

ENGINEERING AND MINING JOURNAL-PRESS

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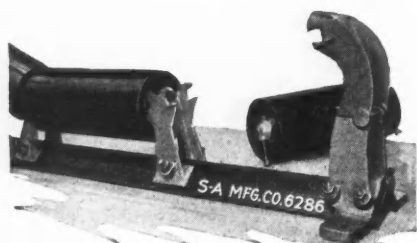


A Glimpse of the
Sicilian Sulphur Industry
Loading cakes after treatment at the
refinery near the mines at Camitini.
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Photo by Ewing Galloway

An Explanation of Flotation Based on X-Ray Data, by C. G. McLachlan
Petroleum Supply of Japan - III, by Arthur Huber Redfield
A. I. M. E. Meeting at Salt Lake City
Mine Taxation in Utah, by George J. Young

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ENGINEERING AND MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 120

New York, September 12, 1925

Number 11

Silver as Currency

A FRIEND sends us an editorial from a San Francisco journal, which advocates the abolishing of silver as minor currency. No better evidence of the complete divorcement of western metropolitan journalism from the great mining industries which founded and built up California and the West in general could be afforded than this capricious proposal. Referring to the effort of the Treasury to have the public use more silver and less paper on account of the saving thus effected to the government (because of the great waste due to easy wear and tear of paper currency), this San Francisco journal rebels, decrying the use of silver, especially silver dollars. It proceeds:

"If the aim of the Treasury is to save money in making money, a substitute might be found of no more intrinsic value than paper and more durable. No one will quarrel with the medium, so long as Uncle Sam's credit is behind it. Steel, for instance, might be minted into sizes conveniently small. The public will cheer any economy that puts more purchasing power into its pockets. But shopping or pleasure bent it does not like to go about loaded down like a pack mule."

It is difficult to see the brilliancy of this argument. If one must go around loaded with specie like a pack mule, who would not prefer being loaded down with gold and silver to being weighted with iron—like a coastwise schooner with pig iron below decks? Incidentally, whoever has had the experience of being loaded down once with gold or silver, or both, will remember the feeling of wealth which comes once in a lifetime. There was an occasion when the writer of this editorial had handed to him so much money in silver that he had to engage a porter and a cab to convey it to an institution where it could be converted into more readily portable money; and he could understand the solid satisfaction of the old pirates and "kings." And this satisfaction was based upon reality. Recently, in looking into the dictionary we found as a bookmarker paper money in one bill which stated itself to be worth five hundred thousand marks. The original taker of this note would have done well to substitute \$125,000 in silver, even if the silver were heavy.

The days when the jaded newspaper editor complains about the weight of real money are the fat and opulent and secure days, known only, in recent years, to Americans. Let the San Francisco writer thank his stars for his location and his ignorance, which is bliss. Had he been German or French or Russian or Greek he would have been for years now swapping paper for silver and hiding his silver in a teapot.

There is little danger, however, that the present use of silver as coinage will be lessened. The European nations have one by one embraced the old silly heresy of the inherent value of paper money without metallic security; and one by one gone bankrupt or ruinously in debt. One by one they are now emerging and attaching themselves to the old rock of the gold standard, and with renewal of faith in gold comes that in silver.

On Becoming Known

THE MODESTY of a retiring disposition may be refreshing in this age of advertising and clamorous self-assertion, but in most cases it will have to serve as its own reward. Turtles keep within their shells, and make progress very slowly. The engineer who takes no step to affiliate with any of the organizations of recognized standing within his field and who fails to make himself known, by name at least, to those who may be asked if they have ever heard of him limits his professional world considerably. He may also suffer at times for this negligence, possibly without knowing it. When an inquiry is made as to the standing of an engineer, as often happens, the reply that he is unknown and his name not listed anywhere certainly makes a bad impression. To avoid this appearance of being unqualified the engineer can do several things. He can and should join an engineering society of national scope and of recognized standing within his field, if he has not already done so. He can use a professional card, and probably does, if he be engaged in consulting work. If he be privately employed, he can make himself known to the editors of the technical magazines that he uses in various ways. He can make himself known to those who see these magazines by contributing articles to them. His experience must indeed be very limited if some part of it is not worth setting down in print. Of course, it is the average engineer that is referred to. Those who have done spectacular work or have been connected with spectacular projects enjoy a corresponding prestige. In most cases, it will be found, those who have reached the top of the professional ladder have early realized the value of publicity and have never hesitated to use all gentlemanly and ethical means within their power to obtain it.

Geologic Age and Atomic Disintegration

THE POPULAR ACCOUNT of atomic disintegration and its possible application to specific problems of geologic age, which Prof. Alfred C. Lane gave before the Canadian Institute of Mining and Metallurgy in March, was received with much appreciation: and, now that it has been printed, loses nothing of its romantic attractiveness. The paper is given in a simple and unassuming way, which adds to the clarity and charm. Professor Lane is one of those geologists who do not fear to go straight to the point and who do not find it necessary to "put on dog." Discussing the various methods of safely estimating disintegration, he selects as that which bids fair to produce the most definite results the method of comparing the ratio of lead to uranium in a given rock or mineral, both lead and uranium being results of atomic disintegration of original radium. Dr. Lane suggests that by this method the age of granites whose relations are uncertain might be obtained. In the article

he notes that for granites of the Mesozoic and Tertiary and the minerals derived therefrom, the ratio of lead to uranium is very small, being always less than three per cent (0.03) when galena is eliminated; and for the Tertiary minerals less than 0.01. For the late Paleozoic granites it is around 0.04 for the Devonian, 0.05 or more. But distinctly Pre-Cambrian granites have a ratio of more than 0.10, whether from America or Europe; and they run up as high as 0.20.

These broad relations seeming fairly consistent, they may be applied, Dr. Lane thinks, to determining relative age where these are unknown. Pegmatite in Connecticut, for example, which has been regarded by some as Pre-Cambrian, gives a ratio of 0.051, which can hardly be Pre-Cambrian, but may more likely be Devonian. In view of the widespread occurrence of pegmatites in New England, which are prolific in useful and rare minerals, and which may be in part at least of the same age as the Branchville pegmatite, this suggestion is of interest. Similarly in the case of the mineral veins (carrying pitchblende) of Joachimsthal in Europe: there has been a diversity of opinion regarding their age, some claiming they are Tertiary, others Pre-Tertiary. The lead-uranium ratio casts a heavy ballot in favor of the latter age, this ratio being 0.028.

The Natural History of the Pegmatites

THE ARTICLE ON THE PEGMATITES, especially those connected with the occurrences of tin and columbium in the Black Hills of North Dakota (which article appeared in our issue of Aug. 22) is a distinct contribution to economic geology and to general geology. The chief fact established is the action of replacement within these pegmatite veindikes subsequent to their final consolidation; and the origin of many of the crystals of rare minerals and of metallic ores through this replacement process. The original quartz of the pegmatite at the Peerless mine, at Keystone, S. D., for example, was locally replaced by muscovite, albite, cassiterite, and columbite. Albite is also found here and in other mines to have replaced other earlier pegmatite minerals, such as microcline. Muscovite, without accompaniment of albite, also replaces microcline. The lithia minerals, lepidolite (lithia mica) and spodumene (silicate of alumina and lithia), appear to be replacement products, as are the columbium and tin (columbite and cassiterite), and to be close to albite and muscovite in age. Locally, at least, the lithia mineral amblygonite (fluophosphate of alumina and lithia) is replaced by albite. Apatite, the phosphate of lime with fluorine and chlorine, is also a late mineral, accompanying and at times replacing albite; and beryl, the silicate of aluminum and beryllium, has the same general age. There are more intimate age relations between the different minerals, which intimate relations are sometimes reversed. Some of the successions described by Hess in given cases may be open to other interpretations, judging only from his illustrations; but the broad fact seems to hold, of an intense replacement of original quartz and potash feldspar (microcline and perhaps orthoclase) by soda feldspar (albite), muscovite, and the minerals of the rare elements. Most of these rare minerals, as will be noted, contain as constituents one or more of the notably volatile magmatic elements. Muscovite

also falls into this group, since it carries fluorine, even if not as an essential constituent; and has been widely regarded as probably only formed in the presence of fluorine. The group of volatile or rare elements which are thus shown to be of late introduction, replacing quartz and potash feldspar, includes fluorine, chlorine, phosphorus, lithium, titanium, beryllium, niobium, tantalum, and tin. Sulphur is not present in this group: there are sulphides in the pegmatites, but Hess believes these to be of later origin; the temperature at the time of the deposition of the albite and the minerals of the rare and volatile elements was apparently higher than that of the sulphide deposition.

The origin of muscovite in pegmatites or granites, by replacement of orthoclase and through the action of diffused fluorine, has already been described.¹ Moreover, the fact that albite (soda feldspar) forms in certain pegmatite veindikes at a later period than potash feldspar (orthoclase and microcline) and in part by replacement of earlier-formed orthoclase, has been noted by Lehmann, Brögger, and Spurr.² Hess's observations confirm and add to these earlier ones; and establish the fact that this later period, conducive to the replacement of orthoclase by soda feldspar and by muscovite, was in the cases he describes beyond question a period of high gaseous activity, marked by a concentration of the volatile and rare magmatic elements. While this concentration of gases, with doubtless exothermic reactions, might be expected to maintain or raise the original magmatic temperature, there is little evidence that any very high temperature resulted. Muscovite is unstable above 800 deg. C., passing into other silicates such as olivine, scapolite, and augite; so that the highest temperature was probably below that point.

Later than this period of comparatively high temperature, which was associated with the deposition of tin oxide, come (in the pegmatites described by Hess) tungsten (wolframite) arsenopyrite, bismuthinite, and molybdenite; while galena and blende are apparently later and deposited at a lower temperature.

Another set of phenomena throw light on this whole important question—those of the gold-quartz veindikes of close pegmatitic affiliations. Spurr³ has noted that in three important and typical instances at least, in Ontario, Canada, and in Australia, the feldspar contained in these veins is albite, never potash feldspar. This ties up with the observations above chronicled, that soda feldspar crystallizes in many pegmatites at a later period than potash feldspar; and would seem to prove that the magma solutions which deposited the gold-quartz veins were sodic. Quite unexpectedly, however, the wall rock in all these cases shows an increase of potash over the normal content, indicating that the solutions residual from the crystallization of the quartz and soda feldspar were potassic. This evidence may revert back to the pegmatites in question.

Extreme deductions cannot be drawn from the facts in hand. There is no evidence that the replacing magmatic solutions which deposited the rare earths and metals in the Keystone pegmatites were dilute or of long duration. The likelihood is to the contrary. The presence of rare gem minerals and huge crystals in vugs points to a concentrated, not a dilute, fluid; to

¹J. E. Spurr: Professional Paper 55, U. S. Geological Survey, pp. 43, 107, 113.

²Op. cit., p. 115.

³Engineering & Mining Journal-Press, May 30, 1925, p. 890.

crystallization from a suffusion of such a highly concentrated fluid rather than the slow passage of dilute solutions which Hess is inclined to postulate.

In general, the data accord well with views of pegmatites widely accepted since the classic work of Scheerer and of Lehmann, but afford a distinct addition to our knowledge and comprehension, constituting perhaps the most important paper on pegmatites that has been published in the United States. It is only fair to add that Drs. Larsen and Sheller, to whose work Hess refers, have long been working out the natural history of pegmatites, with great success, and the publication of their work will be an important event.

The California Diamond Jubilee

THE seventy-fifth anniversary of the admittance of California into the Union as a state is being celebrated in California as this issue of the *Mining Journal-Press* is going to press. The interval of seventy-five years is comparatively short, but when we visualize the historic events not only of California but of the United States we are quite willing to express astonishment at the material progress which is apparent.

Were a pioneer gold miner to return to California at this time he would find an area crisscrossed with paved and unpaved roads and railroads, tremendous acreages in farms and orchards, great cities and many towns, vast hydro-electric power installations and a prosperous population of three and a half million or more people engaged in varied occupations in sharp contrast to the trapper, gold miner, and stockman of the pioneer era. The old days have gone by long ago. Modern civilization means rapid and facile transportation facilities by auto, bus, railroad, and steamship. It means cheap and dependable power distributed to farms, cities, and isolated factories and mines. It means varied occupations—agriculture, lumbering, stock raising, mining, and manufacturing. California is fortunate in possessing numerous resources and an excellent climate. The initial pioneer stock has been augmented by people from many countries. A consistent and rapid growth of population is to be expected.

Machinery at Cincinnati

REMARKS made at the spring meeting of the Congress at Cincinnati by the electrical engineer of an important Pennsylvania coal company are quoted at length in the July issue of the *Mining Congress Journal*. The *Journal* puts these rather mystical words into the engineer's mouth:

"Others instead of using the old economical steam converters, put in centrifugal pumps. One advantage of a centrifugal pump is that it does not take up so much room. . . .

"The average plant will be a pump with a capacity of 1,000 currents or more. The new pumps will reach from 300 to 600 ft. These will be centrifugal pumps, the motor usually using 100-horsepower general electric current. . . . In a large motor with four or five hundred hours' heat it is our practice to put on slippering motors. When start of the pump is accomplished you have three circuits between the incoming line and the first circuit. . . . In this circuit you have the starting. The voltage switch is in the same circuit and there is a priming voltage which is attached to the top of the centrifugal pump. Between that and the other line there is a conductor. There is a controlling switch between line 2 and 3 and the priming pump starts."

Over the Fence

THE RAINBOW'S END seems only just over the hill to the small boy: and it does not seem impossible that he may find the pot of gold which, according to tradition, lies buried beneath it. He typifies also the full-grown man, as does the donkey who, finding his own grass too scant for his liking, stretches his neck through the fence, to strain at the entirely similar herbage on the other side. The grown man seeks, not so much grass, as pots of gold: and the rainbow's end lies just over the hill.

Americans, among the most restless and adaptable of nationalities, are perhaps especially notable for incessant change of place and vocation, seeking better feeding grounds. In the end, and on the average, this probably makes for an increased general average prosperity and intelligence: the mere act of moving about develops the initiative, the will, and the wits; and makes a keener individual. The individual manifestation of this restless urge is, however, often apparently futile. The farmer's son almost always seeks the city; the city man thinks he can lead an idyllic existence at "scientific" farming. The doctor warns his son against the hardships and disappointments of his profession, while a thousand lads whose fathers were not doctors are hastening toward a profession which looks to them like the realization of their dreams. Artisans' sons are striving to become writers and artists; while children of writers and artists and millionaires are hobnobbing with the horny handed, and vainly urging them to become radicals. Engineers, apparently, are ill-paid—at least engineers so devoutly believe; mining engineers are at a discount; accordingly, real estate, bond selling, and insurance, those wastebaskets for the reception of the restless, receive many, of whom great numbers are destined not to flourish exceedingly.

In Europe, especially in certain countries, the sons follow the footsteps of the father or the family tradition; it is a comfortable and restful custom, and makes for efficiency, if not for brilliancy. The modern tendency in the United States is away from this: the world is the young man's oyster, which he will open with his wit; and he has seen too much of the limitations of his paternal ancestor, and of the drawbacks of his occupation, to follow after. Besides, he wants novelty and variety.

And yet this enterprise and restlessness can be carried too far: and it results, in and by itself, in many failures. The sought-for opportunity is more often than not under our own feet, where we are at present. Persistent effort may uncover a pot of gold—or, to speak more professionally, pay-ore—where we are, more swiftly than anywhere else. Everywhere there is room above; while below the pressure is suffocating.

Economic forces are constantly at work leveling out real differences in fundamental opportunity; if one occupation becomes a little more golden than the other, there is a rush to that side, so that it rocks the ship; and the premium is gone. Therefore, engineers, for example, should strive to be better engineers; and to embrace the business side of engineering, since that is the advantage of the moment, when the world is in the hands of the merchants; and the same is true of the mining engineer. Technical training has been turned out of our colleges wholesale, till it has become cheap; but individual superiority and initiative in engineering and mining, as everywhere else, will forever command a premium.

Glimpses of the Sicilian Sulphur Industry



Photos by Ewing Galloway

*Above—One of the mines at Camitini, in Sicily, which was once the world's chief source of supply of sulphur.
At the shaft seen, the brimstone is hoisted electrically from a depth of 709 ft.
Below, unhooking a car at the mouth of an adit*

Mine Taxation in Utah

Properties Are Assessed on Full Valuation of Plant and Equipment, Plus Nominal Value of Claims, Plus Three Times Net Annual Proceeds

By **George J. Young**
Associate Editor

UTAH is not an important manufacturing state. Its principal industries are mining, agriculture, and stock raising. Thus the exploitation of natural resources largely determines the annual wealth output. The state has maintained a conservative position with respect to taxation, but has, in common with most of the states, allowed its total tax to greatly increase as well as the per capita ratio of taxation. Apparently, equilibrium in state expenditures has been reached at a gross figure of about \$18,000,000, resulting in a per capita tax of \$37.80. In 1916 the total state tax was \$8,857,095, or a per capita tax of \$21.08. The present tax is, as in most states, excessively high. Increases appear in the state general fund, city and town taxation and roads, but the greatest increase is in district and high-school expense, which amounted to \$18.85 per capita for the year 1924.

The state tax for general fund purposes is restricted to 2.4 mills per dollar of valuation. Counties are restricted in their levies for general fund purposes and for county roads and other specific purposes. City and town levies are also restricted to certain maxima. The state has an excise tax of 2½c. per gallon on all motor fuels and the usual motor vehicle fees. Public utilities and mining companies are subject to assessment by the State Board of Equalization.

BASIS OF VALUATION FOR TAX PURPOSES PRIOR TO 1918

For a number of years mines were taxed on (1) their mining claims (acreage) at the price paid to the Government; plus (2) machinery and improvements at actual value, and plus (3) the annual net proceeds at the actual amount. Property other than mining was assessed at about one-third of its actual value. Although the state laws provided for appraisal of all real estate and property at actual value, assessments, except in the instance of net proceeds of mines, did not meet this condition, and tax levies were made to conform to this condition. The Utah Legislature of 1915, in an effort to compel full valuation, fixed the tax levy so low as to require a substantial increase in assessments. This resulted in more or less confusion, which has continued up to the present.

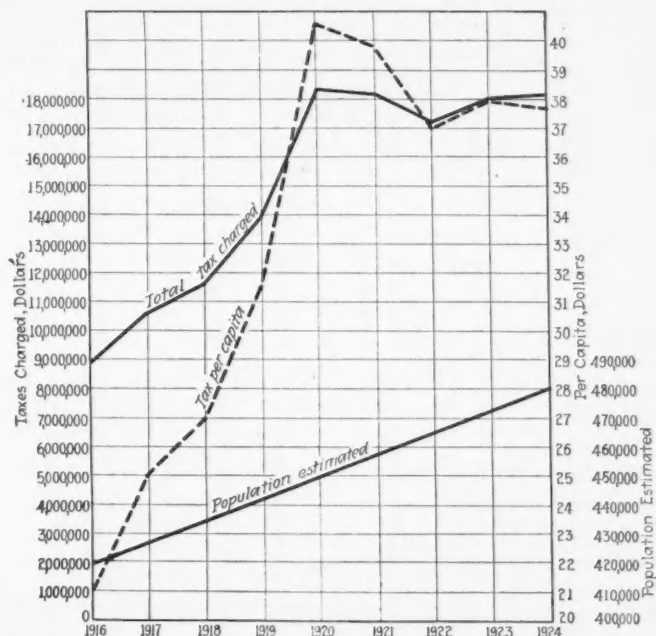
BASIS OF VALUATION, ACTS OF 1918 AND 1919

In 1918, a constitutional amendment was passed providing for the taxation of the surface holdings of mining companies at \$5 per acre, excepting, however, ground not used for mining purposes; all machinery and improvements at actual value and in addition a value established by taking some multiple or sub-multiple of the net proceeds. The Legislature of 1919 adopted *three* as the multiple, to apply to net proceeds.

The following gives the essential details of the mine taxation method, under the acts of 1918 and 1919:

"Mines are assessed at \$5 per acre, and in addition for a

value which is three times their net proceeds on the basis of verified statements by the producer, of which the record is kept in a special assessment book for mines. The assessment is apportioned to the county in which the mines are situated. The net annual proceeds of coke, bullion, and



Showing excessive increase in taxes, as compared with growth of population

matte made from untaxed coal and ore is deemed a product of mines and taxed as personal property. Improvements, buildings, erections, structures and machinery of mines or mining claims which have a value independent of such mine, or supplies used in mills, reduction works, or mines are to be assessed as other property. Net proceeds and improvements, etc., are assessed by the State Board of Equalization."

Net proceeds are defined in the revenue law of 1919 as follows:

"The words 'net annual proceeds' of a metalliferous mine or mining claim as used in this section are defined to be the net proceeds realized during the preceding calendar year from the sale, or conversion into money or its equivalent, of all ores from such mine or mining claim extracted by the owner or lessee, contractor or other person working upon or operating the property, during or previous to the year for which the assessment is made, including all dumps and tailings, after making the following and no other deductions from the gross proceeds thereof:

"(a) The amount of money actually expended during the year for labor, tools, appliances and supplies used in the mining operations, including the labor of the lessee and his employees and the amount expended by the lessee for tools, appliances and supplies used by him in his mining operations; provided, that the personal labor of lessee shall be computed at the prevailing wage.

"(b) The actual and necessary office and clerical expenses and salaries of employees, other than corporate officers, within the state.

"(c) The actual cost of installation, construction, maintenance and repair of machinery and improvements made during the year in and about the working of the mine for use in extracting the ores.

"(d) The actual cost of reduction works and mills, and improvements thereof, constructed during the year and operated in connection with the mine.

plant except where additions and improvements are made, when it increases a proportionate amount. No doubt when reconstruction of a mill occurs, the plant and equipment valuations are readjusted to accord with the new condition. The valuation of the mineral lands is nominal.

Table I—Mine Assessments in Utah

County	1923			1924		
	Real Estate	Implements and Machinery	Three Times Net Proceeds	Real Estate	Implements and Machinery	Three Times Net Proceeds
Beaver	\$11,700	\$183,253	\$2,031	\$11,700	\$140,484	\$19,294
Box Elder	46,115	545,888	400,584	45,083	534,349	230,637
Cache	5,000			5,000		
Carbon	9,567,421	5,353,444		8,241,637	5,584,679	
Davis						
Duchesne	24,728	4,731		22,243	6,710	
Emery	1,474,008	464,230		924,041	497,005	
Garfield		5,811			5,811	
Grand	130,025	29,900		125,193	37,702	
Iron	107,985	10,142		107,585	63,951	
Juba	6,200	749,374	5,722,826	5,820	688,751	4,495,076
Kane	400	355		400	230	
Millard	11,845	3,935		9,432	3,600	
Morgan	17,052	735,281		17,052	750,343	
Piute	39,540	392,320	487,751	39,540	391,365	
Rich	179,535	6,450		179,535	4,850	
Salt Lake	493,732	12,421,258	9,750,836	493,732	12,971,026	27,018,267
San Juan		24,100			16,475	
Sanpete	26,734	3,215		26,334	3,155	
Sevier	130,202	68,401		107,802	69,211	
Summit	365,717	1,020,692	3,424,530	284,936	1,069,161	6,051,177
Tooele	96,786	959,008	74,893	94,955	941,634	908,267
Uintah	850,214	107,222		850,814	110,651	
Utah	6,500	756,092	2,485,880	6,500	796,635	7,258,150
Wasatch	26,800	171,702	2,357,524	26,800	162,050	1,825,167
Washington		9,495			8,595	
Weber		260			260	
Totals	\$13,618,239	\$24,026,559	\$24,906,855	\$11,626,134	\$24,858,683	\$47,806,035
Total		\$62,551,653			\$84,290,852	

"(e) The actual cost of the transportation of the ore from the mine to the market or reduction works.

"(f) The actual cost of sampling, assaying, reducing and smelting the ore and extracting the metals and mineral therefrom.

"(g) The amount paid for state and local taxes during the year.

"(h) The amount paid for compensation insurance, or in lieu of such compensation insurance, for compensation of injured employees, and the compensation paid to dependents of killed employees, required to be paid under the Workmen's Compensation Laws of Utah.

"Money expended during any year except the calendar year for which the deduction is made shall not be included in the deductions to be made in arriving at net proceeds. The salaries, or any portion thereof, of corporate officers shall not be included as a deduction in arriving at the 'net proceeds' herein defined."

Three tables have been prepared from the biennial report of the State Board of Equalization and Assessment of Utah. Table I gives the mines' assessment for real estate (acreage), improvements and machinery, and the amount represented by three times the net proceeds. The tabulation gives a further segregation by counties and for the years 1923 and 1924. Table II gives a segregation of the assessment for the years 1923 and 1924 in the large groups of tax payers. Table III gives the mine assessments in three representative counties for the years 1923 and 1924. Fig. 1 shows the trend of taxes charged and the per-capita equivalent for the years 1916 to 1924, inclusive.

TAXATION ON NET PROCEEDS

The principle of valuation on the basis of the annual proceeds of a mine is sound and has the advantage of simple methods of determination. The conditions imposed for the determination of net proceeds in an individual case are fair, with the exception that depreciation, or provision for the retirement of capital invested in plant and equipment, is not allowed except for actual plant and machinery expenditures within the year. This valuation of plant and equipment as well as real estate appears to be static during the life of the

A valuation based upon three times the net proceeds and a full valuation of plant and equipment taxes the mine, which has a life of three years, at its full value throughout the interval. A mine which lasts only a year would be greatly *overvalued* and a mine having a life of over three years would be *undervalued*. A mine having a life of ten years would be undervalued during its first years and overvalued during its last years, assuming that continuity of net proceeds is maintained.

A mine having a life of two years or more would be taxed on its plant and equipment upon a valuation of double what it should be were depreciation allowed. However, capital expended for development is not taxed, and this compensates for the double valuation of plant. Apparently, development cost, under paragraphs (a), (c), and (d), is allowed as a direct deduction from gross income, so that there is thus a return of capital input for development.

Any other than the arbitrary uniform multiple basis for the valuation of net proceeds would have to be based upon multiples applying to individual mines. This would require that estimates on the life and probable output as well as probable metal prices be made. In effect it would amount to valuation upon a present worth

Table II Segregation of Total State Assessment
Assessments made by the State Board of Equalization

	1923	1924
Car companies	\$2,322,985	\$2,487,135
Express companies	254,302	253,795
Power companies	17,446,351	17,876,239
Railroad companies	94,440,637	95,720,691
Telegraph companies	1,280,978	1,313,213
Telephone companies	5,215,655	5,240,756
Mining companies	62,551,653	84,290,852
Water companies	281,522	281,362
Totals	\$183,794,083	\$207,463,522
Live stock	24,667,962	23,873,012
Improvements	125,414,977	129,551,130
Aggregate value lands, including mining claims	214,865,239	206,300,182
Personal property	97,968,214	98,264,082
Totals	\$646,710,475	\$665,451,928
Total taxes charged	18,068,574	18,182,062
Per cent of assessed valuation (average)	2.79	2.73
Bonded indebtedness		9,982,855.50
Per cent mining assessment to whole	9.67	12.66

basis. This method of valuation is objectionable chiefly because there exists no method of accurately predicting commodity, labor, and price indices. During stable industrial conditions these three indices do not change greatly, and averages are accurate enough to be used. The recent experience with the economic disturbances produced by the war shows the extreme difficulty of predicting financial outcome on the basis of annual

the last few years of the life of a property. Suggestions have been made that the multiple should be reduced in the last two years of the life of a property. However, the State Supreme Court has upheld the state in an action to effect such reductions. *Mine owners are opposed to any system which attempts to value the ore in the ground.* It is claimed that mines are overtaxed to an extent corresponding to the degree

Table III—Mine Assessments in Salt Lake, Juab and Summit Counties

	Salt Lake County		Juab County		Summit County	
	1923	1924	1923	1924	1923	1924
Real estate, improvements and machinery.....	\$12,914,990	\$13,464,758	\$755,574	\$694,571	\$1,386,411	\$1,354,097
Three times net proceeds.....	9,750,836	27,018,267	5,722,826	4,495,076	3,424,530	6,551,177
Total assessment.....	22,665,826	40,483,025	6,478,400	5,189,647	4,810,941	7,405,274
Net proceeds.....	3,250,278	9,006,089	1,907,609	1,498,359	1,141,510	2,017,059
Assumed levy, per cent.....	2.75	2.74	4.27	3.26	3.29	3.21
Calculated tax.....	\$625,211	\$1,109,233	\$276,632	\$169,183	\$157,280	\$237,709
Percentage of net proceeds.....	19.2	12.3	13.9	11.2	13.7	11.97
Ratio fixed to net proceeds.....	3.97	1.49	0.39	0.46	1.21	0.62
Ratio fixed to three times net proceeds.....	1.32	0.49	0.13	0.15	0.41	0.27

averages. Valuation of mineral in the ground or valuation of a mineral property on the basis of ore developed and ready for mining is therefore too speculative for taxation purposes.

