Engineering and Mining Journal

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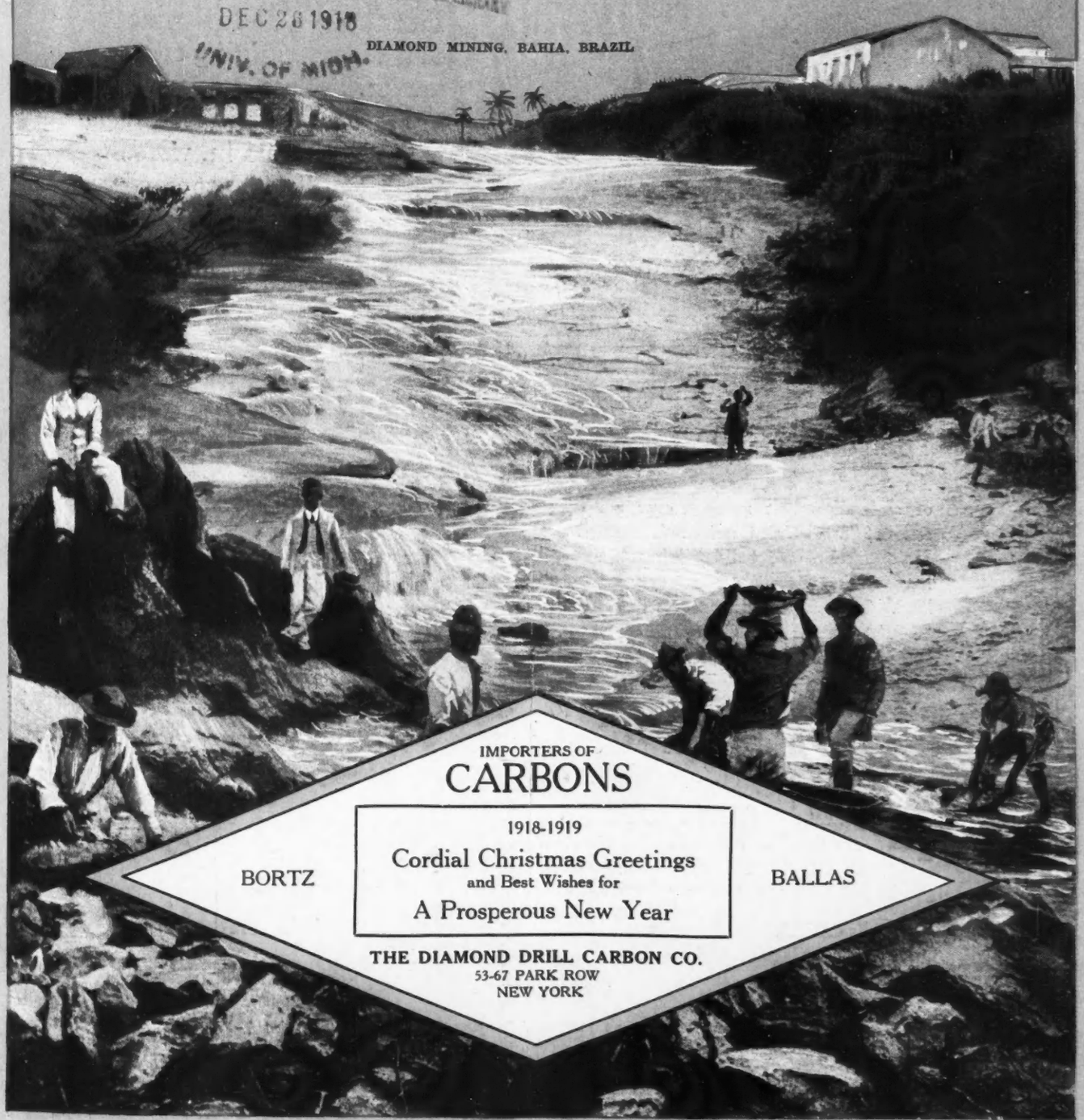
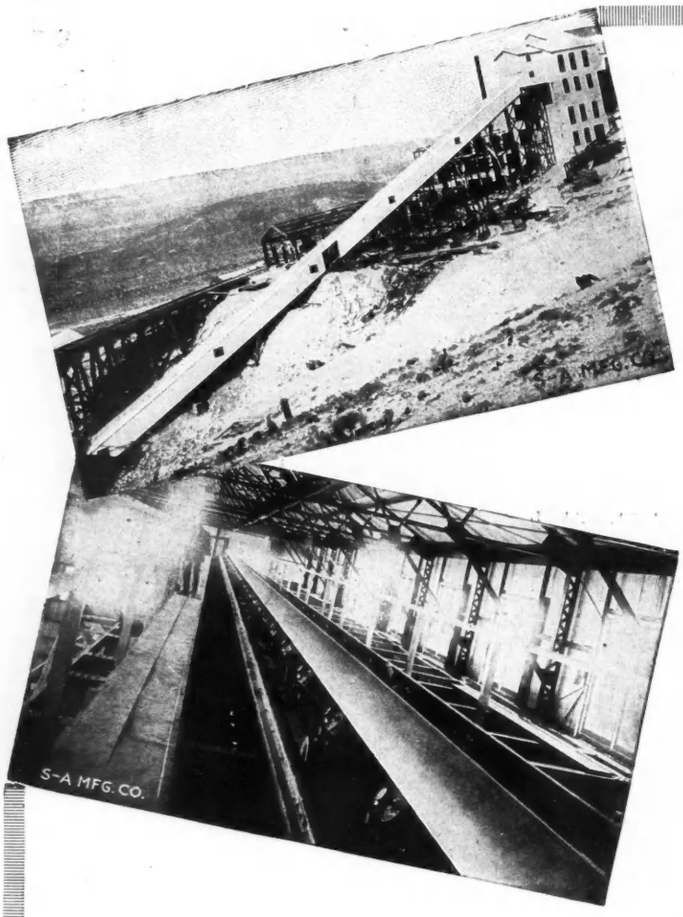
DIAMOND MINING, BAHIA, BRAZIL





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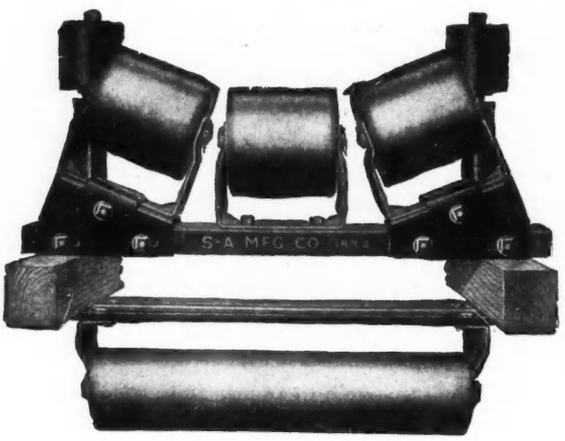

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Engineering and Mining Journal

