

Engineering and Mining Journal

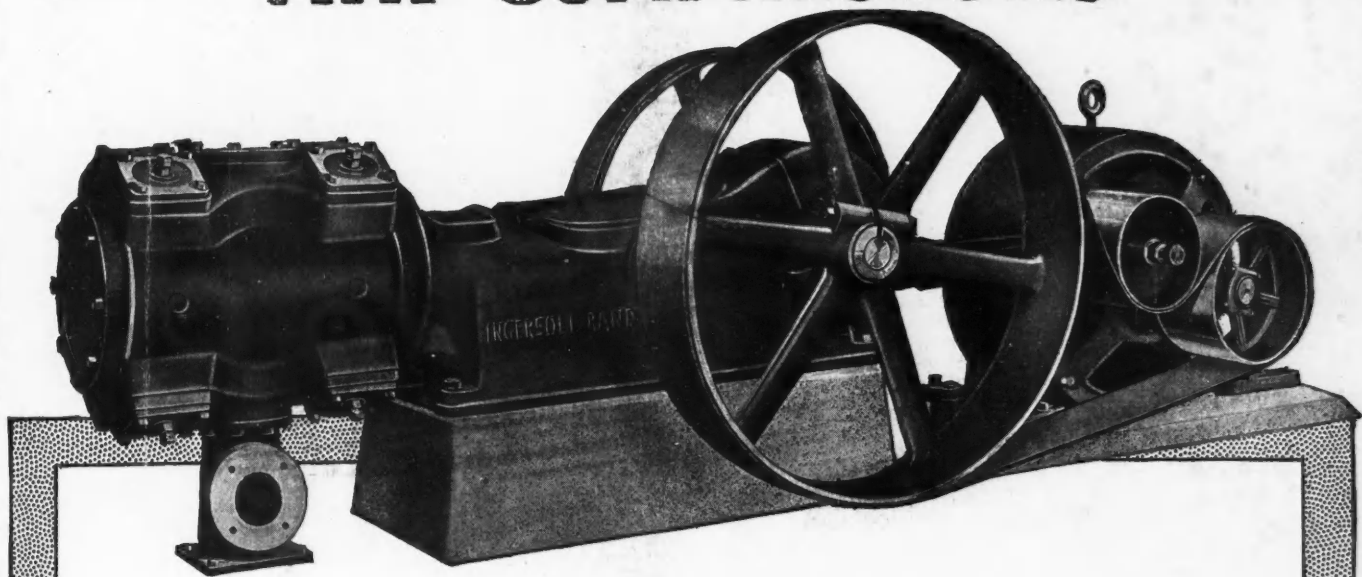
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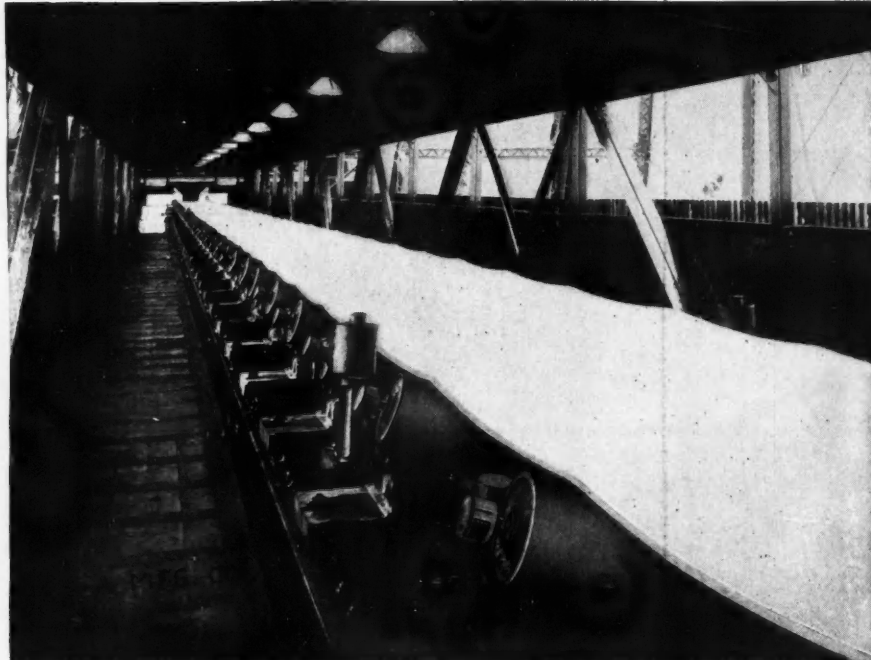


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Mining in the Argentine Andes

BY A. W. ALLEN

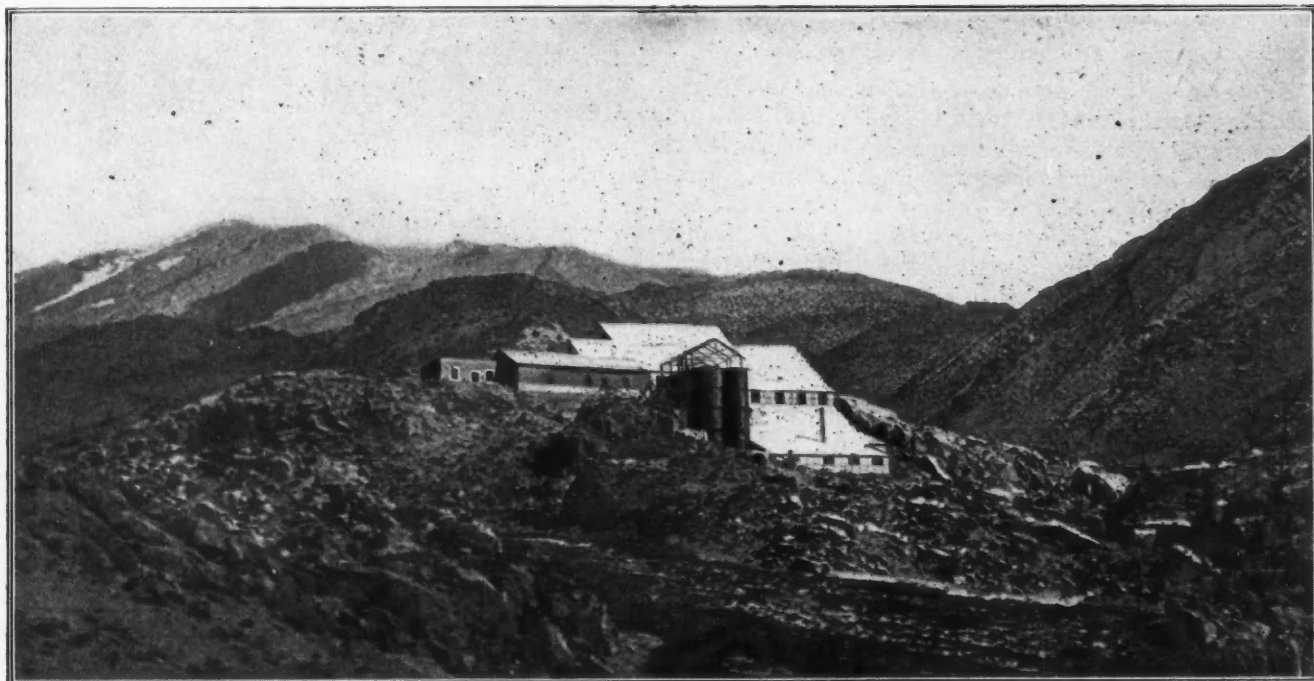
Metallurgical Engineer, 309 Broadway, New York

Mining in the Argentine is a discredited industry, due to the many swindles that have been perpetrated in that country. The climate of the mining region is not good and the labor is discouraging to one accustomed to ordinary efficiency. The industry has lacked competent technical direction, which has been one cause of the consistent failures.

IF THERE is any one country in the world where mining is thoroughly discredited, it is the Argentine Republic. Two factors are mainly responsible—the success (from the promoters' point of view) of

Simpson aptly remarks, “. . . the mining engineer is classed as a sort of confidence-trick man who can hypnotize his listeners with entrancing reports of limitless wealth in some inaccessible region and get them to part with their cash while under the delusion that they are being enriched.”

The work that has been carried out under the guise of mining operations has in many instances been of a kind to baffle convincing description. Operations of shaft sinking and tunneling seem to have been pursued for years for no other apparent reason than to prolong the life of the concern supplying the funds. The opening-up of orebodies in isolated mountain regions and the yearly expenditure of large sums for the purpose, without the controlling influence of ele-



A CYANIDE PLANT IN THE ARGENTINE ANDES

systematic swindles with which the industry has been associated in the past, in conjunction with a lack of experienced technical assistance in the inception and realization of mining and metallurgical projects.

A technical mining man going to the Argentine should prepare himself to be looked upon with something akin to suspicion, to see eyebrows raised slightly when he announces his profession, for, as W. E.

mentary account keeping or systematic audit, has been of common occurrence with foreign companies and has usually coincided with the fact that no feasible or practical method was known to science or art for the extraction of any valuable metal the reserves might contain. Concentration practice has been decided upon and equipment purchased without even a preliminary test and apparently without a thought as to whether

the ore could be successfully concentrated or the product marketed. Cyanide plants have been designed and erected with little regard to the actual suitability for Andean ores and with no reasonable hope for successful operation. Smelting equipment has been erected only to be almost immediately scrapped.

The fact that the decay of Argentine mining is attributable to the misguided efforts of inexperienced engineers has been duly recognized by the government authorities to the extent that the *jefe* of the mining section of the Ministry for Mines and Agriculture has drawn attention to the "*gravísimas consecuencias*" resulting from "*la insuficiencia frecuente de la dirección técnica de las explotaciones.*" It is a lamentable fact that foreigners, more than native engineers, are responsible.

Lack of technical skill in direction and exploitation has unhappily synchronized with a peculiar local tradition that sharp practice, if successful, is an indication of praiseworthy skill and by no means a matter for condemnation. The combination of ill-advised mining and metallurgical enterprise, coupled with the sentiment that a successful swindle is legitimate practice, has proved irresistible, and Argentine mining has collapsed under the strain.

To eradicate the prevalent idea as to the position of mining as a business will doubtless take time, but a reaction is inevitable as soon as it is demonstrated that the methods employed may be commercially and morally sound. The status of the mining engineer will then be restored and the industry will receive the attention it undoubtedly deserves.

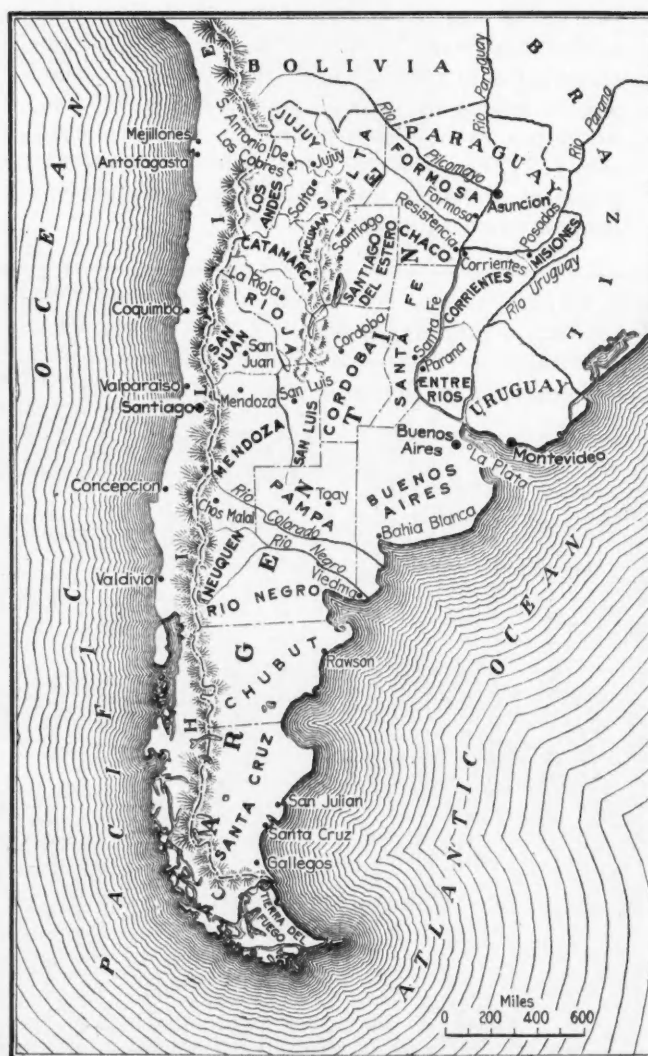
OPERATING DIFFICULTIES ENCOUNTERED

Mining in isolated regions is invariably beset with difficulties, and engineers may vie with one another for a hearing as to the tribulations under which they have carried out their work in various localities. The labor question is always of primary importance, and there are many classes of so-called "cheap" labor. Where the supply is plentiful and where effective discipline is aided by government protection, the utilization of "cheap" labor may be advocated. In the Argentine Andes, however, no police are allotted to those isolated regions where mining is carried on. To invoke the law is not a proceeding which the foreign mine owner or his representative is inclined to favor, especially in the case where the nearest magistrate's court is far distant from the mine. The peon, therefore, has little fear of consequences whatever his delinquencies. An increasing vigilance on the part of the executive is necessary, but hasty judgment is fatal and must be tempered with a resignation to inevitable natural conditions and ethnological traits. It soon becomes apparent that an act of consideration that might be termed a kindness is analyzed as a sign of weakness and immediate advantage is taken of the attitude.

The labor situation almost baffles solution unless mine owners are prepared to import labor on a large and regular scale. Skilled miners are unobtainable in most regions, and the average Argentine peon of the Andean provinces is untrainable for any serious work. Labor involving any responsibility must necessarily be given to others. Chileans are largely in demand as

miners, a work to which they are better adapted on account of their greater experience and general capability. Supervision is undertaken by men of all nationalities. In my own case a few months of unconscious effort in this direction resulted in the mustering of a cosmopolitan throng containing representatives of eight European and five American nationalities, in addition to the indispensable Chinese cooks. Differences of opinion were not uncommon, but bones were seldom broken on this account.

Wage rates vary in different localities, but foreign (Chilean) miners, timbermen or machine men usually earn from three to six pesos per day (about \$1.30 to \$2.60 U. S. Cy.) according as to whether they are employed by daywork or on contract. Peon labor underground is paid about 2½ pesos as compared with two pesos on the surface. Carpenters and masons earn



MAP OF ARGENTINA, SHOWING PROVINCES

six pesos per day and fitters from four to six pesos. Millmen are usually recruited from the shops.

The bulk of the Argentine laborers wish to work at mining only when they are in need of a little extra money. They leave as soon as they have a few pesos to their credit, but generally before they have adapted themselves to their surroundings or made themselves of real use or independent of perpetual supervision. The exceptions are few and far between. Steady work and the chance of systematic saving of money have no

attraction whatever to the average peon, although the foreigners are eager to take advantage of the opportunities offered and invariably open a bank account at the nearest town.

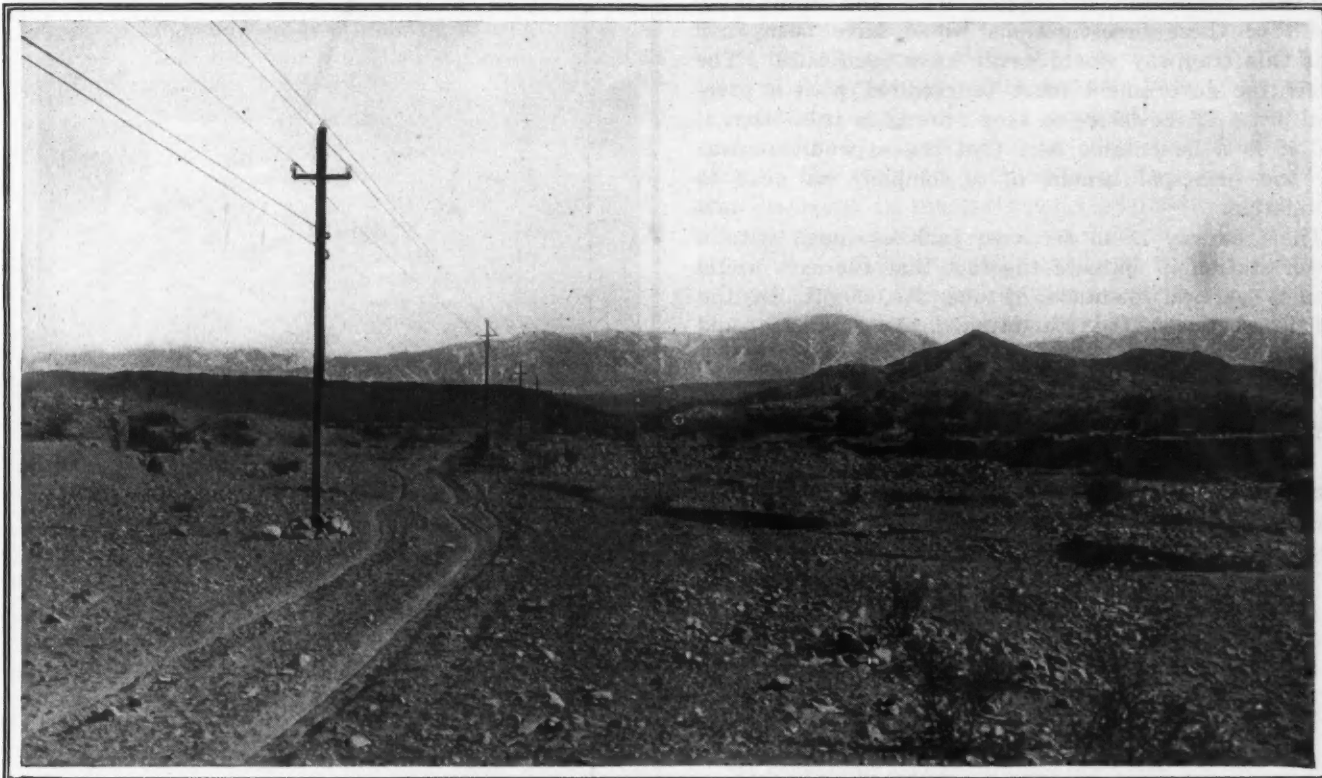
The labor supply is always in a state of exasperating fluctuation. The *cosecha* (harvest) claims practically all the peon labor during a considerable part of the year. During this time, which constitutes the best season in the mountains, they prefer to work in the lowlands for a pittance. When the *cosecha* is over, they return to the mines to earn a few pesos and to work under the worst possible climatic conditions.

Feast days and holidays are apparently limited only by the number of days in the year, and their observance constitutes a perpetual irritation to employers and a stumbling block to any really continuous effort. Voting for government officials is obligatory and non-attendance punishable with fine or imprisonment. When the booth is situated some distance from the

bonuses are alike ineffectual in an attempt to make him take an interest in the work. Contracts offering considerable advantages are made only to be broken at the first opportunity in those cases where the conditions cannot be evaded. Repeatedly I proved that the average peon would prefer to trick his employer out of 10c. rather than work to earn twice the amount with the same expenditure of labor.

In the smaller towns connected with the railways the ubiquitous Ford is much in evidence, but its area of usefulness is generally confined to those districts where transport is easy. As a general rule the roads are in a shocking condition and no attempt is made to keep them in repair—in marked contrast with the conditions in Chile, across the mountains.

Large sums have been spent in trying to adapt motor lorries in the haulage of mining machinery and supplies, but they have invariably met their Waterloo in the rivers and quicksands. Freighting is done, for the



THE TRANSMISSION LINE TAKING ELECTRIC POWER TO THE MINES IN THE MOUNTAINS

mines, the journeys of the employees to and fro and the time necessary to recover from the effects of the visit occupy the best part of a week. Stragglers return at odd dates, and there must be no question as to their reinstatement. The interruption to the work must be viewed with as much complacency as possible, and it would seem that there is an axiom that industry must be regulated solely and entirely for the benefit of the employees, and that no other consideration whatsoever should be allowed to influence the management of affairs. No one who has ever heard the amazingly illogical requests periodically made by the peon would doubt for a moment that in his mind there is an entire dissociation of ideas as to cause and effect. He has no thought whatsoever beyond his own immediate well-being. Bribes and

most part, by mule teams and two-wheeled carts capable of carrying from one to two tons. Five mules are usually harnessed to the cart, and sufficient compressed feed (*pasto*) for the animals is carried to last five or six days. Burros are also used extensively for light loads in the mountains.

Railroad communication is scanty and inadequate, and the extension of mining is not likely to be realized until additional provision exists in this direction. The mineral belt from Mendoza to Bolivia lacks any high-grade or really valuable products. Lead with low silver content, manganese, wolfram, copper ores and many other products might be profitably exploited if the cost of transport to the centers were not prohibitive as it is at the present time. Freighting will always be an important problem and must be con-

sidered on a concentrated but not a high-valued product. The mineral belt badly needs a geological survey to justify extensions of the railroads in various localities. Without such means of communication the cost of exploitation and operation must invariably be in excess of any probable return.

The San Juan province, with an extensive and unproved mineral belt, possesses only one-quarter of a mile of railroad per 100 square miles of territory. Other provinces, such as Los Andes, have none. In the province of Rioja an ambitious aerial tramway scheme was entered into and a Bleichert ropeway erected at government expense to connect the mines in the Famatina district with the township of Chilecito, a distance of over 20 miles. The undertaking involved a considerable outlay which benefited only the immediate locality. Subsequent events have demonstrated that, had skilled mining and metallurgical assistance been available to estimate the reserves and probable extraction of copper from the mines, the result of these investigations would have been such that this tramway would never have been built. The Argentine government must be credited with a practical proof of its desire to keep mining in this district, and it is a lamentable fact that the expenditure was for the principal benefit of a company so near to liquidation.

The tramway is in sections, each equipped with a power station in spite of the fact that the cars would drop a vertical distance of over 11,000 ft. in the journey between the Famatina loading station and Chilecito.

ANDEAN CLIMATE IS DIFFICULT

Workers in high altitudes must expect intense cold at times. In parts of the Andes this condition is aggravated during several months, often the greater part of the year, by hurricane winds. The eddies seem to form in the mountains and the wind passes through certain *quebradas*, or gullies, and invariably in the west to east direction. These hurricane gusts alternate with periods of calm, each for about a minute or so. Conditions often persist for weeks on end with no intermission, day or night. In the open the force of the wind is sufficient to make human or animal progress impossible for the time being. Inside a building the noise made by the scurrying gravel and sudden gusts is such that one is in a constant state of wonderment as to how long anything made by human hands can withstand the strain. Exposed glass is "frosted" in a short time by the flying sand blast and needs to be well protected with wire netting, otherwise it becomes pitted with neat holes or blown in. Roofing timbers must be tied to the building with unusual precautions, and roofs are generally coated with a thick layer of a mortar made with sand and clay, which adds to the weight of the roof and, when dry, forms an effective protection against leaks.

Snow falls from April to July, and the higher peaks retain their mantle throughout the year. A combination of wind and snow in what is locally known as a *blanco viento* produces intense cold and a phenomenal drop in temperature. Traveling across the Andes is a perilous proceeding, and several passes through the mountains are not negotiable during certain seasons of

the year on this account. The winds invariably prevent the snow from lying on the ground to any considerable extent. It is either blown away down the valleys or evaporates in the air or on the ground without leaving a suspicion of moisture.

Rain is almost unknown in the higher altitudes. From November to February cloudbursts are apt to occur in isolated spots, especially in the vicinity of heavily mineralized outcroppings. A mass of water falls in one place and gathers an irresistible momentum as it rushes down the mountain sides. Wholesale destruction accompanies its progress. In a few moments roads may be completely obliterated, river courses changed, and tens of thousands of tons of sand, earth and stones shifted from one place to another. The lack of any warning other than an ominous roar and the



EFFECT OF AN ARGENTINE CLOUDBURST

impossibility of estimating where the next cataclysm may occur make adequate provision against damage almost impossible.

Fuel is scarce in the mountains and firewood for cooking and heating almost unobtainable. A small gnarled shrub (*jarilla* or *yareta*?) is usually available in small quantities for domestic purposes. This contains a great deal of resinous material, produces much smoke and deposits a quantity of semi-volatilized tar in the chimneys.

In the isolated districts the only mine timber available is a variety of poplar, which has to be hauled from the lowlands at considerable expense. As with many other materials, the expense of freighting is in excess of first cost. This timber is of the poorest quality and has a short life in the mine, where the water is usually far from pure. Steel construction has been proved to be preferable for mill work, and this material, combined with concrete, galvanized iron and asbestos sheeting, results in neatness and minimum cost for erection.

The rivers, of which there are few, vary in size from torrents of exceedingly muddy water toward the end of the year to small streams during the dry seasons. The steady all-year supply of water is from springs, and the excess during flood time from melting snow or *crecientes* (cloudbursts). The principal rivers are the San Juan and the Jáchal, both in the San Juan province. Neither is navigable at any time, but both are valuable for irrigation purposes and serve to change

the appearance of spots in the valleys from barren sandy deserts to stretches of bright and welcome vegetation. Much of the water is available for power supply, but little of it is utilized for this purpose. The high proportion of solids carried during the flood season and for some months afterward constitutes a problem in ordinary hydraulic-equipment operation.

Toward the northern provinces (Los Andes, Jujuy and Rioja) quartz veins are common, but toward the south they are seldom seen. Several gold mines have been worked in various parts of the Argentine Andes. In the San Juan province the principal mines are found in the Guachi, Castaño and Gualilan groups. The Guachi mine never merited its name (mountain of gold) and is now abandoned, although its possibilities may have been neglected on account of its isolated position. The Gualilan mines, near Iglesia, were discovered in the middle of the Eighteenth Century and produced much gold by an amalgamation process, subsequently supplemented by roasting. The property consists of about 18 mines, and the expenditure some 30 years ago was in the usual lavish scale of English mining companies of the period, the equipment and buildings being unusually substantial. Whether the expenses for any single month were ever met by the returns may be doubted, but the property passed from hand to hand until its final collapse, attributed, according to local tradition, to the elopement of the



A TYPICAL ANDEAN FORMATION

manager with an accumulated yield of bullion. Such happenings were apparently by no means uncommon.

Actual mining work at Gualilan is suspended at the present time, but a cyanide plant is in operation treating the tailings from the old amalgamation process. The bullion produced assays high in silver. A large tonnage of arsenical iron pyritic ore is at dump carrying a considerable amount of gold. The encountering of this combination in the lower levels of the mine was doubtless a potent cause for the discontinuance of operations at a time when little was known about the treatment of sulphide gold ores. Copper-silver ores

also occur at Gualilan and should repay investigation. The mines are pleasantly situated at an altitude of only a few thousand feet. The drawbacks to success are inaccessibility and shortage of water and fuel. The Castaño mines are nearer to the capital of the San Juan province and have been intermittently worked for some time as gold-silver propositions. A mill and cyanide plant has recently been operated by a small syndicate. Argentiferous copper ore is also met with in this district, together with deposits of galena, oxide of manganese and zinc blende.

The bulk of the silver in this part of the Andes occurs in combination with lead as galena, of which there are extensive deposits. The Salado mines are in San Juan province in the same latitude with Coquimbo and near the Chilean border. These mines were re-discovered in 1844 and have been worked for silver at intervals since that date. The usual *antigua* methods of mining were followed by the Chileans, resulting in a honeycombing of the ground in the search for narrow stringers of high-grade ore. A considerable amount of work has since been done by two English companies. Wire silver occurs in places, but the bulk of the metal is associated with galena, in conjunction with iron and manganese. A small smelting plant, operated at the foot of the hills on the banks of the Jáchal River, was destroyed in the earthquake of 1894. No further attempt was made to repair the damage. "*La mano de Dios*" was sufficient excuse for lack of further effort.

Lead, copper, manganese, zinc and iron are met with in quantity in almost every locality. Galena deposits are perhaps the commonest, and the mineral usually carries an appreciable amount of silver. A silver content of 30 oz. per ton in extensive deposits is not unusual, but transportation costs are high and shortage of fuel prohibits the concentration to bullion form. The principal copper mine of the Argentine is the Famatina, in the province of La Rioja. This company has been reconstructed several times, fresh life has been infused into it at intervals by the application of more capital, but its fate was the same as many other Argentine mining concerns. Since the discussion of the apportioning of blame for the last fiasco, the company's affairs have been allowed to sink into oblivion and the corporation is now in liquidation.

The present copper production from the republic is trifling and the exports are nil. It needs only the successful operation of one mine for a length of time, coupled with a forgetfulness of past fiascos, to give the necessary impetus to a resumption of work.

Wolfram ores occur in several localities, and valuable deposits of the mineral possibly only await development and exploitation. In addition to the question of freight-costs, two factors are tending to delay development. One arises from the local idea that assumes that parties interested in the acquisition of mineral land are out to make vast fortunes. The result is that prices asked for land where wolfram ores are indicated are fabulous and absurd. It is useless to attempt to explain that there is nothing developed and practically nothing "in sight." The owner of the land is invariably deaf to all arguments and suave in his determination to part with the right, if he does so at all, only at a staggering price. The second drawback to

wolfram mining lies in the fact that the mineral has been classed by the authors of the mining laws in the "segunda categoria" and distinct from gold, silver, lead, copper, etc. Land that contains minerals in the "segunda categoria" can be worked only by the owners of the land or upon their express permission. Cases have occurred where parties in ignorance of the law covering the classification of minerals have taken out mining rights for a certain area and have proceeded to develop a wolfram claim, to find that the first output was legally claimed by the owner of the land.

The principal company interested in wolfram-ore production has been the Hansa Sociedad de Minas, operating in the San Luis province. Exports from the republic are decreasing in arithmetical sequence, being 536 tons in 1913, 394 tons in 1914 and only 158 tons in 1915. Encouragement of the output in the Andean provinces should result in considerably improved returns.

BORATE MINING

Another branch of mining that is almost dormant on account of the lack of transportation facilities is that for borate. The deposit occurs in the Atacama desert in the Argentine provinces of Las Andes and Jujuy. This area is an extension on the Atlantic side of the Andes of the nitrate fields in Chile and resembles them in barrenness and aridity.

Some little work in Jujuy is still being carried on. In this province the deposits are worked for a few months of the year, being completely submerged in the rainy season. The borate, occurring as the double salt of calcium and sodium, is found in much the same manner as the nitrate on the Chilean *pampa*, and close to the surface of the ground. The large lumps removed with pick and shovel are dried to a degree permitting the screening of the adhering sand and earth. The clean crystals are then sacked for shipment and carry about 30 to 40% of B_2O_3 .

The borate deposits are extensive, but inaccessible when comparison is made with similar deposits in Peru. Exports dropped from 933 tons in 1913 to 613 in 1914 and 192 in 1915.

All registration of mining claims must be carried out in the provincial centers of government and not in the federal capital. Application for mineral rights must be presented in writing to the office of mines in the capital of the province in which the discovery has been made. The application must be accompanied by full details as to location and a specimen of the mineral. Rights are issued as soon as an official signed survey plan of its position is available. The latter is usually obtainable with little trouble provided an agreeable method of persuasion is adopted with the mine's engineer. Mines are not supposed to be taxed, nevertheless levies are periodically made by the local authorities who are "laws unto themselves." Power plants operating mining equipment are also subject to local tax assessment for uncertain amounts. The mining law insists that a property, or *pertenecia* as it is called, must be worked by at least four miners during 230 days of the year. The balance of time may be presumed to have been allowed for "normal" interruptions caused by general elections, holidays and the more important *fiestas*.

At the present time measures are being continually introduced limiting the export of metals. Silver is practically unsalable in the republic and must be exported at considerable cost. The domestic consumption is small in the absence of a silver coinage. Gold is salable in small quantities and at a discount. Banks are not inclined to deal with the precious metals as in other countries, and the most elementary ideas exist among technical advisers and assayers to trading companies as to how shipments of metal should be valued.

Insurance of bullion on the railroads can be effected only at a prohibitive rate, and from mine to railroad it is impossible to come to any arrangement with the insurance companies. It is therefore necessary to conduct personally bullion from the mine to the ship at considerable expense and loss of time, the journey often taking a fortnight from outlying districts.

Research Corporation Fellowship

The Research Corporation, of New York, offers a fellowship of an annual value of \$2500 to encourage scientific research directed to developing the industrial arts. It is to be awarded on competition consisting of the submission of evidence of scientific attainments, discoveries or inventions, and of special fitness for advanced work.

All persons desiring to compete must fill in a form of application, which will be furnished by the secretary of the corporation upon request, and file the same before Oct. 1, 1917, together with such letters of reference, scientific publications or other documents or evidence as they may wish to submit. A specific statement must be included of the particular field or object of investigation which the competitor proposes to conduct and a pledge that he will devote himself faithfully to the prosecution of such research if awarded the fellowship.

Foreign Trade in Copper

Exports of copper from the United States in May, 1917, are reported by the Department of Commerce as follows, the figures for April being given for comparison:

| | April Lb. | May Lb. |
|--------------------------------------|--------------|-------------|
| Ore and concentrates, contents | 516,958 | 583,662 |
| Unrefined, in bars, pigs, etc. | 1,738,430 | 737,230 |
| Refined, bars, etc. | 102,733,039 | 105,337,317 |
| Old and scrap | 1,236 | 368,909 |
| Plates and sheets | 3,834,546 | 1,243,761 |
| Wire | 2,651,964 | 3,194,365 |
| Total | 111,476,173 | 111,465,244 |

The weight of ore exported in May was 5835 tons; of concentrates, 337 tons.