The advantage of the net-proceeds valuation is that it determines a value each year that conforms with the prices realized from actual transactions. Thus, if the mine makes nothing, because of low metal prices, the net proceeds valuation becomes zero regardless of the multiple used. If satisfactory prices are obtained and profits made during the year, the valuation has a direct relation to the profit made. It is not based on contingencies nor upon speculative estimates of averages. The moot point is the multiple to be used. The lower multiple distinctly encourages the industry, while the higher multiples bear with severity upon the mines with heavy initial production that are seeking to become established and which need all the capital that can be obtained for exploration and development.

Another interesting point is that mines shipping all or part of their ore without milling have an advantage in that they have a minimum of capital locked up in plant and equipment. Mines that have milling or reduction plants have a maximum of capital invested. In the latter group the static or plant valuation entails a much greater tax than in the case of the mine not concentrating or reducing its ore. Thus, under market conditions resulting in no net proceeds for mines in either group, the mine with the largest capital investment would pay the largest tax. Diminished operating costs due either to large tonnage production, high recoveries, or improvements in metallurgy would increase net proceeds, and the state would share in these advantages. Likewise a period of high metal prices would automatically increase the state's share.

Within certain limits mine owners and operators are satisfied with the method of taxing net proceeds, but they feel that some concession should be made during

that other property is assessed below its full value. The claim is made that other property assessments are on the basis of 60 per cent actual value, which is said to indicate that mines are actually taxed upon a multiple of five. There is something to be said on both sides of this contention.

MINING ASSESSMENT COMPARED BY COUNTIES

The assessment on mining property was 9.67 per cent in 1923 and 12.66 per cent in 1924 of the total state assessment. In Table IV, I have tabulated the total assessments for four mining counties. The proportion of the mining to the total assessment for the four counties was 10.8 in 1923 and 16.6 per cent in 1924. In Juab and Summit counties for 1924, the mining assessment approximates one-third of the total assessment of these counties. Given a year of good metal prices it is evident that the foregoing percentages would be greatly increased.

Table III gives the ratio of the fixed assets to three times the net proceeds, and this brings out the important differences in some of the mining counties. Salt Lake County, where the mines maintain expensive plants, gives a ratio of 1.32 and 0.49 for 1923 and 1924 respectively, as compared with 0.13 and 0.15 for Juab County.

It is improbable that any pronounced change will be made in the methods of assessing the mining industry of Utah. The present situation is, however, better than that which exists in certain Western mining states. The only industry to be taxed on the basis of net proceeds, or income, is the mining industry. Would it not be a reasonable and fair principle to value all of the industries upon an impartial basis involving net returns and money invested in plant and facilities, with depreciation allowed for plant and machinery?

Bawdwin Produces Steadily

During June, 1925, 27,580 tons of ore, including 4,032 tons of high-grade ore, was produced from the Bawdwin mine of the Burma Corporation, and 19,100 tons was milled in the treatment plant, producing 8,029 tons of lead concentrate. Refinery products were 3,504 tons of refined lead and 383,264 oz. of refined silver, 56,793 oz. of the latter being recovered from the treatment of copper matte. The experimental zinc plant produced 1,200 tons of zinc concentrates, assaying 15.5 oz. of silver, 7 per cent lead, and 43.5 per cent zinc. In addition to the above, 718 tons of copper matte and 150 tons of antimonial lead were produced.

Table IV—Comparison of Mine and Total Assessments

	1923	1924
Juab County		
Total assessment.....	\$17,321,102	\$15,283,786
Total by State Board of Equalization.....	10,328,251	9,085,925
Total mines.....	6,478,400	5,189,647
Salt Lake County		
Total assessment.....	256,953,167	276,173,587
Total by State Board of Equalization.....	48,014,591	65,448,900
Total mines.....	22,665,826	40,483,025
Summit County		
Total assessment.....	16,090,811	19,200,288
Total by State Board of Equalization.....	9,909,938	12,933,880
Total mines.....	4,810,941	7,405,274
Utah County		
Total assessment.....	52,019,520	56,246,578
Total by State Board of Equalization.....	17,593,794	22,599,105
Total mines.....	3,248,472	8,061,285
Total for four counties		
Total assessment.....	342,384,600	366,904,239
Total for mines.....	37,203,639	61,139,231
Per cent of total assessment.....	10.8	16.6

Froth Flotation Explained by X-Ray*

By C. G. McLachlan

North Vancouver, B. C.

IN THE COURSE of an investigation to determine some of the controlling factors in flotation, experiments indicated that if floatable and non-floatable minerals were considered on a basis of their atomic

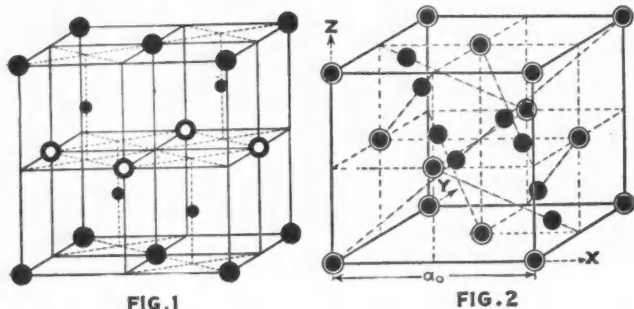


Fig. 1—The arrangement of the atoms in the unit crystal of chalcopyrite (CuFeS₂)

Large black circles represent copper atoms; ringed circles iron atoms; and small black circles sulphur atoms. (*Journal American Chemical Society*, Vol. 39, 1917, ii, p. 2518. Diagram by Burdick and Ellis)

Fig. 2—The unit cube of pyrite (FeS₂)

The iron atoms are represented by the ringed circles; the atoms of sulphur by the black ones. $a_0 = 5.38 \times 10^{-8}$ c.m. From Wyckoff's "Structure of Crystals" p. 297. The Chemical Catalog Co., 1924

structure, as revealed by X-ray analysis, it might be possible to explain why some minerals float and others do not. Accordingly, a search was made for information as to the structure of the sulphides, oxides, and carbonates, and space-lattice diagrams were obtained for minerals belonging to each of these classes, some of which have been reproduced here from the publications in which they originally appeared.

In Figs. 1, 2, 3, and 4 is shown the structure of chalcopyrite, pyrite, molybdenite, and sphalerite. Inspection of these diagrams reveals that the crystal faces of chalcopyrite and pyrite are composed of metal

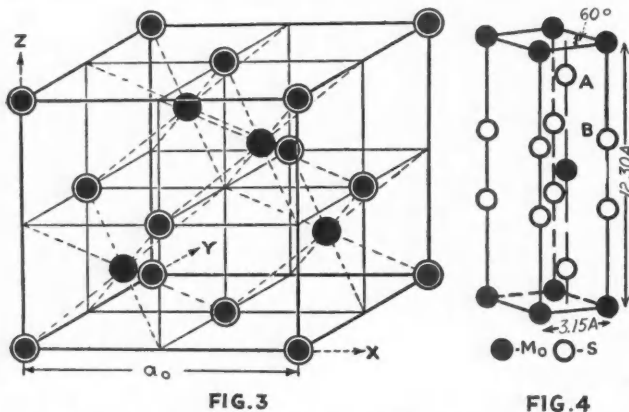


Fig. 3—The unit cube of sphalerite (ZnS)

Either the zinc or the sulphur atoms can be represented by the ringed circles. $a_0 = 5.40 \times 10^{-8}$ c.m. From Wyckoff's "Structure of Crystals," p. 292. The Chemical Catalog Co., 1924.

Fig. 4—The unit crystal of molybdenite (MoS₂)

The black circles represent molybdenum atoms. $A = 1.10^{-8}$ c.m. *Journal American Chemical Society*, Vol. 45, p. 1466, 1923. Diagram by Dickinson and Pauling

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atoms; those of molybdenite, of sulphur as well as metal atoms; while in the case of sphalerite the zinc and sulphur atoms are interchangeable.

The diagrams for the oxides of copper, zinc, and arsenic, reproduced in Figs. 5, 6, 7, and 8, show that apart from the fact that oxygen and not sulphur atoms are present in the crystal faces of these minerals, they are otherwise very similar in structure to either molybdenite or sphalerite.

In Fig. 9 is given the general atomic arrangement for crystallized minerals belonging to the calcite group, and it will be seen that here again oxygen is present in each crystal face. These diagrams therefore indicate that the chief difference which exists between floatable and non-floatable minerals lies in the fact that non-floatable minerals have oxygen present in their surfaces in place of sulphur. The problem then resolves itself into what is the particular difference

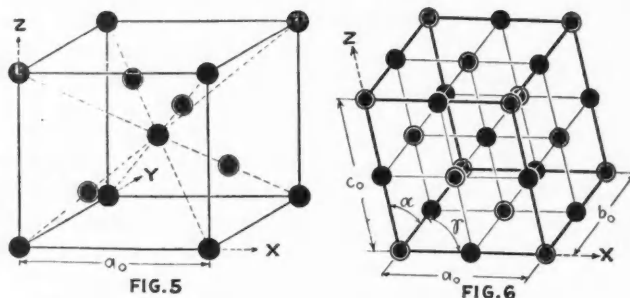


Fig. 5—The unit cube of cuprite (Cu₂O)

The copper atoms are represented by ringed circles and oxygen atoms by black circles. $a_0 = 4.32 \times 10^{-8}$. From Wyckoff's "Structure of Crystals," p. 266. The Chemical Catalog Co., 1924.

Fig. 6—The possible unit arrangement of cupric oxide (CuO)

The ringed circles represent either the copper or oxygen atoms. $a_0 = 3.74 \times 10^{-8}$ c.m. $b_0 = 4.67 \times 10^{-8}$ c.m. $c_0 = 4.67 \times 10^{-8}$ c.m. From Wyckoff's "Structure of Crystals," p. 269. The Chemical Catalog Co., 1924.

between oxygen and sulphur that is responsible for the variation exhibited in flotation by the oxides and sulphides.

If, however, it is remembered that pure metals float and that the space-lattice diagrams show that some sulphides also have surfaces composed of metal atoms, the question seems to hinge on the point as to what is the property that sulphur has in common with the metals which is responsible for the metals and sulphides being floatable. The property which suggests itself is that the sulphur and the metals have an affinity for oxygen, and therefore so will the surfaces which they form. On the other hand, a surface that already contains oxygen cannot be expected to possess this attraction for gaseous oxygen to anything like the same extent. An estimate of the energy involved by the affinity force mentioned may be judged from the fact that at 20 deg. C. one gram-molecule of silver has an affinity for oxygen equivalent to 2×10^{11} ergs.

It might be pointed out that this energy of chemical affinity is not necessarily used up while the mineral is being floated; otherwise it would be impossible to

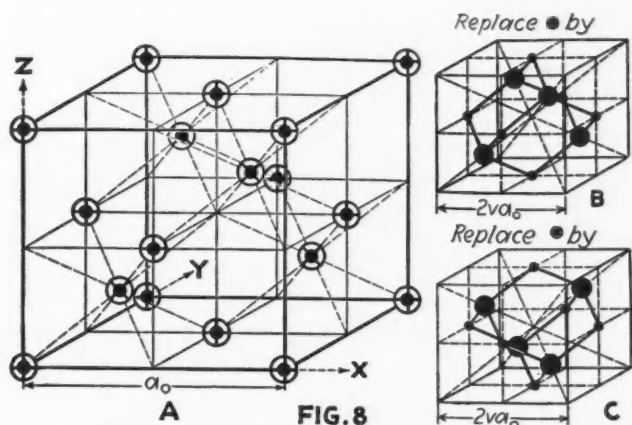


Fig. 8—The unit cube of the atomic arrangement of arsenious oxide (As_2O_3)

For the reconstruction of this atomic grouping the symbols + and X in A should be replaced by B and C; the centers of the symbols are to be taken coincident with the centers of the small cubes. Large black circles represent the arsenic atoms; the small circles are atoms of oxygen. $a_0 = 11.06 \times 10^{-8}$ c.m. From Wyckoff's "Structure of Crystals," p. 285. The Chemical Catalog Co., 1924.

refloat a mineral once floated without regrinding it and creating a fresh surface, but this energy may be considered as directly related to the attraction which exists between floatable minerals and gaseous oxygen, resulting in these minerals surrounding themselves with a gas film which prevents their being wetted by water, and facilitating their entrance into the bubble-liquid interface, where they become attached to the air bubbles.

The suggestion that certain minerals float because they have an affinity for oxygen was made by C. T. Durell,¹ in 1915. Mr. Durell stated that "chemical affinity assists sulphides in adsorbing oxygen or carbon dioxide," and this writer, and, also, Corliss & Perkins,² H. R. Adam,³ R. S. Dean,⁴ and Dean and White,⁵ all point to the necessity of floatable minerals being surrounded by a gas film which prevents their being wetted by water, but it is interesting to note how this fact is now substantiated by X-ray data.

I wish to acknowledge the assistance of the National

¹Min. & Sc. Press, Vol. 111, (1915) p. 430.

²Ibid., Vol. 114, (1917) p. 803.

³Ibid., Vol. 121, (1920) p. 765.

⁴Ibid., Vol. 122, (1921) p. 291.

⁵Ibid., Vol. 124, (1922) p. 410.

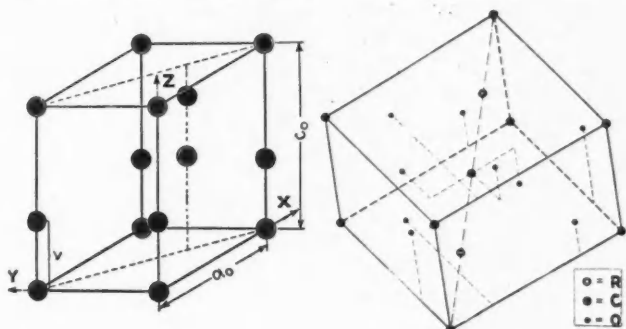


Fig. 7—The unit crystal of zinc oxide (ZnO)

The zinc atoms are represented by the ringed circles; the atoms of oxygen by full circles. $a_0 = 2.7 \times 10^{-8}$ c.m. $c_0 = 4.4 \times 10^{-8}$ c.m. the parameter v is about $\frac{1}{2}$. From Wyckoff's "Structure of Crystals," p. 276. The Chemical Catalog Co., 1924.

Fig. 9—The arrangement of the atoms in the unit of structure of members of the calcite group (RCO_3), American Journal of Science, Vol. 50, p. 317

Research Council of Canada for the award of a bursary in connection with the present work, and for granting permission to publish this abstract from my report.

Platinum in Southern Rhodesia

The existence of platinum in Southern Rhodesia has long been recognized, but it is only recently that serious attention has been given to the possibility of locating the metal in payable quantities, according to *The Statist*, London. The announcement therefore that platinum had been found in a lode formation on the Great Dyke near Makwiro has created considerable interest, and has led to a huge amount of pegging, claims, it is reported, having been marked out for 40 to 50 miles on either side of the Great Dyke. The mineralization appears to be somewhat erratic, but comparatively little serious development has yet taken place.

The London & Rhodesia Mining & Land Co. has secured options over ninety-six blocks of claims, extending over an area of nine miles on the western side of the Great Dyke between the Makwiro and Serui rivers. Samples are reported to have disclosed values ranging from mere traces to $3\frac{1}{2}$ dwt. As transport facilities are good, Makwiro being about 60 miles from Salisbury on the main railway line to Bulawayo, it should not be long before some definite information as to the possibilities of the discovery is available.

The Great Dyke is a belt of mineralization, four to five miles wide, extending from the Umvukwe Hills on the north to the Doro Hills, in the Belingwe district in the south. It is stated to be composed of norite, serpentine, and enstatite rocks, being therefore very similar in geological characteristics to the Bushveld complex at Lydenburg. The existence of platinum has also been reported at Umvukwe, where the Transvaal and Rhodesian group is working chrome and asbestos deposits. The metal has also been found in the serpentine of the Great Dyke near Lalapansi and in the ancient alluvials of the Somabula.

In addition to the discovery at the Great Dyke, a norite dyke has been located near Selukwe, running parallel with the Great Dyke, although up to the present it does not appear to have been prospected. At Wankie some years ago a small body of norite was found near Lukosi. Not far from the Lonely mine two basic intrusions were located in 1921. One of these was a norite body about five miles long and more than a mile wide. The second consisted of gabbro and more or less acid rock. It extended for some ten miles northward down the Umsobolongwe valley and across the Bubi river.

The enormous extent of the Great Dyke (which stretches for some 300 miles across country), and the lack of prospectors with knowledge of the ores containing platinum, accounts for the limited information so far available, but the present season is likely to extend one's knowledge of the mineral deposits of Southern Rhodesia materially.

Brazil's Manganese Output

Production of manganese in Brazil in May amounted to 27,302 long tons, in June to 31,499 tons. Stocks on hand July 1 were 71,196 tons. Exports of manganese ore during June came to 31,431 tons, of which 27,931 tons was shipped to the United States, the remainder going to Rotterdam.

The Petroleum Supply of Japan—III*

*Results of the Search for Oil in Chosen, Taiwan, Sakhalin, Manchuria
and British North Borneo—Conclusions—Bibliography*

By Arthur H. Redfield

U. S. Geological Survey, Washington, D. C.

IN SPITE OF THE ENCOURAGEMENT given by Clements' and White's estimates of reserves in "probable" and "possible" territory, both the Japanese Government and the Japanese oil industry have manifested either a profound disbelief in the possibilities of obtaining further petroleum production in Japan or a determination to conserve the petroleum resources of the islands for some time of national emergency. The relatively lower price of crude oil in the United States and the Dutch East Indies during the overproduction of 1922 and 1923 tended further to discourage drilling, which was becoming more expensive and less successful. Certainly the efforts of the Japanese leaders have been bent toward obtaining for Japan new sources of supply for crude petroleum. These efforts have included both the Japanese dependencies and foreign countries.

Chosen (Korea)

Chosen (Korea), largest of the Japanese dependencies, can add nothing to Japan's supply of crude petroleum. This peninsula, a little larger in area than the State of Idaho, is a block bounded by faults and composed of ancient crystalline and altered Paleozoic and Mesozoic rocks, with a little Tertiary, intruded by andesite and covered in places by basalt flows. Such rocks have nowhere been known to contain accumulations of oil or natural gas of commercial value.

Chosen's requirements of petroleum products are met entirely by importation. Before the World War, Chosen consumed annually about 203,000 bbl. of refined oils, greases, waxes, and bitumens. Since 1919 the colony consumes about 253,000 bbl. a year of petroleum products. The United States and the Dutch East Indies are the leading sources of supply; some refined oils and greases, however, are imported from Japan.

The table in the next column shows the amounts of petroleum products imported into Chosen from 1910 to 1923 inclusive.

Taiwan (Formosa)

The first of the Japanese domains to be tested by the drill was Taiwan (Formosa), where drilling has been carried on for a quarter of a century. At one time high hopes were held of the island and a field was reserved for the use of the Imperial Navy. On the whole, however, the output of Taiwan has been disappointing. It has satisfied neither the requirements of Japan's navy nor the demands of commerce. Instead of supplying Japan with petroleum, Taiwan imports petroleum products both from Japan and from foreign countries.

Taiwan represents in its outline an elongated oval, whose major axis, 202 miles long, trends north-northeast-south-southwest. It lies in about the latitude of

Refined Petroleum Products Imported Into Chosen, 1910-1923 (a)

In Barrels of 42 U. S. Gallons.

	Gasoline	Kerosene	Lubricating and Other Heavy Oils (b)	Fuel Oil	Paraffine Wax (c)	Total
1910	(d)	171,340	(d)	(d)	(d)	171,340
1911	(d)	188,478	(d)	(d)	(d)	193,866
1912	(d)	214,714	8,207	(d)	.....	222,921
1913	(d)	217,004	5,988	(d)	.....	222,992
1914	(d)	170,120	8,367	(d)	4,726	183,213
1915	(d)	192,910	7,118	(d)	2,572	202,600
1916	(d)	163,715	11,213	(d)	5,751	180,679
1917	(d)	157,629	11,087	(d)	4,290	173,006
1918	(d)	149,020	16,445	(d)	6,368	171,833
1919	(d)	238,563	18,926	(d)	7,032	264,521
1920	(d)	241,457	22,923	(d)	6,240	270,620
1921	(d)	159,456	18,378	(d)	2,776	180,610
1922	26,072	173,908	47,502	6,072	7,712	261,226
1923	25,334	228,790	23,024	7,595	3,595 (e)	288,338

(a) Returns of the Foreign Trade of Chosen.

(b) Converted from unit of weight (kin) at an assumed average specific gravity of 0.90.

(c) Converted from unit of weight (kin) at an assumed average specific gravity of 0.920.

(d) Not separately stated.

(e) Estimated.

the southern and central Bahamas. About two-thirds of its area is mountainous. In the west, however, lowland, 29 miles at its widest part, extends from latitude 24 deg. 30 min. to 22 deg. 30 min. N.

In the extreme north of the island between Kiirun and Tansui rises a volcanic group of numerous irregular mountains and peaks of Tertiary andesite, with its greatest height in Taitun-soa or Mount Daiton, 3,659 ft. above sea level. These are regarded as a continuation of the inner volcanic zone of the Ryukyu arc.

The backbone of Taiwan is formed by the rugged Niitaka range, which extends in a broad curve, concave to the east, from Cape Sansho in the northeast to Cape Garampi in the extreme south. This central range, whose highest peak, Mount Niitaka or Mount Morrison, reaches 14,362 ft. above sea level, is built of Pre-Cambrian crystalline schist, overlain by Paleozoic and Mesozoic slate and limestone.

East of the central range lies a narrow strip of mountainous country, presenting to the Pacific Ocean a precipitous cliff-wall with in many places a sheer descent of 3,000 to 7,000 ft. This eastern or Taito range consists of both Tertiary shale and andesitic rocks.

On the west the central range is paralleled by the Kali range, which extends 198 miles in length, and 17 to 19 miles in breadth, and attains in places an elevation of 9,270 ft. It is built of folded Tertiary beds, chiefly sandstone and shale.

West of the Kali range lies a single broad alluvial plain, covered by Quaternary sand and clay extending from north to south of the island. Beneath the Quaternary cover the structure of the Tertiary is unknown.

SEEPAGES LONG KNOWN

Petroleum seepages in the folded Tertiary of the Kali range have long been known, notably near Byoritsu, about 65 miles southwest of Taihoku; and near Ban-shoryo, 22 miles northeast of Takao and 19 miles south-east of Tainan. No attempt was made to develop these

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commercially, however, until the Japanese took control of the island. A little petroleum is now produced by the Nippon Oil Co. at Byoritsu, and by the Nippon company, for the Japanese Navy, in a small field owned by the government near Banshoryo. The area of the proved oil fields of Taiwan is placed at about 5 square miles.

The earliest recorded production of crude oil in Taiwan amounted to 34 bbl. in 1900. Production was fitful until 1904, when 789 bbl. was obtained, and rose to 7,445 bbl. in 1908. The yield dropped to 1,637 bbl. in 1911, but in 1913 it increased to 18,084 bbl. The peak of production occurred in 1916 when 19,950 bbl. was recorded. Since then, production declined steadily, until in 1921 only 9,263 bbl. was obtained.

In December, 1921, a gusher was struck in the Byoritsu field, which increased the average daily production from 710 to 2,450 gal. By dredging out existing oil wells and bringing in new gushers the production has been increased to 13,065 bbl. in 1922 and 15,912 bbl. in 1923.

New fields were developed in 1924 at Kinsui, in Shin-chiku Province, and at Cape Chikuto, in Tainan Province. Three wells at Chikuto are producing at depths of 1,800 to 3,000 ft. The petroleum found is reddish in color and rather low in gasoline content. Owing to the broken nature of the strata it is not known how long this field will produce.

At Kinsui a flow of approximately 300,000,000 cu.ft. of gas daily was struck. About 114 bbl. of gasoline may be extracted from 5,000,000 cu.ft. of gas.

The production of crude petroleum in Taiwan in 1924 is placed at 23,285 bbl. and the daily output at the beginning of 1925 at 63 to 68 bbl. Increased production was obtained by cleaning out and deepening wells that had been previously shut down.

WELLS SHORT-LIVED

The wells in Taiwan are small producers and comparatively short-lived. The faulting and tilting of the strata, and the active earth movements which are still going on, have prevented a steady flow of oil.

The only refinery in Taiwan, operated by the Nippon Oil Co. at Byoritsu, has a capacity of a little over 600 bbl. a month. Its entire output is consumed within the island. No statistics of its output are published; according to Coumbe it furnishes about a third of a million gallons (8,000 bbl.) of kerosene and gasoline annually.

Of the 40,000 gal. a month which the northern or Byoritsu field produces, about 63 per cent is refined.

The consumption of refined oils, greases, and waxes in Taiwan is supplied chiefly by importation. Before the World War, the island imported 77,000 bbl. annually, chiefly from the United States, the Dutch East Indies, and Japan. During the war period, imports dropped to 40,305 bbl. in 1916. Since 1919, however, 78,000 bbl. has been imported annually.

The chief petroleum product consumed in Taiwan is kerosene, of which 3,500,000 to 4,000,000 gal. is imported annually, or about 1 gal. for each of the 3,600,000 inhabitants. About half of this amount is imported from the United States and the remainder from the Dutch East Indies and Japan. When the hydro-electric plant now under construction at Lake Candidius is completed, it is expected that more electricity and less kerosene will be used for lighting all over the island.

About 370,000 gal. a year of lubricating oils are imported, chiefly from Japan. The government-owned railroads are the chief consumers.

Karafuto (Japanese Sakhalin)

The island of Sakhalin was long neglected by the Japanese. So little interest was taken in the territory that it was not until 1809 that Japanese explorers discovered that Sakhalin was an island and not a peninsula. The northern portion was occupied by Russia in 1857. The southern came under the control of the Japanese.

In 1875 Japan ceded the southern portion of the island to Russia. By the treaty of Portsmouth, however, which concluded in 1904 the Russo-Japanese War, the portion of Sakhalin south of latitude 50 deg. N. was returned to Japan. This constitutes today the colony of Karafuto.

Structurally, the elongated island of Sakhalin belongs to the main or Honshu arc of the Japanese Islands. In general,

it is considered to be the true northward continuation of the structure of Honshu and Hokushu. Its mountains have the same north-south trend, and are composed of similar rocks.

The island of Sakhalin consists in the southern or Japanese portion of three parallel mountain ranges separated by longitudinal valleys trending north and south. The first or eastern range, formed of Paleozoic slate intruded by later igneous rocks, begins at Cape Aniva (Cape Shiritoko) and is cut off from its neigh-

“THE WORLD MAY WELL AWAIT with interest the outcome of Japan’s ventures into northern Sakhalin for crude petroleum and into Manchuria for oil shale. Of all the fields outside Japan proper in which Japan has endeavored to find oil, these are the most promising and the most practical. . . . There appears to be every likelihood that northern Sakhalin contains oil. There are numerous seepages of oil and paraffin; the stratigraphy is favorable; and the structure is not unpromising. What is more, the Hoku-shin-kai has already obtained production from eight wells scattered over five different areas. How much oil is present, only time and drilling can determine.”

