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# Monthly Review

OF THE FEDERAL RESERVE BANK OF MINNEAPOLIS

## Crosscurrents slow economy

Within the generally satisfactory economic climate of the Ninth district, there has been an undercurrent of cautiousness amounting to uneasiness in some local areas. A few industries, such as mining and lumbering in western Montana and Upper Michigan, are definitely less active than a year ago. The impact of reduced employment has been felt on spending in these areas, especially since the end of this summer's active tourist trade. Althought specific areas of weakness are evident, the district economy continues to function at a high over-all level.

Two facts stand out in the district's economic situation. The first is that the major economic indicators for the district no longer show the strong advances that were characteristic during 1956 and early 1957. The second is that present economic activity is nevertheless above a year ago. What has been termed a 'sidewise' movement continues to describe the general economic condition of the district.

Strongly underwriting this high level of district activity is this year's favorable district crop output. Although earlier estimates indicated larger crop production than last year, the USDA's October 1 estimate was still larger, estimating a total district crop fully 10 percent above last year. This assures a high level of marketing and processing activity. It also assures abundant feed supplies to sustain high livestock production. Crop and feed

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conditions in South Dakota, particularly, are greatly improved this year, in contrast with the disappointing results of the two previous years. District farm incomes total about 4 percent above a year ago for the first seven months of this year —not including soil bank payments.

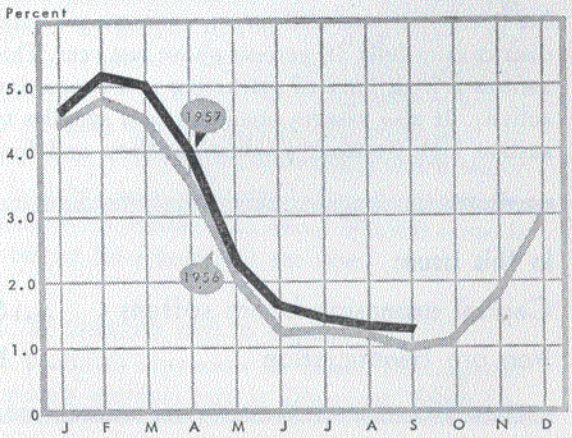
Other evidences of high level activity include substantial increases in district bank debits during September, and the fact that retail sales have continued at or above year-ago levels. The banking picture remains stable with total deposits up slightly from a year ago and with only a moderate increase in bank loans.

With the district economy 'leveling' it is not surprising to find some increase in the amount and severity of adjustments being made by certain industries in particular areas. While total employment within the district appears to be about even with a year ago, there is some increase in unemployment totals, and hours worked per week are also down slightly. Unemployment now measures 1.4 percent of total non-agricultural employment in the district, as compared with 1.2 percent of total employment a year ago. When the pluses and minuses of such adjustments are totaled, however, they continue to add up to a district economy that is active at a high level and which has not yet experienced any over-all decline.

On the national scene, there are indications that business spending for new plants and equipment may taper off. Defense spending is also currently scheduled for some slicing in the near future—although this might be subject to change due to the influence of 'sputnik' and other international developments. Basic upward pressures on prices appear to have eased, even though consumer prices may continue to rise. Average wholesale prices declined slightly between mid-September and mid-October, due largely to seasonal declines of farm prices and food. However, prices of some other basic industrial materials, such as steel scrap and lead, are also lower.

Conditions as they are now seen do not suggest any significant changes in Ninth district economic activity in the near future.

**Unemployment as a percent of total employment (nonfarm) in the Ninth district**




*The following selected topics describe particular aspects of the district's current economic scene:*

## CURRENT BANKING DEVELOPMENTS

The Ninth district banking figures for September were dominated by developments at the large city banks in Minnesota. Thus, a $24 million decline in loans and a $17 million drop in deposits for all member banks in the district was more than accounted for by a $33 million reduction of loans and a $58 million loss of deposits at the city banks. Member banks in all district states or part states except Minnesota reported loans and deposits either up or unchanged for the month.

The entire decline of loans at the city banks in September represented the liquidation of loans to banks which, since they are generally of one day duration and fluctuate widely from day to day, are not strictly comparable to the usual bank loan. Loans of the ordinary kind were unchanged in amount at the city banks in September. Last year the city banks reported that such loans fell $5 million during the same month.