Imports of copper into the United States in April and May, 1917, are reported by the Department of Commerce as follows:

| | April Lb. | May Lb. |
|---|--------------|------------|
| Ore and concentrates, contents | 14,632,621 | 11,878,237 |
| Matte and regulus, etc. | 3,617,594 | 4,941,783 |
| Unrefined, in bars, pigs, etc. | 29,600,136 | 31,573,727 |
| Refined, in bars, etc. | 224,005 | 453,128 |
| Old, etc., for manufacture | 1,853,157 | 1,065,695 |
| Composition metal, copper chief value | 11,330 | 23,310 |
| Total | 49,938,843 | 49,935,880 |

Material imported in May was 36,304 tons ore, 10,574 tons concentrates and 4858 tons matte and regulus, etc., mainly from Canada, Mexico, Cuba and Chile.

Observations on Attracting Capital

By J. F. KELLOCK BROWN

Mining Engineer, 137 McGill St., Montreal, Canada

A dissertation on the natural depravity of incompetent promoters and irresponsible boosters, with some good advice for those seekers after capital who are willing to be rational.

THESE remarks are addressed to the man with a mine to sell, be he prospector, promoter or engineer. Perhaps it is strange that the latter should be included in such a lecture; but at times even an engineer, according to his character, becomes subject to an attack of "imagination run riot." In many quarters attention should be paid to an oft-told tale, for the grand old subject of the unscrupulous company promoter—that hardy annual of the technical press—is due another revival from a fresh source. Some recent and past experiences form the background of the story.

SQUARE DEALS AND OTHER KINDS

The process that the development of a mineral property has to go through before it becomes an actively producing mine looks simple and is simple—in fact so simple that it becomes difficult for some men to realize it, more particularly that suspicious class which must always see around the corner and up the back of any word said to them, searching for some hidden motive. The class which never gives a fair deal, and therefore cannot conceive such a thing to exist, has far too great a say in mining affairs.

Unless there is equity in any transaction there will be no continuance of business. That is the first maxim to bear in mind. If you buy a horse and the seller of the animal "does you," you do not exactly pine to buy another horse from the same man; but if you got satisfaction on the first deal, you would probably give the owner the preference on the second transaction.

The promoter and prospector vote *en bloc* for the common sense of that remark, but take the subject a little nearer home and the fishing becomes bad. The moral is that in mining far too many men never consider a second deal as a possibility; which means that they are in the business to make a cleanup on one transaction and to do so they rely upon every form of misrepresentation, or worse, that it is possible to employ. If we could persuade all who are directly or indirectly interested in this work that it is a business just like any other business, such as selling furniture or buying a house, in which the reputation of the manufacturing or building concern has something to do with its sales, and in which the business goes to the representative who, first of all, knows what he has to sell and all about it, and, second, meets competition by the production of a better article at a lower price, and, third, pays attention to small business details, such as proper presentation of the subject; if we could persuade mineral property dealers on both sides universally to accept these statements, perhaps the millennium might arrive.

Exaggeration and indefinite statements are fatal errors in the search for mining capital. This is another

maxim to keep in view. Consider that capital is not just engaged in a mad scramble to develop mining lands. Consider that there are just as many people selling mines as there are farmers selling milk in a suburban locality. The milk supply may be scarce in these days and mines, also, may be relatively so, but under ordinary conditions this is not the case. Hundreds of proposed developments are placed before capital every day; and through much of this experience capital, or those who make the preliminary investigations for capital, naturally soon gets to know the hall-marks of the exaggerator and the characteristics of the reliable statement. The interceder for capital who concludes his remarks thus: "God didn't make this country for farming, and the timber is all cut off it, so he must have made minerals down below" does not acquire much standing in the halls of finance. Nor does the local engineer or owner acquire much of a reputation for veracity by trailing capital's representative three days in the bush, baiting the way with tales of 10-ft. veins, and winding up by pointing to a rice-paper string of quartz, saying: "There, sir, that always broadens out as it goes down, and there is millions beneath your feet for the asking." The "asking," by the way, is often only a small matter of half a million dollars or so.

LOCAL CAPITAL SELDOM SUFFICIENT

In the beginning of things there are always the prospector and the ancient partnership "grubstaking" to consider; but since these men cannot go far themselves, local capital generally takes a hand. Since it cannot within reason be expected that the struggling merchants and traders of a developing district can take upon their shoulders the entire development of a mining area, there is reached, sooner or later, a stage when an appeal has to be made to regular financial mining channels. It is in making this step that the handling of a property most frequently takes the wrong turning. Owing to conflicting views leading to legal entanglements, exaggerated ideas of the work accomplished, or poor valuation of the work to be done, mining progress languishes. This is a common state of affairs in most mining districts. The prospects are legion that have had local capital put into them, carrying them onward part of the way, and then failed to connect with outside capital. In many cases this is due to the fact that the early investigators never had a prospect at all, but there is an equally large number of prospects that never passed babyhood because the buyer and the seller could not get on common ground.

It is well to recognize the fact that, just as it takes two to make a quarrel, so also it takes two to make a business transaction, and both have to be satisfied. Let us forget the stupid and often prevalent idea that the question of selling a mineral property is a duel between the local man and a shark from the city, wherein each tries to get the better of the other, based on the general principle of trying to get something for nothing. Instead, get around a table and remember that each side to the transaction has to have a reasonably equal divi-

sion of the deal. Both have rights. The one has the property and the other the capital. Simple—oh, so simple that it can't be done. Instead of the first man demanding a sum of money, large or small, but mostly huge, or the second man demanding a discount of the cost of production of the property to that stage, a much more equitable proceeding, and one that would lead to quicker and more satisfactory results, would be to concede the suggestion that a share-and-share basis might be conceived. The game of grab may be fascinating, but it is also responsible for much loss of capital in a district.

A suggestion worth some consideration might be the formation of a vigilance committee on mining affairs and promotions in each district. It would be a good thing if the local interests hung a motto upon their walls, and read it three times a day, to the effect that "there is such a thing as reputation, and reputation is as applicable to a country and to a district as to a man." A few individuals working along certain disreputable lines can destroy the entire reputation of a country in the financial center to which it must make its appeal, making conditions such that, no matter how reasonable or how good a prospect appears, it cannot be financed because it is in a district that bears a bad name. Instances of this can be multiplied the world over, and it is the cause of the change of fashion in mining investment that has taken place in certain lands.

WHEN LOCAL "BOOSTING" IS HARMFUL

Another equally stupid and most harmful proceeding is the irrational local boosting that takes place whenever there is a discovery of supposed importance, a boosting that consists solely of written words without any backing or knowledge of the true situation. A typical example of this "bull" is a story of an Alberta manganese discovery, that has been going the round of the Canadian press within the last few weeks. On reading it with any understanding one is inclined to wonder if all the press news measures up to the same standard of exaggeration and inexactitude. Surely most papers could ring up a reliable engineer on the telephone and get the proper presentation of the data in half an hour.

Another illustration of unfortunate exaggeration is found in the "hurry-up" stock-subscription literature of almost any "Buncombe Asphalt and Oil Co., Ltd., fearful and wonderful examples of the promoter's art. The authors of such specimens must have taken some college prizes for plausibility. Really the promoters who visit a district for the purpose of picking up mineral property should be licensed before being allowed to proceed about their business. The situation calls for such a proposal, just as it is considered necessary to grant a certificate to the manager of a mine after it has commenced operation. Why not do the same thing to the man who proposes to start a mine?

One of the most exasperating features of such ventures, constituting another reason why these affairs should be strongly handled and investigated before public presentation, is the partial and intentional use of well-known names in such a way as to give the impression that they are more or less connected with the enterprise. As matters stand at present the making of proper excerpts from reports by good men is a quite well-established art—the art consisting of the ability to get the "juice" and apply it to another picture.

I have a friend who tells me that he can find anything I want in raw materials in this part of Canada. So insistent is he that I have a sort of sneaking notion that one day he will wave a wand and show a platinum discovery at my feet. The country, in his estimation, has never been properly exploited; capital has missed, and continues to miss, many golden opportunities. By design I asked if he could find me a deposit from which a common every-day product could be manufactured. He vanished, returning after three days with the statement that what I required was easy; and with that he placed upon the table a small and doubtful sample, not any larger than a small-sized egg. In his ignorance, my friend expected his sample to be sufficient to decide an expenditure of half a million dollars. An option of purchase, running well into three figures, was tabled. I visited the spot myself, and viewed a worthless deposit whose only claim to fame lay in the chemical analysis. There was neither quantity, nor any sign of quantity; the situation was bad, and the price absurd.

COMMON CASE OF SELF DECEPTION

Individuals of this type are common and as dangerous as they are common. They have the idea irrevocably fixed in their minds that if any material is inquired for it must be in instant demand, wanted in a terrific hurry, and worth millions; and so scarce that only their particular spot on the earth has it. A possible purchaser has therefore, in their minds, to buy it regardless of price. Years of failure and weary waiting have failed to alter their opinion. Hope springs eternal in the promoter's breast—there is no truer proverb than that. Having got this idea into their heads, they proceed to indulge in the process (called, by the ignorant, one of the attributes of a good citizen) known as "boosting" the property and district, and not infrequently get themselves advertised extensively as enterprising citizens of their particular neighborhood; while all they are accomplishing is much harm, harm that takes years to overcome. The irresponsible booster whom the local papers are fond of backing up, without the ghost of an idea as to whether the booster is right or wrong, is a trouble to his district. Multiply him by a thousand and he becomes a menace to proper progress. "Boosting" just because "boosting" is a habit, a virtue, is bad policy because it forgets that the stupid booster administers the greatest knock a country can receive. The idea seems to be that if one shouts loud enough, a man with money will hear. Unfortunately, this type of shouting drowns the voice of the holder and promoter of areas where reasonable production could be commenced.

ONE BORN EVERY MINUTE

I live in a town of 50,000 inhabitants, let us say, and, with the exception of infants in arms, every citizen holds stock in some industrial or mining venture calculated in some glowing day of past regrets to bring riches within the reach of all. A latent sense of past foolishness makes most of us hold our tongues about such investments; but nevertheless they were made, as now and again the declared wills of some of the most prominent citizens disclose to our astonished eyes heaps of worthless stock certificates bought by men we have all come to look upon as the embodiment of cautious investment. These things are memories of long ago.

Notwithstanding that this is a good business district, where we flatter ourselves we do know something about business, it is rather weird to discover how close is the connection in the mind of the promoter between proper business and the other sort of enterprise. They soulfully call it "bringing capital into the country" or "developing their own neighborhood and deserving a patriot's crown." We have had gold companies, oil companies, steel companies, hosiery companies and many another of varied hue and species; the only common feature being the money they were to bring to their fortunate owners. How many millions of capital have gone in this one district on enterprises founded on a wrong basis, started before the market was there, or begun upon a deposit of material inadequate to meet the demands of the plant. And if millions have gone from this one small section of the country, what must be the amount of money poured out in other parts of the land? Truly romance cannot yet be dead—the foot of the rainbow still glimmers.

There can be only one meaning taken out of these examples of our extraordinary methods of attracting capital. They have been inadequate, disorganized and haphazard in the past; we have no sense of the usefulness of any of these proposals to the country; and there is no balance in our judgment of the rights of capital in making new investments. Would we not then have taken a big step forward to increased development, if we had two things done: a method or a program whereby the natural possibilities of each deposit, district, place, could be properly valued; and further censorship over any project proposed for the investment of capital?

A History of the Detinning Industry*

The quantity of tin recovered from tin-plate scrap in the process known as detinning makes this industry a factor of considerable importance. The Goldschmidt Detinning Co. handles in excess of 100,000 tons of tin scrap per year. The Welsh tin-plate industry absolutely controlled the world up to about 1890, disposing of over 70% of its production in the United States. The McKinley act of 1890, placing a high protective tariff on tin plate, established the industry in this country, and before the outbreak of the war over 1,000,000 tons of tin plate was produced, and at the present time production is estimated at 1,300,000 tons.

Naturally, the increased production of tin plate to large proportions brought forward the problem of utilizing the scrap and clippings which accumulated in large quantities. The modern process is a development of many decades of study and experimentation. All the processes may be divided into three general classes—the mechanical process, the chemical process and the electrochemical process.

The mechanical process consisted in attempting to separate the iron and tin by means of heat and more recently by refrigeration. These methods were impractical, mainly because it was not possible to obtain thorough separation of the tin from the iron.

The chemical and electrochemical processes also failed, because the acids used attacked the iron as well

as the tin, or did not dissolve the tin sufficiently and left considerable adhering to the iron. Also the chemicals used were too expensive to make the process an economical one.

Three processes have operated successfully during the last forty years, during which time one or another has alternately obtained superiority, due to refinements in that process over the others. These three processes are the electrolytic-alkali, the chlorine process, and the alkali-chemical process.

ELECTROLYSIS IN AN ALKALI SOLUTION

In 1876 Keith¹ recommended the electrolysis of tin scrap in an alkali solution, and in 1882, Th. Goldschmidt, in Germany, conducted experiments with a warm solution of caustic soda using the tin plate as the anode and the iron plate as the cathode. One trouble with the process was that the electrolyte had to be watched constantly and great care exercised to separate thoroughly the tin from the iron. The tin recovered at the cathode is spongy or finely granulated precipitate, which can be easily removed and melted, a considerable advantage, as it obtains in a single operation a serviceable iron that can be compressed into solid billets and readily marketed. The tin sludge can also be easily melted into pig tin. This fact caused the process to come into general use, and it dominated the field up to about 1907.

THE CHLORINE PROCESS

The chlorine process was first proposed by Higgins² in England in 1854, and later by Parmalee³, Seely⁴ and Pantou⁵ in this country. It was known that only dry chlorine gas could be used, which will combine with tin under development of considerable heat to form anhydrous tetrachloride of tin, a heavy liquid which fumes strongly in the air. As chlorine does not attack iron at low temperatures, the process seems apparently simple. Considerable improvements and modifications were necessary however in order to make use of this property of iron.

A chlorine detinning plant was established in New York City in 1873, operating under the Seely patent, but failed because of the financial panic in that year. Lambotte, in Brussels, in 1885, started to operate the chlorine process on a large scale with a shaft furnace filled with tin scrap from the top, while chlorine gas strongly diluted with air was introduced at the bottom. This chlorine was combined with the tin from the scrap, and the air would carry away the tetrachloride to condensers, where it was condensed. The detinned clippings were then removed from the furnace bottom and compressed into billets. However, the control of the chlorine gas is difficult and the workmen were greatly annoyed. Furthermore, the detinned clippings were not entirely detinned and were covered to some extent with tetrachloride of tin.

In 1907 Th. Goldschmidt abandoned the electrolytic method in favor of the chlorine process with the result that more tonnage is detinned today by chlorine than all other processes combined. One basic condition of chlorine detinning is the exclusion of all humidity to avoid a destroying effect on the iron. The material must also be free from all organic substances such as

*Abstract of an article entitled "A Short History of the Detinning Industry," in "Reactions," second quarter, 1917.

¹U. S. Patent, 176,658; ²English Patent, U766, 1854; ³U. S. Patent, 102,148; ⁴U. S. Patent, 127,375; ⁵U. S. Patent, 135,578.

paper, straw, varnish, etc. The dry tin scrap is put into large cylindrical containers in more or less loose form or compressed into billets. The containers are closed tight and dry chlorine is introduced. As considerable heat is formed, means are taken to cool the apparatus. High pressure is used to cause the chlorine to penetrate every part of the tinned scrap. This process can be carried on in larger units than in the electrolytic process, and labor charges are therefore materially reduced. The tetrachloride of tin produced is largely used in the silk-dyeing industry.

ALKALIES IN COMBINATION WITH OXIDIZERS

Another process, detinning by alkalies either alone or in combination with oxidizers, has been developed in recent years to a point where results compare in every respect with the chlorine process. The scrap is placed in a hot solution containing excess of free alkali and saltpeter or other oxidizer. The mass is then boiled for several hours, during which time the tin accumulates in the form of crystals of stannate of soda. The crystals are drawn off, subjected to centrifugal action and remaining mother liquor diluted with necessary caustic soda and saltpeter to enable it to be used again. The stannate of soda is afterward dissolved in water and oxide of tin precipitated by means of bicarbonate of sodium. Only a small loss of alkali occurs, as the solution is used over and over again. The saltpeter is also recovered at the end of the operation with the exception of the amount required to oxidize the tin. The tin oxide obtained in this process is used extensively as a coloring matter in the enamel industry or is smelted to form pig tin of high quality.

The Goldschmidt Detinning Co. uses this process as well as the chlorine process, and its output comprises large amounts of tetrachloride of tin and pig tin of a purity which in every respect is the equal of Straits tin. The company recovers every year about 2000 gross tons of metallic tin.

Increase in Quicksilver Production

Final statistics of the domestic production of quicksilver in 1916, compiled by H. D. McCaskey, of the United States Geological Survey, show an output of 29,932 flasks of 75 lb. each, at the average sales price of \$86.08 per flask reported by producers. This represents an increase in quantity of 8899 flasks and in value of \$749,635 compared with the yield of 1915. In the New Year's preliminary figures given out by the Survey on Jan. 3, 1917, the production of 1916 was estimated at 28,942 flasks from best information available, and the value was given at \$3,643,800.

The production of California in 1916 was 21,045 flasks, against 14,283 flasks in 1915. The production from shaft furnaces was 19,497 flasks, and the remainder came from retorts. The principal producers were the New Idria, New Almaden, New Guadalupe, Oceanic, Helen, St. Johns, Cloverdale, Culver-Baer, Patriquin, King, Oat Hill, and Great Eastern mines. A new producer began operations at Tehachapi, in Kern County—a new locality of interest. There was general activity in all the old-established quicksilver mines and districts and some experimentation in concentrating low-grade ores and old dumps and in furnace improve-

ment, and there was increase in recovery of metal formerly lost at plants now dismantled.

The output of Texas was 6306 flasks, all from shaft furnaces, and the producers were the Chisos, Big Bend, Texas-Almaden, "38," and Mariposa mines, all but the first of which were reopened in 1916, some under new management, to take advantage of the higher prices then prevailing. The Chisos has been in steady operation since the early development of the Terlingua district, in Brewster County, where all the producing properties lie in a comparatively small area.

The production from Nevada was 2198 flasks, of which 1593 flasks came from shaft furnaces and 605 flasks from retorts. The principal producers were the Goldbanks, Mercury, Nevada-Cinnabar, Red Devils and Lost Steers, the last two being in the new district near Mina. Prospecting was active in Humboldt and Elko Counties. In Arizona, Oregon and Washington there was a combined output of 383 flasks. There was but one small producer each in Arizona and Washington. In Oregon the Black Butte mine, reopened in 1916, was the principal producer. Considerable activity was shown in prospecting and development work near Gold Hill.

The exports of quicksilver during 1916 were 8880 flasks, of which much the greater part went to England and Japan in nearly equal quantities, smaller exports going to Canada, Hongkong, Scotland, and many other countries. The quicksilver imported for consumption in 1916 amounted to 5659 flasks, the largest part of which came from the mines of Spain and Italy, chiefly through New York.

Foreign Iron and Steel Trade

Exports of iron and steel from the United States in June and the fiscal year ended June 30 are valued as below by the Department of Commerce. The first line gives the total value of iron and steel exports; the second line the value of machinery; the third line the total tonnage, in gross tons of those articles which are reported by weight:

| | June | | Year | |
|------------------------|--------------|---------------|---------------|-----------------|
| | 1916 | 1917 | 1916 | 1917 |
| Iron and steel, values | \$76,257,884 | \$119,141,836 | \$621,209,453 | \$1,129,341,616 |
| Machinery, values... | 20,541,139 | 27,946,036 | 182,077,065 | 262,241,278 |
| Tonnage exports, tons | 527,542 | 631,712 | 4,862,154 | 6,885,543 |

The value of June exports was the highest ever recorded in a single month. The total values for the fiscal showed an increase of 81.8% over the previous year, and were by far the largest ever reported. The largest increases in tonnage were in pig iron, in billets, ingots and blooms, in steel bars and in plates.

Imports of iron and steel reported by weight were as follows, in gross tons: In June, 26,888 tons in 1916 and 28,421 tons in 1917; for the fiscal year, 309,051 tons in 1916, and 395,161 tons in 1917. The only notable increase was in scrap. There was an important decrease in steel rails, chiefly from Canada.

Iron ore imports into the United States in June were 134,154 gross tons in 1916 and 54,846 tons in 1917. For the fiscal year ended June 30 the total imports were 1,425,717 tons in 1916 and 1,149,958 tons in 1917; a decrease of 175,759 tons, or 19.3%. Of the imports in 1917 Cuba furnished 613,308 tons; Spain, 216,046; Sweden, 147,610; Newfoundland and Canada 142,570 tons. There was a large increase in the imports from Spain and a heavy decrease in those from Sweden.

Stoping Methods at the Franklin Mines

By H. H. HODGKINSON

Mine Superintendent, Wharton Steel Co., Wharton, N. J.

Method of shrinkage stoping at the Franklin mines of the New Jersey Zinc Co. Details of operations, consumption of materials, tonnages handled per man and costs per ton are shown in detail.

THE orebody at Franklin, N. J., consists principally of a granular mixture of willemite, franklinite and zincite, the gangue being a highly crystallized white limestone. It has a maximum vertical depth of 1150 ft., dipping southeast 40 to 60 degrees.

The greater part of the ore is mined by means of shrinkage stopes 17 ft. wide, the orebody being so mapped out that there is a pillar of solid ore 35 ft.



METHOD OF PROPPING BAD GROUND IN THE FRANKLIN MINE

in width left in place between each stope slice. The stope slices are carried transversely across the orebody according to line (each stope is laid out on a coordinate and numbered, starting with a line through the old Parker Shaft as 00). Each stope varies in length according to the variation in the horizontal distance

from foot to hanging wall, while the height is equal to the distance between levels, which is about 50 feet.

Formerly the ore was mined entirely by means of large drifts on each level driven longitudinally with respect to the orebody, there being as many as five of these drifts on a single level, the pillars between varying from 10 to 25 ft. in thickness or more. Cross-cuts at frequent intervals were also driven connecting these drifts. The ore was all shoveled by hand into cars. Owing to the equipment and capacity of the mill, only the richest ore was mined, the leaner material being left in the pillars. The ore chutes delivered the ore to the main level, and it was hauled by mules to the shaft or slope to be hoisted.

CHANGE OF MINING METHODS

When the method of mining was changed, a new shaft was sunk and haulage drifts were driven in the foot wall on the main levels 300, 750, 950 and 1150; thus they are outside and away from the orebody a sufficient distance to be protected from any injury due to mining operations, it being unnecessary to have large pillars of ore in place to support them. From these haulage drifts, which are equipped with 6-ton electric locomotives hauling cars of five tons' capacity, a number of raises were driven to serve as ore chutes connecting the foot-wall drifts of each level. These ore chutes are placed in the pillars between the stopes and hence receive no interference from stoping operations.

Besides these raises, others were driven for the purpose of bringing down rock mined in the quarries and mill rejections, with which to fill the stopes after the removal of the broken ore.

In beginning stoping operations a crosscut 5½ x 7 ft. is driven on the lowest level of the ore from foot to hanging wall, which is widened later to 17 ft. with a height of 12 ft. A temporary track is laid in the small drift, consisting of 20-lb. rails of 2-ft. gage, the ore being loaded into 1½-ton cars and trammed to the ore chutes by two men.

After the ore is removed, sills are placed and the track graded to 1½% from the foot wall, so that the grade will be in favor of the load in tramping the ore. Set timbers, which consist of 4-ft. 3-in. caps inside and 8-ft. legs, are next erected and loaded with rock filling packed in behind to support them; about 18 in. of 6-in. lagging is placed on the caps of the set timbers, which are braced and equipped with plank chutes by means of which the ore is loaded in cars instead of being shoveled. From on top of the set timbers a raise 4 x 4 ft. is driven in the foot wall up to the level above, which serves as an entrance and exit to the stope after the chutes in the set timbers are full of broken ore and no longer available for that purpose.

At the intersection of the stopes with the numerous drifts on each level it is necessary, before beginning stoping operations, to build cribbings of 8-in. oak timber on each side of the stope to give additional

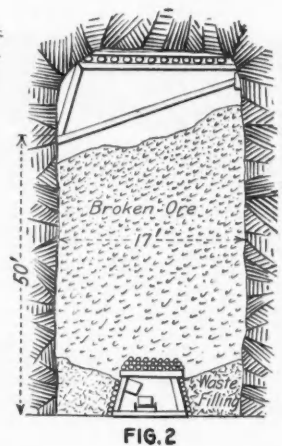
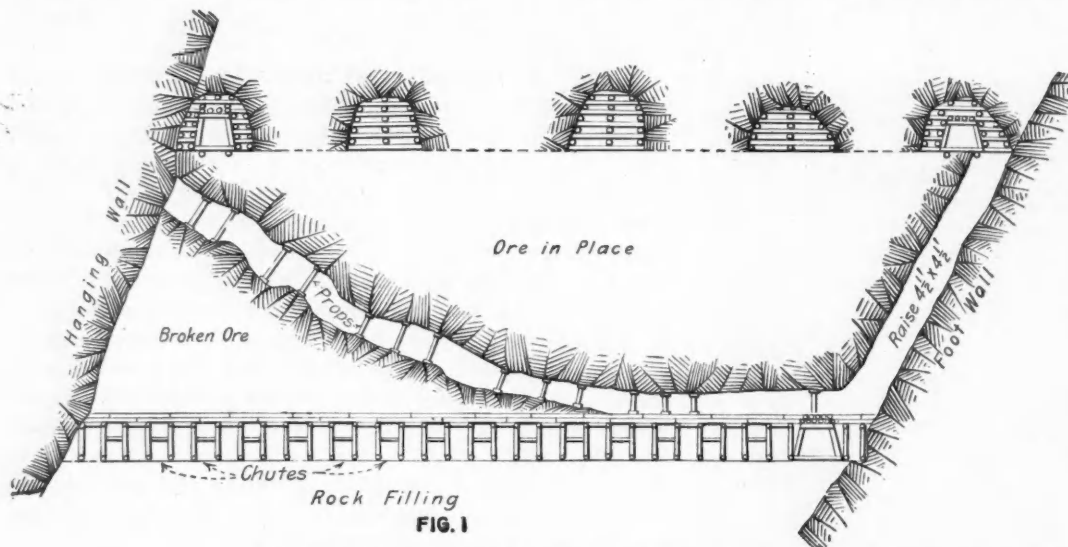
support to the pillars and also to hold in the stope the broken ore which would otherwise flow out on the level. The cribbings are filled with broken ore, obtained from the stope to which they belong, to make them more substantial.

The work of mining the ore in the stope slices is done from on top of the set timbers. Holes 8 ft. in depth are drilled in the back or roof at an inclination of from 45° to 60° by means of hammer drills using 3/8-in. quarter-octagon drill steel sharpened with a cross-bit. These holes are loaded with six sticks of 50% 1 x 8-in. low-freezing gelatin and blasted at the close of each shift. The miners begin mining operations at the hanging-wall end of the stope, retreating toward the foot wall, standing on the broken ore as the operations proceed upward. The work of stoping is performed by two men in each stope, who not only do their own drilling and blasting, but also clean down their loose ground, place props and blockhole the chunks

It is usually found necessary to protect the miners working in the stope and engaged in cleaning the sides and pulling the ore down into the chutes, from any falls of ground; for, as the ore is drawn down, these men are continually getting farther away from the ground over their heads.

The operation of drawing the broken ore out of a stope is begun at the hanging-wall end of the stope, the miners working on a sloping pile. As the chutes become empty, the car is moved back to the next chute, retreating toward the foot wall and protected by the broken ore on the set timbers from any falls of ground which would otherwise crash through the exposed set timbers.

After the stope is drawn, the set timbers and lagging are removed to be used again elsewhere and the stope filled with waste rock. The fill is dumped from the foot-wall end of the stope by means of the regular tram-cars, the car advancing out into the stope on a



LONGITUDINAL AND CROSS SECTIONS OF STOPE IN FRANKLIN, N. J., MINE

that are too large to pass through the chutes. These men break from 100 to 250 tons per drill shift, drilling from ten to eighteen 8-ft. holes, the amount of ore broken per foot of hole drilled varying from one to two tons.

The surplus ore in the stope is drawn out through the chutes in the set timbers so as to permit a space of about 6 ft. from the surface of the broken ore to

track laid on the fill. When the stope becomes filled, set timbers are again erected and the whole operation is repeated.

The largest amount mined in a single stope for one month was 7310 tons of ore. The largest amount of ore trammed from a single stope in one month was 5250 tons, while 4490 cu.yd. of rock filling is the maximum amount of rock placed in a single stope with hand tram-cars in a similar period.

MINE OPERATING SUMMARY

Results for Active Shrinkage Stopes (Average)

| | | | |
|---------------------------------------|---------|--|---------|
| Tons broken per man in stope | 48.5 | Tons trammed per man; tramming, handling and electric haulage | 15.3 |
| Tons broken per drill shift | 145.3 | Tramming explosives cost, per ton | \$0.001 |
| Tons broken per foot of hole drilled | 1.34 | Fill trammed per man tramming, cu.yd. | 14.1 |
| Breaking explosives, cost per ton | \$0.036 | Fill trammed per man, electric haulage, cu.yd. | 96.0 |
| Timber charges, cost per ton | \$0.15 | Fill placed per man; tramming, handling and electric haulage, cu.yd. | 10.1 |
| Tons trammed per man tramming | 20.4 | | |
| Tons trammed per man electric haulage | 69.0 | | |

The above results are based on a shift of 8 hours.

the solid back of the stope to permit good working space. In this manner the stope is mined 12 ft. above the next higher level, thus permitting space to erect set timbers again in order to continue stoping operations from this level.

The stope, which is now filled with broken ore, is ready to be drawn as soon as the back is timbered.

DUTY ON METALS ENTERING NEW ZEALAND, according to "Commerce Reports," is as follows: Pig iron, fencing wire (plain and barbed), sheet lead, and plain sheet zinc enter free of duty from all countries; on nails the duty varies from free from all countries to 48c. per cwt. of 112 lb. from the United Kingdom and possessions, with 24c. additional from all other countries; iron bars, bolts, sheets and plates enter free from the United Kingdom and possessions, with 20% additional from all other countries; corrugated galvanized iron, 48c. per cwt. from the United Kingdom and possessions, with 9 3/4c. additional from all other countries. In addition to these rates of duty, there is a special war tax of 1% ad valorem collected on all imports into New Zealand.

Tentative Safety Rules for Gold Dredges in California

Practical ideas, received from representatives of various interests, have been incorporated in rules pertaining to general welfare and safety of employees on the gold dredges of California. Public hearings are being held this week in San Francisco, by the Industrial Accident Commission of the State of California, for the consideration of these proposed regulations and for the reception and discussion of other pertinent suggestions.

THE Industrial Accident Commission of California Insurance and Safety Act to make and enforce was empowered by the Workmen's Compensation safety orders for various industries. In carrying out the provisions of this act the Commission requested the following men to formulate a set of safety rules for gold dredges: Harold Mestre (chairman), consulting engineer; F. L. Lowell (secretary), deputy mine inspector, Industrial Accident Commission; L. D. Hopfield, department manager, Natomas Co. of California; C. W. Gardner, representing Hammon Engineering Co.; A. L. Wilde, district representative, International Brotherhood of Steam Shovel and Dredge Men; Carl Brown, manager, California Casualty Indemnity Exchange; H. M. Wolfen, mining engineer, U. S. Bureau of Mines, chief mine inspector, Industrial Accident Commission; R. L. Eltringham, electrical engineer, Industrial Accident Commission.

The rules drafted have been divided into four sections: General Safety and Welfare; Guards Against Falling and Falling Objects; Machinery and Power Transmission; and Electrical. The "Electrical Utilization Safety Orders," "Air Pressure Tank Safety Orders," and Sec. 29, 30, 31 and Sec. E (appendix) of the "Quarry Safety Rules" shall apply, where applicable to gold dredges.

GENERAL SAFETY AND WELFARE

Rule 401. Reporting of Accidents.

(a) Report of Fatal Accidents—Whenever a fatal accident occurs on or about any gold dredge, notice thereof shall be given promptly, by telephone or telegraph if possible, to the chief mine inspector, by the superintendent or other person having immediate charge of the work at the time of the accident. Upon receiving such notice the chief mine inspector or a deputy shall, if feasible and if the nature of the accident shows it to be necessary, proceed to the scene of the accident as early as possible and investigate fully the cause of the accident, and shall file the result of such investigation as a report in the office of the chief mine inspector. Whenever the chief mine inspector or a deputy cannot proceed as above to the scene of the accident, the person in charge of the gold dredge shall be so informed, and such person in charge shall obtain signed statements, sworn to where practicable, of those who witnessed the accident, or, if no one was present at the time of such

accident, he shall obtain the statements of those first arriving upon the scene. Such statements shall give, as far as possible, the details of the accident, the facts leading up to it, and its probable cause; such statements shall immediately thereafter be sent to the Industrial Accident Commission, which shall file the same in its office. A transcript of the evidence given at the coroner's inquest may be sent in place of these statements if the operator so desires.

