combined in this curve.

MONEY: The commercial money rates here shown are based on a weighted average of five varieties of paper in Minneapolis. Although national, more largely than local, business conditions determine this rate, it is an important consideration in determining local business policies.

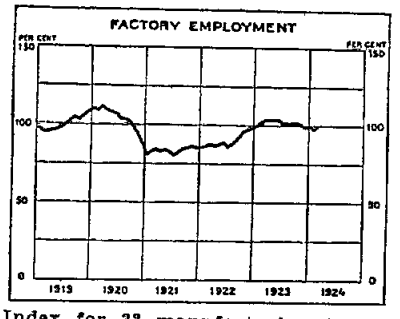
AVERAGE BUILDING PERMIT: The number and value of building permits granted are customarily accepted as indicative of prospective business activity. This graph, however, shows the average size of building permits for eighteen selected cities, thereby giving greater weight to the larger projects which are either started or deferred because of business considerations, and which have a determining influence upon the degree of activity in the building trades and in the supply of materials. This curve furnishes an index of business sentiment which is made up very largely of confidence in the stability of prices. Allowance for secular trend is necessary to eliminate changes due to the development of industries in these cities. The variation of building material prices, as compared with 1913 levels, has been eliminated in constructing this graph.



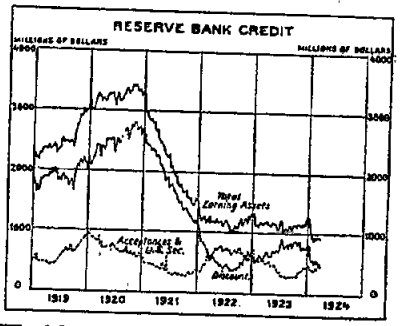
Index of 22 basic commodities corrected for seasonal variation (1919=100). Latest figure—February, 1924.



Index of U. S. Bureau of Labor Statistics. (1913 = 100, base adopted by Bureau.) Latest figure—February, 1924.



Index for 33 manufacturing industries (1919 = 100). Latest figure, February, 1924.



Weekly figures for 12 Federal reserve banks. Latest figure, March 19, 1924.

Summary of National Business Conditions
(Compiled March 25 by Federal Reserve Board)

Employment at industrial establishments increased in February and the output of basic commodities was slightly larger. Distribution, both at wholesale and retail continued large. Wholesale prices were somewhat higher, and there was a further increase in the volume of borrowing for commercial purposes.

PRODUCTION: The Federal Reserve Board's index of production in basic industries, adjusted to allow for length of month and other seasonal variations, increased less than one per cent. in February. Production of pig iron, steel ingots, and flour increased while mill consumption of cotton and production of cement and lumber declined. Factory employment advanced one per cent in February following successive decreases during the three preceding months. Increases in working forces were reported by most industries and were particularly large at iron and steel plants, automobile factories, and textile finishing establishments. Fuller employment through reduction of part time work is indicated by an increase of over five per cent in average weekly earnings. Building activity was slightly less than in January, though contracts awarded were seven per cent larger than a year ago.

TRADE: Railroad shipments in February were in greater daily volume than in January and carloadings of practically all important commodities were larger than a year ago. The daily average volume of wholesale business increased about five per cent in February, but was slightly smaller than a year ago. Sales of meat, dry goods, and hardware were larger than in February, 1923, while sales of shoes were smaller. Department store sales in February averaged about the same daily volume as in January and about eight per cent more than a year ago, while merchandise stocks at these stores at the end of the month were six per cent above last year's level. Business of mail order houses and chain stores also showed increased activity in comparison with January.

PRICES: Wholesale prices, as measured by the index of the Bureau of Labor Statistics, advanced slightly in February. Prices of fuel, metals, and building materials increased, while prices of farm products, clothing and chemicals declined. During the first two weeks in March price declines occurred in wheat, cotton, silk, hides and rubber, and price advances in hogs, copper and crude petroleum.

BANK CREDIT: The volume of borrowing for commercial purposes at member banks in leading cities in the early part of March continued the increase which began in the latter part of January, and on March 12 total loans of the reporting banks were higher than at any time since the seasonal peak at the turn of the year, and about $275,000,000 higher than a year ago. At the Federal Reserve banks during the four week period ending March 19, a further decline in the volume of discounts for member banks and of acceptances was offset by an increase in the holdings of United States securities, so that total earning assets were at about the same level as in February. Federal Reserve note circulation continued to decline, while the total money in circulation increased.