The large outflow of deposits at the city banks was occasioned almost entirely by the withdrawal of U. S. government deposits amounting to $54 million. Deposits owned by banks were reduced $9 million while other demand deposits rose $3 million. Time deposits rose $2 million during the month. In September last year total deposits of city banks fell only $7 million. In the year ended September 25 city bank deposits rose $58 million, with $38 million of the increase registered in time deposit balances.

Although the loans and deposits of country member banks rose in September by $9 million and $41 million respectively, the gains were less than in September last year when respective gains of $17 million and $47 million were reported. Total deposits of country banks at the end of September were $145 million above a year earlier with a gain of $116 million in time deposits.

## CROP OUTPUT GAINS

Estimates of district crop output for October 1 indicate a total harvest for the Ninth district of about 10 percent above last year. This latest USDA crop estimate was also about 3 percent higher than the forecast on September 1. Greatest gains were in corn production, as favorable weather improved the harvest outlook during the month of September. Wheat and soybeans also were estimated at higher levels than in September. Flax declined another 20 percent from the September forecast, due largely to widespread damage from yellow aster.

Within the 10 percent increase in crop output for the district compared with a year ago, only flax production is down from last year, with a drop of almost 50 percent, from 47 million bushels to 25 million bushels this year. Production of all other crops exceeds that of a year ago, and in many cases by substantial margins.

Durum production within the district is estimated to be up just slightly from a year ago, at an estimated output of 40.8 million bushels.

Crop production for the entire nation is equal to that of a year ago, despite widespread unfavorable conditions during the early part of the year. Important shifts of acreages to feed crops have resulted in large supplies of livestock feed.

## BORROWINGS AT THE FEDERAL RESERVE

The average daily amount of borrowings from the Federal Reserve Bank of Minneapolis in September was virtually unchanged from the August average which was the lowest monthly borrowing average since January. A small increase in borrowings by Reserve city banks in September was accompanied by an equal decline in country bank borrowings. This trend continued into October.

In the first half of October average borrowings by the Reserve city banks were up $6.9 million from the September average, while country bank borrowings were down $2.8 million from the September figure to the lowest level of this year. The number of country banks in debt at the Federal Reserve during the first half of October was also the lowest for the year.

### Average borrowings from the Federal Reserve Bank of Minneapolis

(millions of dollars)

| | 1957 | 1956 | 1955 |
|---|---|---|---|
| January | $18.0 | $27.2 | $ 4.9 |
| February | 31.6 | 47.0 | 13.6 |
| March | 51.2 | 43.5 | 36.3 |
| April | 54.6 | 40.4 | 48.6 |
| May | 77.8 | 69.6 | 52.6 |
| June | 58.4 | 62.4 | 51.0 |
| July | 40.8 | 51.1 | 48.5 |
| August | 32.0 | 24.4 | 41.9 |
| September | 32.0 | 23.2 | 69.4 |
| October | | 13.1 | 60.4 |
| November | | 7.0 | 48.0 |
| December | | 16.4 | 33.0 |

## DISTRICT FARM INCOME UP 4 PERCENT

Cash receipts of Ninth district farmers from the sale of farm products during the first seven months of 1957 exceeded their income of a year ago by roughly 4 percent. This compares with a 1 percent increase for the nation as a whole. All district states except Montana shared in the increase; cash receipts of Montana farmers were down about 1½ percent compared with a year ago. Both North and South Dakota showed substantial gains of 7 percent over last year during this period.

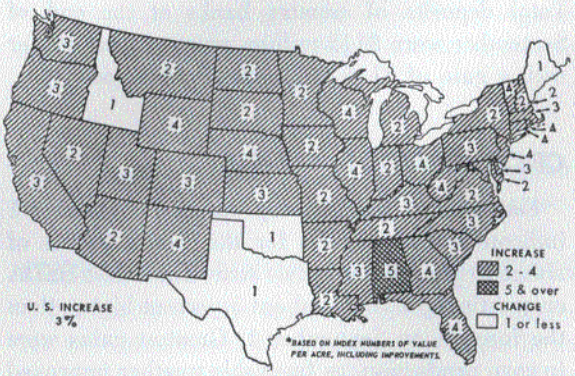
## DISTRICT LAND VALUES CONTINUE RISE

Prices of farm land in the Ninth Federal Reserve district continued to rise during the four-month period ending July 1, 1957, according to the latest estimates by the U. S. Department of Agriculture. Land values in the four main district states rose a uniform 2 percent during this period. This is a continuation of the general rising trend which has persisted since about 1954.

