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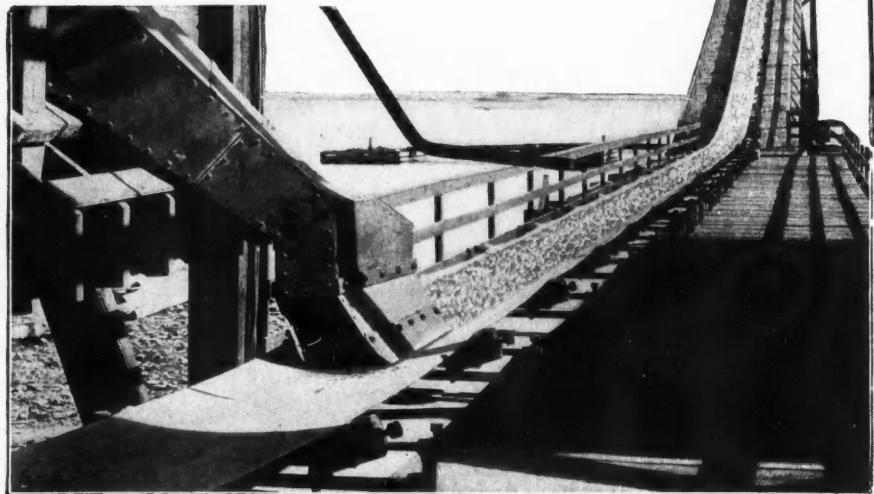
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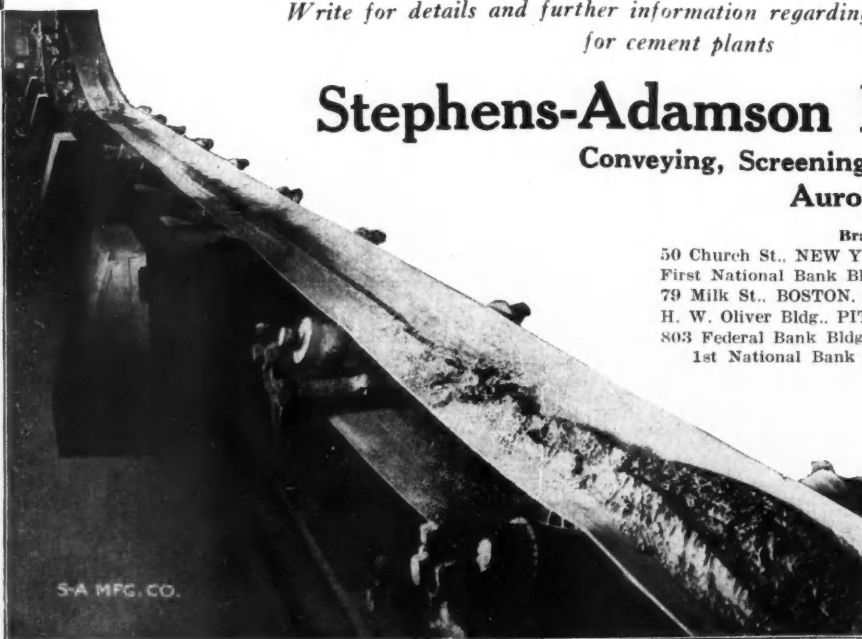
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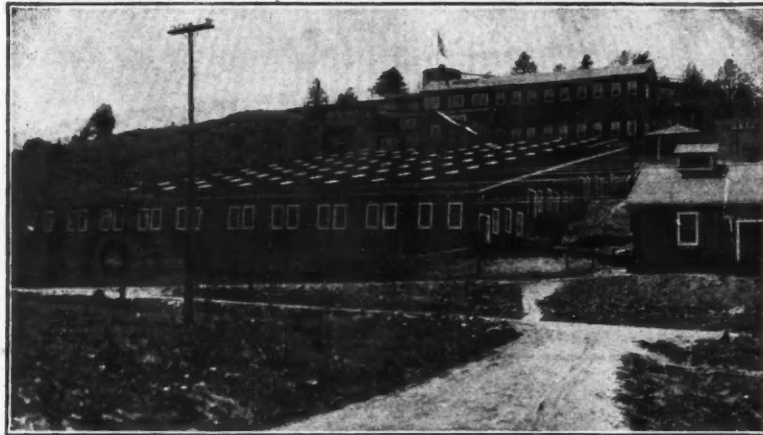
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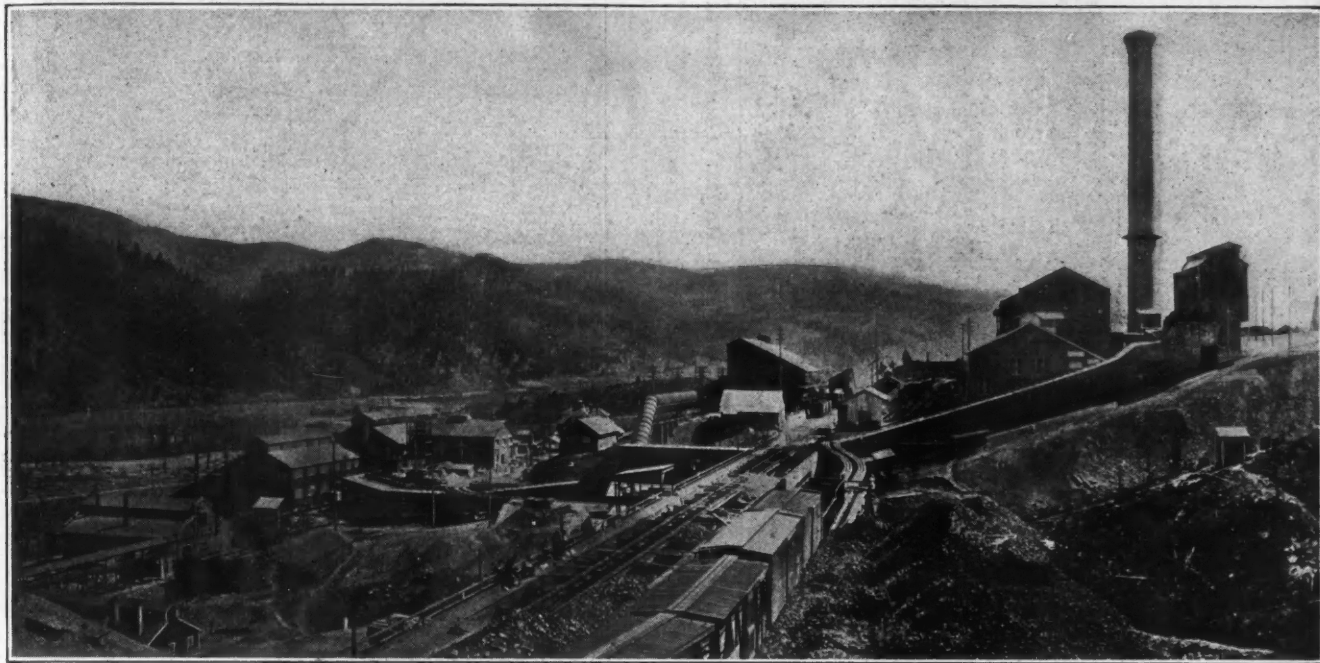
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Engineering and Mining Journal

October 12, 1918

Volume 106

Number 15



VIEW OF BUNKER HILL PLANT FROM THE WEST

Sintering and Charge Delivery at the Bunker Hill Plant*

By C. T. RICE

A detailed description of the features of the Bunker Hill plant and the methods adopted to insure efficient and economical operation. The

Trail self-cleaning grate bar is used in the Dwight & Lloyd sintering machines, and other improvements over normal design are features.

OWING to the increased amount of zinc blende in the charge, three additional Dwight & Lloyd sintering machines had to be installed at the Bunker Hill & Sullivan smeltery, and in order to increase the capacity of the plant as a whole another blast furnace is being added. At the lead refinery two more softening and two more desilverizing furnaces are being put in; also a byproduct furnace to work the antimonial skim into hard lead. At the silver refinery another cupel furnace is being erected. As all these improvements will add materially to capacity and efficiency, by the time the present period of expansion and reconstruction is over the Bunker Hill installation will be one of the most important lead plants in the West. However, it is probable that the method there will always be characterized by a high lead charge, so that tonnage of ore treated will not be relatively great.

*The third of the series of articles on the design and operation of the Bunker Hill & Sullivan smeltery and refinery which began in the July 20 issue.

The necessity of keeping the plant in operation has, in the meantime, been a problem. Added to this, difficulty has been encountered in breaking in a green crew at a time of serious labor shortage and far from a source of efficient smeltermen. Consequently, there has been little time for developing the finer points in metallurgical practice. Both on that account and because the changes now under way or contemplated will not be completed until the autumn, the present article must be viewed as little more than a preliminary description, and a rough outline of the main features that will finally characterize the metallurgical practice at this plant.

There are many interesting features in the operation of the Bunker Hill works. All products are refined for final marketing, even the copper sulphate obtained in parting the silver from the gold of the doré bars. The cleanliness and success with which powdered coal is used, not only for generating steam but also for

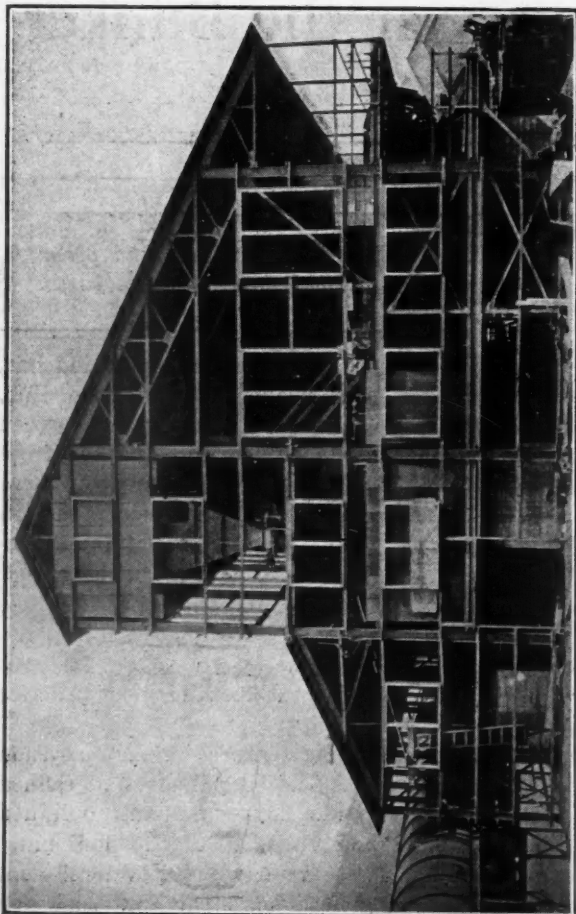


FIG. 1. ROASTER BUILDING AND BALLOON FLUE

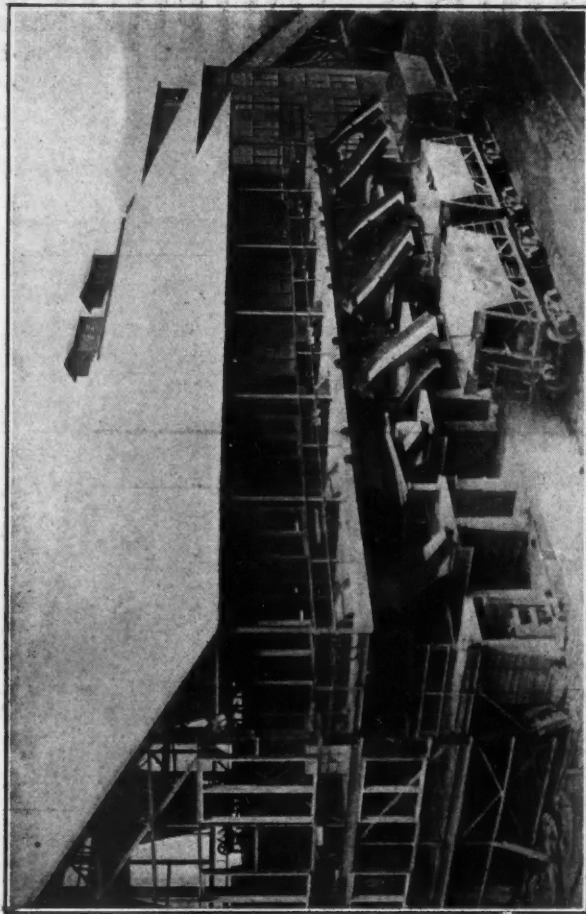


FIG. 2. ROASTER BUILDING AND SINTER CARS

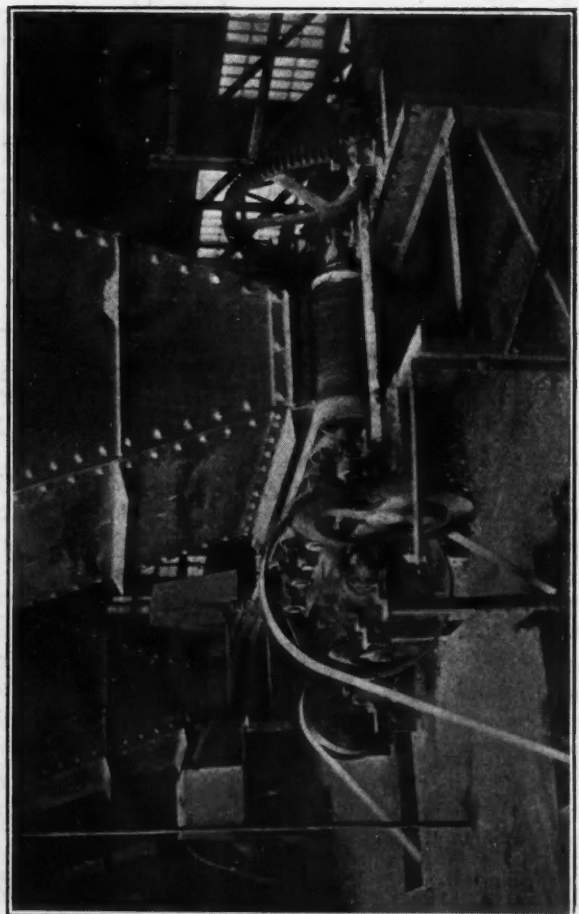


FIG. 3. ROASTER BUILDING—PUG MILL FLOOR

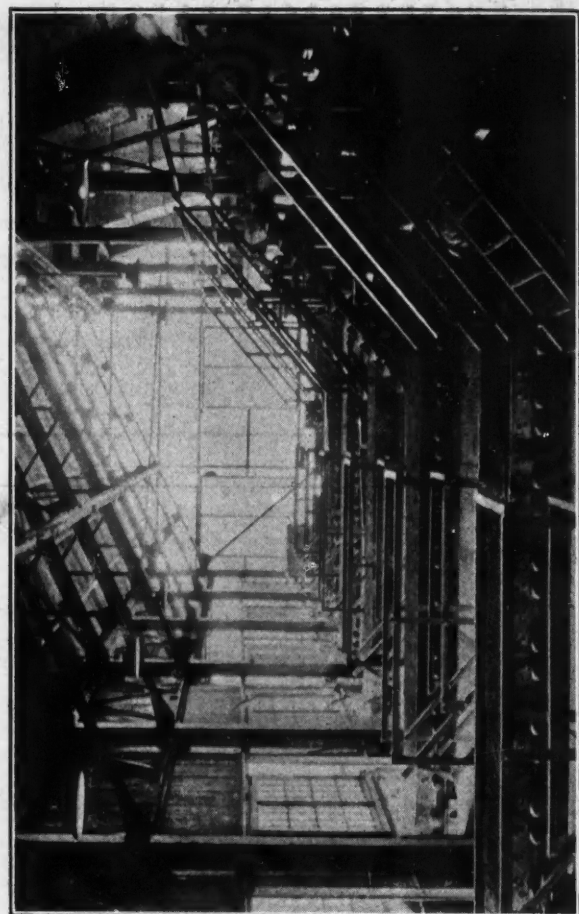


FIG. 4. ROASTER BUILDING—OPERATING FLOOR

the heating of the various refining furnaces and kettles, is notable; and, as a result, it is the ultimate intention to make it the only fuel used, other than coke, in the smelting operations. Another feature of the plant is the attention which has been given in



FIG. 5. AUXILIARY DUST BOX BESIDE SINTERING MACHINES

the design, both of the plant as a whole and in detail, in order to save labor. This is especially evident in the admirable design which was finally adopted for the Dwight & Lloyd installation, where everything from



FIG. 6. D. & L. MACHINES, END VIEW

pug mill to D. & L. dampers and motors is controlled from the operating floors. The equipping of these machines with Trail self-cleaning grates has also aided materially in saving labor.

Still another feature in this program of labor economy is the adoption of the Miller casting machine for molding the refined lead into pigs. This machine has been developed by John F. Miller, who was formerly in charge of refining operations at Trail. The Miller machines used at the Bunker Hill plant have a capacity of 20 tons an hour each, and require only four men to operate them at this rate and to load the pigs into railroad cars.

DISPOSAL OF FUME

The manner in which the smelter fumes are handled also deserves attention. Those from the D. & L. and the Wedge roasters and the various refining furnaces

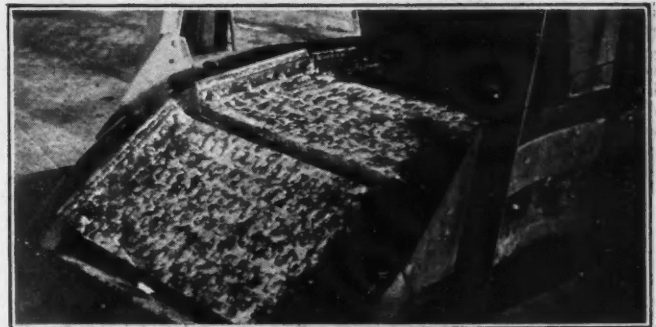


FIG. 7. TRAIL GRATE

go to the Cottrell plant for removal of the dust and fume by static precipitation. The blast-furnace gases, being variable in quantity, temperature, and quality, go to a baghouse for mechanical removal of the dust and fume. A high efficiency will therefore be attained in recovering both fume and dust, for each of these devices is used in a field in which it has shown itself to be the most effective and economical. Still another feature of the plant is the high lead charge—between 35% and 40%—being smelted in the blast furnaces, as well as the purity of the metal which is obtained by the refining, the pigs, as shipped, assaying 99.989%



FIG. 8. SINTER CAKE ON TRAIL GRATE

lead. Consequently, nearly all Bunker Hill soft lead is of corroding grade.

A minor feature of the smelter is the use of standard-gage tracks throughout the plant. With the necessity of transferring equipment to and from the machine shop at the mine for repair, as well as of moving it about the plant itself, the adoption of standard-gage track throughout, even to the charge and slag tracks, gives great flexibility, and is a point which will appeal to smelter superintendents. In the valley

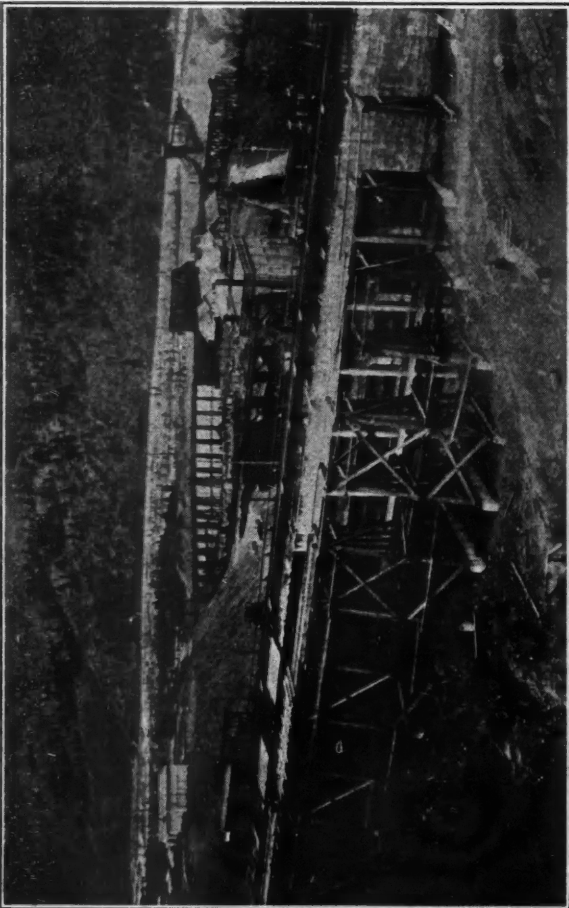


FIG. 9. CONCRETE BINS FOR SINTER

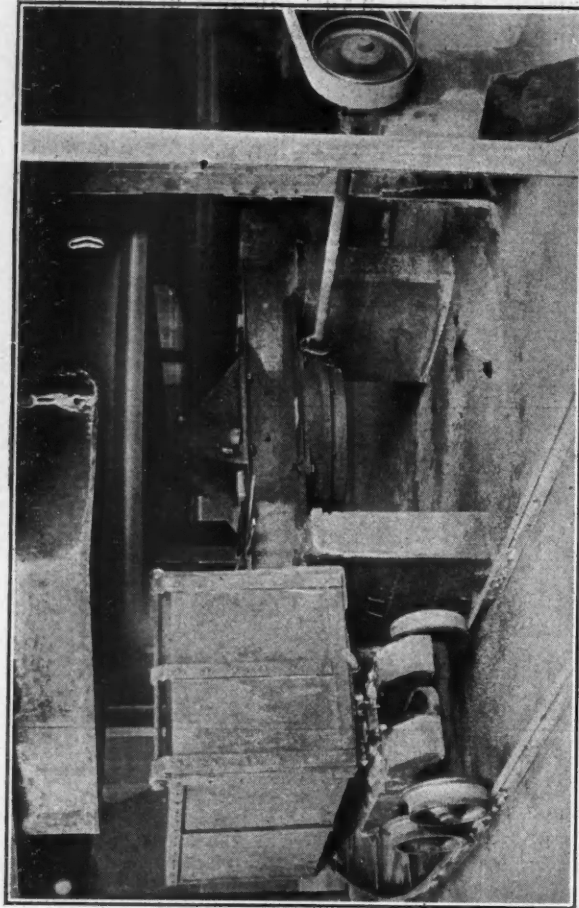


FIG. 10. WEDGE COOLING TABLE

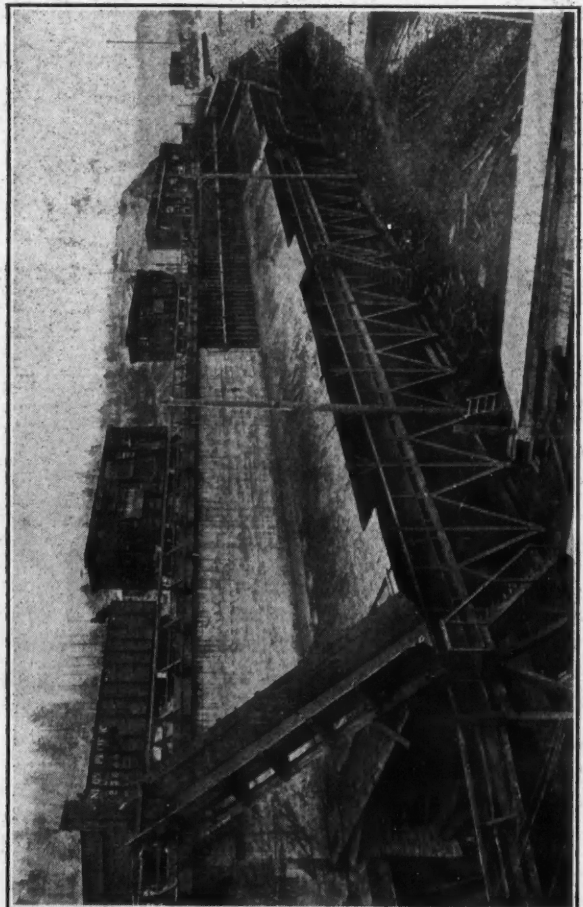


FIG. 11. FRONT VIEW SECONDARY BINS

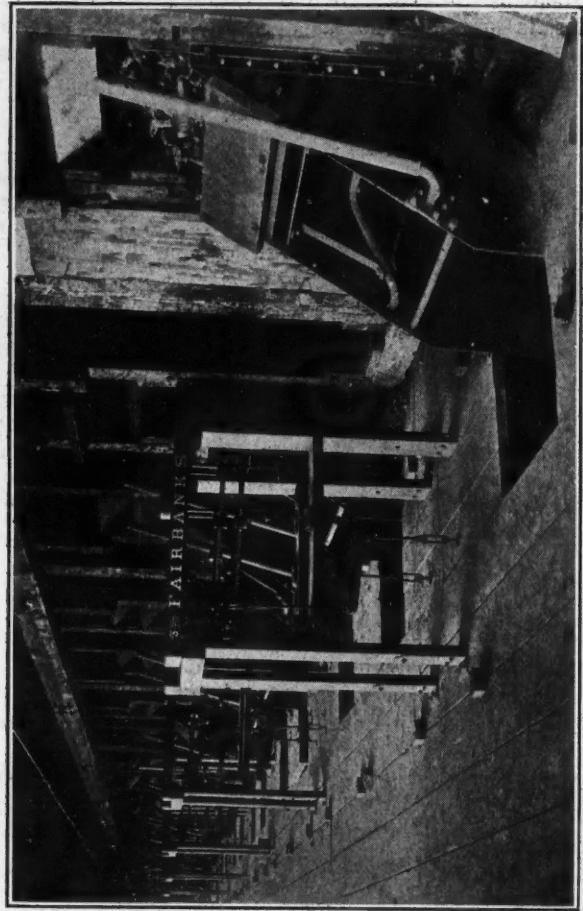


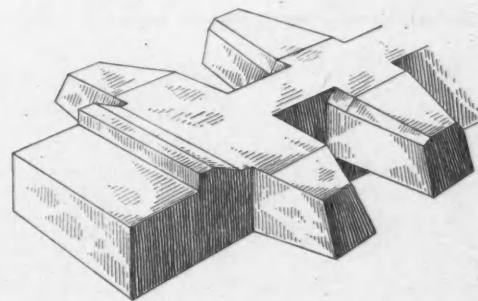
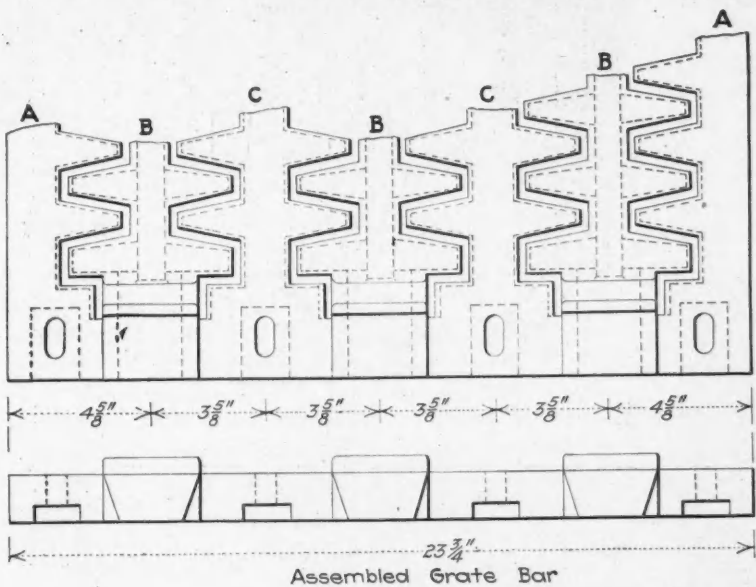
FIG. 12. WEIGHING FLOOR, SECONDARY BINS

below the plant there is unlimited space for dumping the slag within a few hundred feet of the blast furnaces—a feature which will be appreciated greatly in the future.

The question of whether to place the plant in the district or at some coast point, where a wider selection of ores would be available, was debated for some time, but finally it was decided that a site near the mines and concentrator of the company was preferable. The one finally selected has several distinct advantages. It is on an existing railroad spur (no small consideration when construction time is limited); it is reached by a direct 2½% grade from the mill bins and the main line, and yet has every advantage of a hillside location. On account of the peculiarity of the site, it has been possible to place both the receiving and the charge bins in neighboring gulches, so that the main tracks come in at the same level over the tops of both sets of bins, with the result that little switching is necessary in distributing the various cars in a train to their proper destinations about the plant. This also enables the D. & L. and Wedge products and the

hearth Wedge furnace 21 ft. in diameter, and seven D. & L. sintering machines. The Wedge furnace is used to give the matte and high-sulphur ores a preliminary roast before they go to the D. & L. machines for final roasting and sintering. The Wedge furnace is at the near end of the building, and beyond it are the seven 42 x 264-in., Type E, D. & L. sintering machines. These are standard and are provided with special dust boxes (Fig. 5) having baffle screens for catching the coarsest of the dust sucked through the grates. They are set at 16-ft. centers, giving ample elbow room.