(b) Report of Personal Accident—Every personal accident occurring on or about a gold dredge shall be promptly reported to the man in charge of the dredge by the person injured, or, if such person shall be unable to do so by reason of the injury, then by some person acting in behalf of the injured person; and such injury shall be promptly reported to the superintendent's office, where it shall be recorded. These records shall at all times be open to examination by the chief mine inspector or any deputy.

Where the injury disables through the day of injury, or requires skilled medical attention, a written report must be made to the Industrial Accident Commission on the blank form furnished by the Commission. This report must be forwarded within 35 days from date of injury.

Rule 402. Care of the Injured.

(a) Telephones—A telephone shall be installed on or near every gold dredge in order to provide quick communication with a doctor. Arrangements shall be made so that in case of an accident requiring medical treatment the doctor shall be brought to the injured man or the injured man to the medical aid as quickly as possible.

(b) First-Aid Equipment—It shall be the duty of operators, superintendents, or anyone in charge of any gold dredge or gold dredges to keep in the winch room, or other approved location on each boat, a stretcher of a type approved by the Commission, a woolen blanket,

TABLE I. MISCELLANEOUS

| | |
|--|---|
| 1 blunt end eye dropper. | 1 teaspoon. |
| 1 U. S. army tourniquet. | |
| 1 small medicine glass. | Preparations |
| 1 pair scissors. | 2 oz. tincture iodine, $\frac{1}{2}$ U.S.P. |
| 1 pair forceps suitable for extracting splinters, etc. | 2 oz. 2% solution of Boric Acid. |
| 2 doz. applicators for iodine. | 2 oz. aromatic ammonia. |
| $\frac{1}{2}$ doz. paper drinking cups. | 1 doz. ampoules, 1 c.c. aromatic ammonia. |

TABLE II.

| | |
|---|--|
| 5 yd. 1-in. gauze roller bandage. | $\frac{1}{2}$ doz. large-size bandage compresses |
| $\frac{1}{2}$ doz. triangular bandages. | (3) in. sq., folded upon itself 18 |
| $\frac{1}{2}$ doz. small-size bandage compresses (1-in. sq., tails $\frac{1}{2}$ yd. long, center of compress being sewed to tails; folded upon itself about 20 times). | times, tails 2 yd. long, center of bandage compress being sewed to tails). |
| 1 doz. medium-size bandage compresses (2) in. sq., tails 1 yd. long; center of bandage compress sewed to tails; folded upon itself about 20 times). | 2 1-yd. pkgs. picric acid gauze. (An equivalent quantity of gauze in smaller packages may be substituted for one 1-yd. package). |
| | $\frac{1}{2}$ doz. yucca splints. |
| | $\frac{1}{2}$ yd. 2-in. gauze roller bandage. |

TABLE III. BANDAGES

| | |
|--|--|
| 5 yd. 1-in. gauze roller bandage. | Plain gauze 1 yd.—2 packages. |
| $\frac{1}{2}$ doz. 1-in. x 10 yd. gauze. | $\frac{1}{2}$ doz. Z. O. adhesive plaster, $\frac{1}{2}$ in. x 4 yd. |
| $\frac{1}{2}$ doz. 2-in. x 10 yd. gauze. | $\frac{1}{2}$ doz. Z. O. adhesive plaster, 1 in. x 5 yd. |
| 2 compresses, U.S.A. style (large size). | 8 oz. Carron oil with 2% carbolic acid. |
| 2 triangular bandages. | This must be placed in four 2-oz. bottles, sealed with paraffine or other suitable material. |
| 5 yd. 2-in. gauze roller bandage. | |
| Handy-fold plain gauze (6 x 36-in.)—2 yd. handy-fold or equal. | |

a waterproof blanket and such additional first-aid materials as are designated in the tables 1 and 2 or 1 and 3, in good condition for use in caring for any person who may be injured on or about the boat. Where satis-

factory arrangements have been made for the prompt bringing of medical assistance to the injured man on the boat, and there is more than one boat operated by the same company, and the boats are operated in reasonably close proximity to each other, one stretcher of approved type centrally located and easily accessible to the attending physician may be supplied instead of the one stretcher on each boat, as above required.

Substitutes for the above materials may be permitted by the Industrial Accident Commission on request.

(c) **First-Aid Training**—The superintendent shall see that at least one man on each shift on each dredge is thoroughly trained in first aid. For the purposes of these rules, men shall be considered to be thoroughly trained when they are able to administer first-aid treatment for shock, bleeding, burns, cuts, bruises, sprains, fractures and dislocations; they shall be able to administer artificial respiration by the prone-pressure (or Schaefer) method and understand the proper methods of transporting the injured.

All employees shall receive first-aid training and classes for their instruction shall be provided not less than once in each calendar month.

Rule 403. Intoxicating Liquor.

No employee shall, while under the influence of intoxicating liquor, go aboard a gold dredge, nor shall any employee carry intoxicating liquor aboard the same. It shall be the duty of the dredge master, or the man in charge, to enforce this rule.

Rule 404. Sanitary Requirements.

(a) **Drinking Water**—(An excerpt from the statutes and amendments of the codes of the State of California: An act to require employers of labor to furnish, without charge, pure drinking water to their employees during working hours. Approved May 24, 1915. In effect Aug. 8, 1915.)

Every employer of labor in this state shall, without making a charge therefor, provide fresh and pure drinking water to his employees during working hours. Access to such drinking water shall be permitted at reasonable and convenient times and places.

Any violation of the provisions of this act shall be deemed a misdemeanor and punishable for each offense by a fine of not less than twenty-five dollars (\$25), nor more than one hundred dollars (\$100), or by imprisonment for not more than thirty (30) days, or by both such fine and imprisonment.

(b) **Toilets**—It shall be the duty of the operators of every gold dredge to provide a suitable enclosed toilet on the dredge.

Rule 405. Illumination.

All parts of the dredge where men are required to be or go when the dredge is in operation shall be provided with adequate light at all times.

Rule 406. Fire Protection.

A box containing at least 2 cu.ft. of clean, dry sand and a scoop shall be kept at each of the following places on all gold dredges: Winch room, each oil switch or auto starter or each group of oil switches or auto starters, oil and grease store room, provided that one approved extinguisher of the one-quart carbon-tetrachloride type may be substituted for each 2 cu.ft. of sand required.

Rule 407. Protection Against Drowning.

(a) **Safety Ladders for Hulls**—Safety ladders must be fastened to each side of the hull of the boat to extend from the main deck to 3 ft. below water line. One

ladder must be placed on the forward end of each pontoon and one on each outer side forward of the main house.

(b) **Life Line**—A wire hand rope shall be run along both sides of the boat and so hung that it shall be at all times at or near the water line; an additional line shall be used where necessary to meet this provision.

(c) **Life Buoy**—A standard-size circular cork life buoy, with sufficient length of rope attached, must be placed on the main deck of each boat on each side, just inside of forward end of main house, in a convenient place, and maintained in serviceable condition. The life buoys shall be secured with seals, which are to be broken only in case a man has fallen into the pond.

(d) **Grappling Hook**—A grappling hook with sufficient rope attached to reach the bottom of the pond shall be placed in a convenient place on the main deck of every dredge and secured by a seal. This seal is to be broken only in case a man has sunk in the pond and it is necessary to grapple for his body.

Rule 408. Goggles.

A suitable pair of goggles shall be issued to each individual worker who is exposed to any serious eye hazard through the nature of his work.

Rule 409. Hand Tools.

Hand tools shall be regularly inspected and the heads annealed and dressed as often as necessary.

GUARDS AGAINST FALLING AND FALLING OBJECTS

Rule 421. Gantry Platforms.

Platforms shall be provided on bow and stern gantries at a convenient distance below all sheaves, so that such sheaves shall be safely accessible for greasing or other purposes. These platforms shall be of close planking, not less than 2 in. in thickness and suitably supported. Openings not larger than necessary to admit free passage of ladder, spud and stacker lines shall be left and protected by toe-board, and such sections of the flooring as necessary to permit the working of the head lines shall be made removable. Gantry platform railings shall be of substantial construction and securely fastened. If pipe railings are used, floor flanges will not be considered a secure method of fastening, unless stanchions are extended through platform and flanges placed on under side and bolted through.

Rule 422. Railings and Toe-boards.

(a) **Railings**—The outside edges of all decks, elevated walks, runways or platforms except the roof of the winch house and the main deck, if 4 ft. or more from the water or deck below, must be provided with a railing not less than 3½ ft. high.

Note: Thirty-six inch railings will be permitted where at present in existence.

(b) **Toe-boards**—If the height exceeds 6 ft. above water or deck below, a toe-board must be provided to prevent material from rolling or falling off, except that no toe-boards shall be required on the stacker runways, roof of the winch house or the main deck walk across the stacker belt at the lower end.

(c) **Deck Openings**—All deck openings must be guarded with a railing not less than 3½ ft. high, have a toe-board not less than 6 in. high and an additional railing midway between the toe-board and top rail. Railings are to be constructed in a safe and substantial manner of either pipe, metal work or wood. One or

more sides may be on hinges, or, if hinges are impracticable, sockets may be used. The screen well shall be considered as a deck opening. All deck openings which can not be guarded as required in this manner must be guarded with a cover, preferably hinged.

(d) Doorways—Doorways used as landings shall be guarded with a single rail which may be more than 42 in. but not more than 60 in. above the deck, or else vertical hand rails shall be provided on each side of doorway.

(e) Access to Elevated Platforms—Permanent elevated platforms must be equipped with a permanent stairway or stationary ladder. Where a stationary ladder or stairway passes through any elevated platform, the opening shall be of sufficient size to permit of easy passage in a normal position by any one using the ladder or stairway.

Rule 423. Ladders.

(a) Substantial Construction. All ladders shall be of substantial construction throughout and shall be maintained in a safe condition, with the rungs tightly fastened and free from seriously weakening cracks or wear.

(b) Spacing of Rungs—Rungs shall be spaced uniformly and be not less than 12 in. or more than 15 in. from center to center.

Fixed Ladders: (c) Construction of Rungs—Rungs, if of wood, shall be clear lumber, free from checks and knots, of a minimum size of $1\frac{1}{2}$ x 3 in., and set in stringers at least $\frac{3}{4}$ in. at the bottom. (d) Clearance—There shall not be less than 6 in. clearance from each rung to the nearest permanent object back of ladder. (e) Protection of Rungs—If ladder is made by nailing rungs to a vertical or inclined post or upright, the ends of rungs shall project at least 6 in. beyond post or upright at each end. (f) Width of Ladders—Stringers shall be spaced not less than 15 in. apart. (g) Projection above platform—Ladders shall project at least 3 ft. 6 in. above any platform to which the ladder leads, unless convenient and secure hand-holds are fixed at such places.

Portable Ladders: (h) Precautions against Slipping—All portable ladders (except substantial stepladders) must be provided with either sharp points at the foot, or wide, rough-surface feet, or other effective means to prevent slipping. Ladders for use in oiling overhead shafting, where necessary to rest same on the shafting, must be arranged to hook over the shafting.

(i) Width of Ladders—All portable ladders are not to be less than 15 in. wide at the top. (Note: It is suggested that the width of ladder be increased $\frac{1}{2}$ in. per ft. of length from top to bottom.)

Rule 424. Stairways.

(a) Handrails—All stairways must be equipped with handrails, the top of which shall be 30 in. vertically from the nose of the tread, as follows: 1. Where the stairway is not built next to a wall or partition, rails must be placed on both sides. 2. If stairway is closed on both sides, at least one handrail must be provided. 3. If width is greater than 4 ft., rails must be provided on each side.

(b) Illumination—All stairways must be properly lighted, either by natural or artificial light.

(c) Risers and Treads—All risers and treads on any stairway shall be uniform, except that on existing in-

stallations a shorter riser may be permitted at the bottom. (Note: Stairways should not be built at a sharper angle than 50 deg. For sharper angles, ladders should be used instead.)

Rule 425. Stacker Runways.

Evenly spaced cleats shall be provided on stacker runways and maintained in good condition and tightly fastened. No toe-board is required on these runways but an intermediate rail shall be provided half-way between the top rail and runway; this rail may be of wire rope, if preferred. A safe approach shall be provided to the inner end of both stacker runways.

Rule 426. Stacker-Crossings.

A cross-over walk from the port-stacker runway to the starboard-stacker runway at or near their outer ends shall be provided and equipped with a railing.

Rule 427. Stacker Rock Stops.

Rock stops to prevent rock from rolling back on stacker belt shall be placed over the belt not more than 50 ft. apart, the lower stop to be not more than 25 ft. from the end of the delivery chute.

Rule 428. Stacker-Belt Side Guards.

Side guards of substantial construction and at least 6 in. high shall be provided on both sides of the stacker belt.

MACHINERY AND POWER TRANSMISSION

Rule 441. Gears.

All gear wheels must be protected with a closed guard of metal wood or wire mesh of such dimensions and construction that the point of mesh of the gears cannot be reached from outside the guard and that no shear will exist between the spokes of the gear wheel and any portion of the guard or adjacent structures. A suitable trap or opening shall be provided at a point well away from the point of mesh so that the gears can be safely greased while running.

Rule 442. Belts.

Belts Must Be Guarded—All belts, ropes or chains driving machinery or shafting, where exposed to contact, must be guarded. In all cases the point where the belt, rope or chain runs on to the pulley, sheave or sprocket, if within 7 ft. of the deck or platform, must be guarded.

Exception: Belts which are so small or so slow-moving that they are not in any way a source of danger.

(b) Horizontal Belts—All horizontal belts, ropes or chains driving machinery or shafting, 7 ft. or less above the deck or platform, where exposed to contact, must be guarded. All overhead belts 6 in. or more in width and over 7 ft. from deck or platform, must be guarded underneath and on sides, unless so guarded that persons can not pass under them. All chain or rope drives over 7 ft. from deck or platform must be guarded in like manner as belts over 6 in. in width are guarded. In all cases the guard must cover the outer faces of the two pulleys or sheaves and extend upward to such a point and be attached in such a way that in case the belt, chain or rope breaks, the guard will withstand the whipping force.

(c) Vertical and Inclined Belts—Vertical and inclined belts must be substantially guarded as follows: 1. If the guard must be less than 15 in. from the belt, with a complete enclosure of wood or metal to a height of 6 ft. above the deck. 2. If the guard can be placed

with at least 15 in. clearance from the belt, with a two-rail railing at least 3½ ft. high.

Rule 443. Pulleys.

All pulleys or parts of pulleys within 7 ft. of a deck or platform must be guarded where exposed to contact.

Rule 444. Stacker Drum.

Point of contact of stacker belt with the upper side of the drum at the outer end of stacker shall be guarded in such a manner as to prevent possibility of injury between belt and drum.

Rule 445. Sprockets.

All sprockets must be guarded, if exposed.

Rule 446. Clutches.

All clutches must be completely guarded when exposed. (Note: Practically all clutches have protruding parts which make them as dangerous as projecting set-screws on shafting.)

Rule 447. Screen Rollers.

(a) Tread Rollers—Tread rollers shall be covered with a closed guard and the guard must extend over the contact of the roller with the tread ring on the revolving screen and up at least 2 ft. on said tread ring above point of contact. The housing may be of wood, metal or wire mesh.

(b) Thrust Rollers and Guide Rollers—The point of contact of thrust rollers and guide rollers with tread ring shall be completely guarded.

Rule 448. Shafting.

All transmission shafting, either horizontal or vertical, and all dead ends of shafts wherever exposed to contact must be guarded.

Rule 449. Setscrews.

All projecting setscrews on moving parts must be removed, countersunk or protected by a solid collar, or a headless setscrew must be used. No part of the setscrew must project above the surface.

Rule 450. Keys and Keyseats.

All projecting keys in shafting, where exposed, must be cut off or guarded, and all keyseats in ends of shafts, where exposed, must be filled flush or guarded.

Exception: Keys in the upper tumbler shaft and swing winch drum shafts shall be excepted.

Rule 451. Flywheels.

All flywheels shall be guarded with a closed guard to the height of 6 ft. or to the top of the flywheel.

Rule 452. Grease Cups.

All grease cups with the exception of self-feeding cups must be piped out to a safe and convenient place for the oiler to reach.

Rule 453. Sheaves.

All sheaves shall be guarded so as to eliminate any shear between the spokes or web of sheave and any part of frame or housing and also to prevent possibility of being drawn into sheave by a line or of being jammed between line and housing or guard.

Rule 454. Bow-Line Fair-Lead Track Rollers.

Bow-line fair-lead track rollers shall be guarded with a suitable fender traveling ahead of roller on track and so adjusted and constructed as to prevent a man's hand or foot from passing beneath the fender or being jammed between the fender and track.

Rule 455. Spud Lines.

Spud lines shall be completely housed with metal or wood from the aftermost deck sheave to a point 6 ft. above the top deck.

Rule 456. Grinding Wheels.

(a) Protection Hoods—Straight grinding wheels must be provided with a complete protection hood of sufficient strength to retain broken parts in case the wheel should break. This hood must be adjusted close to the wheel and extend forward over the top of the wheel to a point at least 30° beyond a vertical line drawn through the center of the wheel.

(b) Flanges—The sizes of straight flanges used with straight wheels and protection hoods shall not be less than shown in the accompanying table. (Note: Wheels should be handled with the greatest care in unpacking, storing, delivering, etc., and should never be left standing on the ground or wet places. Great care should be used in mounting wheels; never force a wheel on the arbor. It is advisable to use thin, compressible washers between wheel and flange to obtain a perfect bearing at the outer edge of the flange; both flanges should be of the same diameter and the arbor nut should not be tightened more than is necessary to hold the wheel securely. Vibration should be avoided at all times.)

STRAIGHT FLANGES AND STRAIGHT GRINDING WHEELS USED WITH PROTECTION HOODS

| Diameter of Wheel in Inches | Minimum Outside Diameter of Flange | Minimum Diameter of Recess | Minimum Thickness of Flange at Bore |
|-----------------------------|------------------------------------|----------------------------|-------------------------------------|
| 6 | 2 | 1 | |
| 8 | 3 | 2 | |
| 10 | 3½ | 2½ | |
| 12 | 4 | 2¾ | |
| 14 | 4½ | 3 | |
| 16 | 5½ | 3½ | |
| 18 | 6 | 4 | |
| 20 | 7 | 4½ | |
| 22 | 7½ | 5 | |
| 24 | 8 | 5½ | |
| 26 | 8½ | 6 | |
| 28 | 10 | 7 | |
| 30 | 10 | 7 | |

(c) Safety Wheels—Where protection hoods are not used, safety wheels fitted with safety flanges must be provided.

(d) Arbor Ends—Arbor ends must be guarded.

(e) Speed of Wheels—Speed of wheels must not exceed the speed guaranteed by the manufacturer.

TABLE OF GRINDING WHEEL SPEEDS

| Diameter of Wheel in Inches | Revolutions per Minute for Surface Speed of 4,000 Ft. | Revolutions per Minute for Surface Speed of 5,000 Ft. | Revolutions per Minute for Surface Speed of 6,000 Ft. |
|-----------------------------|---|---|---|
| | 1 | 15,279 | 19,099 |
| 2 | 7,639 | 9,549 | 11,459 |
| 3 | 5,093 | 6,366 | 7,639 |
| 4 | 3,820 | 4,775 | 5,730 |
| 5 | 3,056 | 3,820 | 4,584 |
| 6 | 2,546 | 3,183 | 3,820 |
| 7 | 2,183 | 2,728 | 3,274 |
| 8 | 1,910 | 2,387 | 2,865 |
| 10 | 1,528 | 1,910 | 2,292 |
| 12 | 1,273 | 1,592 | 1,910 |
| 14 | 1,091 | 1,364 | 1,637 |
| 16 | 955 | 1,194 | 1,432 |
| 18 | 849 | 1,061 | 1,273 |
| 20 | 764 | 955 | 1,146 |
| 22 | 694 | 868 | 1,042 |
| 24 | 637 | 796 | 955 |
| 26 | 586 | 733 | 879 |
| 28 | 546 | 683 | 819 |
| 30 | 509 | 637 | 764 |
| 32 | 477 | 596 | 716 |
| 34 | 449 | 561 | 674 |
| 36 | 424 | 531 | 637 |

(f) Eye Protection—Unless an individual pair of goggles is furnished to every man who has occasion to use the grinding wheel, each wheel shall be guarded with a fixed eye guard of plate glass, so placed as to prevent possible injury to the eye from flying particles. The glass shall be maintained in a clean and serviceable condition.

(g) Tool Rests—If tool rests are used, they shall be at all times kept within ¼ in. or less of surface of the wheel. (Note: It is recommended that tool rests be removed where possible.)

ELECTRICAL RULES

Rule 461. Danger Signs.

All machines and apparatus operating at above 650 volts shall be marked by the use of the word "danger" followed by an indication of the voltage carried.

Rule 462. Grounding of Dredge and Electrical Equipment.

(a) **Electrical Apparatus**—The noncurrent-carrying metal parts of all electrical apparatus on the dredge shall be effectively grounded. Effective grounding on a wooden boat shall consist of linking the frames of the main and swing winches together with a suitable metallic connector and effective metallic connection of the part to be grounded to the frame of either winch. On steel boats, grounding to the frame of the boat by bolting to it or otherwise shall be considered effective grounding.

(b) **Power Cable**—The armor of the power cable leading from the bank to the boat shall be grounded by attaching a clamp to the cable at or near the shore pole and fastening an "O" 19-strand copper cable to it and connecting this copper cable to an iron pin driven into the damp ground.

Rule 463. Insulation of Conductors.

(a) **Overhead Lines**—Overhead transmission lines between the generating station or substation and the dredge shall be supported upon insulators, which shall be adequate in quality, size and design for the voltage transmitted. Such line shall be maintained not less than 14 ft. above the ground or any structure used as a passageway.

(b) **High-voltage Wires**—All high-voltage wires installed on gold dredges between shore pole and the dredge, as well as on the dredge, shall be in the form of properly insulated cables, which shall be armored or effectively protected against abrasion, but the armor shall be electrically continuous throughout, and shall be effectively grounded. The installation of efficiently insulated wires in metal conduit to transmit power shall be considered to meet this requirement.

(c) **Support of Cables and Wires**—All cables and wires unless provided with grounded metallic covering shall be effectively insulated and shall be supported by efficient insulators. The conductors connecting lamps to the power supply shall in all cases be insulated.

(d) **Cables Entering Fittings**—Where unarmored cables or wires pass through metal frames or into boxes or motor casings, the holes shall be substantially lined with insulating bushings.

(e) **Joints in Conductors**—All joints in conductors shall be mechanically and electrically efficient, and shall be soldered wherever necessary. All joints in insulated wire shall, after the joint is complete, be re-insulated to the same extent as the remainder of the wire.

Rule 464—Transformers.

(a) **Circuits Entering or Leaving all Transformers Protected by Circuit-Breakers**—Circuits leaving transformers shall be protected by automatic circuit breakers to interrupt the current, but fuses and a disconnecting switch may be substituted for a circuit-breaker.

(b) **Primary Disconnecting Switch**—Primary fuses and disconnecting switches shall be placed on shore in the primary circuit ahead of the transformers, but in no case shall the switches be opened or closed under load.

(c) **Oil Switch**—A main oil switch of sufficient capacity to interrupt the circuit must be installed on the primary circuit.

(d) **Transformer Rooms**—Transformer rooms shall be properly lighted and shall be of fireproof construction.

Rule 465. Switchboards.

(a) **Construction**—Main and distribution switch and fuseboards shall be made of noncombustible, nonabsorbent, insulating material, which shall be free from metallic veins. The board shall be mounted upon supporting frameworks of iron or steel and fixed in a dry place. If insulated conductors are used in the wiring of the board, the insulation of such conductors shall be flameproof.

(b) **Inclosing Switchboard**—All switchboards and panel boards having exposed current-carrying parts operating at over 150 volts to ground, and not isolated by elevation, shall be suitably inclosed in cabinets, screens, or rooms or other inclosures to make them inaccessible to others than the authorized operator.

(c) **Insulating Platforms**—Conducting floors around switchboards shall be provided with a suitable insulating platform or mat so placed that no person can inadvertently touch live parts unless standing on the insulating platform or mat.

Rule 466. Switches, Fuses, Automatic Circuit Breakers, etc.

(a) **Switches Shall be Provided**—All points at which a circuit has to be made or broken shall be provided with proper switches, which shall be so installed that they can not be closed by gravity.

(b) **Guarding Live Parts of Switches**—All manual switches shall have suitable casings or guards protecting the operator from danger of contact with current-carrying parts, effective during ordinary operation.

(c) **Mounting of Switches, Fuses, Circuit Breakers, etc.**—All switches, circuit breakers, rheostats, fuses, and all instruments used in connection with motor generators, rotary converters, transformers, and motors shall be mounted on standard bases of noncombustible and insulating material. This provision shall not apply to compensators for induction motors. The above mentioned switches, circuit breakers, rheostats, fuses, and instruments may be mounted on a common base, provided such base is of noncombustible, insulating material, and insulated platforms or mats shall be provided in front of all electrical-control devices.

(d) **Disconnecting Switch Ahead of Fuses**—An individual switch shall be installed directly ahead of every fusible cut-out in order that the fuses may be completely disconnected from all sources of electrical energy when the cut-out is being re-fused. Fuses shall be adjusted or replaced only by an authorized person.

(e) **Fuses in Insulated Box**—Fuses shall be located in a metal or insulating box. A legible warning against removing fuses before the switch controlling same is opened shall be placed on the outside of the cover of said metal or insulating box. This does not apply to fuses mounted on a switchboard. (Note: It is recommended that where fused switches of the externally operated type are used, the cover of the switch cabinet be so interlocked in relation to the switch handle as to prevent opening the cover until the switch has been opened, and to prevent the closing of the switch while the cover is open.)

(f) Capacity of Fuses—Fuses and automatic circuit breakers shall be constructed so as effectually to interrupt the current when a short circuit occurs or when the current through them exceeds a predetermined value. The capacity of fuses used to protect feeders shall not exceed the current capacity of the feeder by more than 25 per cent.

(g) Capacity Shall Be Marked—Fuses shall be stamped or marked, or shall have a label attached, indicating the maximum current that they are intended to carry.

(h) Primary Meters. In no case shall primary meters be used.

Rule 467. Motors.

(a) Circuit Breakers and Cut-Outs—Every stationary motor and every portable motor, together with its starting device, shall be protected by a circuit-breaking device or by fuses on each line and switches arranged to cut off entirely the power from the motor.

(b) Guards for Moving Parts—Suitable guards for inclosures shall be arranged at each motor when necessary to prevent persons or objects from inadvertently coming in harmful contact with moving parts.

Rule 468. Electric Lighting.

(a) Lamp Sockets—The exterior of the sockets of all incandescent lamps, installed after these rules go into effect, shall be entirely nonmetallic.

(b) Flexible Lamp Cord—The use of flexible lamp cord for lighting connection is prohibited except where its use is necessary on account of excessive vibration or for portable incandescent lights, to be used in connection with the inspection and repair of machinery and equipment; and in that case the cord shall be especially insulated or armored. Such portable lights shall be protected by a wire cage large enough to inclose both lamp and socket, unless a socket with nonmetallic exterior is used. A handle shall be provided to which the light and socket shall be firmly attached and through which the leading-in wires shall be carried, except that where the insulation of the leading-in wires is thoroughly reinforced by taping, the handle may be omitted.

Croesus, Ontario's High-Grade Mine

The history of the Croesus mine, situated in the Munro district of Ontario, records an unusual occurrence of a high-grade gold deposit, it being one of the few high-grade mines in that province.

The property consists of two claims, known as the Walsh and the Dobie, which were purchased in June, 1915, by the Croesus Gold Mines, Ltd., the stock of which is owned by the Dominion Reduction Co., of Cobalt, Ont. Eugene L. Steindler, general manager of the holding company, has supplied the following interesting information regarding the property.

On the Dobie claim there existed a spectacular high-grade outcrop, which the owners of the claim had covered with a steel plate, which they kept bolted down and locked, to prevent "high-grading." The initial operations consisted of sinking a prospecting shaft on the vein, and about 30 ft. from the high-grade showing. After sinking 14 ft., ore was encountered equally as rich as the surface showing; this continued down to the 200-ft. level, the shaft alone

producing approximately \$1000 to the foot. The vein is a quartz vein with an average width of 2½ ft., and lies comparatively flat, the dip being only about 20° from the horizontal.

The gold in the vein is free and coarse. In the first 200 ft. of the mine, no gold occurs that is not visible to the naked eye. Unless free gold can be seen, the vein rock is practically barren. The gold occurs like plums in a pudding, but in sufficient quantity to make the average grade extremely high.

During the time the mine was being opened, the high-grade ore was picked out by hand and crushed in a mortar, and the resulting gold amalgamated directly and melted. This produced bullion 910 fine in gold, with about 60 points in silver. The richness of the ore can be best described by saying that of 746 lb. of rock hoisted at one particular time, approximately \$47,000 in gold was produced. All the ore is practically specimen ore. For example, one piece weighing 1 lb. 15 oz., avoirdupois, contained \$292.68 worth of gold, the value having been determined by submersion in water, taking account of the differences in specific gravity. The Ontario Government purchased five pieces of this ore which contained \$10,000 in gold.

Geologically, the high concentration of the gold seems to have been influenced by a shear zone. Aside from this property, none of the surrounding claims has as yet shown any likelihood of being productive. Development has now been carried to the 300-ft. level, at which point the vein has dipped under the shaft, and a crosscut to the vein is being driven. The length of the oreshoot is approximately 80 ft. A small mill has just been completed, consisting only of a picking belt, a 4½-ft. Hardinge mill and amalgamating plates. The high-grade and oversize waste is picked off the belt, the fines being crushed and passed over the amalgamating plates. On the dumps are several thousand tons of rejects from the earlier development, which will undoubtedly run \$40 per ton.

The occurrence of this high-grade ore has been misstated in previous descriptions, when described as nuggets, as it is really free-gold in the quartz, but highly concentrated as herein described.

Nevada Consolidated Report

The thirty-first quarterly report of the Nevada Consolidated Copper Co. for the quarter ended June 30, 1917, shows 20,817,356 lb. copper produced, as compared with 18,852,321 lb. for the preceding quarter. The following shows the production for the last quarter by months: April, 6,727,192 lb.; May, 7,239,978 lb.; June, 6,850,186 lb.; an average monthly production of 6,939,119 pounds.

During the quarter 1,021,990 dry tons of Nevada Consolidated ore, averaging 1.46% copper, was milled, as compared with 949,916 dry tons averaging 1.48% copper for the previous quarter. Of the tonnage milled, 75% was supplied from the pits and 25% from underground workings of Ruth mine. In addition, 18,145 dry tons of the Consolidated Coppermines Co. ore was milled. During the quarter the company paid a dividend of 50c. per share and a capital distribution of 50c. per share.

Iron Ore in Missouri

ST. LOUIS CORRESPONDENCE

The Iron Mountain mine in Missouri has again been sold and is being reopened by the new owners. An attempt is being made to work the low-grade thin veins by crushing and jigging, which the old company tried and failed to do profitably, as the veins were too small and the cost of crushing the enclosing hard porphyry too high. There is considerable lean ore of this type both there and at Pilot Knob. Perhaps it could be worked at a profit under prevailing high prices but would probably be a "war bride" at best. The old rich orebodies as well as those at Pilot Knob are exhausted as far as known.

In the southern part of Missouri there are numerous, small residual deposits of brown iron ore which are rather uncertain and frequently high in sulphur. In the aggregate the tonnage is large but so uncertain and scattered are the deposits that they are largely a farmer's proposition, to be worked on the surface when there is nothing else to do. More ambitious efforts have been made by using steam shovels and washers but unsuccessfully. The washed product runs 40-48% iron.

The "basin" or "sink-hole" type of deposit, of varying size, found in the central part of the state, may run 50-60% iron. The larger ones, however, have been exhausted. The lone charcoal furnace at Sligo, the last of six or eight formerly in operation, is running on these "banks."

The production of iron ore in Missouri in 1914 is given in the report of the State Geologist (as quoted by *Iron Age*) as 36,304 tons, which figure rose to 40,290 tons in 1915. The producers for 1915 were the Sligo Furnace Co., Salem; L. C. McSpadden, Salem; Iron Mountain Mining Co., Iron Mountain; Julian Pickes, Morrellton; A. J. Sanders, Steelville; and Kingsbury Mining Co., West Plains.

The proximity of Missouri iron ore to Illinois coal has doubtless suggested pig iron to some. But as shown above the iron ore is poor and cannot usually be worked at a profit, while Illinois coal, I am informed, does not coke satisfactorily. It is possible that with modern ovens, with their higher temperatures and pressures, a merchantable grade of coke can be made, especially from the washed coal.

The only blast furnace using coke as fuel, in Missouri, is at South St. Louis and is smelting Mesabi iron ores. It gets some Missouri brown ore but not enough to run on thus far. The Iowa ore it had figured on using is, for some reason, not coming to it; this is said to occur as a large body of low-grade brown ore requiring modularizing after preliminary washing.