WALTER RENTON INGALLS, *Editor*

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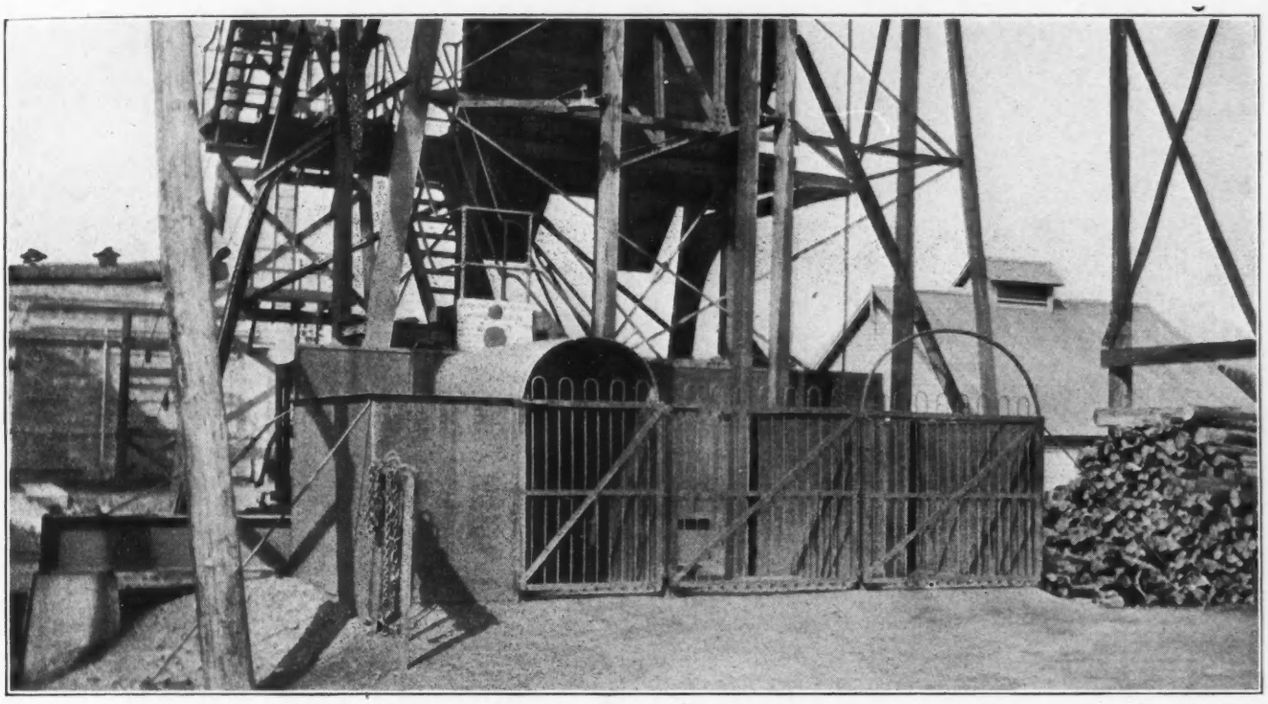


FIG. 1. SHAFT COLLAR SHOWING SELF-CLOSING GUARD GATES

Safeguarding the Mine Shaft

By D. E. CHARLTON

Accidents attributable to operations connected with shafts form a considerable proportion of those occurring in or around mines. Forming a connecting link between the surface and underground workings, not only is it necessary that extreme care be used in the sinking and construction of a shaft, but, upon its completion, it is essential that certain practices be adopted, the aim of which is to prevent accidents. The article deals in a general way with protective measures that may be applied in shafts, both mechanical safeguards and safety regulations.

INASMUCH as the shaft is an essential part of underground mine equipment, it is necessary that considerable attention be given to safeguarding it properly; and the study of mine-shaft accidents, the correction of wrong practices, and the introduction of various types of accident-preventing devices have done much to reduce the number of accidents at or in shafts. There is, perhaps, a tendency on the part of many operators to feel that because some shafts are of temporary duration, and serve as a means of extraction for a small tonnage, little attention need be given to matters of safety, and that the expense involved is out of proportion to the operation, but the small mine can be successfully and economically provided with proper safeguards, and the men taught the necessary regulations, and both of these efforts will result in worth-while returns to the operator. An expensive shaft equipment, provided with elaborate safeguards, is undoubtedly an effective sight to the visitor, but the results in accident prevention may be just as satisfactory at a smaller shaft, and with less expense, if the right sort of coöperation is obtained between the men and the management.

The various types of headframes permit of a diversity of methods of safeguarding, but in general it may be said that proper guard rails and toe boards should be supplied on all stairways and platforms. These may be of lumber or standard iron pipe, although for permanency and durability the latter is to be recommended. If the shaft is of the straight skip-dump type, and includes a bin into which the ore is dumped, the worker at the chutes should be protected from rocks and other

falling material, and the platforms from which he operates should be substantially braced and provided with guard rails. The use of a cage in ore hoisting precludes the above-mentioned protection to an extent, but makes other guards necessary, and much of the safety that may accompany the operation of hoisting depends on the cage rider or top-man.

Electric Haulage on Stockpiles Requires Special Safety Provisions

The stockpile trestle should be provided with sufficient light for night work. Switches and frogs should be blocked, and ample provision made in the matter of guard railings. In electric haulage systems, the motors should be equipped with proper safety devices and continuous-ringing bells should be supplied. Most standard makes of motors include all that is necessary in that line, but many excellent devices to overcome local conditions have been installed to meet individual and special circumstances. One that is worthy of mention is an iron plate that forms a roof over the motor operator and is used to good advantage where it is necessary that the motor pass by the dumping plate in the headframe where there is danger of loose chunks falling and striking the motorman.

Types of Guards at Shaft Collars

The shaft collar should present a neat appearance and be a special study from a safety standpoint, for here it is necessary to guard not only the mine worker but the passer-by. Fig. 1 shows an excellent manner of guarding a shaft collar. As illustrated, the entrances to the two hoisting compartments and to the ladderway are provided with self-closing iron gates that must be unlatched before being opened. A sheet-steel fence surrounds the shaft and presents a pleasing effect. The ladderway compartment is completely covered with a semicircular iron roof, so that men will be protected from falling objects while entering or leaving the ladderway. Fig. 2 shows another type of ladderway housing, and offers substantial protection from falling material. At the left of the photograph is shown a type of wooden shaft-guard gate that will be found serviceable and which may be installed at small expense.

Safety signs may be posted to excellent advantage about the headframe, where they will serve as a reminder to the men entering the mine. Signs forbidding riding on the skip, those calling attention to the danger of falling objects, and others of a similar nature should also be conspicuously posted.

Comfort as Well as Safety Should Be Considered in Placing of Ladders

The best practice in placing shaft ladders is to extend them at least four feet above sollars or landings, and they should be placed at least four inches from the side of the shaft timber, to allow a good handhold or foothold. Where it is not practicable to extend the ladders, iron staples should be used, and these will serve as well. Steel or wooden ladders, or a combination of both steel and wood, may be used, but the essential points are that they should be kept in repair and substantially supported. A 12-in. tread will be found the easiest, and an inclined ladder will be less fatiguing than a vertical one. Sollars should be placed at least 25 ft. apart in vertical shafts and should be kept clear of obstructions at all times.

Separating the Ladderway From the Hoist Compartment

All ladderways should be properly separated from the hoisting compartments, either by boarding them off completely or placing heavy wire screening over the aperture. The latter practice is to be preferred, as it interferes less with the ventilation. It is recommended that wherever possible electric lights be installed throughout the length of the ladderway compartment, and this is particularly advisable where the shaft is dry, for the carrying of lights through the shaft may then be prohibited and one source of danger from fire eliminated. At one dry shaft with which I

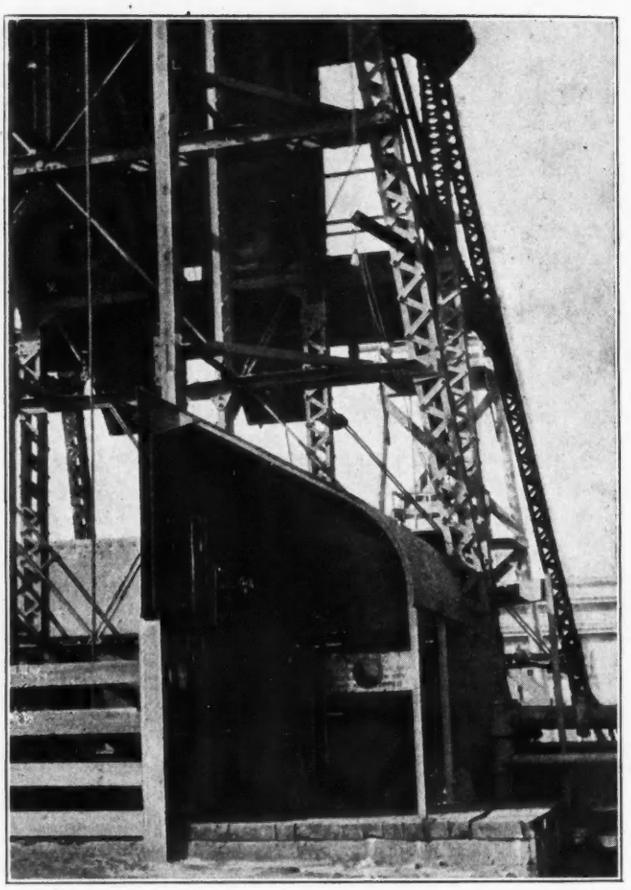


FIG. 2. LADDERWAY HOUSING AT SHAFT COLLAR

am familiar a coil of two-inch pipe connected to a main water line was placed directly below the collar of the shaft, encircling the two hoistways and the ladder compartment. The pipe was perforated, so that when the valve was turned on, at regular periods, the water could run down and thoroughly wet the timbers.