A feature of the installation is the grouping on the operating floor of the devices for controlling the different D. & L. auxiliary mechanisms, such as the hand-wheels for opening and closing the slide gates to the hoppers which deliver to the belts going to the pug mills; the clutches controlling the belt-feeder drives; the levers for starting or stopping the pug mills; the switches for the driving motors of the sintering machines; the levers for starting or stopping D. & L. grate motions; the levers operating the dampers



Stationary Bar

FIG. 13. PLAN OF TRAIL GRATE

clean-ups to be sent in either direction from the roaster building with no adverse grade.

In every way the site is ideal, not only topographically, but also from the fume-damage standpoint. Only a slight flattening was needed in putting in the foundations of the various buildings. The smeltery has been placed well up on the side of the valley, and the prevailing winds take the stack gases up a mountain side, covered only with scattered second-growth timber, having little value. The farms in the neighborhood are few and small, and little trouble is to be expected in the matter of smoke litigation. Every advantage has been taken of topographical contour. The ore as it travels through the plant is elevated only once, and that is by belt conveyor from the primary ore bins to the top of the roaster building.

THE DWIGHT & LLOYD INSTALLATION

The roaster building is 160 ft. long by 68 ft. wide, and has five floors, with ample room and light for work (Fig. 1 to 4). This building contains a seven-

on the D. & L. machines; the switches for starting and stopping the exhaust fans; the ammeters showing the current taken by the different roaster fans; and the cones for regulating the speed of grate travel on all the machines. Thus each unit and its subsidiary apparatus can be controlled without leaving the one floor, or the immediate locality of the machine itself.

TRAIL SELF-CLEANING GRATE BAR

The herringbone grate bars usually sent out on D. & L. machines are generally so unsatisfactory and become so quickly clogged with sinter that they are soon changed for some other type. Probably one of the main reasons why the slots on such grates clog rapidly is that they run diagonally to the direction of the jerk or travel of the grates; consequently the tendency is for this jerk to break the sinter from the cake which has formed in the slots, instead of pulling the sinter out of the slots, together with the cake itself, as is the case when the slots run parallel with the jerk.

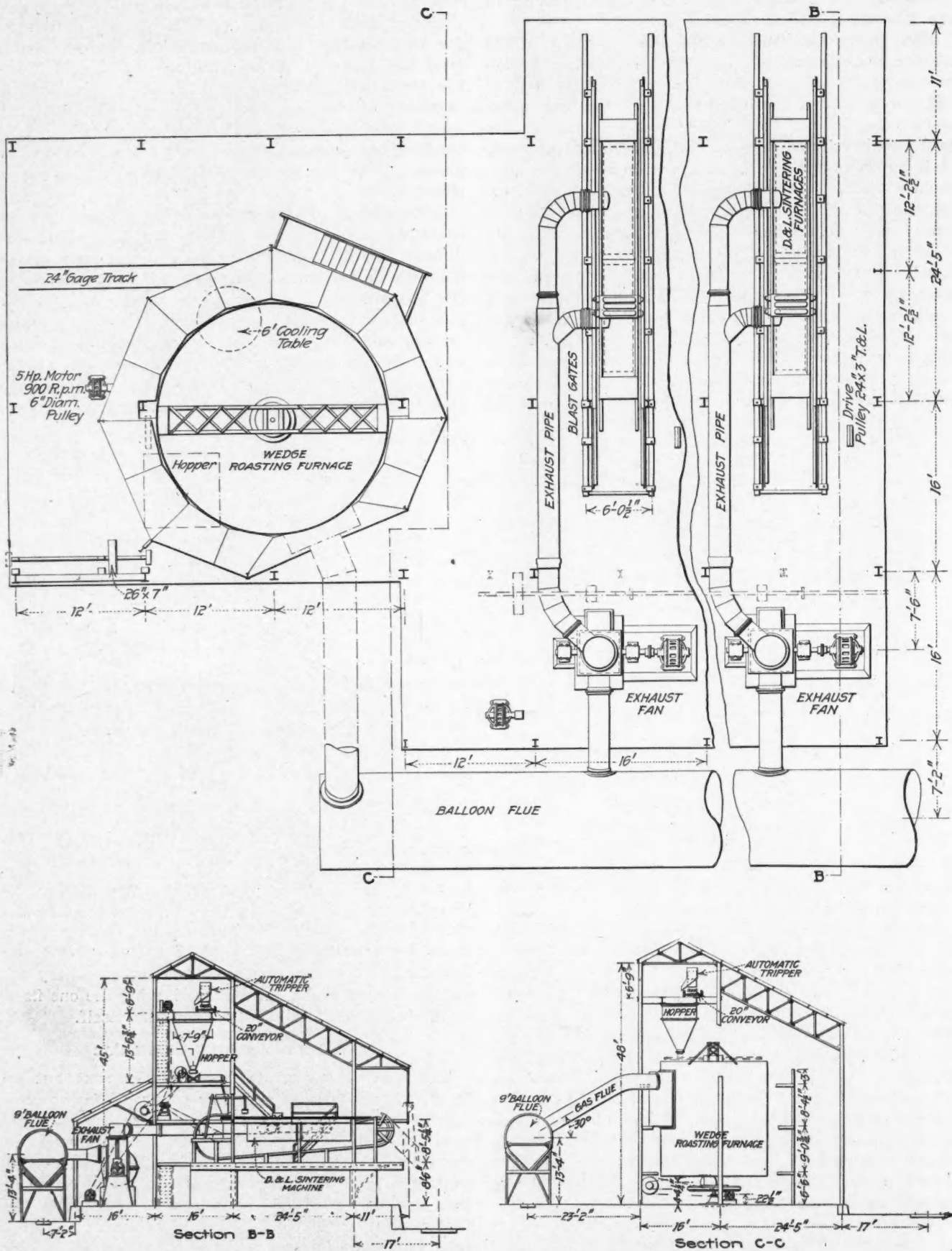


FIG. 14. PLAN AND CROSS SECTION OF ROASTER PLANT

This tendency for the grates to clog depends upon the readiness with which the roaster charge sinters, and also upon the way in which the feed is mixed and put on the grate. If returned fines or other material which is coarser than the easily fusible part of the feed is mixed with the charge, and the feed is allowed to bank up on the grate in front of the spreader board, so that the coarse and not easily fusible part rolls

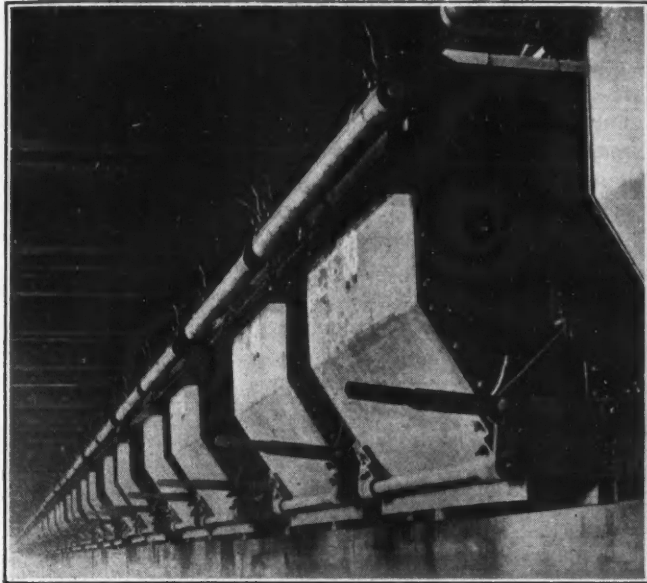


FIG. 15. WEIGHING HOPPERS, SECONDARY BINS

to the toe of the feed pile, the tendency is to form a coarse and refractory bed immediately above the bars. The readily fusible part is caught on top of this layer, and thus kept from reaching to the slots, and so forming a sinter in them.

Several of the Utah smelteries use locally designed grate bars in which the slots are cast parallel with the direction of grate travel. At the edges the ribs that form the slots are tied together by webs, and under the center of each grate bar runs a longitudinal reinforcing rib. Both because of the webs and the reinforcing ribs, a considerable tendency still remains for the grate bars to become clogged with sinter; for, try as hard as one may, it is impossible to keep all the easily fusible fines from reaching the grate itself. By cutting away the margin webbing of the Utah grate bars, the Riddell grate, which is patented, is obtained. But there still remains much room for improvement even with this bar, so far as blinding of the slots is concerned; and a pneumatic hammer with chisel tool must be used from time to time to clean the grates. The trouble seems to be that the grate is rigid throughout the pallet, and no rocking to keep the slots free of sinter occurs between the grate bars. The richer the feed in lead or in other easily fusible components, the more rapidly do the slots in the grate bars become clogged with sinter. Probably that is the reason why it remained for the management of the Trail smeltery, where a high lead charge is being treated, to devise what appears to be in many ways the most satisfactory grate bar for use on D. & L. machines.

The Trail grate bar, which was developed more than six years ago at the plant of the Consolidated Mining and Smelting Co., Trail, B. C., when the property was

under the management of R. H. Stewart, embodies a rocking motion in the individual grates. Any sinter which tends to form between the fingers of the grate bars is broken off, and the slots are thus automatically kept free. Owing to its successful operation, even when the feed is high in lead and easily fusible, the design has been adopted at both the Northport and the Bunker Hill smelteries, where the roaster feed is also high in lead, and a hard, clinging cake is formed on the grates of the sintering machines. The only modification made in the original design of the grate at these plants has been to cut down the opening between the fingers to $\frac{3}{8}$ in., thereby reducing the amount of fine material that runs through the slots while the feed is being spread on the grates, and until sintering really begins.

DETAILS OF THE TRAIL GRATE BAR

The Trail grate, as can be seen from the accompanying drawings, which show the device as it is used in British Columbia, is built with three different types of bars so arranged that a loose bar alternates with a fixed bar. Both are cast with fingers extending out from a longitudinal rib; and the loose bar rocks as the grates pass around the guide rails and over the drive wheel at the ends of the machine, thus breaking up any sinter which may have formed between the fingers. As both the fingers and the longitudinal ribs on the grates are tapered, the sinter, as soon as it is broken up, must pass on through the fingers, leaving the slots free.

The bars A (see Fig. 13) along the sides of each



FIG. 16. CHARGING FEED CAR

pallet are fixed. Between these two side bars are two stationary central bars C, and three movable central bars B. The fixed grate bars are attached to the pallet through the connecting angle castings, which bolt to the sides of the pallet. To facilitate centering of the fixed bars, the bolts which secure these to the connecting angles are carried in slotted openings. The movable grate bars are held loosely in sockets formed

by the pallet and the notches in the under sides of the connecting angles. Owing to the size of the sockets, as compared with the ends of the loose bars, and also because the loose bars are of somewhat shorter length than the distance between the sides of the pallets, a movement in all directions of the loose bars is obtained.

Most of the rocking movement of the bars occurs as grates drop ahead to go around the guide rails of the machine, while the sintered cakes are being broken loose. A less violent rocking, which gives a final cleaning to the slots, is obtained while the grates are being lifted around the track by the drive wheel. Consequently, the slots in the grates are not only cleaned automatically, but full grate opening is also obtained while the cake is being sintered.

As at present designed, no provision is made for automatically centering the loose grate bars. Consequently, it is necessary for the attendants occasionally to center these loose bars on the several grates by inserting a chisel bar between the fingers. If desirable, this can easily be avoided by casting the movable grate bars with lugs on the under side, and then placing

would appear reasonable to assume that the device will be tried at other plants and to a greater extent than heretofore. Especially is this true at a time like the present, when labor is scarce and expensive, for the Trail grate will be found to aid materially in reducing the amount of help necessary to operate a sintering plant consisting of five or more D. & L. machines.

The sintered cake, which is $4\frac{1}{2}$ in. thick, is discharged (Fig. 8) by chute into hopper-bottom steel cars that stand on the track below and is taken, after being weighed, to the concrete bins in the gulch to the right of the plant (Fig. 9), where the charge for the blast furnaces is made up. As will be noted from Fig. 14 (plan), the exhaust fans that serve the D. & L. machines are set at an angle of 30° with the balloon flue, so as to deliver the roaster gases with the proper direction of motion. This is the only balloon flue in the plant, the only place where there is enough dust in the gases to warrant its use.

Owing to the use of the Trail grate, and to the way in which the controls are assembled on the operating floor, only nine men will be required at the roaster

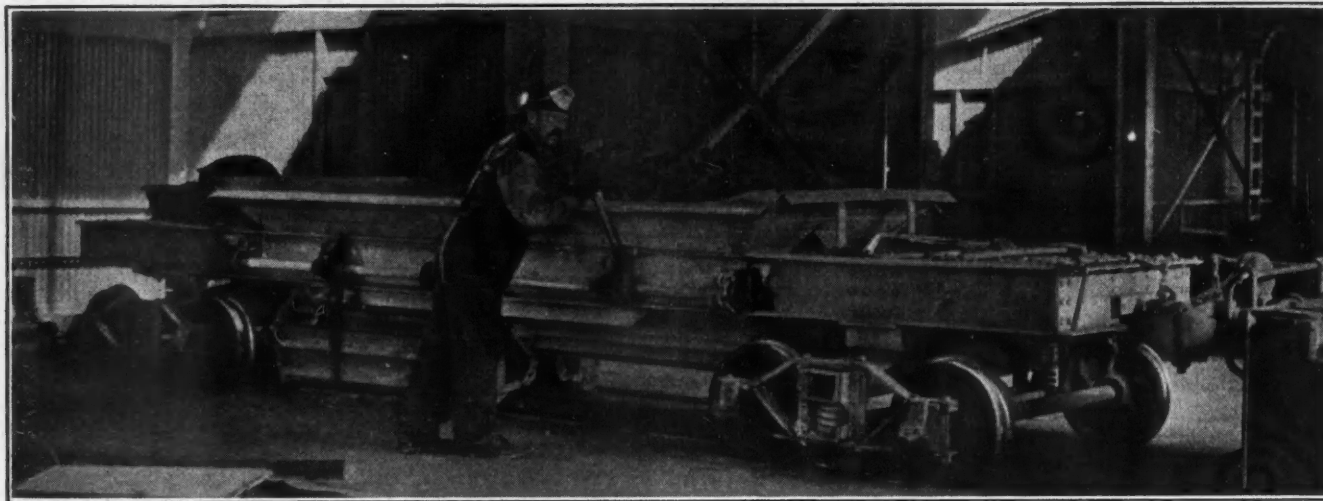


FIG. 17. CHARGING A BLAST FURNACE

tapered guides under the traveling grate and between the drive wheel and the feed box.

A modification which will be found highly desirable at installations where an easily sintered feed is being treated and a hard and firm cake is obtained, consists in casting the connecting angles with recesses for receiving the outer ends of both the grate and the pallet bolts, so that these will not extend beyond the angles, as they do at present. It has been found at the Bunker Hill plant, where a high-lead feed is being sintered, that the charge often fuses so tightly around the ends of these bolts that the cake becomes firmly attached to the grate and is not broken loose by the jar as the pallet drops over at the end of the machine. However, few sintering plants appear to be making a cake strong enough to make trouble in this connection.

ADVANTAGES OF THE TRAIL GRATE

Not only is the labor of frequent chiseling of slots and hammering of grates, to free them from sinter, avoided by the use of the Trail type of grate, but the life of the bars is prolonged indefinitely. As the Trail grate is not patented and has so many good points, it

building when all seven D. & L. machines are in operation—a conveyor man and helper, two furnacemen and three helpers at the seven sintering machines, and one man and a helper at the Wedge furnace.

At the roasting furnace, the sulphur in the matte and in the high-sulphur concentrates is brought down to 8 or 9% without fuel. After being sprayed on the cooling table, Fig. 10, the Wedge calcine goes back to one of the steel bins, to be added to the D. & L. charge. The D. & L. feed is made up to contain from 10 to 11.5% sulphur, and the sinter as it leaves the machine carries from 2 to 4% sulphur. Each of the D. & L. machines has a capacity of 80 tons of this charge per 24 hours. In order to make the sinter charge porous, and thus to facilitate the elimination of the sulphur, as well as to increase the capacity of the machines, the jig middling supplying most of the iron to the blast-furnace charge (15 mm. and under) is added to the D. & L. charge. The ores coming from the sampling mill are rather fine, having all been crushed to pass a 4-mm. trommel, and, owing to the high percentage of lead, the feed fuses easily unless diluted with the jig middling.

The matte-fall at the blast furnaces has been about 12%, so that double roasting on the D. & L. machines has been adopted to obtain a considerably lower sulphur content in the sinter sent to the blast furnaces, and thus cut down the amount of matte which has to be sent back for re-roasting.

THE DELIVERY OF THE BLAST-FURNACE CHARGE

The different parts of the blast-furnace charge sinter, oxide ore, furnace returns, lime rock, and coke, are brought together at the secondary bins, which are all side by side in the gulch on the west of the plant. Wooden bins are used for the oxidized ore, coke and lime rock, and reinforced concrete ones for D. & L. sinter and blast-furnace and refinery returns. There are 8 concrete and 16 wooden bins, each having a volume of 3300 cu.ft., and a capacity of about 200 tons of ore or sinter or 52 tons of coke. Behind the coke bins is a stock pile, so that stock material can easily be loaded by locomotive crane and grab bucket directly into the coke bins.

The secondary bins are all built with two mouths. In front of each bin mouth is a Fairbanks-Morse scale, from the beam of which is suspended a weighing hopper. These beams are arranged side by side along the weighing platform, from which the arc gates of the different bins are easily operated. The different parts of the charge are rapidly weighed out as the two scalemen pass quickly along in front of the bins. On each beam the amount of charge to be weighed out is set, and all the weigher has to do is to run the charge into the hopper until this beam balances.

The weighing hoppers are fitted with bottom-discharge gates (operated by cleverly linked levers) from the loading track, which runs directly under the center line. Just as there are two chute mouths to each bin, so each charge car has two hoppers. As the charge hoppers are placed the same distance apart as the two weighing hoppers, both hoppers of a discharge car are loaded at each bin with one spotting of the car.

LOADING AND CHARGING

The general arrangement of the bins, the weighing platform, the weighing hoppers and the loading tracks, is shown in Figs. 12, 14, 15 and 16, the order being similar to that used by Jules Labarthe at Mason Valley in making up the charge for the blast furnaces at that copper smeltery. Charges are kept in readiness in the different hoppers, so that the feed cars can be quickly loaded. In order to economize headroom, the charge cars are built low, and are fitted with longitudinal, bottom-discharge doors. These are closed by a chain and ratchet arrangement and are tripped by the same lever arm, Fig. 17, with which the chains are wound in closing the doors.

A five-ton Baldwin-Westinghouse electric locomotive is used to pull the charge car to the furnaces, of which two are in use at present, as it is desired to have charge at the furnaces whenever it is needed. The two cars will be more than sufficient to supply three blast furnaces when these are running.

The blast-furnace feed is bedded in the hoppers of the charge cars. First the coke is dumped into each of the two hoppers, then the crude ore, the lime rock, slag, dross, and, finally, sinter. Owing to their fine-

ness, the Alaska-Juneau concentrates are not made part of the hopper charge, but are fed into the furnace in sacks; and the charge from the car itself is then dumped in on top, so as to hold them better in the furnace.

New Treatment for Sulphur

Recovery of native sulphur from rock mixtures with which it occurs in several Western regions is one of the problems calling for solution because of the increased war demand for sulphur and the consequent attempts to operate deposits of native sulphur in West Texas, Idaho, Wyoming and Nevada. The liquation method, which has been practiced solely heretofore, involves relatively costly installation; the operation is expensive under the usually prevailing fuel conditions, and the recovery of sulphur has been low. Liquation plans have been operated in Wyoming and Nevada, and recently two were installed in the West Texas sulphur district.

About a year ago the engineers for Minerals Separation Co. made tests for the purpose of demonstrating that the flotation method was applicable to the separation of native sulphur, and at about the same time Kirby Thomas, of New York, conducted a series of experiments which indicated that the recovery of sulphur by flotation methods was commercially feasible and presented advantages over the liquation operation. The data were subsequently presented to the Bureau of Mines, at Washington, and the Bureau arranged with James A. Hyde, of San Francisco, to make a complete and adequate series of tests. This work is now being done, and the results are reported to be satisfactory.

The flotation process permits of the treatment of fines and of sulphur-bearing material not adaptable to the liquation method. The West Texas Sulphur Co., of Culbertson County, Tex., is planning to install flotation equipment as soon as the results of the Government tests are made available.

Silver Mining in Ontario, Canada

Although shipments of silver from Ontario for the first half of 1918 were lower by 1,367,785 oz. than for the corresponding period of 1917, the value was \$683,185 greater, the average price of silver per ounce for the first half of 1918 being 92.8c., as against 75.4c., in the corresponding period of 1917, states an Ontario Bureau of Mines report. Companies shipping more than 500,000 oz. were Nipissing Mining Corporation, Kerr Lake, O'Brien, Buffalo, Coniagas, and Temiskaming. New shippers this year include Edwards & Wright, Ltd., operating the old Green-Meehan mine; the Silver Eagle, of Silver Centre; and the Keeley mine, in South Lorrain, where a high-grade vein has been uncovered. The Lumsden Mining Co. also made a clean-up. The National Mines, Ltd., recovered and treated tailings from Cross Lake that had been deposited there by the Old King Edward and Silver Cliff mines. The Mining Corporation of Canada is now treating a large tonnage of slimes and tailings from Cobalt Lake in the new mill. Silver was recovered from gold ores to the extent of 47,427 ounces.

The Morale of Mill Crews

By PAUL T. BRUHL*

The absence of enthusiasm on the part of the average mill crew is traceable to a number of causes, and the author of the paper suggests remedial consideration of the conditions thus produced. Fair wages, bonuses, comfortable surroundings, and other features of advanced practice in administration are urged as conciliatory measures in the alleviation of conditions productive of discontent and irritation. The transitory nature of employment in mills and the feeling of insecurity sometimes present among employees are conducive to decreased efficiency. The author's purpose is to make things easier for the millman—his chief consideration being the welfare of those under the supervision of shift bosses.

ONE of the most noticeable features of industrial conditions, not only in this country but in every important mining center in the world, is the lack of harmony that exists among the personnel of the mill crews. In this paper I purpose analyzing the reasons for this deficiency and suggesting some ways in which matters may be improved. The main reason for an unfortunate absence of enthusiasm for the interests of his employer on the part of the worker is the feeling that he has no stake whatever in the welfare of the concern, and that he is not receiving in just proportion to what he is giving. If it be a fact that the workman is not receiving a fair living wage, in contradistinction to merely a living wage, the trouble can be remedied easily enough by increasing his remuneration. In this connection it must be remembered that such men as a class are not unreasonable, and there need be no fear that if an inch be granted an ell will be demanded. There must be mutual confidence, otherwise the whole fabric of industrial success will collapse.

VALUE OF THE BONUS SYSTEM

If the wages are adequate, a waning enthusiasm can be directly stimulated by the introduction of the bonus system. The bonus the company can afford to pay is not difficult to calculate, because the management can estimate the profit that will accrue from a certain increase in tonnage and can set aside a small portion of it for the operators. I have never known this system to fail. The standard set must be a high one, but obviously not one almost impossible to attain; and the bonus, to be an inducement, must be earned occasionally. It is unwise to award a bonus to the shift which puts through the largest tonnage. Credit should be divided equally among all the operators, and the day should be considered as consisting not of three eight-hour shifts but as one period of 24 hours. Millmen have often told me that they receive, say, only \$5 a shift, whereas they produce \$10. What these men need before leaving high school is a course in economics,

so that an insight into the principles on which the business of the world is conducted may be obtained. Men of this type fall a ready prey to the sophistries of extremists; and it is to the interest of every company to endeavor to patiently educate and not merely run them out of town, and pass them along to the neighboring camp, more embittered but certainly no wiser.

FAVORABLE CONDITIONS LEAD TO CONTENTMENT

The manager should always bear in mind that contented men will remain in his service. Let housing conditions be equally comfortable for both married and single men; especially let bunk houses be so fitted that the night-shift man can sleep undisturbed during the day. A man who has not had sufficient rest cannot be an efficient worker. Change of shift should take place every week, at any rate during the hot summer months. These may appear trifling matters, but anything that adds comfort engenders harmony; and economy in mill management is more easily effected by an increase in mutual respect than by a cheeseparing policy in the matter of wages.

An efficient millman is proud of his work. To encourage this the mill must be kept clean and tidy on all shifts. Each millman should, I think, be given an opportunity to work, for a few days at least, with the mechanics in his department, so that he can do minor repairs himself and thereby obviate the need of a mechanic for a job requiring but five minutes and a monkey wrench. I have seen, in a large mill, an operator hang up a Wilfley table for several hours because tools were issued only to mechanics. The reason given for this rule was that if a wrench had been provided matters might have been made worse! Surely the logical and most economical step to have taken would have been to instruct the operator as to the correct thing to do and the correct way in which to do it. An operator, if relieved of all responsibility, degenerates into a mere watchman, and certainly does not improve by remaining in the service of a company where such conditions obtain. The chief reason for this is that a large number of operators are not millmen in the real sense of the word, and are following the work, temporarily, as a side issue.

MILLING CONSIDERED A TRANSITORY OCCUPATION

It is difficult to understand why milling should not be regarded as a profession; or why the lack of even a semblance of sound argument in the statement that any man is good enough is not immediately recognized. A man may be good enough, but does that argue that he is the best man for the job?

To be able to find employment with facility must mean that the labor supply is constantly shifting. It certainly is not due to a shortage of labor, otherwise there would not be evidence of so much unemployment. It must be because there is a great lack of contentment in mining organizations, attributable either to poor living conditions, to poor working conditions, or to both. The former are inevitable in new camps, but

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they should be improved at the earliest possible moment. For the latter there is never any excuse. What constitutes poor working conditions? First and foremost there is unsympathetic management, creating an environment wherein the operator finds in foremen and shift bosses not fellow workers but beings holding aloof from him. Such a state of affairs is bad business and poor democracy. The success of the men in charge depends not so much on their taking themselves seriously as on their working in harmony with the rest of the force. They should strive to be looked upon with respect, and not with awe—to be regarded not as the men who have the power of "firing," but as co-workers.

FEELING OF INSECURITY IS DEMORALIZING

The widely prevailing feeling among millmen that the element of permanency is absent from their jobs, and that their employment depends upon the whims and fancies and grouches of the shift bosses, is a source of indifference, discontent and inefficiency. For this reason I am opposed to any one but the superintendent having the power to discharge, and this power he should exercise only after inquiry into the facts of the case. What would one think of a judge who considers that loyalty to a district attorney obliges him to give a decision without hearing the defense? No district attorney expects him to. If no question of breach of discipline is involved, a man should be dispensed with only as a last resort.

It is an undoubted fact that lack of ability in a certain job engenders a dislike for the work, and persistence in that job—unless further experience has conquered the dislike—is demoralizing. An objection to this policy that is frequently put forward is that the plant is not a training school; but that is precisely what a modern mill ought to be. What better service can an organization hope to get than from the men whom it has itself trained? The expenditure of a little time on a man of suitable character is one of the finest investments, for it saves the monetary loss inherent to a system which permits a constant succession of men to come and go.

TRANSFER TO OTHER OCCUPATION SOMETIMES DESIRABLE

A man sometimes falls off in efficiency because he becomes "stale." Whenever this occurs, let him be given a change in occupation by transferring him to another department. There is always a disinclination to make changes, but I think that, besides being economical, it has the advantage of providing the superintendent with a potential supply of shift bosses. A shift boss should never be brought in from the outside as long as there is a man already on the mill force who is capable of holding the position. Such a practice kills all enthusiasm by removing most of the incentive to hard competitive work. It is impossible for all to pluck the golden apple from the tree, but it is a satisfaction to know that all have an equal opportunity to reach for it.

The practice of permitting continual overtime—in some cases of enforcing it—is an unsound one. The question ought to be regarded not from the point of view of what the operator likes, but of what is good for him. The problem of sick-pay has been partly

solved by industrial commissions, but no provision has been made for the man who is incapacitated by illness for two or three days. If the medical officer certifies him unfit for work, he ought to receive half pay. This is no new idea, for it was the custom in African mills several years ago. The British Labor Party recently suggested that every workman ought to be entitled to two weeks vacation every year on full pay. The suggestion was turned down, wrongly, I think, by the labor people of this country.

COÖPERATION IN SOLVING PROBLEMS

The following quotation is taken from an article by F. Dean Bradley in a recent issue of the *Journal*: "The employees as well as the superintendent's office were consulted freely. . . . as a result . . . the men had become so interested that they were still figuring improvements not only on the filter but in other units of the mill." This is pleasant reading and shows a correct appreciation of human nature. In some mills suggestion boxes are provided, and employees are invited to contribute ideas. The matter ought not to rest with the reading of a suggestion and its refusal as impracticable, but an explanation should be given as to why it cannot be utilized. If a suggestion is adopted and proves a success, the value of the prize awarded ought to bear some relation to the economy effected.