During the 12-month period ending July 1, farm land values in the Ninth district rose 6 to 10 percent in the individual states making the average yearly rise 8 percent. The average rise for land values in the March-July period was only 3 percent.

The number of sales of farm land continues to be quite small throughout the district as well as for the nation as a whole. And in the resulting 'tight' land market, farmers themselves are the major source of demand for farm land. As the trend toward farm enlargement remains strong, present operators continue to bid actively for land offered for sale in order to add to their present acreages and increase efficiency.

### Percentage changes in dollar value of farmland*, March 1957 to July 1957




# Distribution of credit

In recent months, an expanding demand for credit has produced rising interest rates. The Federal Reserve has been unwilling to allow an expansion of commercial bank credit sufficient to meet the larger demand for loans. Such action would add unduly to the nation's money supply which, as the upward trend of prices recently suggests, is already adequate. The creation of a large volume of new money would only aggravate the inflationary problem. Thus, for the Federal Reserve to allow commercial bank credit expansion so more borrowers might be accommodated, would be to abdicate the responsibility which it shares with other federal agencies of maintaining reasonable stability for the value of the dollar.

Some have complained not about the supply of

credit, but about the way in which it is distributed. They charge that the most deserving borrowers are not always successful in competition for the limited supply of funds.

The allocation of credit in a free society is governed chiefly by the dictates of savers, who supply our economy with the bulk of its lendable funds. By insisting upon the highest return available for a given risk or the safest risk available for a given return, savers behave in the same way that sellers do in favoring the highest bidder. Competion for the saver's dollar prompts lending institutions likewise to employ the criteria of earnings and safety in deciding which of many loan applications will be granted. This is because savings are likely to be channeled away from those institutions which compare unfavorably with others in the matter of earnings and asset quality or safety.

The importance of safety is underscored by the consideration that one bad loan can wipe out the earnings from many good ones and may even create an insolvency. Indeed, federal and state laws were passed many years ago which require periodic examination of major financial institutions by the supervisory authorities in order to afford an additional measure of protection for funds entrusted by the public. Banks, insurance companies, savings and loan associations and other lenders may receive complaints from the supervisory agencies when they make loans to borrowers of questionable risk.

The search by savers and their financial intermediaries for earnings and for safety then shapes the distribution of credit in our society. Those who best demonstrate the ability to repay and who are willing to pay what others are for credit are generally the successful applicants for the limited supply of lendable funds. To be sure, imperfections in the market exist. Some borrowers may be far removed geographically from a lending institution, the judgment of lenders about particular loans may be in error, or some lenders and borrowers may be ignorant of other opportunities, for example. However, it has yet to be demonstrated that alternative arrangements for allocating credit would reduce the imperfections.

But, whatever the merit of alternative arrangements, it is important to recognize that some potential borrowers are unable to obtain credit because better risks or higher bidders have already exhausted the limited supply of loans. Since credit represents command of scarce productive resources, and since resources must be employed in the most advantageous ways if the output of our economy is to be the largest possible, the present practice of allocating credit in our free society provides some assurance that the resources supplied by savers will not be squandered in less than the most productive uses.

This is because, generally, the most productive borrowers are also the best risks. Their financial statements indicate they've done a good job in satisfying their customers—that society values their products more highly than the resources used in creating the products. Too, the higher profits of the more efficient producers enable them to outbid less efficient producers in the credit market. In contrast, loan applicants with financial statements indicating a lack of success—an inability to employ resources as productively as others—are not likely to impress lending officers favorably.

The credit men at thousands of lending institutions in our nation—by virtue of their training, experience and incentives—are exceptionally well qualified to make the judgments and appraisals which are necessary to equate the limited supply of credit with the demand in a way that will further the goal of lifting the nation's output. This goal is shared by the Federal Reserve System which does not control the allocation of credit but which does influence the supply of commercial bank credit. This influence is intended to promote sustained economic prograss and stability in the buying power of the dollar.

# Capital expansion boom softens

*Capital expansion plans appear now to be shifting with less emphasis on industry programs, more on public spending.*

As inclement weather sets in and the construction industry in this district closes down activity on some projects and postpones others until milder weather returns, an evaluation of the economic impact of the capital expansion program which has been of boom proportions in the past three years is appropriate. During this time business firms, non-profit organizations and the federal, state, and local units of government have made large additions to existing stock of capital facilities in the economy.