Power wires should be carefully boxed or carried down the shaft in conduits and placed in one corner of the ladderway compartment, away from the ladder side. Steam pipes should be covered, although this will usually be done as a matter of steam conservation.

At shaft stations it is essential to safety that sufficient light be provided, and this is also an advantage in facilitating operations. The station is necessarily

the underground gathering place for the men, and, unless a pump room is provided, it is advisable that first-aid material, stretchers, and similar equipment always be available here. The use of mine telephones is becoming almost universal in the larger mines, and usually each station is provided with an instrument. It seems hardly necessary to say that the system of bell signals for the hoisting or lowering of the skip or cage should be posted in a conspicuous place on each level.

Shaft gates at stations are an absolute necessity, and in some instances the mine management has not been satisfied with a low gate or bars, but has placed sectional wooden doors which cover the complete opening to the shaft. Where this procedure interferes with ventilation, the practice is to use a door made of heavy wire mesh, reinforced with strap or band iron.

Safeguarding the Skip Pit

In the skip pits or at the loading chutes in the shaft, a run-around should be provided so that the skip tender will not have to cross the shaft at any time. Cleaning out the skip pit is dangerous work, but may be made perfectly safe by the installation of a door or doors that will completely cover the hoisting compartments directly above the skip pit. They may be hinged on one side of the shaft, operated by a counterweight and pushed back against the shaft wall when not in use.

Regulations regarding the hoisting or lowering of the skip or cage, loading or unloading material, and respecting the number of men permitted on the cage vary with different localities, but all have been evolved after a careful study of conditions and are intended to prevent accidents. Many of the points discussed in this article have already been mentioned in the *Journal* and other publications, and there is much more that may be said about safe practices in the maintenance and operation of mine shafts. The last ten years have seen notable development in mine-accident prevention in this country, but much remains to be done and still greater improvement and progress can be achieved by coöperation and discussion.

Camp Bird, Ltd.

The annual report of the directors of Camp Bird, Ltd., indicates that no ore was mined during the fiscal year ended June 30, 1918, and that the mill buildings, together with their machinery, were sold for $39,000. The only revenues were, $20,962, which resulted from interest on bank deposits and rentals of ore-bearing ground, and $320,122 received as dividends on shares of the Santa Gertrudis Co., Ltd., owned by the Camp Bird, Ltd.

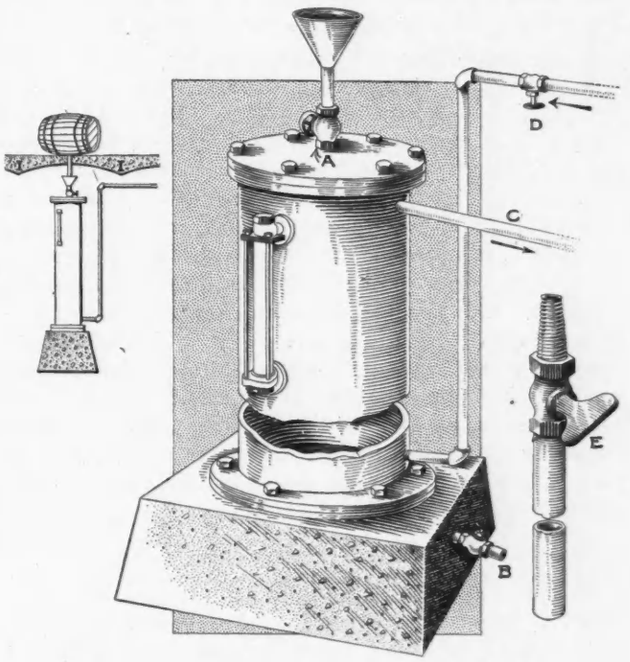
A new tunnel is being driven a distance of two miles to tap the Camp Bird vein at depth. The ventilation of the tunnel is of vital importance and will be obtained from Shaft No. 3 on the Camp Bird vein by a raise connecting with the ninth level, which should be finished in January, 1919. The cost of establishing natural ventilation will be paid by the tunnel company, although the cost of maintaining the Camp Bird upper workings in a condition affording air circulation will fall upon the Camp Bird, Ltd., during its period of activity. The object of the tunnel is to cut the Camp Bird vein at depth, and this point was reached June 1 at a distance of 11,000 ft. from the mouth of the tunnel and 300 ft. further than was originally estimated. The time required to perform the work was within the estimate, but the cost, owing to labor conditions, far exceeded expectations.

New buildings have been erected which afford ample protection against storm and with a minimum of fire risk. Natural ventilation should be available by January, and at that time the territory opened by the new tunnel will become available for exploration.

Combined Lubricating Oil Tank And Feeder

By L. V. Lauther

An efficient oil tank and feeder can be made at almost any mine shop by means of a length of flange pipe of large diameter, as illustrated. The joint of pipe is



LUBRICATING OIL TANK AND FEEDER

mounted vertically upon a concrete base and is closed at top and bottom by means of gasketed flange plates. A gage glass is provided near the upper part of the tank, and a valve connection made at the top and provided with a funnel. A drain cock *B* is similarly provided at the bottom. By drilling and tapping in pipe connections above, as at *C* and below as at *D*, oil partly filling the tank thus made will be forced upward and out by water under pressure admitted through the valve *E*. By regulating this pressure, oil will flow out through *C*, where it can be distributed through the various engines and machines as required. The valve shown in detail is inverted into the bung of the oil barrel, and by partly draining the tank and regulating the drip from the spigot the oil tank is filled. On account of the height of such a tank, it is most conveniently placed in a cellar where the barrels can be discharged from the main floor. Such an apparatus is superior in economy of both labor and oil to intermittent oil drawing from a barrel.

Mosquito Elimination and Malaria Prevention*

By C. N. HARRUB

The work of most mining engineers carries them away from the beaten track—to districts where they have often to grapple with problems of varied character, hygienic as well as technical. The mosquito—either the malaria-carrying anopheles or a member of one of the comparatively harmless but none the less pertinacious types—is ubiquitous, and may be responsible for more disorganization and blasphemy, in proportion to its size, than the proverbial "bull in a china shop." A reiteration of the essential factors for the elimination of the pest will serve a useful purpose, and will draw attention to the simplicity of the fundamental precautions to be observed.

THE course of procedure to follow in endeavoring to reduce malaria is to break the line of transmission from patient to healthy person. As it is definitely known that malaria is transmitted only through the agency of mosquitoes, this is the logical point of attack. No mosquitoes, no malaria. Hence the elimination of malaria reduces itself to a question of eradication of the mosquito. This is best accomplished by making it impossible for mosquitoes to breed.

The first three stages of the life of a mosquito—the egg, the larva, and the pupa—are spent in water, and without water it is impossible for mosquitoes to propagate. The problem is thus to eliminate water, or to render it unfit for mosquito breeding. This may be accomplished in one of four different ways, but in practice it may be found necessary to employ all these to achieve satisfactory results. The four methods are drainage, oiling, fish control, and larvicides.

Training Streams

As mosquitoes breed in running water as well as in stagnant pools, steps should be taken to arrest development before the adult insect is produced. This preventive work should consist in cleaning the channels of all obstructions, straightening the course, and regrading the beds so as to confine the water to as narrow a stream as possible, to insure maximum rate of flow. Difficulty is sometimes encountered in this work, especially in low flat ground. The stream banks should be clean cut, and all obstructions removed to minimize the chance for floatage to collect, and also to provide an edge which minnows may approach. Depressions in which water may pool and produce mosquitoes should be filled so that the water will drain off.

Construction of Ditches

Open ditches, where necessary, should be as straight as possible, and should have clean-cut slipping edges and narrow bottoms. The main ditch should be dug first, and then such laterals as are found necessary. In joining a lateral to the main ditch, it should be given a down-stream direction, to prevent the deposition of silt and sand at the junction. In some cases, where the maintenance of open ditches is too expensive, it is found advantageous to line them, or portions of them, with concrete, not necessarily for their full depth, but just the bottom and a small distance up the sides. Lined ditches are more easily cleaned, but care must be taken to provide sufficient anchorage so that the lining will not be washed out.