Refined Petroleum Products Imported Into Taiwan (Formosa) in 1910-1923 (a)

In Barrels of 42 U. S. Gallons

	Gasoline	Kerosene	Lubricating and Other Heavy Oils (b)	Paraffine Wax (c)	Total
1910	(d)	68,474	1,126	1,026	70,626
1911	(d)	71,383	237	2,038	73,648
1912	(d)	78,708	310	1,225	80,243
1913	(d)	80,353	826	2,712	83,891
1914	(d)	62,343	965	2,234	65,542
1915	(d)	41,700	294	2,092	44,086
1916	(d)	38,359	299	1,647	40,305
1917	(d)	39,313	978	1,044	41,335
1918	(d)	42,733	3,563	947	47,243
1919	(d)	60,948	1,871	1,259	64,078
1920	(d)	57,219	2,642	1,498	61,359
1921	2,048	89,883	6,598	1,835	100,314
1922	1,667	60,351	2,406	1,223	65,647
1923	2,286	90,335	2,481	2,365	97,467

(a) Returns of the Foreign Trade of Taiwan.

(b) Converted from unit of weight (kin) at an assumed average specific gravity of 0.900.

(c) Converted from unit of weight (kin) at an assumed average specific gravity of 0.920.

(d) Not separately stated.

bor by Morvin Bay. The second or central range, trending likewise north and south, and known as the Soya-Susanaya range, extends from Aniva Bay for about 53 miles to the coast. It also is built of Paleozoic slate intruded by igneous rocks of unknown age. The third range, known as the Great Sakhalin Range, begins at Cape Crillon (Cape Noroto) and extends up to west coast beyond latitude 51 deg. N. It is composed of steeply dipping and even overfolded Cretaceous beds flanked on both sides by closely folded Tertiary, intruded in places by late igneous rocks. The valleys which separate the longitudinal ranges are underlain by Tertiary and Quaternary sedimentary beds.

As the two eastern ranges are short, the Great Sakhalin Range forms for about 130 miles the bulk of the narrow island. From about latitude 49 deg. N. onwards, a second range, the Tym Mountains, built of Paleozoic slate trending north-northwest-south-southeast, joins the Great Sakhalin Range, converging toward it. Between these ranges lies the valley of River Tym, a structural basin filled with Tertiary (?) sedimentary strata.

Few indications of petroleum in Japanese Sakhalin are reported, and these reports have not been authenticated. In 1918 five petroleum districts in Karafuto, with a total area of 4,998,400 tsubo (4,083 acres), were opened for prospecting. These are all situated in a coastal strip 70 miles long on the west of the island near Agyu, which is situated a little north of 47 deg. north latitude. No record of any prospecting or of its results has been published.

In general, the Tertiary rocks of Japanese Sakhalin are too closely folded to present much prospect of containing commercial quantities of oil. The older rocks are even more disturbed, and offer practically no possibilities of oil or gas.

Russian Sakhalin

Far better prospects for producing petroleum lie in Russian Sakhalin than in any of the Japanese colonies. By a seeming irony of fate, the 50th parallel of latitude, which was chosen arbitrarily by the Treaty of Portsmouth as the boundary between the Russian and Japanese portions of Sakhalin, marks approximately the boundary between the prospective oil lands and the probable barren lands, as well as between the deposits of low-grade coal and the high-grade coal of Sakhalin. As regards mineral fuels, Japan received the poorer half of the island.

North of latitude 51 deg. N. the Cretaceous of the Great Sakhalin Range dips under the Tertiary; and north of latitude 51 deg. 30 min. the Paleozoic schist of the Tym Range gives way to Tertiary rocks, and the country assumes more and more the appearance of a broad, irregular plateau, of which the highest part, Engis-pal (2,000 ft.), is the corner of a broad ridge, not a true chain. This uneven plateau first takes the place of the Great Sakhalin Range in the west and then that of the Tym Range in the east, so that in the north it alone occupies the full breadth of the island.

Farther north the whole west end of the hilly country, dominated by Engis-pal, is covered exclusively, as far as the tundra permits observations, by a sandstone, probably post-Pliocene, which extends from the west to the east coast.

The Tertiary beds are fairly uniform in character, representing the deposits of a shallow sea. In the

lower beds shale and clay, sandstone, and conglomerate predominate. The middle division is composed chiefly of clayey sandstone. The upper beds consist principally of loose sand and clay.

The Tertiary of Sakhalin has not been definitely subdivided into epochs, because of the lack of determinative fossils. As the Tertiary rests locally in apparent conformity upon the Cretaceous, the Eocene is probably represented. The Oligocene is apparently absent. Most of the known outcrops of Tertiary sediments belong to the Miocene or the Pliocene.

Of the Upper Tertiary sediments the Miocene are especially widespread. Three main areas of the Miocene occur, the eastern ridge of hills, the western ridge, and Schmidt Peninsula. The Miocene series consists in its lower stages of sandstone and lignite seams interbedded with clays and sands, and in its upper stages of sand and sandstone.

The Pliocene, exposed in the ridge of hills which parallel the eastern coast, consists of sandstone beds of varying hardness and of varying thickness, and clays.

The Tertiary rocks of Sakhalin, including the Pliocene, are intensely folded. Near the coast of northeastern Sakhalin they dip 40 deg. to the east, and west of the oil seeps they dip 60 to 70 deg. to the east. Polevoi assumes that there is an anticline, overturned toward the west, of which the top has been eroded off. At least two interruptions to deposition appear to have occurred in the Tertiary period. Faulting also had an important part in achieving the present structure of Tertiary.

The post-Pliocene deposits are not folded, but there is evidence of several oscillations of the coast during the period.

PETROLEUM SEEPAGES ON EASTERN COAST

Seepages of oil occur on the eastern coast, where the streams cut across the coastal ridge, issuing from sand or sandstone or even conglomerate. Clay is met in only a few places. These beds were formerly considered to be Miocene, but fossils found by Polevoi show them to be Pliocene. Other productive strata will be found, in the opinion of Polevoi, to lie below the present known outcrops in the Miocene.

Such testing as has been done shows the presence of eight or nine productive oil sands ranging in depth from 45 to 930 ft. below the surface. Behaghel divides the sands into two groups, of which the upper group occurs at an average depth of 500 ft. and the lower group at an average depth of 700 ft.

The belt of possible oil territory extends 185 miles along the east coast from Okha Creek, in the north, to Chakre, in the south. The belt is 6 to 12 miles wide and extends roughly parallel to the coast. Seepages of petroleum and lakes and pools of paraffin occur in three chief districts in the northeast of the island—namely, those of Urkt, Nyi-Nabil, and Chaivo. The principal fields are those of Okha, Nogligk, Nabil, Nutovo, and Boatasyan.

The Urkt oil district lies in that part of northern Sakhalin which at Cape Golovachev visibly narrows until it reaches its minimum width to the northeast of the Gulf of Baikal. The oil indications are found 16 miles from the village of Pomor, at the eastern slope of the central watershed, which here attains an elevation of 1,000 ft. above sea level.

The Nyi-Nabil oil district in the south comprises the seepages and outcrops along the streams that flow into Nyi Bay and Nabil Bay and the coast between. Chief of these streams are the Nogligk, Imtchin, Viglenut, Katangli, and Vini.

The Chaivo district lies between the Urkt and the Nyi-Nabil districts. The petroliferous area of this district is in the upper parts of Rivers Nutovo and Boat-asyn which flow into Chaivo Bay, which empties into the Okhotsk Sea through Kleye Strait.

SEEPAGES ON WEST COAST NEAR ENGIS-PAL

Indications pointing to the possible presence of petroleum occur also on the west coast of Russian Sakhalin, near Engis-pal. Seepages of oil and deposits of "kir" (oxidized or inspissated petroleum) are reported on the west coast of Sakhalin along Langeri Brook, which flows in the Amur estuary opposite the Amur River.

The crude oils from north-eastern Sakhalin range in density from 18.4 to 28.8 deg. A.P.I. (specific gravity, 0.944 to 0.911), and yield little gasoline. Most of the analyses of Sakhalin oil that have been published have been of oil from surface seepages, which have naturally undergone considerable alteration from their original condition through evaporation and oxidation. A fresh sample of brownish-green oil, with a density of 24.2 deg. A.P.I. (specific gravity 0.909) from the sands of Nutovo River, by Polevoi, gave on analysis the fractions in the table below:

Indications of petroleum in the northern or Russian portion of Sakhalin have long been known. They were first reported in 1870 by a merchant of Nicolaievsk who had visited the island. Interest in the possible deposits was dampened, however, by the remoteness of the island from the centers of civilization and by its use as a penal colony. In 1901 an imperial decree closed the mineral resources of the island to prospecting or development by private individuals or firms. During the Russo-Japanese War the use of the island as a penal colony was discontinued. The loss of the southern part of the island to the Japanese in 1904, as a result of the war, stimulated interest in the mineral resources of the northern part which remained to Russia.

In the decade following the Russo-Japanese War, Russian Sakhalin was prospected more thoroughly by Russian and English geologists; concessions were granted; and efforts to develop the concessions were made by English, Russian, and Chinese capitalists. The outbreak of the World War in 1914 put a stop to

Analysis of Crude Petroleum From Nutovo River.

Fractions	Per Cent
Up to 150 deg. C.	0.3
150 to 285 deg. C.	37.2
Above 285 deg. C.	62.5

100.0

The quantity of paraffine in the residue was 0.01 per cent.

these activities. When the Soviet Government came into power in 1917, and absorbed the Far Eastern Republic on Nov. 14, 1922, the oil deposits were declared nationalized and the existing concessions voided.

In 1920 Japan came into actual if not legal possession of northern Sakhalin. As a result of a massacre of Japanese subjects at Nikolaievsk, Siberia, Japanese troops occupied northern Sakhalin; and the Japanese Foreign Office announced that they would remain in possession of the area until the Soviet Government should make due amends.

HOKU-SHIN-KAI ORGANIZED

In the meanwhile the Japanese moved energetically to develop the possible petroleum resources of the territory. Northern Sakhalin was quickly and thoroughly prospected by 600 to 700 Japanese engineers.

In 1921 a syndicate known as the Hoku-shin-kai (North Star Co.) was organized with a nominal capital of 5,000,000 yen (\$2,500,000), of which one-fourth was paid in. Of the total stock, 27,000 shares were allotted to the Kuhara Mining Co.; 25,000 shares to the Nippon Oil Co.; 15,000 shares to Okura & Co.; 5,000 shares to the Mitsui Bussan Kaisha; 20,000 shares to the Mitsubishi Mining Co.; 5,000 shares to Suzuki Shoten; and 8,000 shares each to a few individual capitalists. Its purpose was to exploit the oil fields of northern Sakhalin for the Japanese Navy. An undivided half-interest in the mining rights of the Stakheef company, holder of a former Russian concession, had previously been obtained by the new entrant in the field.

For its exploratory work the navy granted the Hoku-shin-kai a subsidy of 600,000 yen (\$299,100) in 1920; 1,400,000 yen (\$697,900) in 1921; and 1,500,000 yen (\$747,750) in 1922.

SINCLAIR GETS CONCESSION

In the meanwhile American interests had been active. In 1922 a concession was granted by the Far Eastern Republic to the Sinclair Consolidated Oil Corporation, of New York, by the terms of which the Sinclair company obtained exploration rights in northern Sakhalin for a period of five years. During the first year the concession was to cover all northern Sakhalin; each year thereafter the area covered was to decrease in size, until at the end of the fifth year it was to be limited to 1,000 square versts.

In January, 1923, a concession to the Sinclair company was approved by the Council of People's Commissars at Moscow. This granted to the Sinclair company the right to produce oil, natural gas, and bitumen for a period of thirty-six years, from an area not to exceed 1,000 square versts.

The company agreed to construct for the Soviet Government two sites for ports on the east coast of Russian Sakhalin; to spend 400,000 gold rubles (\$205,600)

"THE BED OF SHALE, 2,500 to 4,000 ft. thick, extends over the entire area of the Fushun coal field. The total reserves of oil shale are placed at 5,500,000,000 short tons, containing an average of 5.5 per cent of available oil, or 300,000,000 short tons (1,100,000,000 bbl.) altogether. On the basis of this calculation the Fushun reserves of shale oil should be sufficient to supply Japan with 6,000,000 bbl. of oil a year for 300 years. The oil shale is not especially rich. It yields (as stated) on an average 5.5 per cent of crude oil, or about 14½ U. S. gallons to the ton. The shale worked in Scotland yields about 10 per cent of crude oil or 25 gal. to the ton. The Esthonian oil shale gives well over 20 per cent, or 50 gal. per ton. On the other hand, at Autun, in France, shale yielding 7.5 to 8 per cent of crude oil, or 20 to 22 gal. a ton, is being worked on a small scale."

on the property within the first five years; to pay to the Soviet Government a royalty of 5 per cent on the sale of all products of the territory, or, if none are sold, a minimum of 100,000 gold rubles (\$51,400) yearly; to pay in addition to rent a tax per pood according to a fixed scale; and to pay a tax, equal to 30 per cent of the pood tax, for the benefit of local institutions.

The contract was subject to termination by the Soviet Government if the United States Government should adopt any measures hostile to the Soviet Government or should fail to accord formal diplomatic recognition to the Soviet Government.

In September, 1923, the Hoku-shin-kai was reported to be pushing its development work under military protection. Oil of high quality was said to be produced from two gushers, one on Boatasyn Creek and one in the Chaivo region.

In 1924, a 600-bbl. well yielding oil of a density of 20 deg. A.P.I. was struck at a depth of 400 ft. At this time there were altogether eight producing wells out of thirty-one drilled. Four of these were at Okha Creek; the others were on Nutovo Creek, Chaivo Creek, near Nuivo Bay, and on the shore of Lake Katangli. For storage there were four steel tanks and three earthen reservoirs. No oil has been shipped out yet.

JAPAN AND SOVIET AGREE

Early in 1925 an agreement was reached between the Japanese and Soviet governments, whereby the Japanese agreed to withdraw their troops in exchange for certain oil rights in the region. By the terms of the agreement Japan is to receive concessions to exploit 50 per cent of the oil-bearing territory of northern Sakhalin. The oil lands are to be divided into squares, and 50 per cent of these squares which are already being worked by the Japanese will be granted to Japan. In any concessions granted by the Soviet Government covering the remaining squares, Japan will have equal rights with other nations.

For a period of from five to ten years the Soviet Government will allow Japan to explore for oil on the east coast of northern Sakhalin over a territory of 1,000 square versts, and 50 per cent of the oil lands discovered will be granted to the Japanese in the form of concessions. The royalties payable each year will be from 5 to 15 per cent of the oil obtained, but in the case of gushers the percentage will be increased to 45 per cent.

According to reports, it is planned to reorganize the Hoku-shin-kai into a semi-governmental oil company in conformity with the Russo-Japanese treaty. The new company will have a new name, but will have the same principal shareholders.

Manchuria

Manchuria, though politically a part of China, is dominated economically by the Japanese. The chief factor in the commercial control of Manchuria is the Japanese-owned South Manchuria railway, which extending from Port Arthur up the valley of Liao River to Harbin, where it connects with the Siberian railway, is the sole means to transporting the staple products of Manchuria, soya beans, millet wheat, and rice, to the outside world. To this is added the financial control secured by Japanese banks in the chief cities and Japanese capital invested in the few industrial enterprises of the country.

Geographically, Manchuria consists of a broad plain,

or, rather, valley, opening to the southwest in the Gulf of Liaotung, between two mountain systems trending northeast-southwest, the Khingan system on the northwest and the Changpai system on the southeast. These ranges have peaks which rise as a rule from 3,000 to 6,000 ft. above sea level, and a few reach a height of 8,000 ft.

The Khingan Mountains, in the northwest, are in reality the steep escarpment of the Mongolian Plateau, broken off, according to Richthofen, by faulting against the low plains of Manchuria. The displacement of the fault amounts in places to 2,000 ft., and is quite abrupt. Bailey Willis, however, explains the abrupt descent from mountains to plain by down-warping. The mountains are formed of a complex of ancient crystalline schist and gneiss, folded Paleozoic and Mesozoic strata, and igneous rocks of more than one age.

The plain of Manchuria is a great down-faulted, or down-warped, basin filled with Quaternary alluvium and loess which effectively mark the nature and structure of the underlying rocks.

On the north the plain of Manchuria is bounded by the Little Khingan, an east-west range constituted by gneiss, granite, and Paleozoic rocks, with flows of basalt.

The southeastern or Changpai system consists of a series of ranges, trending northeast-southwest, which rise to 2,000 ft. on the side toward the plain and to more than 6,600 ft. on the side toward the sea. On the northeast they are attached to the Sikhota-alin Mountains of eastern Siberia; on the southwest they extend in the Liaotung Peninsula. These mountains are built of a basement of highly folded Pre-Cambrian crystalline rocks, overlain by moderately disturbed Cambro-Ordovician slate, sandstone, and limestone and by Carboniferous limestone and coal measures, all intruded by later porphyry and covered in places by flows of Mesozoic basalt. The Cenozoic is represented only by a few lake basins of Tertiary faulted down into older rocks, by Quaternary alluvial deposits in the river valleys.

The Changpai system is bounded on the northwest by a fault which may be traced from the Peninsula of Liaotung northeastward even beyond Kirin. Along this fault eruptive manifestations are numerous; the route from Kirin to Mukden follows the border of a basaltic plateau. On the southeast it is likewise bounded by a fault which extends along the boundary of Manchuria and of Chosen in the valleys of the Yalu and of the Tumen. On the border of this fault also volcanoes, such as Mount Pei-shan, are supposed to have risen.

OIL SHALE IN ABUNDANCE

In the last few years the Japanese navy has devoted much interest to deposits of oil shale in the Tertiary basins of the southeastern mountain system, especially in the Fushun coal field about 25 miles east of Mukden. The Fushun basin forms a narrow belt in the valley of Hun River about 20 miles long and 1.5 miles wide. The Tertiary beds dip at angles of 25 to 30 deg. to the north. They are probably faulted down on the north against the older rocks. The basin is divided into two parts by a central highland in which the beds have been contorted and bent almost at right angles. Faults are numerous, but not large enough to interfere seriously with mining the coal.

The Tertiary beds of Miocene age may be divided into an upper and a lower division. The lower division

consists of tufaceous sandstone, conglomerate, and shale, with two interbedded coal seams, all intruded by and interbedded with basalt, which has altered the shale and the coal. The upper division is composed of a thick seam of bituminous coal overlain by 2,500 to 4,000 ft. of brownish-gray shale which contains 4 to 10 per cent of oil. The average oil content of the Fushun shale, however, is 7 or 8 per cent. By the dry-distillation process a recovery of 5.5 per cent is expected.

The bed of oil shale, 2,500 to 4,000 ft. thick, extends over the entire area of the coal field. The total reserves¹ of oil shale are placed at 5,500,000,000 short tons, containing an average of 5.5 per cent of available oil, or 300,000,000 short tons (1,100,000,000 bbl.) altogether. On the basis of this calculation the Fushun reserves of shale oil should be sufficient to supply Japan with 6,000,000 bbl. of oil a year for 300 years. The reserves available at various depths are shown in the first table following.

According to an unnamed export,² the total amount of shale available in the open-cut mining zone is 520,000,000 short tons. If 500,000,000 short tons of shale, with an average yield of 5.5 per cent of oil, is mined, the total crude oil production will be 27,500,000 short tons (174,157,500 bbl.). In twenty-five years' time the area could supply over 1,000,000 short tons (6,333,000 bbl.)

	Tons
Down to 100 ft. below surface	252,000,000
Down to 200 ft. below surface	505,000,000
Down to 300 ft. below surface	756,000,000
Down to 500 ft. below surface	1,223,000,000
Down to 1,000 ft. below surface	2,330,000,000
Down to 2,000 ft. below surface	3,415,000,000
Down to 3,000 ft. below surface	4,932,000,000
Down to 4,500 ft. below surface	5,477,000,000

annually, which is more than treble the present production of Japan.

The yield of refined products per short ton of shale containing 8 per cent of recoverable crude oil is as follows:

	U. S. Gallons
Gasoline	1.84
Fuel oil	5.06
Gas and lighting oil	6.70
Lubricating oil	1.85
Pounds	
Paraffin wax	0.20
Sulphate of ammonia	0.40

The expense of treatment of a ton of shale is estimated as follows:

	Yen	\$
Dry distillation costs	1.42	\$0.71
Oil extracting costs	1.83	.91
Manufacture of sulphate of ammonia .....	.89	.44
Disposal of residue shale .....	.40	.20
	4.54	2.26

The value of the products obtained is placed at 6.246 yen (\$3.11), showing a profit of 1.706 yen (\$0.85) per ton of shale treated. A net profit of 13 per cent on the entire investment is figured. These calculations are based on the returns shown by the Scottish test.

Tests of a shipment of 500 tons of Fushun shale conducted in Scotland in December, 1923, however, showed

that the oil content was about 10 per cent lower than originally estimated. The amount of ammonium sulphate also did not come up to expectations. This has been ascribed, however, to air-slacking on the long voyage, with the consequent absorption of moisture, generation of heat, and loss of volatile matter. The average yield of oil was 12.21 gal. per ton and of ammonium sulphate was 50.58 lb.

However, as the editor of *Oil News*, London, points out in a footnote³, no test of the shale on a commercial scale has so far been made. Moreover, no discussion has been made of the question of sulphur compounds, which occur so frequently and give so much trouble in oil-shale refining.

The Fushun deposit has several distinct advantages for working. It occurs in a thick stratum at accessible depths below the surface. An abundance of cheap labor is available at low wages. An abundance of coal for fuel is available from the underlying seam. Plenty of water for industrial uses is at hand.

The oil shale rests immediately upon a thick bed of fair coal of which over 5,000,000 tons is mined annually. As the overburden of shale has to be stripped off and carted away to obtain the

coal, the cost of extracting the shale must be borne in good part by the coal.

In the last analysis the mining of the oil shale and the extraction and refining of the crude oil need not be commercially profitable. Viewing it as a feature of national defense, the Japanese Government may be expected to subsidize liberally an industry which will supply the needed fuel for the navy.

A concession was obtained from the Chinese Government in 1924 to work the shale. The South Manchurian Ry. Co. appropriated 7,000,000 yen (\$3,489,500) during the fiscal year 1924, for constructing a dry-distillation and oil-extracting plant on the Scottish system, capable of handling 700,000 short tons of shale annually. The navy expects the plant to turn out 50,000 short tons of shale oil each year and has proposed to take the entire output at a price which will guarantee the railway company against loss.

British Borneo

The attention of the Japanese petroleum industry was turned also to the British possessions in northern Borneo. The geology and oil possibilities of British Borneo have elsewhere been summarized by Redfield. The mountain chain which forms the backbone of the island and the boundary between the British and the Dutch possessions is composed of crystalline rocks and of Paleozoic sandstone, quartzite, slate, and limestone. This is flanked on the northwest by a belt of folded Tertiary beds of varying width, bordered in turn by a hem of Quaternary alluvium along the coast.

At Miri, in Sarawak, the Anglo-Saxon Petroleum Co., a Royal Dutch subsidiary, is producing oil from a Miocene sandstone on the western limb of an asymmetric anticline trending northeast-southwest. The

¹ *Far Eastern Review*, Vol. 20, No. 4, Shanghai, April, 1924.
² *Journal of the Japanese Chamber of Commerce*, Dairen, March, 1924.

³ *Oil News*, Vol. 16, No. 611, p. 177, London, Aug. 16, 1924.

“THOSE WHO WOULD UNDERTAKE the commercial development of the Sakhalin oil fields must reckon with a number of difficulties. Roads are practically non-existent. Prospecting is hindered by the thick vegetation and the swampy tundras. The climate is severe. The island is relatively remote from the world's industrial centers. The only settlements are a few small villages of Gilyak fisheries and hunters and Orotskin deer hunters, and labor, both skilled and unskilled, would have to be brought in from the outside.”

production has risen from 141,000 bbl. in 1913 to 3,940,000 bbl. in 1923 and an estimated yield of 4,500,000 bbl. in 1924.

Practically all the remaining possible oil land in British Borneo has been held by British interests. In British North Borneo the British-Borneo Petroleum Syndicate, Ltd., successor to the British Borneo and Burma Syndicate, Ltd., holds a concession until July, 1925, to exploit the whole of British North Borneo and a 999-year lease to 440 square miles on the Klias Peninsula and to Mangalum Island, off the coast, at a nominal rent, and free of royalty or export duty on products.

In Brunei the syndicate holds thirteen mining leases and a government prospecting license covering over 150 square miles, adjacent to the Miri field in Sarawak.

An arrangement was made in 1912 between the syndicate and the Nederlandsche Koloniale Maatschappij, a subsidiary of the Standard Oil Co. of New Jersey, under which the Koloniale Maatschappij was to prospect the entire colony of British North Borneo and develop the Klias Peninsula. The Koloniale company accordingly drilled four wells on the Klias Peninsula. Shows of oil and gas were met in Nos. 1 and 2, but these wells were abandoned at depths of 1,500 and 1,280 ft. respectively. According to a profile drawn by Schmidt, the wells were drilled in a closed syncline. Well No. 4 struck oil at 2,303 ft. and produced at the rate of 1,200 gal. of light oil a day, but the well was capped. After the conclusion of the agreement with the Nederlandsche Koloniale Maatschappij, the D'Arcy Exploration Co. took over the greater part of the lease, but so far has not attempted drilling.

A concession to 10 square miles on the Klias Peninsula was leased to the Kuhara Mining Co. of Tokyo. This company was reported late in 1923 to be prospecting the peninsula. No further details of its activities are known.

Conclusions

The world may well await with interest the outcome of Japan's ventures into northern Sakhalin for crude petroleum and into Manchuria for oil shale. Of all the fields outside Japan proper in which Japan has endeavored to find oil, these are the most promising and the most practical.

Geographically, northern Sakhalin belongs rather to Japan than to Russia or even Siberia. Structurally, it is a northward continuation of the Honshu arc of the Japanese Islands. The boundary between the Japanese and Russian portions of the island is purely arbitrary. From a commercial standpoint northeastern Sakhalin is no farther from Yokohama than it is from Vladivostok. It is much nearer to Tokyo than to Moscow.

The recent agreement between Japan and the Soviet Government seems to recognize these facts. Politically, the Soviet Government retains control; the Japanese troops are to be withdrawn. The development of the oil fields is entrusted to the Japanese, subject to the payment of certain royalties. Each nation seems to

have got what it most wanted. Japan received the oil, if it is present in satisfying quantities. Russia receives a steady income from an oil field too distant to develop or to defend conveniently.

There appears to be every likelihood that northern Sakhalin contains oil. There are numerous seepages of oil and paraffin; the stratigraphy is favorable, and the structure is not unpromising. What is more, the Hoku-shin-kai has already obtained production from eight wells scattered over five different areas. How much oil is present, only time and drilling can determine.

The oil fields of Sakhalin would appear, on the basis of our present knowledge, to be fairly extensive. They have the further advantage of being situated practically on the coast. The east coast, however, generally lacks good harbors and safe anchorage. It is believed that Kleye Inlet could be dredged to accommodate fair-sized steamers. The harbors are closed by ice from November or December to April or May, and in the open season are subject to frequent and heavy fogs.

Oil, if found, could be piped without great difficulty to the west coast, where better anchorages occur. To lay a railroad to Otomari, the nearest port in Karafuto, would be difficult, slow, and expensive.

DIFFICULTIES IN WAY OF DEVELOPMENT

Those who would undertake the commercial development of the Sakhalin oil fields must reckon, however, with a number of difficulties. Roads are practically non-existent. Prospecting is hindered by the thick vegetation and the swampy tundras. The climate is severe. The island is relatively remote from the world's industrial centers. The only settlements are a few small villages of Gilyak fisheries and hunters and Orotskin deer hunters, and labor, both skilled and unskilled, would have to be brought in from the outside.