Easier money conditions were reflected in a slight decline in rates for commercial paper to 4½ per cent and also in lower rates for bankers' acceptances and reduced yields on Treasury certificates. The March offering of $400,000,000 of one year Treasury certificates, bearing interest at four per cent as compared with four and one-quarter per cent on a similar issue sold in December, was over-subscribed.

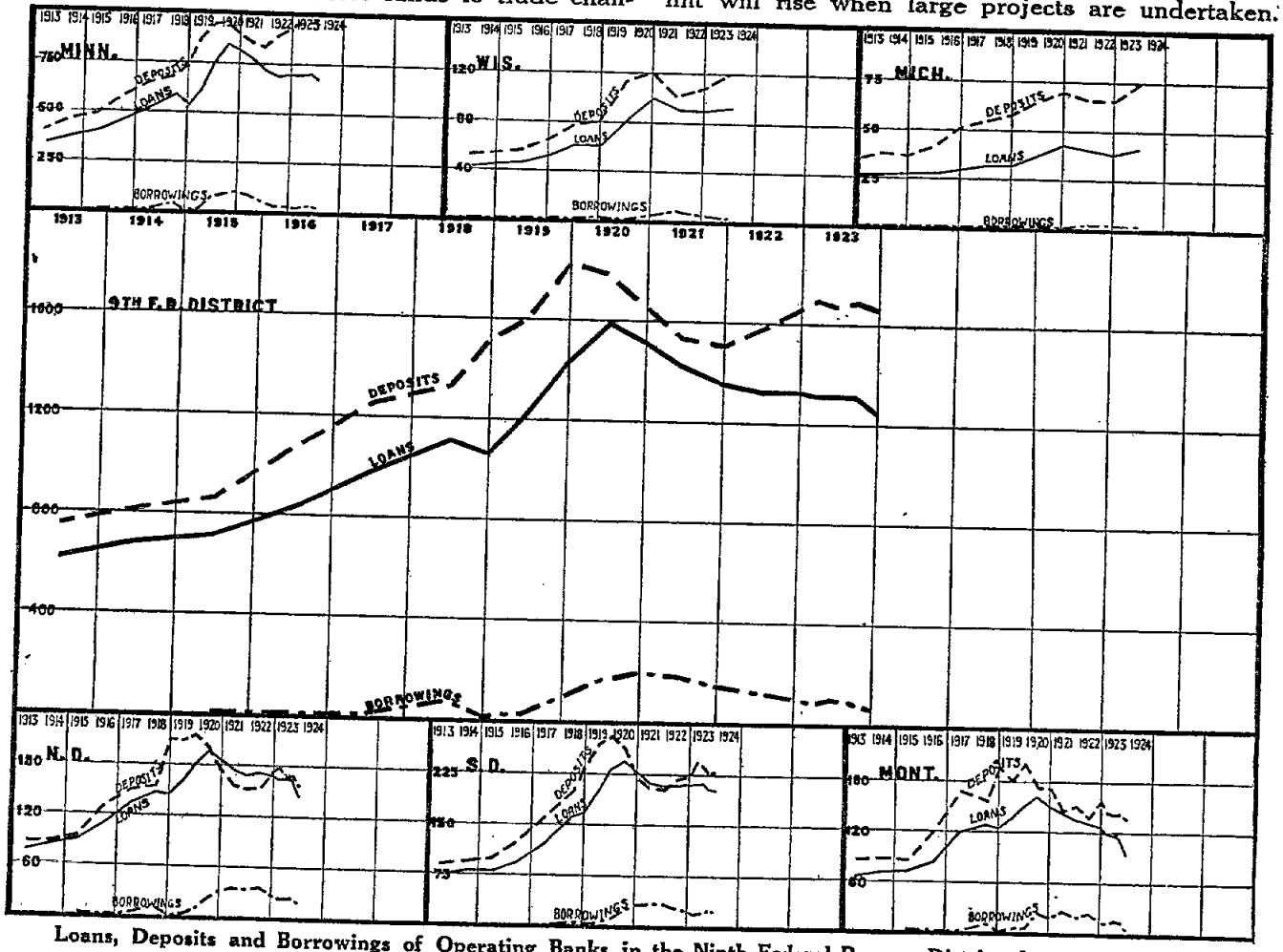
DISTRICT SUMMARY FOR THE MONTH

The marketing of agricultural products in February was abnormally large. There were extraordinary increases in the grains, especially in corn, and hog receipts continued at high levels. The stability and improvement which took place simultaneously in the prices of grain and of much of the livestock is particularly noteworthy in view of the heavy marketing of the month.