Drainage, Filling, and Maintenance

Tile pipe may be used in subsurface drainage, the object being to lower the water table, so that storm water will be more rapidly absorbed by the ground. It is also used to intercept seepage from hillsides. Where the collection of water cannot be economically drained, filling must be resorted to, but if the area is too large it may be partly filled, so that the reduced water area may be controlled more easily. As a rule, draining is more satisfactory and cheaper than filling. Under maintenance come any measures necessary to keep the ditches in their most efficient condition, such as removal of collections of débris, regrading, and other upkeep provisions. Vegetation will grow, and must be removed, and in ditches which always contain water, aquatic growths and algæ often have to be combated. In such cases copper sulphate will be found useful. Ditches should be inspected at frequent intervals to see that they are free from obstructions, and records should be kept. These should show the work performed and the materials used, so that costs may be figured. It is well to have a map of the area, with the locations of all ditches shown on it.

Oiling Practice in Mosquito-Control Work

Oiling may be used as a supplementary control measure when funds for proper drainage are not available, or until drainage work can be carried out. The object of oiling is to kill the larvæ before they can develop into mosquitoes, and also to render the water disagreeable to the mosquitoes, so that they will not deposit their eggs in it. The oil should spread well, so as to form a thin film over the surface of the water. Many kinds of oil are effective in this work, ranging in density from that of kerosene to that of crude oil. The former has been used extensively, and has some advantages over some of the other grades. It forms a thin film, spreads rapidly, and is easily obtained. Its chief objection is that it evaporates quickly, but to overcome this feature, it may be added to a heavier oil, the mixture being so proportioned that it works well in the sprayers and readily forms the film on the surface of the water. The percentage of kerosene in the mixture varies considerably, and may be as high as 75 to 80%. The film is more permanent with such a mixture than with kerosene alone.

Oil may be applied successfully to pools, ditches, streams, and edges of ponds and rivers. It should also be used in such containers as fire barrels and similar storage places. In ponds or streams of large size it is unnecessary and useless to endeavor to cover the entire area, because the larvæ are seldom found in the deep

*From a paper presented before the city health officers of Florida and reprinted in *Engineering and Contracting*, Oct. 9, 1918.

water, and because a film of large dimensions will be easily broken up by wind action and driven to one side.

Wherever oil is used, care should be taken to see that all débris, such as floatage and weeds, is cleared out. The efficiency of the oil film depends entirely on its continuity, and if grasses or weeds and sticks are left penetrating the water surface, they not only interfere with the spreading of the film, but the film will not come in contact with them at the water surface. A small annular space is left around each grass or stick, and here the larvæ may come to breathe. An excessive amount of oil will sometimes overcome this difficulty, but this method is too expensive for general practice.

Methods of Applying Oil

Oil may be applied in any of a number of ways, for example, by means of a common garden sprinkling pot, a knapsack sprayer, a drip can, a small bundle of oil-soaked cotton waste, a sprayer from a boat, or thrown from a small dipper. This last method is only a make-shift, is wasteful of oil, and should never be considered as a permanent method of distribution.

The field of usefulness of the sprinkling pot is limited to small areas, where all parts are easily accessible. The knapsack sprayer is best for general use. It increases the range over which the oil may be spread, the operator being able to cover a radius of 20 ft., if desired. The can holds 5 gal., and is carried on the back of the operator, thus leaving both hands free when not operating the sprayer. This is a great advantage when traveling over rough ground. Drip cans are used on small streams. The can is placed about 3 or 4 ft. above the water level so that the force of the fall will break up the drop of oil and immediately spread it out in the required film. The rate of dripping depends on the size of the stream and its velocity. In a small stream, a foot or so in width, 10 to 20 drops per minute will usually suffice. On larger streams as many as 60 drops per minute may be required. This is a matter which should be determined by trial. Whenever possible, it is best to place the drip can so that the oil falls on a rather swift part of the stream. This aids in breaking up the drop, which then spreads out over the quieter water below. Various kinds of drip cans are used, different kinds of oil requiring different methods of handling.

The oil-soaked cotton waste is used on streams where the flow is too small to require the use of a drip can. The waste is dipped in the oil and then squeezed just enough to stop the dripping. It is then fastened by wire in the bed of the stream at its headwaters. The oil gradually works out and forms the required film. It will serve for about a week and must then be re-dipped. Hand pumps and sprayers are used in small flat-bottomed boats to spray the edges of streams, lagoons, and similar places, where drainage cannot be economically employed.

Fish Control

In certain localities, malaria-control work is materially assisted by fish. The top-feeding minnow is the deadly enemy of the mosquito larvæ; and, if given a little assistance, will often entirely prevent the development of mosquitoes in a pool. It is necessary to keep clean and smooth edges on the pool or stream, and to remove all floatage in which the wigglers may hide. Small pools may be stocked with these minnows, and oiling thereby rendered unnecessary. Such pools should be inspected frequently to be sure that the fish control is effective.

Larvicides

Under certain conditions larvicides may be used in malaria-control work, but as a rule they are less satisfactory and more expensive than draining or oiling. Larvicides are poisonous, and they should therefore be used with care and discretion. They may kill fish and other aquatic life if applied too freely, and, by thus destroying the top feeding minnows, destroy one of the best natural agents in mosquito control. A larvicide may be used to best advantage in such containers as fire barrels, where it cannot injure stock or kill forms of life other than those for which it is intended. One feature in favor of some larvicides is that one application is sufficient for a whole season, or until the water is changed. Such a one is niter cake.

Prophylaxis and Screening

In addition to the mentioned methods of control, which are designed to eliminate the mosquito, prophylaxis and screening may, in certain cases, be used to advantage. In prophylactic work quinine is used. The dose varies with the object in view, a larger one being more to produce immunity than to simply ward off the disease. It has been used very effectively in Italy among the rural population. For the 10 years preceding 1902 the average annual death rate was above 14,000. At that time quinine prophylaxis was started, with the result that in 10 years the rate had been reduced to a little over 3000, or about 25% of the former figure. As no other means of control were employed during this time, quinine must be given the credit for this reduction. It has also been used with equally good results in all tropical countries.

Screening of houses should be done in all malarial localities, but cannot be considered by itself as an efficient method of control.

Tin and Tungsten Ore in Siam

According to an official estimate, the Siamese output of metallic tin for 1917 was about 142,000 piculs (9466 short tons), as compared with 151,175 piculs (10,078 tons) for the fiscal year 1916, says *Commerce Reports*. The Siamese government collects a royalty on tin and tin ore amounting to about 25% of the market price in Singapore, the fluctuation in value at the latter place being adjusted and the rate reckoned according to a "royalty scale" published in the Siamese government *Gazette* from time to time. A recent issue of this *Gazette* contained a notice of an extension of the "royalty curve" to meet the increased price of tin.

The approximate quantity of tungsten ore recovered during 1917 was 12,000 piculs (800 short tons), against 8769 piculs (584 tons) in the previous year. A recent order in the government *Gazette* announced that the royalty on tungsten ore, which was previously collected at the same rates as in force on tin ore, had been reduced to 10% *ad valorem*.

Free Acid Determination in Presence Of Metallic Salts

BY LOUIS F. CLARK*

The acid leaching of copper ores is rapidly becoming standard practice as an efficient method of extraction, and the determination of free acid in solutions containing metallic salts is thus of considerable interest. The determination is a difficult one, and the ordinary direct titration with alkali is unreliable. Textbooks ignore the subject; and the publication of the following paper, which deals with a specialized method of estimation, and is accompanied by extensive information of a practical nature, should be a welcome addition to the available literature on the control of operations in the wet metallurgy of copper.

THE accurate and rapid determination of free acid, usually sulphuric, in the presence of metallic salts, has long been an interesting problem. The contribution on the subject which the present paper offers is made not because it is thought to be a definite and ultimate solution of the problem, but because, by the procedure described, satisfactory results have been obtained in Chile, and in the belief that others may find it equally helpful.

The determination of free acid alone is readily effected by the aid of indicators, which show a change of color at the neutral point, or thereabout. If a solution contains, besides free acid, metallic salts, then either the color change of an indicator is obscured, or it is impossible to determine the true end point, because the hydrolyzation of weak base salts permits precipitation, and such salts may be reported as free acid. Further, solutions in which free-acid content is desired may be dirty or turbid with suspended matter. It may even be undesirable to attempt filtration, because of acid consumption in attendant oxidation. On the other hand, when such solutions are clear, or may be made so, the usual methods for the determination of free acid take advantage of the very fact of incipient precipitation of weak bases, and the solutions are titrated to a permanent turbidity rather than to the color change of an indicator.