The question of legal title is by no means settled. The Sinclair concession was declared cancelled by the Soviet Government on the ground of the company's failure to make the necessary explorations within the allotted time. The refusal of the Japanese military authorities to allow the landing of drilling material, as claimed by the Sinclair company, was not considered a valid excuse for failure to comply with the terms of the concession. The Sinclair company does not accept the annulment of the concession and has refused to receive back the money deposited by the company as a guaranty for carrying out the work.

In a letter to the *Petroleum Times** of London, dated Feb. 9, 1923, the Second Sakhalin Syndicate, Ltd., reasserted the validity of its concession, granted in 1909 by the Imperial Russian Government, but annulled by the Soviet Government, claimed the support of the British Foreign Office, and denounced the Sinclair concession as an encroachment on private property. It may be safely assumed that the other holders of pre-war concessions will take the same attitude.

* *Petroleum Times*, Vol. 9, No. 215, p. 230, London, Feb. 17, 1923.

"IN THE LAST ANALYSIS, however, the distillation of oil from shale at Fushun need not be commercially successful. The Japanese Navy stands ready to take the entire output of the operations. When a question of national defense is involved, the Japanese Government may be expected to subsidize the venture if necessary. A new chapter in the story of oil shale development may be written in Manchuria."

This is not the place to argue the validity of these claims from the abstract standpoint of international law. In international affairs, as in private business, the strength of a claim is too often to be measured not by its inherent justice but by its possibilities of "making trouble." To what extent the British Government will actively support the holders of these pre-war claims remains to be seen. Some arrangement may yet have to be made with the holders of rival concessions.

Manchuria may hardly be regarded as foreign territory. The "peaceful penetration" of the Japanese into this area has been long-standing and thorough. Mines, railroads, banks, and shipping are all in Japanese hands. The native and Chinese agriculture of necessity pays tribute to the commercial overlords of Japan.

The oil shale of Fushun is not especially rich. It yields on an average 5.5 per cent of crude oil, or about 14½ U. S. gallons to the ton. The shale worked in Scotland yields about 10 per cent of crude oil, or 25 gal. to the ton. The Esthonian oil shale gives well over 20 per cent, or 50 gal. per ton. On the other hand, at Autun, in France, shale yielding 7.5 to 8 per cent of crude oil, or 20 to 22 gal. a ton, is being worked, though on a small scale.

There is little commercial experience in the distillation of oil shale by which to measure the possibilities of the Fushun shale. In only two countries is the distillation of oil shale on more than an experimental basis—namely, in the United Kingdom and in Esthonia. In the United Kingdom, especially in Scotland, the industry has found it hard to compete with natural petroleum and its products, even though the latter have been transported over thousands of miles of sea. The quantity of oil shale mined has decreased from an average of 3,229,000 metric tons before the World War to an average of 2,629,000 tons since 1919. Since the war the principal producers of oil shale in Scotland have been amalgamated under the name of Scottish Oils, Ltd., in which the Anglo-Persian Oil Co. is financially interested. The Scottish refineries are now employed in part in refining crude petroleum imported from Persia.

Statistics of oil shale mining in Esthonia are available only for those years which followed the World War. Production has grown rapidly from 9,664 metric tons in 1919 to 183,985 tons in 1923. The shale yields 50 to 80 gal. of crude oil with a density of 22.6 deg. A.P.I., per ton of shale. The beds are practically horizontal, and large quantities of shale can be mined near the surface by stripping off with steam shovels about six feet of overburden. There is ample market for the oil in a small progressive country in which there are no other native fuels. However, few generalizations can be made on the basis of a recorded experience of only five years.

In the last analysis, however, the distillation of oil from shale at Fushun need not be commercially successful. The Japanese Navy stands ready to take the entire output of the operations. When a question of national defense is involved, the Japanese Government may be expected to subsidize the venture if necessary. A new chapter in the story of oil shale development may be written in Manchuria.

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Alaska's Mineral Output Less in 1924

Mines in Alaska produced \$17,457,333 worth of minerals in 1924, as against \$20,330,643 worth in 1923, according to the U. S. Geological Survey. The total value of the mineral output of the territory since 1880 is \$535,084,276. These figures are abstracted from the annual report on the mining industry of Alaska, now in preparation under the direction of Philip S. Smith, chief Alaskan geologist. The sources of Alaska's mineral output in 1923 and 1924 are given below:

Mineral Output of Alaska, 1923 and 1924

	1923		1924	
	Quantity	Value ¹	Quantity	Value
Gold, oz.	289,539	\$5,985,314	304,072	\$6,282,724
Copper, lb.	85,920,645	12,630,335	74,074,207	9,703,721
Silver, oz.	814,649	668,012	669,641	448,659
Coal, short tons	119,826	755,469	99,663	559,980
Tin, metallic, short tons	1.90	1,623	7.00	7,028
Lead, short tons	410	57,400	631	100,879
Placer platinum metals, oz.	25.90	3,004	21.98	2,594
Miscellaneous mineral products including petroleum, marble, gypsum and lode platinum metals.		229,486		348,728
		\$20,330,643		\$17,457,333

In spite of the gradual exhaustion of the richer gold placer deposits, the gold output in 1924 was larger than that for 1923. The increase was due mainly to activity in the lode mines in southeastern Alaska. The benefits to the gold-mining industry of interior Alaska that are certain to result from the completion of the Alaska Railroad are rather slow to appear in the production of gold, for the work of testing larger areas of placer ground and the engineering work needed to complete ditches and install dredges or other power-driven mining machinery require considerable time. The developments now in progress and increased prospecting for metal-bearing ledges will eventually lead to an increase in production.

The decrease in the total value of the mineral output of Alaska in 1924 from that of 1923 may be attributed almost entirely to the smaller production and the lower price of copper.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

FEDERAL M. & S. Co.'s improved flotation practice at the Morning mill materially increases earning capacity. Large ore reserves opened on the 2,650 level. Future outlook promising, with substantial reserves. Purchases Sally mine, Boundary district, B. C.

Utah-Apex producing 4,000,000 lb. of lead per month. Recently acquired holdings of Bingham & Eastern and a number of other properties.

Labor shortage at mines of Minas Geraes, Brazil, due to higher wages paid by coffee plantations.

Russian manganese industry reviving as liberal concessions are granted W. A. Harriman & Co.

Judgment of \$30,000 rendered against North Butte in personal injury suit.

Aravaipa Mining Corporation organized to acquire and operate properties formerly operated by Aravaipa Mining Co. New corporation also acquires the Goddard estate. L. W. Douglas is president.

Advices from Paris lay stress upon the phosphate deposits of Tunis as being a prime factor in the present warring conditions in French colonies.

Development permits may be obtained on lands covered by oil permits, according to recent ruling of Interior Department.

Leasers on Copper Queen properties near Bisbee, Ariz., now shipping approximately 10,000 tons per month.

A fund of \$100,000 left by late W. A. Clark for a memorial club house to be erected at Clarkdale, Ariz.

Utah-Apex Producing in Excess of 4,000,000 Lb. of Lead per Month

New Zinc Deposits on 2,000 Level—Recent Acquisition of other Properties

Largely by reason of the high price of lead, the Utah-Apex Mining Co. is producing more lead than ever before in its career. It produced more than 40,000,000 lb. in the first ten months of its fiscal year. It is at present producing over 4,000,000 lb. of lead monthly, and each cent advance in price means additional profits of about \$40,000 monthly. The smelting company which treats Utah-Apex's ore and concentrates pays the latter for the metallic content according to prevailing high quotations for lead, zinc, and silver. The Utah-Apex company begins its Aug. 31, 1926, fiscal year facing a lead price near the record peace high, with nothing in sight to cause cessation of demand. The company has recently made a very important strike of zinc ore on the 2,000 level. Based on preliminary development work in the new ore zone, there is every indication that the vein extends over into the recently acquired Utah Lead & Copper property. This new mine is contiguous and consists of thirteen claims extending over 102 acres adjoining the main holdings of the Utah-Apex to the north. The development of this mineral ground can be carried on through the workings of the Utah-Apex mine. A short time ago the Utah-Apex company acquired the holdings of the Bingham & Eastern Mines Co. and of the Pine Canyon & Bingham Tunnel Co. Utah Lead & Copper is a lead property and is expected to insure long-time production



Crevice formed by earthquake, June 28, 1925, Logan, Mont. Average width of opening 9 inches

of that metal even after the immense reserves in the Utah-Apex mine have been exhausted, and the Pine Canyon purchase gives the company a valuable tailing-pond site, with practically unlimited water, which, it is expected, the Utah-Apex will utilize in the near future in the operation of a new concentrating plant.

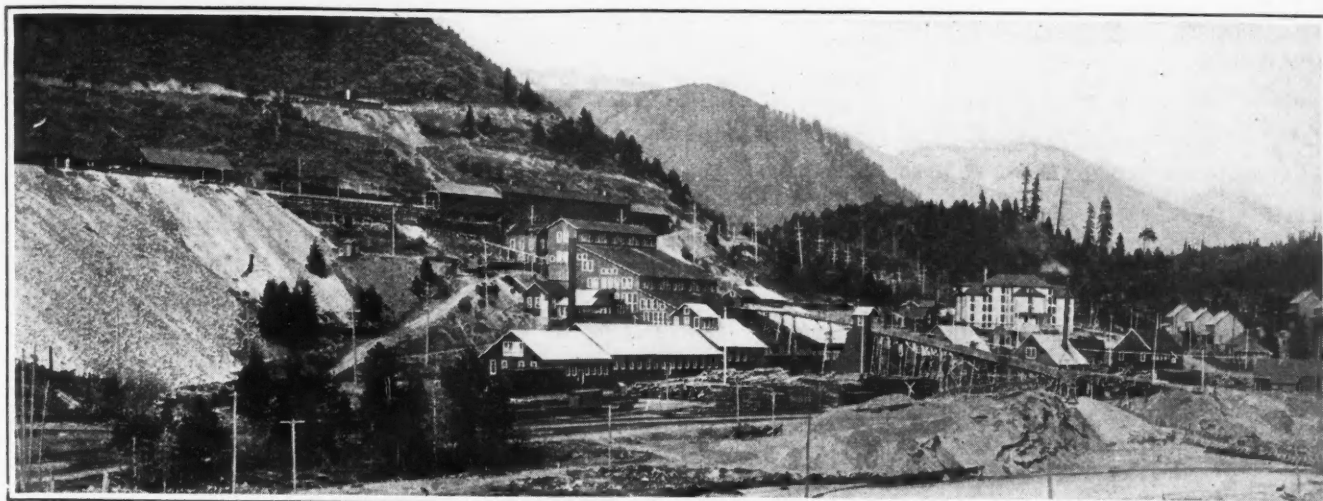
Copper Queen Leasers, Near Bisbee, Ship 10,000 Tons per Month

Other Mining Operations in Cochise County, Ariz.

Thirty-seven leases on Copper Queen property are reported to be shipping approximately 6,000 tons of copper ore and 3,500 tons of silver-lead ore a month. The Southwest and the Lowell divisions of the Copper Queen are the largest shippers. More than 200 miners are employed by the local lessees, which adds considerably to the payroll of the district.

The Del Norte Leasing Co., operating through the Hoatson shaft of the C. & A., is not mining ore at present. A much larger hoist is being installed, and when this is completed will enable the company to increase its tonnage considerably. The Hill Top Mines Co. is making steady shipments of silver-lead ore to El Paso. The ore is transported to Rodeo, a distance of 23 miles, by two five-ton Liberty trucks. A breakdown in the compressor some time ago necessitated a return to hand drilling for a short time.

The Ainsworth Copper Co., seven miles from Hill Top, is again active. There has not been much work done on the property for the past few years, but with the increase in price of lead, operations will be resumed. Considerable work had been done on the property in years past, which was known as the King Copper Mining Co. All machinery has been overhauled, and a new power drill installed. The Gleeson district is also active, and it is expected that the Leadville Mining Co. in the Courtland district will soon again be on an operating basis.



Morning mill of the Federal Mining & Smelting Co. at Mullan, Idaho
A thousand tons per day of zinc-lead-silver ore is efficiently treated by preferential flotation.

Federal M. & S. Co. Earns At High Rate

Improved Flotation Practice at Morning Mill—Ore Opened on 2,650 Level—F. H. Brownell Discusses Outlook for Future

By Arthur B. Parsons
Assistant Editor

WITH the great oreshoot in its Morning mine, at Mullan, Idaho, developing in splendid fashion on the new 2,650 level; with the Morning mill doing better work on the complex lead-zinc-silver ore than ever before; and with its position as leading producer in the Oklahoma and Kansas sections of the Tri-State zinc-lead district well established, the outlook for the next few years, at least, is highly encouraging to stockholders of the Federal Mining & Smelting Co. Of course the market price for lead and zinc is a vital factor in the prosperity of the company, but the horizon in this respect certainly is unclouded at present. The accompanying table sets out the excess of receipts over expenditures, and sums spent for construction and new equipment. The

While some extensions to present known orebodies may be developed, the officials expect the production from these mines to diminish materially within two years and to be virtually exhausted within five. The future will depend upon new properties that may possibly be acquired, and the Morning mine, recently opened to the 2,650 level, which is 1,850 ft. below the present main operating adit. It is being exhausted at the rate of about 150 ft. vertically per year.

Mr. Brownell considers the probable life of the mine from three aspects: (a) Comparison with other mines in the district. Six mines, including the Frisco, Gem, Hercules, Mace, and Tiger-Poorman, have been bottomed at depths of from 460 to 2,250 ft. The Bunker

vein, so far as known, is about 4,000 ft. long; and from the outcrop to the present shaft bottom is a distance of about 4,000 ft. This theory, however, is too general to have any important bearing on the case. Mr. Brownell concludes with this frank and philosophical paragraph:

"About all we can say with any certainty, then, in regard to the Morning, is that it is a big, strong vein, averaging 12 ft. in width, which shows no sign of coming exhaustion as yet. With increasing depth, it is proportionately approaching the point of termination, and has already reached a depth at which anxiety as to the future becomes justified. But the life of a mine is much like the life of a man; every year that goes by is a year nearer the end. None the less, from the practical standpoint at the expiration of any given year, there is often, perhaps usually, no marked sign of a change from the apparent condition at the close of the preceding year. The experience of the Coeur d'Alene mines has been that some indication of an approaching end is usually found on at least one level, and sometimes on more than one, before the bottom is reached. Continuing the analogy between the life of a mine and a man, and recalling what has been said above, one might think of the Morning as of a man of threescore years and ten, but still hale and hearty—his life expectancy in this case is six years; he may live many years longer—and he may not."

It is not always that stockholders have as honest a discussion of the outlook for the future.

That the officials are reasonably sure of the continuation of the ore for at least two more 200-ft. "lifts" below the 2,650 level is indicated by the letting of a contract recently for the sinking and lining with concrete of an additional 400 ft. J. Fred Johnson, who concreted the new shaft of the Chief Consolidated mine, at Eureka, Utah, will have charge of this work. The maintenance of the shaft has cost upward of \$80,000 a year for installing and readjusting jacket sets and keeping the shaft in alignment. A test section in the 90-ft. sump below the

Quarter Ended	Excess Receipts Over Operating Expenditure	Construction and Equipment	Operating Net Earnings
Oct. 31, 1924	\$898,832	\$90,583	\$808,249
Jan. 31, 1925	1,021,298	72,589	948,709
April 30, 1925	921,389	103,176	818,213
July 30, 1925	830,543	81,487	749,056
Total for 12 months	\$3,672,062	\$347,835	\$3,324,227

fluctuations are largely caused by the rise and fall of metal quotations.

The annual report of F. H. Brownell, president of the company, contains an unusually apposite and illuminating discussion of the probable future of the enterprise. The life of the principal mines in the Tri-State district at the end of 1924 could be estimated fairly accurately. The mines, listed in order of their profits in 1924, are as follows:

Mine	Profits, 1924	Probable Life, Years
Brewster	\$450,000	3½
Kansouri (9 months)	345,000	3
Lucky Bill (9 months)	144,000	3
Gordon (9 months)	125,000	5
Jarrett (6 months)	81,000	1½
Muncie (9 months)	88,000	2
Lucky Syndicate (9 months)	25,000	4

Hill, 1,600 ft. deep, and the Hecla, 2,400 ft., together with the Morning, 1,850 ft. deep, show no signs of bottoming as yet. (b) Prichard slate theory. Many experts are inclined to accept the theory that when a mine in the Coeur d'Alene district reaches the Prichard slates, which underline the quartzite, it will be unprofitable. The owner naturally approaches the slate with trepidation; yet there is no certainty that the slate will terminate the vein, and, moreover, the depth at which the slate may be reached admits of extremely wide variation. (c) As a general conclusion, geologists estimate that a deep-seated fissure vein, of the type of the Morning, is likely to have about the same vertical as horizontal extent. The

2,650 level was concreted early this year with excellent results, so that the new portion will be concreted as rapidly as it is sunk. The concrete lining extends back to the wall and is effective in preventing the slacking and swelling of the ground. It is possible that the shaft above the 2,650 level will be lined

with concrete also, although that would involve considerable interference with current production.

Marked improvement in the results obtained in concentrating in the Morning mill has been a factor in increased earnings. This improvement has also made possible the mining of large quantities of hitherto unprofitable ore in the upper workings of the mine.

Frederick Burbidge, general manager for the company, who makes his headquarters at Wallace, in the Coeur d'Alene district, has supplied the following comparative figures for the average results obtained during the first four months of 1925, and the corresponding period in 1924:

Recovery of lead increased 7 per cent.
Grade of lead concentrate increased 9.5 per cent.

Recovery of zinc concentrate was slightly improved.

Recovery of silver increased 6 per cent.

The advantage, of course, lies not only in the increased recovery of metals but in the decrease in freight and smelting charges resulting from the better grade of lead concentrate to be marketed.

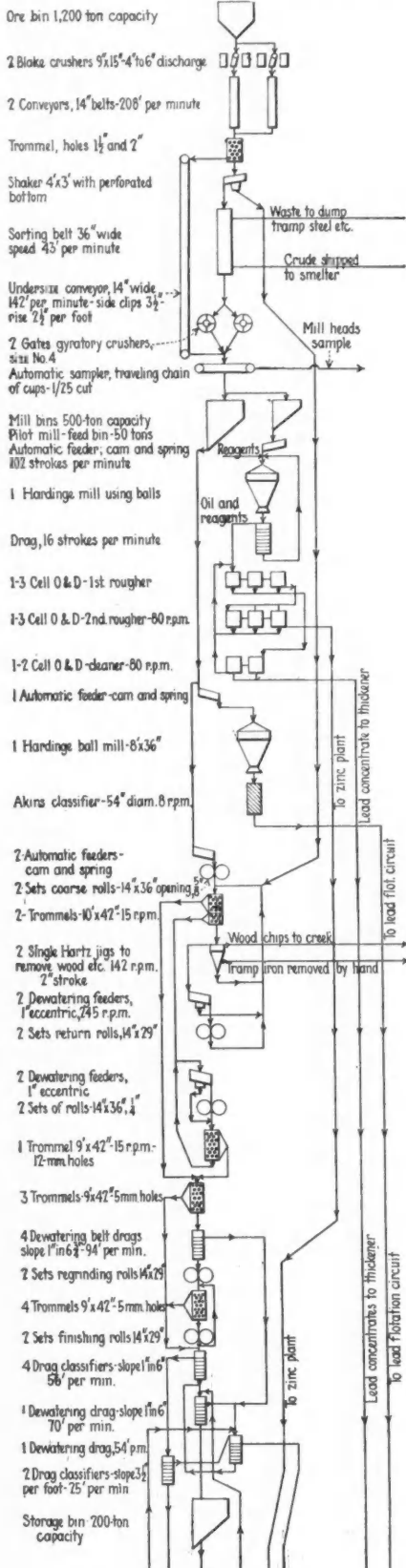
The accompanying flow sheet shows the present scheme of operations. The important difference is the increased use of flotation and finer grinding. Formerly Hancock jigs and many more tables were incorporated in the flow sheet. Now the jigs are eliminated entirely and the only tables to make a finished concentrate are the first set of twenty-eight Wilfleys. They handle a 16-mesh feed and make a clean lead concentrate. The other tables either remove a tailing, clean some lead from a zinc flotation concentrate, or make some other intermediate separation. The O-D flotation machine is named after T. M. Owen, formerly assistant manager of the company, and M. P. Dalton, the mill superintendent, and was developed at Mullan. It has a horizontal impeller or rotor on the same order as the K. & K. machine. Features are the comparatively large diameter of the rotor and the slow speed necessary to introduce a large volume of air. Cascade machines and Callow cells are also included in the flow sheet. Several new Hardinge mills were added to provide the additional grinding capacity necessary for handling about 1,000 tons per day.

One reason for the improved recovery probably is the change in character of the flotation feed. It has always been contended that the admixture of some granular material made for better results in a flotation machine. When slimes only were sent to the machines the tailing was not nearly so low as it now is.

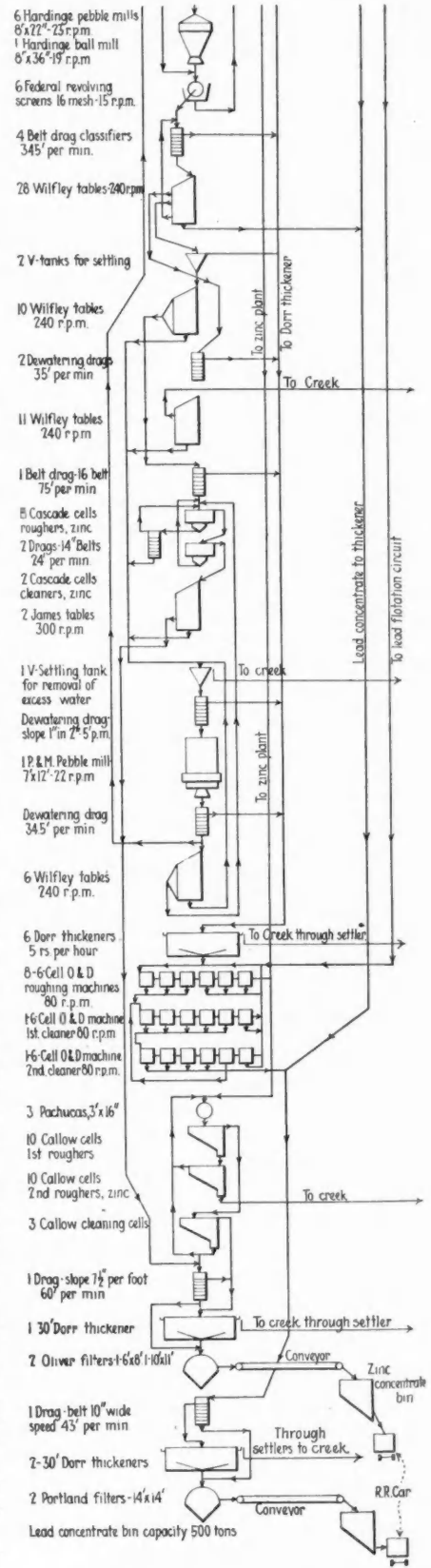
The Morning is, of course, the big producer of the Federal company, contributing in 1924 about 65 per cent of the lead, 15 per cent of the zinc, all of the 1,679,000 oz. of silver, and 40 per cent of the earnings. The following statement from the last annual report contains this significant comment:

"New properties have been vigorously sought by your company in other fields, particularly Idaho, Montana, and British Columbia. Its experience, like

that of other companies similarly engaged, is that it is becoming extremely difficult to find new mines capable of profit, and the expense of exploration and investigation is so considerable that it may perhaps be questioned whether the incurring of such expense will much longer be justified."



Flow sheet of Morning mill
(Continued on column 3)



Flow sheet of Morning mill
(Continued from column 1)

Walker Mine, Plumas County, Calif., Producing 800 Tons Concentrates Daily

The physical condition of the Walker mine, Spring Valley, Plumas County, Calif., was never better, according to President J. R. Walker after a recent inspection trip. Costs have been reduced to a minimum. Production of the mill is ranging from 750 to 800 tons daily.

The old oreshoot, which has been steadily productive for nine years, contains about 400,000 tons of ore, 200,000 tons of which has been broken ready to be drawn upon. Between the old shaft and the face of the north drift on the No. 6 level there is a shoot containing 900,000 tons of ore.

The company is now preparing to do development work below the tunnel level in the ore zone which in the upper levels shows mineralization. Two winzes are to be put down—one on the main orebody and the other on the south orebody. Control of the Walker Mining Co. is owned by the International Smelting Co.

Clark Memorial Community Clubhouse

PLANS have just been completed for the construction of a \$90,000 community clubhouse at the smelter town of Clarkdale, in the Verde Valley, the structure to be erected from a fund of \$100,000, bequeathed to Clarkdale by the late Senator William A. Clark, former president of the United Verde Copper Co.

The building, which will be known as the "Clark Memorial Community Clubhouse," will be one of the most beautiful structures of its kind in the entire state. The architects' plans will be forwarded to the United Verde Copper Co. this week, and it is expected that bids will be called for within the next few weeks. Work on the new structure will be started as soon thereafter as possible, it was announced, so that the citizens of Clarkdale may enjoy the use of the clubhouse during the winter.

The clubhouse will be an L-shaped structure and will be constructed of tile, with stucco finish, the dimensions being 191 and 133 ft. over all. The auditorium will be 60 by 90 ft. and will be used for assemblies of various nature, including basketball games and movie shows. At one end of the auditorium will be a large stage from which theatricals may be presented. There will be a clubroom reserved exclusively for the use of women, a men's lounge, billiard and card rooms; a library and writing room for the use of both men and women, and also kitchen and pantry. The structure will be surmounted by a red-tile roof and a wide verandah will extend the entire length of the building on the east side.

Federal M. & S. Co. Purchases Sally Mine on Wallace Mountain

Leadsmith Incorporated and Surf
Inlet's Reserves Limited

The Federal Mining & Smelting Co., which acquired a 55 per cent interest in Atlin Silver Lead Mines a short time ago, now has purchased the Sally mine, on Wallace Mountain, near Beaverdell, in the Boundary district of British Columbia. The Atlin Silver Lead Mines' property consists of fifteen claims, about ten miles from Atlin Lake. Several hundred feet of sinking and drifting has been done. A trial shipment of thirty tons brought a return of 0.16 oz. in gold and 57.7 oz. in silver per ton and 29.2 per cent of lead and 12.4 per cent of zinc. The Federal company has undertaken to develop and equip the property in consideration for a 55 per cent interest. By the agreement, all profits from the sales of ore or concentrates are to be credited against the cost of operation until the mine becomes a profitable producer. When that time is reached 75 per cent of the profits are to go to the Federal company and 25 per cent to the Atlin company's shareholders until the Federal has been reimbursed its outlay for equipment and development, estimated at \$600,000, after which Federal will receive 55 per cent and Atlin shareholders 45 per cent of profits.

Ore Shipments to Trail Smelter

The Sally mine has come to the fore on account of the persistent richness of its ores during the last three years. The 782 tons sent to the Trail smelter during last year contained on an average approximately 360 oz. of silver per ton, besides low gold and lead contents. During this year, more than 400 tons of this class of ore has been shipped to the Trail smelter, and the last shipment made before the sale brought a return of approximately 600 oz. of silver per ton.

The Federal purchased the mine from Wallace Mountain Mines, which is composed of Penticton citizens and capitalized at the modest sum of \$10,000—capital that has been returned in dividends several times over during the last three years. The purchase price approximated half a million dollars.

The Federal has under option several other claims on Wallace Mountain, and evidently purposes making a large consolidation. In the past, operators on Wallace Mountain have been content to ship only high-grade ore, but it is understood the Federal will erect a concentrator and cyanide plant, with a view to treating the low-grade ores as well as shipping the high-grade ones.