### Business capital expenditures

Business firms during the current year have been making a record investment in buildings, equipment and other capital goods. According to the Securities and Exchange Commission, the total investment of the nation's firms this year will exceed $37 billion. This represents a 6 percent increase over the record $35.1 billion invested in 1956. This in turn was a record investment, 22 percent above the previous high of $28.7 billion in 1955.

The sharp rise in expenditures on new buildings, equipment and other capital goods indicates that the economy has been experiencing a capital expansion boom. Since the spring of 1955 through the third quarter of this year the outlays made by business firms have risen consistently each quarter on a seasonally adjusted basis. According to the schedule of expenditures for the fourth quarter of this year as reported by the Securities and Exchange Commission, there will be a drop in quarterly capital outlays made by business for the first time since 1955. This reversal in trend immediately raises speculations over the probable end of the current capital expansion boom.

Considering future plans of industrial firms, there may be a levelling off period ahead. There are several developments that lead to this conclusion. According to the National Industrial Conference Board, smaller profit margins and less liquidity have resulted in a decline in appropriations for future expansion programs. For the first time since the boom started in early 1955, appropriations being made for future expansion are less than current expenditures. On the basis of this information the Conference Board reported in September that capital outlays made by manufacturers may decline around the end of the year.

Secondly, in the past two years the capacity for producing major industrial materials has grown faster than the output of such materials, according to data compiled by the Board of Governors of the Federal Reserve System. This year manufacturers again have added a record volume of productive facilities at a time when output declined slightly. This has further widened the gap.

Output of steel has a direct bearing on the

growth of the iron ore industry in this district. A second large taconite plant in northern Minnesota has been placed in operation to supply steel furnaces with manufactured iron ore pellets. Work continues on the exploration and development of ore sources as well as on the experimentation of methods of beneficiation which will culminate in the building of additional taconite plants. However, according to present capacities several years may elapse before another plant is built.

A third indication of a slackening in the capital expansion program in the district is that the search for industrial sites has declined this year according to industrial development departments of railroads, state industrial agencies, and a few industrial realtors in this district. Fewer sites have been sold or leased thus far in 1957 as compared with the activity in the corresponding period of last year. Realtors report that multiple-story industrial buildings have become more difficult to sell.

Although capital expanditures made by business firms may be receding slightly during the fourth quarter, considerable strength remains in the private capital goods sector of the economy. Currently, there remains a backlog of projects which is only fractionally lower than a year ago. However, the economy may not feel the stimulus of an expanding program of new plants and equipment expenditures such as it has for nearly three years.

### Non-profit institutions continue their expansion programs

No decrease has been observed in the rate of expansion programs of non-profit institutions. Religious, educational, hospital, social and recreational structures are being built in increasing number. In the nation as a whole, the value of such structures put in place during the first eight months of this year was 17 percent higher than in the same period of 1956.

In the Ninth district, the number and valuation of building permits issued for such structures have again risen this year. In this district, the valuation of building permits issued for the construction of churches and other religious buildings in the first nine months of this year was about 5 percent above the total in the corresponding period in 1956. The aggregate valuation on permits issued for hospitals was almost double the amount of a year ago.

### Public construction high

In the current year impressive gains have been made in the volume of construction financed by the three levels of government. In the first eight months of this year, the value of construction put in place in the entire nation was 10 percent above the same period in 1956. Heavy construction especially has been booming this year. The federal highway program, which has been referred to as the largest public works program in history, is gaining momentum. Highway construction expanded more than seasonally in September.