Russian Platinum Output

The production of platinum in the Ural district in Russia in 1916 is estimated by a correspondent of the *London Mining Journal* at only 78,674 troy oz., against 107,774 oz. in 1915; 156,775 oz. in 1914; 173,642 oz. in 1913; and 185,381 oz. in 1912. The decrease last year extended to nearly all the districts but was most marked on the Demidov estates and the Shuvalov placers. The shortage of labor has been one of the causes of the decrease. The fact that all crude platinum is now requi-

sitioned by the Government has led, it is believed, to the concealment of some quantities, so that the figures given are below the real output. A considerable quantity of crude platinum is understood to be held by Russian banks which advanced money to the producers before the metal was taken by the Government.

Judge Bourquin Decides

According to telegraphic dispatches from Butte, Judge Bourquin, on Aug. 27, rendered a decision in the case of Minerals Separation vs. Butte & Superior in favor of the plaintiff. This case hinged on the use of more than 1% of oil. Previous to the decision of the U. S. Supreme Court in the Hyde case, Butte & Superior had been using less than 1% of oil. After that decision, Butte & Superior adopted the use of a larger quantity of oil, considering that such was outside of the scope of the decision of the Supreme Court. Minerals Separation then claimed that such was still an infringement of its patents.

In rendering his present decision, Judge Bourquin is reported as using the following words:

The defendant uses the patent process, uses the plaintiffs' invention, uses the same elements in the same combination in the same way with the same furniture to the same but poorer results and exceeds the patent claims in reference to oil uselessly, wastefully and injuriously, merely with intent to avoid infringement. To secure to patentees their invention the law looks quite through mere devices and forms to the substance of things, and if in substance the invention is taken, all devices to evade the letter of the patent avail nothing to escape the consequences of infringement.

We shall defer any comment upon this last decision until we have received the full text of it.

Bureau of Mines Appropriation

The following table shows the appropriations for the work of the Bureau of Mines for the fiscal year just closed (1917) and for the next fiscal year (1918):

| BUREAU OF MINES APPROPRIATIONS | | |
|--|-----------|-------------|
| | 1917 | 1918 |
| General expenses, Bureau of Mines..... | \$70,000 | \$73,300 |
| Investigating mine accidents..... | 347,000 | 353,800 |
| Testing fuel..... | 135,000 | 135,000 |
| Mineral mining investigations..... | 100,000 | 100,000 |
| Investigations, petroleum and natural gas..... | 70,000 | 100,000 |
| Mining experiment stations..... | 75,000 | 150,000 |
| Improvement of grounds and removal and installation of machinery, etc., Pittsburgh and Bruceton..... | | 35,000 |
| Repairs to mine-rescue cars..... | 26,055 | |
| Care and maintenance new buildings, Pittsburgh..... | 4,305 | 17,220 |
| Purchase of three additional mine-rescue cars..... | 53,000 | 81,750 |
| Equipment of three additional mine-rescue cars..... | 13,500 | 13,500 |
| Operating new mine rescue cars..... | 35,000 | 98,000 |
| Inspecting mines in Alaska..... | 7,000 | 7,000 |
| Books and publications..... | 1,500 | 1,500 |
| Land leases, etc., for mine-rescue cars..... | 1,000 | 1,000 |
| Removing mining experiment station, Pittsburgh..... | 42,700 | |
| Total..... | \$981,060 | \$1,167,070 |

It is to be noted that \$100,000 is appropriated in 1918 for petroleum and natural-gas investigations, against \$70,000 in 1917. The appropriation for mining experiment stations is doubled.

Milling Costs at the Inspiration and Bunker Hill Plants

In the article under the above caption, appearing in the July 21 issue of the *Engineering and Mining Journal*, a typographical error appeared in the tabulated "Cost of Copper at Inspiration." The item of concentrating and royalty should read 2.243c. per lb., instead of 0.243c., as published.

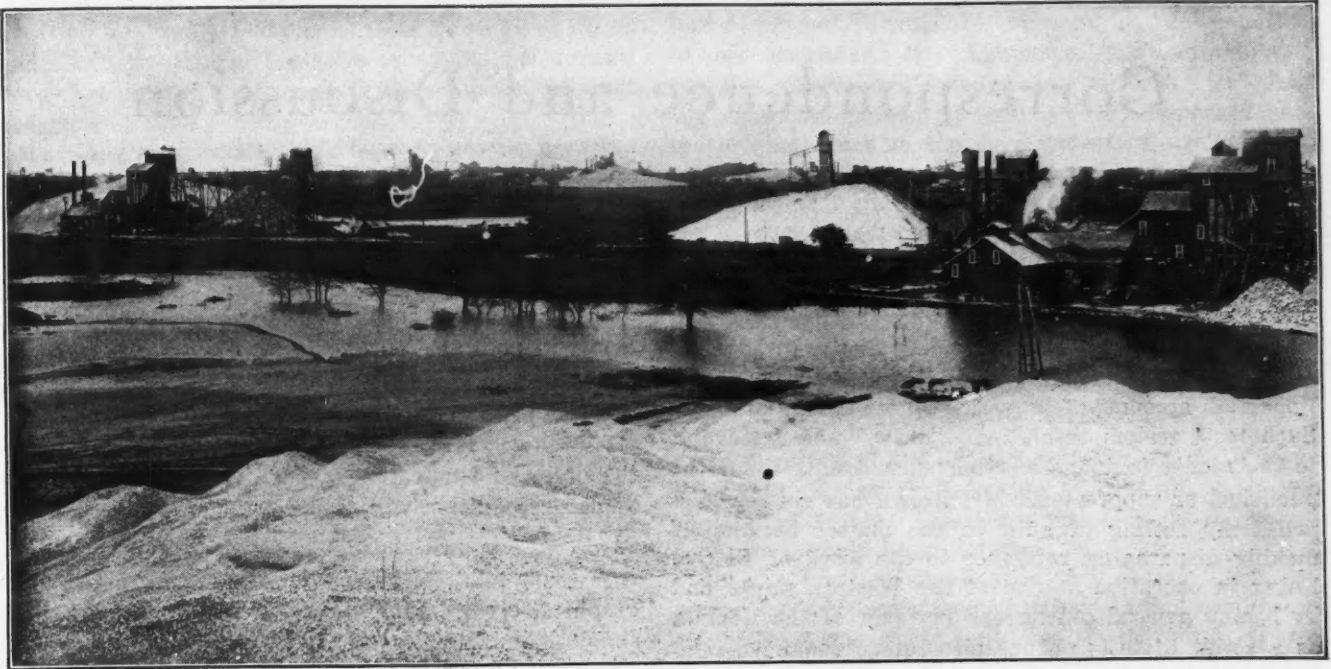
Photographs from the Field



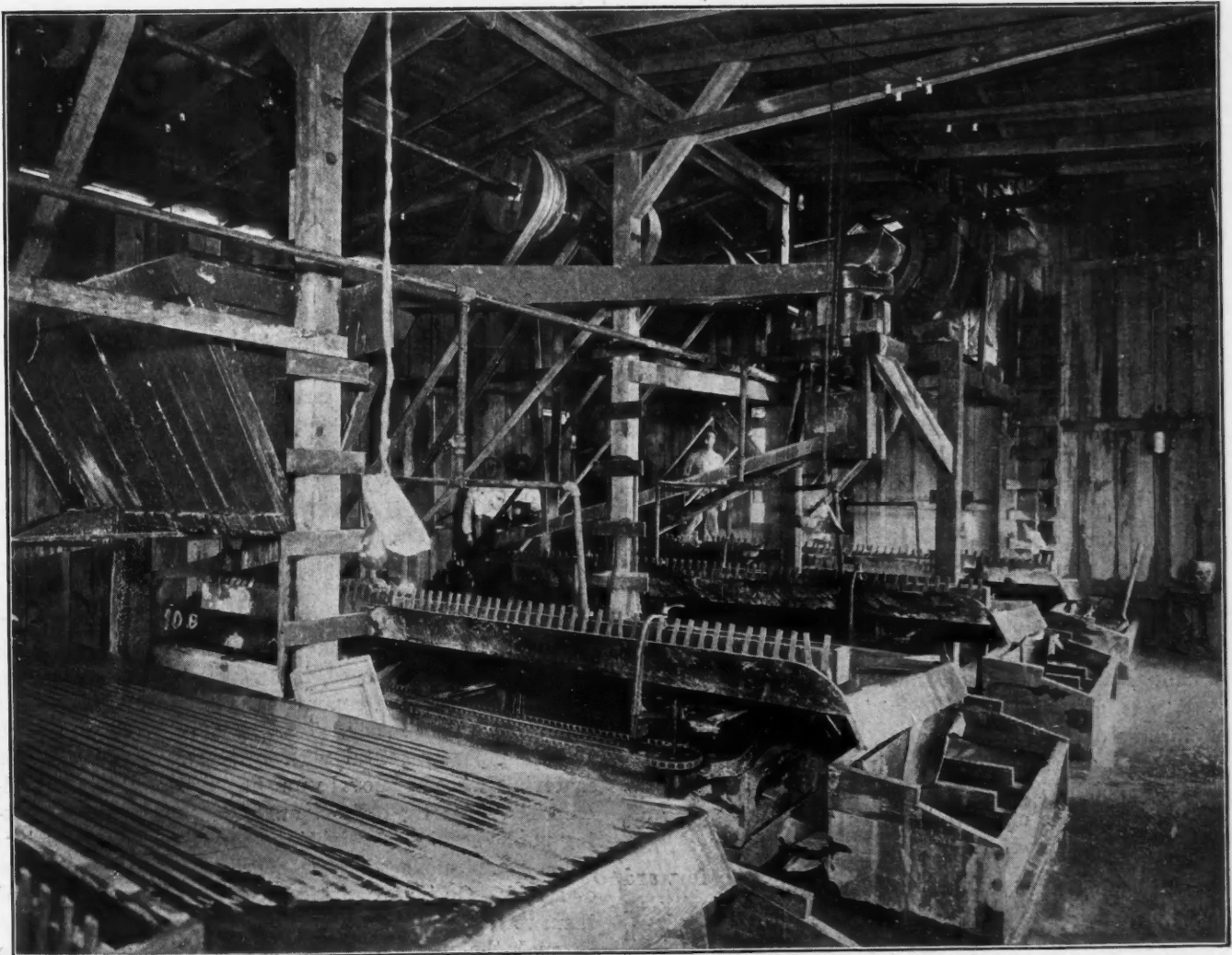
FIRE ON JULY 7 DESTROYED SURFACE BUILDINGS AT LAST DOLLAR SHAFT, CRIPPLE CREEK, COLORADO



EL PASO CONSOLIDATED MINE ON BEACON HILL, CRIPPLE CREEK GOLD DISTRICT, COLORADO



GROUP OF MILLS AND TAILING PILES IN THE WEBB CITY SECTION OF JOPLIN DISTRICT IN SOUTHWESTERN MISSOURI



VIEW IN SLIME DEPARTMENT OF A TYPICAL ZINC MILL OF SOUTHWESTERN MISSOURI IN THE JOPLIN DISTRICT

Correspondence and Discussion

Tube Milling in Rhodesia

Permit me to explain, in reply to F. C. Brown's criticism in the *Journal* of July 28, that the object of the original article was not to make disparaging reference to the Komata lining, but to give an unbiased and impartial account of a series of tube-milling tests. Such tests seldom result in a "draw," and I leave it to the reader to judge whether such results should be published or suppressed. Mr. Brown has entirely dispelled my feeling of guilt in the matter by himself making disparaging reference to the work of El Oro lining in operation at one of the Western mines and by basing general conclusions in favor of the Komata as a result of tests on one class of feed only.

With regard to the Rhodesian experiments, the deciding factor was crushing per horsepower from coarse gravel (2- to 3-mesh) to —200-mesh. At the same time and in order to explain definitely the superiority of the higher-speed lining in this particular instance, a test was made with a much finer material (20-mesh). The results were more favorable to the Komata and agreed with the comparative analyses now published by Mr. Brown on a material carrying 18.5% of +28-mesh, and which it may be assumed, all passed 20-mesh. As clearly stated in the article under criticism, the decisive tests had to be made on a coarsely milled rock approximately 150 times this size, so that the screen analyses now published do not constitute a reasonable rebuttal of the South African results.

On referring again to the literature of the subject, I note in Mr. Brown's article describing the Komata lining¹ that a test on a ½-in. diameter feed resulted in the discharging of the quartz particles after the first passage only slightly rounded, and apparently not even fractured. This is precisely what happened at the Lonely Reef and led to an immediate congestion of the grinding circuit. By manipulating the feed tonnage so as to permit the returning of the unground particles to the mill an excessive number of times until they were gradually reduced to slime, the tonnage handled fell below the economic minimum. El Oro lining at normal speed with the same pebbles and using less horsepower, was able to reduce the coarse feed in a single passage to under 1% on 20-mesh, thus permitting table amalgamation of the tube-mill discharge pulp.

It was only by disregarding the gospel of the infallibility of the imported flint, or the substitution of mine rock, and by using a maximum-sized tough, heavy and artificially rounded felsite, that I found it was possible to slime effectively so coarse a feed in a tube mill of such comparatively small diameter.

It is to be hoped that Mr. Brown will come forward with the results of tests showing the superiority in tons slimed per horsepower with the Komata lining with

a coarse feed, on which he bases his objections to the results of the tests under criticism. More information on this point will be welcomed by metallurgists who seldom have the opportunity of making such tests for themselves and who realize that the available information is scanty and often biased by the conservatism of local practice. The Komata lining merits a wider attention; and it is only by the frank discussion of the limits of application of such modifications that extended recognition will result.

CLASSIFIER EFFICIENCY

I would like the opportunity of correcting a typographical error in the article under discussion. With simple classifiers the efficiency of separation, dividing an undersize from an oversize, may be found from the formula,

$$\frac{100(a' + a'')}{A}$$

where A equals total tonnage to classifier, a' equals tonnage of undersize in the classifier overflow, and a'' equals tonnage of oversize in the classifier underflow (not *overflow* as stated).

Compound-classifier efficiency may be estimated by extending the formula thus:

$$\frac{100(a' + a'' + a''' \dots + O)}{A}$$

where a' equals tonnage of required grading in first product, a'' equals tonnage of required grading in second product, etc., O equals the tonnage of required undersize in overflow, and A equals the total-feed tonnage.

The same system may, of course, be used in connection with efficiency estimations of screening apparatus.

New York, Aug. 15, 1917.

A. W. ALLEN.

Danger in Brass Carbide Lamps

The communication of John B. Stewart on "Danger in Brass Carbide Lamps," in the July 28 issue of the *Journal*, is interesting and records, as my memory serves, a novel observation. I have therefore forwarded it at once to *Chemical Abstracts* so that it may be brought to the attention of as many chemists as possible.

Apropos of this, it may be recalled that when "gas lighting" was introduced, iron pipe, except gun barrels, was not an article of commerce and therefore brass and copper tubes were used. The gas as sent through these service pipes was foul with tar, ammonia, and other materials whose removal was the subject of later developments. Among other troubles encountered in making public-service gas lighting acceptable were the mysterious explosions of these service pipes when heated or struck. On investigation Dr. Robert Hare discovered them to be due to copper acetylide formed in the pipes through the action of the acetylene in the gas with the ammoniacal solution of copper previously formed there.

¹"Min. and Sci. Press," Feb. 3, 1912.

With the commercial introduction of acetylene this observation was recalled and many tests made, all of which tended to show that no explosive compound was formed between acetylene and copper if the ammonia was not present.

Mr. Stewart speaks of this flash as having occurred during the cleaning of the lamp. This recalls that various ammoniacal preparations, such as "Household Ammonia," are now quite commonly used in cleansing metals. Is it possible that one of them was used in cleansing these lamps prior to their re-use? If such should prove to be the case, some small residue of cuprous-ammonium compound may have been left in the lamp with which acetylene could react.

CHARLES E. MUNROE.

Washington, D. C., Aug. 21, 1917.

Area of Segments of Circles

Referring to Mr. Marquard's article, "Area of Segments of Circles," in the Aug. 11 issue of the *Journal*, why not the general formula?

Where altitude of segment alone is given,

$$\text{Cosine } \frac{1}{2} \text{ central angle} = \frac{R - A}{R}$$

Where A is less than R ,

$$\text{Area} = R^2 \tau \frac{\angle}{360} - \frac{1}{2}(R^2 \text{ sine } \angle)$$

Where A exceeds R ,

$$\text{Area} = R^2 \tau \frac{360 - \angle}{360} + \frac{1}{2}(R^2 \text{ sine } \angle)$$

\angle = the central angle, and A the altitude of the minor segment.

U. W. HARWOOD.

Rochester, Nev., Aug. 17, 1917.

Ammonia Leaching Process

While here, on a Western trip, I happened to read in the Milling Number of the *Journal*, which I had not had an opportunity of looking over before, the statement that Mr. Benedict, of the Calumet & Hecla company, was the first to make ammonia leaching applicable on a large scale. As a point of information I may say that the Kennecott Copper Corporation, at the Bonanza mine, Alaska, was really the first company to operate ammonia leaching on a large scale, as it has been running a 400-ton plant there successfully on tailings since about April, 1915, as I recollect.

I worked out the treatment scheme on Kennecott tailings first on a small scale at Flat River, Mo., in 1912 or 1913, and in 1914 designed a one-ton plant for Kennecott which proved satisfactory, and the 400-ton plant followed. Most of the work in this connection in Alaska was done by E. T. Stannard, once mill superintendent at Flat River, Mo., then at Braden Copper, and now manager of Kennecott Copper Corporation in Alaska. The ammonia plant in Alaska is making a recovery of 75% or thereabout.

H. A. GUESS.

Spokane, Wash., Aug. 5, 1917.

[We were well aware of the ammonia process introduced at Kennecott. Indeed, we hoped to have a contribution from Mr. Stannard on that subject in the

same number with Mr. Benedict's, but Mr. Stannard found himself unable to prepare it, delegated it to his assistant, Mr. Lawrence, and unfortunately Mr. Lawrence's manuscript arrived too late. We expect to publish it shortly. We supposed that the original work in the development of the ammonia process was more or less a nip-and-tuck matter, but we were under the impression that Mr. Benedict's was the earliest. However, we appreciate that it is always dangerous to say that anything is the first, the biggest, the deepest, etc., without careful investigation and thorough knowledge.—Editor.]

Daylight Saving in Portugal

On page 684 of the *Journal* for Apr. 14, 1917, is an editorial favoring the adoption of daylight saving in the United States. Possibly a few remarks on its use in Europe would be of interest.

Here in Portugal one hour of daylight saving is employed during the summer months. It is accomplished by setting the clock time one hour ahead of the astronomical time. It gives a longer evening by one hour with no noticeable effect in the morning. It is most advantageous in mining work, where the summers are often too short at best. It permits the maximum of overtime work and the minimum requirements on artificial lighting. It gives Portugal the same amount of available daylight as the northern part of England. It permits a 12-hour daylight day to be worked. If adopted in the United States universally, it would be a great boon to industry under the present trying circumstances.

Viseu, Portugal, May 16, 1917.

F. W. FOOTE.

A War Service for Engineers

Knowing that the *Journal* must often come in contact with engineers who have not yet found their place of usefulness in the war and so seek its advice, I beg to draw attention to the fact that men are needed for the Engineering Division of the Signal Corps, as inspectors at the numerous factories producing aeroplanes and aeroplane engines.

I have just been appointed District Manager of Inspection, Aircraft Engineering Division, Signal Corps, for New York and vicinity, and should be glad to see any applicant for this service.

Graduate engineers or men with shop experience are preferred, but a school for inspectors is soon to be opened at the Curtiss aeroplane factory at Buffalo, where accepted applicants can be sent to learn their duties, after being enrolled, and while drawing their pay—\$100 to \$200 a month. At the school their real aptitude can be better determined and their pay and duties assigned accordingly.

Such being the case there are opportunities for all sorts, from an underpaid draftsman to the chief executive of a large concern, since not only are inspectors needed, but district managers and staff officers, and men in the executive positions will later be commissioned in the Signal Corps as Reserve Officers.

R. S. RAINSFORD.

Care of J. G. White & Co., 43 Exchange Place,
New York, Aug. 10, 1917.

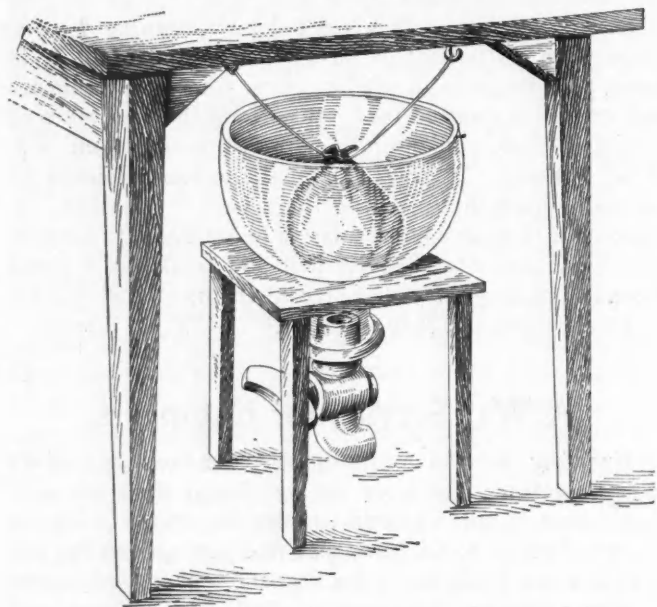
Details of Milling and Smelting

Container for Lead Acetate

BY J. R. TETLIE*

At the Aurora Consolidated Mines Co., Aurora, Nev., trouble was experienced with the lead sponges in the assay of gold and silver cyanide solutions by the zinc-dust method. Since using the container herein described, the trouble has been overcome and good consistent sponges are obtained.

Cut the bottom out of a glass carboy and fit the mouth with a stoneware stop-cock. Invert the carboy and place it on a stand. It can then be placed under a table out of the way. A bag of sheeting or thin canvas is made to hold the lead acetate. Place about



LEAD ACETATE IS KEPT IN BAG HUNG IN CARBOY

10 lb. of lead acetate, crushed to $\frac{1}{2}$ in., in the bag which should be suspended from the underside of the table so as not to rest on the bottom of the carboy. Fill the latter half full of water. At the end of 24 hours the solution will be strong enough for use. It will need no more attention until nearly used up, when the carboy and sack should be cleaned out and fresh acetate and water put in. Thus a supply of clear and saturated solution is always ready. With 30 solution-assays per day, replenishing is necessary about once a month.

Clear Water from Streams

One way to secure clear water, which has proved successful, according to James E. Noble in *Power*, Aug. 28, 1917, is shown in Fig. 1. A shaft well is sunk from 25 to 50 ft. from the stream, depending on the nature of the soil. The shaft will in some cases have to be made water-tight to a depth where gravel or sand is en-

*Aurora, Nev.

countered. This will prevent mud from washing in during periods of high water. The bottom of the well should be several feet below low water in the stream to insure a sufficient supply at all times.

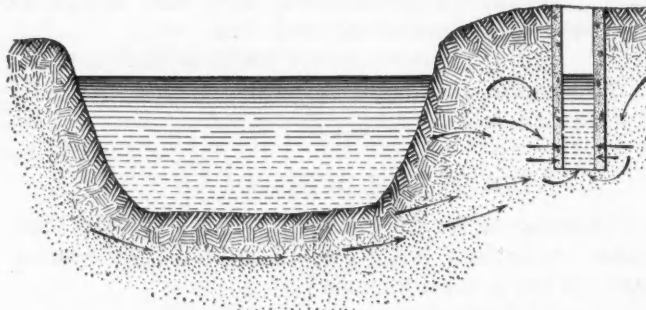


FIG. 1. WELL SUNK ALONGSIDE THE STREAM

Another plan is shown in Fig. 2, in which an iron or cement tank is lowered to near the bottom of the stream with an opening to admit water at the downstream end of the tank. Two pipes are shown connected to the

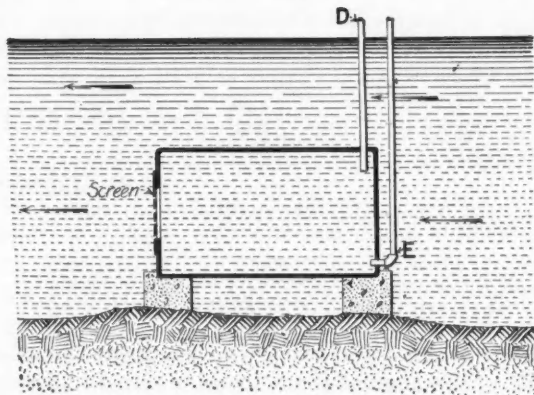


FIG. 2. TANK LOCATED NEAR BOTTOM OF STREAM

tank. The one marked *D* is for the regular pump suction, and the one marked *E* is connected near the bottom to allow pressure to be admitted to flush out the tank when there is an accumulation of sediment.

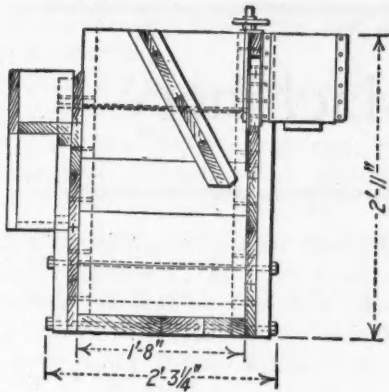
Cascade Flotation Machine

BY D. H. FAIRCHILD*

In the *Journal* of May 19, 1917, an article appeared on the "Cascade Flotation Machine," by Clifford R. Wilfley. It may be interesting to know in connection with this that about August, 1915, a flotation machine of the "cascade" type was built and used a short time by the Ray Consolidated Copper Co. to handle the tailings from the other flotation machines.

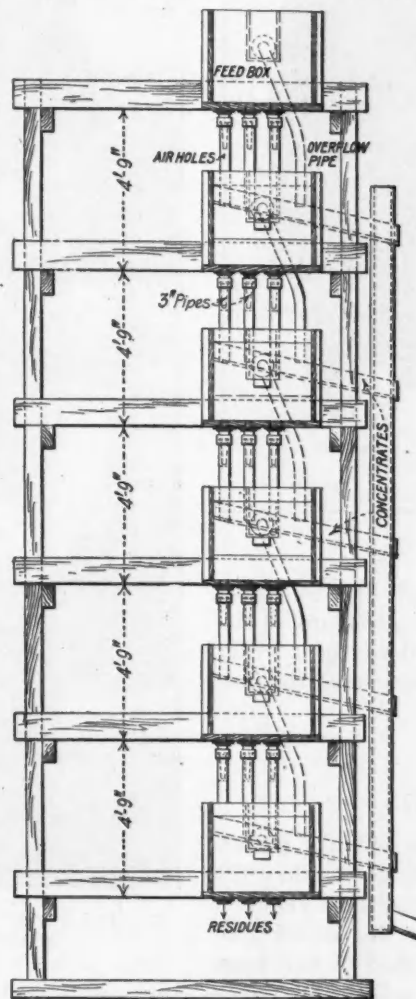
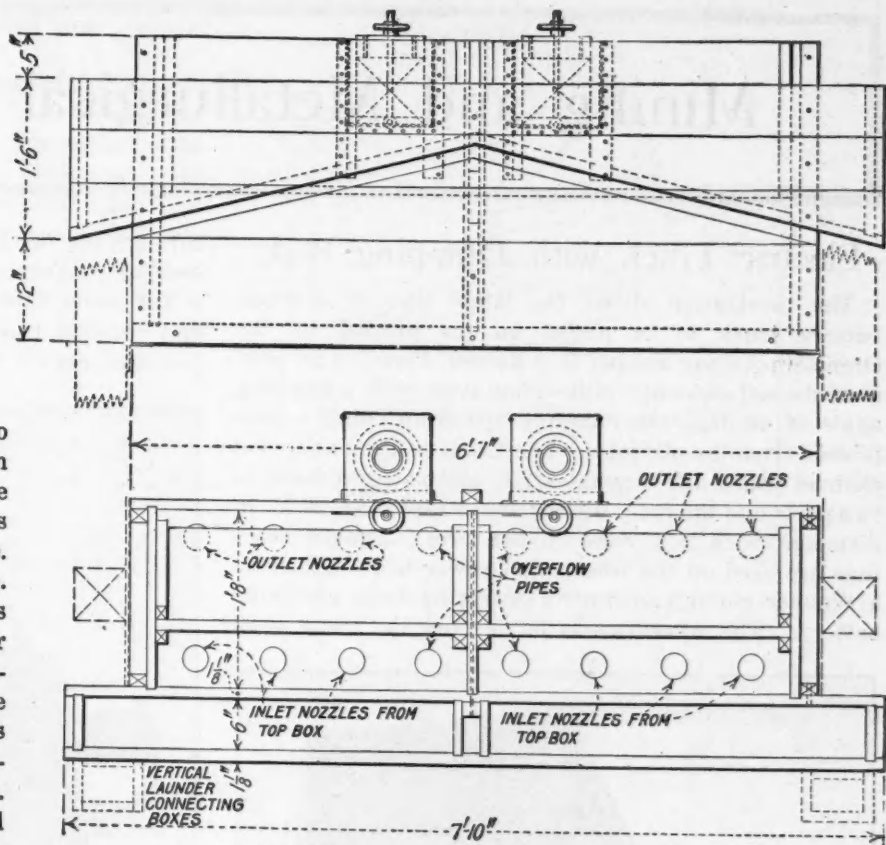
This machine was about 30 ft. high and was constructed in a series of steps with the sides and back boxed in by tongue-and-groove material. On each step was set two stave tubs about 3 or 4 ft. in height by

*Fairchild Engineering Co., 527 Seventeenth St., Denver, Colo.

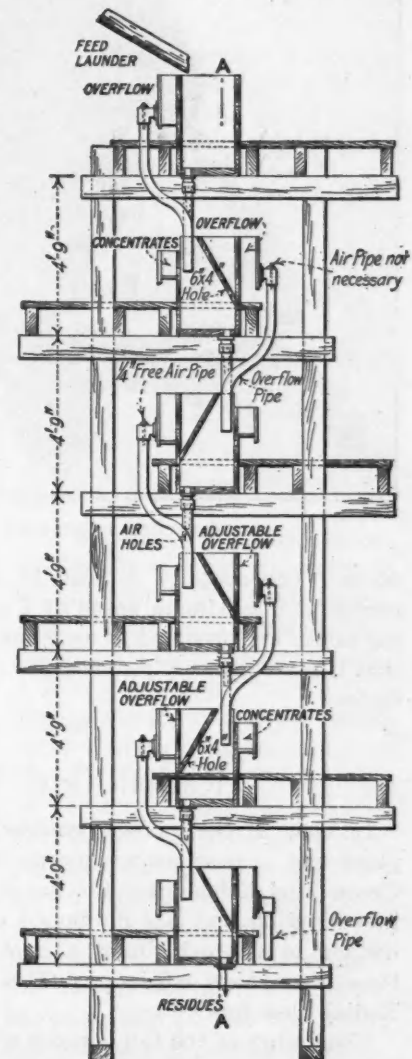


about 2½ ft. in diameter. Each two tubs on each step were set directly in line, respectively, with those on the next step, making two lines or series from top to bottom of the machine. In the front of each tub about 8 in. below the top was an outlet. This outlet was boxed in and the pipe or launder carried directly downward almost to the top and just above the center of the next tub below. As the feed entered the top, it was equally divided between the two upper tubs. As these two tubs filled and overflowed at the outlet the pulp, falling through the perpendicular pipe or launder to the next tubs, became aerated to a degree and a froth resulted in all tubs below the upper two. This froth that was formed overflowed around the edges of the tubs and fell to the floor of the "steps." From step to step it progressed downward by gravity to the bottom, where the concentrate formed was taken care of. The machine was removed after a test that showed it was inefficient. The heads fed to this machine were extremely low-grade, and the test for this reason could hardly be compared to one where original flotation feed was used. However, it was generally conceded by all concerned that this type of machine did not provide sufficient agitation for the best results. The agitation was too languid or anæmic to secure high efficiency.

In view of the articles published in the *Journal* of May 19, 1917, on the "Cascade Flotation Machine," and in the *Journal* of April 14, 1917, on "A Hydraulic Flotation Machine," the accompanying drawings will be of interest. They represent machines of the cascade type as installed at the Central Mine, Broken Hill, Australia. The drawings are published by courtesy of the *Mining and Engineering Review*, of Melbourne, Australia.