Leadsmith Mines Incorporated

Leadsmith Mines has been incorporated with a capital of \$500,000, to take over and develop the Noonday group, at Sandon, in the West Kootenay district of British Columbia. The incorporators are practically the same group of men who so successfully have operated the Silversmith mine, at Sandon, during the last six years. John B. White, of Spokane, is president of both concerns and Oscar V. White managing

Zinc Deposit of Abandoned Page Mine to Be Explored

THE Federal Mining & Smelting Co., of Wallace, Idaho, is engaged in carrying out an interesting development program at the old Page mine, west of Kellogg, which promises to result in adding another productive mine to operations of that company in the Coeur d'Alenes. Many years ago a shaft was sunk 600 ft. and the vein explored by drifting. The ore, however, proved to be mainly zinc, which could not be profitably mined at that time, and operations were therefore discontinued. The old records of these operations show that a diamond drill was driven from the bottom of the shaft to prospect a parallel vein, which resulted in finding a shoot of lead-silver ore of good grade. The primary purpose of the present work at the Page is to explore this parallel vein, which will be reached by crosscutting about 500 ft. from the bottom of the shaft. It is also believed probable that the zinc ore already developed may be profitably mined under present conditions.

director of both. The Noonday group has been idle for ten years.

Belmont-Surf Inlet Mines Reserves Approaching Exhaustion

Clyde Heller, of Philadelphia, president of the Belmont-Surf Inlet Mines, recently made an examination of the Surf Inlet mine, on Princess Royal Island, British Columbia, and he also looked over some mining properties in the Portland Canal division. No important additions have been made to the ore reserve at the Surf Inlet mine during the last two years, and indications point to the end of the existing reserve being reached within the next few months. The company's officers have examined a number of properties in different parts of northern British Columbia, in the hope of finding a mine at a satisfactory price, which it could purchase and to which it could move its plant when the Surf Inlet mine is worked out, but, so far, the search has been futile.

California Clays Suitable for Sanitary Wares

The Standard Sanitary Manufacturing Co., of Pittsburgh, has announced a merger with the Pacific Sanitary Manufacturing Co., which has two plants in California, one at Richmond and the other at San Pablo. As a result of the merger the California plants are to be expanded at an expense of \$5,000,000, according to local reports. The clays and other raw mineral products of California have been found to be especially adaptable to the manufacture of sanitary ware and the manufacturing conditions and markets are advantageous. The development is especially significant in that it affords additional outlets for mineral products, particularly clays.

Washington News

By Paul Wooton
Special Correspondent

Personnel of U. S. Bureau of Mines Now 830

Potash Leasing Permits Cover 1,000,000
Acres.—A New Detonator
Devised.

At the end of the fiscal year the U. S. Bureau of Mines had 830 employees, of whom 307 held technical positions. The technical staff was distributed as follows: Washington, 44; Pittsburgh, 99; field, 99.

The technical staff in Washington was constituted as follows: engineers, 19; chemists, 12; miscellaneous, 13. In Pittsburgh the engineers numbered 43, the chemists 35, and those with miscellaneous specialties 21. The division in the field force was: engineers, 83; chemists, 27, and miscellaneous, 54.

These figures do not include the technical men who are connected with the Bureau in a consulting capacity.

Potash Permits Granted Under Leasing Act

Potash permits covering more than a million acres of public land have been issued since the enactment of the mineral leasing act. In the same period only seventeen leases have been issued, but the aggregate investment required by them exceeds \$2,000,000.

A superior detonator for high explosives has been devised by the Bureau. It has been found that silver azide retains its explosive properties regardless of the presence of moisture. This overcomes one of the objections of mercury fulminate, which loses its sensitiveness under conditions of use in some mines.

In connection with its efforts to find new uses for silver, the Bureau investigated all of the unstable compounds of silver. Though the superiority of silver azide has been demonstrated, none of the other compounds gave promising results, although silver fulminate is a thoroughly efficient detonator and can be substituted for mercury in case of an emergency.

Judgment of \$30,000 Against North Butte in Personal Injury Suit

A default judgment of \$30,000 was awarded to Mrs. Frank W. Waldemar, of Bisbee, widow of Frank W. Waldemar, deceased, in a personal injury suit brought by Mrs. Waldemar against the North Butte Mining Co., a Minneapolis corporation. The ruling represents the largest personal inquiry judgment ever obtained in Arizona in the federal court, so it is stated.

Mrs. Waldemar's attorneys were M. E. Cassidy, at one time claim agent for the Copper Queen in Bisbee; Thomas Flynn, and Thomas Nealon. The suit grew out of the death of Mr. Waldemar in August, 1924, from a premature blast, while working in the North Butte lease, at Superior, Ariz. Mr. Waldemar had just gone to work for the company and was working his first

Mammoth Smelter at Kennett, Calif., Closes

THE Mammoth smelter at Kennett, Calif., has been shut down, as the mines furnishing the important ore supplies have been worked out and profitable ore at current metal prices is no longer available. The smelter was started in 1904, and except for shutdowns succeeding the war period, has been almost continuously operated. With the closing of the smelter the outlet for low-grade siliceous ores of gold and silver which flowed to this plant from California and Nevada points is no longer available. As a result the closing of the smelter will seriously affect a number of smaller properties.

shift when the explosion occurred. It was contended in the suit that he had worked twelve hours when the explosion took place, instead of the regular eight hours, as required by law. His death left the widow and their two children destitute.

It is reported that, following the fatal accident, the North Butte company transferred its lease, and its statutory agent left the state, and no service could be obtained. The company is also reported to have refused the request of the Arizona Corporation Commission to appoint a new statutory agent. About ninety days ago, the former statutory agent returned to Superior, and service of the papers in the suit was had on him. It was brought out that this agent had not resigned as agent for the company, according to the records of the corporation commission.

At the trial, the defendant company, the North Butte, did not appear, and the plaintiff then put on her testimony, showing the death of her husband and the proof that the papers in the case had been served on the statutory agent of the defendant. Judge Jacobs issued a default judgment of \$30,000.

Developing Quicksilver at Opalite, Ore.

The Mercury Mining Syndicate is developing a quicksilver deposit at Opalite, Ore., 20 miles west of McDermot, Nev., and 1½ miles north of the Oregon-Nevada line. An Ingersoll-Rand compressor of 250 cu.ft. capacity is being installed as well as buildings and living quarters. Fifteen men are employed. The company which formerly operated a quicksilver property at Ione, Nev., known as the Ione Mercury Co., has taken down its furnace at Ione and discontinued work.

National Lead Co. Buys Interest in German Smelter

E. J. Cornish, president of the National Lead Co., announced upon his arrival from Europe that the Williams Harvey Corporation, in which National Lead owns a one-third interest, has bought a half interest in the Wilhelmsburgh Smelting Works, at Hamburg, Germany.

Aravaipa Mining Co. Property to Be Developed by Lewis W. Douglas and Associates

The property of the Aravaipa Mining Co., which more than 30 years ago was developed by the Aravaipa Mining Co., is to be developed and operated by a group of Arizona mining men, headed by Lewis W. Douglas, son of J. S. Douglas, president of the United Verde Extension Mining Co.

The Grand Central Mining Co., a Delaware corporation, now operating a tailing dump at Fairbank, Ariz., and of which Lewis W. Douglas is president and general manager, has an option on fifteen claims in the Aravaipa Mining district, belonging to Mrs. Rosa Firth and C. A. Firth, for \$20,000, of which \$2,000 has already been paid.

Mr. Douglas, on behalf of the Grand Central company, has made an arrangement with the trustee of the Goddard estate, owner of the property of the Aravaipa Mining Co., to acquire a large interest in the Aravaipa claims, with the object of consolidating them with the Firth claims and developing the whole as a mine.

It is reported that a limited amount of development work has disclosed 50,000 tons of ore which according to sampling averages better than 15 per cent lead and 23 per cent zinc and a small tonnage of 30 per cent lead ore.

On the lower-grade lead ore which cannot be shipped to a smelter at a profit, metallurgical tests show that it can be treated at a net profit of \$4.50 per ton under existing transportation conditions and an 8-cent lead market. The ore and concentrates will be hauled from the mine to Cork, on the Arizona & Eastern R.R., 45 miles distant.

The Grand Central Mining Co. has an authorized capital of 250,000 shares of a par value of \$1, of which 239,000 are outstanding, 150,000 being used for the purpose of raising funds for the development of the Aravaipa property. The company is operating a tailing dump at Fairbank, Ariz., in which there are approximately 55,000 tons of ore averaging 5 per cent lead (in the form of lead carbonate), 3½ oz. silver, and 90c. in gold. The company has been operating this dump since September, 1924. The life of the dump is estimated to be fifteen months, and it is anticipated that a net profit of between \$1.50 and \$2 a ton will be derived.

The officers and directors of the Grand Central Mining Co. are Lewis W. Douglas, president, treasurer, and general manager; M. J. Elsing, vice-president; Frank C. Brophy, secretary, and H. Hendrickson, director.

Bingham Metals Operates Old New England Mine

The old New England mine, in West Mountain district, Bingham, Utah, adjoining the Utah-Delaware and the United States mines, is operated by the Bingham Metals Co., recently organized to purchase the mine on contract. Operations are on a leasing basis under the direction of R. M. Hampton. During August, Bingham Metals shipped 15 carloads of lead-silver ore.

Ben Lomond Mine Has Promising Future

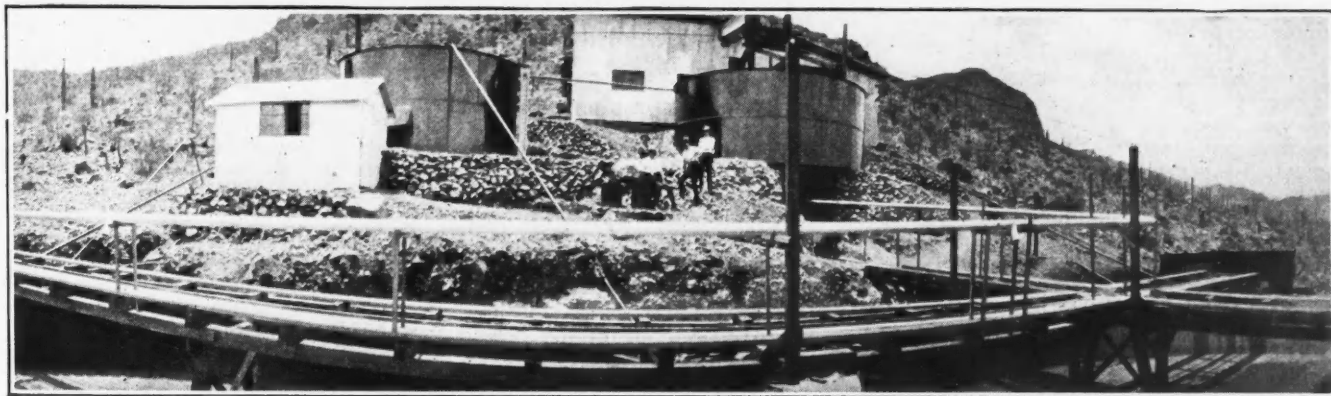
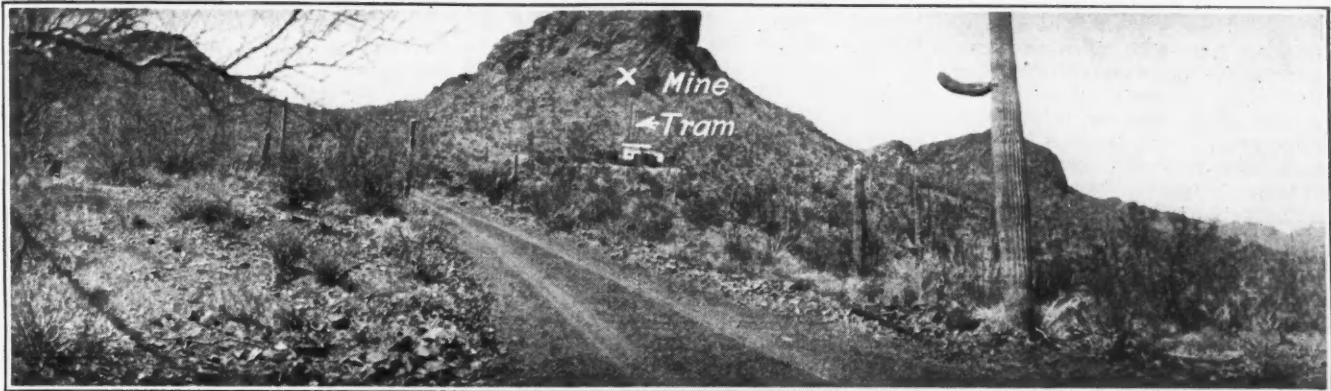
The Ben Lomond Investment Co., of Arizona, is developing the Ben Lomond mine, 55 miles east of Ajo, Ariz., in the Quijotoa district, and 80 miles from Tucson. A good road has been completed to the mine, making it possible to deliver fuel oil at the mine for 10c. per gallon. The mine is at an elevation of 3,000 ft. above sea level and the known orebody extends 600 ft. higher, thus indicating large reserves. The mine is operated as an open cut, with three benches well started. The ore is low-

The new shaft at the Laura mine of the Inland Steel Co., at Hibbing, is now in operation and is shipping ore. The skips are 2½ ton and operate in balance. The shaft consists of three compartments, each 57 in. square. In addition to the new shaft, a complete equipment of buildings has been erected, consisting of dry house, boiler house and engine house combined, shops, and an office. More than 3,500,000 tons has been shipped from this mine, and there is still 1,200,000 to be mined.

The Corsica mine of the Pickands Mather Co., between Gilbert and McKinley, Minn., and formerly operated as

Grass Valley and Mother Lode Activities

Estimates for the sinking of a 1,000-ft. shaft are being asked for locally at Grass Valley, Calif., by Cooley Butler, who has acquired control of the Woods tract west of Grass Valley. Errol MacBoyle and his associates are expected to operate the Idaho-Maryland mine, which has been shut down since the release of the Metals Exploration Co.'s option. Preparations are being made by F. S. Schmidt and his associates to operate the Golden Center mine.



UPPER: Ben Lomond mine, tram and mill. LOWER: Close-up view of Ben Lomond mill

grade gold suitable for milling. About 35,000 tons of \$15 ore is now broken, ready for the crushers. Since the mine is 400 ft. above the mill, the ore is handled on a double-track gravity tram without the use of any power. The mill is equipped for handling 100 tons per day and while only recently started is working up to capacity. All freight is landed at Ajo, and hauled by truck to the mine. The present water supply is from a well 1½ miles distant and is ample for a 1,000-ton plant. Power is furnished by a Diesel engine.

Morton Mine, Hibbing, Minn. Acquired by Inland Steel Co.

The Morton mine, at Hibbing, Minn., formerly operated as an underground mine by the Todd-Stambaugh Co., was recently taken over by the Inland Steel Co. It has been inactive since 1922. Since it was opened, in 1912, more than 200,000 tons has been mined, and the tonnage yet available exceeds 2,000,000. The Inland Steel Co. will start at once to prepare it for active operation.

an underground mine, has been stripped of its overburden during the last two years. Though the yearly shipments have averaged 250,000 tons each, with the open-pit method of mining now possible heavier production can easily be secured. The mine still has available upward of 4,000,000 tons.

Moscow Silver Mines Co. Reports Good Ore on 1,100 Level

A recent strike in the property of the Moscow Silver Mines Company, Star district, 12 miles from Milford, Utah, makes officials confident that the long-sought faulted orebodies so productive above in the upper level have been found.

The ore is a lead carbonate characteristic of the deposits in the upper workings of the Moscow Metals, the Red Warrior and the Beaver Combination, which constitute the Moscow Silver Mines Co. holdings. The ore at the bottom of a winze from the 1,100-ft. level contains about 25 per cent lead and from 6 to 10 oz. of silver.

Potash Permits on Ground Covered by Oil Permits

A potash permit may be issued to a second party for development work on the same land on which a first party has a permit for the development of gas and oil, provided that the potash permittee waives the right of patent as a reward for discovery, according to a Department of the Interior ruling received by Eli F. Taylor, register of the United States land office in Salt Lake.

The question of the issuance of separate permits for potash development arose out of the petitions of forty-three applicants for permits to develop potash resources on oil-lease land near Thompson, Utah. Since under the old ruling, the potash permit carried the right to fee simple title to one-quarter of the area named in the permit, these applications were rejected by the Salt Lake office and later by the Commissioner General of the land office in Washington. The decision of the Department of the Interior comes as a reversal of the two previous decisions.

Railway to Be Constructed to Rouyn Gold Field

NEGOTIATIONS between the Quebec government, the mine owners of the Rouyn district, the Rouyn Mines Railway Co., and the Canadian National Railways, which have been in progress for some months, having reached a satisfactory conclusion, tenders have been invited for the construction of a railway into the Rouyn gold field. It will connect with the Trans-continental line of the Canadian National Railways at O'Brien, about 50 miles west of Amos, extending for 44.71 miles to Rouyn Township. The construction of the line will be undertaken by the Rouyn Mines Railway Co. When completed it will be leased by the Canadian National Railways and operated as part of their system.

Russian Manganese Industry Reviving and Concessions Granted

The concessions recently granted by the Russian Government and private interests to W. A. Harriman & Co., Inc., for the development of the manganese properties in Russia are expected to furnish a normal supply of this commodity. The concession runs for twenty years, and a new organization has been formed, with the cooperation of larger European consumers, to consolidate the numerous small holdings and reorganize completely the methods of production along modern lines.

According to recent reports, more than 100,000 tons of Russian ore have been sold by the American concessionaire for shipment to the United States over the remainder of the current year. The annual world requirements of manganese ore are estimated to be 1,750,000 tons. Although manganese deposits occur in some form in many parts of the world, it is not economical, except in case of emergency, to work most of the deposits outside of Russia, India and Brazil, which before the war produced 95 per cent of world supplies.

Though manganese from Brazil has been the mainstay of the American steel industry for the last ten years, it is improbable that Brazil will continue to be as large a contributor as heretofore.

Labor Shortage at Mines in Minas Geraes, Brazil

High Wages Paid Coffee Pickers Responsible for Exodus of Mine Labor
—Food Prices Rising

By reason of the shortage of labor, the Ouro Preto Gold Mines are struggling along under great difficulties. Never was the situation so bad in this respect, and this notwithstanding the high wages paid. The St. John del Rey company is also in similar straits. One cannot see any specks of blue sky through the existing dark clouds. On account of the present high price of

coffee the producers can afford to pay exceptionally high wages for picking and preparing it for market. Minas Geraes and other states bordering on Sao Paulo are the recruiting grounds for the laborers required, and the demand is insatiable. With the country depleted of its toilers, comparatively little planting is done, and the price of foodstuffs has in consequence risen to unprecedented figures. There is thus a vicious circle, and no one can foretell when and where it will break. The coffee grower finds it more profitable to plant coffee than anything else, so the little foodstuff that is grown is easily cornered by the merchants. The small man living by breeding a few pigs and fowls has to sell off or kill his stock, since he cannot pay the high price of maize to keep them profitably. Thus it goes on from bad to worse.

Smelting Iron With Charcoal on Increase

There is a slight boom on in Minas Geraes in smelting iron ore with charcoal, and ten or more furnaces are now in blast in different places, all doing well. Of course the charcoal fuel becomes more and more costly as the forests within reasonable reach of the ironworks are devastated, so it cannot be many years before these furnaces close down. Big profits will, however, be made for some years. Most of the plants have capacity of ten to fifteen tons of pig iron per day, but there are some fifty-ton plants under construction. Except for this iron business and a little manganese production, everything in the mining line is very quiet. The arsenic plant of the Ouro Preto Co. is producing, as a byproduct, about thirty tons of As_2O_3 per month, but there is no market for it.

French Antimony Concessions Granted—Revival in Bauxite Mining

Two mining concessions for antimony have been granted recently by the French Government to the Société des Mines et Fonderies d'Antimoine at Massac, Cantal. The concessions apply: (1) Mines de Cistreres, in the communes of Lubilhac; Saint Beauzair and Saint Just, in the Department of the Haute Loire, and (2) the Mines de Massac, in the Department of Cantal.

Aside from that demanded by the aluminum industry and certain allied chemical industries, there has been a remarkable revival and progress in the development of bauxite mining in France as a result of the demand for the mineral for the production of cement. The parent Lafarge company, working the original Jules Bied patent, is increasing its production facilities in various parts of southern France and has formed a subsidiary in Indo-China, near Haiphong. It will produce the cement from bauxite deposits there. A British company is working various deposits in southern France, part (the higher grades of ore and that freest from silica) being shipped to England and the remainder being made into aluminous cement at the French plant on the lower Rhone near the deposits.

Johannesburg Letter

By John Watson
Special Correspondent

Extraordinary Meeting of Platinum Proprietary Co. Gold Claims Staked on Komati River Were First Discovered in 1887

Johannesburg, July 28—An extraordinary meeting of shareholders in the Platinum Proprietary Company of Lydenburg, Ltd., was held in Johannesburg on Aug. 20 to ratify and confirm an arrangement between the directors of the company and the Central Mining & Investment Corporation, Ltd., whereby the latter will purchase 10,000 reserve shares of the company at the price of 50s. each, cash on delivery, and the directors grant to the corporation the option to purchase up to Jan. 31, 1926, a further 50,000 shares in the company at the price of 50s. each, and the option to purchase up to July 31, 1926, an additional 75,000 shares at the price of 50s. each. In the event of the exercise by the corporation of the second option, the corporation has undertaken to offer 25,000 of the 75,000 shares to holders at the date of the exercise of such option, in the proportion of one share for every four shares held, at the price of 50s. each. The Central Mining & Investment Corporation stipulates that the company's future prospecting and development operations shall be conducted under its supervision, through its consulting geologist, E. T. Mellor, and that, when the mining stage is reached, the corporation will take over responsibility for the company's administration, both technical and otherwise. The new arrangement was approved.

A block of 74 claims was recently pegged for gold on the banks of the Komati River, near the Swaziland border, by W. Herbert, Sr., and W. Herbert, Jr., of Durban. The father had found this reef in 1887. With some partners, he then sank a shaft to a depth of 100 ft. and made a drive 40 ft. long. The Rand began to be opened up about that time and Mr. Herbert and his partners, coming to the end of their available capital, also left for Johannesburg. A small syndicate was recently formed in Durban to explore these claims. A party of three left Durban in a Ford car and the old shaft was re-discovered, though the shaft was half filled with water and the mouth overgrown by trees. Samples of quartz yielded 9.8 dwt. per ton.

Application for Dredging Seattle Harbor Filed

C. H. Hanford, a former Federal Court Judge, and J. E. Boyer, both of Seattle, have made application to the State Land Commissioner, C. V. Savidge, for a lease giving them the right to dredge Seattle Harbor, the unsold tidelands and tidelands sold prior to 1907, when the mineral reservation clause was inserted, for gold.

Paris Letter

By Francis Miltoun Mansfield
Special Correspondent

Mineral Resources a Large Factor in the Moroccan Revolution

Paris, Aug. 22.—Phosphate production in the French colonies and protectorates is steadily increasing. No concentrating plants are in operation, and little attempt has been made to prevent waste at the mines. The run-of-mine product, roughly sorted, is that which is commonly shipped from Morocco, Algeria, and Tunis. Treatment at the mine for the production of phosphoric acid will come when either electricity is available in quantity or other fuel-fired furnaces may be efficiently operated. Meanwhile, the mainland refining plants benefit from this condition.

Phosphate Deposits the Bone of Contention

One of the great riches of Morocco which have induced the French to hold so tenaciously to their foothold in that country has been the phosphate deposits of the middle Atlas. Deliveries to Europe in 1924 amounted to 430,441 metric tons, compared with 190,723 in 1923. The Algerian and Tunisian mines also found a market on the Continent for 370,000 metric tons more than in 1923.

The North African provinces, in whose prosperity mainland France is directly interested to so great an extent, are thus seen to have increased production of this basic product in a single year by above six hundred thousand tons. Further increases are looked for as a result of the 1925 campaign. Actually, sales in Europe are six hundred thousand tons below what they were in 1913. From 1903 to 1913 the average yearly increase in consumption was 240,000 metric tons. Only this last year have the Moroccan exploitations of France been advancing toward their own share in the volume of Continental business.

Total Moroccan production in 1924 was 430,340 metric tons, compared with 250,000 tons in 1923, an increase of 72 per cent. Of this quantity France took 113,674 tons; Switzerland, 108,564 tons; Holland, 77,875 tons; Denmark, 33,108 tons; Great Britain, 30,228 tons; Czechoslovakia, 14,175 tons, and Belgium, 11,313 tons.

The French Government has accepted with a sigh of relief the final results of the negotiations affecting the holdings of the Mannesmann Brothers in Morocco. The firm, before the war, was the largest single holder of land, concession, and mining rights throughout the French protectorate and the Spanish zone. The Treaty of Versailles took away all their holdings in the protectorate, including those of the Agadir hinterland, which latter was the prime cause of the first troubles between the French and Germans in Morocco and which led to the final Moroccan statute as resulting from the Act of Algeciras.

There remained the Mannesmann interests in the Spanish zone, notably the valuable iron ore deposits back of Melilla, which in their turn were the cause of bringing down the Riff hords on the

Spanish forces in 1922, resulting in the actual pillaging of the mines. This was the spark which set the international conflagration ablaze once again, so far as Morocco was concerned—and it is still blazing. Many believe that the whole Moroccan question is bound up with the mineral resources of the country.

British Syndicate to Acquire Mannesmann Holdings

Paris learns that a British syndicate is to take over the Mannesmann properties in the Spanish zone and the Bay of Alhucemas, where the Spaniards are actually embarking a new army to operate with the French in the south in subduing the Riff. The celebrated Westphalian firm has stated that "under existing conditions it would be most difficult to work the properties without continual political complications and that henceforth the foreign operations of the company would be confined to the Balkans." This has been the case ever since a complacent Spain enabled these German interests to get a foothold, though, for that matter, the French themselves were powerless before the war to eject them from the protectorate to the south, as the contracts had been made previously with the Sherifian government.

If British interests, which are said to be investing many millions sterling in the enterprise, propose to work these mining properties, without waiting for Abd-el-Krim and his Riff rebels to be crushed between the French and Spanish pincers, there may well arise the necessity for some sort of a British police force or soldiery, in a warlike uniform and accoutrements, which will of itself bring a whole new element into the Moroccan muddle, and present a new political complication far reaching in its ultimate effect. The alternative is said to be that Italy, for keeping neutral, would demand compensation in the phosphate mines of Tunis, neighboring upon her Tripolitan colony, of which she has a pressing need.

Potash Industry of Alsace

French potash exports, the product of the Alsatian mines, during the first quarter of the present year were 203,654 metric tons compared with 217,179 tons during the same period in 1924. Exports went largely to the Belgo-Luxembourg Union, Switzerland, the United States, Holland, and Italy. Production of 1925 is equaling or exceeding that of 1924, thus accumulating the mine stocks which still await distribution. France and Germany between them have divided the world markets pretty effectually, that of the United States being apportioned on the basis of 70 per cent to Germany and 30 per cent to France. French sales of chlorate of potash alone to the United States in 1924 were valued at above eleven million francs, compared with less than five million in 1923. The total German sales for the first five months of 1925 were 651,900 metric tons, an increase of more than 200 per cent above those for the same period in 1924. It has just been learned in Paris that Germany has re-entered the Brazilian market, which had been closed for eleven years.