Use of Alcohol in Acid Titration Work

In most solutions of this sort the color imparted by the metallic salts is not in itself sufficient entirely to obscure the color of an indicator; and, if the tendency toward precipitation could be avoided, such solutions might be readily titrated. With the purpose of preventing the hydrolyzation of such metallic salts, and yet permitting the neutralization of the free acid, experiments were made with a proportionately large volume of alcohol to the volume of aqueous sample taken. At this point the solubility of the various metallic sulphates in alcohol solution became an item of great interest, and it was found from tables that the double sulphates of "alums" formed with ammonium sulphate were quite insoluble in alcohol, and presented the possibility of completely precipitating the interfering elements without changing the free acid content.

A further investigation of the literature on the subject brought out a method by Beilstein and Grosset, given in Sutton's "Volumetric Analysis," in which the free acid in aluminic cakes is separated by filtration of the free acid, dissolved in alcohol, from a precipitate of ammonium-aluminum sulphate. Other texts made it clear that copper, either as cupric alum (ammonium salt), or as the hydrated cupric ammonium salt formed with excess ammonia, could be separated by a critical proportion of alcohol. It was noted also that both ferrous and ferric iron could be similarly separated, either because of the insolubility of the ferric sulphate itself or of the insolubility of ferrous ammonium sulphate. Manganese, too, forms a similar alum.

Experimental Investigation of Analogous Method

Experiments were then conducted as described in the procedure given by Sutton. This involves evaporation of the alcoholic filtrate solution in water, and titration, using litmus as indicator. Such a scheme involves the loss of all the alcohol used, and requires much time and apparatus. Obviously, if the titration could be effected at once in the alcoholic solution, much time would be saved, and the alcohol could be redistilled. This brought up the question of a suitable indicator.

The ideal indicator for usual acidimetric work in alcoholic solution is phenolphthalein, but in this case, where a large excess of ammonium sulphate has been used as a precipitant, the phenolphthalein is useless. Some authors say that titration with alcoholic caustic will permit the use of phenolphthalein in the presence of ammonium salts in alcoholic solution, but this has not been found to apply to the solutions in question. An attempt to substitute sodium sulphate for ammonium sulphate as a separation agent, thus permitting the use of phenolphthalein, was unsuccessful, owing to incomplete precipitation of copper.

Type of Indicator Necessary

In the process described by Sutton, the alcohol is evaporated and the acid taken up in water, in order that litmus indicator may be used, the litmus being insoluble in alcohol. Methyl orange is soluble in alcohol, but apparently the acid is only partly ionized, so that subsequently titration gives an end point when only about half the acid actually present has been neutralized; but this indicator may be used if the alcohol is diluted with about three times its volume of water. This dilution makes recovery of alcohol by redistillation too expensive; but without dilution the titration may be affected by using the indicator on a spot plate on the outside. What is required, then, is an indicator soluble

*Potrerillos, Chile.

in alcohol, not affected by ammonium salts, and sensitive to the slightly ionized acid present.

Various indicators, including lacmoid and methyl red, present possibilities, but cochineal has been found to give excellent results. The last mentioned is preferably used as an internal indicator for the direct titration of the alcoholic solutions.

Use of Cochineal as an Indicator

Cochineal is described as being useless in the presence of ferric and aluminum salts and acetates, and this seems to be true in aqueous solutions. For some time after this indicator was used it was considered advisable to filter the solutions before titrating, as described by Sutton. This seemed to involve a slight mechanical retention of free acid by the flocculent precipitate, so that a blank had to be run in the same way. Later it was found that, if one part of sodium sulphate (anhydrous) with three parts of ammonium sulphate was used instead of ammonium sulphate alone, this large mass of flocculent precipitate became granular. When the solutions were filtered, the copper was dissolved off the paper with hot distilled water, leaving the insoluble residue (usually from a leach test on an ore) on the paper. The copper was then determined in the filtrate. Subsequent experiment has shown that, if enough indicator is used, it is possible to titrate directly, even in the presence of the insoluble ore material.

This titration was at first conducted with alcoholic caustic, in order to avoid any possible effect upon the indicator by ionization of the iron and aluminum precipitates. The alcoholic caustic of the required strength, about 60 gm. c.p. NaOH per liter, was prepared by dissolving the alkali in its own weight of water (distilled) and then pouring the resulting syrup into alcohol of about 36° Bé. quality. About 12 hours should then elapse for proper solution before it is used for titration. The alcoholic caustic has the advantage that the drops are about half the size of those formed by the aqueous solution. This is important when 0.05 c.c. of NaOH solution is equivalent as a neutralizer to about 3 lb. of acid per ton of ore. For any caustic solution, however, a two-way burette should be used, together with a bulb pump from a bottle reservoir, to facilitate rapid manipulation and to prevent evaporation.

The Problem To Be Solved

The particular problem presented in Chile is as follows; and, for convenience, it is divided into two parts:

1. Determination of free acid content in sulphuric acid solutions, obtained from leaching operations on copper ores. The free acid content may be as high as 180 gm. H_2SO_4 per liter of solution.

2. A laboratory acid consumption determination on 2 gm. samples of 80-mesh material. The samples to be treated with 10 c.c. of 12% H_2SO_4 for 24 hours, and the residual free acid determined. Milligrams of acid consumed by 2-gm. samples are reported as pounds per ton of ore.

Solutions: Standard sulphuric acid for leach tests is made about 12.3% H_2SO_4, and two gm. of $(NH_4)_2SO_4$ is added for each 10 c.c. of volume. It is therefore advisable to use about 900 c.c. distilled water, 75 c.c. concentrated H_2SO_4, and 200 gm. $(NH_4)_2SO_4$. This will give about 1 liter of solution, which is standardized against Na_2CO_3.

Ten cubic centimeters of the above-mentioned acid solution contains about 1.33 gm. of H_2SO_4, which will require about 1.08 gm. NaOH for neutralization. I find it advisable to be able to titrate the samples with somewhat less than 20 c.c. of caustic solution for each; hence the use of about 60 gm., or 2 oz., c.p. NaOH per liter, is to be recommended.

Procedure in Dealing With Leach Liquors

(a) When c.p. neutral $(NH_4)_2SO_4$ is available, measure 10 c.c. samples, add about 4 gm. of the salt, and allow to stand 15 min. for complete solution. Add 100 c.c. ethyl alcohol (34° to 38° Bé.), agitate and allow to stand about 20 min. If precipitate is not yet granular, add more $(NH_4)_2SO_4$. Add a dash of cochineal indicator (made in 34° Bé. alcohol). Agitate well with glass rod during titration.

(b) When c.p. neutral $(NH_4)_2SO_4$ is not available, the salt may be prepared by evaporation of the neutralized acid. The product is usually very acid. Hence it is advisable to put the same weight (about 4 gm.) of ammonium sulphate into each beaker, and to cover the salt with 10-c.c. samples in respective beakers. Cover one portion with 10 c.c. distilled water as a blank on the salt used. Agitate and allow to stand about 15 min.; add 100 c.c. of 36° Bé. alcohol, and again agitate. Allow to stand about 15 min. again, and titrate. Correct for alkali consumption on the blank. If metallic salts are required in the same samples of liquor, either filter the acid alcoholic mixture before titration, and wash all free acid out with more of the same alcohol, or re-acidify slightly, after titration of the acid, and then filter to recover alcohol. In either case, dissolve metallic alums from the paper with hot distilled water.

To Determine Acid Consumption on 2-Gm. Samples

Treat 2-gm. samples with standard acid for 24 hours. Use covers on beakers to prevent too great evaporation. Then:

(a) Add 50 to 75 c.c. of 36° Bé. alcohol, allow to stand 20 min., filter, and wash with about 50 to 75 c.c. of the same alcohol. Add indicator to filtrate, and titrate residual acid. Dissolve metallic alums off papers with hot distilled water. When this procedure is followed, some Na_2SO_4 (about 1:3) should be mixed with the $(NH_4)_2SO_4$ used in the acid, in order to make the precipitate more granular.

(b) This alternative seems permissible on some ores. Treat ore samples with standard acid as before, add 100 c.c. 36° Bé. alcohol, allow to stand 20 min., add about 5 c.c. of strong indicator solution, and titrate with much agitation until a persistant change of color is noted. Re-acidify, for filtration, in order to recover alcohol, and dissolve alums off paper in hot distilled water.

Important Considerations To Be Noted

1. If alcoholic solutions are filtered from alum, precipitated before titration, then portions of standard acid should be run in the same way, in order to estimate the slight loss of acid by mechanical retention in the grains of precipitate.