The volume of business in urban centers in this district during February as measured by individual debits recovered all the losses of January and gained sufficiently to bring the total in harmony with the rate of improvement which has prevailed since the revival began last September. As compared with a year ago, the volume was two per cent greater, due in part to improvement in country flour mill production, linseed operations, copper mining, and department store sales.

Banking conditions have improved. Selected member banks in the larger cities reported increases in loans and deposits and reductions in borrowings during the six weeks ending the middle of March. This Federal Reserve Bank experienced a decline of more than three millions in loans during the same six weeks and returned these funds to trade channels through the purchase of government bonds and market bills, totaling nearly six millions. The flurry of demand for Federal Reserve notes which developed in February has completely subsided. Interest rates in Minneapolis remain unchanged. Commercial paper held in this district is fifteen per cent above a year ago. A chart presented at the foot of this page, showing the loans, deposits, and borrowings of all banks in this district from 1913 to the end of 1923, indicates that during the past twelve months, deposits have been rising and loans and borrowings declining. How much of the latter may be due to the fact that some banks closed during the year it has not been practicable to estimate.

Prospective business activity as indicated by building permits is one-fifth above a year ago. These permits necessarily result in orders for building materials, labor and transportation; and these in turn affect retail trade, wholesale trade, and other branches of industry. While the total valuation should be a fair index to the prospective purchases of building material, it is believed that the average building permit is an even better index of business sentiment or general confidence. Since new orders depend upon business confidence, it is important to have some index of it. The average building permit will rise when large projects are undertaken.



Loans, Deposits and Borrowings of Operating Banks in the Ninth Federal Reserve District, from 1913 to 1923.

Presumably the larger projects are the most carefully planned and are either deferred or advanced in time, according to the judgment of those who are undertaking them. These judgments depend upon current opinion as to the outlook for stability of prices and other equally important business considerations. This month we have made a statistical verification of the logic of this sequence of events reaching from the average building permit to the volume of business which actually takes place as shown by the individual debits. After making proper adjustments in the curves for seasonal and secular trends, it appears that a substantial amount of correlation exists between the average building permit and the volume of business in this district, with a lag in the latter of from nine to twelve months, with greater emphasis upon the twelve-month period.

TOPICAL REVIEWS

Grain receipts at Minneapolis and Duluth-Superior increased between January and February, with the exception of rye and flax. Such increases are extraordinary at this time of year. The increase in receipts of corn was especially marked, and February corn receipts acounted to 5,525,000 bushels. This amount was two and one-half times as large as the January receipts and more than six times as large as February receipts last year. A large share of this volume entered elevators at Duluth-Superior. In fact, February receipts of corn at the head of the lakes were greater than the total receipts for the year 1923, causing elevator stocks to treble during the month. Receipts of wheat, oats and barley increased about one-fifth between January and February, and receipts of barley, oats and flax were larger than a year ago. Receipts of wheat and rye were smaller than last year in February. With the exception of corn stocks, there was no great change in terminal stocks of grains during the month. Stocks of oats and rye were slightly larger and stocks of wheat, barley and flax were smaller. As compared with last year, stocks of wheat, oats and barley were smaller and the other grains had larger stocks.

The movement of livestock to the South St. Paul market slowed up in February, except in the case of calves, for which the movement was fully as large as that in January, if the shorter month be taken into consideration. Hog receipts continued to be abnormally large, receipts of cattle were about normal and sheep receipts were sub-normal as compared with the ten-year average for the month. Receipts of all classes of animals were larger than a year ago, especially sheep receipts, which were two-fifths larger.