London Letter

By W. A. Doman
Special Correspondent

Platinum Occupies Prominent Place in Conversation

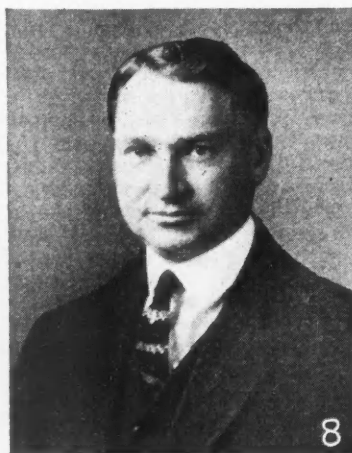
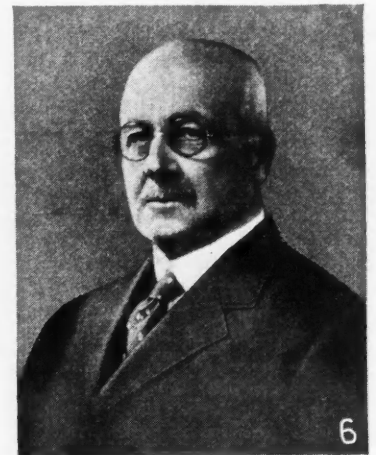
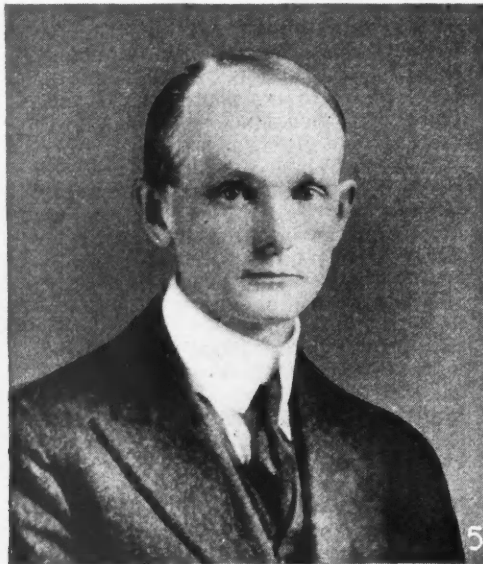
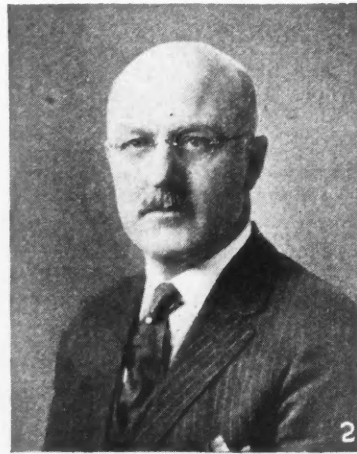
London, Aug. 24—Platinum is still to the front as a topic of conversation. Prices of certain shares rise and fall, but the public has not yet responded. The dealings are almost wholly professional. The reason that platinum is being talked here is that certain well-known persons in Johannesburg, Dr. Wagner and Corr Rissik, for example, have been discussing the matter there, and their remarks have reached this side. The former is hopeful up to a point. Platinum deposits have been proved over an area of 2,000 square miles. That is admitted. But, says Dr. Wagner, "the workable concentrates of the metal are confined to a number of fairly defined areas." The meaning of this remark is that many companies have claims that it will not pay to work, and the public here is wondering which companies they are, as prospective investors do not want to put their money into failures. Corr Rissik says that the companies already formed have a market capitalization of about £14,000,000—before the producing stage is reached. He seems to regard the position as dangerous and utters a warning. Promoters talk of a "platinum Rand," and he makes a very striking comparison between the new discoveries and the early days of the Rand—not to the advantage of the former. He is not against platinum, but against heavy share premiums too soon.

J. A. Agnew made an interesting speech at the meeting of shareholders of the Lydenburg Platinum Areas a few days ago, and he, while hopeful, did not seem to be carried away with optimism. Sensibly enough, he pointed out that the problem was in some respects new, not only to his company but to practically every engineer, and that many minor difficulties had to be dealt with. It is on the matter of the recovery of the metal content from the concentrate, he said, that less information is available today, and for the purpose of obtaining the necessary material on which the research work may be conducted, two pilot plants are to be erected. Johnson, Matthey & Co. are busily engaged on some experimental work.

Railway to Connect Mount Isa and Duchess, North Queensland

The Public Works Commission which has been inquiring into the question has decided in favor of a railway to connect the Mount Isa silver-lead field with the existing rail system at Duchess. As there is nothing but the mining industry to serve by such a line, the commission made a proviso that those most interested in the new field should give a guarantee against loss, and as this had been anticipated by an offer from the principal company, there is no doubt the railway, 52 miles in length, will be built as speedily as possible.

Prominent Mining Men Who Attended the Meeting of the A.I.M.E. at Salt Lake City, Utah



1, Louis S. Cates, vice-president and general manager, Utah Copper Co. 2, A. G. Mackenzie, secretary-treasurer, Utah Chapter, American Mining Congress. 3, George H. Dern, Governor of Utah. 4, Edgar L. Newhouse, Jr., manager, Utah Department, American Smelting & Refining Co. 5, H. Foster Bain, secretary, A.I.M.E. 6, Walter

Fitch, president, Chief Consolidated Mining Co. 7, Robert S. Lewis, professor of mining, University of Utah. 8, J. O. Elton, manager, International Smelting Co. 9, D. D. Muir, Jr., second vice-president, United States Smelting, Refining & Mining Co. A complete list of all members present at the meeting appears on pages 431 and 432.

A. I. M. E. Holds Successful Meeting at Salt Lake City

*Attendance Beyond Expectations—Governor George H. Dern Welcomes Members—
Nearby Mining Camps Visited—Lively Discussion at Business Meeting*

By Edward Hodges Robie

Assistant Editor

SALT LAKE CITY is an ideal place to hold a meeting of mining engineers: it is conveniently reached from all mining centers, and many important mines, mills, and smelters are within a few miles, so that visits can easily be arranged. This is probably why the 132d meeting of the American Institute of Mining and Metallurgical Engineers, held there, at the Hotel Utah, Aug. 31 to Sept. 3, attracted even more members than was expected. About 310 men and 62 women registered on the first day, practically every state of any mining importance being represented.

George H. Dern is not only Governor of Utah, but a mining engineer as well, and co-inventor of a well-known roasting furnace, so his address of welcome was quite different from the regulation one published in the Mayors' and Governors' Confidential Guide. He could not refrain, however, from citing Utah's eminence as a mining state, in fact, pre-eminence, and read a memorandum forced upon him by Dr. George Otis Smith, of the U. S. Geological Survey, giving the total production of Utah gold and silver in thousands of tons, as well as that of the less aristocratic metals. J. V. W. Reynders responded to the Governor's address.

Four papers were read in abstract form at the opening session¹. First, the chloridizing mill of the Standard Reduction Co., Harold, Utah, was described in a paper by H. P. Allen and William C. Madge, the last-named presenting it. The process consists essentially of a chloridizing roast followed by a percolating leach with a nearly saturated solution of common salt, acidified with sulphuric acid, the precipitation of silver on sponge copper, and of copper and lead on tin-plate cuttings. In the discussion, H. P. Allen stated that the precipitation of lead was very nearly complete, the head assaying about 0.7 per cent and the tail 0.02 to 0.03. In reply to a question, it was also stated that precipitation on sponge iron is more rapid than on tin plate, but that the iron is relatively expensive; the U. S. Bureau of Mines is, however, working on the problem and has devised an efficient precipitator using the iron. Governor Dern discussed the economy of the Holt-Dern roaster used, which he attributed to the counter-current principle of action, the hot gases coming up through the charge, preheating the upper part, but being thereby cooled so that dusting and volatilization of the charge near the upper surface does not occur. Also, the air blast is robbed of oxygen in the lower incandescent bed of the charge so that the gas that

reaches the upper layer is reducing and does not cause heat from oxidation. He gave the crushing and hoisting cost as \$1.38 per ton, the ore being very hard. Utah copper, he said, crushes to 60 mesh for 22c. The cost of roasting by the Holt-Dern process, for a proposed 1,000-ton plant in Peru, was estimated to be 25c.

The second paper described the method of unloading ores and coarse-crushing practice at the Magna plant of the Utah Copper Co., by B. E. Mix and L. M. Barker, the synopsis being read by Mr. Mix. This mill has a capacity of 24,000 tons per day. The only question brought up in the discussion was as to the speed of the two 54-in. belt conveyors, each operated by a 125-hp. motor, on a 19-deg. incline. Mr. Mix stated that the normal speed was 175 ft. per minute, but if one were down, the other was speeded up to 350 ft. to take the load.

The milling practice at Midvale was the subject of a paper by C. A. Lemke, presented by D. W. Jessup. Jigs, tables, and Huff electrostatic machines are used. A pilot flotation mill for selective flotation of lead-zinc ores was described briefly in the paper. A new 700-ton selective flotation plant will be ready for operation about the first of the year. There was no discussion of this paper.

Concluding the morning session, E. L. Tucker presented a paper on the "Effect of Cyanogen Compounds on Floatability of Pure Sulphide Minerals," of which he was co-author with R. E. Head. Many experimental data were given of the effects of various reagents in flotation. James M. Hyde discussed the paper briefly; in replying, Mr. Tucker said that the patent situation with respect to the use of cyanogen compounds was hazy, and that further work was being done on the separation of copper and iron sulphides.

BUSINESS SESSION BROUGHT OUT LIVELY DISCUSSION

A meeting of the board of directors of the Institute was held Monday afternoon, at which a handful of ordinary members also appeared. The salary of the Secretary Emeritus (F. F. Sharpless) was voted as \$458.33 per month for the rest of 1925 and the appropriation for the Petroleum Symposium was increased from \$1,600 to \$1,650. The proposed National Museum of Engineering and Industry was explained by Mr. Reynders, Samuel Insull, of Chicago, having been elected to take charge of the movement, which is being sponsored by the founder engineering societies. George C. Stone and H. Foster Bain were delegated to represent the A.I.M.E.

Reports were then requested from representatives of local sections, as to

their activities, aims, and troubles. This brought out some spirited discussion, especially on financial matters. It seemed to be the general feeling that the local sections, like most of the rest of mankind, need more money, but there was considerable difference of opinion as to how it should be raised. Some were for the imposition of local dues; others decidedly opposed. Some thought that headquarters should contribute several hundred dollars yearly to the expenses of local sections. Frank H. Probert delivered an address in which he suggested improvements in *Mining and Metallurgy*, among other things. He thought that it might be a little stronger on technology. Summing up the afternoon's discussion, the new secretary, H. Foster Bain, said that much thought would have to be given to many problems of the Institute. Possibly some of the expenses were too high, and should be shaded down so that others could be increased. Some of the principal features of the financial report for the first seven months of 1925 were as follows:

Receipts

Magazine	\$ 34,096
Dues and initiation	100,377
Sale of books and binding	11,664
Interest	6,196
Total	\$152,333

Expenditures

Magazine	\$ 34,123
Salaries	24,428
Books and pamphlets	18,804
Meetings	3,656
Local sections, inc. traveling ..	5,198
Library	4,667
Employment service	248

Total, plus other expenses \$102,921

Most of the income from dues for the current year, of course, has already been received.

Dr. Bain said that the question of section dues was purely a local matter; that some sections received support from headquarters and that some had no difficulty in financing themselves. He had given much thought to *Mining and Metallurgy* and had not yet come to a decision. He suggested that the "Mining Index" published in the back of that magazine might be discontinued; it costs \$500 a month and interests only a few. The suggestion was made that this might be mimeographed for those who want it; or that it be issued separately and charged for. Also, that a charge be made for the annual directory; or that it be made a bi-annual publication; or that it be sent only to members requesting it.

In the evening, two technical sessions were held, at which the following

¹All the papers presented have been printed and may be obtained from the Secretary of the A.I.M.E. 29 W. 39th St., New York City.

papers were scheduled: "Recovery of Copper by Leaching, Ohio Copper Co. of Utah," by Arvid E. Anderson and Frank K. Cameron; "Mining Districts and Their Relation to Structural Geology," by J. J. Beeson; "Experiments in Shot-firing with Low- and High-Voltage Currents," by A. C. Watts; "Safety Methods in Utah Coal Mines," by Daniel Harrington; "New Byproduct Coke Plant of the Columbia Steel Corporation," by C. T. Keigley; "Blast Furnace Plant of the Columbia Steel Corporation," by P. W. Jackson; "Application of Cottrell Process in Lead and Copper Smelting," by A. L. Labbe; "Production of Ferric Sulphate and Sulphuric Acid from Roaster Gas," by G. L. Oldright, H. E. Keyes, and F. S. Wartman; and

field smelter, read an abstract of Mr. Mazany's article, Mr. Mazany being in South America. The chief feature of this plant is the nodulizing kilns, followed by blast-furnace smelting. The kilns have not been altogether successful, and following North American practice, five seven-hearth roasting furnaces and a 25x120-ft. reverberatory are being built, together with a 13x30-ft. Peirce-Smith converter and a Cottrell plant.

SOCIAL FEATURES ATTRACT

Though the day was rather rainy, most of the members attended some of the numerous outside attractions that had been arranged. These included an organ recital in the Mormon Tabernacle

throughout the plant, mechanical agitation of the pulp having been found to be advisable. A particular object of interest was the filtration department, now consisting of eleven immense American disk-type filters, each having four disks. A standard method of removing the cake has not yet been devised, but a reciprocating heating motion by two or three suspended pieces of rubber hose against the blown-out filter cake seems to be the most successful means of making a clean separation from the canvas.

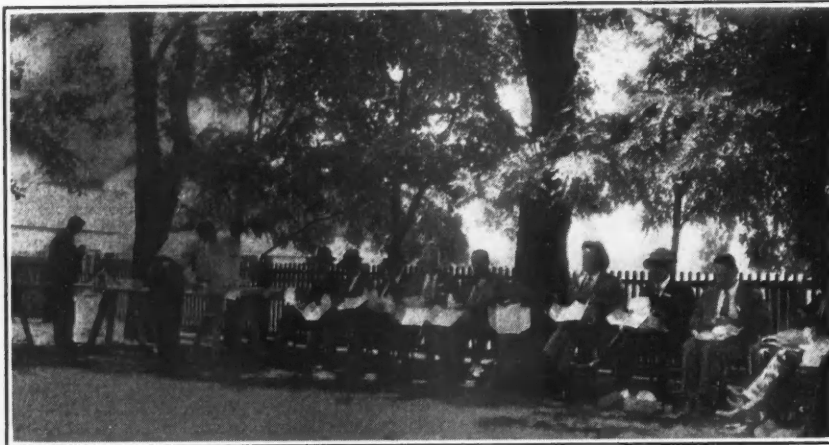
The adjoining Arthur mill was not visited. It has a capacity of 16,000 tons and the flow sheet will be practically the same as that of the Magna plant as soon as certain changes are completed. They are not using the alkaline-xanthate circuit yet, owing to having on hand a stock of old reagents, but will change over in two or three months.

The train then proceeded to Bingham Canyon, and stopped at a point where the visitors could look across the canyon and get a good view of the famous operation of removing a mountain of close to 600,000,000 tons of 1.35 per cent copper ore, of which 245,000,000 tons has already been milled. The appearance of the scene has not changed greatly in the last few years. Twenty benches, about 70 ft. apart vertically, are worked, these being about 150 ft. wide and having banks sloping at about 50 deg. The steam shovels are all being converted to electric shovels, nine now being of the electric type, used on the lower benches. The dippers hold 7 tons of ore. Drilling is done by eleven churn drills and forty-six Ingersoll-Rand F-24's. A prospect drill is now at work in the bottom of the canyon and is in ore at 300 ft. depth, so the lower limits of the ore-body are not yet determined. Blasting takes place at noon, and for the benefit of the visitors a few pot-holes were shot, which make lots of noise even if they do not break much ore.

After viewing the scene for an hour, the train again proceeded, this time back to the smelter at Garfield. An excellent box lunch was served on the train; in fact these box lunches were a most welcome feature of many of the inspection trips and aroused much favorable comment as to their quality and quantity. Copper souvenirs were also distributed to the guests, through the courtesy of the Utah Copper Co. It was the aim to provide something useful to both the ladies and gentlemen, so ash trays were selected.

A hurried trip was then made through the Garfield smelter. The concentrates from the Magna and Arthur mills are here reduced to metal, about three-quarters of the ore charge being this material. Two Martin unloaders of the gantry-crane type remove the concentrates from the open cars in which it is received. A sample of 1/150 of the total tonnage is automatically taken. The furnace charge is bedded and removed in larry cars to twenty-eight multiple-hearth roasting furnaces where the sulphur content is reduced to 10 to 12 per cent. The roaster gas was formerly made into acid in a \$2,000,000 plant, the neighbor-

(Continued on page 432)



Consuming one of the box lunches provided by the commissary department of the Utah Section, on the lawn at Midvale

"Braden Copper Company Caletones Smelter," by M. S. Mazany.

In the discussion of the paper on leaching at the Ohio Copper, presented by Mr. Cameron, it was brought out that there are over 6,000,000 tons of tailings near Lark, containing about 8 lb. of copper per ton, mostly as sulphide. About 1½ lb. could be leached with water and about 2½ lb. with the solution from the precipitation boxes in the Mascotte tunnel. The slime layers inhibit percolation and the treatment of these tailings would hardly pay. The costs of the copper produced by the Ohio Copper Co. to date, however, from leaching the mine, have been only 6.32c. per lb., including shipping and smelter charges. In leaching a dump, it was brought out that the water would have to be added at intervals, to allow access of air to the mineral particles.

In discussing Mr. Labbe's paper on the Cottrell process, E. H. Hamilton asked if carbonaceous smoke could be used for conditioning gases, instead of water or acid. The reply was that it could, but is not so effective. Arsenic trioxide, it was explained, was one of the best non-conductors known. Some difference of opinion was expressed as to whether the Cottrell or a baghouse was the better for large percentages of elemental sulphur.

G. D. Van Arsdale offered written discussion of the paper presented by Mr. Oldright, in which he emphasized the advantage of electrolysis over scrap iron precipitation except for very weak solutions. J. D. Mackenzie, of the Gar-

field smelter, read an abstract of Mr. Mazany's article, Mr. Mazany being in South America. The chief feature of this plant is the nodulizing kilns, followed by blast-furnace smelting. The kilns have not been altogether successful, and following North American practice, five seven-hearth roasting furnaces and a 25x120-ft. reverberatory are being built, together with a 13x30-ft. Peirce-Smith converter and a Cottrell plant.

UTAH COPPER CO'S. PROPERTIES VISITED

All of the second day of the meeting was taken up with a visit to the mines and mills of the Utah Copper Co., and to the Garfield smelter of the American Smelting & Refining Co., where the Utah company's ores are treated. A special train of five cars was provided which ran direct from Salt Lake to the Magna mill, past the 100,000,000-ton tailing pile at the edge of Great Salt Lake. The present capacity of this mill is 24,000 tons a day, and it has been converted to an all-flotation plant. The visitors first saw the two massive Wellman-Seaver-Morgan car dumpers, each of which picks up an 80-ton car of ore and upsets it into the receiving bins. The ore is fed over a grizzly into a No. 27, 54-in. gyratory crusher, set to 6½ in. Further crushing is done in No. 9 gyratories and rolls, impact screens being the principal means used to separate the finer sizes. The tables formerly used ahead of flotation are no longer in service, and in the last month or two the mill has been run with an alkaline circuit using potassium xanthate as a flotation reagent, a procedure which has slightly increased the recovery. Janney flotation machines, with individual motors placed directly above the emulsion chamber, are still used

At the Meeting

- Agens, W. H., Los Angeles, Calif.
Ashcroft, J. L., St. Louis, Mo.
Anderson, L. D., Salt Lake City
Allen, H. P., Payson, Utah
Abbott, Stephen, Salt Lake City
Allport, R. H., Billings, Mont.
Askin, T. B. H., Denver, Col.
Ambler, J. B., Salt Lake City
Anderson, John Carter, Beverly Hills, Calif.
Anderson, Arvid E., Lark, Utah
Armstrong, L. K., Spokane, Wash.
Anderson, A. E., Denver, Col.
- Bell, Chas. M., Denver, Col.
Billings, Thos. Parry, Salt Lake City
Bradford, Robt. H., Salt Lake City
Blades, H. B., Salt Lake City
Bacorn, Harry Dix, Jardine, Mont.
Burch, Albert, Medford, Ore.
Boutwell, John D., Salt Lake City
Barker, E. E., Salt Lake City
Bonnemort, R. J., Sardis, B. C.
Bell, Robt. N., Boise, Idaho
Blanchard, C. H., Salt Lake City
Bateman, G. L., Johannesburg, South Africa
Bouton, Craig M., Pittsburgh, Pa.
Botchford, D. H., San Francisco
Berrien, Chauncey L., Butte, Mont.
Bardwell, Alonzo F., Salt Lake City
Brighton, T. B., Salt Lake City
Bowd, Geo. D., Salt Lake City
Bowman, R. G., East Chicago, Ind.
Boyd, Julian, Ryan, Calif.
Brinton, O. F., Butte, Mont.
Bain, H. Foster, New York City
Bourquin, J. E., Salt Lake City
Bardwell, M. E., Great Falls, Mont.
Booth, L. E., Salt Lake City
Barnard, Thos. A., Anaconda, Mont.
Bonner, W. D., Salt Lake City
Bunce, E. H., Palmerton, Pa.
Brugger, Melvin, Columbus, Neb.
Bacorn, H. C., Jardine, Mont.
Barnard, Enoch A., Anaconda, Mont.
Beam, A. W., Manila, P. I.
Brown, L. E., Salt Lake City
- Campion, E. W., Columbus, Ohio
Christensen, Carlos M., Salt Lake City
Cahoon, Leonard, Salt Lake City
Craig, Ben R., Salt Lake City
Cates, L. S., Salt Lake City
Crane, G. W., Salt Lake City
Conover, J. D., Miami, Okla.
Coghill, Will H., Miami, Okla.
Colbert, C. L., Elizabeth, N. J.
Cameron, Frank K., Salt Lake City
Corfield, R. J., Arthur, Utah
Corfield, C. W., Arthur, Utah
Cowie, Leland K., Anniston, Ala.
Clark, Frank R., Tulsa, Okla.
Chase, R. L., Glendale, Calif.
Clayton, Chas. Y., Rolla, Mo.
Cramer, R. F., Denver, Col.
Clevenger, Gaylen H., Boston, Mass.
Campbell, E. E., San Diego, Calif.
Crane, W. R., Birmingham, Ala.
Christensen, A. Lee, Salt Lake City
Crawford, John, Salt Lake City
Chapin, Theodore, Tampico, Mexico
- Dobbel, Chas. A., Eureka, Utah
Drullard, Howard, Salt Lake City
Dunn, H. E., Pittsburgh, Pa.
Dovey, C. C., Johnstown, Pa.
Dickinson, A. W., Jr., Rock Springs, Wyo.
Dyer, Bert W., Salt Lake City
Dick, J. C., Salt Lake City
Daveler, Erle V., Butte, Mont.
Dickson, T. A., Denver, Col.
Dickinson, A. W., Rock Springs, Wyo.
Dresser, Clarence G., St. Francis, Mo.
Darley, M. J., Salt Lake City
Dobson, Chris G., Lark, Utah
Dern, Geo. H., Salt Lake City
- Eye, C. M., San Francisco
Evans, J. C., Denver, Col.
- Elton, J. O., Salt Lake City
Eastman, Bernard, Payette, Idaho
Erickson, Arthur, Salt Lake City
Ellsworth, J. T., Park City, Utah
- Fitch, Cecil, Eureka, Utah
Fowler, Geo. M., Salt Lake City
Frith, C. W., Salt Lake City
Forrester, Bryce, Hiawatha, Utah
Ferry, W. Mont., Salt Lake City
Frets, Augustus Henry, Easton, Pa.
Fohs, F. Julius, New York
Friendly, O. N., Park City, Utah
Fulton, John A., Reno, Nev.
Frank, Alfred, Salt Lake City
Fieldner, A. C., Pittsburgh, Pa.
Fahrenwald, A. W. F., Moscow, Idaho
Fernald, Henry B., New York City
Fitch, Walter, Eureka, Utah
- Gardner, E. D., Tucson, Ariz.
Goodrich, H. C., Salt Lake City
Gates, John F., Salt Lake City
Gunderoth, Chas. Jos., Bonne Terre, Mo.
Garcia, John A., Chicago, Ill.
Goodale, Stephen L., Pittsburgh, Pa.
Gustafson, Arnold A., Duluth, Minn.
Gillan, S. L., Glendale, Calif.
Gayford, Ernest, Salt Lake City
Gates, Arthur O., Salt Lake City
Gowan, Justin B., Jr., Butte, Mont.
Glassbrook, C. I., Salt Lake City
Gardenier, E. E., Salt Lake City
Gerry, Clarence N., Salt Lake City
Guiteras, Jos. R., Laramie, Wyo.
Grant, W. M., Birmingham, Ala.
Gross, John, Salt Lake City
Gower, H. P., Ryan, Calif.
Gottsberger, B. Britton, New Haven, Conn.
Gates, Donald E., Lafayette, Ind.
Gray, Ralph S., Salt Lake City
- Howard, L. O., Pullman, Wash.
Henton, Hugh N., Pullman, Wash.
Horne, H. W., Salt Lake City
Huntoon, Louis D., Pleasantville, N. Y.
Hamilton, E. H., Montreal, Canada
Heikes, Victor C., Salt Lake City
Holstein, L. S., New York City
Hurley, J. J., New York City
Hodges, E. A., Salt Lake City
Hall, Newton L., LaSalle, Ill.
Herres, Otto, Salt Lake City
Harrington, Daniel, Salt Lake City
Hyde, Jas. M., Palo Alto, Calif.
Hanson, E. L., Bountiful, Utah
Hahn, A. H., Salt Lake City
Hanks, Abbott A., San Francisco
Heidenreich, W. Lee, Santa Monica, Calif.
Hofstrand, O. B., Salt Lake City
Hayden, W. F., Salt Lake City
Henderson, Chas. W., Denver, Col.
Hansen, Earl F., Bountiful, Utah
Hicks, H. C., Salt Lake City
Heikes, Geo. C., Butte, Mont.
Hall, R. Dawson, New York City
Handley, Robt. W., Tooele, Utah
Haas, Maurice, Tooele, Utah
Hodge, C. A., Salt Lake City
Head, R. E., Salt Lake City
Hanley, H. R., Rolla, Mo.
Hunt, Richard N., Los Angeles
Holt, S. P., Bingham, Utah
Havenor, H. E., Salt Lake City
Henderson, C. T., San Francisco
Holland, R. H., Garfield, Utah
Hastings, A. T., Los Angeles, Calif.
- Johnson, Homer L., Eureka, Utah
Jenks, J. H., Los Angeles, Calif.
Jess, John A., Duluth, Minn.
Johnson, H. Norton, San Francisco
Joseph, T. L., Minneapolis, Minn.
Jensen, N. H., Salt Lake City
Judd, Edward K., New York City
Johnson, O. H., Denver, Col.
Jessup, D. W., Midvale, Utah
Johnson, J. Fred, Wallace, Idaho
- Jacobsen, L. K., Salt Lake City
Jacobsen, Simon, Tooele, Utah
- Knight, J. Wm., Provo, Utah
Kniffin, Lloyd M., Fierre, N. M.
King, Clarence R., Randsburg, Calif.
Keyes, Harmon E., Tucson, Ariz.
Kinney, H. D., Easton, Pa.
Kennedy, S. A., Salt Lake City
Katz, Frank J., Washington, D. C.
Keough, O. E., Tooele, Utah
Kaattari, W. Arthur, Tooele, Utah
King, John McG., Denver, Col.
Krueger, Geo. S., Park City, Utah
Klingender, Henry Key, Salt Lake City
- Lindsay, W. R., Engelmene, Calif.
Lain, J. B., Reno, Nev.
Lynch, W. W., Jerome, Ariz.
Leboeuf, J. H., Long Beach, Calif.
Leaver, Edmund S., Reno, Nev.
Lillie, J. J., Eureka, Utah
Lyon, Dorsey A., Washington, D. C.
Lindau, S. Paul, Los Angeles
LaFlare, W. L., Denver, Col.
Lawton, V. O., Salt Lake City
Lawrence, H. W., Oakland, Calif.
Lewis, Robt. S., Salt Lake City
Ludnum, E. T., Denver, Col.
Laws, E. H., Carnegie, Pa.
Lincoln, Paul, Salt Lake City
Latham, Marc L., Yankee Hill, Calif.
Labbe, A. L., Salt Lake City
Longyear, Robt. Davis, Minneapolis, Minn.
Lemke, C. A., Midvale, Utah
Lund, Rupert E., Salt Lake City
Lundberg, Hans, New York City
Laughlin, G. F., Washington, D. C.
- McShane, O. F., Salt Lake City
Merrill, Chas. W., San Francisco
Mathews, Asa A. L., Salt Lake City
Millikan, C. V., Tulsa, Okla.
McDowell, J. S., Pittsburgh, Pa.
Merrill, Jos. F., Salt Lake City
Mitchell, H. McKay, Salt Lake City
Miller, Roy H., Great Falls, Mont.
Madge, Wm. C., Salt Lake City
Makin, Harold B., Provo, Utah
Morris, N. L., Salt Lake City
Murray, W. F., Salt Lake City
Mackenzie, A. G., Salt Lake City
Mix, B. E., Arthur, Utah
McCaskell, J. A., Salt Lake City
MacVichie, D., Salt Lake City
Moffat, J. F., Wallace, Idaho
Mabbs, J. K., New York City
Murray, Dr. Arthur L., Salt Lake City
McKenna, W. J., Tooele, Utah
Marriott, A. D., Denver, Col.
Myers, Walter F., Jr., York, Pa.
McKee, Arthur G., Cleveland, Ohio
Moffat, D. D., Salt Lake City
Mitchell, T. F., Salt Lake City
McDonald, Alex M., Butte, Mont.
McIntosh, Donald H., Salt Lake City
McElroy, G. E., Butte, Mont.
Mace, C. H., Denver, Col.
Miller, Virgil, Salt Lake City
McAuliffe, Eugene, Omaha, Neb.
Muir, Downie D., Jr., Salt Lake City
McChrystal, J. C., Salt Lake City
Marvin, Theodore, Wilmington, Del.
Munn, H. E., Salt Lake City
Mackenzie, J. D., Garfield, Utah
Mathes, Forrest, Salt Lake City
McKillican, Donald D., Jardine, Mont.
Mendenhall, W. C., Washington, D. C.
- Norton, W. W., Salt Lake City
Nighman, C. E., Conda, Idaho
Norden, J. A., Bingham, Utah
Newhouse, E. L., Jr., Salt Lake City
- Oldright, G. L., Salt Lake City
O'Connor, W. T., East Helena, Mont.
Overfield, C. P., Salt Lake City
O'Bryne, J. F., Golden, Col.
- Perkins, A. E., Salt Lake City
Paige, Sidney, Washington, D. C.
- Pascoe, Hubert Leonard, Salt Lake City
Pryde, Geo. B., Rock Springs, Wyo.
Penick, W. L., Salt Lake City
Probert, Frank H., Berkeley, Calif.
Perry, Vincent D., Butte, Mont.
Prince, Geo. W., Jerome, Ariz.
Paige, W. C., Tooele, Utah
Pauleson, M. A. V., New York City
Pack, Alvin, G., Washington, D. C.
Phibbs, Roberts, Provo, Utah
Pett, Imer, Salt Lake City
- Richardson, F. H., Salt Lake City
Ross, Clyde T., Washington, D. C.
Ramsey, Erskine, Birmingham, Ala.
Rice, Geo. S., Washington, D. C.
Rickard, Brent N., Salt Lake City
Rose, Don O., Salt Lake City
Rowch, W. F., Pittsburgh, Pa.
Robie, Edward Hodges, Oyster Bay, N. Y.
Roberts, Howard P., Washington, D. C.
Ricketts, L. D., Warren, Ariz.
Reynders, John V. W., New York City
Raney, C. F., Butte, Mont.
Reber, Louis E., Jr., Jerome, Ariz.
Ries, H., Ithaca, N. Y.
Ralston, Oliver C., Berkeley, Calif.
Rickard, T. A., San Francisco, Calif.
Ring, A. E., Salt Lake City
Rosenblatt, Girard B., San Francisco
- Smith, Frank M., Spokane, Wash.
Skillings, David N., Duluth, Minn.
Simpson, Gerald R., Long Beach, Calif.
Shubart, Benedict, Denver, Col.
Schwenck, J. Rae, Fair Oaks, Calif.
Schwerin, Lenher, Salt Lake City
Swain, S. R., Orange, N. J.
Sibbett, Geo. E., San Francisco
Senger, R. W., Garfield, Utah
Stickney, A. W., San Francisco, Calif.
Scott, Ralph A., Denver, Col.
Schneider, Chas. M., Salt Lake City
Sharpless, F. F., New York City
Steel, A. A., Parma, Idaho
Skeels, F. H., Bay Horse, Idaho
Sanders, W. Murray, New York City
Spicer, H. N., New York City
Soderberg, A., Salt Lake City
Strobel, Roger L., Salt Lake City
Sackett, B. L., Tooele, Utah
Spencer, Wm., Salt Lake City
Smith, H. I., Washington, D. C.
Strachan, Chas. B., Mascot, Tenn.
Smith, Geo. Otis, Washington, D. C.
Saxman, C. W., Salt Lake City
Swainson, S. J., Salt Lake City
Steiner, F. G., Chicago, Ill.
- Thomson, Andrew H., Moscow, Idaho
Thomson, Henry N., Vancouver, B. C.
Thomson, Francis A., Moscow, Idaho
Tonkin, John H., Salt Lake City
Turncaure, F. S., Houghton, Mich.
Turner, Scott, Toronto, Canada
Timm, W. B., Ottawa, Canada
Tegengren, F. R., Pekin, China
Tucker, E. L., Salt Lake City
Thompson, J. W., Salt Lake City
Thomas, Horace D., Laramie, Wyo.
Talmadge, Sterling B., Salt Lake City
Travis, Ira D., Salt Lake City
Thoeni, Victor T., Wyckoff, Minn.
Taylor, Jos. J., Montpelier, Idaho
Thomas, A. H., Columbus, Ohio
Treichler, H. E., Gulf, Texas.
Trask, W. H., Jr., Salt Lake City
- Uren, Lester C., Berkeley, Calif.
Vishnevsky, N. N., Salt Lake City