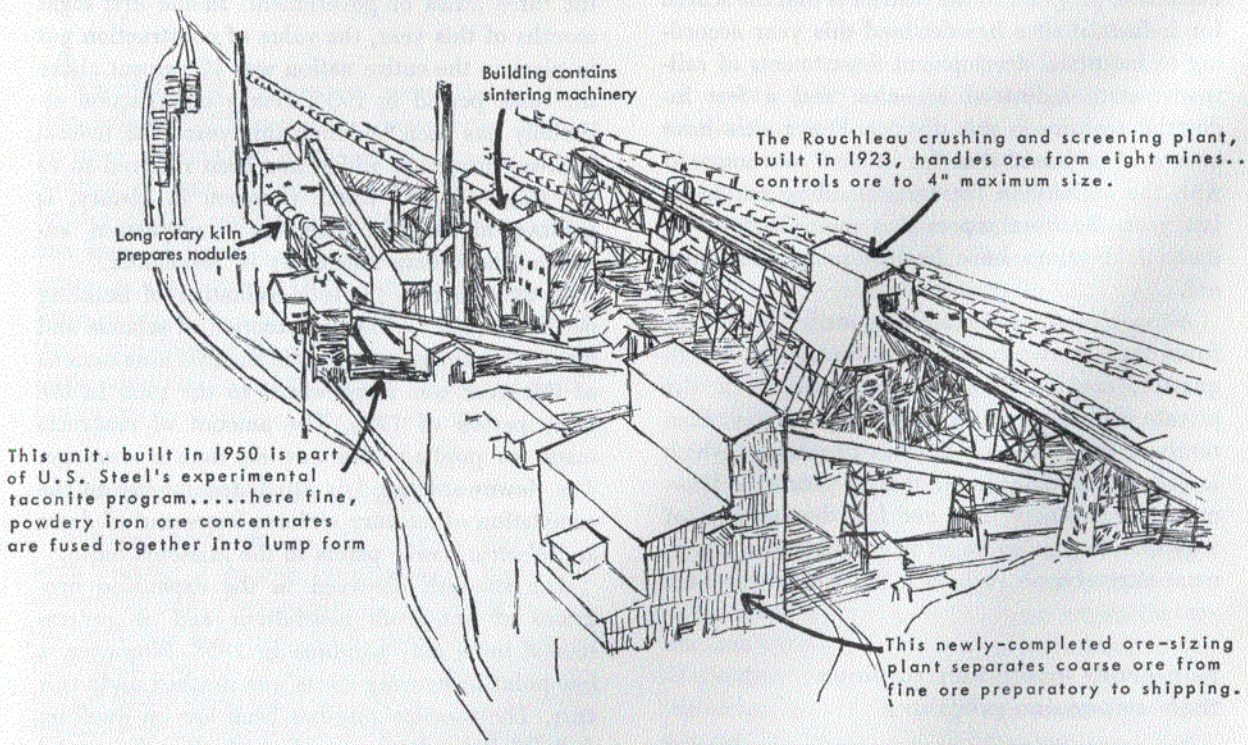
In this district, the total valuation of building permits issued for the construction of schools and other educational buildings in the first nine months of this year was about equal to the total in the same period of 1956. The amount of contracts made for public works was less than a year ago. The downward trend is attributed largely to the completion of military airforce bases and of dams and electric power plants in the Missouri basin.

The strength observed in the expansion programs of non-profit institutions and of governmental units may continue in 1958. Moreover, a low point in housing starts was reached early this year. The vacancy rate has been low on dwelling units available for rent or for sale. For the second quarter of 1957, the Bureau of the Census has reported these vacancies as 2.6 percent of the total in the United States and 2.1 percent in the north central states. Since the stock of vacant dwelling units is low and demand continues strong, residential building may continue to rise somewhat next year. Added strength in these areas may offset, in a large measure, the contraction anticipated in the expansion program of business firms.

*Fifty years old and still growing*

# Iron ore beneficiation

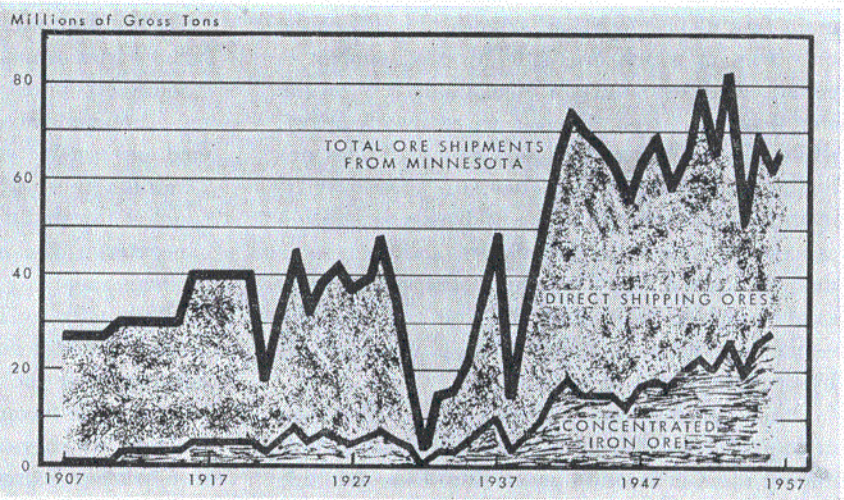
***Ore processing plants of the Oliver Mining Division located south of Virginia, Minnesota are included in this sketch. This is but one of many installations to be found on iron ranges of this district, engaged in the work of 'beneficiation' of iron ores.***