The feeder movement to the country was also smaller in February than in January, except for hogs. Fewer feeder animals were shipped to the country in February than in the same month last year, and the declines were particularly noticeable in calves and sheep.

Prices of the chief products of the farm were firm or rising for the majority of commodities during February. Median grain prices at Minneapolis were all higher than in January with the exception of rye, for which the price remained unchanged. The price of barley and oats has risen to a point nearer the price of rye than at any time since the war, and corn is selling at a higher price than rye. This situation is an interesting commentary on the relative demand for export grains and grains used for local consumption. Mixed tendencies prevailed in February livestock prices at South St. Paul. The median prices of butcher steers and hogs remained unchanged from the January medians, prices of lambs and feeder steers increased and butcher cows and veal calves showed slight declines. There were seasonal declines in the Minneapolis wholesale prices of butter and eggs, the decline being especially marked in eggs on account of the mild weather which has stimulated production. The price of hens showed a seasonal increase and the price of potatoes remained unchanged.

Business volume in February showed a marked recovery from the depressed condition of January, according to the evidence of individual debits at banks in selected cities of this district. While in dollar amounts debits declined 7 per cent from January, the customary decline is about 20 per cent, and consequently, the February volume compared favorably with that of January. February debits were 2 per cent larger than debits in February last year, although the five year trend has been downward.

Business failures showed some decline in number between January and February, as is customary at this time of year, but the number of failures was nearly one-fifth larger than a year ago in February. The liabilities involved in these failures were only about one-half as great as the amount involved in February last year, but were slightly larger than the liabilities of January failures. R. G. Dun and Company reported 85 failures in February, 1924, with liabilities of $1,216,850.

Prospective building activity in the cities of this district increased during February over the January volume. There was an increase of three-fifths in the number of permits granted at eighteen cities, but the average permit was smaller and the total valuation of permits during February was about the same as in January. Both number and valuation during February, however, were more than one-fifth greater than in February last year.

Manufacturing of important products in this district showed declines in February as compared with January, which were largely seasonal in character. Flour production declined more than one-tenth, with Minneapolis and outside mills showing about the same percentage of reduction. Shipments of linseed products fell off by more than the seasonal amount on account of failing supplies of flax seed. The cut of lumber was slightly less in February than in January, but shipments were one-fifth larger, as is usual at this time of year, and manufacturers' stocks of lumber were allowed to decline.

As compared with last year, activity was noticeably greater in country flour mills and with the linseed crushers. There was an increase of nearly 40 per cent in the output of flour in February this year over a year ago at outside mills, while the production at Minneapolis mills was nearly one-tenth less. Shipments of linseed oil were one-third greater and shipments of linseed cake nearly one-fifth greater in February this year than a year ago. Lumber manufacturers cut considerably less lumber in February this year than a year ago and their stocks of lumber are higher now than last year.

Copper mining in this district was somewhat more active during February than during January, if the shorter month be taken into account. Practically as much copper was extracted in February as in January, and the February amount was more than one-fifth larger than the amount extracted in February last year.

Retail sales declined seasonally between January and February. Department store sales were down one-eighth and lumber sales decreased one-tenth. As compared with February last year, department store sales were slightly larger and lumber sales slightly smaller. Stocks of merchandise at department stores and retail lumber stocks showed seasonal increases during February, and department store stocks were about on a level with a year ago, while retail lumber stocks were lower than a year ago.

Wholesale trade in this district during February did not exhibit any marked changes from January or from February last year, except that sales of shoes during February were one-fifth smaller than during February a year ago. Increases in sales of farm implements and shoes between January and February were undoubtedly seasonal occurrences, and the slight declines which were reported in sales of dry goods, hardware and groceries might be accounted for by the shorter month.

The balance sheets of city member banks in this district reflected the opening of spring operations by increases in loans during February and the first half of March. Deposits increased simultaneously by more than the amount of the increase in loans, partly on account of deposits of state and county funds, and these banks were consequently enabled to reduce their borrowings from this Federal Reserve Bank. There was also some reduction in the borrowings of member banks in the country sections of this district during this period, which is a seasonal occurrence at this time of year.