Section A-A

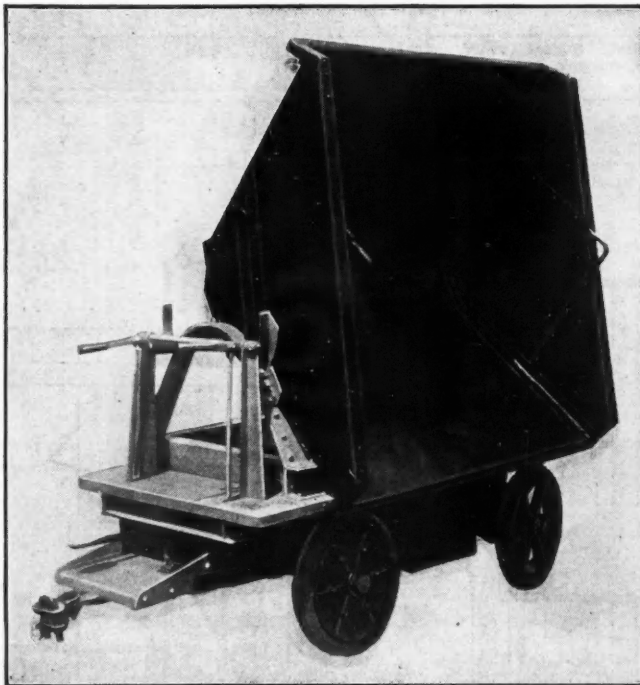


A CASCADE FLOTATION MACHINE TRIED IN AUSTRALIA

Mining and Metallurgical Machinery

Electric Truck with Dumping Body

The illustration shows the latest type of storage-battery truck to be placed on the market by the Orenstein-Arthur Koppel Co., Koppel, Penn. The body is of the self-clearing cradle-dump type, with a dumping angle of 40 deg., the dumping operation being accomplished from the platform. The truck proper has a steel channel frame and a metal-edged oak platform made in two parts and hinged. Wheels are of cast steel, 20 in. in diameter, with 3-in. solid rubber tires. Timken bearings are used on the wheels and power is furnished by a Wagner motor and control operating from an Exide battery. The wheelbase is 52 in. and the tread gage



ELECTRIC DUMPING TRUCK

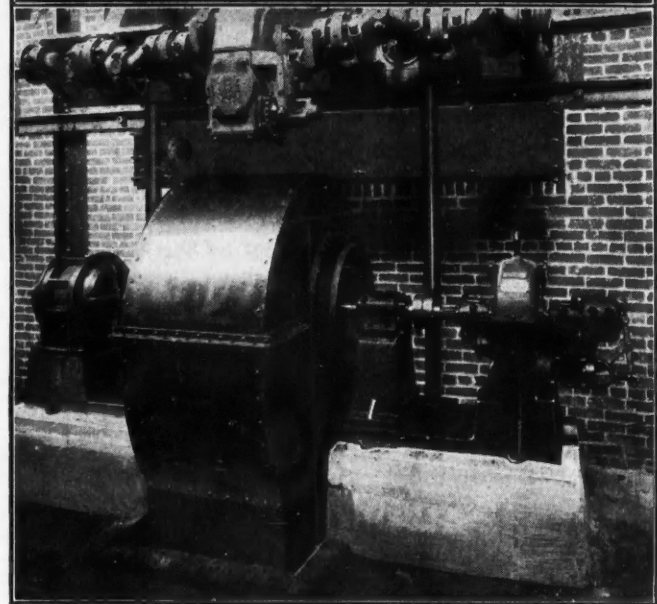
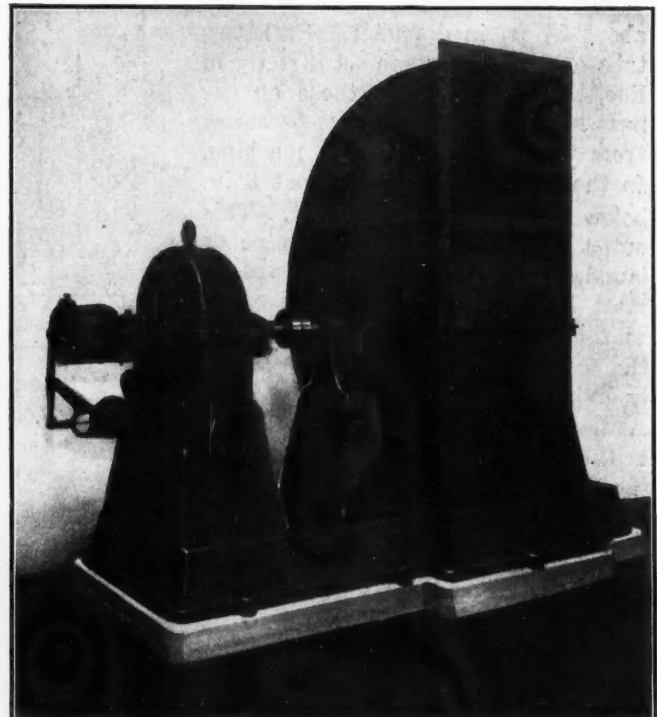
34 in. The capacity is 3000 lb., which can be transported at a maximum speed of 7 miles per hour. Lifting hooks are provided at each end of the body in order that it may be easily removed for inspection of the batteries.

Radial-Flow Fans

In view of the modern tendency to simplify power-plant and mining machinery as much as possible, the Green Fuel Economizer Co. has spent several years of investigation and has developed a fan for direct connection to steam turbines or motors that at the same time gives high efficiency. This is called the Green Radial-Flow fan.

The design of the fan is much along centrifugal-pump lines and is such that the path of the air or gases

through the fan has the least resistance consistent with ease of manufacture and results in an efficiency that is far above that usually met with in fans for forced- and induced-draft service. Furthermore, the use of direct-connected turbine drive, at speeds which give a



RADIAL-FLOW FAN DRIVEN BY DIRECT CONNECTION FROM EITHER MOTOR OR TURBINE

reasonable turbine economy, enables its use in direct competition with the familiar steam-engine-driven fan.

The radial-flow fan lends itself to direct connection to alternating-current motors, at the higher synchronous

speeds, which enables the use of small and compact driving units.

There are large numbers of this type of fan now in service in all classes of industry. It is a favorite for forced-draft service, particularly in connection with underfeed stokers. The illustration shows a small fan used as an individual forced-draft fan for an underfeed stoker in a large plant where they are using individual fans for each boiler unit. This is interesting in that two classes of drive are shown. On one side is a direct-connected steam turbine and on the other a direct-connected motor. The general conditions of the plant in question call for motor drive of the auxiliary units to produce the best over-all economy. There are times, however, in any plant when the steam balance will be so thrown out or when there are troubles on the electrical lines that demand a steam drive as well to produce the best results. Thus the unit shown is a very admirable compromise and does not require the duplication of units.

These fans are also applicable to induced draft and various types of exhaust service, particularly mine ventilation, where the higher pressures are desirable.

Pumping in the Joplin District

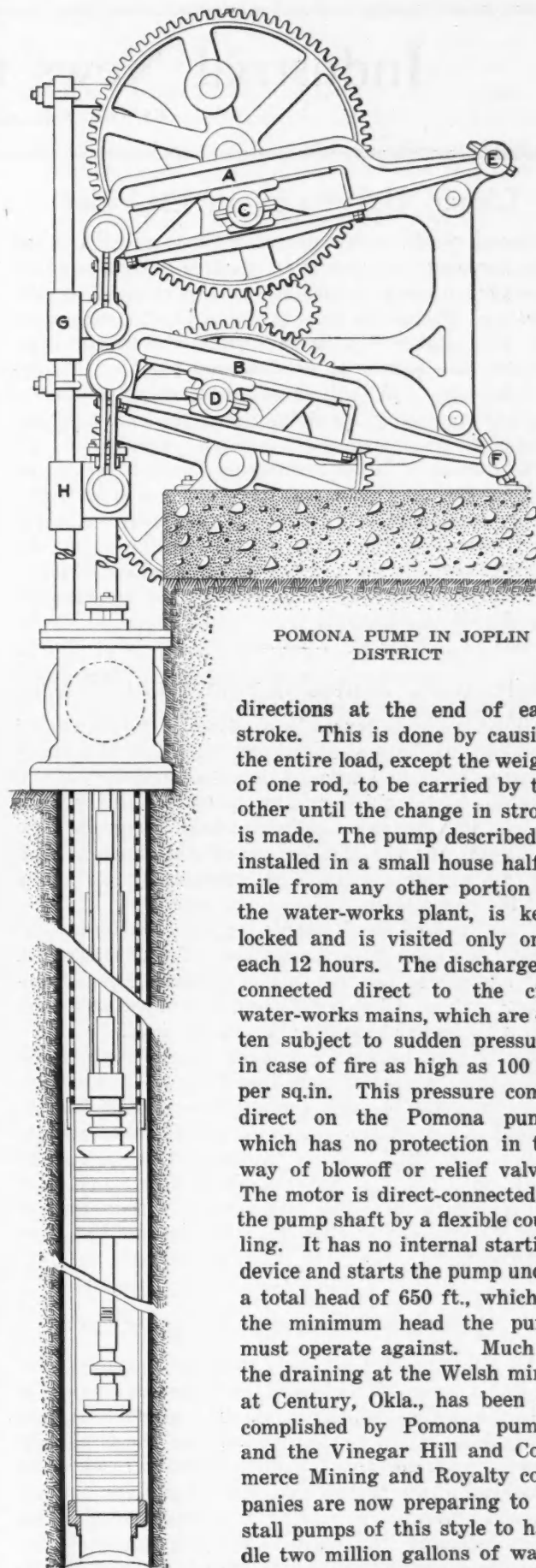
BY P. R. COLDREN*

With the extensive development of the Oklahoma section of the Joplin zinc and lead district there has, in the last two years, been marked improvement in ground-drainage work. This is in part due to the introduction of more modern machinery and methods but also to a more intelligent use of the machinery already at hand.

The success of the Pomona pump, manufactured by the Pomona Manufacturing Co., Pomona, Calif., and recently introduced into the field, seems to rest on a balancing feature so devised that balance wheels are unnecessary, the load being almost continuous at every position of the stroke. One of the pumps was installed about eight months ago at the water-works plant in Webb City, and satisfactory work there went far toward converting mine operators to its possibilities.

In this pump, shown in the illustration, the plunger rods are 500 ft. long and weigh 15 lb. to the foot, making a total of 15,000 lb. The weight of the water column in the well and the head above the well, which is 250 ft. additional, making a 750 ft. over-all lift, amounts to about 20,000 lb., not including the weight of the rods. This must be moved three feet and then delivered to the other plunger to be moved three feet, the over-all travel per revolution being six feet. The delivery of the load from one plunger to the other is about 34 times each minute, and the flow through the discharge pipe 600 ft. per min., this taking place under a load of about 322 lb. per sq.in. at the plunger.

The two rods, the two beams and the plungers, being of the same weight and balancing each other at all points in the stroke, permit of such substantial construction as to eliminate the danger of breaking the rods. Great weight of rods added to the weight of the column would only increase this menace, except for the careful provisions made to protect the rods while they are changing



POMONA PUMP IN JOPLIN DISTRICT

directions at the end of each stroke. This is done by causing the entire load, except the weight of one rod, to be carried by the other until the change in stroke is made. The pump described is installed in a small house half a mile from any other portion of the water-works plant, is kept locked and is visited only once each 12 hours. The discharge is connected direct to the city water-works mains, which are often subject to sudden pressure, in case of fire as high as 100 lb. per sq.in. This pressure comes direct on the Pomona pump, which has no protection in the way of blowoff or relief valves. The motor is direct-connected to the pump shaft by a flexible coupling. It has no internal starting device and starts the pump under a total head of 650 ft., which is the minimum head the pump must operate against. Much of the draining at the Welsh mines at Century, Okla., has been accomplished by Pomona pumps, and the Vinegar Hill and Commerce Mining and Royalty companies are now preparing to install pumps of this style to handle two million gallons of water

daily. The column of the pump may be placed in a drill hole, and the Vinegar Hill company is putting down 17-in. drill holes for this purpose.

*Joplin, Mo.

Industrial News from Washington

BY OUR SPECIAL CORRESPONDENT

Liquid Oxygen as an Explosive

If used within 10 minutes after the saturation of the cartridge, liquid oxygen is as effective as dynamite for blasting purposes, according to experiments of the Bureau of Mines. In view of the successful work done with this explosive, a large liquid-air manufacturing company has agreed to erect a test plant on a commercial scale. This will be at a large mine or quarry, to give opportunity for determining the extent of the value of liquid oxygen as a commercial explosive.

The Bureau of Mines is studying the best methods of handling the substance and the development of satisfactory containers. The cost of the carbonaceous material composing the stick, the liquid oxygen for one cartridge and the container is insignificant. The problem is largely that of reducing wastage and securing the requisite standardization.

Bureau of Mines' Experiment Work

All work on manganese being done by the Bureau of Mines will be centered at the new station at Minneapolis, hereafter to be known as the Lake Superior station. Since one of the chief problems presented in the Lake Superior iron region is the treatment of low-grade manganese ores, the effectiveness of other experimentation on manganese ores will be increased by conducting it at the new station.

While most of the Bureau's copper work is done at Tucson, the Lake Superior station will undertake such of it as may be peculiar to that region. No superintendent will be selected for the Lake Superior station until a civil-service examination can be held.

Mining men in certain sections of the country are urging that, instead of providing for three new experiment stations next year, the appropriation be used to strengthen such stations as those at Salt Lake City and at Berkeley, Calif. These minor stations are badly handicapped by their small working fund, and some mining men in these localities deem it wise to enlarge these stations rather than to establish the new ones authorized.

Russian Mining Commission

The Ministry of Commerce and Industry of Russia has sent a commission of mining men to this country to study the mining industry here. The commission, now sitting daily in the conference room of the Geological Survey, comprises the following members: Theodore Foss, head of the commission, mining engineer and director of several large mining and metallurgical enterprises, including iron-, copper- and platinum-producing companies operating in the Ural mountains; Ivan Goubkin, oil specialist of the Russian geological committee; Avenir Snietkoff, coal specialist of the same committee; and Alexander Stepanoff, secretary.

The purpose of the commission's visit, as stated by the Russian government, is to investigate the mining industry in the United States, so as to utilize the knowledge in the development of Russia's natural resources; to inspect the more important metallurgical works; to obtain information concerning mining legislation; to familiarize itself with geological and mining research as conducted by the Government; and to acquaint the people of the United States with the extent of Russia's natural resources. The commission will travel widely in the mining districts and visit many metallurgical plants.

Assessment Bill Held Up

In view of the continued opposition of Secretary Lane to the Shafroth Bill providing for the suspension of annual assessment work on mining claims during the war, there is considerable doubt that the bill will pass the House. It passed the Senate on July 9, has been reported favorably to the House by the Committee on Mines and Mining, and now is on the House calendar. Before calling up the bill, Representative Taylor, of Colorado, who is in charge of the measure, will make another attempt to convince Secretary Lane that the legislation in no way tends to increase the amount of public land being held for speculative purposes.

Reasons for the enactment of this legislation are given by Representative Taylor as follows: Inability to procure labor to do assessment work; enlistments and the drafting of many prospectors and miners in the army and navy; the high cost of powder, steel, and other materials making assessment work on undeveloped properties almost prohibitive; unproductive expenditure of labor, capital and materials, required in 90% of assessment work, is not advisable at this time.

War Industries Board Problem

Uncertainty exists as to whether the new War Industries Board solves the problem that has faced committee members of the Council of National Defense by reason of the prohibitions of section 3 of the Food Bill which reads:

That no person acting either as a voluntary or paid agent or employee of the United States in any capacity, including an advisory capacity, shall solicit, induce or attempt to induce any person or officer authorized to execute or to direct the execution of contracts on behalf of the United States to make any contract or give any order for the furnishing to the United States of work, labor or services, or of materials, supplies or other property of any kind or character, if such agent or employee has any pecuniary interest in such contract or order, or if he or any firm of which he is a member, or corporation, joint-stock company or association of which he is an officer or stockholder, or in the pecuniary profits of which he is directly or indirectly interested, shall be a party thereto.

The matter has been referred to the Attorney-General whose interpretation, it is believed, will sustain the view held by many that the interposition of the War In-

dustries Board between the Government purchasing agents and the committees of the Council of National Defense will make it possible to hold intact the present organization of the latter body.

A few resignations from committee positions have been received by Bernard M. Baruch, chairman of the Committee on Raw Materials, but for the most part, members are willing to await the opinion of legal authorities before taking final action.

Lead Imports Increase

Imports of lead from Mexico nearly doubled during the first half of 1917. During the same period the amount of lead exported decreased greatly while there was a marked increase in the consumption of it in this country. These facts are brought out in the United States Geological Survey's mid-year report on lead production which follows in full:

For convenience of comparison half of the corresponding quantities for the 12 months of 1916 are inclosed in brackets. The output of domestic desilverized lead, excluding desilverized soft lead for the first six months of 1917, was 152,231 short tons (158,235), the output of domestic soft lead, including desilverized soft lead, was 124,292 tons (117,879), and the output of lead produced from foreign ores and bullion was 29,539 tons (9453).

In view of the scarcity of lead, the increase in lead of foreign origin is very encouraging. The greater part came from Mexico. According to records of the Bureau of Domestic and Foreign Commerce, the total lead imported in the first six months of 1917 was 30,620 tons (17,665), of which 22,507 tons came from Mexico (12,099), and 4569 tons came from Canada (3153). The exports of domestic lead amounted to 29,241 tons (50,283) and of foreign lead 6066 tons (4940). The lead used in articles exported with benefit of drawback was 3270 tons (2585). Thus the total exports of lead were 38,577 tons (57,808). Disregarding stocks, the apparent consumption of lead in this country in the six months was 268,952 tons (230,587). The production of new antimonial lead was 7822 (12,019), and of secondary antimonial lead 1959 tons (2065). The output of secondary pig lead by regular ore smelters was 7578 tons (5548).

Explosives Bill Altered

When the Senate Committee on Mines and Mining completed its alterations of the explosives bill passed by the House, only a portion of one paragraph of the original bill remained. While the Senate bill places the administration of the bill entirely in the hands of the Director of the Bureau of Mines, it defines specifically how many features of the bill are to be administered. The bill as amended provides that

the superintendent, foreman or other duly authorized employee at a mine, quarry or other work may, when licensed so to do, sell or issue, at the beginning of a shift, to any workman under him such an amount of explosives or ingredients as may be required by that workman in the performance of his duties for that shift only, and the workman may purchase or accept the explosives or ingredients so sold or issued but the person so selling or issuing same shall see that any unused explosives or ingredients are returned at the end of the shift, and that no explosives or ingredients are taken by the workman to any point not necessary to the carrying on of his duties for that shift.

All those dealing in explosives are required to keep an accurate record showing the name of each person to whom the explosives are sold. This record is to be sworn to and furnished to the director of the Bureau of Mines on request. The Director of the Bureau of Mines is authorized to issue licenses authorizing the manufacture, possession, sale and issuance of explosives and ingredients. To carry out the provisions of the bill,

an inspector, who is to receive a salary of \$2400, is to be appointed by the President in each state and in Alaska. The additional employees required are to be appointed by the Director of the Bureau of Mines.

One of the most important provisions of the bill is that the Director of the Bureau of Mines is authorized to investigate all explosions and fires that may occur or that have occurred since the beginning of the war in mines, quarries, magazines and all places in which explosives are manufactured, transported, stored or used. Employees of the bureau are given authority to enter the premises where the explosion or fire has occurred and are empowered to examine plans, books and papers. They are authorized to administer oaths and to examine all witnesses and persons concerned.

A penalty of imprisonment for not more than one year and of a fine of not more than \$5000, or both, is provided for those who violate the act or the regulations that it authorizes.

Searching for Nitrate

Measures for insuring a nitrate supply are far enough advanced, it is believed, to make us independent of foreign supply in case of an emergency. A reserve of nitrate has been accumulated sufficient to tide over the short period that would intervene before the needs of the country could be supplied from domestic sources. Hoyt S. Gale, of the Geological Survey, does not attach great importance to the much talked of nitrate-bearing earths in the Western States, but looks to the fixation of atmospheric nitrogen and the oxidation of ammonia to nitrates as the chief reliance for our supply.

"The deposits of nitrate-bearing earths are of very doubtful importance," says Mr. Gale, "on account of the difficulty in recovering a small percentage of nitrates. These earths, or clays, which occur in several of the Western States, have been found to contain in places from 2 to perhaps 5 or 6% of sodium nitrate in conjunction with sodium sulphate and chloride. It is conceivable, of course, that these deposits might be worked by leaching and some method of crystallization to separate the salts. On the whole there is within the United States no known natural source of nitrates that can be counted on to furnish any considerable supply of the refined nitrate salts.

Since the beginning of the movement to develop domestic nitrate supplies, frequent mention has been made of the fact that during the Revolution and the War of 1812, the saltpeter needed for gunpowder was obtained from rich deposits found in many places in the East. Mr. Gale reveals the fact that this source of possible supply has been studied carefully in the hope of finding sufficient to justify exploitation, if only as a war-time emergency, but that the conclusions have been essentially negative. "The total amount obtained from these minor deposits was probably not very large," says Mr. Gale. "In comparison with the greatly increased rate of consumption of nitrates in explosives and industrial uses, the supply obtainable from those sources would be, at best, an almost negligible contribution for present needs, even on the assumption that these small deposits would be worth working again as they were in the past—an assumption which probably is not warranted."

Events and Economics of the War

The President has replied to Pope Benedict's peace proposals that no peace can be made with Germany's present rulers as their word cannot be taken.

The embargo on exports to European neutrals now covers all materials. The price has been fixed for anthracite and will soon be for wheat. Increase of war taxes is being debated in the Senate. The Shipping Board's program calls for 1270 vessels totaling 7,968,000 tons. A nation-wide shipyard strike has been averted. Thirty Dutch ships have been released from New York with Belgian supplies. Investigation of the I. W. W. has been asked of the President by the National Defense Council.

Abroad, the Allies are soon to answer the Pope. Lens remains partly taken. Le Mort Homme and Hill 304, key positions at Verdun, have fallen to the French. The Italians are advancing toward Trieste, having captured Monte Santo. Russia has received another loan from the United States and with it Wilson's message to stand firm for victory. The defense of Riga, which seemed crumbling, has stiffened. Kerensky opened the National Council at Moscow with a warning to malcontents.

Claude Nitrogen Fixation Patents to be Controlled by Big Merger

A combination of the National Carbon Co., the Union Carbide Co. and the Air Reduction Co. has been tentatively agreed upon. The new company will be capitalized at approximately \$200,000,000, the three component companies having a combined capital of about \$159,000,000. This will be raised approximately \$40,000,000 when the new corporation is chartered. Of the three the National Carbon Co. is the largest.

In obtaining control of the Air Reduction Co., according to the New York *Sun*, the new corporation will gain control of the Claude process for extraction of nitrogen from air. The rights of this process were purchased from the French chemist, Georges Claude, by the Air Reduction Co., shortly after its organization in 1915. It also controls the rights to the process of making liquid air and liquid oxygen from air, also invented by Claude. These are said to be the same processes which Germany used in procuring basic products for explosives, which were cut off from Chile by the declaration of war. The company has eight plants, while seven others are in course of construction. Its largest stockholder is Percy A. Rockefeller, son of William Rockefeller. Ambrose I. Monell, president of the International Nickel Co., is another large stockholder. The Société de l'Air Liquide, the first company in France to apply Claude's inventions, is represented on the board of directors.

The National Carbon Co. is one of the largest of its kind in the country. It manufactures lighting carbons, carbon batteries, carbon brushes for generators and hundreds of other kindred products. It owns and oper-

ates many plants in the United States and a branch in Canada. James Parmelee is president and Myron T. Herrick, former Ambassador to France, vice president.

The Union Carbide Co. manufactures calcium carbide and other gas-producing materials, which have been used extensively in the European war, as well as machinery and fixtures associated with the production of calcium and acetylene gases. It controls the Union Carbide Co. of Canada, the Michigan Northern Power Co. and the Electro-Metallurgical Co., and also owns a large interest in the Linde Air Products Co. Its plants are located at Niagara Falls and Sault Ste. Marie, Mich. Alfred P. Sloan is president.

British Labor and War Production

The manner in which England has met labor problems is set forth, for its bearing on similar problems here, in a recent bulletin of the committee on co-operation of the Council of National Defense.

In England, according to the bulletin, those in specified lines of business may not employ men between the ages of 18 and 61. This indicates the extent to which England has gone after three years of war in taking men from less essential industries and in concentrating national effort on work of national importance.

Early in the war it became evident that, if the troops at the front were to be furnished with munitions and supplies, men at home must work in a manner different from that established by trade-union rules and practice. Restrictions upon labor made it impossible to produce the quantities needed. The labor unions assented to the temporary modification of these restrictions upon conditions agreed to by the government that the rules and practices were to be changed only for the period of the war; that no changes were to be made which unnecessarily affected established conditions; that capital was to receive no advantage in the struggle between capital and labor. For example, profits were to be limited and wages controlled by government tribunals. Upon these conditions labor agreed that there should be no stoppage upon work required for the war.

Three fundamental changes in labor conditions were brought about: In certain classes of plants, strikes are not lawful and increases in wages may be asked only to offset increased cost of living; restrictions by labor unions against the so-called "dilution of labor," by the employment of women and of unskilled labor, have been laid aside for the duration of the war, as well as restrictions upon an individual's output.

The procedure regarding the employment of women illustrates the situation. When men went to the front women wanted to take their places, but union rules forbade it on many kinds of work. These rules were relaxed upon the following conditions, and more than 1,500,000 women have been put upon men's work: No woman was to be employed if any man was available for

the work; men were to be reemployed when they returned; the standard of pay was not to be reduced; that is, the minimum rates for men would apply to women.

A record is kept of all departures from pre-war conditions. After the war, readjustments are to be made, in connection with new inventions and other similar matters, to create as nearly as possible the conditions which would have arisen on the basis of pre-war conditions. Furthermore, in general the government is pledged to use its influence to restore, after the war, the conditions affecting labor which existed before the war.

All persons are forbidden to employ men within six weeks after they have left work, unless the man has a "leaving certificate" from the last employer stating that he left with the employer's consent. If such a certificate is unreasonably refused, the Munitions Tribunal may issue one having the same effect and impose a fine upon the manufacturer who refused.

As further indicating what has been done to secure labor needed in connection with the war, there have been organized, under the army, battalions of dock laborers at the large ports. In London alone there are 10,000 dock workers in the army engaged in dock work. These are sent where needed, receiving the regular workers' pay in addition to their army pay.

A committee of seven, with more than 70 local committees, of labor men only, is empowered to receive complaints and has done much in preventing labor disputes. The Ministry of Munitions makes all final decisions. Hours of labor in plants are unlimited, but those usual in each business have been continued as far as possible. In some cases they have been excessive, to remedy which an effort is being made.

Iron Trade Organized for War

"The value of the various organizations built up in the iron trade in recent years has had fresh demonstration in the effective work they have done on various situations created by the war," says *Iron Age*. The American Iron and Steel Institute, the American Pig Iron Association, the Lake Superior Iron Ore Association and the ore and vessel interests represented in the Lake Carriers' Association have all cooperated to put the iron and steel industries at the disposal of the Government.

"With little publicity the Lake Superior Iron Ore Association has done an important work in determining within close limits the amount of Lake ore which must be delivered by the railroads from lower Lake docks to the blast-furnace yards within the season of navigation. The Council of National Defense has viewed with much concern the apparent inability of the railroads to carry to the furnaces as much ore as they delivered last year, that quantity seeming fairly to measure the furnace requirements as indicated by the requisitions furnished the association in the early canvass of the blast-furnace situation. The council through its subcommittees has brought this question home to the individual blast-furnace companies and the ore association. In consultations between the president of the Lake Superior Iron Ore Association and the blast-furnace managers the actual requirements of ore in each case

have been analyzed so as to determine the amount of the various grades required up to June 1, 1918. This method promises to bring about exact results, avoiding any unnecessary ore movement and at the same time meeting the important requirement of providing each plant with enough ore of the proper grades to enable it to run to full capacity.

"The blast-furnace interests are making a gratifying response to the efforts made to have this matter worked out on the right basis and the Railroads' War Board is alive to the necessity of furnishing equipment—even to the subordination of other interests not so essential—after the ore requirement has been definitely fixed.

"It is not amiss to point out that the machinery for marshaling and acting upon the facts relative to the industry on which the country must chiefly depend in this time was ready to hand. The quick mobilization of that industry has been in contrast with much that has been done through strictly Government agencies. It may also be said without elaborating the point that there is much to gain from a closer cooperation between the Government and iron and steel manufacturers than Government representatives have invited thus far."

Purchasing Commission Appointed

A commission to handle the purchases of the Allies in this country has been created through agreement signed by representatives of the Allied governments. The members, as announced by the Secretary of the Treasury, are Bernard M. Baruch, Robert S. Lovett and Robert S. Brookings. These men are also members of the War Industries Board, which is to handle the purchases of supplies for this Government.

Thus far only Great Britain, France and Russia have signed the agreement, but the other Allies are expected to concur shortly. Hereafter the foreign representatives in this country will turn their orders over to the commission instead of placing them directly with manufacturers.

This commission, which will be informed as to the productive capacity of every industry, will assign priority to the different orders and thus make more effective use of the combined resources of this and the Allied countries in the prosecution of the war.

One effect of this plan will be to stabilize prices and eliminate competition among the foreign governments in ordering supplies in this country.

Road Building Behind the Lines

The building and maintenance of motor roads behind the fighting line in France and Belgium are described in a bulletin just issued by the American Highway Association.

In reconstructing roads for military purposes, where they have not been damaged by war operations, it is sometimes possible to afford considerable relief to traffic by widening them. In carrying on the work in mountainous sections subject to heavy rainfall, where it is necessary to have the surface dry out quickly, the roads are sometimes given considerable crown, to shed the water into the ditches. This crown causes much com-

plaint from drivers, for it results in no little skidding; but the transportation authorities believe it is better to dry off the road promptly, even at the loss of a few trucks by accident, than to have it stay soft, damp and easily cut up for some time after each rainfall.

Narrow streets through some hamlets prevent the widening of the roads there. At such places detours are frequently built. It has also been necessary, where narrow bridges would cause congestion on a wide road, to widen the bridge or build another beside it. Some of these are not as strong as might be desired for concentrated military traffic, and the ways in which they are cribbed and braced include every expedient engineering ingenuity can suggest.

The refinements of road building receive scant attention along the battle line itself. In the early days of the war attempts were made to use Telford foundations in damp places. Wedging the stones upright proved a failure under the conditions, so the road builders tried laying them down flat. The traffic pressed the flat stones, and, as this was done, more were placed on top, with broken bricks and stones to fill in. In this way many miles of road have been built.

Railroads Plan Troop Movement

Transportation for 687,000 men must be provided to the various cantonments that the Government is building to house the new National Army. The movement will start Sept. 5. Between then and Sept. 9 the railroads will complete the entrainment of 200,000 men, or approximately 30% of the total number scheduled to be moved to the various training camps.

It is expected that a second movement of approximately 200,000 men will begin on Sept. 19, continuing four days thereafter, and a third movement of the same size on Oct. 3. The Provost Marshal General has designated 4531 points throughout the country as points of local concentration for entrainment.

Some conception of the magnitude of the task confronting the American Railway Association, says its bulletin, in preparing schedules that will assure the safe and prompt transportation of these armies without interfering with regular traffic may be gleaned from the fact that to move merely one field army of 80,000 men requires 6229 cars made up into 366 trains with as many locomotives and train crews.

Meanwhile, in addition to moving the 687,000 recruits for the National Army, the railroads have been asked to supply transportation for the 350,000 members of the National Guard to their training camps. This National Guard movement has already started and will continue in increasing volume until all have been moved.

Oil Producers Need Equipment

The United States Bureau of Mines has informed the Council of National Defense that a lack of well-drilling equipment may make it difficult to meet the country's military and industrial demands for gasoline and other petroleum products.

Van H. Manning, Director of the Bureau, expressed his hope that the council could so arrange that the needed materials might speedily be obtained for the oil

producers. "The situation is critical," he said. "At present drilling is being curtailed, costs of oil-well supplies have been increased and it has become impossible to get them in adequate quantities for any price. The situation is worse than at any time since the war started. Were no wells to be drilled for one year's time our petroleum production would drop at least one-fourth. From California to Pennsylvania small producing wells are being abandoned in order that equipment may be used for new wells from which larger production is expected."

"Hooverizing" Foreign Exchange

"Reports from Washington indicate that the Trading with the Enemy Act, still pending in Congress, will be amended to provide for 'Hooverizing' gold and foreign bills of exchange," says the *New York Times*. "It is understood that legislation will be adopted vesting power in the Secretary of the Treasury or in the Reserve Board absolutely to regulate and control the movement of gold from and to the United States, and at the same time to regulate all foreign banking transactions."

Up to the present the larger banks and banking houses have endeavored to adjust the foreign exchange situation the best they could without legislation and without the medium of Government officials. This has been a hard task, and bankers have felt that they have been subjected to heavy responsibilities. They welcome action by the Government which will place control of the exchanges in the hands of a committee or of a controller. The British Treasury, it is said, has repeatedly urged our Government to take complete charge of the exchanges. To buy supplies Germany is said to have used credits on foreign countries, established by sale of German-owned securities here.

Improvement of Nitrate Port

Chile's nitrate business has grown so of late that \$8,500,000 is to be spent in improving the port of Antofagasta. One of the objects is to equip Chile to hold this greater nitrate business after the war. Bids have been asked of American manufacturers for this work and will be opened on Mar. 30, 1918. Attention is called to the fact that the projected improvement is of importance to the commerce of Bolivia. Antofagasta is connected with Bolivia, via the Chilean-Bolivian Railway. All particulars may be obtained from the Chilean Embassy at Washington or from the Consulate General of Chile at New York.

Iron Ore and Steel Regulation

Carrying a step further the policy set forth in his coal amendment to the Food bill, Senator Pomerene is prepared to push his bill providing for regulating the production, sale and distribution of iron ore, iron, steel and their products. By its terms, power is given to the President to requisition plants and businesses if he believes it to be in the interest of efficiency. The Federal Trade Commission is specified as the agent through which the act will be administered.

Editorials

Price Fixing, Taxation, Etc.