The tongue-twisting name of 'beneficiation' identifies the process going on at more than 80 industrial installations in the eastern part of the Ninth district. These plants are improving the the quality of iron ores shipped from this important mining region. The plant layout sketched above illustrates the large scale of some of these installations. The first beneficiation plant in Minnesota was started in 1907, which makes this year the fiftieth anniversary . . . and the occasion for this review of beneficiation—its past, present and future.

The first of these plants was placed in operation only 15 years after the earliest ore shipment from the Mesabi iron range in 1892. The Mesabi became famous for its immense quantities of rich,

Shipments of concentrated iron ore from Minnesota have shown growing importance in recent years.




easily-mined 'direct-shipping' ores. Yet at an early date the work of upgrading lower quality ores had already begun. For many years beneficiation accounted for only a small part of the ore shipped from the Lake Superior region, but such operations expanded rapidly after World War II, and now nearly half the iron ore is treated.

Largely, though not exclusively, the story of beneficiation is the story of the Mesabi range. The Mesabi is the biggest and most important of the several iron ranges in the Lake Superior district. On a geologic map of northeastern Minnesota the range would appear as an east-west trending strip of iron-bearing rock; its dimensions are about 110 miles long by a few miles wide. Great bodies of rich iron ore etched in the parent rock by past geologic episodes have been mined for 65 years. Since the first shipments in 1892, over 2 billion tons of iron ore have been taken from the Mesabi.

The importance of the Mesabi range continues unabated today, with the range currently accounting for nearly four-fifths of the iron ore being shipped from the Lake Superior region. Early production consisted of ores rich enough to be shipped as they came from the ground—so called direct-shipping ores. Yet other ore bodies were found along the iron formation which were not rich enough in their crude form. An example is the sandy iron ores characteristic of the western part of the Mesabi range. The earliest beneficiation process consisted simply of 'washing' these ores to remove sandy grains of quartz, thereby boosting the content of iron. In fact, washing was the principal means of ore improvement for the first 40 years of beneficiation. Other methods of upgrading have since become more significant so that washing now accounts for little more than a third of the total artificially concentrated ore.

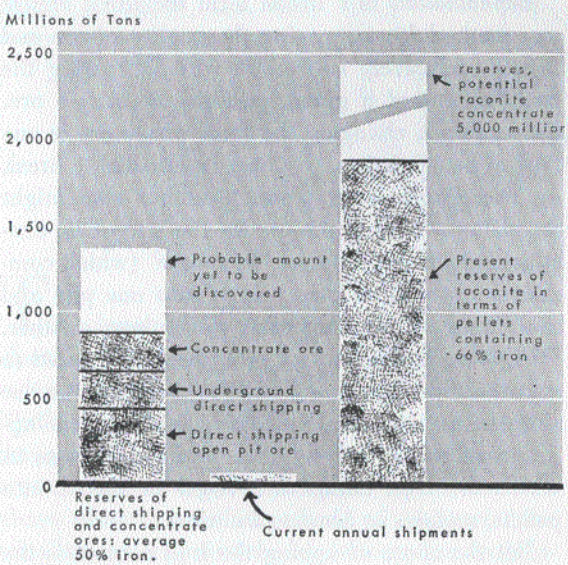
*Beneficiation* is a broad term including almost any method for improving the quality of ore and is not exclusively concerned with increasing the iron content of a given naturally occurring ore. For example, changing the form of the ore is one type of beneficiation. Ore may be crushed to break up excessively large pieces. Another step might be 'sizing'—sorting the ore by the size of its constituent particles. Coarser 'lump ore' (which commands a premium price) goes into one pile and the 'fines' or powdery fragments into another. Furthermore, the fines may be specially treated to get them into lump form (although some fines are shipped as is). This is accomplished in an 'agglomerating' plant by one of several processes in which the iron oxides are fused or baked into pellets, nodules or blocks of clinker.