These selected member banks in the larger cities reported an increase in loans of nearly 4½ millions during the month of February, accompanied by an increase in demand deposits of 5¾ millions. Security holdings, reserves and borrowings were reduced somewhat and time deposits increased slightly. During the first two weeks of March, loans increased 10½ millions, demand deposits increased 14 millions and reserves increased 2½ millions. Security holdings remained unchanged and there were moderate reductions in time deposits and borrowings. Interest rates at Minneapolis banks remained unchanged during the month ending March 15.

The market for commercial paper continued to expand during February. The amount of paper outstanding in this territory increased 4 per cent over January and was 15 per cent larger than a year ago.

This Federal Reserve Bank experienced a decline in member bank borrowings of 1½ millions during the month of February and a further decline of 1¾ millions during the first two weeks of March. These reductions and other changes enabled this bank to increase its holdings of purchased bills and United States securities by 3 millions during the month of February and an additional 2¾ millions during the first half of March. Cash reserves also increased 4 millions during this period. Member bank deposits declined 1 million dollars in February, but increased 3½ millions during the first half of March. On account of heavy withdrawals of cash from banks in the western portion of this district, this bank was called on for abnormal supplies of Federal Reserve notes during February. The amount of notes in circulation increased 5½ millions during the month, but declined one-third of a million during the first two weeks of March, indicating that the period of strain was at an end.

REVISION AND ANALYSIS OF OUR URBAN BUSINESS CURVES

A further revision has been made this month of the curves of the chart on the first page of this report. There has been a gradual downward trend in debits to individual accounts at the banks in cities of this district during the last five years. Since debits are the best index of the dollar volume of business, it is important to measure the extent of this downward drift. In Chart I, the curve of debits is shown, with seasonal changes eliminated, and the same chart contains the line of downward trend which has amounted to .0217 per month in terms of standard deviation. The composite chart of urban business conditions shown on the first page of this report, contains the debits curve with an adjustment for this trend, since the object of the composite chart is to portray short swings unaffected by gradual movements taking place over a period of years.

It has also seemed advisable to remove the trend from the curve of the average building permit which serves the chief function of illustrating changes in business confidence in the future stability of prices and the continuity of demand. There has been an upward trend in the average building permit for the last five years amounting to .0246 per month. The curve of the average building permit, after removing seasonal changes, and its line of trend are also presented in Chart I on this page, and the composite chart on the first page of this report shows the permit curve with the trend removed.

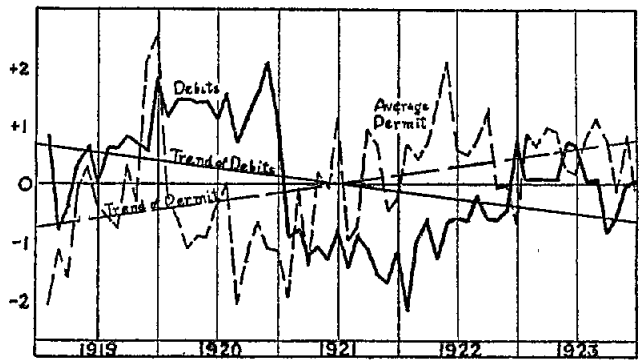


Chart I. Individual Debits and the Average Building Permit in Cities of the Ninth Federal Reserve District, 1919-1923. Adjusted to eliminate seasonal changes and showing the line of trend for each curve.

After making these adjustments for both secular and seasonal trends in the debit and permit curves, it has been found interesting to compute statistically **the number of months by which the debit curve has lagged behind the permit curve during the last five years.** Changes in business sentiment always precede changes in the volume of business, because it is the opinions of business men which, translated into action, create business. The larger increases and decreases in manufacturing, in payrolls, in trade and in savings, practically always follows similar changes in business sentiment.

In the table below are given the results of the computations for lags of various numbers of months between debits and the average building permit. It is seen that the correlation reaches the highest degree with a lag of **nine to twelve months,** and that the figures grouped in quarterly cycles show a higher degree of correlation than either bi-monthly or monthly cycles. This latter fact is a natural occurrence, since from the nature of the permit curve, it is subject to a pronounced saw-tooth movement which is translated into broader movements in the volume of debits. The construction of a large building for which a permit is taken out in a certain month continues over a period of months or years, and consequently, does not cause a like peak in business.