FEASIBILITY OF SUNDAY CLOSING

A matter which has a definite bearing on coöperation and efficiency is the question of Sunday closing. The subject, if my memory serves me right, was once referred to in the columns of a technical paper, but created no discussion. One of the most prolific causes of dissatisfaction and lack of efficiency is seven-day operation—the same old grind, with never a break. If it is asked why Sunday should not be observed as a day of rest, nine men out of ten will reply that mills would not pay unless they ran full time; and, believing that, they are content to make no further inquiry. A New Zealander once told me that when Sunday work was stopped by law in his country, people were astonished to find that no industrial catastrophe occurred. If other industries are not dislocated by Sunday closing, why should mining prove to be an exception? It is hardly necessary to say that I am perfectly aware that all mill work could not be brought to a standstill on Saturday night, but I maintain that the machinery that could be stopped ought to be stopped.

The reader may now offer the criticism that my suggestions are all in the direction of making things easier for the millman. That is indeed the effort of this paper. I would like to see his working and living conditions improved, but I also want to see a higher standard set. I have seen the millman in his native habitat in several parts of the world, and I must confess that I have never seen a class working under greater disadvantages. To build up confidence and contentment, which is to win the battle, to prevent the constant restless shifting of labor, the discontent and strikes, there is only one requisite—honest labor must be made content.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Determination of Nitrates in Caliche and Its Products

BY J. E. CLENNELL*

Methods in vogue in Chile of estimating nitrate content in caliche are insufficient for precise laboratory experimentation. The excuse that exactness in such chemical tests would be meticulous, in view of the inaccurate sampling systems in practice, is becoming less tenable as new methods of caliche treatment are introduced, based largely on modern hydrometallurgical practice. Improved methods of testing caliche and caliche products are described in the present article, and much data given in tabular form of the results of adopting more precise methods of manipulation.

IN THE course of an investigation on the mechanical treatment of caliche, or nitrate-bearing earth from Chile, a reasonably accurate and rapid method of estimating the nitric acid radical, which is reported in terms of sodium nitrate, was found necessary. The system commonly used in the Chilean oficinas, though simple and rapid, did not appear sufficiently exact, particularly with low-grade material, as the end point is somewhat indefinite. The Chilean method, as is well known, consists in acidifying the nitrate extract strongly with sulphuric acid, heating to 70° or 80° C., and titrating direct with a strong solution of ferrous sulphate, usually about 12% FeSO₄·7H₂O, acidulated with H₂SO₄.

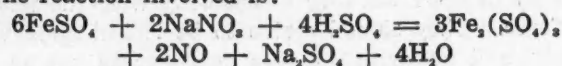
Lester Strauss, in his report on the Chilean nitrate industry (reprinted from *Mining and Scientific Press*, June 13 to 27, 1914), describes the application of the method to the analysis of caliche as follows:

"Five gm. of the finely pulverized sample is boiled in 100 cc. of water and filtered. The filtrate is made up to 100 cc. Of this, 20 cc. is taken, to which 10 cc. of H₂SO₄ (50° Beaumé equal to 62.53% H₂SO₄ or sp.gr. 1.53) is added, and the solution heated in a porcelain evaporating dish to between 70° and 80° C. This temperature is maintained, the solution being stirred with a thermometer, and titration made out to a 12% FeSO₄ solution, acidulated with H₂SO₄. A dark-brown coloration is produced, which disappears on stirring, but leaves a sage-green tint to the solution, which deepens as the titration proceeds. Effervescence is noticed as the titration approaches completion; the end point is reached when further addition of FeSO₄ ceases to produce the brown coloration. Practice is necessary to note the end point. The method is correct to within 2%, which is near enough for practical purposes."

The last sentence is ambiguous as to whether the author means 2% of the amount of nitrate to be determined, or a variation of 2% in the reported percentage; e.g., whether a 20% solution would be determined as 19.8 to 20.2%, or be reported anywhere from 19 to

21%. My experience of the method inclines rather to the latter interpretation.

The reaction involved is:



MODIFIED PELOUZE METHOD

The reaction is obviously the same as that involved in the well-known Pelouze method of nitrate determination, but in that case the estimation is made indirectly, i.e., ferrous sulphate is added in excess; and when the reaction is complete, the excess is determined by titrating the residual ferrous iron with permanganate, bichromate, or otherwise. The amount of ferrous iron originally added must be known exactly, and the difference between this and the amount remaining unconverted into ferric iron at the end of the reaction is the equivalent of the nitrate.

It was thought that this method, or a simple modification of it, might serve for the required determinations. Numerous variations of the method are described in different textbooks. Much care is generally taken to protect the ferrous sulphate from atmospheric oxidation during the process, but experiments show that this is a comparatively unimportant source of error, and can be avoided with sufficient exactness for all practical purposes by the simple expedient of placing a stopper with Bunsen valve in the neck of the flask used for the operation.

CONDITIONS AFFECTING THE REACTION

A large number of experiments, some of which are detailed below, demonstrated the following points in connection with this method:

1. The reaction is incomplete, even after prolonged boiling, unless the concentration of H₂SO₄ in the mixture is considerable, say 25% of the total volume.

2. The reaction is affected by the presence of chlorides. When nitrates and chlorides are acted upon simultaneously by H₂SO₄, chlorine or some chlorous gas is produced, and the amount of FeSO₄ consumed is greater than if nitrate alone had been present. Consequently the amount of nitrate shown by the test is too great.

3. When the final titration of excess FeSO₄ is made by permanganate, a slight error occurs in presence of chlorides, owing to the reducing action of HCl on KMnO₄. This may be eliminated for all practical purposes by sufficient dilution after the decomposition of the nitrate is complete.

STANDARD FERROUS SULPHATE

When the necessity for a high concentration of sulphuric acid was recognized, it was thought that the process might be shortened and simplified by using a ready prepared standard solution of ferrous sulphate, containing the requisite amount of free acid. It was found, however, that the addition of sulphuric acid in

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large quantity, approaching 25% by volume, produced a white precipitate, presumably anhydrous ferrous sulphate, which did not redissolve on agitation or on boiling. By mixing well-cooled solutions of ferrous sulphate and sulphuric acid (50% H_2SO_4 by volume) it was sometimes possible to get a clear solution of the required strength; but, even so, the liquid was likely to become turbid and to deposit the above-mentioned precipitate on standing. Conversely, a neutral or nearly neutral solution of ferrous sulphate is unstable, and rapidly loses strength, giving a yellowish-brown deposit. On the whole, therefore, it is preferable to use a slightly acidified standard solution, and add the requisite amount of strong H_2SO_4 to each test, cooling thoroughly before adding the nitrate solution. The addition of this concentrated H_2SO_4 must be carefully regulated, as variations in the amount affect the result materially.

A convenient standard, which has been adopted in the Butters laboratory, consists of 50 gm. $FeSO_4 \cdot 7H_2O$ and 100 cc. concentrated H_2SO_4 , diluted to 1000 cubic centimeters.

METHOD OF MAKING THE DETERMINATION

The amount of ferrous sulphate to be taken is dependent on the quantity of nitrate in the portion of liquid to be tested. When this amount is not approximately known, time may sometimes be saved by making a rough preliminary test by the Chilean method described above.

In an ordinary case, 50 cc. of standard ferrous sulphate would be taken. To this is added 20 to 25 cc. of concentrated H_2SO_4 in a conical flask, with stopper and Bunsen valve. After cooling by immersion in running water, a measured volume (say 10 cc.) of the nitrate solution is added. The liquid is then gradually heated and allowed to boil gently until all trace of brown coloration has disappeared, leaving a clear yellowish liquid in the flask. Then 100 cc. of previously boiled and cooled distilled water is added, the mixture cooled and titrated with standard permanganate without undue delay.

APPLICATION OF METHOD TO A SAMPLE OF CALICHE

The sample is ground as fine as convenient, say to 60 or 80 mesh. From 5 to 10 gm. (dependent on richness in nitrate), is weighed out and boiled in a flask or casserole with 100 cc. of water. It is then filtered, allowed to drain and washed by three applications of water, using about 25 cc. and heating to boiling each time. Finally the filtrate is cooled and made up to 200 cc., and an aliquot part taken for the nitrate determination. This may vary from 5 to 25 cc., according to the richness in nitrate, and should be accurately measured with a pipette. The portion of liquid so taken is added to a previously prepared mixture of standard $FeSO_4$ and H_2SO_4 , containing a sufficient excess of the former, and the process carried out as above described. A few preliminary trials are generally necessary to determine the best conditions of acidity and dilution and the amount of standard $FeSO_4$ required for each class of material to be assayed, which must, of course, be accurately measured.

A sample of caliche residue was ground to 60 mesh, and 10 gm. was treated, as described, with boiling water, and the filtrate made up to 200 cc.; 25 cc. of this

filtrate was added to a previously prepared mixture of 10 cc. of standard $FeSO_4$ and 20 cc. of concentrated H_2SO_4 , and boiled till the reaction was complete. On titration, 12.8 cc. $KMnO_4$ was required; and 10 cc. of the $FeSO_4$, with addition of 20 cc. concentrated H_2SO_4 and 25 cc. of distilled water, required 16.9 cc. of $KMnO_4$. Hence 16.9 — 12.8, or 4.1 cc., corresponds to the amount of ferrous iron oxidized by the nitrate. Assuming 1 cc. $KMnO_4$ = 2.982 mg. $NaNO_3$, then 4.1 cc. = 12.23 mg. $NaNO_3$ on 25 cc. of filtrate, or 97.8 mg. on 200 cc., representing 10 gm. of residue. Hence the residue contains 0.978% of $NaNO_3$.

STANDARDIZING THE FERROUS SULPHATE

Standardizing must be done under conditions strictly similar to those of the actual assay. For this purpose a solution is prepared containing sodium nitrate and sodium chloride in about the same relative proportions as they occur in the extracts from the caliche. The c.p. sodium nitrate should be heated to incipient fusion in a small porcelain dish, and allowed to cool in a desiccator before weighing, as it is somewhat deliquescent. The amount of chloride in the solution to be tested is easily and rapidly determined by the well-known silver-nitrate reaction with chromate indicator, as the caliche extract is practically neutral to litmus.

In standardizing, a quantity of this mixed nitrate and chloride solution is measured exactly, so as to contain as nearly as possible the amount of nitrate which is present in the actual assay solution. This is mixed with previously prepared $FeSO_4$ and H_2SO_4 in the same amount as in the assay, and put through the same treatment. A blank test is also made to determine the equivalent of the ferrous sulphate in absence of nitrate. In this case distilled water should be used in volume equal to that of the nitrate solution taken in the assay.

PRECAUTIONS NEEDED

The sudden disappearance of the black or brown color shows that insufficient ferrous sulphate has been used. This is also indicated by the appearance of nitrous fumes in the upper part of the flask. In either case the assay is spoiled, and a fresh test should be started, with increased volume of standard $FeSO_4$, or diminished volume of nitrate.

Violent boiling should be avoided, not only because it may occasion loss by spitting; but, as there is only a narrow outlet for escape of steam, the stopper may be suddenly forced out and large quantities of strongly acid liquor scattered about, which might possibly cause serious accidents.

RELATION OF IRON STANDARD OF FERROUS SULPHATE TO NITRATE STANDARD

From the equation given it is evident that the nitrate standard of the ferrous sulphate or permanganate could theoretically be calculated from the iron standard. Assuming $NaNO_3 = 3Fe''$ converted to Fe''' , and $Fe = 55.85$, $NaNO_3 = 85.01$, then 1 mgm. $Fe = 0.5075$ mgm. $NaNO_3$; hence the nitrate standard is obtained by multiplying the iron standard by 0.5075.

When the proper conditions of acidity and dilution are observed, and when chlorides are absent or in negligible quantity, the figures obtained from the iron standard agree closely with those given by the c.p.

TABLE I. ILLUSTRATING EFFECT OF VARYING NITRATE IN ABSENCE OF CHLORIDES

Standard Ferrous Sulphate Solutions				Standard of Permanganate			
Mark	FeSO ₄ ·7H ₂ O, gm.	H ₂ SO ₄ , c.c.	Diluted to c.c.	KMnO ₄ , c.c.		NANO ₃ , mg.	
A	44	367	1000	1	=	2.979	
B	60	300	1000	1	=	2.979	
C	50	100	1000	1	=	2.840	

In all cases, 100 c.c. water added after boiling to complete reaction.

Test No.	Standard Ferrous Sulphate Taken, Mark	Conc. H ₂ SO ₄ Added, c.c.	Water Added, c.c.	Sodium Nitrate Added		Permanganate Required in Titration, c.c.	Equivalent of Fe ⁺⁺ Used by NaNO ₃ , c.c.	Sodium Nitrate	
				Volume, c.c.	NaNO ₃ , %			Present, mg.	Found, mg.
Blank	A	25	25	2	...	38.4	...	20	20
1	A	25	...	4	1	31.6	6.8	40	40
2	A	25	...	8	1	24.8	13.6	80	80
3	A	25	...	10	1	11.5	26.9	100	101
4	A	25	...	10	1	4.5	33.9	100	101
Blank	B	25	10	3	...	51.4	...	30	31
5	B	25	...	6	1	41.05	10.35	60	59
6	B	25	...	9	1	31.5	19.9	90	92
7	B	25	...	12	1	20.5	30.9	120	119
8	B	25	...	10	1	11.45	39.95	120	119
Blank	B	25	5	3	...	51.3	...	30	31
9	B	25	...	7	1	40.8	10.5	70	71.5
10	B	25	...	10	1	27.3	24.0	100	102.5
11	B	25	...	13	1	16.9	34.4	100	102.5
12	B	25	5	10	1	7.2	44.1	130	131
Blank	C	50	30	10	0.5	78.6	...	50	50.6
13	C	50	...	20	0.5	60.8	17.8	100	101.4
14	C	50	17.5	30	0.5	42.9	35.7	150	149.1
15	C	50	20	40	0.5	26.1	52.5	200	198.5
16	C	50	22.5	40	0.5	8.7	69.9	200	198.5

TABLE II. ILLUSTRATING INFLUENCE OF CHLORIDES ON TITRATION OF NITRATE

Standard Ferrous Sulphate Solutions				Standard of Permanganate				
	FeSO ₄ ·7H ₂ O, 60 gm.	H ₂ SO ₄ , 350 c.c.	Diluted to 1000 c.c.	1 c.c. = 2.979 mg. NaNO ₃				
After completion of reaction, 100 c.c. water added in each test								
Test No.	Standard Ferrous Sulphate Taken, c.c.	Sodium Nitrate 1% NaNO ₃ Added, c.c.	Sodium Chloride 5% NaCl Added, c.c.	Permanganate Required in Titration, c.c.	Equivalent to Fe ⁺⁺ Used by NaNO ₃ , c.c.	Amount Present		Found—Sodium Nitrate, mg.
						Sodium Chloride, mg.	Sodium Nitrate, mg.	
Blank	30	...	...	63.8	...	...	100	102
1	20	10	...	8.2	34.3	...	150	154
2	30	15	...	12.0	51.8	...	200	204
3	40	20	...	16.4	68.6	...	250	250
Blank	30	...	5	63.7	0.1	250	100	96
4	20	10	5	10.2	32.3	250	150	154
5	30	15	5	12.1	51.7	250	200	204
6	40	20	5	16.4	68.6	250	250	250
7	25	10	2	22.9	30.2	100	100	90
8	40	15	3	36.2	48.8	150	150	145
9	50	20	4	39.9	66.4	200	200	198
10	30	15	10	11.9	51.9	500	150	155
11	40	20	10	15.6	69.4	500	200	207

TABLE III. ILLUSTRATING EFFECT OF VARYING NITRATE WITH AND WITHOUT CHLORIDE

Standard Ferrous Sulphate Solutions				Standards of Permanganate			
Mark	FeSO ₄ ·7H ₂ O, gm.	H ₂ SO ₄ , c.c.	Diluted to c.c.	A. 1 c.c. KMnO ₄ = 2.91 mg. NaNO ₃ B. 1 c.c. KMnO ₄ = 2.93 mg. NaNO ₃			
A	36.4	364	1000				
B	33.3	417	1000				

After completion of reaction, 100 c.c. water added in each test.

Test No.	Standard Ferrous Sulphate Taken, Mark	Volume, c.c.	Sodium Nitrate 0.5% NaNO ₃ , c.c.	Mixed Solution 0.5% NaNO ₃ , 0.5% NaCl, c.c.	Water Added, c.c.	Permanganate Required in Titration, c.c.	Equivalent to Fe ⁺⁺ Used by NaNO ₃ , c.c.	Present in Test		Found—Sodium Nitrate, mg.
								Sodium Chloride, mg.	Sodium Nitrate, mg.	
Blank	A	50	...	...	25	62.9	...	...	...	...
1	A	50	10	...	...	46.2	16.7	...	50	48.6
2	A	50	20	...	...	28.8	34.1	...	100	99.2
3	A	50	30	...	...	11.1	51.8	...	150	150.7
4	A	50	...	10	...	45.7	17.2	50	50	50.1
5	A	50	...	20	...	28.7	34.2	100	100	99.5
6	A	50	...	30	...	11.7	51.2	150	150	149.0
Blank	B	50	...	...	25	58.3	...	...	...	...
7	B	50	10	...	...	41.5	16.8	...	50	49.2
8	B	50	20	...	...	24.3	34.0	...	100	99.6
9	B	50	30	...	...	7.7	50.6	...	150	148.3
10	B	50	...	10	...	41.1	17.2	50	50	50.4
11	B	50	...	20	...	23.6	34.7	100	100	101.7
12	B	50	...	30	...	6.6	51.7	150	150	151.5

TABLE IV. ILLUSTRATING EFFECT OF VARYING CHLORIDE WITH CONSTANT AMOUNT OF NITRATE

Standard Ferrous Sulphate Solutions				Standard of Permanganate			
	FeSO ₄ ·7H ₂ O, gm.	H ₂ SO ₄ , c.c.	Diluted to c.c.	1 c.c. = 2.85 mg. NaNO ₃ (Based on Test No. 4 and Blank No. 2)			
	50	100	1000				

After completion of reaction, 100 c.c. water added in each test.

Test No.	Standard Ferrous Sulphate Taken, c.c.	Conc. H ₂ SO ₄ Added, c.c.	Sodium Nitrate 0.5% NaNO ₃ Added, c.c.	Sodium Chloride 5% NaCl Added, c.c.	Water Added, c.c.	Permanganate Required in Titration, c.c.	Equivalent to Fe ⁺⁺ Used by NaNO ₃ , c.c.	Present in Test		Found—Sodium Nitrate, mg.
								Sodium Chloride, mg.	Sodium Nitrate, mg.	
Blank 1	50	17	...	...	20	85.8	...	...	...	...
Blank 2	50	18	...	3	20	85.6	...	150	...	...
1	50	17	20	...	...	49.5	36.1	...	100	102.9
2	50	17	20	1	...	50.4	35.2	50	100	100.3
3	50	17.5	20	2	...	50.8	34.8	100	100	99.2
4	50	17.5	20	3	...	50.5	35.1	150	100	100.0
5	50	18.5	20	5	...	50.3	35.3	250	100	100.6

sodium nitrate standard. With a considerable amount of chloride, however, there is a wide divergence; and reliable results can be obtained only by standardizing on a mixed nitrate and chloride solution as above described.

As before stated, acidity and dilution of test solutions are the most important factors in the method. In general, the best results were obtained when the total amount of concentrated sulphuric acid present was one-fourth the volume of the entire solution before boiling. For solutions weak in nitrate the proportion of H_2SO_4 to total volume should be increased, and, conversely, for very strong solutions, it may be diminished.

The tables illustrate the effect of varying conditions on the results obtained. A single determination usually requires about 45 min., as the boiling should not be hurried. A large number of tests may be made simultaneously and, where this is required, the method will probably be found as rapid in practice as the regular Chilean system.

Story of a Small Oil Company*

About three years ago I and some associates thought we would have a try at the oil game. We could not go against the big operators, so we did what the little fellows must perforce do—we went "wildcatting." We got some leases in territory miles away from development, ground that had really been partly condemned. But we concluded to have a try at it. We estimated that it would cost \$16,000 to put down a well.

We organized with \$20,000 capital and went to work. We got a small well, not enough to pay, but enough to encourage us. The well cost \$24,000—more than our capital—but we chipped in the difference to finish it out. When the well was completed our money was gone. To raise more, we sold the lease where the well was for \$30,000, and started another well. At the end of three years we had developed a handsome property besides opening up a new field that is now producing hundreds of thousands of barrels of oil. We did not have easy going. At one time we were in debt more than \$100,000. We had discouragements and disappointments. But we stuck at it, and finally won out.

We felt good, thinking that the property would afford us all a good return for the time and the money spent, and even a modest competency, which it was quite capable of doing. Thousands of people in our section had played the game with the usual result, that is, failure. We alone had succeeded; everybody thought us lucky.

Now mark the result! Our property became productive about the time the war started, that is, about a year ago. We knew we would have to pay war taxes, but did not know how much. We paid no dividends and no salaries, putting all our money in the bank and waiting to see what we would have to pay. When the taxes became due this summer we had saved up \$485,000. The Government, after some figuring, said our taxes would be \$483,000. Out of all the money we had made the first year the Government proposed to take \$483,000, leaving up for our share \$2000.

We protested this and got a reduction of \$112,000. But this is not the whole story. We do not dare to

touch the \$112,000, because we understand the Government is coming stronger than ever, and next year we do not know where we will get the money to pay our taxes. Next year, also, our property will be largely depleted.

But I have not yet told the worst. Our neighbor across the road is a big company. While our taxes are 80% of production its taxes are 25%. Out of each 100 bbl. of oil taken out of the ground by us the Government takes 80 bbl. Out of each 100 bbl. of our powerful neighbor it takes 25 bbl. Although engaged in the same business as our neighbor, we pay three times as much tax. On top of this, of course, we pay all kinds of local taxes. It does not take much of an actuary to tell where we are.

Have we presented these facts at Washington? Certainly we have. Every one admits at once that it is all wrong. But the committee has just one answer for everything of this kind, "We've got to have the money."

It is absurd to say that Congress cannot frame a more just and equal tax law than this law, which ruins the small companies that have observed the law by small and legitimate capitalization, and plays directly into the hands of the big companies that monopolize the business. We inveigh against the exactions of autocracy. We hold up to the people the blessings we enjoy under just and equal laws and a free government, as compared, say, with the burdens borne by the French people before the Revolution. I have done this very thing in my war work, and felt it in my own case to be a mockery.

There is not the slightest doubt that present conditions are interfering with oil development. Work is being suspended or held back in the hope that conditions will improve. There is no sound reason why this should be so. Price will keep reasonable pace with the cost of production and take care of that. But it is immaterial what the price is if the Government takes all or more than a just proportion of the product. In a greater or less degree the inequality of Federal taxation affects the entire petroleum industry, and unless means be found to correct this the effect, from every standpoint, practical, legal and moral, must be viewed with concern.

Potash Production Increasing

The statistics on the production of potash for the first six months of 1918 received by the U. S. Geological Survey to date show a total output of 20,000 to 25,000 short tons of pure potash (K_2O), indicating that the output for the entire year may reach 50,000 to 60,000 tons. As only 32,573 tons was produced in 1917, the production is evidently increasing rapidly. The domestic production now equals 20 to 25% of the normal domestic consumption before the war, which is estimated to have been about 240,000 tons. The statistics for the first half of the year are incomplete, returns not having been received from a few large producers, and it is possible that the production in 1918 may exceed 60,000 tons, as reports indicate that a number of new enterprises may be put in operation during the second half of the year.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

*C. G. Hornor, of Guthrie, Okla., in the New York "Sun."

Valuation of Mines in Arizona

By E. JACOBS*

THE last published report of the proceedings of the State Board of Equalization of Arizona shows that the value of property directly connected with the mining industry of the state constituted about 56% of the total value of all property subject to taxation by the state for the year 1917. Though the approximate percentage for the year 1918 has not yet been determined, it will no doubt be larger than that of 1917, as the increase in valuation of the producing mines of Arizona, as shown in the table, is larger proportionately than that of all other taxable property. Incidentally, it may be mentioned that in 1917 the percentage for productive patented and unpatented mines was 46.9; for non-productive patented and unpatented mines and mill sites, 1, and for smelters, concentrators, and improvements on all mining property, 8.1 per cent.

The principal duties of the State Tax Commission of Arizona include those of valuing and assessing all producing mines. In the last biennial report of the commission, the following observation is made:

The labor involved in determining the proper valuation for the great producing mines, the railroads, and other classes of property, valued and assessed by the Tax Commission, is exceedingly great. . . . During the time in which the many different properties are being considered, it is customary to grant hearings to all interested parties. Of necessity, these hearings consume a great deal of time, as does also the later review of the testimony taken. In this connection, it is interesting to note that more than 54% of all taxable property in the state is valued and assessed by the Tax Commission.

The laws of Arizona require the Tax Commission to supervise the work of all county assessors, as well as county boards of equalization, and to require that all property be listed and valued at its full cash value, and in this connection it may require any county board of equalization to reconvene at any time and make such orders as the Tax Commission shall determine are just and necessary.

As to assessment of producing mines, the report says:

The greatest achievement of the Tax Commission has been the successful solving of the great mine-tax problem. For the last 20 years the question of mine taxation has been puzzling county assessors and boards of equalization, as well as the Legislature itself. In 1907, the Territorial Legislature enacted what was known as the "Bullion Tax Law." This law was founded on the principle of valuing a producing mine, for taxation purposes, "for an amount equal to 25% of its gross output annually." Under this law all of the producing mines in the state were valued at something like \$20,000,000. This law remained in effect until 1912, being repealed by the Legislature that year. In 1913, the Legislature enacted a special mine-tax law based on the principle of valuing a mine for taxation purposes for an amount equal to four times the net plus 12½% of the gross output annually. Under this law all of the producing mines of the state were valued at approximately \$110,000,000. Under the method adopted by the Tax Commission, all of the producing mines in the state were valued at approximately \$172,000,000 for the 1916 assessment. This valuation does not include mining machinery, smelters, nor improvements on mining property, which amount to nearly \$39,000,000.

It is exceedingly gratifying to the Tax Commission to make known to the people of Arizona that its efforts to value and assess this by far the greatest class of property in the state have met with such a large degree of success. That its efforts have proved successful is attested by the fact that only three minor hearings were called for to protest against the final valuations found by the commission when sitting as a board of equalization. In some of these cases slight adjustments were made, and nothing even resembling a lawsuit was brought about through this immense increase in taxable valuation on producing mines.

In 1915, the Tax Commission adopted a method of assessing the mining property in the state which,

*Phoenix, Arizona.

though a great improvement over the special mining law previously in force in Arizona, was ultimately found "not sufficiently elastic to meet all of the conditions that were encountered in valuing the many mining properties within the state." Consequently, in May, 1916, it was resolved that "in order to arrive at a just and equitable valuation of the productive patented and unpatented mines and mining claims and groups thereof," the following classification be adopted:

- Class 1. Copper mines whose orebodies are found in veins, fissures and lenses and do not show evidence of exhaustion.
- Class 2. Copper mines whose orebodies consist of porphyry deposits and large acreages of contiguous ground largely unexplored and undeveloped.
- Class 3. Copper mines whose orebodies consist of developed low-grade porphyry deposits.
- Class 4. Copper mines whose ore deposits show evidence of exhaustion.
- Class 5. Gold and silver mines whose ore deposits show evidences of exhaustion.
- Class 6. Gold and silver mines whose orebodies have not shown evidences of exhaustion.
- Class 7. Zinc and lead mines.
- Class 8. All producing mines of irregular output.

Later, it was resolved to add subdivisions as follows:

"A," which shall include all such properties as have entered the profitable productive stage during the year 1915.

"B," which shall include all properties that have suspended profitable production during the period under consideration, for reasons other than market or physical conditions.

"C," which shall include all such properties that have suspended profitable production when said properties could have been operated at a profit during the period under consideration.

The mines of each company or corporation were then assigned to the respective classes or subdivisions thereof to which by physical as well as other characteristics it was deemed they should be assigned.

CAPITALIZATION FACTORS DETERMINED

After all of this preliminary work had been attended to, the main question of a capitalization factor to be used in valuing each of the several classes of producing mines was given consideration. In order to arrive at a real net, it was decided not to allow items such as mine depletion, interest charges, new construction, acquisition of new real estate, and depreciation on personal property to be deducted. Owing to the fact that the several mining companies use different factors for depreciation, it was decided to make all uniform by disallowing every charge of this nature and taking care of it through the capitalizing factor employed.

The factors used in capitalizing the average annual net for a four-year period for mines were as follows: For Class 1 and subdivisions, 15%; Class 2 and subdivisions, 15; Class 3 and subdivisions, 15; Class 4 and subdivisions, 20; Class 5, 25; Class 6, 20; Class 7, 20 and Class 8, 33½ per cent.