Van Asmus, Edward, San Francisco, Calif.
Van Winkle, C. T., Salt Lake City
Varley, Thos., Salt Lake City
Van Evera, DeWitt, Provo, Utah
Van Evera, J. Wilbur, Crosby, Minn.
Verdussen, J. A., Brussels, Belgium
Vrang, Christian, Salt Lake City
Walters, R. J., Denver, Col.

Weideranders, E. O., Salt Lake City
Walsh, Timothy D., Randsburg, Calif.
Wade, W. R., San Francisco, Calif.
Welcker, T. J., Salt Lake City
Wheeler, R. A., Seattle, Wash.
Woolley, Ralf R., Salt Lake City
Wiseman, Philip, Los Angeles, Calif.
Wilkin, G. S., Salt Lake City
Wilson, Alfred W. G., Ottawa, Canada

Wegner, Gilbert W., Tooele, Utah
Wade, Jas. W., Salt Lake City
Welch, J. Cuthbert, Tooele, Utah
Welch, Harry V., Los Angeles, Calif.
Watts, A. C., Salt Lake City
Wenk, Morris, Corvallis, Ore.
Williamson, F. O., San Francisco, Calif.
Wilson, W. A., Salt Lake City
Wilson, Byron, Wallace, Idaho
Walker, Wm. J., Dividend, Utah

Wallower, H. H., Baxter Springs, Kan.
Walters, Geo. W., Seattle, Wash.
Wichman, F. M., Salt Lake City
Wright, Morgan H., Butte, Mont.
Williams, Clyde E., Seattle, Wash.
Wadleigh, D. W., Midvale, Utah
Young, H. W., Midwest, Wyo.
Young, C. M., Lawrence, Kans.
Young, A. B., Salt Lake City
Zimmerly, S. R., Salt Lake City
Zalinski, E. R., Salt Lake City

(Continued from page 430)

ing mills using about 140 tons a day. Now that they have adopted an alkaline circuit, however, there is no market for the acid, and the plant has been shut down. Reverberatory furnaces alone are used for smelting, three being in operation, with two in reserve. These are fired with pulverized coal, ground 85 per cent through 200 mesh in twelve Raymond mills. Four of the furnaces are 120 x 23 ft. and one is 134 x 26 ft. Charging hoppers are being installed down the center of the furnaces as well as along the side walls. Eight Peirce-Smith converters, 13 x 30 ft. outside dimensions, are used for the final step in the process. One of the most charming of the ladies present, looking at these horizontal converters in action, wanted to know why they built fires in the ball mills here.

TECHNICAL PAPERS READ IN EVENING

Two technical sessions were held at the hotel in the evening, one devoted to mining and geology, and the other to metallurgy. The mining papers included the following:

"Deep Hole Prospecting at the Chief Consolidated Mines," by Charles A. Dobbel; "Electric Shovels and Caterpillar Tractors at Bingham," by H. C. Goodrich; "Notes on the Geology of East Tintic," by G. W. Crane; "Iron Fields of the Iron Springs and Pinto Mining Districts, Iron County, Utah," by Duncan MacVichie; and "Mining Methods in the Mother Lode District of California," by Stanley L. Arnot.

The first paper of the metallurgical section was "Lead Smelting in Utah," by B. L. Sackett, Carlos Bardwell, Simon Jacobson, and N. H. Jensen. After a brief discussion, D. W. Jessup presented his paper on "Evolution in the Preparation of Ore for Lead Blast Furnaces." In the discussion, it was brought out that the moisture in the feed to Dwight & Lloyd furnaces is ordinarily from 9 to 15 per cent for best results rather than from 7 to 9 as given by Mr. Jessup, though Mr. Jessup stated that ignition was difficult above 9 per cent. In the new concentrating plant at Midvale now under construction, and a photograph of which is shown on this page, an all-slime product will be made, and Mr. Jessup stated that double roasting might be required. The Pomeroy disk feeds were not successful at Midvale.

"Pulverized Coal as Fuel for Copper Refining Furnaces," by E. S. Bardwell and Roy H. Miller, was read in abstract by the first named. Oil is now more economical, so it is used instead of coal; results are practically the same, though Mr. Bardwell stated that the repair cost is likely to be a little higher with

oil than with coal. Per ton of copper refined, 294 lb. of coal is used, compared with 151 lb. of oil. Coal dust up to 5 per cent moisture might be used, though as much moisture as this might cause trouble by making the dust stick in the bins.

"The Chief Consolidated Volatilization Process and Mill," by G. H. Wigton, was read by J. S. Olmstead. Thomas Varley offered a written discussion. Replying to a question as to how the metals were volatilized, it was stated that the silver and lead were in the metallic form, though some compound of lead with sulphur might be present. As to gold, Mr. Olmstead did not know, though it was present as metal in the precipitated fume. The last paper of the evening was by R. G. Bowman on "Anaconda Electrolytic White Lead." About twenty-six tons of white lead per day is now being produced at the East Chicago plant.

FIELD TRIPS TAKE UP LAST TWO DAYS

Wednesday and Thursday were taken up with field trips to the many interesting mines, mills, and smelters in the vicinity of Salt Lake. On Wednesday, one party went to the Murray and Midvale lead smelters and the Midvale mill, while those interested in iron went to the smelter of the Columbia Steel Corporation at Iron-ton. Luncheon was served at the Hotel Roberts at Provo, for those who went to Iron-ton, whereas the guests at Midvale regaled themselves on the lawn of the manager's residence as shown in the accompanying photograph on page 430.

Wednesday evening, a banquet was tendered the visiting guests at the hotel. The steak and French fried was enlivened by songs and dances by cabaret and vaudeville performers, aided by some of the members at near-by tables. J. C. Dick was chairman, W. Mont Ferry, toastmaster, and the speakers included J. V. W. Reynders, George H. Dern, and Charles S. Thomas. T.

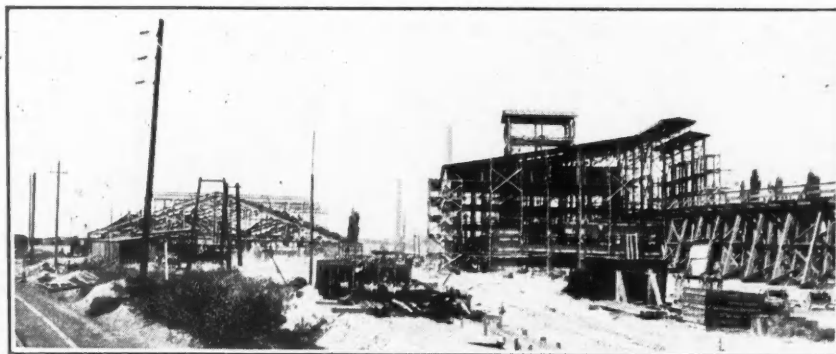
A. Rickard graciously thanked the Utah members of the Institute for the mental and physical hospitality offered their guests at the various meetings and his words were silently seconded by all the guests present, for certainly nothing further could have been done in the way of releasing technical information, in providing transportation, or in attending to the wants of the inner man. A dance on the roof of the hotel was perhaps the most enjoyable social feature of the meeting.

Various field trips by stage and special train marked the last day of the meeting. These included Tintic, Park City, and Tooele. Unfortunately, the underground luncheon at the Silver King Coalition had to be called off on account of the large number present, and the road to the Park-Utah mine was impassable for the stage on account of a light rain. The Tintic party returned to Salt Lake at 8 p.m. tired and hungry, but happy at the close of what was certainly as successful a meeting as the Institute ever had.

California Organizations Plan To Discuss Mine Problems

Arrangements are being completed for a series of joint regional conferences this fall throughout California, to formulate a state-wide working program for the advancement of the mineral industry, by the California Development Association, the Department of Mines and Mining of the Sacramento Chamber of Commerce, the Mineral and Allied Industries of California, the California Metal and Mineral Producers Association, and the California Chapter of the American Mining Congress.

Northern and Central California meetings will be as follows: Grass Valley, Tuesday, Sept. 15; Stockton, Friday, Oct. 9; Redding, Tuesday, Oct. 13; Sacramento, Oct. 26. Meetings are now being arranged at San Diego, Los Angeles, and Randsburg or Bakersfield.



New 700-ton concentrator of the United States Smelting, Refining & Mining Co. at Midvale, Utah, as the visitors saw it. The smelter is some distance in the background

Men You Should Know About

Carl O. Lindberg, of Los Angeles, is in New York.

E. T. McCarthy left Australia for the Malay States on Aug. 19.

Edwin A. Sperry, professor of mining in the University of Tientsin, China, is at his home near Sacramento, Calif.

Simon Guggenheim, president of the American Smelting & Refining Co., has received from the University of Colorado the degree of Doctor of Laws.

John R. Suman, of Houston, Tex., vice-president of the Rio Bravo Oil Co., is making a vacation tour through the Western States and Canada.

H. D. Budelman, mine superintendent for the West End Consolidated Mining Co., at Tonopah, Nev., has returned to Tonopah from a business trip to Los Angeles.

Paul C. Schrapes, metallurgist for the South American Development Co. of Guayaquil, Ecuador, is in California investigating various phases of the cyanide process.

T. A. Rickard, contributing editor of *Mining Journal-Press*, was among the members of the A.I.M.E. who visited Salt Lake City to attend the summer meeting of the Institute.

C. T. Fairbairn, of Birmingham, Ala., general manager of the southern district for the Republic Iron & Steel Co., is making a ten-day visit to Duluth and the iron ranges of Minnesota.

Ellsworth R. Bennett, of Rochester, Nev., has been appointed an interim member of the Nevada tax commission, to serve in place of Commissioner Marsh, who is absent from the state.

L. R. Robins, general superintendent of the Tonopah Belmont Development Co., has returned to Tonopah, Nev., from Wickenburg, Ariz., where his company has optioned a promising property.

David Donoghue, geologist of the Marland Oil Co. of Texas and formerly consulting geologist, has resigned to accept the position of chief geologist of the Texas Pacific Coal & Oil Co.

Dr. W. S. McCann, formerly of the Geological Survey of Canada, is making an investigation of the bauxite deposits of British Guiana on behalf of the British Aluminium Co. and its associated companies.

Verne D. Johnston, of Ironwood, Mich., geologist for the Oglebay-Norton Co., has been transferred from the mining headquarters in Ironwood to the general office in Cleveland, Ohio, where he will now make his home.

H. Kenyon Burch has been appointed consulting engineer to have charge of the design and construction of a concentrating plant to treat a portion of the ores from the mines of the United Verde Copper Co. at Clarkdale, Ariz.

John Borg, of New York, president of the Callahan Zinc-Lead Co., after spending a month at Wallace, Idaho, in connection with the company's operation, has returned to the East, going by

way of Georgian Bay, Ontario, where he planned to stop for a week.

C. C. Thoms, deputy supervisor of the Department of Petroleum and Gas of the California State Mining Bureau, has been transferred to Santa Paula; **H. A. Goode** has been transferred to Taft and **E. Huguenin** to the Los Angeles district.

J. J. Warren, president of the Consolidated Mining & Smelting Co. of Canada, has returned to Toronto after a visit to the company's properties in British Columbia. He stated that there was sufficient ore in sight on the Sullivan property to supply the smelter for some years.



Edward H. Robie

Edward Hodges Robie, assistant editor of *Mining Journal-Press*, attended the meeting of the A.I.M.E. at Salt Lake City last week. His report of the meeting appears on pages 428-432 of this issue. From Salt Lake he left for Colorado, where he will visit various mining camps and smelters. He expects to spend some time in the Joplin-Miami district before his return to New York.

John R. Seigart, of Iron Mountain, Mich., and **M. E. Willmott**, of Clayton, Idaho, manager of lead mining operations of the Ford Motor Company in Idaho, were recent visitors in the Cœur d'Alene mining district, Idaho. They were accompanied by **Robert N. Bell**, of Boise, for many years mine inspector for the State of Idaho.

James Horsburg, assistant general manager of the Mount Morgan Company, Queensland, lately returned to Australia from a trip to America. He was sent to this country especially to investigate the latest methods of handling and treating copper-bearing ores, and when the last American mail left his report was being considered by the Mount Morgan directors, in connection with the question of whether the mine would be permanently closed down, following an increase of wages and a decrease of working hours.

Owen Letcher has severed his connection with the *South African Mining and Engineering Journal* and is succeeded by **Engineer Lieutenant-Commander J. Burnard Bullock, R. N. (S.R.)**. Mr. Bullock, who is an honors graduate in physics of Diocesan College, Rondebosch, and in electrical engineering of Durham University, and a chartered electrical engineer, has been associated with mining and engineering in the Transvaal for the last twelve years. **J. E. Mills Davies** will act as assistant editor. Mr. Davies is a South African, and came to the Transvaal before the Anglo-Boer War as a representative of Messrs. Bambridge, Seymour & Co., consulting mining engineers, London. His first work in South Africa was a prolonged investigation of the geology and mineral prospects of the country between Rehoboth and the Orange River on behalf of the Hon. C. J. Rhodes and others in Kimberley.

William Chattin Wetherill, of the Department of Mechanical Engineering, University of Pennsylvania, has joined the staff of the Department of Commerce to act as director of investigations into the utilization of metals, the introduction of simplified practice, and the elimination of waste in the metal-using industries. Mr. Wetherill is widely known in engineering and industrial circles, and has also had extensive experience in important naval engineering work. He is on a year's leave of absence from the University of Pennsylvania, where he has been for three years assistant professor of experimental engineering. He entered the Bureau of Construction and Repair, U. S. Navy, during the World War. In the Navy Department he was assistant in the construction of naval aircraft, and in this connection was sent to Europe to investigate the navy's air equipment. Since 1920 he has been connected with the Engineering School of the University of Pennsylvania, and for the last three years has directed important experimental engineering work. The most important of the metals which are to be taken up, under the direction of Secretary of Commerce Hoover, are iron, copper, tin, lead, and zinc. Already the Department of Commerce, through the Bureau of Standards, the Division of Simplified Practice, the Minerals Division, Iron and Steel Division, Machinery Division, and Specialties Division of the Bureau of Foreign and Domestic Commerce, has brought about important developments, both as to improving methods and processes and to the development of domestic and foreign markets. And it is at the request of the metal industries, together with offers of their co-operation, that the activities are to be correlated and an effort made to make the program thoroughly comprehensive and nation-wide. In connection with Mr. Wetherill's work, it has been pointed out that annual savings to five relatively small groups in the iron and steel field through the co-operation of the Division of Simplified Practice had totaled nearly \$25,000,000 and that this division's work was but one phase of the Department of Commerce co-operative service to the industries of the United States.

New Machinery and Inventions

Convertible Shovel-Crane Is Tractor-Mounted

A half-yard full revolving shovel crane has recently been added to its line by the Harnischfeger Corporation, Milwaukee, Wis. It is known as Model 204 and can be used, with its 30-ft. boom, either as a shovel or a crane. It has a rated lifting capacity of 13,000 lb. at 10 ft. radius, which is 75 per cent of its tipping capacity.

The power is supplied by a single gasoline motor developing 40 hp. at 960 r.p.m., although an electric motor can be supplied if desired. The two main drums are independently mounted on separate shafts and have a standard line speed of 110 ft. per min. Both the revolving frame and car body frame are of cast steel in one piece. The corduroy frames are heavy steel castings. The treads are non-cloggable and the tread rollers are swiveled in two directions to adjust to any irregularities of the ground. All gears are well guarded to protect the operator and the first reduction and travel gears are fully enclosed, running in oil. There are two travel speeds— $\frac{1}{4}$ and $1\frac{1}{2}$ m.p.h. either forward or reverse.

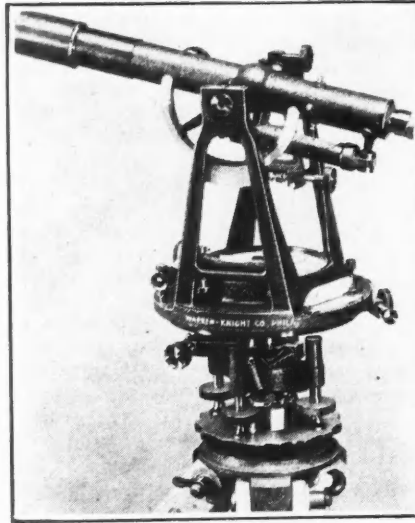


Convertibility from shovel to crane is a feature of this excavator, which is tractor-mounted and gasoline-engine driven

The main machinery and operator's platform are fully enclosed in an all-steel cab. When equipped for shovel operation an all-steel box section boom with outside dipper sticks is used.

A New Precision Transit

Features of construction embodied in a new precision transit just brought out by Warren-Knight Co., of Philadelphia, Pa., give the instrument accurate and permanent adjustment under rough usage, it is claimed by the makers. The bronze standards of this transit, which is named the "Sterling" are combined with a special system of top plate ribbing designed to act as a single unit. Cylindrical bearings carry the telescope axle whose adjustment is effected by the use of opposing capstan nuts. The telescope is $11\frac{1}{2}$ in. long, with disappearing stadia arrangement, permitting cross wires to be focused with or without the stadia. This hori-



Sturdiness marks the construction of this new precision transit

zontal limb is $6\frac{1}{2}$ in. diameter at graduated edge, numbered 0 deg. to 360 deg. on silver; double verniers located at 30 deg. to the line of sight read to single minutes. The vertical arc is of 180-deg. type reading by double vernier to single minutes. The compass is graduated in quadrants with the figures slanted to indicate the direction of reading. The center is of extra large diameter and 7 deg. taper. Materials used are bell metal for inside center, phosphor bronze for the middle center, and bronze for the leveling head. Tangent clamp screws are provided with opposing springs and adjustment for taking up the wear. The weight of the transit is 16 lb. The tripod of spruce weighs 11 lb.

Improved Milling Machines Have Greater Cutting Capacity

Equipping the mining company's machine shop properly is a matter that should not be overlooked. Machines and machine tools are quite as important in their way as much of the equipment that finds its way into the mining and concentrating departments. Anything new in this line therefore possesses a certain interest for the master mechanic and the superintendent. Recently several new types of milling machines which are provided with tapered roller bearings, automatic and centralized oiling systems, and which provide for rear control and convenient operation, have been designed by the Cincinnati Milling Machine Co., of Cincinnati, Ohio.

A sliding gear transmission mounted in tapered roller bearings and providing sixteen spindle

speeds is the feature of these new machines. The tapered roller bearings bring about a smooth cutting action and enable the user to obtain a greater per cent of power through the elimination of friction. With this device the machine has a 15 per cent greater cutting capacity, removing that much more metal than previous designs.

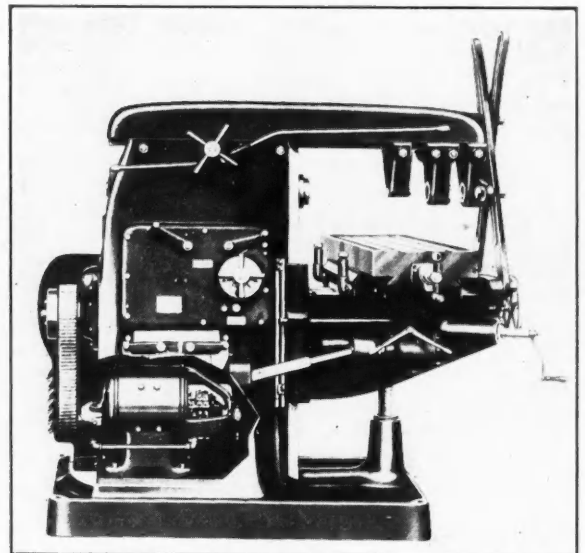
To eliminate the old system of lubricating through individual holes, which resulted in the loss of considerable time and frequent overlooking of necessary parts, these new machines are provided with automatic oiling. All the mechanism within the pyramid column, including the feed box, is automatically lubricated by means of a pump system. The knee, saddle, and table are completely oiled from five stations, thus saving considerable time and assuring the oiling of all parts. The reservoirs and oilers are large.

The power quick traverse permits of ease and speed of operation. On the plain type of machine this power quick traverse, operated by a single lever at the front of the machine, enables the table to travel in either direction at a speed of 100 ft. per minute. The lever automatically stops when the operator's hand is removed.

On many milling jobs and tool room boring jobs it is necessary for the operator to observe the action of the cutter from behind the machine. To facilitate such work a rear control has been designed which enables the operator to stand behind the machine and watch the operation without fear of inefficient work.

These high-power machines are of rigid construction. The column, of pyramid form, gradually tapers from the overarm to the base. An inclosed Westinghouse motor drive is provided within the column for silent chain drive. Sixteen spindle speeds are provided by means of a sliding gear transmission.

Full safety to the operator is provided for. The automatic spindle stop, operated by pulling the starting lever down, brings the spindle to rest immediately, and all universal joints are well guarded.



New type of milling machine with part of outer frame cut away to show motor setting

The Market Report

Good Business in Non-Ferrous Metals

**Zinc Market Strong With Better Prices—Lead Easier but Steady—
Copper Reacts From 14.825c. Delivered**

New York, Sept. 9, 1925—A surprisingly large volume of business in each of the major non-ferrous metals was done during the week ending today, in spite of the Labor Day vacation. Most of the activity was on Thursday and Friday of last week, buyers apparently making their purchases so as to have their minds easy for the holidays. Considerably more copper was sold than

during either of the three weeks immediately preceding, 14.75c. delivered being the prevailing figure. Fairly large sales of lead were made both last week and this. Zinc appears to be the strongest of the trio. A net gain of 0.15c. per lb. was made during the week. Silver reached 72 $\frac{3}{4}$ c. last Saturday, though it has reacted slightly since.

London Cables Hurt Copper Market

Some copper was sold at 14.875c. delivered in the West on Thursday and Friday of last week, and an excellent tonnage brought 14.75c. and 14.82 $\frac{3}{4}$ c. in the Valleys. Cables from London on Tuesday and Wednesday showed sharp declines, and buyers are disinclined to meet the asking prices of most producers today. Business has been actually done at 14.625c. and 14.70c. delivered, at which metal can be obtained in several directions. Others are quoting as high as 14.82 $\frac{1}{2}$ c. and are virtually out of the market. Domestic producers are doing no business abroad, their quotations of 15c. and 15.05c. c.i.f., being nominal. Sales at 14.675c. c.i.f. are reported to have been done in Europe today. The Western Union Telegraph Company purchased 3,500,000 lb. of copper during the week. Producers are puzzled as to who got the business. The "mystery" is cleared by reliable information that the purchase was made from wire makers, one company supplying 2,500,000 lb. Agencies continue to be content not to force metal on the market, though inquiry is fair and good sales could be made if prices were shaded.