2. After titration, alcoholic solutions may be passed through a common large filter, so as to form a rapid separation of the alcohol from the sodium sulphate precipitated during titration. This filtered alcohol is redistilled in a tin-lined copper still, such as is commonly used for distillation of essentials oils. It is placed in a large pan of water, and elevated somewhat off the bottom to give a good water-bath effect. A tin-lined coil, with one charge of condensing water, gives very good condensation here in Chile. The alcohol for redistillation should be slightly alkaline from the titration; but, if not, a small portion of lime should be added. If 38° Bé. alcohol is used to begin this work, one distillation after each set of determinations should keep up the quality of the alcohol. About 20% loss occurs.

3. Cochineal powder should be ground in a mortar and then put into bottles so as to saturate the 34° alcohol used. The indicator is more soluble in a poorer grade of alcohol, but this quality is specified in order not to introduce any more water than is necessary into the system. After a portion of powder has served to saturate two or three portions of alcohol, it becomes very poor in active principle, viz. carminic acid, even though it seems to impart a decided color to the alcohol.

4. Titration should proceed slowly near the end, with continuous agitation to avoid local concentration.

5. For all this work the denatured ethyl alcohol licensed for sale by the Chilean government has been found entirely suitable. If, however, alcoholic caustic solution is preferred, rather than the aqueous, natural ethyl alcohol must be used for this particular solution, because the caustic apparently decomposes the denaturant to an extent that a dirty yellow liquid results.

The foregoing procedures have been outlined to obtain figures desirable here in Chile. The exact details, however, should be regulated to suit any special requirements. Thus here, for the treatment of 2-gm. samples of ore, the alum-forming sulphates are introduced into the standard acid itself, in order to save time in subsequent addition. In this determination those conducting the tests in Chile were interested only in the acid consumed. Such a procedure in the case of a leaching determination might lead to a higher result for the copper extracted than would be considered comparable to operating conditions.

In general, the details of the strength and constituents of a leaching solution are selected to suit individual circumstances and ideas. In some cases it may be possible to combine the two determinations of acid and copper leached on a 2-gm. sample, where the ideas for the determinations are not in conflict, or when it may be possible from the chemical standpoint, or expedient. It would, in such a combination, seem advisable to add any alum-forming sulphates after the time of leaching had expired, rather than to introduce them directly into the leaching acid. In the tests here in Chile, because of the presence of manganese in the ore and its solution, together with the copper (which it is necessary to determine by cyanide titration), a separate and distinct manipulation becomes necessary in order to prepare the solution for the cyanide. It thus becomes a matter of expediency to conduct the determinations by two separate treatments; and the procedure as given for 2 gm. samples of ore only properly covers the item of acid consumed.

Temperature and Concreting*

Heat hastens the hardening of concrete; cold delays it. The effect of cold becomes noticeable in this respect when temperatures are below 50° F., and becomes more marked with the lower temperatures. The general opinion is that freezing will not injure concrete that has first had an opportunity to harden for at least 48 hours, under favorable conditions. If, before early hardening has taken place, concrete is allowed to freeze and thaw at short intervals, it will be damaged. As a rule, concrete will not show any serious effects from having once been frozen if, after it thaws out, it is not again frozen until early hardening is complete. But it is far better to protect the concrete from freezing for from 48 hours to four or five days, depending upon the degree of the cold, rather than to expose it to the possibility of freezing. If such protection is given, no injury need be feared when the concrete is finally exposed to freezing temperatures.

Some of the requirements leading to success with concrete work done in cold weather are self-evident when one remembers the conditions under which concrete hardens and gains strength in warm weather. Warmth and moisture are necessary to the proper hardening of concrete. Any means that will cause both these conditions to be present, in cold weather, particularly during the period of early hardening, will lead to the success of concrete work done at such times, if every other good practice is also followed.

Gold Absorption by Copper Plates†

In connection with cleaning up old mills after shutdown, the following data on this subject were recently obtained, and are published by Rand Mines, Ltd.:

From "A" Mill.—A plate weighing 565 lb. (approximately 5 ft. 6 in. by 12 ft.) was first steamed, then scoured. It was then scaled by application of chemicals and heat. The gold-copper scale obtained contained 12 oz. fine gold, or 42.27 oz. per ton of plate. After scaling, the plate was melted into an ingot, which assayed 3.75 oz. fine gold per ton.

Total fine gold in plate after steaming and scouring: In scale, 12 oz., or 42.47 oz. per ton; in ingot, 1.05 oz., or 3.75 oz. per ton, a total of 13.05 ounces. The return noted is from a plate after 20 years of service.

From "B" Mill.—The plates were first steamed and scoured; then scaled, as in the previous instance, with the following result:

RESULTS OF SCALING COPPER PLATES

Plates (5 ft. 6 in. by 12 ft.)	Weight of Scale Oz.	Weight of Scale After Acid Treatment and Melting, Oz.	Fineness of Bar	Fine Oz.
4 battery (primary)	548	130	740.0	96.20
12 battery (primary)	1,616	316	886.5	280.1
5 tube mill (secondary)	447	83	872.0	72.38
21	2,611	529	.....	448.59

Average yield per plate, 21.36 oz. The scale was refined by acid treatment, using sulphuric acid and niter. The plates from "B" mill had been in use at least 20 years.

*Abstracted from a pamphlet published by the Portland Cement Association.

†Abstracted from the *Queensland Government Mining Journal* Sept. 16, 1918, p. 423.

Pneumatic Mixing and Delivery of Concrete*

By H. B. KIRKLAND

Pneumatic mixing and delivery of concrete find many applications in mining practice, and the following paper demonstrates the simplicity of the method. Perhaps the most notable use of such a system has been in connection with the construction of subways in New York City and suburbs. A portion of the mining work involved has been carried out by the practice of ordinary tunneling and timbering methods, but a large part, where the ground is soft enough, is excavated by shield and concreted in sections. The ability to maintain the position of the mixer, at a convenient distance from the face, by adjustment with lengths of piping, is a feature of the pneumatic concreting system; and its use in underground New York and elsewhere has greatly facilitated subway construction. Wear on conveying piping is necessarily severe, but the expense in this connection is usually counterbalanced by economies effected in other ways.

THE pneumatic method of mixing, conveying and placing concrete is a comparatively recent development in engineering construction. It should not be confused with the cement-gun process, which results in a plastering and is entirely different in operation and purpose. Both methods are patented. The pneumatic method is adapted for heavy, difficult concrete work, using ordinary ingredients with aggregates up to 4 or 4½ in. diameter. Briefly described, it consists simply in blowing batches of concrete through a pipe from a central point of supply to the concrete forms. The materials for a batch of concrete (1½ cu.yd.) are proportioned in a measuring device and dropped into the pneumatic mixer without previous mixture.

Equipment Required for Pneumatic Operation

The plant for pneumatic mixing and placing consists of a mixer, a pipe conveying system, and compressed-air apparatus. The mixer consists of a steel shell having the shape of an inverted cone, surmounted by a cast-steel cylinder in which a door is operated by a small air piston. This door is opened by releasing the air in the cylinder and allowing it to drop open by its weight. At the bottom of the inverted cone chamber is a 90° elbow which forms the connection to the discharge pipe. The door, with the piston, is the only movable part of the mixer, and the inside contains no mechanical mixing apparatus, and is entirely smooth and free from obstructions. An air jet at the heel of the bottom elbow of the mixer is the prime means of conveying and mixing the concrete, and is supplemented by other air jets at the top of the mixer. The main air jet is directed into the center of the discharge pipe, where it catches the material as it falls from the cone-shaped hopper above. The upper air jets create a pressure from above the batch, forcing it downward into the discharge pipe where it is caught by the main jet. To admit air to the mixer, two valves are used, one on the air-supply line leading to the lower jet and the other on the line leading to the upper jets placed above the level of the batch.

The Operation of the Plant

In operating, after the batch containing cement, aggregate, and water is placed in the mixer, the door is closed and the main jet is opened. This is followed by opening the valve to the upper air jets. Many operators vary this method, but the effect of this sequence of control is to start the batch forward at the bottom of the machine, detaching successive parts of the batch at the tip of the cone. The materials in the mixer flow downward in the same manner that sand flows from the upper chamber of an hourglass, but the speed of the flow is accelerated by the air pressure.