The following valuations of producing mines, which show the amounts for 1917 and 1918, respectively, do not include personal property nor real estate:

Property	Amount of Assessment for		Increase	Decrease
	1917	1918		
Cochise County: Arizona & Michigan Development Co.....	\$22,823.00	.....	.....	\$22,823.00
Arizona United Min- ing Co. (owner); Co- chise Mines Devel- opment Corporation (lessee).....	604,635.00	\$604,383.00	.....	252.00

ARIZONA MINE VALUATIONS FOR 1917 AND 1918
(Continued)

Cochise County: (continued)	Amount of Assessment for 1917	1918	Increase	Decrease
Calumet & Arizona Mining Co.	\$37,265,751.59	\$39,827,020.00	\$2,561,268.41	
Calumet & Arizona Mining Co. (Germania group)	20,000.00	88,145.00	68,145.00	
Great Western Copper Co.	104,319.00	197,057.00	92,738.00	
Higgins, Thomas (Higgins Tunnel)	406,764.00	389,184.00		\$17,580.00
Leonard Copper Co.	105,060.00	93,040.00		12,020.00
Peabody Consolidated Copper Co.	49,219.00			49,219.00
Phelps Dodge Corp. (Copper Queen branch)	51,287,023.90	61,485,049.00	10,198,025.10	
Shattuck-Arizona Copper Co.	8,212,787.00	7,396,667.00		816,120.00
Stein, Boericke, et al.	199,877.00			199,877.00
Tejon Mining Co.	31,222.00			31,222.00
Totals	\$98,399,291.49	\$110,170,545.00	\$12,920,176.51	\$1,148,913.00
Gila County:				
Arizona Commercial Mining Co.	\$2,291,796.00	\$2,445,367.00	\$153,571.00	
Balley, Berry & Chapman (owners); Russell & Boys (lessees)	120,276.00			\$120,276.00
Gibson Consolidated Copper Co.	181,046.00	140,600.00		40,446.00
Gila Copper Sulphide Co.	1,060,095.00	1,152,997.00	92,902.00	
Inspiration Consolidated Copper Co.	74,168,898.00	76,439,572.00	2,270,674.00	
Iron Cap Copper Co.	677,414.00	1,844,047.00	1,166,633.00	
Miami Copper Co.	19,133,517.00	24,988,440.00	5,854,923.00	
Old Dominion Copper Mining and Smelting Co. (including United Globe Mines)	12,700,561.00	15,109,243.00	2,408,682.00	
Superior Arizona Copper Co.		66,530.00	66,530.00	
Warrior Copper Co. (owner); Southwestern Leasing and Development Co. (lessee)	483,782.00	658,663.00	174,881.00	
Totals	\$110,817,385.00	\$122,845,459.00	\$12,188,796.00	\$160,722.00
Greenlee County:				
Arizona Copper Co.	\$16,892,715.00	\$18,822,597.00	\$1,929,882.00	
Eagle Gold and Copper Co.		102,320.00	102,320.00	
Keating Mines Co. (owner); Grant Leasing Co. (lessee)		57,413.00	57,413.00	
Leszynsky, J. (owner); Christy & Bennie (lessees)	73,754.00			\$73,754.00
Phelps Dodge Corp. (Morenci branch)	5,438,780.00	6,518,828.00	1,080,048.00	
Shannon Copper Co.	1,337,930.00	443,198.00		894,732.00
Totals	\$23,743,179.00	\$25,944,356.00	\$3,169,663.00	\$908,486.00
Mohave County:				
Gold Road Mines Co.	\$230,595.00			\$230,595.00
Grand Guleh Mining Co.	104,131.00	\$92,494.00		11,637.00
Needles Mining and Smelting Co.	692,875.00			692,875.00
Tom Reed Gold Mines Co.	1,171,846.80	1,071,818.00		100,028.80
Union Basin Mining Co.	316,051.00			316,051.00
United Eastern Mining Co.		4,215,504.00	\$4,215,504.00	
Totals	\$2,515,498.80	\$5,379,816.00	\$4,215,504.00	\$1,351,186.80
Pima County:				
Bush & Baxter (owners of Minnie Mine); A. S. & R. Co. (lessees)	\$310,399.00			\$310,399.00
Empire Zinc Co.	206,412.00			206,412.00
Helvetia Copper Co.	101,035.00	\$74,517.00		26,518.00
Imperial Copper Co. (owner) A. S. & R. Co. (lessee)	510,403.47	918,521.00	\$408,117.53	
Mineral Hill Consolidated Copper Co.	214,225.00			214,225.00
Narragansett Mines Co.	268,545.00	238,215.00		30,330.00
New Cornelia Copper Co.		21,867,473.00	21,867,473.00	
Rosemont Copper Co.		155,299.00	155,299.00	
Twin Buttes Mining and Smelting Co. (owner Morgan Mine); A. S. & R. Co. (lessee)	22,242.00			22,242.00
Twin Buttes Mining and Smelting Co. (owner); Glance Mining Co. (lessee)	410,739.00	397,849.00		12,890.00
Vulcan Consolidated Mining Co.	144,067.00	86,559.00		57,508.00
Totals	\$2,188,067.47	\$23,738,433.00	\$22,430,889.53	\$880,524.00
Pinal County:				
Copper Butte Mines, Inc.		\$136,915.00	\$136,915.00	
Magma Copper Co.	\$3,718,858.00	4,613,384.00	894,526.00	
Ray Consolidated Copper Co.	24,818,248.00	36,445,092.00	11,626,844.00	
Totals	\$28,537,106.00	\$41,195,391.00	\$12,658,285.00	
Santa Cruz County:				
Duquesne Mining and Reduction Co.; R. R. Richardson (owner)		\$283,825.00	\$283,825.00	
Three R. Mining and Milling Co. (lessee)	\$204,835.00			\$204,835.00
Totals	\$204,835.00	\$283,825.00	\$283,825.00	\$204,835.00
Yavapai County:				
Arizona Binghamton Copper Co.		\$316,692.00	\$316,692.00	
Commercial Mining Co.	\$348,255.00	362,296.00	14,041.00	
Consolidated Arizona Smelting Co.	2,296,746.00	2,995,366.00	698,620.00	
Copper Chief Mining Co. (owner); Hayden Development Co. (lessee)	173,080.00	65,525.00		\$107,555.00
Lookout Copper Co. (owner); J. F. Caspart (lessee)	23,934.00			23,934.00

ARIZONA MINE VALUATIONS FOR 1917 AND 1918
(Continued)

Yavapai County (continued)	Amount of Assessment for 1917	1918	Increase	Decrease
United Verde Copper Co.	\$31,536,944.00	\$42,901,915.00	\$11,364,971.00	
United Verde Extension Mining Co.	27,551,329.00	39,259,336.00	11,708,007.00	
Totals	\$61,930,288.00	\$85,901,130.00	\$24,102,331.00	\$131,489.00
Yuma County:				
Leighton, G. B. (Critic Mine)		\$61,348.00	\$61,348.00	
New Planet Copper Mining Co. (owner); Northwestern Leasing and Development Co. (lessee)	\$274,102.00			\$274,102.00
Swansea Consolidated Gold and Copper Mining Co. (owner); Swansea Lease, Inc. (lessee)	610,886.00	451,237.00		159,649.00
Yuca Tungsten Co.		108,942.00	108,942.00	
Totals	\$884,988.00	\$621,527.00	\$170,290.00	\$433,751.00

Summary

County	Total of Assessment for 1917	1918	Net Increase
Cochise	\$98,399,291.49	\$110,170,545.00	\$11,771,263.51
Gila	110,817,385.00	122,845,459.00	12,028,074.00
Greenlee	23,743,179.00	25,944,356.00	2,201,177.00
Mohave	2,515,498.80	5,379,816.00	2,864,317.20
Pima	2,188,067.47	23,738,433.00	21,550,365.53
Pinal	28,537,106.00	41,195,391.00	12,658,285.00
Santa Cruz	204,835.00	283,825.00	78,990.00
Yavapai	61,930,288.00	85,901,130.00	23,970,842.00
Yuma	884,988.00	621,527.00	\$87,123,314.24 263,461.00
Totals	\$329,220,628.76	\$416,080,482.00	\$86,859,853.24

The following are the totals of valuations of the producing mines for the six years (1913-1918) since admission of Arizona to statehood: 1913, \$113,332,604.15; 1914, \$110,393,989.53; 1915, \$118,026,003.74; 1916, \$171,888,616.19; 1917, \$320,220,628.76, and 1918, \$416,080,482. It is noteworthy that the total valuation for the current year is 26.04% higher than that for 1917, and 267% higher than that for 1913, the first year included in the foregoing record.

The valuations given are those of the producing mines only. In addition, there are those of the non-productive mines, improvements in both productive and non-productive mines, surface of certain mining claims, mining machinery and supplies, mill sites and improvements thereon, concentrators, smelteries and appurtenances, and sampling and other works, the valuation of all of which in 1917 was approximately \$62,718,000. So it may be regarded as entirely probable that when the 1918 final figures for these are obtainable, it will be seen that the mining industry of the state represents a taxable value of about \$500,000,000. This leaves out of account the railway, telegraph, and telephone systems of the various mining and smelting companies, so that the total value of all property directly and indirectly connected with the mining industry must be considerably in excess of half a billion dollars.

Sheet Zinc in Great Britain

Great Britain is expanding greatly its production of sheet zinc, especially in rolling thin sheets. One firm is producing zinc strip as thin as No. 4 gage, but the majority of the works engaged in rolling thin sheets are turning out only limited quantities, as their output of the thicker sizes is readily absorbed. It is interesting to note, says the *Ironmonger*, that this industry has almost entirely developed since the war, and that although the quality of the British-made article may not equal the finer brands of Continental and American sheets in use in pre-war days, the difference is largely in the surface finish, and the general quality of the British goods is creditable to the adaptability of the British manufacturer and workman.

Bureau of Mines Activities

The war situation has stimulated to greater activity the efforts of the U. S. Bureau of Mines, whose normal field covers the production of metals and minerals. Much of this increased activity has occurred in connection with the War Minerals Investigation branch of the Bureau, provided for by special Congressional appropriations.

In mining, milling and marketing problems numerous engineers have been active, and the policy has been adopted of affording immediate help in the way of needed advice with regard to suitable methods. Work along these lines has made principally for greater efficiency, and is not intended to form the subject of any special study or memoir.

In the various experiment stations, special problems of ore treatment have been and are under investigation. Experiments in the concentration of Western chrome ores have been made at Seattle; and preliminary work of the same kind on West Texas sulphur ores indicates that they are probably capable of successful treatment by the flotation method. Other investigations concern manganese, graphite, and minerals generally.

Laboratory investigations, with the view of increasing the supply of electrodes so as to make them available for Western electric furnaces, are under way in Colorado.

The subject of chromite production has been investigated by field parties; Bureau of Mines' engineers have also reported on the deposits in Newfoundland and Cuba.

The War Minerals Investigation organization has been concerned with the question of priorities, both of railroad transportation and of supplies and fuel, and a large number of applications have been handled. The Bureau has also had to act as adviser to the Railroad Administration as to the construction of short lines designed to facilitate shipments to and from certain mines, the problem being as to whether such construction was a war necessity or could be postponed.

The Bureau of Mines has acted as advisory engineer to the capital issues committee of the War Finance Corporation with reference to whether proposed issues of mining stock were essential to carrying on the war or could be postponed. It has also worked in coöperation with and acted as adviser to the War Industries Board, especially in matters such as the production of pyrite, sulphur, sulphuric acid and tungsten.

The Labor Section of the War Minerals Investigation is coöperating with the Department of Labor and with the War Department with regard to deferred classification for mining men, and with the man-power committee of the Department of Labor with the object of maintaining maximum production.

As a result of the investigations of the Bureau as to the dangers which threaten production of war minerals, Secretary Lane has written to Chairman Kitchin of the Ways and Means Committee recommending that the Excess Profits Tax be suspended in the case of those mines producing a war essential, until special installations put in for that purpose should be amortized, and this recommendation has been approved by those in possession of the facts.

The platinum situation has been closely studied by the Bureau; and, in coöperation with the War Industries Board, plans and regulations have been drawn up which

it is believed will be satisfactory. These regulations will be put into effect through the War Industries Board.

Special committees have been formed to study special problems. The committee on gold, representing both the Bureau and the Geological Survey, has been appointed by the Secretary of the Interior, at the suggestion of the Bureau, with Hennen Jennings as chairman, and is investigating the problems. A committee on potash has also been appointed which has reported recommendations for further investigation by the Bureau of Mines. The tin problem has also been studied by a special committee, and recommendations to the other Government departments interested have been made.

Close coöperation has been maintained with the U. S. Geological Survey, which has been investigating the various questions from the geological standpoint.

Japanese Sulphur Situation

According to an investigation by the Japanese Department of Agriculture and Commerce, the production of sulphur in April, 1918, was 5878 tons, states a Canadian consular report. Compared with the corresponding period of last year, there was a decrease of 35%. The grand total from the beginning of 1918 to April was 22,035 tons, a decrease of 27% from the figures for the first four months of 1917.

The cause of this falling off is the tremendous advance in freight rates to Australia, the best customer for Japanese sulphur, purchasing about half of the quantity sold. The steamship companies have raised their freight rate to 95 yen (about \$48) per ton, whereas they were charging 35 yen last year. Therefore the price, c.i.f. Australian port, of sulphur selling at 55 yen per ton net in Japan, would be more than 160 yen (including freight marine insurance, war risk, and other charges), which is prohibitive. The merchants of Australia will not give orders to Japan until the freight rates show some decrease. On the other hand, the customers of India, South Africa, and the South Sea Islands, having placed too many orders during last season, are not now active, and the market looks quiet. About 35,000 tons of previous orders are ready for shipment, lying at the manufacturers' warehouses, on account of the scarcity of bottoms. As a consequence of the conditions created by the difficulty in moving their product, some of the manufacturers are in a serious condition and some have even become bankrupt.

The Llallagua Mine of Bolivia

The wonderful profits which are being realized by the great Bolivian tin mines under current conditions, unhampered as they are by any excess-profits taxes, is strikingly shown in the report of the great Llallagua company, whose balance sheet was published in the *Diario* recently. We take this summary from the *Mining Journal* of London. The Llallagua was, perhaps, the largest single producer of tin in the world last year, though figures of Señor Patino's properties are not yet available. The total, at any rate, was 249,580 quintals, or 11,140 long tons, as against 165,534 quintals, or 7454 tons in 1916, showing a remarkable increase, the monthly output averaging 20,200 quintals. This total was equivalent to nearly one-quarter of the estimated output

of barilla from Bolivia, which amounted to 46,000 tons last year.

The net profit for the year amounted to 18,760,633.92 pesos of 18d., after writing off the sum of 761,411.61 pesos to depreciation of plant and equipment, that is, £53,355 17s. 5d., a sum which represents 10% for the value of the machinery, stock and buildings. The profit for the year 1916 amounted to 6,214,977.49 pesos of 18d.; the profit for the year 1917 exceeding that of 1916 by 12,545,656.43 pesos, that is £940,824 4s. 9d. Costs in 1916 and 1917 per Spanish quintal were as follows:

1916.		Pesos of 18d
Exploitation		7.27
Smelting		3.56
Exploration and development.....		3.27
Other expenses.....		7.32
Total		21.42
1917.		Pesos of 18d.
Exploitation		5.45
Smelting		2.06
Exploration and development.....		1.95
Other expenses		9.55
Total		19.01

The average price abroad for tin in 1916 was 67.96 pesos of 18d. per Spanish quintal, and in 1917 was 106.90 pesos. The profit per Spanish quintal increased from 37.54 pesos in 1916 to 75.18 pesos in 1917. The costs of remission and taxes increased to 12.72 pesos of 18d. per quintal. Net profits in 1917 amounted to 18,760,633.92 pesos of 18d. or £1,407,047 10s., which, added to the fund to provide for interests, dividends, and like charges, of 4,068,310.84 pesos, gives a total amount for distribution of 22,828,944.76 pesos of 19d., that is, £1,712,170 17s. 1d. This fund is dealt with as follows:

	£	s.	d.
To dividends 22, 23, 24, and 25 distributed during 1917.....	637,500	0	0
To exploitation fund.....	18,519	3	8
To fund for new works.....	20,483	1	7
To reserve fund.....	6,626	8	2
To fund for eventualities.....	10,000	0	0
To future dividends.....	850,000	0	0
To amortization funds.....	164,000	0	0
Gratifications to employees.....	5,042	3	8
Total	£1,712,170	17	1

Following the foregoing distribution, the capital and reserves of the company stand on the books as follows:

Capital	£425,000
Reserve fund	100,000
Interest and dividend fund.....	850,000
Fund for new works.....	153,000
Exploitation fund.....	95,000
Extraordinary reserve fund.....	70,000
Fund for eventualities.....	50,000
Total	£1,741,000

The tunnel Siglo XX arrived by the end of December at the limit fixed by the program drawn up in 1915, having been driven a distance of 857.70 meters during the year 1917, thus completing the tunnel for the length of 8420 meters. The total amount expended in this work was 1,394,364.60 bolivianos.

The stock of ore available in December, 1917, was 261,902.25 metric tons, of an average tin content of 14.33%—that is, 37,544.60 tons of fine tin.

Lead Acetate Substitute in Cyaniding*

BY THOMAS B. STEVENS

The solutions in some cyanide plants require the addition of varying amounts of lead salts in order to maintain their efficiency as solvents of gold. Lead is also required to build up the zinc-lead couple in the

*Excerpt from the Journal of the Chamber of Mines of Western Australia.

extractor boxes so as to insure economical precipitation. The scarcity of lead acetate in Western Australia has caused metallurgists to direct more attention to the use of other compounds of lead. Litharge is an insoluble salt, but it may be dissolved in either caustic alkalis or acids. Caustic alkalis dissolve it to form plumbites (CaPbO₂); and a mixture of slaked lime and litharge has been largely used to precipitate soluble sulphides from working cyanide solutions. It is probable that the protective alkali usually present in cyanide solutions is in itself sufficient to cause finely ground litharge to act as a precipitant of soluble sulphides. At some plants an economy is affected by feeding used cupels from the assay office into the tube mills or other parts of the grinding plant; but at mills where concentration is practiced the litharge must be thoroughly dissolved before introduction into the plant circuit.

Solutions of lead in the form of plumbites are useless for the formation of the zinc-lead couple in extractor boxes, because the lead is contained in the positive radical and cannot be replaced by zinc. This may be readily proved in the laboratory by dissolving a little litharge in boiling caustic soda and then immersing zinc shavings in the solution, and it will be found that no deposition of spongy lead will take place. At the present time, for coating zinc shavings, litharge is usually dissolved in nitric acid just prior to use. The operation is easy to perform, and requires no heat; and the use of a steam-jacketed pan, such as is necessary when metallic lead is dissolved, is avoided. An earthenware jar to hold about 5 gal. is all the apparatus required. To make 10 lb. of nitrate, 7 lb. of litharge, ground to as fine a powder as possible, is added gradually to 1603 c.c. of 70% (sp.gr. 1.41) nitric acid which has previously been diluted with 6500 c.c. of water, and the whole is stirred with a wooden stick for about 10 min. I have given the weights and measures in this form, as they are those which are usually most easily available at cyanide plants. The solution warms; and when the reaction is completed any undissolved excess of litharge will readily settle to the bottom. The solution of lead nitrate, which will be neutral to litmus, can be readily decanted off. It is advisable to work with a slight excess of litharge, as it can be left in the bottom of the jar to form part of the next charge, so that the full strength of the nitric acid is utilized. It is also important to dilute the acid with water, as directed, before the addition of the litharge; otherwise some insoluble basic lead nitrate is likely to be formed. To make 100 lb. of lead nitrate, 67.4 lb. of litharge and 38.1 lb. (100%) of nitric acid are required. The small amount of nitrate consumed by Western Australian mines does not make it worth while for the acid manufacturer to install the necessary plant. Lead nitrate Pb(NO₃)₂ contains 62.5% of lead, as compared with 54.6% in the acetate (Pb(C₂H₃O₂)₂ · 3H₂O); and, as it is the lead content only which is of use, 9 lb. of the nitrate is approximately equivalent to 10 of the acetate.

The British Columbian Gold Output is showing a serious decline. The value of the metal produced from lode mining in 1917 was \$2,367,190, as compared with \$4,587,334 in 1916—a decrease of nearly 50%. Placer gold won was valued at \$496,000 in 1917, which was \$84,500 less than the value of the 1916 output.

Tin Imports Increasing

Imports of tin ore into the United States continue to gain, according to *Commerce Reports*, 3499 long tons appearing in the July figures, as against 1932 tons in July, 1917. The increase is still more apparent from a comparison of the imports for the first seven months of 1918, which were 13,096 long tons, with the same period in 1917, when they were 4797 tons.

Though imports of pig tin during the month of July, amounting to 15,567,667 lb., show a considerable increase over the July, 1917, imports of only 10,348,323 lb., an importation of 88,452,232 lb. during the seven months ended July 31, 1918, shows a decrease as compared with 90,350,360 lb. during the first seven months of 1917. The following comparison of the imports of pig tin is interesting:

IMPORTS OF PIG TIN IN FIRST SEVEN MONTHS OF 1917 AND 1918

Country	January- July, 1917, Lb.	January- July, 1918, Lb.	Increase or Decrease (-), Lb.	Increase or Decrease, %
United Kingdom.....	26,044,967	14,215,407	-11,829,560	- 45
China.....	4,517,958	3,088,514	- 1,429,444	- 32
Straits Settlements.....	33,825,132	41,126,089	+ 7,300,957	+ 22
Dutch East Indies.....	18,522,083	10,750,553	- 7,771,530	- 42
Hongkong.....	3,912,530	12,246,347	+ 8,333,817	+213
Australia.....	2,823,904	4,041,414	+ 1,217,510	+ 43
Other countries.....	703,786	2,983,908	+ 2,280,122	+324

The phenomenal increase of 324% in imports of pig tin from countries which have not heretofore been considered of importance as producers of this commodity is almost entirely traceable to increased shipments from Japan, which averaged 500,000 lb. monthly during June and July.

Total tin imports into the United States for the seven months, computing all ores as containing 60% of metal, were 106,053,256 lb., or at the rate of 81,163 long tons per annum, which squares nicely with the recent allocation to this country by the inter-allied tin conference, in London, of 80,000 tons per annum. Almost 17% of the total tin imports during the first seven months of 1918 came in the form of ores.

California Mining Claims

BY A. L. H. STREET*

Compliance with the California statute requiring notice of location of a lode claim to be posted at the "point of discovery" is essential to a valid location. But the District Court of Appeal of the state holds in the case of *Batt vs. Stedman*, 173 *Pacific Reporter*, 99, that where it was proved that notice was posted on a lode where quartz showed, there was sufficient proof of posting at the point of discovery, although claimant previously testified that he posted the notice within 75 ft. of the point of discovery.

Incidentally, the court reaffirms the principle that location notices should be liberally construed in favor of claimants under them, and that their main purpose is to identify with reasonable certainty the land claimed.

Another point decided in the same case is that, in a suit to quiet title to a mining claim as between conflicting claims, the fact that particular land is valuable for placer mining is sufficiently established by proof

that a claimant discovered gold therein and has since mined the claim more or less every year, and performed all required assessment work, although there is no proof as to the quantity of gold removed.

The Fourth Liberty Loan

The battlefield in Europe is not the only American front. There is a home front, and our people at home should be as patriotic as our men in uniform in foreign lands. Every American soldier who has fallen in France, every American sailor who has died for his country's cause, has given his life for his people. Surely we, their people, can lend our money to our nation, their country.

The Fourth Liberty Loan is the fighting loan. Its great success will bring comfort and encouragement and a deep sense of pride to our Army and our Navy, and to our Allies; it will bring discouragement to our enemies. Its success means American victory, Prussian defeat. Now is the time to fight harder.

The Fourth loan is the fighting loan, the soldiers' loan. Buy bonds to the limit.

Saturday, Oct. 12, the day on which this issue is sent to you, is the 426th anniversary of the discovery of America. President Wilson has proclaimed it Liberty Day, and requests the citizens of every community in the United States—city, town and countryside—to celebrate the day. The President, in his proclamation, says:

"Every day the great principles for which we are fighting take fresh hold upon our thought and purposes and make it clearer what the end must be and what we must do to achieve it. We now know more certainly than we ever knew before why free men brought the great Nation and Government we love into existence, because it grows clearer and clearer what supreme service it is to be America's privilege to render to the world."

Celebrate the day by buying a bond.

"The Stars and Stripes," the official newspaper published by the soldiers of the American Expeditionary Forces in France, says editorially about the enemy peace offensive:

"Let the weak-hearted who are dreaming of a compromise; let the pacifists who are talking a peace by agreement; let the side-liners who have had enough of war; let the secretly inclined pro-Germans who think this war should end without a decision—let them one and all know once and for all that for the American Expeditionary Force there is no such word as 'Peace' with the Huns unbeaten. The man who talks of peace today, except through victory, is a traitor."

The enemy peace offensive is likened to the action of German machine-gun crews in the Vesle fighting, when they fought and killed Americans until they were surrounded, then shouted "Kamerad!"

The mothers of the American soldiers in France want the same peace their sons demand. All the courage of the ancient Spartan mother is in the hearts of the women of America.

The object of the Fourth Liberty Loan is to bring that peace—a just peace, a righteous peace, an American peace. Answer the latest Hun peace note by buying another bond.

*Attorney at law, 829 Security Bldg., Minneapolis, Minnesota.

The Arkansas Manganese Field

BY DWIGHT E. WOODBRIDGE*

The Batesville manganese district in northern Arkansas has recently become prominent as a producer of high-grade manganese ores. Equipment of mines and the construction of ore washeries are rapidly taking place, but in the opinion of the writer there is great need for careful study of conditions before plant and equipment are selected. It is believed the district has a future. Land holders retard development.

THE north Arkansas manganese field has enjoyed more or less publicity this year, but it has been fragmentary; perhaps there is no general appreciation of what it is doing and of its prospects. Opinions differ widely; theorists consider it of no worth; practical engineers, recalling to mind the brown iron districts of the South, and, comparing the difference in value of manganese ore and residual limonites, and also recognizing the essential similarity of ore deposition and methods of mining and concentration, expect success; and miners who work skillfully with their hands and heads, rather than with their mouths, make high profits.

SITUATION AND EXTENT

The district is situated to the north of the city of Batesville, which is a station on the line of the Missouri Pacific between Newport and Joplin, and it is reached direct either by way of St. Louis or from Kansas City. It has the advantage of being nearer Chicago than any of the Western manganese districts. Lying chiefly in Independence County, there are some 150 square miles of the southern Ozark uplift in which manganese occurs in a belt roughly 18 miles long and from six to eight miles wide. Throughout this area it is to be found as a residuum resulting from the decay of certain shales and limestones, wherever conditions were favorable for such decay and the deposition of the ores freed from those rocks. There is close similarity to the districts of central Alabama, northwestern Georgia, and elsewhere in the South where residual deposits of limonites occur.

Early in 1918 attention was drawn to the region, and speculators arrived in large numbers, attracted by the high prices for manganese and the low cost of land. They were naturally from the near-by oil regions of Oklahoma and the zinc district of the Southwest. Among them were operators, and, where there were but two concentrating plants at the beginning of the year, there are now nearly a score either built, building, or practically assured for early erection. But only three of these are at work. The production of the region will not be far from 18,000 tons this year; not much, but a help, especially as most of this is high grade.

The economically important rock succession is, at the base, a hard, close-grained bluish-white lime called

Izard. This lies tilted slightly to the south and with comparatively little other evidence of disturbance, although its upper surface is undoubtedly exceedingly irregular on account of decay and erosion. Next is a dark, crystalline lime called Fernvale, and by local miners "gray rock" and often "granite." Above is the Cason shale, so-called. Above this is the St. Clair lime, and yet higher in the succession a chert. These rocks range from Ordovician (Izard) to Carboniferous (chert). The chert has been eroded over much of the area, and it is safe to say that where it remains in place and undisturbed, manganese will not be found below. Most of the St. Clair lime has gone. Throughout the greater portion of that part of the district of economic value the Cason shale and the Fernvale lime have been decayed into a series of siliceous clays, and in these clays is the manganese that has been freed from those rocks and left as a minable residuum. Frequently these clays rest directly on the Izard's pitted and roughened surfaces.

Deposits vary greatly in size. A clear conception of the origin and of the limitations it imposes is needed by the prospector and miner. But, strange to say, this understanding is not general. In consequence failures do, and will, result. It is not safe to say, as some do, that no man can tell what is beyond the end of his pick; neither is it safe to make any definite tonnage estimates, as do others, except after prolonged and scientific prospecting. If land owners appreciated this fact, they would be more just and considerate in the terms they demand, and would offer bona fide miners the opportunity to prove ground before requiring the payment of large sums for purchases of lands.

A recent report on the district by the U. S. Geological Survey had the temerity to state certain definite tonnage figures, although prefixing the estimate by the words "perhaps at least." It would have been as logical, considering the state of the field when this report was made, either to have added a cipher to the estimate or to have subtracted one from it.