We are in for experiments in economics, not only in financing, but also in price fixing and taxation; and we might as well make up our minds to it. The most unfortunate part of this is that we are all agreed respecting principles except one, and there ought not to be any radical experimentation. The questions of difference relate mainly to the proper action to be taken in conformity with the fundamental principles. What causes us to fear is the absence of moderation in Washington and the disregard of expert advice.

The great difference as to a principle pertains to what proportion of the expense of the war shall be borne immediately, that is, by direct taxation; and what proportion by posterity, that is, by bond issues. That difference being settled, how shall the taxes be raised?

Everybody agrees on two things, namely, that the idea of war profits is abhorrent. Therefore, all the profit accruing from conditions directly attributable to the war should be absorbed theoretically to pay the bills. Moreover, everybody agrees upon the principle that those persons who enjoy large incomes should pay larger taxes than those whose incomes are small and who are less able to pay.

But, although everybody is agreed on those principles, everybody is not agreed as to how they shall be obeyed. Some legislators advocate the seizure of all war profits, but the more intelligent among them are well aware that such a course would neither be wise nor free from injustice. A machine shop that three years ago was engaged in ordinary manufacturing and during the course of the war changed to the manufacture of shells at greatly enhanced profit, would be a fair subject for complete absorption of all its excess profits. On the other hand, there are important branches of business that have benefited only partially through war prices, and other concerns which show excess profits only through the natural growth of their business, or developments therein. For example, a concern that even before the war began had entered upon a program of reconstruction of plant in order to diminish its cost of production, and having completed that program in 1916, would show in 1917 a profit greatly in excess of anything realized previous to 1914, even in the production of something having nothing to do with the war. The levying of a 100% tax on excess profits would in such a case be nothing but confiscation of capital. Even the assessment of a moderate tax would be an injustice. It is certain that in the adjustment of conditions that are so complicated it would be impossible to be absolutely just. The most that can be done is to be as fair as possible.

Turning, now, to the matter of wisdom respecting the absorption of all excess profits, it is perfectly clear that the machine shop that three years ago was engaged in the manufacture of peaceful articles would not have embarked on the manufacture of shells unless it were going to be able to make more money in doing so. The complete absorption of excess profits would mean that the Government, on its own account, would have to undertake the manufacture of munitions, and it is pretty clear in the minds of everybody that the Government cannot conduct business and industrial affairs so well as private enterprise can do it.

Furthermore, it is extremely difficult to determine just what are profits, anyhow. A large part of what in 1916 was heralded as enormous profits was, in fact, put into plant for the purpose of producing those profits, with the likelihood in some cases that much of such plant would soon become useless, and consequently valueless. The financial records of many important companies in 1917, like that of an important zinc company reputed to have earned nine million dollars in 1916 yet passing a one hundred thousand dollar dividend in May, 1917, furnish ample food for reflection. Therefore, the legislators will find it necessary to allow a liberal margin of excess profits, even on munitions proper, in order to give manufacturers the incentive to make them, and in order, moreover, to compensate for the extraordinary risks that they are obliged to take.

What Congress is going to do in the matter of taxation is still uncertain, but there is no doubt that the Government has embarked on a policy of price fixing, although there is still doubt as to how far it will think it can go. It is mortifying to our national pride that the actual fixing of prices has to be done by the President, the commander-in-chief, who has so many other important things to think about. So far, he has acted only in the matter of coal. Indeed, he has no legal authority to act further. With respect to bituminous coal, his action was drastic and is resented by many producers and already has created chaos in the business. With respect to anthracite coal, the prices fixed were the same as those now prevailing. Indeed, on some grades of coal they were, perhaps, a little higher.

In considering the question of coal, there are questions of public policy and welfare that are different than those governing many other commodities. People must have coal wherewith to keep warm, just as they must have wheat to eat. The Government may properly regulate the distribution of such things as are indispensable, but other commodities, however important they may be, are not absolutely indispensable. For

example, lead is indispensable for cartridges. It is important in the manufacture of white paint. If there be not sufficient lead for both purposes, people can get along for a while without painting their houses, and as the cost of paint becomes too high they will not do so.

There are some interests in bureaucratic circles in Washington that are known to favor radical action in the matter of prices and are by no means reluctant to deal with the subject. Thus, the Federal Trade Commission seems to be itching to obtain authority to try experiments with the business machinery of the United States and the world. This would be something like dismissing the officers of a battleship fleet and substituting a corps of lawyers and accountants. We do not think that the President would be so unwise, and we think it is doubtful whether the experiments with price fixing will go so far as pessimists are now supposing.

The theorists themselves seem to be confused, for they talk about the advantage of high prices for some things, in order to stimulate production, which is, of course, common sense. Thus, nobody talks about regulating the price for petroleum products, but rather is a high scale applauded, with the idea that a waning production will thereby be stimulated. Similarly, is the high price for cotton considered to be a good thing, while, as for the Western farmer, he is guaranteed a minimum for wheat that a few years ago would have exceeded his wildest hopes. Nobody has said anything about reducing the prices for agricultural products or wages for labor. Attention has been centered upon a few commodities that are considered to be the interests of big business. This gives the policy of Washington a decidedly political look.

One thing is certain, namely, that in tampering with the machinery of business many things will happen that were not expected. Let us hope that there will not be so many of these surprises of serious character as to cripple the fighting ability of the country, as the curtailment of coal and copper production has done. The slogan of production, then more production, that we used to hear in the early days of the war, seems to have been forgotten.

The Anaconda Strike

Things came to a head in the labor troubles in Montana when the smelters of the Washoe works struck last Saturday. Both the Washoe and Great Falls plants were then closed, except for certain departments, and, it being impossible to treat the ores from the Anaconda mines in Butte, they were closed also. This will affect practically all of the copper mines of Butte, for, with the exception of East Butte, Anaconda smelted their ores. Indeed, the suspension of operations may be said practically to suspend industrial operations in the State of Montana, for coal mining, lumbering, electric-power production, etc., depend substantially on the operation of the copper mines.

Besides thus checking industry in Montana, the United States will be deprived of a large part of its supply. This has not yet been felt acutely, for the reason that the refiners have been working on surplus stocks of crude copper, but in several cases those stocks have now been used up. In 1916, the United States produced 1,943,000,000 lb. of copper, of which 352,000,000 were derived from Montana. With that large output subtracted, together with the curtailment of the production in Arizona, the United States is going to be badly hampered for copper at a time when the maximum production is wanted.

The labor troubles in Montana have been going on ever since the first of July. The company has made liberal overtures to the men, but the latter would listen to nothing but having their own way, which included especially the establishment of a wage scale of \$6 per day, irrespective of the price for copper.

Zinc Pigment vs. Lead Pigment

Our Washington correspondent reports that the substitution of zinc pigments for lead pigments has been suggested to the Raw Materials Committee of the Council of National Defense by way of remedying the scarcity of pig lead and the surplus of spelter. While the opinion held within the Council of National Defense appears to be entirely opposed to any action which would interfere with the law of supply and demand as respects these metals, it is admitted that some men of high scientific standing believe the suggestion a feasible one.

It is argued that the substitution of zinc pigments for those of lead would do much to relieve the lead stringency and, by making a market for more zinc, would absorb some of the plethora of zinc ore. It is contended that as a war measure the prohibition of the manufacture of white lead, on the ground that the lead in pigments is needed in munitions, would be on the same basis as the prohibition of the manufacture of distilled liquors because the grain is needed for food-stuffs.

It also has been proposed to the Council to omit the last draw in making spelter and carry the second draw a little further, thus leaving enough zinc in the residues to make the recovery of zinc oxide profitable. This system of operation, it is asserted, would reduce the surplus of spelter production and would increase the zinc-oxide production. It is declared to be feasible to smelt, in this way, zinc concentrates containing considerable lead, avoiding lead in the spelter by taking only two draws and recovering the lead in lead-zinc fume. This would tend also to the conservation of zinc, it is contended, because it would prevent the loss which results from making the clean zinc concentrate at present demanded by zinc smelters.

There is, perhaps, something worth considering in the main idea of substituting zinc pigments for lead pigments, but we are doubtful as to the usefulness of the means that are suggested. In the first place, there

is no longer any great plethora of zinc ore, the importation of large tonnages of ore from oversea countries, which was a relieving feature in the market in 1916, having been checked by the present acute shortage in ocean-carrying facilities. Consequently, the price for zinc ore has not declined in anything like the same proportion as the price for zinc, which means that smelters' margins have been greatly contracted.

Nor does the idea of omitting the last drawing of spelter from the distillation furnaces, in order to produce a residue high in zinc, for subsequent extraction by grate burning, look logical. Indeed, at first sight, this looks something like advice to the cook to produce a full garbage pail in order to feed the pigs. However, while such procedure might increase the supply of zinc-lead pigment, it might actually decrease the supply of pig lead, for if all zinc smelters adopted such a practice, the production of pig lead from zinc smelters' residues, amounting to several thousand tons per annum, would be subtracted.

Another thing that stands in the way of the suggestion to the Raw Materials Committee is the difficulty of finding men skilled in the art of making zinc oxide. It is becoming a fairly common custom among American zinc smelters to extract zinc remaining in the residues withdrawn from the retorts by burning such residues on Wetherill grates. From such residues, containing 6 to 8% zinc, somewhere from 60 to 70% of the zinc may be recovered in the form of fume, the cost of the process being relatively small, inasmuch as the retort residues usually contain sufficient unburned coal to serve for all the fuel that is required. However, the fume ordinarily produced is dirty and is used simply as zinc ore, being returned to the retorts. The production of zinc fume of this character and the production of zinc oxide to be used as pigment are two different things. For the latter purpose, proper physical character of the product, especially as to color, is the prime consideration, and the number of available men skilled in that work is rather small. Certain zinc smelters have already undertaken to enter the zinc-oxide business in this way, but they have been having their troubles, which they have not succeeded in mastering, although doubtless they will do so in the course of the next six months.

However, there are possibilities of increasing the use of other white pigments at the expense of white lead. For example, there ought to be a great expansion in the production and use of lithophone; and, as raw material for that process, the crude oxide fume produced by the zinc smelters might be profitably employed. This would have the further advantage of actually adding to the supply of material available for conversion into pig lead. Unfortunately, the present high cost of sulphuric acid is an obstacle. Furthermore, there are low-grade ores, especially the calamine of Leadville, that are too poor for the zinc smelter but ought to be capable of local concentration into oxide fume or to serve as raw material for the manufac-

ture of pigment. The interest of capitalists in making money will surely lead them into such things, if there be any profit in sight, and if the policy of the Administration does not destroy all incentives.

Steel Production in 1917

Partial returns from a number of steel works, including nearly all the larger ones, indicate that the production of steel ingots in the United States in the first half of 1917 was close to 21,500,000 gross tons, or at the rate of 43,000,000 tons a year. This is an increase of 1,600,000 tons over the great output of 1916. This increase in steel in 1917 was made notwithstanding a decrease of 361,000 tons in the make of pig iron, as compared with the first half of 1916. The production of steel for the half-year exceeded that of pig iron by 2,242,000 tons. The difference was partly made up by the use of the stocks of pig iron on hand at the beginning of the year, as it is known that on July 1 those stocks had been drawn down to a low point; but the steel output was augmented in a much greater degree by the use of a large proportion of scrap in the open-hearth furnaces. This is proved by the heavy demand and large sales of steel scrap which have been reported during the past year.

We have heretofore called attention to the fact that steel-producing capacity has been increasing faster than blast-furnace capacity, and the figures above confirm this statement. This state of affairs cannot continue long, and the make of steel must remain nearly stationary until the new blast furnaces now under construction are ready to operate. This will hardly be before the close of the year.

Australian Coal Miners' Working Hours

In the findings of Justice Edmunds in the recent Australian coal miners' strike, the court has ordered that eight hours bank to bank for the first five days of the week and six hours bank to bank on Saturday, Sunday and holidays inclusive; a half-hour for meals; time calculated from the time the first person working on the shift leaves the surface to the time the last person returns to the surface, shall constitute the full working shift in all coal and shale mines in the Commonwealth. What this means to the operators of Australian mines can be appreciated only by those who know of the time actually lost to the companies by the miners taking their "smoke oh's" and "Billy-can" tea.

The "water boilers" who furnish the water for the aforesaid "billy-can" tea are graciously allowed to work a trifle longer if the operators and the executive of the Australian Coal and Shale Employee's Federation can come to some agreement—and the said "water boilers" don't go on strike.

State-owned mines may operate on any scale of wages that Justice Edmunds can affix to his working hours, as taxation pays the losses, and the probability is that the six-hour day and five days per week, which the miners are working for, will be given by Justice Edmunds at the first opportune moment.

BY THE WAY

In relating the remarkable record of furnace at the Cherryvale Works of the Edgar Zinc Co., in a recent issue of the *Journal*, we neglected to state, which we ought to have done, that this excellent furnace was built by the late John C. Dods, under the direction of S. C. Edgar, Sr., who was then president of the Edgar Zinc Co.

It's an ill wind that blows nobody good, and when the wind blows a letter astray it is often ethical to let it do a little of the good work. For example, gaze on this:

Mina Andalusia, Santa Rica, — —, 1917.

Dear Harry: This climate is bad enough, but other things simply get my angora. The only way I figure it out is that Don José Arzuaga is a crook or else he is plain bughouse. As an *administrador* he sure is the limit.

The directors have insisted that, until we strike something better than the present low-grade stuff, expenses must be held down pretty close to \$3000 each month. My instructions were to deal as tactfully as possible with the former owner, but to confine my activities to the purely technical work.

Old J. A. knows the limitations, but he maintains a staff big enough for a real mine. There is a master mechanic at 350 *colons*, a construction foreman at 350, a mine foreman at 300, a mill foreman at 300, a power house foreman at 240, a storekeeper and a bookkeeper at 160 each and (get this, will you?) a stenographer at 120 *colons* per month and grub; the wages of all this gang coming to an equivalent of at least one thousand real dollars. When you add my little bit and Arzuaga's fat slice it leaves precious little for labor, new tools and supplies. Why with one good bookkeeper and a foreman not afraid of getting his hands dirty, I could run the whole shebang alone. Every time Don José rides to the coast, I fire about half the staff, but he either hires each one back again or fetches another A. P. A., which in this section means: *Algun pariente de Arzuaga*.

We have been short on tools for underground work, but the last pack train brought nothing but food and the following:

- 1 cabinet Victrola
- 200 records
- 1 crate carrier pigeons
- 1 repeating shotgun
- 1 box loaded shells
- 2 Airedale terriers

Nary a timber spike, double jack, nor an inch of drill steel. For nearly a week I've had to put some miners on odds and ends of surface work. If I lay them off, they'll quit and go home. Home? Where have I heard that word? Say, Harry, just cable me some urgent message. I'm going to beat it, but I want a plausible alibi. Au revoir,

JACK.

A few weeks ago a million pounds of high explosives were set off by the English under the German trenches on the Messines Ridge in France says *Engineering and Contracting*. The explosion was heard in London, 130 miles away. This is the largest blast ever fired. If each pound of explosive moved only one ton of earth and rock, 1,000,000 tons were hurled into the air. About 200 miners are said to have driven a tunnel, or rather a drift, 1½ miles long in 6 months. In 19 chambers located in cross drifts, the explosives were placed, 25 tons to the chamber. These were detonated simultaneously with an effect that was described as appalling. The speed of driving the drift appears to have been 36 ft. a day. There is nothing remarkable in this performance if the ground was not bad and if it was possible to use explosives liberally. It is not unlike-

ly, however, that explosives were used in small charges so as not to disclose the location of the sapping work to the enemy. [From our own point of view—36 ft. per day is pretty good driving in any kind of ground, and as for small charges of explosives so as not to disclose the location of the sappers, we should imagine that there must have been some "conflicting detonations" on the surface in that vicinity.—Editor.]

August Mining Dividends

Dividends disbursed in Aug, 1917, by 35 United States mining and metallurgical companies making public reports amounted to \$13,735,145. Of this amount, \$278,389 represented special dividends in favor of the American Red Cross, paid by four companies. The regular payments, therefore were \$13,456,756 distributed by 34 companies, which compares with \$11,770,358 paid by 28 companies in August, 1916. Canadian and Mexican companies paid \$1,771,051, as compared with \$1,907,963 a year ago.

American Zinc, Lead and Smelting Co. postponed action on the dividend which would have come due on its

| United States Mining and Metallurgical Companies | Situation | Per Share | Total |
|--|-----------|-----------|-----------|
| Am. Zinc, Lead and Sm., pfd. | U. S. | \$1.50 | \$144,840 |
| Anaconda, c. | Mont. | 2.00 | 4,662,500 |
| Bunker Hill & Sullivan, ls. | Ida. | .50 | 163,500 |
| Caledonia, ls. | Ida. | .03 | 78,150 |
| Champion, c. | Mich. | 6.40 | 640,000 |
| Chief Cons., ls. | Utah | .10 | 88,406 |
| Cons. Ariz. Smelting, c. | Ariz. | .05 | 83,150 |
| Cresson, g.s. | Colo. | .10 | 122,000 |
| Eagle & Blue Bell, ls. | Utah | .10 | 89,315 |
| First National, c. | Calif. | .40 | 240,000 |
| Golden Cycle, g. | Colo. | .03 | 45,000 |
| Hecla, ls. | Ida. | .15 | 150,000 |
| Homestake, g. | S. D. | .65 | 163,254 |
| Internat. Nickel, pfd. | U.S.-Can. | 1.50 | 133,689 |
| Jim Butler, g.s. | Nev. | .10 | 171,802 |
| Loon Lake, c. | Wash. | .01 | 14,404 |
| Mammoth, g.s.l. | Utah | .25 | 320,000 |
| Mass. Con., c. | Mich. | 1.00 | 97,317 |
| Miami, c. | Ariz. | 2.50 | 1,867,785 |
| †Miami, c. | Ariz. | .25 | 186,779 |
| Mohawk, c. | Mich. | 10.00 | 1,000,000 |
| *Mohawk, c. | Mich. | .50 | 50,000 |
| Moscow | Utah | .02 | 18,000 |
| Nevada Hills, g.s. | Nev. | .05 | 53,284 |
| New Jersey Zinc | U. S. | 4.00 | 1,400,000 |
| Plymouth Cons., g. | Calif. | .24 | 58,520 |
| Richmond, ls. | Ida. | .02 | 16,800 |
| Shannon, c. | Ariz. | .50 | 150,000 |
| United Copper | Wash. | .01 | 10,000 |
| United Eastern, g. | Ariz. | .05 | 68,150 |
| United Verde, c. | Ariz. | 1.50 | 450,000 |
| United Verde Extension, c. | Ariz. | .75 | 787,500 |
| *United Verde Extension, c. | Ariz. | .10 | 105,000 |
| Uvada Copper | Nev. | .01 | 6,000 |
| White Knob, c. | Ida. | .10 | 20,000 |
| Wilbert, ls. | Utah | .02 | 20,000 |
| *Wolverine, c. | Mich. | .50 | 30,000 |
| Yellow Pine, z.l. | Nev. | .03 | 30,000 |
| Canadian and Mexican Companies | | | |
| Amparo, g.s. | Mex. | \$0.03 | \$30,000 |
| Asbestos Corpn. of Can., pfd. | Que. | 1.00 | 40,000 |
| Coniagas, s. | Ont. | .12½ | 100,000 |
| Esperanza, g.s. | Mex. | .24 | 109,200 |
| Granby Cons., c. | B. C. | 2.50 | 374,963 |
| Greene-Cananea, c. | Mex. | 2.00 | 976,888 |
| †Kerr Lake, s. | Ont. | .15 | 90,000 |
| Trethewey, s. | Ont. | .05 | 50,000 |

* Red Cross.

† One-half in favor of Red Cross and one-half for Army and Navy Branch. Y. M. C. A.

common stock, pending more certain information as to terms of proposed revenue law and Government action as to its supplies. Initial payment was made by Consolidated Arizona Smelting Co. The only holding company which paid in August was St. Mary's Mineral Land, which distributed \$2 a share or \$320,000; which item is not appended to the table.

The totals for the first eight months of the year are as follows: Mining and metallurgical companies, \$135,083,376; holding companies, \$4,187,789; Canadian, Mexican, Central and South American mines, \$13,001,717. The table shows details of the month's payments.

Personals

H. F. Wierum returned to New York recently from Tasmania.

Horace V. Winchell has sailed from Yokohama for the United States.

Corey C. Brayton will spend the next two or three weeks in Utah and Idaho.

R. H. Clarke has been appointed chemist for the Chino Copper Co., at Hurley, New Mexico.

Jay P. Wood has left Bingham Canyon, Utah, and gone to the Presidio, San Francisco, California.

C. Gore-Langton has gone to Chuquicamata to serve on the staff of the Chile Copper Company.

A. F. Hallett has accepted the position of chemist with the Khirgiz Mining Co., at Ekibastus, Siberia.

Livingston Wernecke, geologist for the Treadwell company, has gone to Wrangell on mine examination work.

Prof. William Campbell of Columbia University is serving as consulting metallographist at the Brooklyn navy yard.

J. A. Stewart, formerly with Pickands, Mather & Co., has been appointed superintendent of exploration for the Midvale Steel Co. in Missouri.

John Gross has been appointed metallurgist with the Bureau of Mines and has left for Fairbanks, Alaska, having closed his Denver office.

Ralph B. Green, superintendent of the American Smelting and Refining Co.'s plant at Hayden, Ariz., is taking a vacation in Denver, Colorado.

W. Parsons Todd, vice president of the Quincy and Adventure mines in northern Michigan, has returned to New York after a visit to the mines.

Bennett R. Bates has been appointed manager of the Cubo Mining and Milling Co., at Guanajuato, Mexico. He will leave about Sept. 5 for Guanajuato.

L. W. Bahney has left the Sheffield Scientific School, Yale, to become metallurgical engineer with the Scovill Manufacturing Co., Waterbury, Connecticut.

Arthur P. Watt, formerly with the St. Louis Smelting and Refining Co., is now at Mine La Motte, Mo., as metallurgist for the Missouri Metals Corporation.

Milo W. Krejci, assistant superintendent of the Boston & Montana Reduction Works of the Anaconda Copper Mining Co., is spending a few weeks in New York and the East.

Henry N. Thomson has resigned as metallurgist for the United Verde Copper Co. and is engaged in consulting practice at 918 S. Kingsley Drive, Los Angeles, California.

Claude H. Cooper, assistant superintendent of the Calumet & Hecla stamp mill at Hubbell, Mich., went to Fort Sheridan last week to enter the training camp for officers.

G. C. Bateman, manager of La Rose Consolidated mine, Cobalt, Ont., has gone to Manitoba to make an examination of the Manigotagon, Gold Lake and Long Lake gold camps.

R. B. Farquhar, Jr., recently assistant superintendent of the foundry of the Midvale Steel Co. in Philadelphia, has accepted an appointment as superintendent of the Watertown Arsenal foundry at Watertown, Massachusetts.

A. K. Knickerbocker, formerly superintendent of the Arthur Iron Mining Co. at Hibbing, Minn., and **Edward Kreamer**, formerly chief engineer, have formed the Mesaba Operating Co. for working leased properties at Cedartown, Georgia.

J. E. McAllister has been appointed vice president and general manager of the National Steel Car Co., Ltd., at Hamilton, Ont. Mr. McAllister was formerly general manager of the British Columbia Copper Co., and consulting engineer to the British America Nickel Corporation.

Burr A. Robinson has resigned as assistant secretary of the American Institute of Mining Engineers to take a position with the United States Rubber Co. **Prof. G. A. Roush**, of Lehigh University, has succeeded him as managing editor of the Institute's bulletin. **A. L. Gresham** becomes assistant to the secretary.

F. W. Denton, who lately retired as manager of the Copper Range mines to become consulting engineer and first vice president of the same company, was re-

cently presented with a gold watch at a dinner at the Houghton Club. There were present 56 department heads who had been associated with Mr. Denton for about 15 years.

George Satterthwaite has resigned as superintendent of the Midvale Steel Co., Philadelphia, and has been succeeded by **Henry D. Booth**, formerly in charge of munitions. **Newell C. Bradley**, assistant superintendent, has resigned, and **John L. Cox** has been appointed assistant to superintendent in charge of engineering and research.

J. R. Finlay has gone to Minnesota to do some work for the Bureau of Mines. About Oct. 1, he expects to go to Colorado and thence to the Cœur d'Alene district of Idaho to fill an engagement the latter part of October. Later he expects to drive from Colorado Springs to Tucson, Ariz., where he will make his headquarters for the winter.

B. A. Shutts, superintendent of the North Cornwall furnaces, Bethlehem Steel Co., Lebanon, Penn., has resigned, effective Sept. 1, to become superintendent of the Central Iron & Steel Co., Harrisburg. Mr. Shutts will be succeeded by **Ira Hoover**, Lebanon, who has recently been assistant to the former superintendent, **W. L. Wolfe**, at the Lackawanna plant of the Bethlehem Steel Company.

C. B. Dunster, manager of the mining department of Breitung & Co., New York, has been appointed manager of E. N. Breitung & Co., at Cleveland, Ohio, and assistant general manager of the Breitung iron properties. **H. L. Kaufman**, the former manager, has resigned to enter the banking business in New York. **H. B. Barling**, formerly chief engineer under Mr. Dunster, succeeds him in New York. **E. N. Breitung** is general manager both of the iron operations from Cleveland and of the miscellaneous mining operations of Breitung & Co., New York.

Obituary

Prof. K. Birkeland of Christiania, Norway, died in Tokyo, Japan, on June 18, aged 50 years. He was a graduate of the University of Christiania and also studied in Paris, Geneva and Bonn. In 1898 he became professor of physics at the University of Christiania. Together with Dr. S. Eyde he developed the well-known Birkeland-Eyde nitrogen-fixation process. He was a member of several societies.

Judge C. C. Goodwin died at Salt Lake City on Aug. 25, aged 85 years. He was born in Rochester, N. Y., and went to California in 1852 during the gold rush, settling in Marysville. He became a miner and later studied law. For a time he edited the "Territorial Enterprise," a mining paper. Later he moved to Salt Lake City, where he became editor of the "Tribune," which position he filled for 21 years. He was editor of "Goodwin's Weekly," widely read in the intermountain region for its trenchant comment on mining and current events.

Oscar Edmund Cary, assistant general manager of the Ohio & Colorado Smelting and Refining Co., died of heart failure at his home in Denver, Colo., on Aug. 20, aged 53 years. He was born at Fort Wayne, Ind. Upon graduation from high school, he entered business which later took him West. In 1901 he entered the employ of the American Smelting and Refining Co. In 1905 he went with the Ohio & Colorado Smelting and Refining Co. at Salida, Colo., where he rose to be assistant general manager. He was a member of the Rotary and Country clubs, and of the Civic Association.

Eugene H. Barton died in Los Angeles, Calif., on Aug. 12, 1917, aged 64 years. He was born at Bartonville, Vt., and was a graduate of the University of Louisiana and of Heidelberg. His practice included operations in civil and mining engineering. He built and operated the railroad between Bodie and Mono Mills, Calif., and later became chief engineer for La Grange dam of the Turlock irrigating system. He had charge of mines at Bodie at one time and about 1902 went to the Yellow Aster mine at Randsburg, Calif., where he became superintendent. In 1907 he was made mine superintendent for the Ray Consolidated company at Ray, Ariz., but left soon after, owing to the panic of that year.

William H. Storms, former state mineralogist of California, was shot and killed at Oakland, on Aug. 20, by Richard Hutchinson, following a quarrel over a placer claim that Storms was trying to sell for Hutchinson. Mr. Storms was born in Hackensack, N. J., 58 years ago. He went

West at an early age and after a career of several years in Idaho, Colorado and Arizona as a miner and writer upon mining subjects was appointed field assistant of the California State Mining Bureau. Among the mines managed by him at various times were the Balliol in Amador County, the Yellow Aster in Kern County, Calif., and the Junction, near Sodaville, Nev. In 1911 he was appointed state mineralogist of California which position he held until 1913. In 1915 he took charge of the development of a property in New Mexico owned by the Haggin and Tevis estates. He was the author of several technical bulletins and reports, including one on "Methods of Mine Timbering" now used as a textbook. He was a frequent contributor to technical papers, including the "Engineering and Mining Journal." He was twice editor of the "Mining and Scientific Press" and was on its staff at the time of his death.

Societies

Mining Institute of Scotland held a general meeting on Aug. 11, in the Royal Technical College, Glasgow.

University of Utah has increased the equipment of its department of engineering and will offer new courses for the coming year.

Exposition of Chemical Industries, the third of national scope, will begin Sept. 24 in the Grand Central Palace, New York. Opening addresses will be made by Dr. C. H. Herty, editor of "Journal of Industrial and Engineering Chemistry"; Dr. Julius Stieglitz, president American Chemical Society; Dr. C. C. Fink, president American Electrochemical Society and Dr. G. W. Thompson, president American Institute of Chemical Engineers. There will be about 350 exhibitors at the exposition.

Industrial News

Morse Bros. Machinery and Supply Co., of Denver, has purchased all the surface equipment at the upper workings of the Camp Bird mine near Ouray, Colo. and will dismantle and ship the equipment to Denver. The new tunnel of the Camp Bird company, being driven to reach the veins at lower depth, renders this valuable equipment unnecessary. The famous Thomas Walsh hardwood-floor boarding house with accommodations for 400 men and the 10,000-ft. aerial tramway are included in the sale.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Cyanidation and Flotation—Process of Extracting Precious Metals and Other Metals from Ore. **John M. Tippet**, Colorado Springs, Colo. (U. S. No. 1,236,501; Aug. 14, 1917.)

Flotation—Art of Concentration of Ores by Flotation. **George D. Van Arsdale** of New York, N. Y. (U. S. No. 1,236,504; Aug. 14, 1917.)

Hydrogen Sulphide—Production of Hydrogen Sulphide from Sulphide Ores and Concentrate. **Raymond F. Bacon**, Pittsburgh, Penn., assignor to Metals Research Co., New York, N. Y. (U. S. No. 1,235,953; Aug. 7, 1917.)

Manganese and Other Metals—Process for the Recovery of Metals From Ores and the Like. **Charles S. Vadner**, Humboldt County, via Battle Mountain, Nev. (U. S. No. 1,236,236; Aug. 7, 1917.)

Ore Treatment—Method for Treating Roasted Ores with Liquids. **Arthur Ramén**, Olympia, Hälsingborg, Sweden. (U. S. No. 1,235,598; Aug. 7, 1917.)

Timbering—Improvements in Miners Timber Measuring Rods or Gauges. **Daniel Sandbrook Nicholas**, Cardiff, England. (Brit. No. 105,129.)

Zinc—Process for the Electrolytic Deposition of Zinc on Metallic Surfaces. **Pascal Marino**, London, W. C., England. (Brit. No. 105,255.)

Zinc Condenser—Production of Metallic Zinc. **Auguste Joseph François de Bavay**, Kew, Victoria, Australia. (U. S. No. 1,233,652; July 17, 1917.)

Editorial Correspondence

SAN FRANCISCO—Aug. 25

Pinal Dome Oil Co. has sold its lands and business to the Union Oil Co., the purchase price being about \$3,600,000, to be paid \$500,000 cash and the remainder in notes or bonds or in cash as the purchaser may elect. The reason given by the president of the Pinal Dome for the sale is that the directors were confronted by many difficulties in the future operation of the property and concluded that the interests of all the stockholders would be best conserved by the sale. The sale was made as of June 1, 1917, and on July 20 the cash first payment, including interest and totaling \$504,000 was paid and the Union Oil Co. took over the property. The Pinal Dome has been authorized by the State Commissioner of Corporations to distribute this amount to stockholders as a dividend of 14c. per share on 3,600,000 shares issued. The company has on hand more than \$600,000 in cash and expects to receive more than \$165,000 additional before Dec. 1, 1917. In announcing this authority or permission the commissioner states that he is acting under the amendment of the Civil Code adopted by the legislature of 1917, by which the directors of California corporations may make partial distribution of assets when of advantage to stockholders and without injury to creditors. Under the amendment corporations can also apply for authority to pay dividends from accumulated surplus, properly distributable from a business standpoint; also to incur indebtedness beyond the subscribed capital stock, where good business practice dictates such course. There is nothing in the amendment prohibiting corporations from doing what they have heretofore done under the "blue sky" law; but in cases where the authority of directors may be questioned they may avoid personal liability by securing authority of the commissioner, under the provisions of the amendment of 1917.