COEFFICIENTS OF CORRELATION FOR INDIVIDUAL DEBITS AND AVERAGE BUILDING PERMIT

Lag*	Monthly Cycles	Bi-Monthly Cycles	Quarterly Cycles
6 months	....	+31.1	+35.5
7 months	+28.2	....	....
8 months	+35.4	+38.7	....
9 months	+38.0	....	+51.1
10 months	+50.3	+56.3	....
11 months	+50.5	....	....
12 months	+46.2	+55.9	+62.9
13 months	+29.9	....	....
14 months	....	+24.9	....
15 months	....	....	+16.6

* Debits lag behind the average permit.

Chart II illustrates the close correlation between the debit curve and the permit curve in quarterly cycles, after allowing for a lag of twelve months in the debit curve. The permit curve has been shifted to the right twelve months in order that the correlation may be better seen. At the major turning points, the two curves, with this allowance of twelve months for lag, have moved simultaneously. The five year peak for both curves occurred in corresponding quarters, followed by declines of approximately the same extent and periods of depression about equal length. The ensuing period of increase was also of about the same length in both cases and the following peaks were in corresponding quarters for both curves. The unusually favorable weather during the last quarter of 1923 brought out a large volume of business which would have been postponed under ordinary weather conditions, and consequently, the debit curve did not decline with the permit curve at that time; but this contrary movement has been compensated for to some extent by the unusually depressed condition of business in January.

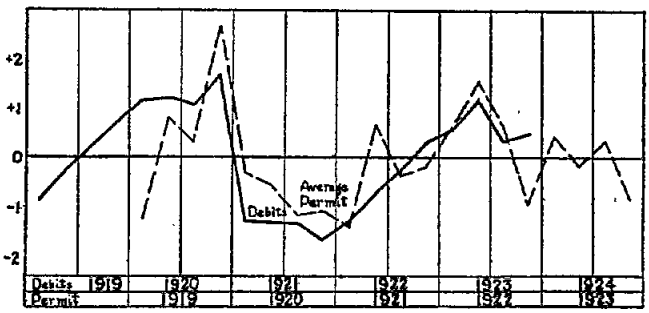


Chart II. Individual Debits and the Average Building Permit in Cities of Ninth Federal Reserve District, by quarters, with adjustments to eliminate seasonal changes and secular trends, and the curve of the average permit moved twelve months to the right for comparative purposes.

WHY FARMERS SHOULD GROW ALFALFA

(Continued from Page Twenty-four)

creases the initial cost, but it should not be omitted for that reason, as the increased yields will quickly repay this cost and leave a good profit above it. Although alfalfa will kill out the weeds, once it has a start, the seed bed should be as free of weeds as possible for the maximum success. A little extra effort on the seed bed is often the only difference between a good and a poor stand. Fall plowed heavy soils will work up into a firm, mellow bed, but for light soils, spring plowing is better. In preparing the seed bed, it should be remembered first, that alfalfa seed is small and needs to be worked down only one quarter inch, and second that the seed covering is hard, which means that for successful germination there must be plenty of moisture in the top soil. Whenever possible, scarified seed should be

sown as this germinates more easily, gives a more even stand, and consequently takes less seed per acre.

Opinions vary as to the best method of seeding alfalfa. Good results have been obtained from such a variety of methods that it is impossible to say that any one is best. This is largely due to local conditions of soil and climate, at the time of planting as well as during the growing season. On one point, however, all authorities agree, that whether scarified or not, whether Grimm or Cossack variety, **the seed should be inoculated.** This can be done by taking an amount of soil about equal to the amount of seed from a field that has a good stand of alfalfa, moistening it a trifle, and then mixing it with the seed before planting. If no alfalfa fields are available, commercial inoculation can be obtained, or inoculation for one bushel of seed may be obtained free of charge from the United States Department of Agriculture at Washington, D. C. In case these liquid inoculations are used, complete directions are furnished which should be carefully followed. Alfalfa can be sown in late March or early April, on fields planted to winter wheat or rye. Freezing weather will not hurt the seed and the action of the frost leaving the ground will work the seed down sufficiently deep. Alfalfa can be sown with a nurse crop of barley or oats, but if oats are used, they should be cut early for hay. When a nurse crop is used, alfalfa is sometimes seeded with it and sometimes broadcasted afterwards. The latter is probably the better method. Alfalfa can be sown by hand in a cornfield after the last cultivation and dragged lightly to work it down the necessary quarter inch. It has been successfully sown in half a dozen other ways, in amounts ranging from two or three pounds per acre when sown in rows, to ten or twelve pounds when broadcasted, and at any time up to late summer as long as there is sufficient moisture for germination. These possible methods prove the versatility of alfalfa, and show how a stand can be obtained under almost any set of circumstances.