STEAM SHOVELS AND WASHERIES NOT ALWAYS ADVISABLE

There has been a general feeling that steam-shovel mining was the proper thing, and that log washing was suitable everywhere. This idea is thoroughly imbedded in the minds of men who never saw a steam shovel, or would not know a log washer from a clothes horse. In point of fact, there are very few properties in the district sufficiently proved to indicate that steam-shovel mining is proper, while some on which shovels are to be placed are clearly not suited to the procedure, which can result only in failure. The same is true as to methods of concentration. Much of the ore is not suitable for washing in logs, or in anything else, for that matter, and should be mined by the old crude method of the pick and shovel and the manure fork. On the other hand, there are areas that are amenable to washing in logs, to jigging and table work. It is all a matter of individual study, and there is no foot-

*Mining engineer, Duluth, Minnesota.

rule to follow, as many seem to think. That there will be steam shovels and washeries for sale cheap in due time, I have no doubt. And that there will be a few places requiring them, I have faith to believe, also.

Not that there are no other methods of concentration to be tried out in the district; there are—several. One man is now setting up a horizontal trommel, running in water, with which he expects to solve all the problems of concentration. Others are using ordinary jigs from Joplin, but without gates, so that the material passing out through the opening above the hutch is mixed. Others have not enough water, or water under natural flow, for the logs and screens; and there are many other peculiar contrivances of more or less interest. All these things will come out right in time and with experience, I take it. Most of the logs in use or under construction have been brought from the Alabama and Georgia fields, and some are too old and worn to be efficient.

Despite the hindrances of various sorts and despite the fact that much is to be learned, this district has a future. Its chief drawback at this time is the attitude of many of the land owners and speculators, whose policy is reprehensible in that it does not permit due prospecting on the part of those who really intend to mine and produce concentrates in a workmanlike manner and on a business basis.

All ore must be hauled to one of the various railway points, and these hauls vary in length up to eight or nine miles. For this good roads are essential, and there are few good roads yet. However, the cost of hauling is remarkably low, under the circumstances. With the improvement of roads that will come when miners produce more material, and take road betterment into their own hands, and with the advent of truck or traction haulage, the cost of delivery at the station will be cut in two. The region is fortunate in that it has an abundance of excellent road building material everywhere at hand, but the county road funds are necessarily inadequate, while the road overseers are inexcusably incompetent.

A. I. M. E. Meets in Milwaukee

The Institute of Metals division of the American Institute of Mining Engineers and the iron and steel section of the Institute met in Milwaukee, Wis., on Oct. 8, 9 and 10, with the American Foundrymen's Association and the American Malleable Castings Association. Prominent in the program of the non-ferrous sessions was the symposium on tin conservation on Oct. 9, in which representatives of the Government and many of the country's largest firms took part. The public was urged to collect tin for the country's use, to substitute other metals for it where possible, and to discontinue the manufacture of non-essential products that consume tin.

Means were also discussed for increasing the byproducts of coke and the fuel supply in the United States. The statement was made that from certain coals it is now possible to secure nearly 20 gal. of gasoline or motor fuel of the same value per ton of coal mined. Among other things, a new type of coke, known as semi-

coke, has been produced, which it is said has proved a satisfactory fuel for all general purposes. The advantages of using coal in pulverized form or of using briquets, or a new fuel known as carbocoal, were discussed, and in several instances statements were made showing that enormous sums have been spent in order to make these substitutes for coal available to the domestic and industrial consumer during the coming winter. The titles of the various papers presented at the non-ferrous sessions during the three days that the convention lasted have already been published on page 508 of the *Journal* of Sept. 14.

A substitute for radium, the world supply of which is only about three ounces of radium element, has been found, according to a statement made at the meeting on Oct. 10 by Dr. Richard B. Moore, of the U. S. Bureau of Mines. Mesothorium is the designation by which it is known, and, according to Dr. Moore, it can be used as efficiently as radium for luminous paint. It can also be used for cancer treatment, although the fact that it has a shorter life makes it much less desirable for this purpose. Paint made luminous with mesothorium will retain this property for four or five years, which is as long as is required for cheap watches, push buttons, and like uses, and which will render unnecessary the use of radium for such purposes.

The Southwest Virginia Copper Region

BY MARSHALL HANEY*

The Southwest Virginia copper region is in Floyd, Carroll, and Grayson counties, in the southwestern portion of the state. It is a noted region, being a part of the eroded Blue Ridge, generally known as the Floyd-Carroll-Grayson plateau. In the early '50s the region was actively worked, and the rich ores were shipped to Baltimore. During the year 1855 eight mines in this region were shipping ore, shipments during one period of six months amounting to 770 tons, averaging 25% copper.

The structure of the vein proves faulting, and the dip varies from 45 to 65°. The rocks on the hanging-wall side of the vein are mica schist, cut in places with diorite; those on the foot-wall side are slightly different, being similar to the other rocks of the Southern Appalachians. The vein consists of a series of layers of pyrrhotite mixed with micaceous material; also stringers of chalcopyrite, and varies in width from 20 ft. to 120 ft. At the Betty Baker mine a drill hole was put down, proving the deposit to a depth of 734 feet.

The old mines that were most extensively worked are the Betty Baker, Cranberry, Kirkbridge, Vaughn and Chestnut Ridge. At one time a smeltery was in operation at the Cranberry, and some of the mines had small settlements around them.

This field presents favorable opportunity for rapid development and early production. Practically all the necessary prospecting has been done, and ore can be shipped at an early date and on a small initial investment. In common with many similar rich deposits, it has remained idle owing to lack of enterprise, capital and competent management.

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Correspondence and Discussion

Mine Sampling and Mining Method

In the *Journal* of Sept. 21, C. T. R. suggests that examining engineers are too prone to sample an orebody without first having decided upon the method of mining that will be best suited to winning the ore. He expresses his belief that the "method of mining" should be decided upon before sampling begins, as unless the ore can be mined so as to obtain an approach to the grade indicated by the sampling, the results based upon the examination are of doubtful value.

There is no question regarding the importance of the principle expressed in C. T. R.'s suggestion. To convey the same idea in other words, it may be pointed out that an examining engineer should appreciate that the average value of a certain slab of ore in the mine, as indicated by a proper averaging of correct samples of this ore, may be entirely different from the average value of the material which is delivered at the surface as a result of the mining of this same slab of ore.

For example, one may have a fissure vein five feet wide, containing a pay streak with a width varying from 12 in. to 24 in., and an average assay value of, say, \$20 per ton. The vein material may break freely from both walls, or it may be frozen to one or both walls. It may be possible to separate the pay streak from the rest of the vein filling on account of a difference in hardness and the use of stripping methods, or it may be utterly impossible to break the vein without a thorough mixing of the valuable and worthless constituents of the vein. Under such conditions it may be necessary not only to decide on the method of mining prior to the determination of the most reliable method of sampling, but, even after the method of mining has been definitely determined, the choice of a proper sampling width may have an influence on the accuracy of the valuation. The sampler may choose to cut samples across all the material which is sure to be broken down in mining the vein, and the sampling width would thus coincide with the stopping width.

The justification for this practice might be the uniform texture and hardness of the entire width of the vein, or perhaps the fact that the material outside the principal pay streak had a certain value too high to permit its classification as waste. The danger might lie in the fact that the different bands of material in the vein were not of the same hardness, a condition likely to result in false assays, due either to salting the sample with too much of the pay streak, or to diluting the sample with too much waste or low-grade material.

The sampler may choose to cut his samples across the pay streak only, assuming that the pay streak is easily distinguished from the remainder of the material. In this case the sampling width and stopping width may differ at each point sampled, and, if the material represented by the sampling width is certain to be diluted by the material outside the pay streak, the valuer may adjust the assay returns of his samples and compute

a composite sample, including the proper quantity of waste, and such composite sample may be used in the calculation of the block value.

It is possible that various combinations of the extreme conditions mentioned may obtain in the same mine. Whatever the conditions may be, the important thing is to determine, as accurately as conditions permit, what the average value of the ore reserve is going to be after it has been mined and delivered at the collar of the shaft or the portal of the tunnel.

In reply to C. T. R.'s request for data showing how the grade of ore sent to the mill compared with the grade indicated by the sampling of the stope where different methods of mining were used, perhaps the following case will be of interest: A \$15 pay streak in a fissure vein was sampled separately from the remainder of the vein, which was relatively low grade or worthless. The pay streak was usually narrower than the stopping width. For considerable distances the ore could be removed clear, by using stripping methods. In other parts of the mine stripping was impossible, and the vein was broken from wall to wall. Where the ore was stripped, the average grade sent to the mill compared favorably with the grade indicated by the sampling. Where the entire vein was broken down, and all the material known to be waste was picked out and left in the stope, the rest of the material, which was delivered to the mill, ranged in value from \$6 to \$8 a ton. Where the entire vein was broken, if the samples had been cut from wall to wall, or if a composite sample had been computed, the calculated average return would have compared favorably with the material delivered to the mill, but the property would have been uninteresting on the basis of such an average assay value.

HARRY J. WOLF.

Denver, Colo., Sept. 26, 1918.

I cannot entirely agree with C. T. R. in his contribution, "Mine Sampling and Mining Method," which appears in the *Journal* of Sept. 21. In stating that "examining engineers are too prone to sample an orebody without first having decided upon the method of mining that will be best suited to winning the ore," it would appear that the criticism is ill advised, inasmuch as the method of mining in many cases is not predetermined, and is often subject to change even after one method has been attempted. Deciding upon the method of mining is, of course, customary practice, but few operators continue to use the initial method if a more economical one presents itself.

Furthermore, underground conditions and other factors often necessitate a change in mining methods. In either of these cases, that is to say, where the method is to be changed, it would appear from C. T. R.'s statement that a complete re-sampling would be necessary to conform to the new method of mining to be used, which hardly seems a fair inference, particularly if results have been productive under the old method of

mining and the new "method of sampling" shows lower assays.

It is not to be expected that one method of mining will produce the same return as another, but it is to be assumed that, if the sampling is properly done in the first place, equivalent values can be obtained in the mining operation. If the method of mining contemplates the removal of ground not included in the area represented by the sampling, it can hardly be said that the sampling is at fault. It would seem that the relation that exists between the "ground removed" and the "ground sampled" is a closer one than that between the "sampling" and the "method of mining."

EDWARD A. THOMPSON.

New York, Sept. 25, 1918.

C. T. R. has exaggerated, in my opinion, the importance of mining method in relation to mine sampling. In the examination of a partly developed mine, the mining method is often obvious, and in sampling the workings a sufficient number of facts can be ascertained by the engineer to indicate how wide the stopes can be made. In the subsequent mining, stope widths may be greatly altered to meet varying conditions. This is usually under the control of the mine captain or superintendent.

New York, Oct. 3, 1918.

MINING ENGINEER.

Grinding of Ore in Ball Mills

The discussion of the comparative efficiency of various ball mills, now appearing in the columns of the *Journal*, suggests that the development of the type of grate usually adopted in many mills deserves mention.

In early experiments with ball mills, the grate was constructed with the idea of *screening* the pulp, thus retaining in the body of the mill the unground particles of ore. This procedure was found impracticable other than in exceptional cases, although the actual working of the mill was not understood at the time; and it was not generally realized that, if the pulp had reached the discharge end of the mill without being ground to the required size, nothing would be gained by retaining it there, where no provision exists to crush any more than the normal flow. The size of the grate openings was then increased, and more reliance was placed on the efficient operation of the mechanical classifier, in closed circuit, to sort the discharged pulp and return the unground portion to the feed end of the mill. Successful ball-mill operation is largely dependent on external classification and return of unground product.

Mr. Del Mar remarks that rock is retained in the so-called quick-discharge mill until small enough to issue through the openings. This suggests screening in the mill, which, I venture to think, is impracticable in the simple type of mill under discussion. If any appreciable proportion of the pulp was unground when the screen was reached, an immediate accumulation would result. This is what probably happened in practice, and the difficulty in regulating the feed under these conditions led to the adoption of a grate with coarser holes in mills of this class, so that there would be no difficulty in passing the material that reached the discharge end of the mill, whether ground to the required size or only

partly ground. This also permitted an increase in the tonnage in the ball-mill circuit, and tended to decrease the wear in lining to which Mr. Del Mar has alluded.

The importance of outside classification, as a means of bringing back to the feed end of the mill the partly ground ore, was not always realized, with the result that too much was sometimes expected of the machine. Facilities for the reduction of the ore must proportionately increase as reduction proceeds, or the smaller duty in the earlier stages of reduction must be counter-balanced by return feed. In common with all newly adopted apparatus, the ball mill was often expected to perform too much, and work was sometimes thrown upon it that could be more economically performed by a primary crusher.

"ORE DRESSER."

New York, Sept. 5, 1918.

The Estimation of Zinc in Zinc Dust

The article by L. A. Wilson on estimating zinc in zinc dust, in the *Journal* of Aug. 24, was of much interest to me, as I have given considerable study to this subject, and to the similar problem of the estimation of metallic aluminum in aluminum dust. The method advocated, depending on the measurement of hydrogen liberated by acid, is similar to one I have occasionally used, and which is described in the *Journal* under dates May 6 and Aug. 12, 1916. The method detailed by Mr. Wilson, however, has the advantage of eliminating the correction for air expelled from the generating flask, and is to that degree an improvement. According to a few tests I have made, it is perfectly applicable to aluminum, at least in fairly coarse particles, if pure concentrated hydrochloric acid be substituted for the 1 to 1 sulphuric acid used in the Wilson process.

I may point out, however, that this process and similar gasometric methods do not really indicate the metallic zinc content of zinc dust, as all other metals which may be present that are capable of dissolving in the acid used, with evolution of hydrogen, will contribute their equivalent of that gas. In determinations for zinc-dust content, the result will be affected by iron, cadmium and, possibly, by aluminum; in tests for aluminum dust, by iron, zinc and, possibly, by copper. For some purposes the error would be negligible, and in some cases the hydrogen equivalent is a real measure of the efficiency of the product for a given purpose, but in using the method it is well to bear this point in mind.

Where a large number of tests have to be made daily, the manipulations and the unavoidable calculations would probably render the method too troublesome. Personally, I should prefer Wahl's ferric sulphate method, using the gasometric process for the purpose of fixing the standard of the permanganate solution on zinc dust of known composition. As Mr. Wilson correctly points out, the ferric sulphate method gives results lower than those calculated from the theoretical equation. The same is true of the analogous method adopted in our laboratory for the estimation of aluminum in aluminum dust, but either process will give extremely satisfactory results if the standard has been fixed as described.

J. E. CLENNELL.

Charles Butters & Co., Oakland, Calif., Sept. 10, 1918.

Events and Economics of the War

The peace offensive of the Central Empires was renewed on Oct. 5, when Prince Maximilian of Baden, newly appointed German Chancellor, proposed immediate suspension of hostilities to the Reichstag, Austria having previously attempted a move in the same direction through Dutch channels. Germany's request for an armistice was countered by the President on Oct. 8; he asked that Berlin make its attitude clear. Lens, Armentières and La Basée were evacuated, and the British drew nearer to Lille; St. Quentin was captured by the French, and their lines north of Rheims were advanced eight miles; heavy fighting occurred along the entire front. In the Balkans, the Bulgarians are said to be withdrawing from Serbian soil, according to their agreement; King Ferdinand has abdicated in favor of Boris, his eldest son. Durazzo, the Austrian naval base in Albania, was destroyed by the Allies. Damascus, the capital of Syria, was captured by the British under General Allenby, who so far has taken more than 70,000 prisoners in the Palestine campaign. The Turkish cabinet has resigned.

Washington announced on Oct. 2 that centralized control of all economic forces of the Allied nations has at last been effected. The War-Minerals Bill received the President's signature on Oct. 5. Two disasters were chronicled during the week—the torpedoing of the U. S. S. "Tampa," a former coast guard cutter, off the English coast, with the loss of 118 lives, and the destruction of a Government shell-loading plant at South Amboy, N. J., by explosion on Oct. 5.

Uncovering Enemy Property

At the request of the Alien Property Custodian, A. Mitchell Palmer, the attention of the mining public is called to that section of the Trading With the Enemy Act which provides that all money or other property held by, for, or for the account of, or the benefit of, an enemy or the ally of an enemy should be immediately reported to the Alien Property Custodian's office, in Washington. This refers also to patents, trade-marks, copyrights, prints, labels and designs. In connection with the last named, the following persons are required to make report to the Alien Property Custodian:

All persons who are in any manner interested in the use or operation of any enemy-owned patent, trade-mark, copyright, print, label, or design, including joint inventors, where one of the inventors is an enemy within the provisions of the Trading With the Enemy Act.

Assignees of an undivided part or share of an invention, or right to carry on a process or operate under a trade-mark, copyright, print, label or design within and throughout a specified portion of the United States, when such patent or process is enemy owned.

Mortgagees and licensees of enemy-owned patents, trade-marks, copyrights, prints, labels or licenses.

The above include guardians, executors and administrators. Any information regarding the enemy interests in any patents, trade-marks, copyrights, prints, labels or designs should be forwarded immediately to Francis P. Garvan, director of the bureau of investigation, Alien Property Custodian's Office, Washington, D. C., even if the information is only gossip or rumor. Oftentimes a clue to important enemy interests is obtained in this way. The money of enemies thus uncovered is invested in Liberty bonds, and is made to fight for the country, instead of against it.

Acid Prices Agreed Upon

The price-fixing committee of the War Industries Board announced on Sept. 26 that, subject to the President's approval, the following maximum prices were agreed upon at a meeting between the manufacturers of sulphuric and nitric acid and the price-fixing committee, held on Sept. 26, these prices taking effect Sept. 30, 1918, and expiring Dec. 30, 1918:

Sulphuric acid, 60° B., \$16 per ton of 2000 lb.; sulphuric acid, 66° B., \$25 per ton of 2000 lb.; sulphuric acid, 20% oleum, \$28 per ton of 2000 lb. These prices are f.o.b. manufacturers' works in sellers' tank cars. All strengths less than 66° B. are to be calculated from the price for 60° B. All strengths above 66° B. (93.2% H₂SO₄) are to be calculated from the price for 66° B. In carboys, in carload lots, ½c. per lb. extra. In carboys, in less than carload lots, ¾c. per lb. extra. In drums, any quantity, ¼c. per lb. extra.

Nitric acid, 42° B., 8½c. per lb., f.o.b. manufacturers' works in carboys. In carboys in less than carload lots ¼c. per lb. extra. There shall be no additional mixing charge for mixed acids, same being figured on the acidity content.

The above ruling was changed by the board on Oct. 4, when it made the following announcement:

The price-fixing committee of the War Industries Board wishes to modify its ruling Sept. 26, so as to read "The maximum prices for acid below 92% H₂SO₄ shall be figured on the price for 60° B. sulphuric acid, and above 92% H₂SO₄ on the basis of 66° B. sulphuric acid."

Influenza Must Be Stamped Out

Appropriation by Congress of \$1,000,000 to enable the U. S. Public Health Service to help combat influenza indicates how serious the present epidemic may become if it is not speedily put down, says *Engineering News-Record*. Engineers and contractors responsible for groups of men, large or small, should inform themselves immediately as to both precautionary and combative measures, which they can readily do by appealing to their local or state health authorities or to the U. S. Public Health Service. In some localities engineers may need to inquire whether their local health authorities are alive to the situation. At this crucial moment our armies and our war industries must not be crippled through any lack of ordinary, or, if need be, extraordinary, health precautions. A duty rests on each individual, as to himself, his immediate associates and his community.

Copper Imports Ruling Changed

The War Trade Board ruling affecting the importation of copper ore has been modified to permit the importation of copper concentrates containing 50% or over of copper from non-enemy countries, instead of 60% or over, as in the former ruling. The previous restriction prohibiting the importation of ore, except from Cuba, Canada, or Mexico, and of copper concentrates containing less than 50% of copper, except from the above countries, remains in force. There is no restriction upon the importation from any non-enemy country of copper matte, blister copper, or copper concentrates containing 50% or more of copper.

Garfield Starts Coal Drive

To avert a coal famine this winter and meet all the needs of the war program, Fuel Administrator Garfield launched a drive on Sept. 30 for coal production to continue until Apr. 1. In a proclamation Dr. Garfield calls upon operators and miners to produce 12,234,000 tons of bituminous coal and 2,030,000 tons of anthracite every week. This tonnage, he promises, will give the country all the coal needed this winter. It represents a weekly increase of 1,731,000 tons of bituminous and 121,000 tons of anthracite over the weekly production averages of the corresponding period of a year ago.

The increase in bituminous production called for is approximately 16½% and that in anthracite, 6½%. It will be seen that the more urgent demand is for the speeding up of bituminous production.

Would Confiscate German Profits

The enactment of a law by Congress to confiscate the German-owned industrial plants in the United States at the end of the war, as well as the profits earned by them, was urged by A. Mitchell Palmer, Alien Property Custodian, in a Liberty Loan address in Baltimore, Md., recently.

"I would divorce utterly and forever all German capital from American industry," said Mr. Palmer. "I have watched these great enemy corporations under my management earn enormous profits, growing out of the very war conditions for which their owners and their owners' friends in Germany are directly responsible, and I face the possibility of piling up these inordinate profits for distribution after the war to the very persons to whom under the circumstances it would be unmoral and unconscionable for them to go. The Government finds itself with a large organization at its own expense preserving property which was placed here originally as a hostile act, looking to the conquest of America."

After the War

Conditions after the war are discussed in a recent issue of *Financial America* by A. Barton Hepburn, chairman of the advisory board of the Chase National Bank, of New York. This may be done with safety now, according to Mr. Hepburn, because none of the nations now neutral would be a deciding factor should they join either side.

"When peace comes the work in all plants making guns, munitions or essential war goods of any kind

will stop," says Mr. Hepburn. "The labor thus engaged will be thrown out of employment, and at a time when the high cost of living will be at the peak. The Government will cancel all contracts for the manufacture of war material, as it has a right to do. The manufacturers will, by the terms of their contracts, have a claim upon the Government because of such cancellations. They will have a claim not only by the terms of their bargain with the Government, but morally and equitably as well. Claims against the Government are proverbially slow in adjustment. In order to prevent such manufacturing concerns from going into bankruptcy, and in order to enable them to shift their line of manufacturing and seek new markets, in order to prevent the non-employment of labor at a crucial time, and in order to prevent a general business cataclysm, the Government should now prepare for that eventuality which is sure to come and be prepared speedily to adjust all contracts.

"In the light of this war's experience, there should be a revision of our tariff laws, our economic laws, especially with reference to credit, currency and banking, and our laws with reference to transportation both on land and sea."

Norway's Iron Industry Lags

Of a total of 191,500,000 crowns invested in new enterprises in Norway in 1917, according to a consular report, 10,150,000 crowns was invested in coal mines; 36,367,000 in the metal industry and mechanical works; 16,232,000 in metallurgy; 25,171,000 in chemical industries; and 5,500,000 crowns in the mining industry. One crown equals \$0.268 at the normal rate of exchange. At the end of 1916, less than 67,000,000 crowns was invested in metal industries and mechanical works, so that in 1917 the capital increased 54%. Compared with these figures, the interest shown in the iron industry is not great, which has caused some concern and is being considered by a special committee.

Roads Operated Economically

Railroads under common management this year have hauled approximately the same amount of freight as last year, with less actual train movement, owing to re-routing and fuller loading of cars. This was shown in the Railroad Administration report on freight-train operation for the year up to June 1.

In the five months' period, the number of tons of freight hauled one mile was 154,000,000,000, as compared with 155,000,000,000 last year. The apparent reduction this year was caused partly by new methods of reporting. Reports showed the number of miles traveled by loaded freight cars, considering the movement of one car one mile as a unit, was 5,903,000,000, as compared with 6,456,000,000 last year. The hauling of empty freight cars was cut down 44,000,000 car miles.

Railroads had 30,791 locomotives in service on June 1, as compared with 30,321 a year before. This was in addition to 4555 locomotives awaiting repairs in shops. There were 2,418,000 freight cars in service, or 130,000 more than last year. A tendency to reduce the miles covered by trains in a day also was reflected in the administration's report.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

War-Minerals Bill Signed

The War-Minerals Bill was signed by President Wilson on Oct. 5. Thus, after more than a year of effort, a measure of Governmental control over certain minerals has been obtained. The signature which made the bill a law was affixed in the President's private study in the White House, in the presence of Senators Henderson and Walsh and the correspondent of the *Engineering and Mining Journal*. As he wrote his name the President said: "I am very glad indeed to sign this bill." Senators Henderson and Walsh took advantage of the opportunity to call the President's attention to the seriousness of the gold situation. The President was well informed on the subject; and several minutes were spent in discussing it.

To Control Price of Pig Tin

The Inter-Allied Tin Executive, which will carry out the terms and agreements of the Inter-Allied Pig Tin Pool recently arranged in London, will control the buying price of pig tin in each producing market, it is announced by the War Industries Board. The latter board will control the prices and terms under which the pig tin is to be sold to the domestic users and dealers.

Preliminary to the issuance of licenses to the users and dealers in pig tin, an inventory of stocks on hand and contracts unfilled by the 2000-odd individuals and plants affected is being made by the tin section of the War Industries Board. If necessary, there will be a redistribution of the stocks on hand to equalize them according to essential uses. Other details of the tin-control plan have already been announced in the *Journal* of Sept. 21 and of Sept. 28.

Mexican Mineral Statistics

According to data compiled by the Department of Industry, Commerce and Labor of Mexico for the year 1917, the production of Mexican mines was as follows: Gold, 5788 kilos; silver, 648,684; copper, 141,528; lead, 26,769; zinc, 3388 and antimony, 2140 kilos. The following data have also been published:

There are in Mexico 25,063 mining properties, totaling 330,641 pertenencias. The gold and silver mines are most numerous, numbering 9840. Silver mines number 5804; lead and silver, 4281; and gold 1800. One mine produces jacinth; nine mines produce opals; one mine produces bismuth; two properties produce rock salt; 53, sulphur; 39, manganese; two, molybdenum; one mine produces fluorspar and 119 mines produce mercury.

The State of Mexico occupied the first place in gold production in the last year, having produced 2124 kilos 737 grams of the metal; Hidalgo was next, with 1855 kilos; and, though in former times it was famous for its output of gold-bearing ores, Guanajuato produced only 9 kilos of gold. Hidalgo took first place in the production of silver, with 336,160 kilos in 1917; Aguascalientes is next, with 103,252 kilos.

In the production of lead the State of Nuevo Leon occupied first place, with 11,308 kilos, Durango following, with 6099 kilos. Zacatecas produced zinc in 1917 to the extent of 3388 kilos, and San Luis Potosi was the highest producer of antimony for the same year, with an output of 2140 kilos.

Chromite Output Meets Needs

The stimulation of domestic production of chromite, which was undertaken in order to provide domestic supplies to take the place of ores hitherto imported and which were cut off in order to save shipping for military purposes, has been successful beyond all expectation, and has demonstrated that there are abundant supplies of chromite in the United States, and that this country would be self-sufficient for several years in this respect, if need should arise. At the same time, measures for conserving chromite that were undertaken with great energy have likewise met with success, with the result that the estimated requirements of this mineral for 1919 fall short of those estimated for 1918. This stimulation is the result of campaigns carried on jointly by the Government departments, including the War Industries Board, the Shipping Board, and the Department of the Interior, and the commercial interests involved.

There is now no shortage whatever of chromite, and the question of the future market has begun to absorb the attention of domestic producers. The matter has been taken up vigorously by the Government departments interested and by consumers of chromite, with the purpose of securing the most satisfactory adjustment possible. As a result of conferences in Washington, the following announcement has been made by the War Industries Board in a telegram sent to San Francisco to Albert Burch, of the U. S. Bureau of Mines, who represented the Bureau in the conferences:

It may be announced that it is the present intention of the War Industries Board to arrange for continued chromite production in the United States for the first half of 1919 at a rate proportionate to the 1918 production, and the trade will be asked to purchase chromite produced in the United States during the first half of the next year at this rate.

The industry on the Pacific Coast developed rapidly during the last summer, and the erection of concentrating plants and the building of roads assure a more economical production.

Remelters of secondary aluminum conferred recently with Pope Yeatman, the head of the non-ferrous section of the War Industries Board. They were unable to agree whether or not it is best to have a price fixed on their product. It was decided to appoint a war service committee to represent the industry and to report later to Mr. Yeatman. The latter has sent a questionnaire to the remelters and to dealers, which asks as to the volume and character of their business.

Help Wanted

Save your breath and help win the war! We are saving almost everything else; let us start in on the air. More action is wanted and less words—more givers to the Comfort Fund for the 27th Engineers. Send in your check and feel the *esprit de corps* trickle down your spine. There is a mining regiment on the map, and that map is France. Never heard of it and the Comfort Fund, you say, or else you'd have come through before? Your check will be ample apology. He gives twice who gives quickly.