Chrome Deposits in San Luis Obispo County, California, are attracting active interest of operators and prospectors. The prospective and payable chrome region is in the Coast Range, extending from Cuesta Pass on the Southern Pacific R.R. northwest to San Simeon. Cuesta Pass is about six miles north of San Luis Obispo. San Simeon is a seaport about five miles west of the mountains and about 40 miles northwest of San Luis Obispo. The country is a range of hills averaging about 1650 ft. elevation above sea level and on the north and east side of a dike on the southern end of Santa Lucia mountains. George L. Holmes, mining engineer of San Francisco and Angels Camp, just returned from examining chrome deposits in this region, reports that See & Miller are developing several claims known as the Lucky Jake, Lucky Chrome, Lucky Davis, Dunn and others. This company is developing on two trails that rise to an elevation of about 700 ft. above Tassajara Valley and have disclosed some small bunches of chrome which is being packed down to the wagon road on burros, employing six men at mining and packing and 11 burros. Further up Tassajara Valley the Obispo Copper Co. has developed a copper deposit by sinking a 50-ft. shaft, producing ore placed on the dump that is reported to contain copper, gold and silver. The north and east side of the range is very brushy and hard to prospect. But good chrome float can be found in most of the cañons and even along the top of the ridge. The main deposits of chrome ore appear to be on the south and west side. Dibblee & Arata have about 1740 acres of ground which is being surveyed and through which trails are being cut, employing five surveyors and other men for general work. A wagon road has been completed to Goldtree, a station on the Southern Pacific about four miles out of San Luis Obispo. The company is shipping two carloads of mixed high- and low-grade ore a week. The total value of the mixed ore is about \$25 a ton. The freight rate on this ore from Pacific Coast terminals to Eastern terminals is \$11 per ton for ores under \$25 a ton value and \$14 a ton for ores over \$25 a ton value. The extraction of ore and developing new lenses employs about 60 men. From one of these lenses they have saved over 1500 tons of chrome ore sampling 48% chrome and 5.8% silica. This is being shipped direct to Eastern points in

carload lots. The company expects within 30 days to be loading an average of one car a day at Goldtree, and possibly to increase that amount within another 30 days. Chrome can be traced along the ridge as far north as Port San Simeon. And on the headquarters of Tobacco Creek, which flows on the east side of the range, some good ore is being developed by Wallor, Frewitt and others of Santa Marguerita. The haul from their properties down to Port San Simeon is about seven miles, or to Bradley on the Southern Pacific about 29 miles northeast. This should be an attractive region for prospecting chrome and copper deposits as good float can be found practically everywhere. But Mr. Holmes states that his examination of the region would prompt the advice to prospect the west and south side if larger deposits are sought.

BUTTE—Aug. 29

(By Telegraph)

Anaconda Mines Shut Down, only enough men being employed to keep properties open and in repair. The shutdown followed the strike of employees at the Washoe smeltery last week. The miners call it a lockout, but the company says the mines could not be worked with the smeltermen on strike. With the Anaconda mines closed, the East Butte, Butte & Superior, Elm Orlu and Butte Detroit are working to capacity, now being able to get plenty of good miners. Other independent companies have been compelled to suspend mining because they have been shipping to the Washoe smeltery. The labor situation in Butte is a complex one. Different unions, taking their type from the Kaiser, have violated and broken contracts before the ink on them was dry. The smeltermen at Anaconda voted not to strike and a few days later they all went on a strike without notice or further preliminaries. The state organization of metal trades voted to enter into contracts with the mining companies and after the contracts were signed the Butte unions in the organization repudiated the contracts, and other unions at Great Falls, which had voted for the contracts, gave the Butte unions permission to go it alone and ignore the contracts. Other unions, like the electricians, made their demands which were granted to an extent satisfactory to the union and then the electricians went on strike just the same. On the other hand there appeared to be an opportunity some weeks ago to reach a settlement with the striking miners, who were ready for a compromise, but the mine managers refused to deal with the committee from the strikers because they represented an "outlaw" union. Now the strikers and the locked-out men are waiting for the next move on the part of the company. It is a remarkable fact that since the strike has been on and 10,000 men have been idle in the district, there has been less law violation, less crime and less disturbances than in any similar length of time in many years. The city police court has practically gone out of business. It has been the most orderly strike in history, and since the lynching of Frank Little, the I. W. W. agitator, representatives of that organization have been extremely quiet and most of them have left the city. In the meanwhile Governor Stewart and officers of the Anaconda company have gone to Washington to lay the facts of the situation here before the Washington authorities. Locally, these hope that the proposed investigating commission will be appointed, for there is a justified belief that some conciliatory commission with Federal endorsement can bring about a settlement. Since the radicals among the labor agitators have left the district there is a greatly changed feeling among the men and a vast majority are willing to negotiate for a reasonable settlement.

DENVER—Aug. 27

Colorado Fuel and Iron Co., notwithstanding the specific agreement of its workmen to the provisions of the so-called Rockefeller Plan that was devised and inaugurated three years ago, is having plenty of labor trouble. The state industrial commission is conducting investigations in all the camps controlled by this company. Hearing of grievances from representatives of about 5000 workmen is being held. Union officials are backing the dissension.

Increased Coinage of Silver, to be considered by the heads of the Federal mints, at a meeting in San Francisco on Sept. 12, has elicited remarks from Thomas Annear, superintendent of the Denver mint. He states that the thirty-seven presses of the Government are incessantly coining dimes but that they cannot meet the demands for these coins. He also concludes that last year was one of unusual prosperity in this country because, although his plant annually buys old gold in the form of jewelry to an average amount of about \$125,000, the purchases in 1916 were low, indicating little need, on the part of our population, to convert spare gold into cash.

Colorado School of Mines' turmoil is an absorbing topic of conversation and press items. The trustees' committee appointed last spring at the time of dropping Howard C. Parmelee from the presidency has labored all summer endeavoring to find his successor. The committee met with most negative results until, in an extremity, the position was finally offered—by the committee, not the board—to V. C. Alderson, the former president, ousted four years ago. The place had been offered to Milo S. Ketchum, dean of the engineering school in the University of Colorado; to Dean Raymond, of the University of Iowa; and to G. H. Clevenger, of Stanford University. Doctor Alderson quickly accepted the offer and returned to Golden from Idaho. However, his tenure in office (which now seems like usurpation) may be either brief or exceedingly stormy. The majority of the state's residents are strongly opposed to him. Owing to the absence of A. E. Carlton, the Cripple Creek mining magnate, who is one of the trustees, it cannot be learned definitely whether or not he voted by wire for the appointment of Alderson. It is positive that two of the remaining four trustees extended him the invitation and consequently they declare him appointed; but the remaining two trustees are equally emphatic that no official action upon the matter has been taken and that they are bitterly opposed to Alderson. It is a significant fact that these two men are the only mining engineers upon the board. They are Frank G. Willis, of Cripple Creek, and Orvil R. Whitaker, of Denver. Alumni are sending many telegrams of protest against Alderson, from all parts of the country.

SALT LAKE CITY—Aug. 23

Tintic District's Output for July amounted to 772 cars of ore, estimated at 38,600 tons, valued at \$975,000, from 32 shippers. After 50 years the tonnage of first-class ore from this camp still keeps up, by far the greater part of output representing ore of this character. Recently a mill has been built by the Tintic Milling Co., which is taking and successfully reducing to bullion siliceous ores from some of the older properties of the district, which are for the most part maintaining simultaneously their output of shipping ores. The Tintic Milling Co. is getting ores chiefly from the Knight properties, the Iron Blossom, Colorado, Dragon Consolidated, etc.

Congestion at Smelteries in the Salt Lake Valley district has been the natural result of the greatly increased production of mines in this and surrounding states during the height of the shipping season. The situation has been met on the part of the smelteries by an embargo of six days, during which time they have had an opportunity to catch up. The embargo was lifted Aug. 16, and shipments are again about normal. The smelters are taxing their capacity to the utmost, but it is to be expected that in these days of increasing production by large and small properties, and with labor not as plentiful as formerly, that there should be an accumulation of ores at times.

RENO, NEV.—Aug. 24

Louisiana Consolidated Mining Co. has completed arrangements for extending the Nevada-California Power Co.'s electric transmission line from Belmont to Tybo, a distance of 30 miles, and a mill for which plans are now being drawn will be built to treat the low-grade ores of the Tybo mine and to make a separation of

the lead and zinc. Five trucks are hauling shipping ore to Tonopah, the ore coming from an 8-ft. body on the 300 level of the main shaft. Five more trucks and trailers are on the road from Reno and the management estimates an output of \$100,000 a month from September on. The Louisiana has acquired the property of the Tybo Lead Co., which has the west extensions of the Tybo veins, and will sink a new shaft on this ground at once. The company also purchased the Pearl and Zenda mines in Kern County, Calif., and operations under the new management will begin during the month. This is a low-grade, silver-gold, property which is estimated to have 300,000 tons of \$5.50 ore in sight. The present mill is to be enlarged to 250 tons daily capacity.

DULUTH, MINN.—Aug. 27

Ore Freight Traffic during July through the Sault canals amounted to 10,341,932 tons. Iron ore constituted 10,308,743 tons of east-bound traffic and copper, 16,709 tons. Cuban manganese ore amounted to 16,480 tons in west-bound traffic consigned to Minnesota Steel Co., Duluth.

Movement of Ore and Coal on the Mississippi River, St. Paul to St. Louis, and return is now assured. The Merritt mine at Manganes is installing a steam shovel to load 8000 ton stockpile of high-grade manganese ore for transportation via St. Paul and the Mississippi River to blast furnaces at St. Louis. The Northern Pacific Ry. is arranging temporary ore docks at St. Paul. The Mississippi Valley Iron Co., operating blast furnaces at St. Louis, is arranging to operate a fleet of barges transporting ore and coal. If success is attained by the Mississippi Valley Iron Co., it is predicted that additional blast furnaces will be erected at points along the Mississippi River.

Season's Progress in Shipping shows that continued delays in shipping business has caused the Mesabi operators to give up all hopes of having shipments as large as those of the season of 1916. At one time it was thought that notwithstanding the late season a record as great as last year's would result but the handicap of the late season has been too great. There will be no catching up for the delays which started in the Spring are continuing throughout the summer. The boats are considered by some to be the cause and the lower Lake ports by others. The Mesabi range at least is doing its share in fine shape; railroads are hauling and can haul more ore than the boats can carry, and the mines are in shape to do more than the railroads can take care of. It is too early to predict what the shipments will be for this season as a late closing will increase the total shipments considerably.

Important Mine Sales have lately been consummated. The largest deals of the year were by the Great Northern or Hill

interests, who had immense workings on the range. Among their larger properties was the Hill annex at Marble, a state lease which has been exceedingly active during late years; this with the Mississippi at Keewatin, is now being operated by the Jones & Laughlin interests. The largest number of properties involved was in the lease to the M. A. Hanna Co. The Great Northern interests have always taken the stand that to lease or sell is more profitable in these times than to hold and operate their mines. Some years ago the entire group was leased to the Oliver Iron Mining Co., but this lease was thrown up in 1915. The present leases dispose of practically all the larger properties which the Great Northern held. Another important deal was that involving the sale of the Bennett mine to Pickands, Mather Co. This sale was made last spring by the Longyear-Bennett interests. The independent owner of mines cannot afford to hold and operate them unless he has a furnace outlet for the ore. Taxes are too high and operating expenses have been rising continually. The companies which own furnaces and have an outlet for iron ore have a chance at the profits which accrue from the manufacture of iron and steel. Great Northern Iron Ore Properties has found this out in years of experience, consequently the deals mentioned have been made and upon a basis, it is said, which will insure a good return to the stock of the corporation.

HOUGHTON, MICH.—Aug. 27

Several New Exploration Projects have been undertaken recently. The Bear Lake "Pool" is working on the southwest quarter of Sec. 24, about a mile east of Bear Lake, which is about 1½ miles northeast of the Ship Canal—or the western end of the Keeweenaw Waterway. Here Finnish farmers found copper on their farms and George North, of Hancock, has taken options and worked them to a small extent, finding a felsite bearing copper and copper stains; within a year, J. M. Longyear, Jr., explored with a diamond drill some of his father's lands and some of Mr. North's, that he has reoptioned, but nothing has been given out officially, although rumor has it that results were favorable. J. H. Turivas, of firm of Briggs & Turivas, iron and steel merchants of Chicago, also has taken an option on Sec. 1-54-35 and Sec. 6-54-34, except the N.E. quarter, from D. N. Levy; and all of this except the S.E. quarter is outside or west of what has been considered as the boundary of the mineral belt.

JOPLIN, MO.—Aug. 25

Strike at Wayland Mine, at Galena, Kan., on Aug. 25, when 100 laborers walked out on account of the mine management announcing a cut of 25c. a day in wages. The machinemen had been getting \$4 and helpers \$3.50. The shovelers in the mine also struck because they asked a raise in wages

and it was refused. It is believed the difficulty will be adjusted. No cut in wages is being attempted in mines in other camps.

Gallium, the rare metal noted about a year ago in Joplin District zinc ores, may prove commercially valuable, according to G. O. Waring, assayer and chemist, of Webb City. In an address before the mine operators' association, Aug. 16, he talked interestingly of this metal. He said it was first noted by a watchman at the plant of the Bartlesville Zinc Co., at Bartlesville, Okla., who observed it oozing out like mercury from lead residues after the redistillation of spelter from the Joplin district. Analysis showed it to be gallium. At that time there was only about an ounce of the metal in existence, it being in a vial in a laboratory in France. Since then more has been obtained from Joplin ores, and recently Mr. Waring received about half an ounce from Washington for experimentation. It is a peculiar metal. A few drops upon a plate will spread over the entire surface, making it a perfect mirror—much better than quicksilver. If a few drops of weak sulphuric acid are dropped on the plate the gallium will reassemble into a globule. Mr. Waring stated that some of the metal has been sold at the rate of \$256 per oz. It is impossible at present to state how much of the metal the zinc ores contain, but it has been detected in appreciable quantities; also germanium and thallium.

Wallower Interests of Joplin and Harrisburg, Penn., have definitely taken over the properties of the Nichols-Williams Mining Co., in the Picher-Century field in Oklahoma, for a consideration officially stated as \$1,350,000, previous reports to the contrary notwithstanding. The property includes three concentrating plants and eight 40-acre leases, located between Picher and Century, right in the heart of the Oklahoma field. The mills are the Golden Rod, the Boston-Miami and the Mihomi. All three are going properties. The purchasing company will be known as the Golden Rod Mining and Smelting Co., and its officers are Edgar Z. Wallower, of Harrisburg, Penn., president; W. R. Ramsey, cashier of the Guaranty Bank, of Oklahoma City, secretary and treasurer; F. C. Wallower, of Joplin, a son of E. Z. Wallower, will be manager. He has for long been one of the prominent operators in the sheet-ground field at Webb City. The new owners announce they will build five more concentrating plants on the Nichols-Williams tracts at once, and they this week purchased the Sparkler mill, at Joplin, to move to their new holdings. Besides this they have subleased one 20-acre tract on which a company made up of J. W. McFarland, of St. Louis, Mo., and Peirce City, Mo., investors have contracted to erect a mill. The leases also include the Bulls-Eye tract on which Charles T. Orr, of Webb City, is reconstructing his Bertha A. mill, which he is moving from Webb City.

The Mining News

ALASKA

ST. ELIAS OIL CO. (Katalla)—Producing most of the gasoline and part of fuel oil used on Prince Williams Sound. Pumping from six wells; seventh, being sunk, was 1810 ft. deep, latter part of June, producing 1 bbl. per day at that depth. Another well is being drilled, 300 ft. deep on Aug. 15, on adjoining claim. G. C. Hazelet, of Cordova, manager.

ARKANSAS

Marion County

BEULAH (Rush)—Leased to W. O. Krueger and associates of Harrison. Ore opened; 100-ton mill on property. Have also leased the Bear Hill mine near Dodd City.

GOVERNOR EAGLE (Dodd City)—Sinking shaft to 180-ft. level to cut blende ore discovered by drilling. Shaft down now 166 ft. Expect to strike ore soon. Mine producing high-grade blende from shallow levels.

SHEPHERD (Rush)—J. C. Shepherd, largest producer of zinc ore in the North Arkansas field, leaves this month to join the officers training camp in Little Rock.

Properties will be managed by R. W. Russell.

Newton County

KILGORE (Ponca City)—Isaac Kilgore, producer of lead ore in North Arkansas field, will start erection of mill soon.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—Production for July was 3,551,205 lb. fine copper.

Gila County

MIAMI COPPER (Miami)—Strike situation according to telegraphic dispatches of Aug. 28 report improvement. Three crafts unions have called off strike. Miners continue to hold out, but a number are returning to work and break is expected with old Western Federation organization.

Mohave County

TELLURIDE (Oatman)—Crosscut on 600-ft. level cut several stringers.
GOLD ORE (Goldroad)—Will install 10-stamp pilot mill and cyanide plant. Expected to be in operation in 90 days.

RED LION (Oatman)—Arrangements completed for installation of equipment and sinking 500-ft. shaft. Adjoins producing ground of the Tom Reed.

OATMAN UNITED (Oatman)—Development on the west crosscut at 400-ft. level yielded results that justify sinking shaft additional 200 ft.; work will be commenced at once.

UNITED EASTERN (Oatman)—July production was 7324 tons, having total gross value of \$175,898, an average of \$24.01 per ton. Extraction averaged 96.47%. Total operating costs, including loss in tailings, was \$6.68, and net profits were \$120,802. For first seven months' operation mill treated 44,889 tons, having total gross value of \$969,395, or \$21.59 per ton. Profits for entire period amounted to \$611,940. Dividends of 5c. per share declared for July and August; each amounted to \$68,000. Mill production will be increased to 300 tons daily or more within 60 days, when installation of three additional cyanide tanks will be completed. Station completed at seventh level and sinking toward eighth, which will be 965 ft. below collar of old shaft and 1090 below collar of new shaft.

CLEOPATRA (Yucca)—Copper and Gold Mines Co. organized by Thor Warner and C. W. Nelson to develop the low-grade deposit on the Cleopatra claims.

Pinal County

MAGMA COPPER (Superior)—Report by W. H. Aldridge, president, for six months ended June 30 shows copper produced was 5,355,183 lb., comparing with 4,276,720 lb. in same period in 1916; average price obtained, 27.77c. against 23.31c. in 1916; operating profits were \$736,959, comparing with \$575,226 in first half of 1916, without deduction of depreciation in either instance.

PINAL DEVELOPMENT (Kelvin)—Development on new ore shoot opened up in the winze progresses with satisfactory results. Plans being made to begin shipping at an early date.

Yavapai County

JEROME COPPER (Prescott)—At meeting held recently property was optioned to General Development Co. Holdings consist of nine claims in the Jerome district and other property in the Mayer district near the Arizona Binghamton. A. L. Johns, in charge.

CALUMET & JEROME (Jerome)—According to telegraphic advices of Aug. 28, crosscut at 20 ft. west of shaft entered slate formation, carrying iron pyrite and chalcopryrite, continuing at a distance of 50 ft. from shaft. Superintendent Rauber says ore will average 5%. Will continue crosscut and start drifting later.

Yuma County

SWANSEA (Swansea)—United Verde interests have taken over the whole Swansea property and commenced sinking 1000-ft. shaft. Reported smelter will be removed to the Bill Williams River and entirely remodeled. Has been producing at the rate of 30 cars per week for a year.

CALIFORNIA

Amador County

FOREST FIRES in the Pine Grove region recently destroyed miles of timber land and many farm buildings. Started east of Sutter Creek and spread south to the New York ranch. The New York schoolhouse and the buildings on John Harker's place were destroyed. Damage to mining property reported not serious.

SOUTH EUREKA (Jackson)—Reported to be extracting large tonnage of ore from deep levels of Oneida. May increase capacity of Oneida mill.

ARGONAUT (Jackson)—Installation of electric pumps reported to be completed, pumping direct from 4800-ft. level to the 2000 and then to surface. Mill running on ore of good grade.

Butte County

EAST BELT DEVELOPMENT CO. (Murphys)—Permitted to sell 90,000 shares capital stock to C. Canfield and James H. Stoddard, to be used in development, purchasers paying in labor to be employed in extending the lower tunnel.

BLOOMER HILL (Oroville)—Reported optioned by Philadelphia men. Formerly a producer. Large tonnage of ore in upper workings and tunnel will be driven below to prove extent. If development warrants expect to install modern mill and probably electric-generating plant.

Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—Steam shovel arrived and will be used in handling ore dumps to be put through flotation mill in next few months. Three-compartment discovery shaft, completed to ninth level, will be continued to 10th. New vertical shaft of two compartments and manway started to open up North Keystone mine.

Inyo County

AVAWATZ SALT AND GYPSUM CO. (Los Angeles)—Permitted to sell \$350,000 par value bonds, to net 80%. Company holds 50 mining claims embracing 4781 acres in northeast part of Avawatz mountains in south end of Death Valley. Deposits reported to be rock salt, gypsum and celestite.

MINNIETTA (Johannesburg)—Two new concentrating tables installed. Mine closed two weeks in July on account of lack of trucks for hauling ore and concentrate. Extreme hot weather on the desert in Searles Lake region interfered with motor car and truck traffic. Mine is situated in the Argus range where the weather does not interfere with mining. Operated by Teagle Brothers.

Mariposa County

EARLY (Mariposa)—Ten-stamp mill working on good ore from 200-ft. level. New gas engine installed. Ore, medium-grade and not all amenable to stamp crush-

ing and plate amalgamation; but mine is said to be paying satisfactorily by this method of treatment. Like most of mines in southern end of Mother Lode, ore is somewhat refractory and engineers who have made tests report that recovery could be increased by cyanidation or flotation.

Nevada County

CENTRAL (Old Diggings)—F. B. Hink of Oakland and R. V. Montgomery of San Francisco optioned this property. Sampling will be done under direction of W. W. Henry of Copper City, superintendent of the Arps Copper Co. A. A. Anthony is owner.

DELHI (Nevada City)—Preparations for resumption of practical operation in progress. Surface buildings being removed from old site to point near portal of tunnel; mill being overhauled and improved. Mine recently optioned by Reno men.

COLORADO

Boulder County

CLARK MILL (Boulder)—Treating tungsten ore from Lucky No. 2 mine.

DEGGE-CLARK (Boulder)—This mill, in Bummer Gulch, operating steadily on ore from Good Friday mine.

Dolores County

RICO-ARGENTINE (Rico)—Ore shipments during July: Company account, 20 cars; lessees, 20 cars. Two classes of ore shipped, one, copper ore with small amount of gold and silver, the other mixed lead-zinc sulphide. New ore shoot opened in raise above main level, assays 3 to 4% copper and some gold and silver.

Gilpin County

RARE METALS CO. (Rollinsville)—Recently purchased two tungsten properties in district. Mill operating at full capacity.

POWERS (Central City)—Mine unwatered and repairing levels under way; sinking and drifting will be resumed.

SILVER DOLLAR (Russell Gulch)—Shaft sunk another lift, and drifting now under way on shoot of good-grade copper-gold ore.

GOLD CUP (Central City)—New shaft house completed and 8-drill compressor installed. On 165-ft. level, electric pump installed. When mine unwatered, 50-hp. electric hoist will be added to equipment.

Gunnison County

DOCTOR (Almont)—Regular shipments zinc-carbonate ore being made from this mine, in Taylor Park. Other properties in district being opened.

Ouray County

SNOWFLAKE, SAILOR BOY AND HERO MINES, at Red Mountain, taken under lease and bond lately.

McLENNAN (Ouray)—Discovery of hübnerite made in shallow workings on this property on Mt. Hayden. Systematic development work now under way.

SILVER LINK (Ouray)—Mine will be reopened. Contract let to drive 600-ft. tunnel on vein from point near south end line and at lower elevation than old workings. Mine a producer of high-grade silver-copper ore in early days of camp.

San Miguel County

SUFFOLK (Ophir)—Being worked through London-Badger tunnel.

FAVORITE (Ophir)—Shipments of crude ore being made. Some ore treated at Suffolk mill.

FITZ MAC (Telluride)—This group sold recently to Denver men. Contract for 150 ft. of driving let.

TELLURIDE CONCENTRATE SHIPMENTS for July were: Tomboy, 48 cars; Liberty Bell, 10 cars; Smuggler-Union and Black Bear, 51 cars to Durango and 16 to Blende; Carruthers Leasing Co., 2 cars; total, 127 cars.

BLACK BEAR (Telluride)—Skip recently installed giving satisfaction. Electric locomotive for lower-tunnel haulage and larger compressor will be installed; output will then be increased to 200 tons per day. Ore treated at Smuggler mill, where capacity was increased by using coarser screens on stamp batteries and regrinding in ball mills; saving increased by flotation.

Summit County

EVANS DREDGE (Breckenridge)—Construction progressing as rapidly as delivery of materials will permit. Expected to have dredge in operation during October.

AMERICAN METALS CO. (Climax)—Controls large acreage of molybdenum-bearing ground, near both Climax and Buffehr's Spur. Much activity in evidence; tent towns have sprung up and building material arriving for dwellings. Stated company will build mill.

BALD MOUNTAIN MINES CO. (Breckenridge)—New tunnel 1000 ft. below old one will be driven. Road to new workings

being built, and Golden Eagle mill will be remodeled and enlarged. Company holds lease and bond on Carbonate, Golden Edge, Little Tommy and New Era.

Teller County

ELKTON (Elkton)—Twenty-two sets of lessees working. Shipments made in July from main Elkton and Tornado shafts.

WORCESTER MILL (Cripple Creek)—Independence men purchased this mill at Rubie mine and are treating Rubie dump ore.

ROOSEVELT DRAINAGE TUNNEL (Cripple Creek)—Progress for July, 78 ft. Lateral from tunnel toward Cresson mine driven 100 ft. Water flow 5980 gal. per min.

IDAHO

Blaine County

SMOKY BULLION (Fairfield)—This group of three lode claims and two mill-sites, situated at head of Little Smoky. Three veins outcrop on surface. All carry good-grade milling ore. A. G. Kirby reopening property under lease and bond by tunnel being driven to tap vein at 400 ft.

Shoshone County

GIANT LEDGE CO. (Murray)—Power line of Washington Water Power Co., being extended to supply Guggenheim dredging operations in Murray district, will be available for development of this property by early autumn. Drifting on 400- and 200-ft. levels developed milling-grade ore.

MICHIGAN

Copper

ALLOUEZ (Allouez)—Has four of its five trolley locomotives in operation; now running smoothly.

BEAR LAKE "POOL" (Hancock)—Being opened to get dip of old pit and finding good copper; rock is brecciated felsite with copper between fragments.

SOUTH LAKE (Houghton)—Seventy-five cars of rock have gone to mill from this shaft and 30 more will be sent down before Sept. 1.

OLD COLONY (Houghton)—No difficulty anticipated in shaft sinking until a depth of 1000 ft. is reached, when broken zone is expected, from drill core results. Sinking progresses rapidly.

ISLE ROYALE (Houghton)—Electric tramming is being installed at Isle Royale to great advantage, particularly in the old shafts where the trams are very long, in many instances. This will also prove advantageous when labor is scarce. Shipping 2700 tons daily as compared with normal of 3200; sinking carried on in five shafts, but much more slowly, owing to lack of muckers.

OSCEOLA CONSOLIDATED (Osceola)—North Kearsarge No. 4 shaft closed for repairs Aug. 27 for a week, so that tonnage, which was 97,000 in July, will not be over 100,000 for August, notwithstanding two more working days.

HANCOCK (Hancock)—August tonnage increased; if labor were to be had, could increase output one-third. Electrical equipment all in operation except Westinghouse storage-battery locomotive, expected any time.

MINNESOTA

Cuyuna Range

STRIKE OF MINERS of the Cuyuna range called off Aug. 16. Miners' demands ignored by mine operators, and miners returned to work at same wage and hours as formerly. Laws enacted at last session of legislature prevented disorder and demonstrations by striking miners. No discrimination by mine operators when miners returned to work. Shortage of underground labor on account miners having left for other mining camps.

CUYLER ADAMS (Deerwood)—Operating diamond drill on NW₁, NW₁, Sec. 4-46-49.

HALE & BRADLEY (Deerwood)—Prospecting on N₁, SE₁, Sec. 4-46-49, with diamond drill.

Mesabi Range

WOUCOUTAH (Mountain Iron)—State lease operated by La Belle Iron Co., has two shovels at work stripping.

HOBART (Gilbert)—Preparations being made by M. A. Hanna Co. to reopen this property, closed down since 1905 on account of the great amount of water.

OLIVER (Eveleth)—Has ten shovels at work removing ore from Adams and Leonidas pits. Operating the Weed, an underground mine, and has two shovels at work loading ore out of two pits at Graham mine; expected that all ore will be removed by end of shipping season.

MISSOURI

Joplin District

SCOTT (Joplin)—Started new shaft at Duenweg mine, and will tram about 700 ft. to mill.

GOLDEN EAGLE (Baxter, Kan.)—Clearing ground to build 350-ton mill just east of St. Louis, Okla.

ST. LOUIS LEAD AND ZINC (Quapaw, Okla.)—Starting shaft on 40-acre lease with intention of building mill.

P. B. BUTLER (Joplin)—Reports drill hole north of Lawton, Okla., shows 170 ft. pay ore.

J. E. HEAD (Joplin)—With Frank Brown, of Independence, Kan., is starting construction of 350-ton mill on Cooper estate, west of Baxter.

J. T. CHAPMAN (Joplin)—Just completing 350-ton plant for Farmington, Mo., investors on Hocker land, south of state line, south of Baxter.

GEORGE C. MEESE (Joplin)—Purchased lease on Crane land from Tri-State Mining Co., and in first hole put down got one screw of cuttings; showed high-grade zinc blende for 10 feet.

GEORGE MOORE (Webb City)—With associates purchased Symmes mill and will move from lease southwest of Joplin to newly developed lease west of Chitwood, Mo., where new shaft just been put down.

IMPERIAL DEVELOPMENT CO. (Miami, Okla.)—Using 16-in. Pomona, a 12-in. Pomona, and 5- and 3-in. steam pumps in shaft just east of Douthit, Okla. Shaft was concreted as sunk, but when drifting was started at 200 ft. heavy water was encountered.

BULKELEY WELLS (Baxter, Kan.)—Has completed \$100,000 plant on Anna Beaver land west of Picher, Okla. Has capacity of 300 tons per shift. Equipped with three-ton skips, being first skips in Oklahoma field. Second shaft to be used for hoisting tools and men. Gas engines used for power; 180-acre lease, well drilled; recovery of 8% expected.

RAINBOW (Quapaw, Okla.)—Has concrete foundations ready for 300-ton mill and heavy machinery mostly set. Company virtually same as Ottawa Mining Co., which is arranging to build 200-ton mill on 40-acre tract adjoining on north. Third mill will be built later on another 40 cornering on east. Also prospecting 200 acres, three miles northeast, and 80-acre lease between Century and Commerce. F. E. Herring, Elk City, Okla., president; O. D. Halsell, Oklahoma City, vice president; R. H. Drennan, Oklahoma City, secretary-treasurer.

MONTANA

Silver Bow County

EAST BUTTE MINING (Butte)—After shutdown of nearly three weeks, company's smelter at Pittsmtont mine started on Aug. 8, with accumulated ore supply and daily output from Pittsmtont and Dutton mines.

TUOLUMNE (Butte)—After inspection of company's properties during last week, William Jahn, of Milwaukee, vice president, gave out following statement: Properties at both old Tuolumne, Main Range and Colusa-Leonard make excellent showing and normal operations will be resumed with settlement of labor troubles. Hoist and new machinery at Main Range and Colusa-Leonard are about ready and within short time work at these properties will be pushed with more speed than ever.

ANACONDA (Butte)—Principal addition made during summer to mine equipment has been new hoist at Rarus mine, three electric-driven air compressors at Leonard, two at Bell and one at Never Sweat mine. Rarus hoist is electric with 2000 tons capacity per day, to increase output of Tramway mine, materially curtailed by recent fire. Four new compressors are Ingersoll-Rand, two are Nordbergs with combined capacity of 45,000 cu. ft. of air per minute. Increase in activity due to high price of silver in both Alice mine in Walkerville district and Nettie mine, situated in westernmost section of Butte camp. At Alice from 100 to 200 tons per day rich silver-izing ore taken from upper levels and shipped to Washoe smelter. At Nettie plans are under way to increase output, which now amounts to about 300 tons per day. West-Nettie being developed through new shaft, 600 ft. from Nettie shaft, with which it will be connected on 500-ft. level.

(Later—All company's mines suspended operations due to closing down of smelters.)

NEVADA

Lincoln County

PRINCE CONSOLIDATED (Pioche)—Shipments have now reached total of 400 tons per day. Ore recently struck in dia-

mond-drill hole No. 3 and drill moved 300 ft. south to prove continuation of orebody. Murray C. Godbe, general manager.

NEVADA GOLDSPRINGS (Nyala)—Reported to have struck tellurium ore in bottom of 50-ft. shaft. W. C. McMullin, general manager.

Nye County

TONOPAH ORE PRODUCTION for week ended Aug. 18 was 8999 tons, valued at \$161,982, comparing with 8543 tons the previous week. Producers were: Tonopah Belmont, 2616 tons; Tonopah Mining, 2050 tons; Tonopah Extension, 2380 tons; Jim Butler, 700 tons; West End, 959 tons; Rescue, 128 tons; Montana, 55 tons; North Star, 55 tons; Halifax, 51 tons; Cash Boy, 105 tons.

WHITE CAPS (Manhattan)—Reduction plant near completion. On 300-ft. level, east crosscut advanced 31 ft.; west crosscut, 40 ft. in quartzite. On 400-ft. level raise on west orebody put up 25 ft., showing ore in face. Large station being cut in east orebody, where electric hoist will be installed to facilitate sinking winze to 550-ft. level. Winze will follow east orebody downward. Station also being cut on 550-ft. level on north side to accommodate large pump and sinking hoist. Believed that timbering will not be necessary as ground is solid quartzite. Making 6 ft. of progress per day in crosscut being driven to strike east orebody.

NEW MEXICO

Grant County

RIVAL (Duncan, Ariz.)—Rival shaft down 60 ft., to be connected at 350-ft. level with Ethel shaft, 1300 ft. distant, on 500-ft. level of latter. Two carloads of supplies recently arrived in Duncan. H. M. Ziesemer, superintendent.