Alfalfa hay is put up in much the same way as the other clovers, but a little extra effort to save the leaves is well worth while. The best practice is not to let it lie as left by the mower, with the leaves uppermost, but to turn it over and dry the stems first. This can be done quickly and cheaply with a side-delivery rake. The windrows can later be turned again with this rake, and it is then ready for the mow. In making alfalfa hay this way, even if rained on, its value is but slightly impaired. It will be blackened by the rain, but most of the feed value remains. Because of the rapidity with which the next crop comes along, cocks or windrows should not be left on the field longer than absolutely necessary for fear of smothering the plants beneath. The last cutting should not be made later than the first week in September in order to insure sufficient growth later to serve as a winter cover. **There have probably been more fields of alfalfa lost because of late cutting or late pasturing and the consequent winter killing than from any other cause.**

A field of alfalfa will sometimes need a little cultivation after it has produced for a few years. This can be well done by means of a spring tooth harrow. "Don't look back!" cautions one writer on this subject. "If you do you'll stop." The field will look pretty well torn up, but the yields will be greater as a result. A top dressing of manure on alfalfa on the lighter soils will also enlarge the yields, and when it is applied in the fall or winter will serve to hold the snow and prevent winter killing. Given the care above described, alfalfa will produce year after year larger quantities of better feed than any other crop.

Conclusion When the crop acreages in Minnesota, Montana, North Dakota and South Dakota are grouped according to their uses and the effect upon the soil on certain dates in 1909 and 1919 some very significant results are obtained. Three groupings have been made **Exhaustive crops,** which include all the grains not cultivated and tame grasses grown for hay; **Stimulative crops,** which include all crops that were cultivated but did not add to the fertility of the soil; and **Improvement crops,** which include all the legumes, whether cultivated or not. The percentages for each of these groups of the total cropped improved land in each state are given below:

Kind of Crops	Minn.		Mont.		No. Dak.		So. Dak.		Four States	
	1919	1909	1919	1909	1919	1909	1919	1909	1919	1909
Exhaustive	72.8	75.1	82.0	70.4	97.6	97.8	69.0	75.3	81.8	83.4
Stimulative	19.5	17.9	1.6	3.7	1.7	1.9	26.0	22.6	13.1	12.7
Improvement	7.7	7.0	16.4	25.9	.7	.3	5.0	2.1	5.1	3.9
Total Cropped Improved Land	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

With the single exception of Montana, there has been a slight decrease in the percentage of acreage devoted to exhaustive crops, and a slight increase in the percentage of improvement crops. This is not a satisfactory showing for the ten years. The number of acres devoted to improvement crops in Montana almost doubled between 1909 and 1919, but the percentage shows a large decline, owing to an enormous increase in wheat, from 260,000 to 1,700,000 acres. The purpose in presenting these percentages is not to show the changes during the period, but rather to emphasize the extent to which we have been "mining" the soil instead of farming it. North Dakota with practically all its land in exhaustive crops has the most serious situation, according to these figures. If figures were available for the year 1923, this percentage might be slightly reduced and the improvement crops increased, as a result of the sweet clover and dairy cow campaigns conducted during the last two years; but exhaustive crops doubtless continue to occupy too great a percentage of the land, in North Dakota as well as in other states. This condition can and should be improved by devoting a greater acreage to alfalfa, the best legume.

WHY FARMERS SHOULD GROW ALFALFA

Present prices for livestock do not warrant the purchasing of expensive feeds, although concentrates are necessary to prepare livestock properly for market. In recognition of this situation, the tariff was recently reduced on mill feeds imported into this country. Any cheapening of feeds should give the farmer a greater margin for profit. It is particularly timely, therefore, for us to present some of the advantages of alfalfa and to urge its more general use in cultivation. Other publications within this district have been conducting campaigns for alfalfa recently which we believe merit support. If our farms are to be stocked with dairy cattle, much larger quantities of both forage and concentrate must be available. Alfalfa can be grown on almost any soil, will provide a hay that pound for pound is equal to bran in feed value, and it is not uncommon to obtain a yield of four or five tons to the acre.