HOW THE COMFORT FUND STANDS

Previously acknowledged	\$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eulich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	10.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	25.00
Richard McCarthy	100.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
G. M. Colvocoresses	25.00
Charles Le Vasseur (monthly)	5.00
A. H. Wethey	25.00
S. Ford Eaton	25.00
H. H. Hunner	5.00
N. G. Thomson	25.00
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.00
Glen Miles	25.00
J. B. Wilmarth	25.00
Frederick MacCoy	5.00
Balance of a certain Joplin contribution received through Lieut.-Col. Gilmore	590.36
H. V. Croll	5.00
American Zinc Institute	100.00
Thomas H. Leggett	15.00
W. F. Pyne	10.00
Earl B. Crane	5.00

Hiram D. McCaskey	10.00
E. F. Salisbury	10.00
W. P. Ross	5.00
Edwin E. Chase	10.00
"Gum Tree," check for £20	94.80
Alex G. Keiller	10.00
H. Sontag	5.00
Total	\$18,492.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Chronology of Mining, September, 1918

Sept. 1—Opening day of American Institute of Mining Engineers' meeting at Denver, Colo.—Mining and industrial machinery exempted from import duty in Mexico.

Sept. 2—War-Minerals Bill reported to the Senate.

Sept. 3—John D. Ryan resigned as president and director of the Anaconda Copper Mining Co., for the period of the war, to become Director of Air Service—Benedict C. Crowell, First Assistant Secretary of War, appointed Director of Munitions.

Sept. 5—International Gold Conference at Spokane, Washington.

Sept. 9—New list of preferred industries issued—Sale of gold, excepting to those holding priority orders, forbidden by the Director of the Mint.

Sept. 11—War-Minerals Bill passed by the Senate.

Sept. 12—Registration day for selective draft—Orenstein-Arthur Koppel Co. plant sold to Pressed Steel Car Company.

Sept. 16—Opening day of seventh annual meeting of National Safety Council at St. Louis, Missouri.

Sept. 17—First furnace of Anaconda's ferromanganese plant put in operation.

Sept. 18—Conference on iron and steel prices between general steel committee and War Industries Board at Washington.

Sept. 23—Opening day of Fourth National Exposition of Chemical Industries at Grand Central Palace, New York.

Sept. 24—Eight-hour day adopted by U. S. Steel Corporation, effective Oct. 1.

Sept. 28—Opening of Fourth Liberty Loan campaign.

Sept. 30—Regulations for licensing platinum issued.

Government To Make Sulphuric Acid

The Government will build and operate a sulphuric acid plant at Emporium, Penn., and another at Mount Union. The cost of the plants will aggregate \$3,000,000. The Emporium plant will consist of eight units on a site selected on Driftwood Creek, close to the plants of the Aetna Explosives Co. and the Emporium Iron Co. In the event that sufficient power cannot be obtained from the plant of the iron company, a 1000-kw. power plant will be erected. The estimated cost of this plant is \$2,000,000.

The Mount Union plant will be erected adjacent to the plant of the Aetna Explosives Co. Twenty acres of land has been purchased at \$56 an acre. The contract has been awarded to the Leonard Construction Co. Preparation of all plans and specifications, in addition to the supervision of the work, will be under the direction of the construction division of the Ordnance Department.

Special Mining Industry Committee for the Liberty Loan

The names of the members of the special Mining Industry Committee for the Fourth Liberty Loan and the list of subscriptions received by them up to Oct. 1 were published in the *Journal* of Oct. 5. The total amount reported was \$8,336,600. Since then the following subscriptions have been received up to and including Oct. 8, bringing the total to \$22,042,850, or about 55% of the committee's quota of \$40,000,000:

Kennecott Copper Corporation.....	\$1,000,000
Canada Copper Corporation, Ltd.....	25,000
Willard S. Morse.....	15,000
Employees, United Metals Selling Co.....	13,700
C. L. Constant Co.....	10,000
Sidney J. Jennings.....	1,000
Justice Grugan.....	500
Homer L. Carr.....	500
Utah Copper Co.....	3,000,000
Nevada Consolidated Copper Co.....	1,000,000
Ray Consolidated Copper Co.....	1,000,000
Chino Copper Co.....	1,000,000
Butte Copper and Zinc Co.....	300,000
Cleveland H. Dodge.....	250,000
Howe Sound Co.....	200,000
El Potosi Mining Co.....	200,000
Utah Southern Mining Co.....	5,000
Benjamin B. Lawrence.....	1,000
Walter Douglas.....	30,000
Archer E. Wheeler.....	4,000
William Braden.....	25,000
N. Y. & Honduras Rosario Mining Co.....	100,000
Copper Canyon Mining Co.....	10,000
Robert E. Safford.....	1,000
Donald C. Brown.....	2,000
John Hays Hammond.....	25,000
W. B. Devereaux.....	2,000
Lewis N. Kramer.....	50,000
Robert Mulford.....	1,200
Pierce & Skogmark.....	4,000
John C. Montgomery.....	500
J. R. DeLamar.....	500,000
Guanajuato Consolidated Mining and Milling Co.....	5,000
Michigan Copper Mining Co.....	50,000
Wolverine Copper Mining Co.....	60,000
Mohawk Mining Co.....	150,000
Butte & Superior Mining Co.....	500,000
International Nickel Co.....	1,000,000
Ruhm Phosphate Mining Co.....	10,000
Metals Trading Corporation.....	200,000
Felix A. Vogel.....	5,000
Florence Iron Co.....	10,000
Bates Iron Co.....	10,000
Mrs. Sophie Bondy.....	1,000
Yukon Gold Co.....	50,000
Yukon Alaska Trust.....	100,000
R. M. Atwater, Jr.....	1,000
A. O. Schoonmaker & Co.....	2,000
A. D. Mackay.....	500
Lawrence Addicks.....	3,500
Rowland W. Cox.....	1,000
American Cyanamid Co.....	350,000
American Trona Co.....	60,000
T. H. France.....	1,000
Two anonymous subscribers.....	526,000
Tonopah Extension Mining Co.....	50,000
Consolidated Interstate Callahan Mining Co.....	50,000
Miss McMillan.....	500
St. Lawrence Pyrites Co.....	5,000
New Jersey Zinc Co. (additional).....	69,000
Guggenheim Brothers.....	1,000,000
Adolph Lewisohn & Sons (additional).....	550,000
Consolidated Copper Mines Co.....	70,000
Butte & Ely Copper Co.....	30,000
Empire Smelting Co.....	5,000
G. L. Carlisle, Jr.....	3,000
Ten subscriptions of less than \$500 each.....	1,350
Total previously reported.....	8,336,600
Grand Total to Oct. 8.....	\$22,042,850

The committee covers the following classifications: Assayers and refiners; metals; mica; mining agents and brokers; mining companies; mining engineers; minerals; smelters; zinc.

Imperial Mineral Resources Bureau

At the imperial war conference last year it was agreed that it was desirable to take steps to set up an imperial mineral resources bureau, says *Iron and Coal Tr. Rev.*, which should be charged with the duties of collecting information from the appropriate departments of the governments concerned, and from other sources, regarding the mineral resources and metal requirements of the

empire; and of advising from time to time what action, if any, may appear to be desirable to enable such resources to be developed and made available to meet the metal requirements of the empire. Accordingly a special committee, under the chairmanship of Sir James Stevenson, was appointed to examine this proposal and to report upon the duties and administrative responsibilities of the proposed bureau. The committee defined the duties of the bureau as follows:

1. To Collect, coördinate and disseminate information as to resources, production, treatment, consumption, and requirements of every mineral and metal of economic value.
2. To ascertain the scope of the existing agencies, with a view ultimately to avoid any unnecessary overlapping that may prevail.
3. To devise means whereby the existing agencies can, if necessary, be assisted and improved in the accomplishment of their respective tasks.
4. To supplement those agencies, if necessary, in order to obtain any information not now collected which may be required for the purposes of the bureau.
5. To advise on the development of the mineral resources of the empire or of particular parts thereof, in order that such resources may be made available for imperial defense or industry.

After consideration of the report of this committee, the government instructed the Minister of Reconstruction, in consultation with the Secretaries of State for the Colonies and India, to take the necessary action to give effect to the recommendations of the imperial conference and the findings of the committee. Detailed proposals were accordingly submitted to the Dominion and Indian governments, who nominated their representatives on the governing body of the bureau, and the general scheme of the bureau has now been finally ratified by the imperial conference.

The bureau will be incorporated by royal charter, and the governing body, which will be under the presidency of the Lord President of the Council, will consist of the following gentlemen:

Sir Richard Redmayne, chairman; Dr. Willet G. Miller (nominated by the Canadian government); W. S. Robinson (nominated by Australia); Thomas Hutchinson Hamer, of the High Commissioner's Office (nominated by New Zealand); W. P. Schreiner (nominated by South Africa); Lord Morris (nominated by Newfoundland); R. D. Oldham (nominated by India); and J. W. Evans (nominated by the Secretary of State for the Colonies).

The following were named by the Minister of Reconstruction, in consultation with the Institution of Mining and Metallurgy, the Institute of Metals, the Iron and Steel Institute, and the Institution of Mining Engineers: W. Forster Brown; Prof. H. C. Carpenter, president of the Institute of Metals; Dr. F. H. Hatch, member of mineral resources advisory committee of the Imperial Institute; Sir Lionel Phillips, lately director of the mineral resources development department, Ministry of Munitions; Edgar Taylor, ex-president of the Institute of Mining and Metallurgy; and Wallace Thorneycroft, president of the Institution of Mining Engineers.

Arnold D. McNair has been appointed secretary, and to him all communications regarding the bureau should be addressed, at the Imperial Mineral Resources Bureau, Holborn Viaduct Hotel, London, E. C., England.

Colorado Mining Districts—In 35 counties of Colorado, according to the U. S. Geological Survey, there are more than 132 mining districts. In five the predominant metal is unknown, in one zinc is the most important product; in one iron, in eight rare metals, in 60 gold, in 21 silver, in 20 copper, and in 16 lead.

Editorials

What After the War?

THE Great War is drawing toward its close; and a victorious close it will be. Every kind and honest heart is rejoicing that the suffering of Europe's people will not be prolonged much further. But with the prospect of peace within a year, our thoughts are bound to turn to the changes in economic conditions that are impending. The problem is so confused and complex that there is no one who is able clearly to forecast events. The best minds are almost as much in the dark as they were in August, 1914. We say "almost" rather than "quite," for without any doubt we have learned during the last four years to think more broadly and with better knowledge of fundamental factors than we used to.

We can see, for example, that the great underlying factor is labor. We have suffered from shortages of material, and concomitantly high prices, owing to lack of men enough to get it out of nature's stores; nor have we had sufficient time to provide adequate mechanical power to replace the deficit of man-power. We could not make the necessary war material and at the same time manufacture the former supply of peaceful material, and therefore we have had to forego the latter. Not only have we had to deprive ourselves of many very desirable things, but, also, we have had to deplete the stocks in warehouses and retail stores. When the War Industries Board boasts of saving leather, rubber and paint by reducing the number of sizes and shades that may be manufactured, it does not mean that it saves any consumption of those things, but simply that it reduces the stock that dealers previously had to carry. As soon as dealers can obtain supplies freely again, they will naturally stock up, and there will furthermore be a great demand for and consumption of all things for delayed work. Similar conditions will exist in Europe, besides which there will be the immense demand for material for reconstruction in devastated areas. These premises, which appear reasonably safe, indicate a strong demand for raw materials, and especially the metals.

But it does not follow that such a demand will develop immediately upon the coming of peace. On the contrary, we must inevitably contemplate a period of readjustment, and much will depend upon how things are handled during that period. The governments will undoubtedly possess large reserves of metals at the termination of the war. Will they resell those supplies, or will they reserve them for national use in reconstructions and improvements? How long will it take private contractors who have converted their machine shops into shell factories to get back to their ordinary industrial basis? What is going to become of the swollen, congested populations of Bridgeport and similar places when their present occupation ceases abruptly? It is easy to foresee that such necessary changes

will produce dislocations that will curtail temporarily the consumption of raw materials. Manifestly such dislocations will be irregular.

We are not among those who look for the arrogance of labor to continue unabated. Labor supply will continue to be short, considering the broad needs of the world, but there will no longer be the pressing need of granting labor's every demand lest the great cause be jeopardized. We shall continue to build ships, locomotives and other things in great quantities, but when on a commercial basis, and when time is not so vital, the employer may talk more upholdingly to his men, and the day will come when 15 will not have to be hired to do the work of 10. This will in itself ease the labor supply, as will the migration of thousands from the munition factories. Even if basic commodity prices undergo no alteration, there is a large lost-motion between the increase in the cost of living, measured by the factor of about 1.5, and the increase in the rate of wages, measured by the factor of about 2. In other words, wages should go down faster than commodity prices. We may look, moreover, for the abolition of Governmental price-fixing to let play once more natural factors that will be salutary.

Many changes of these kinds will institute themselves before the troops begin to come home. Their return will introduce new conditions that as yet nobody can well forecast. It is certain that many of these men will have experienced such alterations of habit and thought during their life in the field and in the trenches that they will not be willing to return to their former occupations. They will be far more used to mechanical work, and their whole outlook upon life will have been changed. In such ways did the men of this country become different after the Civil War. Who will venture to prognosticate what the veterans of the Great War will do?

But there seems to us to be a fundamental, far-reaching economic condition ahead of us that will eventually dominate everything else, and that is the net loss of man-power. The world will have more work than ever to do and will have fewer men to do it with. Every country of Europe and North America will be staggering under a tremendous load of debt; some more than others. How are they going to carry and discharge those loads except by increasing the efficiency of their depleted man-power by means of mechanical power? For examples, imagine the national electrification of Great Britain and the more extensive use of hydro-electric power in the United States, which would release men from the collieries, from transportation, and so on down the line, and set them free to build houses, to make machinery for Siberia and China, etc. Whence would come the capital for such colossal undertakings? By national provision. It is hardly conceivable that nations that have been spending many billions annually

in destruction would boggle over a few billions for construction.

Thoughts of this nature cause us to be optimistic respecting the position of the metals after the war, barring the probability of a depression, perhaps a sharp one, during the period of readjustment. All of the metals should be regarded favorably in this view, but not all just alike. Copper is probably in the best position, for the reason that natural demand has been most severely repressed during the last year, and lead probably stands next to copper, for a similar reason. Iron and steel may be slower in responding, and zinc is likely to lag last. Indeed, the zinc producers will probably have to do something to promote their market. So long as we are unwilling to let gold go to the Orient, and until we can exchange goods freely with that quarter of the world, silver ought to keep high.

Chilean Nitrate Technology

THE importance of the Chilean nitrate industry, from the point of view of the United States as well as of Chile, is indicated by the volume of the imports of the salt into this country since the outbreak of the Great War. The urgent need of nitrate for the manufacture of munitions has been evident; and Chilean natural resources have been drawn upon as far as stocks and available shipping permitted.

The plants which are under construction in the South for the production of synthetic nitrate are now nearing completion; and, as soon as they are producing, the country will be independent of foreign supplies. This latter fact will be patent to all who realize that the production of nitrate from the air has passed the experimental stage. Germany is reported to have manufactured 1,600,000 tons of nitrogen products by synthetic processes during 1917; and recent events have shown that what German chemists can do well American chemists can do better.

In the meantime there is increased activity among chemical engineers interested in the Chilean deposits; and the imminence of the output of the synthetic product in the United States has stimulated research in an effort to formulate more efficient and more economical methods of treatment of the caliche, or nitrate-bearing rock, which is found in such large quantities in the southern republic.

A few months ago we published an account of the Gibbs process—an entirely new method of treatment, which, although evolved in English laboratories, has utilized, in its fundamental features, apparatus invented and manufactured in America.

An extensive amount of experimentation is under way in various oficinas, and the American revolving drum filter may also become standard apparatus in some phase of one or more of the new schemes of treatment under consideration. The results of these efforts must be a general improvement in the extraction; and the retreatment of many of the dumps of residue, some of which contain a considerable percentage of nitrate, may be feasible. An alternative and more successful scheme of treatment will inevitably involve consideration of the practicability of operating with higher tonnage in each individual plant; and various economies would result

from the centralization of effort in those districts where important deposits are contiguous. New and improved methods of beneficiation will insure lower costs; and this will lead to the treatment of large tonnages of low-grade material now considered unprofitable, and not included among payable reserves.

There has been a remarkable analogy between the recent history of Chilean nitrate treatment and the metallurgy of gold. In both cases the bugbear was slime at first, on account of the difficulty of effectively removing the water-dissolved nitrate in the one case, and the cyanide-dissolved gold in the other. The chemical engineers of the nitrate pampa evaded the problem. Caliche was collected by expensive methods of handling, which insured that the minimum amount of fine material, often exceedingly rich in nitrate, was rejected in the first instance as untreatable. The slime, or "borra," as it is called, liberated during crushing, was then a considerable source of loss. The crude method of leaching adopted involved a high absorption and retention of rich nitrate solution by the "borra," whereas a proportion of the rock material, being insufficiently ground, was sent to the dump containing unleached crystals. Under these conditions, efficient sampling was almost impossible without an inordinate expense, as the "borra" was discharged in a sloppy condition, and in amount difficult to determine. The coarser product from the leaching vats consisted of material of varying sizes and widely varying nitrate content, so that it was difficult to obtain a true average sample.

The correctness of the final calculations as to the net result of operations at many oficinas was nullified by the fact that the estimate of nitrate in discharged residue was based on determinations of samples which could only be representative by the merest fluke. This being the case, it was often considered a work of supererogation to follow exact methods for computing nitrate content in the final samples, when it was obvious that the samples themselves were not truly representative. The general result was that there was a tendency toward approximations rather than more exact estimates; and technological progress was, therefore, adversely affected.

The cyanide process encountered much the same drawbacks, but all these were speedily overcome; and the treatment of slime has been mechanically perfected to the degree that finely ground, or naturally fine material, is no longer troublesome.

Both industries had their special problems, so that it is, perhaps, not entirely fair to make comparisons, but it is permissible to say that the success attending the combination of chemical, metallurgical, and mechanical improvements in the cyanide process has resulted in what may justly be termed amazing results. These are due in no small measure to the fact that efficient sampling is feasible by simple and inexpensive methods; and that assaying, as carried out in daily routine work, is as nearly accurate as it is possible to conceive. The result is that the brief history of the comparatively new industry is largely an account of difficulties overcome, and of new apparatus invented and perfected to simplify operations and to insure efficient and consistent results.

One instance aptly illustrates the perfection to which

modern wet methods of ore treatment may be carried in the gold-mining industry; and we quote from a report of operations at a well-known plant this year indicating an actual recovery by cyanidation, in bullion form, of nearly 93% of gold from an ore after amalgamation treatment carrying 0.00021%. After cyanidation the residue contained only 0.000015% of the precious metal.

The research and invention of cyanide engineers has benefited a wide circle of technical workers. Apparatus primarily designed for cyanidation work is in extensive operation in the chemical industry. Automatic filters have been adopted for use in a number of plants unconnected in any way with the industry for which they were originally designed. What was known only a few years ago as typical cyanide plant equipment is now being utilized to recover nitrate from Chilean caliche.

In addition to the adoption of such apparatus, it is interesting to note that intensive research in connection with the estimation of nitrate in caliche and other products is being carried on by a metallurgical chemist—J. E. Clennell—whose treatise "The Chemistry of Cyanide Solutions" is the most exhaustive and at the same time the most informative textbook published on the subject. What is more, it is safe to say that it is unlikely to be superseded by any other similar publication. Few other technical authors deserve such a monopoly. In this issue we print an article by Mr. Clennell on "Determination of Nitrate in Caliche and Its Products," which indicates the same thoroughness and is presented with the same clarity of expression which characterized his contributions to the technology of gold and silver.

We feel sure that the results of his work will be beneficial to the Chilean nitrate industry, and we welcome his contribution as a further evidence of the fact that a successful research chemist can effectually diversify his experimentation.

Progress in Lead Smelting

THE article by C. T. Rice in this issue is of special interest to metallurgists who have kept in touch with the development of lead-smelting plants. There is a great difference between the Grant smeltery, which was in operation a quarter of a century ago, and the Idaho smeltery described. Roasting was performed at the Grant installation in hand roasting furnaces, to which were attached fusion boxes. The semi-fused roasted ore was scraped into conical pots and allowed to cool, and then broken up for the charge for the blast furnace. All the charge was handled in small hand buggies, which were wheeled up to the throat of the furnace and their contents tipped in. The charging floor was a busy place, thoroughly filled with thick fumes and sulphur smoke. One left the plant with the thought that although the work was well systematized, a relatively large amount of muscular effort was needed in smelting operations.

We recall the growth in the size of the blast furnace, the introduction of mechanical charging apparatus, the gradual disappearance of the Brückner roasting cylinders, the introduction of Huntington-Heberlein blast roasting, and the replacement of blast roasting by the

Dwight & Lloyd sintering machines. In the last 18 years, the lead smeltery has been perfected until we may compare the modern plant to a machine the parts of which have been correlated and the whole of which moves surely and in synchronism. Manual labor has been greatly reduced, and what is necessary requires less exertion than was needed in the older works. As in the case of modern copper smelting, good mechanical engineering ability, coupled with experience in metallurgical practice, is responsible for the result.

The War-Minerals Bill

THE War-Minerals Bill, which has been under consideration for nearly a year, was signed by the President last week and is now a law. The delay has been immaterial, for the conditions in those minerals whereof there were shortages that it was sought to correct have steadily improved without any Governmental interference. Indeed, the experience of the last six months has proved that no legislation of this kind was necessary, and probably the authorization that has just been given to the Executive will not be used to any great extent, anyhow.

The bill that was introduced in the Senate by Senator Henderson was a great improvement upon that which had previously been passed by the House. Certain amendments that were made on the floor of the Senate, however, did much to muss it up. One of these forbids reselling by the Government at anything less than the purchase price or cost of production. The other limits salaries to the rates commonly paid in the executive departments. The idea of an ordinary executive department going into the markets, inflated as they are at present, to buy ores with the restriction that they may not sell at less than cost provokes a smile. The guiding principle of "safety first" would indicate that the only safety in these circumstances would be not to buy or contract for anything.

BY THE WAY

The following parable is reprinted from the *Wall Street Journal*:

Now it came to pass in the latter days that William the Butcher made war upon civilization. Then Woodrow, ruler of Columbia, summoned his exchequer, called Congress, and said: "Behold, war is here. See to it that I have the sinews. Make sequins as plentiful as the sands of the sea." Then Congress looked abroad upon the land and saw a beautiful grove of palms, and the owner was called Industry. Then Congress said: "Here is where I get the sequins," and he laid upon Industry a tax equal to almost half the product of the grove. Then Industry bowed his face to the ground and said: "Allah be with thee. If Columbia needs it, take all. Yet peradventure the need may be supplied without my ruin. As the fruit ripens I will take it to the market and offer it to those who buy. Do thou be there and exact a moiety from each purchaser, which none will feel and the aggregate will be more than is demanded of me."

But Congress said: "Not so. There is a quicker way." Then he hewed down all the trees, and plucked therefrom so many of the dates as he thought were necessary, and more for good measure. Then said the wise man of the village, called Economist: "How long, think ye, this war will last?" "I know not," answered Congress, "but peradventure it may take years." "And will you come for more sequins?" "Yea, twice every year," replied Congress. "Thou hast cut down the trees," answered Economist, "how then canst gather more fruit?" "Besmillah take me," yelled Congress, "I never thought of that."

Personals

Have You Contributed to the Association of the 27th Engineers?

E. Maltby Shipp has been examining mica properties in New Hampshire.

John W. Mercer sailed for Europe on Sept. 25, to engage in Red Cross work.

George P. MacKenzie, gold commissioner of Yukon Territory, is in Nova Scotia.

E. L. S. Wrampelmeier has legally changed his name to Ernest Lee Swift.

G. D. Van Arsdale has left for the Southwest to carry on metallurgical work in which he is interested.

C. R. Miller, of the Tonopah Mining Co., has returned from a visit to the Mandy copper mine, Schist Lake, Manitoba.

Donald MacArthur, formerly of St. Louis, Mo., is the manager of the Seaboard By-product Coke Co., Jersey City, New Jersey.

P. A. Robbins, managing director of the Hollinger Consolidated Gold Mines, Ltd., of Porcupine, Ont., has joined the forces of the United States for service overseas.

M. H. Newman is studying the geological condition of the Otis property of the Ontario & Colorado Development Co. in the Matachewan gold area of northern Ontario.

Lee O. Kellogg, mining engineer with the South American Development Co., has returned from Ecuador to New York, and expects to remain here about six months.

Martin Burrell, Minister of Mines in the dominion government, is visiting British Columbia, where he will first investigate the question of the production of zinc and lead at Nelson.

Maj. A. S. Dwight, 11th Engineers, is absent from his regiment on leave, having been detailed to engage in metallurgical work in the lead smelting plant at Marseilles, France.

A. P. Watt has been appointed a consulting engineer to the U. S. Bureau of Mines. His special work at present will be in reference to the concentration of pyrite for producing sulphuric acid.

L. R. Thompson, secretary of the Canadian Advisory Council on Scientific and Industrial Research, has resigned that position to become secretary of the Lignite Coal Board, which is being organized to establish a plant in Saskatchewan for briquetting lignite.

Howard Walde Kitson, who recently left the "Journal" staff to accept a commission as ensign, has completed a three-months' course of training at Annapolis and has been assigned to active service. Ensign Kitson stopped in New York while on the way to take up his new duties.

W. D. Matthews, president of the Consolidated Mining and Smelting Co. of Canada, accompanied by C. B. Hosmer, a director of the Bank of Montreal, and Walter O. Miller, district superintendent of the Canadian Pacific Ry., recently visited the smelter at Trail, British Columbia.

Dr. F. W. Farrier, representing the Munition Resources Commission of Canada, and **R. Graham**, assistant professor of mineralogy at McGill University, are making a trip into the heart of the Cascade Range, British Columbia, to inspect mica deposits, discovered by **William Schmock**, who accompanies them.

H. B. Wolcott, of Joplin, Mo., until recently superintendent of the Little Martha mine at Chitwood, in the Joplin district, and **W. A. Stewart**, of the firm of Ruhl & Stewart, of Joplin, have received commissions as lieutenants in the coast artillery after attending the officers' training camp at Newport News, Virginia.

H. R. Van Wagenen, newly appointed general manager of the Canada Copper Corporation, has arrived in Princeton, B. C., from Denver, Colo., and is taking up his residence at the scene of the company's operations at Copper Mountain. **Oscar Laehmund**, the retiring general manager, will spend the winter in Spokane.

Prof. Arthur L. Walker is now back at Columbia University, having been absent on ordnance work since early last June. He has been acting in a supervising capacity for the metallurgical section, inspection division, and during the last four months has visited many munition plants from the Mississippi Valley to the East. He has now been ordered to Columbia by the Ordnance Department, in the capacity of consulting metallurgist, so that he can serve the department whenever called upon.

Obituary

Col. Thomas Ewing, a well-known mining operator of the Pacific Coast, died suddenly in San Francisco recently, aged 80 years.

Eugene L. Steindler, general manager of the Dominion Reduction Co., Ltd., at Cobalt, Ont., died of pneumonia on Oct. 2, in New York, aged 32 years. Mr. Steindler was also a director of the Bluestone Mining and Smelting Co., Yerington, Nev. He was a graduate of Columbia University and a member of the American Institute of Mining Engineers as well as of the Bankers' Club of America.

Societies

Engineers' Club of Northern Minnesota held its regular monthly meeting at Eveleth, Minn., on September 23.

American Institute of Mining Engineers, New York section, met on Oct. 4 at Machinery Club, New York. Those present were addressed by Mark L. Requa on "Gasoline Conservation." A dinner preceded the meeting.

Institution of Mining Engineers (British) held its annual meeting at Nottingham on Sept. 13. The Institution medal for 1917-18 was presented to C. E. Rhodes. The following papers were among those read: "A Method of Determining the Magnetic Meridian as a Basis for Mining Surveys," by T. Lindsay Galloway; "Digest of the First Report of the Mine-Rescue Apparatus Research Committee," by D. Penman; and "The Chance Acetylene Safety Lamp," by W. Maurice.

Industrial News

Hoover Steel Ball Co., of Ann Arbor, Mich., announces the death of its president, **Leander J. Hoover** on September 22.

Mogi & Co., importers and exporters of New York, have moved their export department to 291 Broadway, under the management of **Keizo Nagao**. The firm's general office will remain at 118-120 East 25th Street.

Lakewood Engineering Co., Cleveland, Ohio, has opened new offices in Chicago in the Lumber Exchange Bldg. The announcement is also made that the **Charles T. Topping Machinery Co.** has merged its interests with the Pittsburgh office of the Lakewood company and solicits the continuance of its customers' patronage through the office of the latter company.

Enamel for Mine Equipment. The Enameling and Stamping Corporation, at Second and Webster Aves., Long Island City, N. Y., is equipped for the work of applying coatings of baked-on enamel to mine equipment. Such coatings may be of all kinds of enamel up to 400-600 deg., including transparent rust-proofing, acid-proofing, etc. The company confines its work to finishing or refinishing articles made by other manufacturers.

National Tube Co., Pittsburgh, Penn., calls the attention of engineers to the paper entitled "Preservation of Hot Water Supply Pipe in Theory and Practice," by F. N. Speller, metallurgical engineer, National Tube Co., and R. G. Knowland, of the department of applied chemistry, Massachusetts Institute of Technology. This paper was presented at the annual meeting of the American Society of Heating and Ventilating Engineers in New York in January, 1918, and has been reprinted in pamphlet form from the Journal of the society.