PROGRESS (Steeplerock)—Temporarily suspended mining operations, awaiting arrival of pump to handle increased flow on 200-ft. level. Developing complex ores. A 65-hp. semi-Diesel engine and a six-drill air compressor now on way from factory. Charles Hanson, superintendent.

CARLISLE (Steeplerock)—Mill operating 20 hr. daily, concentrating about 100 tons per shift. Concentrates run about \$100 per ton. Ores contain gold, silver, copper, lead and zinc. Shipments now steadily made at rate of about five cars monthly. W. Murray Sanders, manager.

UTAH

Beaver County

MOSCOW (Milford)—Continuation of lead-silver orebody found on 1400 level shipping ore. Winze being sunk below level. July shipments amounted to 12 cars or 600 tons as compared to 20 cars or 1000 tons in June. Lessened output due to 4th of July holiday. Ore brings \$1500 to \$1600 a car; chiefly lead-silver, and zinc.

Juab County

TINTIC STANDARD (Eureka)—New station on 1300 in shipping ore. Connections to be made by drifting with orebody opened on 1174 level, and continuing to 1300 and downward.

TINTIC DRAIN TUNNEL (Silver City)—Organized by Knight interests to drive long drainage tunnel from east to west over a distance of five to six miles, starting at some point in Goshen Valley and ending near Silver City, where it will enter the Dragon Consolidated mine. Will open at depth large territory, which has been productive at higher levels and allow operation where water has previously prevented. Also expected to develop water for irrigation of Goshen Valley lands.

Piute County

FLORENCE MINING AND MILLING (Marysvale)—Alunite mill of this company in operation. The alunite will be crushed and calcined and shipped to the east. It is planned later to add a leaching plant at Marysvale, and ship potassium sulphate.

PITTSBURGH & UTAH POTASH CO. (Marysvale)—Machinery has begun to arrive for new potash mill to be built at Benap, on west side of Sevier Canyon, six miles north of Marysvale, at base of main operating tunnel. Switch completed from Denver & Rio Grande track to mill site. James Long, in charge.

Salt Lake County

CARDIFF (Salt Lake)—Average daily output is 125 tons of ore. Recently inspected by Ezra Thompson, president, and other directors, to see recent developments, and transport conditions.

OHIO COPPER (Bingham)—Monthly earnings stated to net \$50,000. Through ownership of Mascotte tunnel, transportation costs reduced. Mining costs said to average 22c. per ton. Company handling

60,000 tons of ore monthly, averaging 0.80% copper, with 45% extraction. Minerals Separation flotation plant being installed, expected to raise present monthly output of 500,000 lb. to about 900,000 lb., and give 80% extraction.

Summit County

NEW QUINCY (Park City)—Car of good-grade ore from raise and drift above main-tunnel level being prepared for market.

PARK CITY KING (Park City)—Contract let for extending new tunnel now in 130 ft., 300 ft. further. Being driven toward Crescent-Alliance fissure, with limestone-quartzite contact objective. Some mineralization showing in face.

Utah County

FISSURES EXPLORATION (American Fork)—Reported operating Pacific mine under long lease to extend operations, taking in Live Yankee, Belerophon, and Merrill groups adjoining, and lying at head of Mary Ellen Gulch.

CANADA

British Columbia

IRON-ORE DEPOSITS of Vancouver Island, known as the Bugaboo group, with probable ore tonnage of 500,000 and possibly 250,000 more reported under option to interests headed by D. C. Jacklin. Also intimated new interests will acquire coal properties in the district.

Ontario

McRAE (Porcupine)—Operations suspended after sinking to depth of 100 ft.

MALOOFF CLAIM (Sesekinika)—Shaft down 40 ft. Test pit north of shaft shows vein widening with tellurides and free gold.

CANADIAN KIRKLAND (Kirkland Lake)—Surface exploration discovered 17 veins, some giving high assays. Tenders asked for plant for development.

KIRKLAND LAKE (Kirkland Lake)—Beaver Consolidated made third payment on this property, leaving one installment remaining of about \$75,000.

SCHUMACHER (Schumacher)—Active development resumed. Compressor with capacity of 25 drills and a new transformer installed.

BUFF (Munro Township)—Sinking begun on No. 1 vein and at depth of 20 ft. high gold content encountered. Small plant will be installed.

ORR GOLD MINES (Kirkland Lake)—This newly organized company capitalized at \$3,000,000 has taken over the Orr and another group belonging to Samuel Renaud and associates.

DOMES MINES (South Porcupine)—Recently passed quarterly dividend because labor shortage caused heavy curtailment in operations. Dividends reduced from 50c. to 25c. three months ago.

NEWRAY (Porcupine)—Manager Charlebois states vein struck in crosscut on 400-ft. level, 985 ft. from shaft, is 5 ft. wide. United States Smelting, Refining and Mining Co. reported to have optioned mine for 60 days.

COBALT PROVINCIAL (Cobalt)—This property, adjoining the Nipissing, reopened under management of John Redington. Ore reserves estimated at 148,000 oz. Shaft being sunk on vein at southwest end of property.

BLACK CLAIM (Kirkland Lake)—Shaft reached depth of 165 ft., vein at this point being narrower than on surface but continuing highly mineralized. Work temporarily suspended on account of closing down plant supplying air.

MEXICO

BOLEO (Santa Rosalia)—Copper production in July was 1,440,180 lb.; grade of ore 3.516%.

GERMANY

NEW COAL FIELD, discovered in Silesia, according to German dispatch emanating at Amsterdam. Work preparatory to exploitation to begin in September.

AUSTRALIA

GOLD PRODUCTION in Queensland in June was 15,859 oz., a decrease of 1110 oz. from June, 1916. For six months ended June 30 total gold won was 116,862 oz. in 1916, and 86,985 oz. in 1917; a decrease of 29,877 oz. Other Australian gold yields are reported for May: Western Australia 79,434 oz., a decrease of 4443 oz. from May of last year. Victoria, 14,005 oz. fine. For the five months ended with May total was 82,971 oz., a decrease of 22,883 oz. from last year. New South Wales output was 6684 oz. in May and 34,097 oz. for the five months, which is a decrease of 10,072 oz., or 22.8%, from last year.

The Market Report

Metal Markets

| SILVER AND STERLING EXCHANGE | | | | | | | |
|------------------------------|--------------------|-----------------|---------------|------|--------------------|-----------------|---------------|
| Aug. | Sterling Ex-change | Silver | | Aug. | Sterling Ex-change | Silver | |
| | | New York, Cents | London, Pence | | | New York, Cents | London, Pence |
| 23 | 4.7550 | 88½ | 44½ | 27 | 4.7550 | 88½ | 45 |
| 24 | 4.7550 | 88½ | 44½ | 28 | 4.7550 | 88½ | 45 |
| 25 | 4.7550 | 88½ | 44½ | 29 | 4.7550 | 89½ | 45½ |

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

| Aug. | Copper | | Tin | | Lead | | Zinc |
|------|---------------|-------|---------|--------|---------|--------|--------|
| | Electro-lytic | Spot. | N. Y. | St. L. | N. Y. | St. L. | St. L. |
| 23 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7½ |
| | @ 25 | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7½ |
| 24 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7½ |
| | @ 25 | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7½ |
| 25 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7.70 |
| | @ 25 | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7.80 |
| 27 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7.70 |
| | @ 24½ | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7.80 |
| 28 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7.70 |
| | @ 24½ | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7.70 |
| 29 | 24½ | 61½ | 10 30 | 10½ | 10 30 | 10½ | 7.80 |
| | @ 24½ | | @ 10 70 | @ 10½ | @ 10 30 | @ 10½ | @ 7.80 |

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 the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basis point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r. t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

| Aug. | Copper | | Tin | | Spot | Spot | |
|------|----------|---------------|------|--------|------|------|------|
| | Standard | Electro-lytic | Spot | 3 Mos. | | | |
| | | | | | | | Spot |
| 23 | 120 | 119½ | 137 | 241½ | 239½ | 30½ | 54 |
| 24 | 120 | 119½ | 137 | 241½ | 239½ | 30½ | 54 |
| 25 | 120 | 119½ | 137 | 241½ | 239½ | 30½ | 54 |
| 27 | 120 | 119½ | 137 | 240 | 238½ | 30½ | 54 |
| 28 | 120 | 119½ | 137 | 241½ | 239½ | 30½ | 54 |
| 29 | 120 | 119½ | 137 | 242½ | 240½ | 30½ | 54 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½c.

NEW YORK—Aug. 29

Stagnation in the metal markets became even more complete than in the previous week.

Copper, Tin, Lead and Zinc

Copper—Sales were but trifling and quotations scarcely more than nominal. There was a slightly weaker tone, and in the latter part of the week September copper was to be had on terms equivalent to 24½@24½c., cash, New York, while fourth-quarter delivery was freely offered at 24c. regular terms. Consumers will not

buy until they have learned what the Government is going to do.

Messrs. Baruch, Brookings and Lovett, of the War Industries Board, have been made a purchasing committee in behalf of the Allies. Eugene Meyer, Jr., has been appointed copper buyer for this committee.

The Washoe and Great Falls works of the Anaconda Co. were closed on Aug. 27, owing to strikes, wherefore complete suspension of operations in the Anaconda mines immediately followed.

In Arizona, mines of the Morenci and Miami districts are still closed. Bisbee is reported operating at about 80% capacity.

Copper Sheets are quoted at 37c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—This market was very dull, with nothing more than slight fluctuations in the price. At the close Banka tin was quoted at 58½@59c.

Receipts of tin concentrates at Liverpool in July were: Bolivia, 943 gross tons; Nigeria, 806; total, 1749 tons, containing 1130 tons metallic tin.

Tin exports from the Straits in July were 4460 gross tons.

The production of Banka tin during the half-year ended June 30 was 6132 tons, an increase of 230 tons over the first half of 1915. Shipments for the half-year were 8241 tons. Stocks on June 30 were: In Banka and Batavia, 211 tons; in Holland and afloat, 1150 tons; total, 1361 tons.

Visible stocks of tin on Aug. 1 as reported by Messrs. Ricard & Freiwald were as follows, including tin afloat: Great Britain, 8429; Holland, 1882; other Europe, 2190; United States, 6867; total, 19,368 gross tons. This is a decrease of 1087 tons during July.

Lead—There was no change in the situation. Transactions were insignificant.

Zinc—Transactions were light. Such as were reported were at reduced prices. Zinc dust is quoted at 14c. at Denver, Colorado.

Exports of zinc ore from Haiphong, Tonkin, for the four months ended April 30 were 10,566 metric tons, a decrease of 1776 tons from last year.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at \$19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—This market has again relapsed into comparative inactivity; No. 1 ingots are quoted at 48c. per lb., New York.

Antimony—Scarcely any business was done. We quote spot at 14½@15½c. and futures at 14@14½c., c.i.f. bond.

Bismuth—Unchanged at \$3.50 per pound.

Cadmium—Unchanged at \$1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at \$115. San Francisco reports by telegraph \$112.50, market steady.

Gold, Silver and Platinum

Gold—Shipments from New York for the week were \$6,000,000 to Japan, \$800,000 to Spain and \$750,000 to Peru.

Shipments amounting to \$7,500,000 in gold have been made recently from Japan to British India.

Silver—This market has continued strong with advancing prices the past week, due to small stocks in London and New York, and the urgent demand both for coinage and commercial purposes. Owing to lower freight and insurance, via the Pacific, silver is being shipped to the East from San Francisco, and buyers are paying a premium over London price on account of this differential in cost of transportation. Market closed strong.

Mexican dollars at New York: Aug. 22, 68½c.; 23, 68½c.; 24, 68½c.; 25, 68½c.; 27, 69c.; 29, 69c.

Silver stocks in Bombay at the close of July amounted to 1700 bars. The stocks in Shanghai at the same date were 15,100,000 dollars and 19,700,000 on sycee silver.

The Indian government currency reserve on July 31 amounted to 2431 lakhs of rupees in silver, an increase of 335 lakhs during July.

The French Mint reports that no gold pieces were coined during 1916. There were struck 162,878,489 coins of silver, having a total face value of 154,283,813 francs. This is the largest silver coinage ever reported in a year.

Platinum—Unchanged at \$103@105.

Palladium—Firm at \$120@125.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 25—Blende, per ton, high, \$76.90; basis 60% Zn, premium, \$75, medium to low, \$70@65; calamine per ton, basis 40% Zn, \$40@38; average selling price, all grades of zinc, \$74.40 per ton.

Lead, high, \$108.20; basis 80% Pb, \$105@100; average selling price all grades of lead, \$103.46 per ton.

Shipments the week: Blende, 13,634; calamine, 864; lead, 1588 tons. Value, all ores the week, \$1,156,090. Shipment eight months: Blende, 305,358 tons; calamine, 28,128 tons; lead, 53,635 tons. Value, all ores eight months, \$30,258,600. Increase over eight months last year: Blende, 85,664 tons; calamine, 10,808 tons; lead, 14,975 tons.

Buyers were pleased by the arrival of an added number of cars and of capacity of 40 to 50 tons each, making a record shipment for the week of 16,086 tons of all minerals. Price offerings continued strong to the weekend, but buying became easier at the close.

Platteville, Wis., Aug. 25—Blende, basis 60% Zn, \$70 for premium ore, down to \$65 for medium grade lead ore, basis 80% Pb, \$110 per ton. Shipments reported for the week are 3565 tons of zinc ore, 74 tons of lead ore, and 426 tons of sulphur ore. For the year to date, the figures are: 92,601 tons of zinc ore, 4338 tons of lead ore, and 18,698 tons of sulphur ore. Shipped during week to separating plants 3541 tons of zinc ore.

Other Ores

Molybdenite—Unchanged at \$2.10@2.20.

Manganese Ore—Unchanged at \$1 for high-grade metallurgical ore.

Iron Ore—The market remains quotable on the season basis, Mesabi nonbessemer being \$5.05. It has just developed, however, that in case of making sales, something unusual at this season, shippers would quote an advance equal to the cost of Lake transport, the season prices being based on \$1 Lake freight. The Bethlehem Steel Co. has bought a moderate tonnage of Lake Superior ore, on account of the shortage in imported ore, and paid 50c. above the nominal prices, the sale being based on Lake freight of \$1.50. It is expected wild charters will soon be on the basis of \$2.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are easier, charters having been made at 32s. 6d. for northern ports, and at 40s. for southern ports; further amelioration is expected in ocean rates.

Tungsten Ore—High-grade ore was quoted at \$23@25. Low grade at \$19@20. High-grade scheelite was reported sold at \$27@28. Sales of ore of all kinds amounted to several hundred tons.

Iron Trade Review

NEW YORK—Aug. 29

Even with the Government announcement of steel prices known to be close at hand, the market has done some further readjusting on its own account, says "Iron Age." Pittsburgh has been the chief scene of activity and the business done has been almost uniformly at the expense of prices. The trade is much at sea as to the extent to which the readjustment will go, and is

not helped by conflicting advices from Washington as to prices to Allied governments and the public. In the absence of power to enforce a uniform price for the three classes of buying, the Administration is represented as turning to the Senate bill for such control of iron and steel as has been provided for food and fuel. Meanwhile sentiment grows in favor of substantially uniform prices to the Government, Allies and the public provided there is the anthracite type of adjustment rather than that in bituminous coal.

If the Government adopts the proposal to pay higher prices for finished steel to high-cost mills, pig iron may escape regulation except that due to the expected reduction in coke.

PITTSBURGH—Aug. 28

There is no further light from Washington as to what the Government will do in the matter of steel prices, either for itself, its Allies or the general trade. A hint that Washington is thinking of lower prices, in general, than has been surmised was furnished by the fixing of coal prices last week on a general basis of about \$2, when the lowest forecast had been \$2.50, but coal interests have some expectation that the Government may consent to raise the price somewhat. No action has been announced as to coke prices, but such announcement is expected in the near future, at \$3.75 or \$4 if coal stays at \$2, but otherwise at a somewhat higher figure.

The Government continues to place orders for steel, but the tonnages are not large in the aggregate, and the proportion of the steel output that is being absorbed by the Government, or is likely to be absorbed in the next few months, is decidedly smaller than was estimated a couple of months ago, possibly not over 10%. When shipbuilding is in full swing, six months or more hence, the proportion may be 20%. Steel for the European Allies remains a consideration for future business, although an occasional order is being placed now for some specialties.

Domestic buyers of steel continue their waiting attitude and are exhibiting the greatest patience. The mills are interested simply in shipping against orders and contracts now on books, their greatest hope being that the bulk of this tonnage can be converted into shipments before there is any serious break in the market.

None of the regular finished steel products is quotable at lower prices than formerly, although the tone of the market is softer. In unfinished steel there have been further declines and bessemer and basic iron are quotably lower while in all districts pig iron prices are largely nominal. In the local market, heavy melting steel is stronger, the Carnegie Steel Co. having made some purchases at \$38.

Pig Iron—Some odd lots of bessemer iron have been purchased by a producer at \$50 and \$52, valley, and there is more to be had at \$52, representing \$1 decline in the week and \$3 from the top point. A curious sale of basic from an eastern furnace has been made for delivery in this general district at a price equal to \$45.75, valley, but this does not make a market. It is assured that basic could be bought at \$50, or \$4 under the recent maximum. There is no regular buying to make a market, or prices in general would probably be lower. We quote: Bessemer, \$52; basic, \$50; malleable and foundry, \$53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Billets, which a week ago were offered at \$85, afterwards sold at \$80 in small lots and now there are offerings at \$75 without finding enough takers to absorb the offerings. Slabs are also offered at \$75. Last offerings of sheet bars were at \$85. The market is simply sagging, without displaying any life at all. Forging billets are lower, being offered at \$95.

Ferroalloys

Ferromanganese—The market is not quotably changed, prompt and balance of year being \$375@400 and first quarter of half of next year, \$350. The trade seems to expect lower prices eventually rather than higher.

Coke

Connellsville—The market stiffened sharply the last two days of last week, weakened decidedly on Monday and firmed up today, on prospects of poorer car supplies on account of diversion of coke racks to comply with Priority Order No. 1 in favor of full car supplies for the shipment of Lake coal. We quote spot furnace at \$13.50@14 and spot foundry at \$14@15, per net ton at ovens. The trade still awaits fixing of prices by the Government but there is no line on when this will occur.

STOCK QUOTATIONS

| N. Y. EXCH.† Aug. 28 | | BOSTON EXCH.* Aug. 28 | |
|-----------------------|------|-----------------------|-----|
| Alaska Gold M. | 51 | Adventure | 2 |
| Alaska Juneau | 31 | Ahmeek | 98½ |
| Am. Sm. & Ref. com. | 96½ | Algoma | 50 |
| Am. Sm. & Ref. pf. | 112 | Allouez | 64 |
| Am. Sm. Sec. pf. A | 100 | Ariz. Com. cts. | 11½ |
| Am. Sm. Sec. pf. B | 93 | Arnold | 25 |
| Am. Zinc | 20 | Bonanza | 21 |
| Am. Zinc pf. | 58 | Butte-Ballaklava | 55 |
| Anaconda | 71½ | Calumet & Aris | 79½ |
| Batopilas Mtn. | 1 | Calumet & Hecla | 54½ |
| Bethlehem Steel | 112½ | Centennial | 17 |
| Bethlehem Steel, pf. | 109 | Copper Range | 56½ |
| Butte & Superior | 30½ | Daly West | 2 |
| Cerro de Pasoco | 33½ | Davis-Daly | 4 |
| Chile Cop. | 52 | East Butte | 10½ |
| Chino | 52½ | Franklin | 6 |
| Colo. Fuel & Iron | 44 | Granby | 78 |
| Crucible Steel | 70 | Hancock | 13 |
| Dome Mines | 9 | Hedley | 15 |
| Federal M. & S. | 22½ | Helvetia | 25 |
| Federal M. & S. pf. | 41 | Indiana | 2 |
| Great Nor., ore ctf. | 37 | Isle Royale | 60 |
| Greene Cananea | 43 | Keweenaw | 27½ |
| Gulf States Steel | 102 | Lake | 9½ |
| Homestake | 110 | La Salle | 3½ |
| Inspiration Con. | 51 | Mason Valley | 6½ |
| International Nickel | 36½ | Mass | 11½ |
| Kennecott | 40 | Mayflower | 6 |
| Lackawanna Steel | 81 | Michigan | 1½ |
| Miami Copper | 35½ | Mohawk | 79½ |
| Nat'l Lead, com. | 54 | New Arcadian | 3 |
| National Lead, pf. | 105 | New Idria | 16 |
| Nev. Consol. | 21½ | North Butte | 16 |
| Ontario Mtn. | 6 | North Lake | 1 |
| Quicksilver | 1½ | Ojibway | 1 |
| Quicksilver, pf. | 2 | Old Dominion | 54 |
| Ray Con. | 26 | Oseola | 85½ |
| Republic I. & S. com. | 82 | Quincy | 89 |
| Republic I. & S. pf. | 102½ | St. Mary's M. L. | 74 |
| Sloss-Sheffield | 50 | Santa Fe | 7½ |
| Tennessee C. & C. | 16½ | Shannon | 7½ |
| U. S. Steel, com. | 119 | Shenock | 7½ |
| U. S. Steel, pf. | 116½ | Shattuck-Aris | 23 |
| Utah Copper | 97 | So. Lake | 2½ |
| Va. Iron C. & C. | 63½ | So. Utah | 16 |
| | | Superior | 7½ |
| | | Superior & Bosk. | 3 |
| | | Trinity | 5 |
| | | Tuolumne | 1½ |
| | | U. S. Smelting | 59 |
| | | U. S. Smelt'g. pf. | 49 |
| | | Utah Apex | 16 |
| | | Utah Cop. | 2 |
| | | Utah Metal | 41 |
| | | Victoria | 31 |
| | | Winona | 3 |
| | | Wolverine | 45 |
| | | Wyandot | 30 |

N. Y. CURB* Aug. 28

| | |
|-------------------|-------|
| Big Ledge | 1 |
| Butte & N. | 1½ |
| Butte C. & Z. | 9½ |
| Caledonia | 68 |
| Calumet & Jerome | 2 |
| Can. Cop. Corp. | 2.43½ |
| Carlisle | 6 |
| Cashboy | 08 |
| Con. Ariz. Sm. | 21 |
| Con. Coppermines | 9½ |
| Con. Nev.-Utah | 07 |
| Emma Con. | 1½ |
| Ferber | 1.60 |
| First Nat. Cop. | 2.81½ |
| Goldfield Con. | 52 |
| Goldfield Merger | 06 |
| Greenmonster | 9½ |
| Hecla Min. | 94 |
| Howe Sound | 51 |
| Jerome Verde | 1 |
| Kerr Lake | 5½ |
| Magma | 45 |
| Majestic | 38 |
| McKinley-Dar-Sa. | 65 |
| Milford | 31 |
| Mohican | 31 |
| Mother Lode | 31 |
| N. Y. & Hond. | 15 |
| Nipissing Mines | 91 |
| Ohio Cop. | 1½ |
| Ray Hercules | 31 |
| Richmond | 56 |
| Rochester Mines | 55 |
| St. Joseph Lead. | 20 |
| Standard S. L. | 34 |
| Stewart | 24 |
| Success | 41 |
| Tonopah | 41 |
| Tonopah Ex. | 2 |
| Tribrulion | 31 |
| Troy Arizona | 19 |
| United Cop. | 75 |
| United Verde Ext. | 4.75 |
| United Zinc | 28 |
| Utica Mines | 28 |
| White Knob, pf. | 11 |
| Yukon Gold | 2.18½ |

SAN FRAN.* Aug. 28

| | |
|-----------------|------|
| Alta | 03 |
| Andes | 10 |
| Best & Belcher | 02 |
| Bullion | 02 |
| Caledonia | 12 |
| Challenge Con. | 01 |
| Confidence | 05 |
| Con. Virginia | 14 |
| Gould & Curry | 02 |
| Hale & Norcross | 03 |
| Jacket-Cr. Pt. | 11 |
| Mexican | 08 |
| Occidental | 60 |
| Ophir | 08 |
| Overman | 01 |
| Seg Belcher | 02 |
| Sierra Nevada | 06 |
| Union Con. | 28 |
| Utah Con. | 02 |
| Belmont | 4.70 |
| Jim Butler | 10 |
| MacNamara | 14 |
| Midway | 12 |
| Mont.-Tonopah | 20 |
| North Star | 10 |
| Rescue Exls. | 20 |
| West End Con. | 68 |
| Atlanta | 12 |
| Booth | 07 |
| Comb. Frac. | 03 |
| D'held Daisy | 03 |
| Florence | 13 |
| Jumbo Extension | 27 |
| Kewanas | 12 |
| Nevada Hills | 13 |
| Nevada Packard | 31 |
| Round Mountain | 27 |
| Silver Fleck | 08 |
| White Cop. | 1.23 |
| Big Jim | 1.69 |
| United Eastern | 4.20 |

BOSTON CURB* Aug. 28

| | |
|----------------------|------|
| Alaska Mines Corp. | 50 |
| Bingham Mines | 12½ |
| Boston Ely | 60 |
| Boston M. | 60 |
| Butte & Lon' N. Dev. | 16 |
| Calaveras | 3 |
| Calumet-Corbin | 01½ |
| Chief Con. | 2 |
| Cortez | 10 |
| Crown Reserve | 25 |
| Crystal Cop. | 77 |
| Eagle & Blue Bell | 2½ |
| Houghton Copper | 50 |
| Intermountain | 15 |
| Iron Cap, Com. | 15 |
| Iron Cap Cop. pf. | 15 |
| Mexican Metals | 32 |
| Mines of America | 1 |
| Mojave Tungsten | 42 |
| Nat. Zinc & Lead | 14 |
| Nevada-Douglas | 1 |
| New Baltic | 17½ |
| New Cornelia | 17½ |
| Oreco | 35 |
| Pacific Mines | 1.30 |
| Rex Cons. | 17 |

SALT LAKE* Aug. 28

| | |
|---------------------|------|
| Bannack | 55 |
| Big Four | 05½ |
| Black Jack | 1.06 |
| Cardiff | 4.50 |
| Colorado Mining | 16 |
| Daly-Judge | 5.60 |
| Empire Copper | 1.30 |
| Gold Chain | 12 |
| Grand Central | 50 |
| Grand Gulch | 1.19 |
| Iron Blossom | 87 |
| Lower Mammoth | 03 |
| May Day | 07½ |
| Moscow | 15 |
| Prince Con. | 1.00 |
| Silver-King Coal'n. | 2.95 |
| Silver King Con. | 4.00 |
| Sioux Con. | 1.11 |
| So. Hecla | 1.30 |
| Uncle Sam | 04 |
| Wilbert | 28 |
| Yankee | 07 |

TORONTO* Aug. 28

| | |
|------------------|-------|
| Bailey | 03 |
| Beaver Con. | 34 |
| Buffalo Mines | 11.00 |
| Chambers Ferland | 1.13½ |
| Coniagas | 3.90 |
| Hargraves | 13 |
| La Rose | 50 |
| Peterson Lake | 10 |
| Right of Way | 1.05 |
| Temiskaming | 32 |
| Wettlaufer-Lor. | 1.05 |
| Dome Exten. | 16 |
| Dome Lake | 17 |
| Foley O'Brien | 1.60 |
| Hollinger | 4.75 |
| McIntyre | 1.57 |
| Newray | 81 |
| Schumacher | 40 |
| Tech-Hughes | 42 |
| Vipond | 34 |
| West Dome | 18 |

STOCK QUOTATIONS—Continued

| COLO. SPRINGS Aug. 28 | | LONDON Aug. 12 | |
|-----------------------|-------|------------------|-----------|
| Cresson Con. | 5.87½ | Alaska Mexican | 20 10s 0d |
| Doctor Jack Pot. | 04 | Alaska Tre'dwell | 1 2 4 |
| Elkton Con. | 05 | Burma Corp. | 13 18 9 |
| El Paso | 25 | Camp & Motor | 10 10 0 |
| Gold Sovereign | 04 | Camp Bird | 0 6 0 |
| Golden Cycle | 2.05 | El Oro | 0 9 0 |
| Granite | 40 | Esperanza | 4 7 6 |
| Isabella | 10 | Mexican Mines | 4 7 6 |
| Mary McKinney | 10 | Nechl. pld. | 0 12 6 |
| Portland | 1.40 | Oroville | 0 15 9 |
| United Gold M. | 19½ | Santa Gert'dis. | 0 10 0 |
| Victorator | 50 | Tomboy | 0 18 6 |

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

| Silver | New York | | | London | | |
|-----------|----------|--------|--------|--------|--------|--------|
| | 1915 | 1916 | 1917 | 1915 | 1916 | 1917 |
| January | 48.855 | 56.775 | 75.630 | 22.731 | 26.960 | 36.682 |
| February | 48.477 | 56.755 | 77.585 | 22.753 | 26.975 | 37.742 |
| March | 50.241 | 57.935 | 73.861 | 23.708 | 27.597 | 36.410 |
| April | 50.250 | 64.415 | 73.875 | 23.709 | 30.662 | 36.963 |
| May | 49.915 | 74.269 | 74.745 | 23.570 | 35.477 | 37.940 |
| June | 49.034 | 65.024 | 76.971 | 23.267 | 31.080 | 39.065 |
| July | 47.519 | 62.940 | 79.010 | 22.597 | 30.000 | 40.110 |
| August | 47.163 | 66.083 | | 22.780 | 31.498 | |
| September | 48.680 | 68.515 | | 23.591 | 32.584 | |
| October | 49.385 | 67.855 | | 23.925 | 32.361 | |
| November | 51.714 | 71.604 | | 25.094 | 34.192 | |
| December | 54.971 | 75.765 | | 26.373 | 36.410 | |
| Year | 49.684 | 65.661 | | 23.675 | 31.315 | |

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine

| Copper | New York | | London | | | |
|--------|----------|--------|----------|---------|--------------|---------|
| | 1916 | 1917 | Standard | | Electrolytic | |
| | | | 1916 | 1917 | 1916 | 1917 |
| Jan | 24.008 | 28.673 | 88.083 | 131.921 | 116.167 | 142.895 |
| Feb | 26.440 | 31.750 | 102.667 | 137.895 | 133.167 | 148.100 |
| Mar | 26.310 | 31.481 | 107.714 | 136.750 | 136.000 | 151.000 |
| April | 27.895 | 27.935 | 124.319 | 133.842 | 137.389 | 147.158 |
| May | 28.625 | 28.788 | 135.457 | 130.000 | 152.522 | 142.000 |
| June | 26.601 | 29.962 | 112.432 | 0.000 | 137.455 | 142.000 |
| July | 23.865 | 26.620 | 95.119 | 128.409 | 125.500 | 140.409 |
| Aug. | 26.120 | | 110.283 | | 126.304 | |
| Sept. | 26.855 | | 113.905 | | 134.071 | |
| Oct | 27.193 | | 122.750 | | 142.523 | |
| Nov | 30.625 | | 134.659 | | 168.357 | |
| Dec. | 31.890 | | 145.316 | | 162.842 | |
| Year | 27.202 | | 116.059 | | 138.281 | |

| Tin | New York | | London | |
|-----------|----------|--------|---------|---------|
| | 1916 | 1917 | 1916 | 1917 |
| January | 41.825 | 44.175 | 175.548 | 185.813 |
| February | 42.717 | 51.420 | 181.107 | 198.974 |
| March | 50.741 | 54.388 | 193.609 | 207.443 |
| April | 51.230 | 55.910 | 199.736 | 220.171 |
| May | 49.125 | 63.173 | 196.511 | 245.114 |
| June | 42.231 | 62.053 | 179.466 | 212.883 |
| July | 38.510 | 62.570 | 168.357 | 242.181 |
| August | 38.565 | | 169.870 | |
| September | 38.830 | | 171.345 | |
| October | 41.241 | | 179.307 | |
| November | 44.109 | | 186.932 | |
| December | 42.635 | | 183.368 | |
| Av year | | 43.480 | | 182.096 |

| Lead | New York | | St. Louis | | London | |
|-----------|----------|--------|-----------|--------|--------|--------|
| | 1916 | 1917 | 1916 | 1917 | 1916 | 1917 |
| January | 5.921 | 7.626 | 5.826 | 7.530 | 31.167 | 30.500 |
| February | 6.246 | 8.636 | 6.164 | 8.595 | 31.988 | 30.500 |
| March | 7.136 | 9.199 | 7.375 | 9.120 | 34.440 | 30.500 |
| April | 7.630 | 9.288 | 7.655 | 9.570 | 34.368 | 30.500 |
| May | 7.463 | 10.207 | 7.332 | 10.202 | 32.967 | 30.500 |
| June | 6.936 | 11.171 | 6.749 | 11.12 | 31.011 | 30.500 |
| July | 6.352 | 10.710 | 6.185 | 10.644 | 28.137 | 30.500 |
| August | 6.244 | | 6.088 | | 29.734 | |
| September | 6.810 | | 6.899 | | 30.786 | |
| October | 7.000 | | 6.898 | | 30.716 | |
| November | 7.042 | | 6.945 | | 30.500 | |
| December | 7.513 | | 7.405 | | 30.500 | |
| Year | 6.853 | | 6.777 | | 31.359 | |

| Spelter | New York | | St. Louis | | London | |
|---------|----------|--|-----------|--|--------|--|
| | 1 | | | | | |

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