The conveying pipe consists of any standard smooth steel pipe with joints made with bolted flanges or any type most easily and rapidly handled in making connections. The most rapid wear on the pipe occurs at the points where there is likely to be a slight irregularity or a shoulder. Threaded pipe is also thinner where the threads are cut, and of course wears through there first. For making deflections of the pipe line, cast elbows are used. An ordinary cast-iron elbow will last sometimes less than a day, but a case-hardened steel elbow will usually last a few weeks. The best elbow is cast manganese, which will almost outlast the pipe itself. These elbows are made in 45° with a thickness of ⅝ in. on the inner curve and ⅜ in. thickness on the outer curve. This gives a weight of about 220 lb. for an 8-in. elbow. The radius of the elbow is 3 ft. minimum, as a shorter radius is too sharp a turn and causes plugs in the line. Shorter radius elbows may be used, however, at the discharge end of the pipe. A split elbow of 90° has also been used for 6-in. pipe. This elbow is split lengthwise so that the outer half of the curve, which usually wears rapidly, may be replaced.

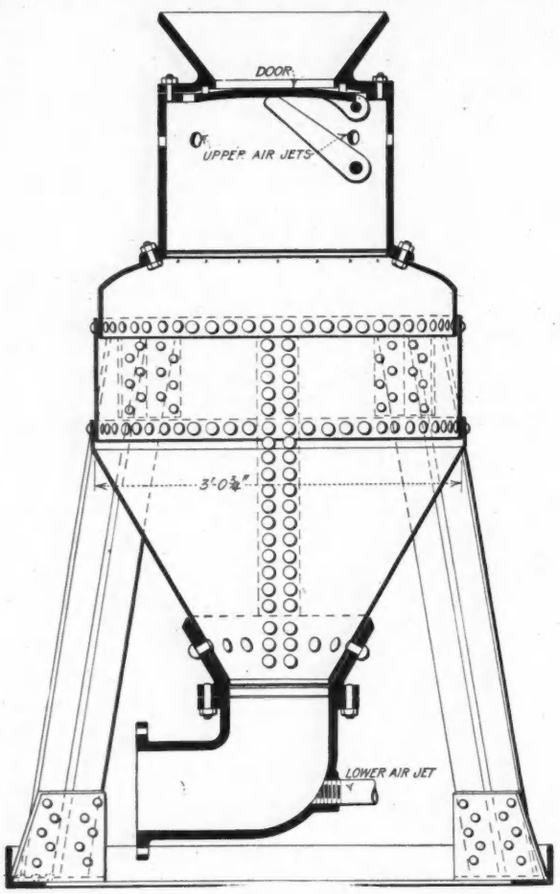
A means of deflecting or guiding the discharge of concrete in the forms consists of a series of slightly tapered pipes, fitting together like stovepipe. Two or three sections of this light pipe 3 or 4 ft. long are all that are needed in a tunnel form for diverting the discharge from one side wall to the other and for guiding the concrete discharge around points of rock projecting from the roof. Where the tunnel is wide, however, as in a double-track railroad tunnel, a "Y"-branch is used in the line, so there are two lines of pipe entering the tunnel form. A side valve or gate is placed in the "Y" for diverting the batches through one line or the other.

A compressor of suitable type is employed, the one ordinarily selected being a straight-line, one- or two-stage machine, compressing from 80 to 125 lb. The drive may be steam, oil, or electricity, as may be cheapest, most convenient, or most economical. It is desirable to have the plant near the mixer, and it is necessary to provide air storage close to the mixer sufficient at least to store enough air to discharge a batch of concrete at the maximum distance required. This

*Abstracted from the *Compressed Air Magazine*, and *Trans.*, Western Society of Engineers, July, 1918, p. 8817.

storage should have at least 100 ft. capacity, with 30 cu.ft. capacity added for each 100 ft. of pipe line. There should be additional storage at the compressor if the mixer is a considerable distance away (for example, more than 300 ft. distant).

The amount of air required to convey concrete depends upon the specific gravity of the materials, the smoothness of the pipe, the number of bends in the pipe line and their radii, the distance conveyed vertically and horizontally, and upon the pressure or velocity of the air used. For the standard-size mixer, this is about 2 cu.ft. of actual free air compressed to 100 lb. per



CONCRETE MIXER AND MONTEJUS

sq.in. per lin.ft. of pipe per batch. In other words, to convey one batch 500 ft. it will take 1000 cu.ft. of actual free air compressed to 100 pounds.

The Mixing Process

One of the first questions asked by the engineer is, "How is the concrete mixed?" This is explained by a study of the conditions which affect the batch from the time it is placed in the mixer until it is delivered in place in the forms.

In loading the mixer, the ingredients, cement and water, are usually placed in a measuring hopper, so that when the hopper is emptied into the mixer the first commingling of the ingredients takes place. The first commingling is not particularly important, as it is slight. When the air is turned on, that portion of the batch which is at the bottom of the mixer, in front of the conveying air jet, is first to move and is instantaneously followed by portions dropping from above. As the mixer has the shape of an hourglass, the central portion of the batch in the mixer flows down first, and the portion in the sides follows in the stream from the upper part, exactly as sand flows in an hourglass. During this operation the mingling of the different ingredient parts causes the smaller ingredients to flow into the voids between the larger ingredients. As the portions of the batch drop into the lower air stream, which travels at an exceedingly high velocity, these portions are carried along in suspension, much as dust is carried along in a storm, except that the particles are much closer together. Although the speed of the air jet is high, that of the concrete materials is much lower. The speed of the concrete varies according to the amount of voids in the materials which permit the air to pass through. The air in passing through tends to carry with it the smaller ingredients; that is, the sand tends to fill the voids between the rocks, and the cement tends to fill the voids remaining, and, as the voids become filled up with the smaller ingredients passing through, the speed of the mass increases, the pressure of the air behind the mass increases with the decrease of the voids in the mass, and the speed of the mass concrete increases.

Now, in this explanation of the mixing process I have assumed that the air velocity passing through the pipe is sufficient to keep the materials in suspension. It is important to have a sufficient air pressure for this purpose, because, when the air velocity is reduced, the materials simply roll and tumble along the bottom of the pipe. The concrete will also mix in this manner, but it is not conducive to good operation and makes a dirty pipe line, which is likely to become plugged. In shooting concrete, therefore, it will be found that with an 8-in. pipe and with materials of the specific gravity of limestone, the pressure should not fall below 50 lb. per sq.in., as the materials will then begin to drag along the pipe. Any air expended below 25 lb. is wasted when blowing concrete through an 8-in. pipe.

Three general types of pneumatic installations have been developed through the requirements of different classes of work. These are the central plant or plan of placing the mixer at a central point, from which the conveyor pipe is laid to the forms; a portable plant or outfit upon which the mixer is carried, and is either loaded from bins carried on the same conveyance or supplied by a belt or other loading device; and a scheme of loading the mixer at various points, as at the bottom of manholes in shallow tunnels, and supplying it with materials through a chute from the various corresponding points along the surface. The last mentioned is a form of central plant made semi-portable.

Consolidated Interstate-Callahan Mining Co.'s report for the third quarter of 1918 shows extensive development work. The repairs and operating costs amounted to $220,958, a net profit of $49,750 being obtained from ore shipments. The development work in the mine and alterations in the concentrating mill have proved satisfactory and a mineral recovery of 92% is expected. The adjustment of differences between the company and the American Metal Co., Ltd., over a long-term contract for treating the ores, resulted in a cancellation of the contract and the surrender of 145,097 shares of the company, held by the American Metal Co., thus reducing the outstanding stock of the Consolidated Interstate-Callahan Mining Co. to approximately 300,000 shares.

Standardization of Mining Methods VI—Standard Equipment*

By CHARLES A. MITKE†

This paper contains suggestions toward greater simplification of operations underground by means of standardized equipment and the elimination of unnecessary variety. Tools, tool houses, and machines are considered, and requirements outlined that will aid in the establishment of more efficient operation. The standard tool car.

THE handling of tools and supplies underground has not received the attention that the subject deserves, although it is one of the important links in the chain of standardized operations in prospecting and development. Good work is impossible unless good tools are provided and a sufficient supply is kept on hand to meet all emergencies. A miner was once heard to remark: "Give me the tools, and I will do the work." This statement followed the boss's reprimand at the end of a shift for not doing a satisfactory day's work; but the miner had been forced to spend several hours seeking an ax and pick before setting up to begin his round. The fact that a great part of the miner's time has to be spent in collecting tools and supplies is not always understood by bosses.