Daily Prices of Metals

Sept.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
3	14.475@14.575	55.25	57.00	9.50@9.60	9.25@9.55	7.575@7.625
4	14.50	56.00	57.75	9.50	9.25@9.55	7.65@7.70
5	14.50	56.00	57.75	9.50	9.30	7.65@7.70
7	.....	.....	.....	.....	.....	.....
8	14.50	55.875	57.625	9.50@9.55	9.25	7.70@7.725
9	14.375@14.45	55.625	57.375	9.50	9.25	7.725
Av.	14.488	55.750	57.500	9.515	9.320	7.678

*The prices correspond to the following quotations for copper delivered: Sept. 3d, 14.725@14.825c.; 4th and 5th, 14.75c.; 7th, holiday; 8th, 14.75c.; 9th, 14.625@14.70c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of Mining Journal-Press and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

St. Louis Lead Declines

The American Smelting & Refining Co. maintained its official contract price for New York lead at 9.50c. all week. The leading interest in the West, on the other hand, is quoting 9.25c. in the St. Louis market, thereby putting the two major lead markets in approximately their normal relation. Last Thursday in New York a good-sized shipment of early-delivery lead brought 9.90c. and since then some small lots have been sold at 9.55c., but the market is dominated by the contract sales of the leading interest, which continue on the same relatively large scale as that prevailing during August. Demand is well distributed between battery makers, paint manufacturers, motor-car companies, and cable interests. Some urgent demand for September lead for foreign shipment has developed, which may have a buoyant effect on the domestic market.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
3	62	63	67 $\frac{1}{2}$	252 $\frac{7}{8}$	255 $\frac{3}{8}$	37 $\frac{1}{2}$	35 $\frac{7}{8}$	36 $\frac{3}{4}$	36 $\frac{3}{16}$
4	62 $\frac{1}{2}$	63 $\frac{3}{8}$	68 $\frac{1}{2}$	255 $\frac{3}{8}$	258 $\frac{1}{2}$	38 $\frac{1}{4}$	36 $\frac{1}{4}$	36 $\frac{3}{4}$	36 $\frac{1}{4}$
7	62 $\frac{5}{8}$	63 $\frac{3}{8}$	68 $\frac{1}{2}$	257	259 $\frac{1}{2}$	38 $\frac{1}{2}$	36 $\frac{1}{4}$	36 $\frac{1}{4}$	36 $\frac{1}{4}$
8	62 $\frac{1}{4}$	63 $\frac{1}{4}$	68 $\frac{1}{4}$	256 $\frac{1}{4}$	258 $\frac{1}{4}$	38 $\frac{1}{8}$	36	36 $\frac{1}{8}$	36 $\frac{3}{8}$
9	62	63	67 $\frac{1}{2}$	254 $\frac{1}{2}$	257	38	35 $\frac{7}{8}$	36 $\frac{1}{8}$	36 $\frac{7}{16}$

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Zinc in Excellent Demand

Increased demand on the part of galvanizers has added strength to the zinc market, a consistent increase in the quotation having been recorded each day during the week. In some quarters it is believed that Europe will be in need of American zinc during the next month or two, and this, in connection with the strong domestic demand and the fact that no great increase in production from American mines is in sight, makes zinc producers optimistic. The supply of visible zinc is equivalent to only about two weeks' consumption at the present rate, viewed from a

Silver, Gold, and Sterling Exchange

Sept.	Sterling Exchange "Checks"	Silver		Gold London	Sept.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
3	4.84 $\frac{1}{2}$	72 $\frac{3}{8}$	33 $\frac{1}{4}$	84s11 $\frac{1}{2}$ d	7	.....	72	33 $\frac{3}{8}$	84s11 $\frac{1}{2}$ d
4	4.84 $\frac{3}{8}$	72 $\frac{3}{8}$	33 $\frac{3}{8}$	84s11 $\frac{1}{2}$ d	8	4.84 $\frac{1}{2}$	72	33 $\frac{1}{8}$	84s11 $\frac{1}{2}$ d
5	4.84 $\frac{1}{2}$	72 $\frac{7}{8}$	33 $\frac{7}{8}$	.....	9	4.84 $\frac{3}{8}$	72	32 $\frac{1}{8}$	84s11 $\frac{1}{2}$ d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

world-wide standpoint. For the present, Europe remains below American parity. High grade is quoted at 8.75c. per lb., the ruling figure for several weeks.

Tin Market Listless

Though domestic business in tin has been comparatively small, the price for prompt Straits strengthened during the week, closing at 57.375c. or 0.75c. above the figure for last Wednesday. Some weak interests in London, whose offerings are supposed to have depressed the market last week, are now believed to be out of the market.

Silver Advances to New High, Then Reacts

On Sept. 5, new high prices for the year were reached in both London and New York. Continued purchases for China account were responsible for the advance, but when China turned seller there was a sharp reaction. This drop was only natural when the sole support of the market was removed, but New York sellers are reluctant at the lower level and the market appears steady.

Mexican Dollars: Sept. 3d and 4th, 55½c.; 5th, 56c.; 7th, holiday; 8th, 55½c.; 9th, 55½c.

Rise in Lire Features Exchange

Italian lire again took a decided jump, increasing from 3.84c. to 4.10c. during the week. The other principal foreign exchanges remained virtually stationary. Closing quotations on Tuesday noon, Sept. 8, were as follows: francs, 4.70c.; lire, 4.10c.; and marks 23.8c.; Canadian dollars are now at a discount of 0.0271 per cent, against a slight premium last week.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £118 @ \$120 per long ton for 98 per cent.

Antimony—

Chinese brands, spot, 17@17½c. per lb.; September, 16½@17c.

Market firmer and active, with good demand for spot and early arrival.

Cookson's "C" grade, spot, 19½c.

Needle and oxide nominally unchanged from quotations in the Sept. 5 issue.

Bismuth—\$2.65@2.70 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s. 3d.

Iridium—\$400 per oz. for 98@99 per cent. Nominal. London, £75@£80.

Nickel—Ingot, 33@34c.; shot, 34@35c.; electrolytic, 38c.; London, £170 @ £175 per long ton.

Palladium—\$78@83 per oz. Crude, \$65. London, £16 10s. nominal.

Platinum—\$120 per oz. refined officially quoted. Sales also at \$115@118. Crude, \$113.50@114. London, £25 per oz. for refined; crude £23.

Quicksilver—\$81@81.50 per 75-lb. flask. London, £13 10s.@£13 12s. 6d. Market very dull.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium,

Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten and Zirconium are unchanged from the Sept. 5 issue.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports:

Brazilian, 42@44c.

Indian, 44c.

Caucasian (unwashed), 42c.

Caucasian (washed), 44c.

Tungsten Ore—Per unit of WO₃, N.Y.:

High-grade wolframite, \$12@12.50. Ordinary quality, \$11.75. Market quiet

as a consequence of large buying during the last month. Consumers fairly well covered for remainder of the year.

High-grade Western scheelite, \$12.50 @ \$13, nominal.

Chrome Ore—Indian ore—second grade—offered c.i.f. New York at \$19 per long ton. High grade Indian ore, \$22@23.

Galena and Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum, and Vanadium Ores are unchanged from quotations in the Sept. 5 issue.

Zinc Blende Higher— Lead Ore Lower

Joplin, Mo., Sept. 5, 1925

Zinc Blende		Per Ton
High	.....	\$58.50
Premium, basis 60 per cent zinc	.....	\$56.00@57.00
Prime Western, 60 per cent zinc	.....	\$54.00@55.00
Fines and slimes, 60 per cent zinc	.....	\$53.00@50.00
Average settling price, all.	.....	\$53.34
Lead Ore		Per Ton
High	.....	\$135.20
Basis 80 per cent lead	.....	\$120.00
Average settling price, all.	.....	\$128.10

Shipments for the week: Blende, 13,440; lead, 3,693 tons. Value, all ores the week, \$1,190,630.

It is currently reported that one purchasing agency contracted 4,000 tons of blende today, with the price to be set by the seller, not exceeding the high basis price of the class of ore purchased.

The output has advanced to 16,600 tons per week, insufficient to supply domestic needs when the tonnage exported is deducted. Another export agency loaded 12 cars, in addition to 52 cars loaded by the Hirshler company this week.

Lead offerings dropped twice today, \$5 each decline, closing at \$120 basis offered, with very few sales reported on the lowered quotations.

Platteville, Wis., Sept. 5, 1925.

Zinc Blende		Per Ton
Blende, basis 60 per cent zinc	.....	\$55.50
Lead Ore		Per Ton
Lead, basis 80 per cent lead	.....	\$120.00

Shipments for the week: Blende, 790 tons; lead, none. Shipments for the year: Blende, 32,378; lead, 1,396 tons. Shipments for the week to separating plants, 1,629 tons blende.

Non-Metallic Minerals

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fluorspar,

Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Sept. 5 issue.

Mineral Products

Arsenious Oxide (White arsenic)—3.75c. per lb.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and Zinc Oxide are unchanged from prices in the Sept. 5 issue.

Ferro-Alloys

Ferrotungsten—\$1.15 per lb. contained W. Market firm.

Ferrocerium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from the prices in the Sept. 5 issue.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16½c. per lb.

Nickel Silver—29½c. per lb. for 13 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Sheets, 20½c. per lb.; rods, 17½c.

Lead Sheets—Rolled, 13½c.; clipped, 13½c.

Zinc Sheets—11c. per lb., f.o.b. works.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and Zirkite are unchanged from prices in the Sept. 5 issue.

Steel Prices Steady—Pig Iron Quiet—Coke Higher

Pittsburgh, Sept. 8, 1925

The steel trade seems now to have struck a steady gait, to be maintained with less change than is common with steel until the end of 1925, excepting possibly such slackening as often occurs in the late weeks of the year.

A continuance of present production, allowing for a little decrease in December, would make the year's ingot production 42,000,000 tons. This would be 3 per cent below that of 1923 and 3 per cent above that of 1920, the two best tonnage years since the war, so that there is a probability this year will rank second best of the seven post-war years.

Pig Iron—The Pittsburgh and Valley market has not shown activity, as have a few other districts. Prices show no tendency to change: Bessemer, \$19; basic, \$18; foundry, \$18.50, f.o.b. Valley furnaces.

Connellsville Coke—Buying of furnace coke in the east has turned lighter again, but prices are quotable a little higher, at \$3.50 to \$3.75. Merchant operators are slow to blow in ovens, fearing labor scarcity, if not trouble, as their wages are 30 per cent below those of the Frick company, which has lately blown in not a few ovens. Spot foundry coke is quotable up 25c., at \$4@4.50.

Situation at the Mines

By Albert H. Fay

Assistant Editor

THE continued high price of lead, zinc and silver, as well as the increase in copper prices had a stimulating effect on the mining industry as a whole. The average price of these leading metals was the best it has been in six months. With copper on hand in storage at the lowest since the war period, and the demand continuing active, both for foreign and domestic account, the outlook for this industry is encouraging.

Average Metal Prices

Period	Copper	Lead	Zinc	Silver
March	14.004	8.914	7.319	67.808
April	13.252	8.005	6.985	66.899
May	13.347	7.985	6.951	67.580
June	18.399	8.321	6.990	69.106
July	13.946	8.151	7.206	69.442
August	14.490	9.192	7.576	70.240

Dividends. Dividends paid in August were somewhat less than paid in any of the three months previous. However, there has been increased mining activity due to better metal prices, so that the August dividends in 1925 were about \$3,000,000 in excess of the amount paid in August, 1924. The Keystone Mining Company, Utah, enters the list of dividends payers with a distribution of \$67,500. The Anaconda paid \$2,250,000 in August of this year, while the dividend was passed a year ago. The Hecla mine declared a dividend of \$500,000 payable September 15. A number of other companies have declared dividends payable in September.

Copper—The surplus stock of copper on hand the latter part of August was 176,000,000 lb., compared with 750,000,000 lb. in August, 1921. The Anaconda company announces that the Great Falls plant will be increased 33½ per cent. Small mines in Butte are more active. The Cerro de Pasco Co. has completed the first unit of the Cottrell precipitating plant, the initial results of which are very satisfactory. The same company is producing at the rate of 7,000,000 lb. of copper per month. The Verde Central, in Arizona, reports the discovery of a large deposit of copper carbonate and development work is being vigorously pushed. The Denn mines, at Bisbee, are being reopened. The Van Dyke Copper Co. is prospecting with rotary drills. The large mines of Arizona are all working at full capacity. The Allenby Copper Co., B. C., employs 200 men and has begun shipments to the Trail smelter. Regrinding plant at Mohawk Mines, Mich., increases production, and satisfactory results are obtained from the reclamation plant of the Calumet & Hecla. The labor conditions in Michigan are not encouraging. It is difficult to recruit skilled miners. The turnover is large, and serious consideration is now given to mechanical devices to supplement hand labor. A number of men from coal fields and some from the iron country have been employed recently in the copper mines. In California the final shutting down of the Mammoth smelter, at Kennett, leaves only two large properties operating in Shasta County.

Silver—The price of silver is the highest in months and practically all inactive silver mines are taking on new life. New silver ore deposits are reported in Boulder and Gilpin Counties, Colo. The Canadian-Lorrain mine has opened rich silver ore and native silver in substantial quantities.

Silver-Lead—The silver-lead-zinc producing companies of the West are enjoying unusual prosperity by reason of the shortage of lead and the consequent high prices for both lead and zinc as well as silver. The situation has had a marked influence, during the past few months, on the main silver-lead-zinc properties in the Northwest, especially in the Coeur d'Alene district, Idaho, and the Slocan and Kimberly districts of British Columbia. All of these districts are now the most active and prosperous in the West. The Duthie mines enters the list of shippers after a year's idleness. The Trail smelter is re-treating the old flue dust from the Granby smelter at Grand Forks. At Leadville, Colo., there is a marked increase in ore shipments, of approximately 40 per cent over the month of August, 1924. Conditions at Silverton are better than at any time in the last ten years. In the Tonopah district, the Tonopah Western Mining Co. provided \$100,000 for exploration work.

The Gold Hunter mines acquire control of the Atlas Mining Co. in the Coeur d'Alene. Henry Ford is developing lead mines in Custer County, Idaho. The Hecla mine reserves are greatly increased by recent discoveries. In southeast Missouri the St. Joseph Lead Co. has reopened Mine La Motte. In Inyo County, Calif., the strike at Ophir on the Engineer's Exploration property has attracted considerable attention.

Zinc—Continued good prices for zinc and lead ore brought about steady activity in the Joplin-Miami district during August. Production, at the first of the month about 14,500 tons per week, advanced to more than 16,500 tons at the month's close. However, night shifts are not popular and comparatively few companies are using them. The month saw the passing of the district's largest concentrator when the Oronogo Circle mill was destroyed by fire.

The California Zinc Co. is producing 2,000 tons of concentrates per month from Shasta County mines which were formerly worked for copper. Zinc ore is reported as having been discovered near Sudbury, Ontario. The Nabob Silver-Lead Co. reports the discovery of a vein of zinc ore in the Coeur d'Alene district, Idaho. In British Columbia, the Lucky Jim Lead Zinc Co., at Rosebery, is shipping eight to ten carloads of zinc and two cars of lead concentrates from its mill monthly.

Gold—In California the gold-dredging industry employs 19 dredges; 4 in northern California, 2 at Oroville, 12 at Marysville and Folsom and 1 at La Grange. The Trinity Dredging Co. is constructing a new dredge to be placed in operation on the Trinity River near Lewiston, Cal. Lode mining retains about the same position as in July, with slightly increased activity in the Grass Valley area. In Colorado the Cresson Gold Mining Co. has discovered a new body of high-grade ore. Placer mining in Arizona on the Hassayampa River and its tributaries is proving profitable. In Canada a deposit of gold-bearing ore on the Waite claim, Rouyn district, is being developed rapidly. The Noranda mine is planning to erect a smelter to handle its copper-gold ore. The McIntyre mines, Porcupine, Ontario, are producing at the rate of \$300,000 per month. The Hollinger mine is milling 5,400 tons per day, yielding an income of \$50,000 per day.

In the foreign fields the outstanding feature was the fifty-year concession obtained from Russia by the Lena Goldfields Ltd., by which the holdings of three other large corporations are merged into the Lena concession.

Iron—Shipments of iron ore from the Lake Superior district in August totaled 8,532,726 tons. The total to Sept. 1 this year is 35,457,160 tons. Present indications are that 56,000,000 tons will be shipped this season, against 46,000,000 tons in 1924. The ore is moving from the mines at a fairly good rate and the outlook for the winter months is good. Plenty of labor is available. Wages remain the same. Henry Ford has started exploratory operations with diamond drills on lands taken under option on the Marquette range. There have been no important changes at the mines. A shortage of water is causing some concern on the Michigan ranges, where considerable current is derived from hydro-electric plants. One company is putting in steam pumps in place of electric because of this current shortage.

The Oliver Iron Mining Co. has started both units of the crushing and screening plant at Hibbing. This \$1,000,000 plant is giving satisfaction and can take care of all the lump ore the mine can produce. Its maximum capacity is about 300 fifty-ton cars in ten hours. The Morton mine was taken over by the Inland Steel Co.

General—The U. S. Borax Company wins its suit regarding the validity of lode claim patents on colemanite deposits. The Tri-State conference at Phoenix on the utilization of the Colorado River ended in a failure to come to any agreement. The Spokane Stock Exchange is enforcing its new rule requiring all mining companies desiring to be listed to furnish detailed information regarding their properties. Phosphate mines in Tennessee are operating at full capacity. The first airplane shipments of steel pipe were made in Idaho. A new mining association has been formed at Boise, Idaho, to advance the interests of the industry.

Company Reports

Howe Sound Co.

Copper; British Columbia—Lead; Mexico

The Howe Sound Co. report for the six months ended June 30, 1925, shows net income of \$369,398, after depreciation and bond interest, but before depletion. Income account for six months ended June 30, 1925, as follows:

Gross	\$3,172,854
Operating costs	2,562,433
Operating income	\$610,421
Other income	94,452
Total income	\$704,873
Depreciation and interest	335,475
Net income (a)	\$369,398
(a) Before depletion	

The company produced 906,035 oz. of silver, 13,372,641 lb. of copper, 9,039,220 lb. of lead, and 730,476 lb. of zinc during the half year. Production of ore at El Potosi, the company's lead mine, was below normal during a considerable portion of this period, due to the construction program, which included retimbering 1,300 ft. of the main hoisting shaft, and installation of electric hoists and compressors at all shafts.

Operating expenses for the six months included cost of putting the Calera mine, the company's zinc producer, in readiness for production of ore, and also retimbering of the shafts and cutting of ore pockets at the various levels of El Potosi mine, as the new hoisting equipment includes large hoisting skips.

At the Britannia copper mine, in British Columbia, production has been held below capacity and development carried forward on an increased scale, particular attention being given to the opening of the extension to the Bluff deposit. The Victoria shaft was sunk 150 ft. below the 2,200 level, where development has exposed a greater ore area than on any of the levels above, with the ore still higher in grade.

Santa Gertrudis Co., Ltd.

Silver; Mexico

The report of the Santa Gertrudis Co., Ltd., for the quarter ended June 30, 1925, shows the following financial results:

Total revenue after allowing for development and participation of owners, but before deducting reserve for depletion and depreciation	\$281,794
Capital expenditure for Inversiones and Dos Carlos Companies	46,975

The average milling rate was at full capacity. Of the 177,140 dry short tons of ore milled, 1,481 tons came from Santa Gertrudis, 114,177 tons from the Inversiones company's properties, and 61,482 tons from Dos Carlos. The new cyanide recovery plant was in operation throughout this period, and is now closely approximating the results obtained in the original experimental work. There now remains no doubt of the commercial success of this plant.

Pato Mines (Colombia), Ltd.

Gold; Colombia

Report of Pato Mines, Ltd., for the year ended Sept. 30, 1924, shows a profit of £67,639 12s. 9d. The credit balance carried forward at the end of the financial year after payment of two dividends of 7s. per share is £86,391 6s. 2d., subject to excess profits duty and corporation profits tax.

In his annual report of field operations, J. Doyle, the manager, states that 1,505,256 cu.yd. was dredged, as compared with 1,337,886 for the previous year, the gross value of the gold recovered being \$490,969.68, averaging 32.6c. per cubic yard, against \$404,232 averaging 29.9c. for the previous year, the average depth dredged being 26.7 ft. as against 31.4 ft. The field cost for the year averaged 12.64c. per cubic yard, as compared with 10.09c. for the previous year.

After the exhaustion of the dredgeable area on the Nechi property, arrangements were made with that company for the hire of its dredge to operate on Pato properties. The report states that 1,364,386 cu.yd. was dredged, the gross value of the gold recovered being \$309,732.00, averaging 22.7c. per cubic yard, the average depth dredged being 44.87 ft. The field cost averaged 13.4c. per cubic yard.

As of Sept. 30 the balance sheet shows £143,775 12s. 0d., represented by gold on hand, cash, and government securities.

Profit and Loss Account for the Year Ended Sept. 30, 1924.

Debits		£		s. d.	
To dredge running expenses and repairs		38,671	19	8	
Miscellaneous expenses		40,149	1	2	
Administration expenses, London			78,821	0	10
Depreciation			1,778	1	10
Balance carried down			19,586	4	7
			75,571	2	5
To directors' extra remuneration			175,756	9	8
Income tax, provision for year			1,511	8	5
Balance to balance sheet			6,420	1	3
			67,639	12	9
			75,571	2	5
Credits		£		s. d.	
Gold returns		164,671	15	10	
Less realization charges		3,423	2	8	
Rent receivable from Nechi Mines (Colombia), Ltd., for facilities derived from the company's dam, buildings, and plant			1,166	13	4
Miscellaneous revenue			4,995	10	3
Interest, exchange, and dividends			8,345	12	11
By balance brought down			175,756	9	8
			75,571	2	5
			75,571	2	5

McIntyre Porcupine Mines, Ltd.

Gold; Ontario

The report of the McIntyre Porcupine Mines, Ltd., for year ended June 30, 1925, shows a net income of \$1,253,766 after taxes, depreciation, etc. Comparative figures are shown as follows:

	1925	1924	1923
Earnings	\$3,546,637	\$3,291,178	\$2,249,741
Expense, etc.	1,927,500	1,788,332	1,334,517
Operating profit	\$1,619,137	\$1,502,846	\$915,224
Other income	95,833	77,537	56,619
Total income	\$1,714,970	\$1,580,383	\$971,843
Taxes	96,084	91,914	52,677
Res. for dep.	365,120	295,628	179,658
Net income	\$1,253,766	\$1,192,841	\$739,508
Dividends	798,000	559,639	546,042
Surplus	\$455,766	\$633,202	\$193,466
Profit-and-loss surplus	3,311,543	3,137,489	1,795,615

Ore hoisted during the year totaled 399,683 tons, averaging \$9.60 a ton, equaling \$3,861,287 as compared with 360,356 tons of \$9.70 ore, representing \$3,494,998, the previous year. The recovery per ton, however, was lowest since 1916, the mill handling 400,259 tons of \$9.43 ore, with a recovery of \$8.86 a ton. This compared with an average mill-ore value of \$9.95 and recovery of \$9.40 since the mill went into operation in 1912.

During the year 438,524 tons of ore was broken, against 386,659 tons the previous year. Of this 43,012 tons came from development work.

Ore reserves are now 1,348,283 tons, against 1,167,064 tons a year ago, but the average grade is down 50c. a ton, to \$9.20. Ore broken in stopes is up from 182,184 tons to 221,025 tons. The chief increase in reserves was at the Jupiter property, where tonnage is placed at 286,978, compared with 122,703 tons the previous year.

Mining costs per ton milled are placed at \$3.1022, against \$3.1649 in 1924. Shaft sinking is up from 0.2644 cents a ton to 0.4511 as a consequence of charging the cost of the new six-compartment shaft to operation. Total operating costs stand at \$4.8156, compared with \$4.9657 the previous year.

Freight Rates on Metals, Ores, and Concentrates

Carload Lots

Copper Bullion and Refined Copper

Table with columns: From, To, Rate per Ton of 2,000 Lb. (All, Rail, Gulf), From, To, Rate per Ton of 2,000 Lb. (All, Rail, Gulf). Includes entries for El Paso, Tex., Garfield, Utah, etc.

Marine Freight Rates

Table with columns: New York to (Hamburg, Liverpool, Antwerp, Havre), Gulf ports to (Hamburg, Liverpool, Antwerp, Havre), Pacific coast ports to (Hongkong, Kobe). Includes rates per gross ton copper and lead.

Lead Bullion (Pig Lead Where Shown)

Table with columns: From, To, Rates per Ton of 2,000 Lb. (To New York, To St. Louis). Includes entries for East St. Louis, Ill., Pueblo, Colo., etc.

Slab Zinc

Table with columns: From, To, Rates per Net Ton to (E. St. Louis, New York). Includes entries for Donora, Pa., Langeloth, Pa., etc.

Zinc Ores and Concentrates

Table with columns: To, From, Rate per Net Ton. Includes entries for Bartlesville, Okla., Sand Springs, Okla., etc.

Rates on Ores and Concentrates

Table with columns: From, To, Value of Product Rate (\$5 to \$100). Includes entries for Butte, Mont., Black Eagle, Mont., etc.

(a) Minimum tonnage of 200 tons per day. (b) In open cars, minimum 80,000 lb. (c) Siliceous ore tailing. (d) Applicable on ore, only when shipped in trainload lots of not less than 10 cars and exclusive of switching charges at Rossland.

Table with columns: From, To, Value of Ores and Concentrates Rate (\$10 to \$100). Includes entries for Burke, Idaho, Bradley, Idaho, etc.

(a) Minimum weight, marked capacity of car used, but not less than 80,000 lb. (b) Minimum weight, 80,000 lb. (c) Minimum weight, 40,000 lb. (d) Crude ore for concentration, 30c. per ton. (e) For \$9 value rate is 95c.; \$8 values, 90c.; \$7 value, 85c.; \$6 value, 80c. * Indicates a change of tariff since last report.

Mining Stocks—Week Ended September 5, 1925

Table of mining stocks including Anaconda, Arceadian Consol., Ariz. Com'l., Calaveras, Calumet & Hecla, etc. Columns: Stock, Exch., High, Low, Last, Last Div.

NICKEL-COPPER section listing Internat. Nickel and Internat. Nickel pfd.

LEAD section listing Carnegie Lead & Zinc, Glud-tone M. M. Co., National Lead, etc.

ZINC section listing Am. Z. L. & S., Am. Z. L. & S. pfd., Butte C. & Z., etc.

GOLD section listing Alaska Juneau, Argonaut, Barry-Hollinger, etc.

GOLD AND SILVER section listing Black Oak, Con. Cortez, Con. Virginia, etc.

SILVER section listing Alvarado, Beaver Consol., Castle-Trethewey, etc.

SILVER-LEAD section listing Ahumada, Bingham Mines, Cardiff M. & M., etc.

IRON section listing Bethlehem Steel, Char. Iron, Char. Iron pfd., etc.

VANADIUM section listing Vanadium Corp.

ASBESTOS section listing Asbestos Corp., Asbestos Corp. pfd.

SULPHUR section listing Freeport Texas, Texas Gulf.

DIAMONDS section listing De Beers Consol.

PLATINUM section listing So. Am. Gold & P.

MINING, SMELTING, REFINING AND GENERAL section listing Amer. Metal, Amer. Metal pfd., etc.

LONDON QUOTATIONS, WEEK ENDED AUGUST 29, 1925 section listing Aramayo Mines, British Platinum, etc.

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.