McGraw-Hill Book Co., Inc., 239 West 39th St., New York, has taken over all the publications of the **Clark Book Co., Inc.**, 27 William St., New York. To insure prompt attention, orders for the following titles should be addressed to the McGraw-Hill company, and not to the Clark company, in New York, nor to the Myron C. Clark Publishing Co., 608 South Dearborn St., Chicago, Ill.: **Berg**, "Timber Test Record," 50c.; **Dana and Trimble**, "Trackman's Helper" (new edition of Kindelan's "Trackman's Helper"), \$2; **Gillette**, "Cost Data," \$5; "Economics of Road Construction," \$1; "Clearing and Grubbing," \$2.50; "Earthwork," \$2; "Hand Book of Rock Excavation," \$5; **Gillette and Dana**, "Cost Keeping and Management Engineering," \$3.50; **Haring**, "Law of Contracts," \$4; **Robinson**, "Military Preparedness and the Engineer," \$2; **Taylor**, "Backbone of Perspective," \$1; "Surveyors' Handbook," \$2.

Trade Catalogs

Worm Gearing. Fawcus Machine Co., Pittsburgh, Penn. Pamphlet; 7 x 10; pp. 8; illustrated.

Riley Underfeed Stokers. Sanford Riley Stoker Co., Worcester, Mass. Publication No. 31; 8½ x 11; pp. 4; illustrated.

Crayons. Zelnicker Crayon Works, St. Louis, Mo. Folder; 3½ x 8½; pp. 4; illustrated. Crayons for marking lumber, hot metal, etc.

Rolled Zinc. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3½ x 6½; pp. 4. Describes rolled zinc of ordinary and "Horse Head" grades.

Sand Blast Principles and Data. Pangborn Corporation, Hagerstown, Md. Bulletin No. 50; 8½ x 10½; pp. 8; illustrated. A treatise on sand blasting.

Equipment and Machine Tools. Walter A. Zelnicker Supply Co., St. Louis, Mo. Bulletin No. 247; 3½ x 8½; pp. 16; illustrated. New and second-hand.

Fawcus Herringbone Gears. Fawcus Machine Co., Pittsburgh. Catalog; 9½ x 12½; pp. 16; describes various types of gears and gear drives and flexible couplings.

Steam Shovels, Cars, Locomotives. Walter A. Zelnicker Supply Co., St. Louis, Mo. Bulletin No. 249, September; 8½ x 11; pp. 4; illustrated. New and second-hand equipment.

Shoveling Machines. Myers-Whaley Co., Inc., Knoxville, Tenn. Bulletin; 10½ x 8½; 20 pp.; illustrated. Describes automatic shoveling machines, operated by one man and run either by electricity or compressed air.

Filter Presses for All Purposes. T. Shriver & Co., Harrison, N. J. Catalog; 8½ x 11½; pp. 44; illustrated. Covers all kinds of filter presses for all purposes as well as filter paper, filter cloth and pumps.

Zinc Metals. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3½ x 6½; pp. 4. Describes the qualities and uses of "Horse Head," "Bertha," "Sterling," "Franklin," "White Bronze" and "Nassau" brands of spelter, as well as spiegeleisen and silver-lead bullion.

Zinc Dust. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3½ x 6½; pp. 4. Describes zinc dust of its manufacture, dividing it into two classes according to the method of production. These classes or brands are the "Standard" (or fumed) and "Atomized Zinc" dust.

Zinc Pigments. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3½ x 6½; pp. 12. Describes and classifies the various brands of zinc oxide of its manufacture under three heads, namely, pharmaceutical zinc oxide; French or indirect process zinc oxide; and American or direct process zinc oxide. It also describes lithopone and ochre.

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.

Manganese Dioxide, Process of Separating From Its Ore. Leroy E. Sowers and Preston S. Phillips, Livermore, Calif. (U. S. No. 1,277,144-145; Aug. 27, 1918.)

Metallurgy—Method of Reducing Metallic Compounds. John J. Boericke, Merion, Penn. (U. S. No. 1,277,034-035; Aug. 27, 1918.)

Metallurgy—Process of Obtaining Metals from Metallic Oxides. Oliver B. Dawson, El Paso, Tex., assignor to Dawson Metallurgical Furnace Co. (U. S. No. 1,277,047; Aug. 27, 1918.)

Oil Shales—Apparatus and Process for the Extraction of Hydrocarbon Materials. Alexander M. Boyle, Reno, Nev., assignor to Crane Shale Oil Corp., Reno, Nev. (U. S. No. 1,276,866-879; Aug. 27, 1918.)

Steel, Method and Means for Annealing. James George Rapid Munday, Kingston-Upon-Hull, England. (U. S. No. 1,277,244; Aug. 27, 1918.)

Tunnel, Method of Constructing Shield-Driven. John F. O'Rourke, New York, N. Y. (U. S. No. 1,277,107; Aug. 27, 1918.)

Tunnel Mold Form. Christian Brynoldt, Pittsburgh, Penn., assignor to Blaw Steel Construction Co. (U. S. No. 1,277,186; Aug. 27, 1918.)

Editorial Correspondence

SAN FRANCISCO—Oct. 1

The Gold Output of various Alaskan camps and Yukon Valley for this year is estimated at 50% below normal, according to a dispatch from Dawson, which quotes Walney Richmond, superintendent of the Northern Commercial Co. His estimate includes the following figures, which have been gathered from various sources: Iditarod, \$1,500,000; Fairbanks, \$1,000,000; Televana, \$900,000; Ruby, \$250,000; Marshal, \$200,000; Hot Springs, \$150,000; Keyukuk, \$140,000; Circle, \$100,000; Rampart, \$30,000. Decline in output is said to be due to lack of men and the fact that much of the ground is of such low grade that it does not pay to work it during a period of high costs.

DENVER—Oct. 2

Yule Marble has for many years been regarded as one of Colorado's choice products and it has won first place in many competitions. The Lincoln Memorial in Washington, the new postoffice building in Denver, and many prominent and beautiful structures throughout the country have been built of this fine stone. Large sums have been expended in the equipment of the quarries in Gunnison County, and the dressing plant at Marble is capable of turning out massive blocks and great columns for monuments or decorative purposes. Engineers and mining men will regret to hear that the property has been sold for taxes, and is about to be dismantled. In view of the present high metal prices, it is probable that much valuable equipment will be removed and sold at a sacrifice, and that rails, wire, and special machinery will go to the junk men. The passing of Yule Marble represents the loss of one of the best advertisements Colorado has had for the last 20 years.

Boards of Advisors in each metal-mining state have been appointed to assist Director Manning in investigating and certifying to appeals for invocation of the furlough privilege. The board of advisors for Colorado includes Fred Carroll, state commissioner of mines, Denver, chairman; Hugh C. Watson, district representative, Leadville; Charles N. Bell, district representative, Telluride; and D. C. Wanamaker, district representative, Cripple Creek. The object of the furlough boards is to protect the metal and non-metallic mineral industries from depletion of man-power, in so far as deferred classification and furloughing of necessary men is possible. In each case where a furlough is requested, the evidence will be investigated, and its justice and correctness attested by the district advisory officer, who will submit the case to the chairman of the board for the state. If the claims are found satisfactory, the chairman will certify to the evidence and forward it to Director Manning, chief certifying officer, for final disposal. George J. Salmon, chairman of the labor committee of the Bureau of Mines, in cooperation with J. E. Spurr, of the man-power conservation committee, will promulgate instructions and rulings for the guidance of the advisory boards.

Metal-Mine Operators of Colorado are giving their labor supply careful study at this time, in view of the danger of indiscriminate recruiting of labor in the state for industries elsewhere. In addition to the loss of several thousand men per month, which is now going on, the draft will probably take a greater number unless definite steps are taken to alleviate the situation. Mining men of the state, especially those who are employers of labor in producing mines, are gathering information, which will be forwarded to the authorities at Washington, with the view of impressing upon the administration the imperative necessity of giving deferred classification to all men now subject to draft employed in metal mining, and to prepare the way for the importation of Mexican miners to the state. The leaders in Washington who appreciate the gravity of the situation will make a concerted effort to avoid the absolute disaster which now threatens the metal-mining industry by reason of the labor shortage. All mine operators are urged to place spe-

cific information regarding their labor conditions in the hands of their representatives as soon as possible, and to use all personal influence for the protection of an industry which is among the most essential for the winning of the war.

SALT LAKE CITY—Oct. 3

The Salt Lake Office of the Federal employment service states that an effort is being made to keep the mines of this section supplied with as much labor as possible. This effort has already helped in a number of cases. Though the Government makes no effort to control the price of labor in the mines and unions have no mine wage scale enforced in the majority of the mines of the state, the market has established the following scale of wages in a natural way, as stated by the Government employment authorities: Leyner machine men, \$5.50 per day; machine miners, \$5.25; hand or single jacks, \$5, and muckers, \$4.75 per day. The prevailing scale for mill and smeltery hands of the common labor class in the mills and smelteries is as follows: Arthur, \$4.25 per day; Magna, \$4.25; Garfield, \$3.65; Murray, \$3.55, and Midvale, \$3.55 per day. Other than common labor is paid for more along the salary line, although it is often figured by the day according to the value of each employee in the particular position in which he acquires skill.

A Committee of Three has been appointed to investigate labor conditions in Utah under the draft law. One of these, J. C. Lynch, was appointed by the Department of Labor at Washington; another member, Charles F. Adams, by the district board of Utah, and the third, A. W. Ivins, represents the Department of Agriculture. The functions of the board will be to investigate the different labor conditions throughout the state brought about by the draft, and the committee will act independently of the district board, but may be called upon to assist in the operation of the draft, giving special reference to industrial and occupational claims for exemption or deferred classification when they are necessary. The committee will visit different industrial managers of the state, and find out their needs and requirements, to prevent, if possible, the taking of valuable industrial men for military service. The committee will also aid in keeping the industries of the state supplied with labor.

Attention of Utah Mining Men is being actively directed toward the proposed amendment to Section 4, Article 13 of the state constitution relating to the taxation of mines and mining property, to be voted upon at the coming election in November. The Utah Legislature at its last session showed undue hostility to the mining industry of the state by passing the joint resolution calling for the amendment through both houses under pressure, without referring it to the Committee on Mines and Mining, and practically without debate. If this measure should become a law, the mines, which are now assessed on their net proceeds, on their surface ground and on their improvements, plus an occupation tax of 3% on their net proceeds will be at the mercy of the state board of equalization, an appointive body, which will have power to tax mines at a value based on some multiple or submultiple of their net annual proceeds; that is, the power of taxation would pass from the regularly elected representatives of the people. Arguments for and against the proposed amendment were filed with the Secretary of State, Sept. 27, and will be prepared in pamphlet form and submitted to the voters. The affirmative argument was presented by Francis W. Kirkham, and claims that mines are taxed at only 20 to 30% of full value, because the net proceeds, which about equal net gains, are taxed, and not the value of the mine. This assertion cannot be proved and merely is an assertion. Also, attention might be called to the fact that mining claims in Utah are assessed at an average of \$21.21 per acre, as against \$13.11 per acre for agricultural acreage, according to the last published report of the state board of equalization. The negative argument was presented by Jesse Knight, of Provo. Among other things, it affirms that the method of taxing mines proposed in the amendment is wrong in

principle, contrary to the theory of American government and should be defeated by voters regardless of political affiliation. To delegate such powers to a board chosen by a partisan Governor, and responsible to him only, would take away the rights of the people, be extremely dangerous, and might result in confiscation of property. The amendment places no limitation on the board of equalization in assessing net proceeds of metal mines. The proposed amendment was not introduced until the last day of the Legislature, and was passed without hearing and without due consideration. It is designed to replace constitutional provisions on taxation framed after due deliberation by a non-partisan convention chosen by the people. Mine owners and operators desire to pay their proportion of all additional revenue necessary to meet the requirements of the state. The proposed amendment would retard development, and would be the beginning of class legislation in the state. "Reduced to plain language, it means constantly increased powers to the board of equalization, who can therefore favor their personal friends and penalize their political enemies. It is taxation without representation in its worst form and invites graft and blackmail." If the proposed method of taxation should be adopted in regard to mines, it would probably set a precedent for taxing other Utah industries, such as sugar manufacture, and it is thought that the people interested in industries other than mining, including the dominant church here, will also oppose the amendment on this account. Every one connected directly or indirectly with mining is being strenuously urged to vote against the measure.

WALLACE, IDAHO—Sept. 23

Chromite Deposits of Eastern Oregon have been investigated by Sidney L. Shonts, mining engineer, of Wallace, Idaho, who visited the district as the representative of the Government. His observations were confined to Grant, Baker and Willowa counties. The principal producers are in Grant County in the vicinity of Canyon City, Prairie City and John Day. Promising discoveries have been made in the other two counties, but as profitable production depends upon the war demand, which is uncertain as to its duration, little is being done in the way of new development and prospecting. The section visited by Mr. Shonts has produced about 11,000 tons of chromite this year, and it is estimated that during the remaining three months of the year this will be increased to 13,000 tons. Mr. Shonts is of the opinion that the Government should fix the price of chrome ore for a definite period, as has been done in connection with other war minerals, as a means of encouraging production. Practically no chrome was produced in eastern Oregon before the war, as the price was about the same as the freight rate, and unless some protection is provided by the Government it is expected that the same condition will prevail after the war.

Hecla Mining Co. paid a dividend of 15c. on Sept. 23, the disbursement being the first since last January, when dividends were suspended in anticipation of the payment of a heavy excess-profits tax. The company is capitalized for \$250,000, having 1,000,000 shares of the par value of 25c. During 1917 Hecla paid in dividends \$1,600,000. In spite of the labor shortage, which has materially reduced the lead production of the Coeur d'Alene district, the Hecla company has maintained normal production. In announcing the current dividend, stockholders were advised that dividends hereafter would be paid quarterly instead of monthly, on the 28th of March, June, September and December, to stockholders of record on the first of the dividend month. Last April the company tendered the Government \$123,000 in payment of its war tax, claiming classification under section 210 of the war Excess-Profits Tax Law. Up to this time the Treasury Department has taken no action on the tender, and Hecla is therefore still "up in the air" regarding the Government's construction of the law and the actual amount that will be demanded, under its provisions. In the annual report for 1917 James F. McCarthy, manager of the Hecla, estimated the ore

reserves in the mine at 1,326,399 tons, and it is probable that these figures represent a fair estimate at this time. The shaft has recently been completed to the 2000 level, and a large station is being cut preparatory to crosscutting to the orebody. The present lowest level is the 1600, and the new level will therefore add 400 ft. of virgin ground, which is expected to be fully as productive as the workings above.

HELENA, MONT.—Sept. 28

Butte Mine Operators were informed by the district exemption board that claims for exemption would be considered individually and not as a class. In making its rulings on various cases, the board stated that it would follow the regulations prescribed by the Provost Marshal and that miners would be considered individually, the same as in other occupations regarded essential and described as "necessary."

JOPLIN, MO.—Sept. 28

Power Shovelers to take the place of shovelers in the zinc mines of the district are to be given a trial. The Golden Rod Mining and Smelting Co. and the Vinegar Hill Zinc Co. both have purchased shovels, and in each case power is to be furnished by electric motors operating underground. The shortage of shovelers is becoming more acute, and companies other than the two mentioned are planning the installation of power shovels should these prove to be successful.

High-Grade Zinc Concentrates have attained a new record for the district at the Quebec mine, which was recently placed in operation near Douthat, Okla. The first five cars of ore were sold to the Fort Smith Spelter Co. and assays for each car were 64.8%, 64.9, 64.9, 65.0 and 65.7% zinc, or an average of 65% metallic zinc for the five cars. This is considered particularly good, on account of its being the first production made at a new concentrator. Moreover, in addition to the high metallic zinc content of the concentrate, it is free of lime and iron and carries only a trace of lead. With only four shovelers working, 156 tons of ore was produced during the last week, the dirt showing a recovery ranging from 11 to 22 per cent.

CALUMET, MICH.—Oct. 5

The Recent Increase in Wages raises the amounts paid to copper miners to the equivalent of what is paid in the munitions and war materials plants. This fact has induced a small number of the old-time miners and trammers to return to the district, but the labor problem is still far from solved, and copper companies are seriously considering appealing to the Government for assistance. At both the Allouez and Isle Royale mines additional battery locomotive tramping equipment is being installed, Calumet & Hecla and Mohawk are planning on further increase of similar equipment, but deliveries by the manufacturers are slow. It is understood that the mining companies will have no difficulty in securing the exemption from the military draft of their skilled or necessary men. Exemptions will be asked for all classes of labor, as it is estimated already 5000 men have left to enter the armies and navies of this country and the Allies. Because of

the high cost and delays in delivery of electrical equipment for tramping, it is probable that some of the companies will install more rope haulage. The Franklin has an excellent system of rope haulage, and this, in addition to its method of intensive mining, has gained wide attention as a reduction factor in both mining and tramping costs. The Ahmeek is the only mine in the district which is using mules for tramping, and the company has few animals. The crooked drifts at most of the properties make impossible the use of the rope haulage system entirely. Copper Range, particularly at the Champion mine, has had good success with trolley locomotives, but they are to be found in few other mines of the district.

TORONTO—Oct. 5

Gold Mining Operators are encouraged in the hope that the government will afford them some measure of assistance, by the recent visit of several officials from the Ottawa mint to Porcupine. The party included J. Bonar, B. Pearson, Gordon F. Dickson, and E. N. Entwistle, and it is understood that their purpose was to obtain first-hand information as to the actual situation at the mines. No official announcement has been made, but the general impression is that any relief granted may take the form of placing gold mines in the preferred class as regards delivery of supplies and perhaps a reduction in taxation.

VICTORIA, B. C.—Oct. 1

The Dominion of Canada Assay Office at Vancouver is now ready for the treatment of platinum and other minerals. The equipment is the only one of its kind in Canada, and includes an electric still, four fume cupboards which are used in the wet process of refining; three balances set on concrete bases, two concussion pulverizers, an electric furnace, and an oxy-acetylene torch.

The Removal of the Present Royalty on the gold output of Yukon Territory is being demanded by companies and placer miners of that district. Consequently Dr. Alfred Thompson, member of the Dominion Parliament for the Yukon, has announced that at the next session he will ask that, as a war measure, the royalty be removed. He thinks that this can be done easily by introducing an amendment to the Yukon Placer Mining Act. Dr. Thompson asserts that his constituents are not requesting too much, in view of the increased cost of mining and the desirability of encouraging the output of gold.

The Establishment of an Analytical Laboratory at some central point in the province is desired by mining men of British Columbia, and an agitation to this end has been in progress for some time. In the hope that his action may induce the authorities to take this step, M. S. Davys, of Kaslo, has offered, through the Kaslo Board of Trade, to furnish a building for such a mill, and it is understood that the municipal authorities will furnish the necessary electrical power. It is admitted that a laboratory of the kind would be of material service to the operators of the southern interior of the province.

Investigation of the Schedule of Charges and the general policy of the Consolidated

Mining and Smelting Co. of Canada toward the operators of British Columbia will probably begin soon. Messrs. Fowler, DeLashmut and Anderson, three prominent mining men of the province, who were nominated by the Associated Boards of Trade as being the proper persons to conduct such an investigation, have accepted their appointment by the dominion government, the latter, apparently, having met their wishes in regard to empowering them to take evidence on oath and also as to providing the finances necessary to enable them to make their work thorough and complete.

The Production of Gasoline in commercial quantities from gas wells in Alberta is possible as the result of investigations of Dr. D. B. Dowling, of the Dominion Geological Survey. At one large gas well, south of Calgary, a plant is already in course of erection for the extraction of gasoline from the gas. It is asserted that tests of the gas after the extraction of the gasoline revealed the fact that the only difference made was a reduction of less than 12% in the heat units. Though the flow of gas at the wells in question is sufficient to meet any ordinary commercial demand, Calgary is supplied from other wells, and, as there is little chance of another franchise being granted, the owners of the former are turning their attention to the production of gasoline. Because of the scarcity of this fuel, the dominion government is conducting a thorough survey of the natural-gas district with a view to increasing Canada's available supply of gasoline.

The Mining Industry of the Kootenay District, with the exception of gold mining, has never been more prosperous, according to Fred A. Starkey, president of the Associated Boards of Trade of Eastern British Columbia. Commenting upon conditions, he said: "Since the outbreak of the war, the silver-lead properties of the Slocan district have been reopened and without exception are doing well. Properties which had been closed down and did not expect to operate for a long time are producing more metal than ever before. Clarence Cunningham is now building a concentrator at Three Forks to serve the properties on the Sandon side of the range. He first obtained the Queen Bess Mine, which, with little work, was made a consistent producer, and now he also controls the Sovereign, Wonderful, Van Roi, Alamo, Idaho, and Wakefield, all of which are producing silver and lead. The Van Roi and Hewitt have their own mills, and the new one will serve the other properties. The plant is to cost about \$150,000. The Rosebery-Surprise Co., at Sandon, has just taken over the Ivanhoe and the Canadian, which are old mines. The Slocan Star is another good property, and work is being continued on a nine-foot vein in the old workings under the management of R. H. Stewart. C. F. Coldwell is working on the old Utica mine, which is now shipping. The Cork-Providence is working to full capacity, and development in this section is greater than ever before. In East Kootenay the Sullivan mine, owned by the Consolidated Mining and Smelting Co. of Canada, is the biggest shipper. Another big producer is the Paradise, at Wilmer."

The Mining News

ARIZONA

Cochise County

DENN-ARIZONA (Warren)—Shaft to be sunk to 1800 level.

Cocconino County

KAIBAB SMELTING COMPANY (Fredonia)—Organized by Cyrus A. Phelps and John J. Kamm, of Los Angeles, for the establishment of a smeltery at a point north of the Grand Canyon.

Gila County

MIAMI COPPER (Miami)—Copper production during September was 5,012,865 pounds.

Mohave County

HACKBERRY (Hackberry)—Shaft down 900 ft. and station being cut. To crosscut to vein.

ANTLER (Kingman)—Shipping copper ore to United Verde Extension smeltery. Property owned by Commercial Copper Co., but has been closed down.

STANDARD MINERALS (Kingman)—Machinery being hauled for new mill.

TWINS (Kingman)—Shaft being sunk to 300 level, where crosscutting will be started to cut vein that faulted below the 100 level.

MCCRACKEN (Signal)—Erecting 100-ton mill for lead-silver ores. Long tunnel has cut orebody.

Pima County

BLACK BESS (Ajo)—Small mill in operation, handling gold and tungsten ore.

NEW CORNELIA (Ajo)—Opening sulphide body and shipping. Drift nearly com-

pleted from 250 level of shaft to gloryhole, where four steam shovels are operating. Large additions being made to leaching plant. Nearly 1000 men employed.

Pinal County

SILVER KING (Superior)—Started Marcy mill that is handling 35 tons a day from a 1000-ton dump. Extraction claimed to be 90%, mainly silver. Richer ore is being shipped.

Yavapai County

HIDDEN TREASURE (Clarkdale)—Operations will start as soon as machinery can be procured. C. W. Bennett is president and general manager.

VERDE SQUAW (Jerome)—Shaft down 66 ft., bottomed in schist and quartz that

show chalcopyrite and bornite. Crosscutting will begin on the 250 level.

Yuma County

RED CLOUD (Yuma)—Mill recently destroyed by fire at a loss of \$100,000.

CALIFORNIA

Calaveras County

UTICA (Angels Camp)—Storage reservoirs have been sold to Pacific Gas and Electric Co. Has been supplying power, light and water to the town for several years, but since chief mining activities have been restricted to the Gold Cliff mine, the large power and light plant has not been so essential.

GWIN (Paloma)—Recent storms caused shaft collar to cave and carry steel headframe into the depression. Plant is being dismantled to be sold as scrap iron and steel, greater part having been already removed.

Eldorado County

A **FEDERAL SMELTERY**, to be built near Sacramento for the treatment of ores in Eldorado and Placer counties, will be asked for by mining men. It is claimed that the development of surface ores carrying copper, gold, silver and other minerals would be aided through such an installation.

CHROME MINERS employed by Fisher & McCurdy have asked the courts for the attachment of a carload of ore in payment of wages. The court turned the matter over to State Council of Defense, which decided that the men will get their wages.

SILICA DEPOSIT at Latrobe developed by W. E. Beck, of Placerville, for shipment to San Francisco, to be used in manufacture of plaster and other surface building material. This is the first silica ordered from this region.

NOONDAY COPPER (Placerville)—To be reopened and developed by E. N. Wilkenson and associates.

ROCKY BAR (Placerville)—Old machinery dismantled and sold to Union Iron Works, San Francisco. Mine now operating with new installation.

CHROME SHIPMENTS from Taylor deposits by W. H. Smith, and amounting to six cars, encourage the development of sulphide ores and the contemplated installation of a treatment plant.

Inyo County

SILVER REEF CAMP, three miles south of Yellow Jacket Springs, is active, and several lessees are mining silver-lead ore. The Blind Springs Hill, Mountain View, and other properties are making good showing. Joe Main, Thomas Dennison, John Meyers, William Welsh, C. O. Clark, Lee Currie, Frank Arcularius, McLean & Cooper and A. B. Davis are all developing high-grade ores.

Kern County

AMERICAN DEVELOPMENT (Brown)—Developing low-grade gold veins. Power to be developed from south fork of Kern River. Situation is about 30 miles northwest of Randsburg.

Shasta County

MAMMOTH (Kennett)—Smeltery production during September is estimated at 1,400,000 lb. of copper.

COLORADO

Teller County

ALPHA AND OMEGA (Cripple Creek)—Sinking to be resumed soon by the Dig Gold Mining Co. Shaft has been sunk to 270 ft. and is to be put down another lift of 100 ft. A supply of shaft timbers is now being shipped to the property. Company contemplates considerable development work from the bottom of the shaft. David Burke is superintendent.

EMMA AIMEE (Cripple Creek)—Mine of Victory Gold Mining Co. leased to John B. Barnes and associates, of Casper, Wyo. Work started on new adit tunnel below the old dump.

REX (Cripple Creek)—Manganese ore has been exposed in several surface openings, and a vein has been opened in a tunnel at a depth 75 ft. below the surface. Crosscutting is in progress from the tunnel to determine the width of the vein. Property of the Rex Gold Mining and Milling Co. is leased to the Lincoln Mines and Reduction Co. Property under option includes the Ironclad, Pard, Magna Charta, Quartzite, and Annex claims, comprising about 25 acres. Leasing company plans the erection of a mill, and ground will be broken soon for the foundation of the first unit. It is stated that machinery for the plant has

been ordered. This discovery of manganese in the Cripple Creek district is not the first, for 12 or 15 years ago manganese minerals were found in the Chicago Tunnel, entering Globe Hill from Poverty Gulch; in the Albany Tunnel, on the northwestern slope of Bull Hill, and in the Dexter mine. The present discovery is the first prominent find of manganese on Iron Clad Hill.

DEERHORN (Victor)—Payable ore opened on Clifford-Green lease, and trial shipment has been made to Golden Cycle Mining and Reduction Company.

GOLD SOVEREIGN (Victor)—New ore-body recently opened on the fourth level by lessees working through the Jackson shaft. Shipments being made to Golden Cycle Mining and Reduction Co. at Colorado Springs.

ZENOBIA (Victor)—West & Co. have leased property and are reopening. Payable ore has been cut by new development work, and shipments are being made.

IDAHO

Shoshone County

NABOB CONSOLIDATED (Kellogg)—Completed winze from Nabob tunnel that provides outlet from two levels.

OLD HICKORY (Mullan)—To develop Hickory mine. Early workings consist of three shafts and a number of open cuts. Oscar Nordquist is president and manager.

KENNAN MINING (Wallace)—Control has been taken over by John A. Percival, of New York, and development is to begin at once.

MICHIGAN

Copper District

SENECA (Calumet)—Diamond drill from 1054-ft. point in shaft shows shot copper in Kearsarge lode rock at a depth of 480 feet.

HANCOCK (Hancock)—High-grade rock still showing in two new eastern lodes.

ISLE ROYALE (Houghton)—Richest rock being hoisted from ground tributary to No. 4 shaft on Isle Royale lode. Twenty tram locomotives are in use at three shafts.

AHMEEK (Kearsarge)—During September produced 93,460 tons of copper rock from three shafts.

MASS CONSOLIDATED (Mass)—Considerable mass copper being mined.

OSCEOLA (Osceola)—During September 90,000 tons of copper rock was mined.

WINONA (Winona)—Has four new openings in the excellent grade of rock. Mill continues to handle product of Winona and Michigan.

UTAH

Piute County

FLORENCE MINING AND MILLING (Marysvale)—New roasting and leaching plant which has been under construction at the mine is nearly completed. Several trial runs have been made on the alunite ore.

MINERAL PRODUCTS (Marysvale)—Mill treating 200 tons of alunite daily and producing up to 40 tons of potassium sulphate. Finished product sold largely to Armour Fertilizer Co. under contract.