Advantages of Alfalfa Owing to its many uses and advantages, alfalfa should prove a boon to every farmer who will raise it. Due to its high feed value, alfalfa hay is always in demand and its price per ton is approximately equal to that of bran. On this account, alfalfa hay will be a good cash crop for farmers who do not feed livestock, or for those who are fortunate enough to produce more than their own requirements. Alfalfa seed is also a very profitable crop where conditions favor its production, and it is possible to obtain two or three bushels per acre from the same field that produced two tons of hay per acre earlier in the season. The hardy, northern grown **Grimm** and **Cossack** varieties of alfalfa will produce a permanent field of the best hay known for cattle, horses, swine or sheep; and when ground, for poultry.

Two or three cuttings each season will eliminate Canada and sow thistles and all annual or biennial weeds. At the same time, alfalfa will improve the soil physically and chemically so that when the field is again plowed, it will be found in better condition to raise crops profitably than at the time it was seeded down. The chemical method of improvement is pretty generally known, that of increasing the nitrogen content of the soil by means of the bacteria that live on the roots. These bacteria take nitrogen from the air, change its form to make it available, and store it up for future crops. The physical improvement is also due to its root system. The deep tap roots penetrate the hard pan and provide capillary channels which raise the water level in the soil, or provide an outlet for an excess of moisture in the topsoil. The smaller branch roots increase the humus content, and thereby increase the moisture-holding ability of the soil, with the result that clayey soils are loamier, and sandy soils are heavier.

Feeding Alfalfa It has long been known that alfalfa will take the place of an expensive concentrate in rations for growing animals, because of its high protein content, which is required for body development. A somewhat newer use of alfalfa which has proved equally satisfactory is wintering mature hogs on alfalfa hay. Green, bright alfalfa hay, properly cured so that the leaves are conserved, is an appetizing feed for bred sows during the winter. In addition to inexpensively supplying the protein which sows should have for the production of husky, healthy pigs, alfalfa hay forces the sows to exercise while they are obtaining their feed; and winter exercise is a very essential feature of brood sow management. The bulk of a feed of alfalfa hay is much greater than that of a corresponding amount of protein fed in the form of a concentrate, which exercises the digestive organs while the bulk in their stomachs keeps them filled up instead of hungry, and the greater time spent in feeding keeps them active and vigorous.

At farrowing time, sows should have a light cooling grain ration, and the benefits obtained from this will be greatly enhanced by giving them all the alfalfa hay they will eat, which will vary from one to two pounds a day for gilts, up to two and one-half pounds for sows. After farrowing even if tankage is added to the ration, the alfalfa hay should be continued, for it is an aid in keeping up the milk flow, and pigs can seldom be fed more cheaply than through their mothers.

Thirty to forty pigs, when thirty-five or forty pounds in weight, can be turned out to pasture on an acre of alfalfa; and with a moderate grain ration (3½ pounds grain per 100 pounds live weight) they will put on weight very economically and at the same time develop a good substantial framework for another hundred pounds of weight to be put on in the fall. Another advantage that alfalfa has over any other kind of hog pasture is in the economy in cost of fencing. An acre of alfalfa will ordinarily support thirty pigs for several years, if their noses are ringed to prevent rooting. This involves but one cost for erecting a hog-tight fence, while with temporary pastures such a cost occurs each year.

When feeding alfalfa hay to mature cattle or horses, care should be taken not to feed too much. Alfalfa is best used when it takes the place of the concentrate in a ration and supplements the other feeds.

Alfalfa Culture Alfalfa will grow on any type of soil, except deep peat land. However, it will not grow on sour or acid soil, nor low wet ground. Sour soils can be sweetened by an application of lime, limestone, marl, or marble dust, and then alfalfa will make a good stand. This application of lime will greatly improve the stand on a neutral soil as well, and greatly reduce the chance of winter killing. Liming the soil, when necessary, in-

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