But the chore of upping the iron content is the

main task of beneficiation, and washing is not the only way in which ore with low iron content is enhanced. A whole group of methods rely on the simple fact that iron minerals are extremely heavy, while most of the waste material that dilutes ore bodies are relatively light. They are called 'gravity' methods. One example is the hi-density separation process in which the mixed ore and gangue is dumped into a liquid so dense that quartz and sandy minerals float while the iron minerals sink —like separating golf balls from ping-pong balls by dropping them in water.

Other beneficiation processes rely on the magnetic properties of iron minerals, and most notable among these is taconite processing. Fine grinding of taconite rock frees the wanted iron minerals from the unwanted waste minerals. An iron ore concentrate is then pulled from the pulverized rock by magnetic force—roughly comparable to sorting steel marbles from glass ones by using a powerful magnet. The powdery concentrate is then pelletized or in other ways formed into lumps.

**There are still substantial reserves of conventional iron ores in Minnesota.**

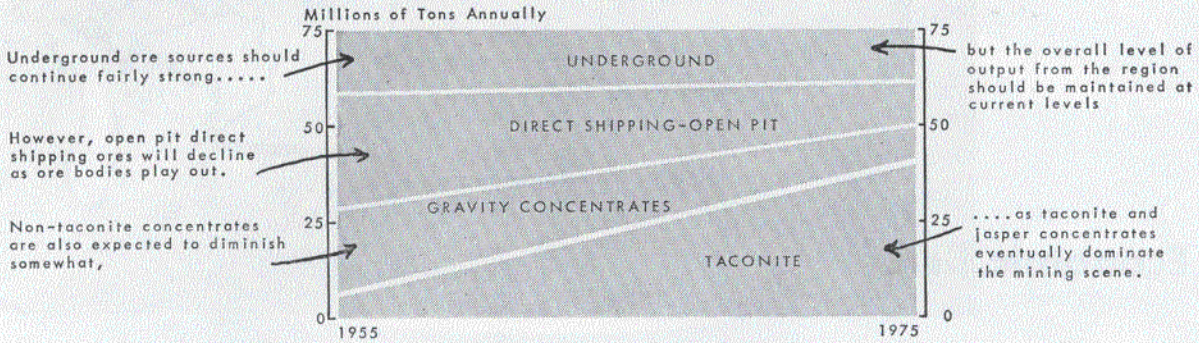



Of the approximately 28 million tons of beneficiated iron ores shipped from Minnesota in 1956, taconite accounted for about 5 million tons, washing accounted for some 10 million tons, hi-density medium gravity separation accounted for about 7 million tons, while other gravity methods accounted for slightly over 4 million tons. Taconite concentrates are expected to grow significantly, perhaps supplying as much as 35 or 40 million tons annually by 1975, while other types of concentrates will tend to gradually decline in importance over the years.

In a sense taconite is an ultimate step in beneficiation for it reaches right into the lean, hard iron-bearing bedrock itself from which both high and low grade iron ore deposits have been formed by natural processes over a period of millions of years. If all the iron ore bodies were scooped out, only the hard, unaltered bedrock—which is taconite—would remain. A high grade iron ore might run up to 65% iron, a low grade ore might test 35% iron, while taconite runs a lean 25% iron.

Operations involving beneficiation require the mining and costly handling of extra tonnages of crude ore just to ready one ton of concentrate for shipment, and thus tend to increase iron ore production costs. It might be asked, then, how does higher cost ore fit competitively into the future picture? The answer in part is that there seems to be no escape from higher ore prices. Even the richer foreign ores such as those in Canada and Venezuela represent high cost excursions relative to the better Mesabi ores of the past. Part of the higher cost will be offset by improved quality—taconite concentrates, for instance, may average more than 64% iron (contrasted with an average iron content of recent Mesabi range ore shipments of barely over 50%). While ore costs in general are likely to be higher, the real price of the end product, steel, may not rise if sufficient productivity gains are made in the intermediate steps. Recent experience with taconite concentrates suggests that beneficial results of high quality ores may include increased blast furnace productivity by as

## Outlook for iron ore production from the Lake Superior region in 1975.




much as 20 percent; lowered requirements of coke by as much as 10 to 15 percent; lower slag rates by minimizing the silica content of the ore; and possibly better quality iron. With results such as these coming from the use of taconite pellets, the higher cost of beneficiation operations find stronger economic 'justification.' While taconite processing has been successfully launched, its future scale of operations remains conjectural.