Salt Lake County

MONTANA-BINGHAM (Bingham)—During September shipped eight cars of ore, largely low-grade copper carrying some silver and gold, from the Keystone tunnel of the former Fortuna workings. Two cars of lead-silver ore was also shipped. Development done on main tunnel level. Some shortage of labor.

OHIO COPPER (Lark)—Rebuilding of part of mill recently damaged by fire in progress. Considerable activity at Lark. More men wanted for various work.

CARDIFF (Salt Lake)—Thirty-ton mill at foot of second-class ore dumps being operated by M. J. Dailey, lessee, is producing concentrates. Enough ore available to operate till the first of the year.

CANADA

British Columbia

DRUM LUMMON (Douglass Channel)—Building concentrating mill of Gibson type.

MAPLE LEAF GROUP (Franklin Camp)—Has been leased. Considerable development has been done. The Union and Pathfinder mines, of the same district, may also be leased.

GRANBY CONSOLIDATED (Graves Point)—Byproducts plant, now under construction, will be ready for operation in January.

SILVER BELL (Kaslo)—Equipment and supplies being shipped in. R. F. and S. Green are owners.

WOOLSEY GROUP (Revelstoke)—Claims on Silver Creek have been leased, and development is to start immediately. Ore is silver-lead.

DONOHUE MINES (Stump Lake)—Reopened. New machinery and equipment to be installed, including air compressor and drills, with additions to the hoisting plant. John D. Leedy, of Seattle, Wash., is manager.

CONSOLIDATED MINING AND SMELTING (Trail)—Recent fire destroyed Dwight & Lloyd roaster building and resulted in damage amounting to \$40,000.

MINING AND PROSPECTING for platinum on the Tulameen River is active, having been materially stimulated by the interest that representatives of the Geological Survey Branch are taking in the work. The Church Co., of Tacoma, Wash., is extensively developing property on the Tulameen above Bear Creek, having put in a big dam and a 200-yd. flume. Twenty men with three large centrifugal pumps are working the bed of the river over a distance of 700 ft., and recovering platinum and gold. Several smaller outfits are at work, and the government, having established camps at Slate Creek, is sinking test holes on the bars and benches to determine the value of the ground.

Manitoba

MANDY (Schist Lake)—Contract has been let for the hauling of 10,000 tons of copper ore from the mine during the winter.

Ontario

ASSOCIATED GOLD FIELDS (Larder Lake)—Has made a rich discovery of gold at the 500 level.

HURONIA (Larder Lake)—Arrangements have been made to resume mining.

DAVIDSON (Porcupine)—New main working shaft down 400 feet.

MCINTYRE (Porcupine)—Opening up new main haulage level at depth of 1400 feet.

SHUMACHER (Porcupine)—Annual report to be issued soon will cover period from Mar. 31, 1917, to July 31, 1918, during which operations showed small deficit, accounted for by property being closed part of time.

WHELPDALE (Porcupine)—Will resume work.

ADANAC (Cobalt)—Several good silver veins and stringers have been cut at the 310 level.

FOSTER (Cobalt)—Leased by C. L. Campbell and F. Fairburn, and underground work will soon be started. Ten carloads of ore have been shipped from the old dumps, which contain about 13,000 tons, including some of high grade.

KERR LAKE (Cobalt)—Annual report for year ended Aug. 31 shows output of 2,582,933 oz. silver with ore reserves estimated at 1,637,000 oz. Net earnings were \$1,899,804, and surplus was \$1,022,317.

LA ROSE (Cobalt)—Operating sorting plant at the Violet property for recovery of high grade from the new discovery. Shipping mill ore to the concentrator.

MINING CORPORATION (Cobalt)—Investigating properties in British Columbia near Hope; also has an option on the Engineer Gold Mines, in the Atlin district, Northern British Columbia.

NIPISSING (Cobalt)—Has cancelled options on Matachewan properties.

OPHIR (Cobalt)—The Mining Corporation has sunk a 125-ft. winze 15 or 20 ft. from the contact.

SAVAGE (Cobalt)—Shipping daily to McKinley-Darragh mill.

ONTARIO-KIRKLAND (Kirkland Lake)—Has installed an electric plant, and will sink main shaft from 100 to 300 level.

ORR GOLD MINES (Kirkland Lake)—Injunction issued in favor of the minority interests, restraining the completion of the deal for control with the Kirkland-Porphyry Co., has been extended until October 7.

TECK HUGHES (Kirkland Lake)—Work has been resumed.

BOSTON CREEK (Boston Creek)—Suit brought by John Papassimaker, of the R. A. P. Syndicate, against this company having been amicably settled, work on the property will be resumed soon. Negotiations between the company and the R. A. P. Syndicate for the amalgamation of the company are understood to be progressing.

BOSTON GOLD LEAF (Boston Creek)—No. 5 vein, showing free gold, has been stripped for several hundred feet.

PATRICIA (Boston Creek)—Mill closed down on account of fuel shortage.

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
3	4.7550	101½	49½	7	4.7550	101½	49½
4	4.7550	101½	49½	8	4.7550	101½	49½
5	4.7550	101½	49½	9	4.7550	101½	49½

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

Oct.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	N. Y.	St. L.	
3	*26	†	8.05	7.75			8.65
4	*26	†	8.05	7.75			@8.75
5	*26	†	8.05	7.75			8.55
7	*26	†	8.05	7.75			@8.65
8	*26	†	8.05	7.75			8.40
9	*26	†	8.05	7.75			@8.50

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) 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 basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Oct.	Copper			Tin			Lead		Zinc
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.		
3	122	122	137	337½	337½	29½	28½	54	
4	122	122	137	337½	337½	29½	28½	54	
5	...	...	...	...	...	...	...	...
7	122	122	137	337½	337½	29½	28½	54	
8	122	122	137	337½	337½	29½	28½	54	
9	122	122	137	337½	337½	29½	28½	54	

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1515c.; £280 = 59.3939c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Oct. 9, 1918

In such markets as are free, and therefore reflect economic factors, the overshadowing influence this week was the prospect of an early peace.

Copper—The situation is even more acute, owing to increased Governmental demands, while, on the other hand, the production of refined copper each month falls below expectations. The production this month will

be diminished, possibly to the extent of 10 million pounds, by the explosion of an ammunition plant near Perth Amboy on Oct. 5. Some trifling damage was done to the Raritan works, but both Maurer and Chrome escaped injury. However, at each of these plants the men failed to appear for work on Saturday, Sunday and Monday, and the diminished production will be on that account.

Advices from Japan indicate that stocks of copper are accumulating in that country, where the producers are unwilling to sell for delivery to Europe or America at the prices fixed by the United States and Allied countries.

The matter of copper price after Nov. 1 is to be discussed by producers and the price-fixing committee of the War Industries Board on Oct. 23.

Copper Sheets—The base price of copper sheets remains at 35½c. per lb. Copper wire is quoted at 29½ to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—There is no longer any market of any kind. The American Steel Products Co. is now the sole importer for all kinds of tin, Chinese and Banka included. Import licenses for Chinese and Banka tins will not be granted on any other conditions. The Steel Products Co. will attend to the distribution of all lots of tin in excess of 10 tons through the American Iron and Steel Institute. The price and terms will be regulated by the War Industries Board. This eliminates everybody except the Steel Products Co. and the jobbers and dealers in small lots.

An Allied Purchasing Executive.—The following notification was issued on Sept. 5 by the British authorities.

"An Inter-Allied Tin Executive has been established to sit in London to control the price and distribution of tin for the Allies.

The following are the names of the executives and the countries they represent:

"Great Britain: Sir Leonard W. Llewellyn, controller of raw materials department, Ministry of Munitions; W. A. Tennant, tin controller, Ministry of Munitions.

"United States: George M. Armsby, chief of the tin section of the War Industries Board; John Hughes, chairman of the American Steel Institute.

"France: Lieutenant Sauvage.

"Italy: Colonel Riggi.

"The secretarial duties will be carried out by H. A. Buck, the secretary of the London Metal Exchange, who is also a member of the British Tin Control Committee."

Lead—The situation is easier. Production is being maintained, but the easier tendency is due mainly to the success of the Lead Producers' Committee in checking some kinds of consumption.

The Lead Producers' Committee for War Service is now allotting and clearing all carload shipments of virgin lead, both domestic and bonded, refined and antimonial. In order to distribute most equitably the supply of lead remaining after provision has been made for U. S. Government orders, the Lead Producers' Committee for War Service requests information relative to all purchases made during 1915, 1916 and 1917. A card that is to be so filled out as to provide this information has been sent to all buyers.

Following is a list of "chief uses" of lead. Buyers are asked to name one only in the place provided on the card for that purpose: Batteries, brass, bullets and shot, car seals, cable, foil, locomotives, mixed metals, paints and colors, railroad equipment (other than locomotive), retail sales, shrapnel, sheets, pipes, bends, etc., steel mills.

Zinc—The market went off rather sharply from day to day. October spelter is not very plentiful, but there were offers to sell November-December, which was offered freely from a good many quarters. At the close October spelter was freely offered at 8½ and November-December at 8¼, and it was doubtful whether those prices could be realized.

There were some large sales of high-grade spelter at something less than the maximum price.

The American Metal Co. found, owing to the great increase in the cost of smelting, that it was advantageous to itself to surrender its share holdings in the Consolidated Interstate Callahan Mining Co. in consideration of the cancellation of its smelting contract with that company, which was made on ante-bellum terms.

Zinc Sheets—Unchanged at \$15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The market was dull and a little weaker. We quote spot at 14@14½c. October shipments from the Orient were quoted at 13½@13¾c. c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at \$1.50 @ 2 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Strong at \$125@130. San Francisco reports, by telegraph, \$120, steady.

The matter of quicksilver price is to be discussed at a meeting on Oct. 25, between the producers and representatives of the War Industries Board.

Silver and Platinum

Silver—Based on fixed prices, London 49½d. and New York \$1.018½ for 999 fine, considerable business has been done according to Federal Reserve Bank terms and regulations. Shipments to London for the week ending Oct. 5, 1,933,000 ounces.

Pixley & Abell's circular states that the Indian currency returns for Aug. 15 and 22 show a substantial increase in silver coin and bullion. The total amount now held in and out of India, is 2429 lacs, as against 1044 lacs on Apr. 7 last. On Aug. 24 there were in Shanghai 24,500,000 taels of sycee and 14,300,000 Mexican dollars.

Mexican dollars at New York: Oct. 3, 78; Oct. 4, 78; Oct. 5, 78; Oct. 7, 78; Oct. 8, 78; Oct. 9, 78.

Platinum, Palladium and Iridium—Prices fixed at \$105, \$135 and \$175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 5—Blende, per ton, high, \$77.90; basis 60% zinc, premium, \$75; Class B, \$65@60; Prime Western, \$55@50; calamine, basis 40% zinc, \$40@35. Average selling prices: blende, \$53.73; calamine, \$34.45; all zinc ores, \$52.84.

Lead, high, \$105.25; basis 80% lead, \$103@100; average selling price, all grades of lead, \$101.40 per ton.

Shipments the week: Blende, 10,541; calamine, 459; lead, 1742 tons. Value, all ores the week, \$779,890.

Though some blende was sold early in the week at \$55 basis, on Friday only \$52.50 was bid, and some ore was purchased on \$50 basis today. All night work has been suspended at the Eagle-Picher company's mines, which made it possible for several new ones to start and for at least one mine to resume double-shift work. The general tendency is toward a lowering output, owing to the large number of men that have been called from the district, and production will be further restricted as men are called into the service by the draft.

Platteville, Wis., Oct. 5—Blende, basis 60% zinc, highest price reported, \$75.60; base price for premium grade, \$75; base price for high-lead blende, \$52. Lead ore, basis 80% lead, \$97.50 per ton. Shipments reported for the week were 2074 tons blende, 73 tons galena, and 611 tons sulphur ore. For the year to date the totals are 98,752 tons blende, 6001 tons galena and 36,362 tons sulphur ore. During the week 3087 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Reported unsalable.
Manganese Ore—Unchanged.
Molybdenum Ore—No business reported.
Pyrites—Prices of domestic pyrites are determined by negotiation between buyer and seller. Prices range between 28 and 34c. per unit according to location.

Tungsten—The activity in this ore has decreased, although the higher-grade ores are still in demand. High-grade scheelite has sold for \$25 to \$26 per unit and high-grade wolframite for \$25.50 per unit. Low-grade ores are dull, and are quoted at \$19 to \$24 per unit, according to amount and kind of impurity.

Iron Trade Review

PITTSBURGH—Oct. 8

It is believed that October will prove a record-breaking month in steel production. September is known to have shown a substantial gain over August, although the precise figures are not available. The sharp increase in output is attributable in part to the progress of the season, October being always a month of favorable weather, and in part to improvement in the quality of coke furnished the blast furnaces.

No further restrictions have been announced as to the production of any finished steel lines, and the chief conservation work of the War Industries Board is in the direction of reaching agreements with consumers whereby they will use less iron and steel. These agreements are made chiefly with those who are entitled to priorities or have a high place in the preference list, as other consumers would not receive material in any event. Thus the makers of talking machines are advised to discontinue such manufacture entirely by the end of the year. Makers of agricultural implements, who are entitled to B-2 priority, are to consume no more than 75% as much iron and steel in the twelvemonth beginning Oct. 1, 1918, as in the preceding twelvemonth, and this curtailment is expected to save 500,000 tons, the major part being pig iron, which will be reflected in a still greater steel output, as the supply of pig iron has been limiting steel production.

The latest indications are that the economies arranged in the use of steel will be approximately balanced by the additional war requirements that have been coming up, so that it will be impossible to reduce the estimate that fully 23,000,000 net tons of finished rolled steel is needed for the current half year. With production at about 9,000,000 tons in the last three months, and promising to be materially heavier in the current quarter, there will still be a considerable deficit, and the priority system will have to take care of that.

Pig Iron—Blast furnaces report some improvement in the quality of coke received, conducting to heavier outputs, but average quality is still far below former standards. Output in the first half of the year is officially reported at 18,227,730 gross tons, showing a loss of over a million tons from the output in either half of 1917, this being due to the railroad blockade early in the year. Output in the second quarter was at the rate of more than 20,000,000 tons for a half year, and production at present is still heavier. There are practically no market transactions, distribution being in the hands of the pig-iron committee, and new wants arising cannot be satisfied except by securing an allocation from the committee. The market remains quotable as follows: Bessemer, \$35.20; basic, \$33; No. 2 foundry, \$34; malleable, \$34.50; forge, \$33, f.o.b. furnace, freight to Pittsburgh from the Valleys being \$1.40 and from six detached furnaces somewhat less.

Steel—The recent order that unfinished steel may not be sold to a buyer who will resell without advancing the stage of manufacture cuts out the usual merchant operation of middlemen, but it does not appear that it would prevent the middleman acting as a broker, the contract being drawn between producer and consumer and the broker merely receiving a commission from the producer. Scarcely any steel is available in any event. We quote: Billets, \$47.50; sheet bars and small billets, \$51; slabs, \$50; wire rods, \$57.

Ferroalloys—Ferromanganese continues fairly active for first half delivery, but consumers show no uneasiness as to their being fully supplied. We quote 70% ferromanganese at \$250, delivered, with \$3.50 per unit for higher manganese content, and 16% spiegeleisen at \$75, furnace, with rumors of a little shading.

Coke—Coke production continues at a good rate as regards tonnage, and quality is said to be improving. Distribution is now proceeding smoothly. We quote Connellsville at \$6 for furnace, \$7 for foundry, \$7.30 for crushed, over 1-in., and clean screenings from old dumps, over 1-in., at \$5.50, per net ton at ovens, these being Government limits, with no shading.

MONTHLY AVERAGE PRICES OF METALS

Table with columns for Silver, New York, and London prices for 1916, 1917, and 1918. Includes rows for Jan, Feb, Mar, Apr, May, June, July, Aug, Sept, Oct, Nov, Dec, and Year.

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

Table with columns for Copper, New York, and London prices for 1917 and 1918. Includes rows for Electrolytic and Standard, and monthly data from Jan to Dec.

Table with columns for Tin, New York, and London prices for 1917 and 1918. Includes monthly data from Jan to Dec and an average for the year.

Table with columns for Lead, New York, St. Louis, and London prices for 1917 and 1918. Includes monthly data from Jan to Dec and an average for the year.

Table with columns for Spelter, New York, St. Louis, and London prices for 1917 and 1918. Includes monthly data from Jan to Dec and an average for the year.

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Table with columns for Pig Iron, Bessemer, Basic, and No. 2 Foundry prices for 1917 and 1918. Includes monthly data from Jan to Dec and an average for the year.

† As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

Large table of stock quotations for N.Y. EXCH., BOSTON EXCH., SAN FRAN., and TORONTO. Lists various companies and their stock prices.

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

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

	Large Mill Lots		St. Louis	Chicago	San Francisco	—New York—	
	Pittsburgh	Louis				Current	One Yr. Ago
Blue Annealed							
No. 10	4.25	5.52	5.52	6.50	5.495	9.50	
No. 12	4.30	5.57	5.57	6.55	5.545	9.55	
No. 14	4.35	5.62	5.62	6.60	5.595	9.60	
Black							
Nos. 18 and 20	4.80	6.32	6.32	7.40	6.295	9.80	
Nos. 22 and 24	4.85	6.37	6.37	7.45	6.345	9.85	
No. 26	4.90	6.42	6.43	7.50	6.395	9.90	
No. 28	5.00	6.52	6.52	7.60	6.595	10.00	
Galvanized:							
No. 10	5.25	6.97	6.97	8.05	6.845		
No. 12	5.35	6.97	6.97	7.95	6.795		
No. 14	5.35	6.97	6.97	8.10	6.945		
Nos. 18 and 20	5.65	7.17	7.17	8.25	7.245	11.40	
Nos. 22 and 24	5.80	7.32	7.32	8.40	7.295	11.55	
No. 26	5.95	7.47	7.47	8.55	7.445	11.70	
No. 28	6.25	7.77	7.77	8.85	7.745	12.00	

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	\$55.00	\$38.00	\$65.00	\$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb.	3.134*	83.00	3.134*	68.00
Light rails, 12 to 14 lb.	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb.	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, 1/2-in. and larger	\$3.90	\$5.00	\$4.50	\$5.30	\$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars	3.25	3.65	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	—New York—		St. Louis	Chicago	San Francisco	Dallas
		Current	1 Yr. Ago				
Beams, 3 to 15 in.	\$3.00	\$4.245	\$5.25	\$4.27	\$4.27	\$5.25	\$5.50
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Angles, 3 to 6 in. 1/2 in. thick	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Tees, 3 in. and larger	3.00	4.245	5.30	4.27	4.27	2.55	5.50
Plates	3.25	4.495	9.00	4.52	4.52	5.50	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$4-5	\$4-5	\$4.50

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL						
	—New York—		Chicago	St. Louis	San Francisco	Dallas	Warehouse
Mill, Pittsburgh	Current	One Year Ago					
1/2-in. and larger	\$4.65	\$5.65	\$7.00	\$5.57	\$5.55	\$7.15	\$8.00

CONE HEAD BOILER							
	Mill, Pittsburgh	Current	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
1/2 in. and larger	4.75	5.75	7.10	5.67	5.65	7.25	8.00
3/4 and 1	4.90	5.90	7.25	5.82	5.80	7.40	8.15
1 and 1 1/2	5.25	6.25	7.60	6.17	6.05	7.75	8.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

Galvanized iron rigging	List + 20%
Galvanized cast steel rigging	Net List
Bright plow steel	30%
Bright cast steel	17 1/2%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	\$5.75	\$7.00	\$7-7.25	\$6.25	\$8.00	\$7.25
Assorted	5.90	7.00	7.15	6.40	8.25	7.50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh
Iron bars 3.5c. Steel bars 2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
	\$0.12	\$0.16 1/2	\$0.18	\$0.18	\$0.17	\$0.16 1/2

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	15c.
Hollow	24c.	25c.		26c.

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Inches	Steel		Inches	Iron	
	Black	Galvanized		Black	Galvanized
1/2 and 1	44%	17%	1 to 1 1/2	33%	17%
1 to 3	48%	33 1/2%			
	51%	37 1/2%			

Lap Weld					
	Black	Galvanized		Black	Galvanized
2	44%	31 1/2%	2	26%	12%
2 1/2 to 6	47%	34 1/2%	2 1/2 to 4	28%	15%
			4 1/2 to 6	28%	15%

Butt Weld. Extra Strong Plain Ends					
	Black	Galvanized		Black	Galvanized
1/2 and 1	40%	22 1/2%	1 to 1 1/2	33%	18%
1 to 1 1/2	45%	32 1/2%			
	49%	36 1/2%			

Lap Weld. Extra Strong Plain Heads					
	Black	Galvanized		Black	Galvanized
2	42%	30 1/2%	2	27%	14%
2 1/2 to 4	45%	33 1/2%	2 1/2 to 4	29%	17%
4 1/2 to 6	44%	32 1/2%	4 1/2 to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1. From warehouses at the places named the following discounts hold for steel pipe:

	New York	Black Cleveland	Chicago
	1/2 to 3 in. butt welded	33%	43%	41.1%
3/4 to 6 in. lap welded	15%	39%	37.1%

	New York	Galvanized Cleveland	Chicago
	1/2 to 3 in. butt welded	16%	28%	26.1%
3/4 to 6 in. lap welded	3%	25%	23.1%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5 1/2.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	\$2.50*	List	\$1.20	\$1.65	\$1.05	\$3.00
Hot pressed hexagon	2.50*	List	1.00	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.25	1.00	2.00
Cold punched hexagon	2.50*	List	.75	1.25	1.00	1.60

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
	1/4 by 4 in. and smaller	30%	45%	37%
Larger and longer up to 1 in. by 30 in.	15%	37%	25-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:			
New York	\$2.50	Cleveland	\$3.00
Chicago			\$2.50
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$5.00	Cleveland	\$4.00
Chicago			\$3.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Less Than Carload Lots		Carload Lots
	Carload	Less Than Carload	
Tarfelt (14 lb. per square of 100 sq. ft.)	\$64		\$65
Tar pitch (in 400-lb. bbl.)	21		22
Asphalt pitch (in barrels)	40		45.50
Asphalt felt	72.50		77.20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	\$1.35	\$1.60	\$1.70	\$1.95	\$2.05	\$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt-saturated felt (14 lb. per square) costs \$5.35 per 100 lb. Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$2.20 per roll in carload lots and \$2.45 for smaller quantities. Shingles, red and green slate finish, cost \$5.50 per square in carloads, \$5.57 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
St. Paul	\$.055	\$0.11	\$0.162
Cincinnati	.07275	.1361	.1834
Chicago	.07	.12	.17
Kansas City	.0786	.15	.205
Seattle	.09	.17	.30
Los Angeles	.074	.139	.213
New Orleans	.15	.19	.29

LUMBER—Price per M in carload lots:

	8x8-In. x 20 Ft. and Under			12x12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock Gov't Prices plus Freight	Spruce	Y.P. Fir
Boston					
Cincinnati	\$39.00		\$38.00	\$43.00	\$42.00
Kansas City	38.00	40.50	\$40.50	\$38.50	43.00
Seattle	24.50	24.50	24.50	24.50	24.50
New Orleans	55.00				60.00
St. Paul		52.00	48.00	48.00	60.00
Denver	43.00	35.50			40.00
Los Angeles		40.00			45.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock Gov't Prices plus Freight	Y.P.	Fir
Boston					
Cincinnati	\$45.00		\$41.00	\$44.00	\$40.00
Kansas City	45.50	\$54.75	54.75	52.25	60.00
Seattle	24.50	24.50	24.50	24.50	24.50
New Orleans	49.00				65.00
St. Paul	62.50	45.00	43.00		48.50
Denver	43.25	34.50	34.50	35.00	33.00

NAILS—The following quotations are per keg from warehouse:

	Mill	St. Louis	Dallas	Chicago	San Francisco
Wire	\$3.50	\$4.50	\$4.75	\$4.32	\$5.75
Cut	4.00	5.40		4.47	6.40

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	\$3.35	\$3.35	\$2.22
Jersey City	2.99	2.99	2.16
Boston	3.59	3.00	2.77
Chicago	2.45	2.45	2.21
Pittsburgh	2.55	2.55	2.31
Cleveland	2.72	2.72	2.44
Denver	3.67	3.07	

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	\$16.50	\$13.50	\$2.70	\$2.45
Kansas City	22.00	20.00	2.20*	2.10*
Chicago	18.00	17.50	1.80	1.10
St. Louis	22.00	16.00		1.75
Boston	22.50	18.00	3.50	3.15
Dallas	16.50			
San Francisco	20.00			2.15
St. Paul	24.00	18.00	1.50*	1.40*
New Orleans	20.00			3.30
Cincinnati	14.20			11.95‡
Denver	26.25	13.20		2.40*
Los Angeles	25.00			2.50†
Seattle	25.00			2.50†

* 200-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.
Note—Refund of 10c. per cloth bag, amounting to \$2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	\$1.91	\$1.26	\$2.10	\$1.30	\$2.05	\$1.20
5-gal. cans	2.01	1.36	2.25	1.40	2.25	1.30

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red		White	
	Current	1 Year Ago	Current	1 Yr. Ago
100-lb. keg	Dry 14.00	In Oil 14.50	Dry 13.25	In Oil 13.50
25- and 50-lb. kegs	14.25	14.75	13.50	13.75
12½-lb. keg	14.50	15.00	13.75	14.00
5-lb. cans			15.75	15.50
1-lb. cans				17.00

MINING AND MILLING SUPPLIES

HOSE—

	Fire			50-Ft. Lengths 75c. per ft. 40%
	First Grade	Second Grade	Third Grade	
Underwriters' 2½-in.				
Common, 2½-in.				
1-in. per ft.	\$0.60	\$0.35	\$0.30	

Steam—Discounts from List

First grade..... 25% Second grade..... 30% Third grade..... 40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade		Heavy Grade	
	40%	40+5%	35%	40+5%
New York				
St. Louis				
Chicago				
Birmingham				
Denver				
Cincinnati				

RAWHIDE LACING—40—5% off list.

MANILA ROPE—Fo. rope smaller than ½-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft., 1-in., 6; 1-in., 4½; 1-in., 3½; 1½-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

Boston	\$0.34½	Denver	\$0.35½
New York	36	Kansas City	34
Cincinnati	33½	San Francisco	32
Chicago	33	Seattle	34
St. Paul	34	St. Louis	34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	\$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.75
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	\$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—\$55.00
Clay brick, 2nd quality	per 1000	35.00—40.00
Magnesite, raw	ton	30.00—35.00
Magnesite, calcined	ton	32.00—35.00
Magnesite, dead burned	net ton	32.00—35.00
Magnesite brick, 9 x 4½ x 2½ in.	net ton	110.00—125.00
Silica brick	per 1000	50.00—60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is \$4 to \$5 cheaper per 1000.

St. Louis—High grade, \$55; St. Louis grade, \$40.
Birmingham—Fire clay, \$55—60; silica, \$55—60.
Chicago—Second quality, \$25 per ton.
Denver—Silica, \$35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In.		6 In. x 8 In.	
		by 8 Ft	6 In.	by 8 Ft	6 In.
Chicago	Plain	1.33	1.18		
San Francisco	Douglas Fir—Green	1.35	.96		
San Francisco	Douglas Fir—Creosoted	2.70	1.92		

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak		Red Oak Treated A Grade	
6x8x8		6x8x8	
No. 1	\$0.59	No. 1	\$0.36
No. 2	.77	No. 2	.53
No. 3	.90	No. 3	.72
7x9x8 treated white oak			1.05
7x9x8 treated red oak			.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver	
			In Bbl. Lots	In Car-load Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	\$0.58	\$0.65	\$0.30	\$0.27
Pure destructively distilled pine oil	.58	.52	.30	.27
Pine tar oil	.35	.34	.24½	.19
Crude turpentine	.45	.60	.44	.38
*Hardwood creosote, sp. gr. 0.96-0.99	.23		.34½	.31

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Cleveland	13½ x 13½	13½ x 20½
Chicago	\$32.00	\$38.00
	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing				Gelatin				Black Powder*
	20%	40%	60%	80%	20%	40%	60%	80%	
New York		\$0.28½	\$0.35½						\$2.50
Boston	\$0.25½	.28½	.35½	.42½					2.50
Cincinnati	.19½	.23½	.29½	.44½					2.45
Kansas City	.21½	.27½	.34½	.44½					2.55
Seattle		.25½	.32½						
Chicago	.19½	.23½	.34	.44					2.45
St. Paul	.20	.27½	.34½	.44½					2.45
St. Louis	.20	.27½	.34½	.44½					2.35
Denver	.18½	.26	.33	.43					2.55
Dallas	.24	.31½	.38½	.48½					

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, 31½c.; St. Louis, 35c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The St. Louis price is 9½c. for concentrated, 20c. for fused; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 14c. f.o.b. Pueblo; St. Louis, 16c.

ALUMINUM DUST—Chicago price is \$1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points

	Union	Cameo	Union
	100-Lb. Drums Per Ton	100-Lb. Drums Per Ton	25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	\$106.00	\$101.00	\$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81