Taconite from the Mesabi range will be the chief future source of ore concentrates in the Lake Superior region, but not the only one. 'Jasper' from Upper Michigan, a non-magnetic equivalent of taconite, will also contribute to the Lake Superior district's total. In Michigan two beneficiation plants are already in operation. Marquette Iron Mining company started up a 600,000 ton per year plant at Republic last year, while the corporately-related Humboldt Mining company commenced work at its 300,000 ton plant at Humboldt in 1954. In addition, the M. A. Hanna company will begin construction this year of a beneficiation plant in Dickinson county with operations scheduled for 1959. The well-publicized commercial taconite operations in Minnesota are Reserve Mining company's 5 million ton plant already in operation at Silver Bay, and Erie Mining company's 7½ million ton plant at Hoyt Lakes scheduled for full operation next year.

Taconite and jasper are the 'glamour boys' of the Lake Superior iron district. But direct shipping ores and intermediate grade ores will continue to contribute important amounts for many years to come—though necessarily in declining volumes. Beneficiation plants for treatment of non-taconite ores are continually being constructed, with several new ones added in the past few seasons. An upper limit to iron ore production in this district will be set by costs. Given favorable demand and a reasonable growth in productivity, the Lake Superior district can continue to contribute about the same tonnage of ore to the nation's steel needs that it does now and it can do this for almost an indefinite period in the future.

In summary, beneficiation has completed its first half century as a successful commercial process on the iron ranges of this district, and its increasingly important role for the next half century is clearly evident. The table on the opposite page shows that reserves of direct-shipping ores and of ores requiring minor degrees of processing are still substantial. Yet the better materials will eventually play out, and low grade ores, in particular taconite, will take their place in the mining economy of the district. The region has by past record shipped about four-fifths of the U. S. supply of iron ore and it contains, according to recent estimates, close to three-fourths of the U. S. reserves, both actual and potential. Developments in beneficiation seem to assure that the Lake Superior region will continue to be the most important domestic source of iron ore.

# Economic Briefs

## 1. Iron mine begins shipments from Montana

High grade iron ore is being mined in a small open pit operation in central Montana, 17 miles south of Stanford. In production only since April 1956, the mine has already yielded between 13,000 and 15,000 tons of ore which have been sent to Duluth, Minnesota by rail. The ore being mined runs from 63 to 64 percent iron. Although the deposit was known at least 75 years ago, serious development was not undertaken until the Young Montana Corporation began test drilling in the area about three years ago.

## 2. New N. D. oil field sparks Williston basin

Burke county in northwestern North Dakota is today the focus of much oil industry attention. Development of the new Lignite oil field, about 25 miles northeast of the nearest oil production in the Tioga field, has proved to be the key factor in a resurgence of interest in the Williston basin. Discoveries in recent weeks several miles from wells in the Lignite field have uncorked oil—either in new pools or else as part of one large pool. In either event, there seems little doubt that a major oil field has been discovered. Pan American Petroleum Corporation, with about 800,000 acres, is the largest lease holder in the area.

## 3. S. D. uranium mill to expand

A $500,000 expansion of Mines Development company's uranium mill at Edgemont, South Dakota is scheduled to begin about the first of the year. Negotiations have been completed with the Atomic Energy Commission to boost production at the mill to 500 tons a day or 13,000 tons a month. The $2 million plant, which has 70 employees, was the first uranium mill in South Dakota when it began operations in July 1956.

## 4. Minnesota iron ore pellet plant closes

Decreased operations in the steel industry causing reduction of iron ore needs have resulted in the closing of Reserve Mining Company's pellet plant at Babbitt, Minnesota. The plant, with an annual capacity of 300,000 tons, employed about 140 persons. However, the Babbitt mine, crushing plant and railroad shops, which employ over 1,000 men, will continue operations.

## 5. Copper exploration underway in Michigan

A small copper exploration shaft is under construction near Wakefield in Upper Michigan by the United States Metals Refining Company. The shaft, which will reach a depth of 215 feet, will be used to determine the character of the formation and for sampling purposes. Target is the None-Such shale formation in which the present producing White Pine copper mine, about 25 miles northeast, is also located. In its current copper exploration program in the area, United States Metal Refining controls 20,000 acres and is operating 10 diamond drills.