When hand drilling was the practice, the careful handling of the steel and supplies was simple compared to the complications that are inseparable from machine drilling. The hand miner, on receiving his hammer and several pieces of steel, is prepared to do a day's work, whereas the machine miner must assemble a far greater variety of tools and supplies before he is ready for drilling. To start without a complete outfit means stoppage of the work and a series of delays until the necessary parts are found.

Distribution of Tools and Supplies Underground

A distinct system for the distribution of tools underground is employed in almost every mine. In one case a number of locked tool boxes may be found, to which only the shift bosses and repair men have keys. The difficulty with this system is that the repair men may lose their keys or the shifters forget theirs, causing serious delays. Cupboards are used in other mines. These are always open, and anybody may help himself. As a general rule, there are seldom any tools there, as the men forget to return what they take out; and it is hardly possible, with such a lax system, to keep an accurate check on the contents of the cupboards. Another plan is to have the tool house and powder magazine in the same drift, which, of course, is extremely dangerous. In still another instance, tool houses, with all tools and supplies, arranged in their proper place, may be situated so near to the powder magazine, though in a separate drift, that the powderman can attend to both. He checks out all the tools at the beginning, and receives them at the end of the shift. This is a good system, inasmuch as an accurate record can be kept of all tools, but it is practicable only in small mines where the distances between the working faces and the tool house are short. In large mines, in which the workings are scattered and the drifts and raises a considerable distance from the central tool house, it is not practicable to return the tools at the end of the shift. An improvement over this method would be to leave the tools in the different working places in the mine, and have the tool "nippers" check them over, replacing them when necessary with others from the central tool house. When going off shift the boys should leave a report of all tools and supplies taken from the central tool house, and of the situation of the working places in the mine where they were distributed. A record should also be kept of all machines taken from the working places and sent to the repair shop.

Care of Rock-Drilling Machines

Marked progress has been made in drilling-machine design in the last few years, and new models are constantly put on the market. It has, therefore, been impossible to standardize on one particular machine. In some camps it was considered good business to scrap the old machines and purchase new ones at once, though other organizations continued to use their old machines and added new ones when they were brought out. This led to an accumulation of many different types. A number of good machines are now available, and it is possible to select a few which are best adapted to the kind of ground that is being worked, and to standardize on them. At several properties where many different machines were in use, a Paynter tester was installed, and the drills were tested for efficiency. It was found that many machines which apparently seemed to be working well struck a blow only one-third of their rated strength. Machines in this condition involve a constant loss, and the tester provided a rapid and satisfactory method of determining how many drills among those which had been in stock for a considerable time were fit for further use. Those found to be worn out were immediately scrapped.

Repairs to Rock Drills

A machine which is out of order is frequently put aside on the ground. The next miner who comes along may not know of its condition, and, quite possibly, may pick it up and put it on the bar. After he has made his complete set-up he discovers that the machine is entirely out of order. Examples of such a mistake are frequent, and time studies have shown that in one mine, within a single shift, as many as three machines have been put up on the bar, each in turn found to be in defective condition.

When the drill does not work well, the miner underground often opens the valve chest and tries to take the machine apart. Often this is done where there is a con-

*The sixth of the series of articles which began in the Nov. 9 issue of the *Journal*.

†Mining engineer, Bisbee, Arizona.

siderable amount of loose dirt and by a miner whose hands are not clean and who has no cotton waste. Many particles of dirt and rock are dropped into the mechanism, and by the time the miner thinks he is through with the repair work the machine is in a far worse condition than it was before he opened it. In all cases where there is anything seriously wrong with a machine it should be sent to the proper repair shop, which may be either underground or on the surface. Often, owing solely to low air pressure, the drill appears to be out of order, and the machine man is tempted to take it apart and try to find out what is the matter.

Frequently, the miner forgets to blow out the hose with compressed air before connecting the machine, and any rock and dirt accumulated there is sent directly into the machine and causes much trouble and delay. Every miner should have a standard oil can to take the place of the variety now in use, which includes tomato cans, tobacco cans, and various kinds of bottles. These receptacles usually contain dirt, which finds its way into the machine.

Sound of Machine No Indication of Work Done

Many miners believe that, when it is operating in a drift, they can judge a machine by the sound. The remark is frequently made: "Listen to the hammer of that machine. There is a good machine. You can tell by the sound that it is surely cutting the rock." In most cases judgment made on such evidence is based on error. The sound of a machine is no indication of its actual cutting power. Machines often sound as if doing excellent work when, in reality, operating at only 50% efficiency. This can be proved by the Paynter testing machine.

Sufficient rock drills should be kept in stock underground. Accidents will happen occasionally, and machines get out of order, and there should be a number on hand to provide against such an emergency. In this event any man who starts a round, even if he has serious machine trouble, will be able to finish it in the shift.

Small Machines Often Suitable

Wherever possible, the small machines should be used, except in drifting in extremely hard ground, where the larger machine still holds its own. Recent competitive tests have been made with several drifting machines weighing about 150 lb., and the results compared with those obtained from small machines, weighing about 45 lb., and the drilling speed was found to be the same in both cases. This is possible because the smaller machine puts in a smaller hole, and consequently less ground is taken out. The tests were made in fairly hard ground. In medium ground, however, more satisfactory results were obtained with the small machine than with the larger one; and this indicates a wider field for it than has been thought possible.

In some mines the small machine has already replaced the large machine in all development work, as well as in hard ground in stopes, and is giving equal if not better satisfaction. Moreover, it has the added advantage of requiring only one man, either to operate or set up, which naturally reduces the expense. Under present conditions of high cost of production and scarcity of competent mine labor the small machine should be more generally adopted, and the large machine and larger steel held merely in reserve for use in exceptional and unusual cases.

With the small machine, and correspondingly smaller-size steel, the holes drilled will naturally be much smaller than those drilled with the heavy Leyner type of machine. Consequently, in hard ground, higher-strength powders should be used. This was formerly impracticable, on account of poor ventilation, but recently so much attention has been devoted to an improvement in the methods of maintaining healthful atmospheric conditions, that it is now possible to use the higher-strength powders in the smaller holes without detriment to the working atmosphere.

Handling Steel Underground

Before it is possible to standardize on steel, it will be necessary to standardize on machines. Usually, in most mines, four to six different kinds of steel are in use. Experiments are being conducted in one mine having an output capacity of 2000 tons a day, and an effort is being made to standardize on one kind of steel only, which is to be used for drifting machines, pluggers,

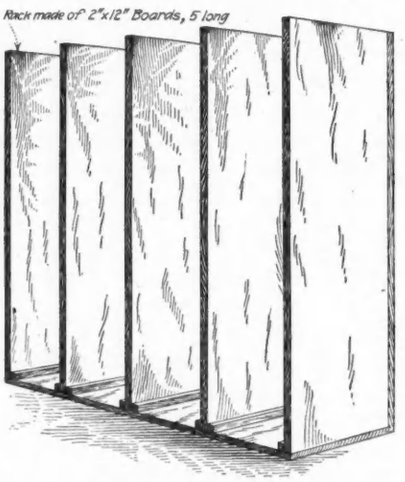


FIG. 1. UNDERGROUND STEEL RACK

and stopers. However, it has not been demonstrated that this will be practicable; but it is reasonable to believe that the entire drilling in the average mine can be done with two kinds of steel—the large, round, hollow steel (1⅛-in. diam.) for large machines working in exceptional ground, and the hollow quarter octagon (1⅞-in. diam.) for the Jackhamer type and stoping machines. This is being done successfully in several mines, and when put into general use will facilitate the standardization of steel and do away with the expense of carrying in stock a number of different kinds. The inefficiency resulting and the confusion caused underground should thus be materially reduced.

Necessity for Underground Steel Racks

Another important consideration is the character of the steel and drill bit. A great deal has been written on this subject, and much has been done to improve the design. The drill bit should be made with great care, with the temper which the ground requires, and with the exact gage, cutting edge, and reaming surfaces. Four pieces of steel (the 1st, 2d, 3d and 4th) should be fastened with an iron ring into one bundle, to facili-

tate handling. This bundle contains all the steel required for the drilling of one hole to its proper depth, and can be used over again until the steel becomes dulled.

Another problem is to keep the steel moving. For example, after it passes through the drill-sharpening shop, it is transported to the shaft, lowered in steel cars to the various stations, and taken thence to the steel racks. Frequently, it is merely stood up on the ground, and becomes plugged before it is put in the machine. This may be avoided by the use of steel racks, where it is sorted into different lengths and kinds. These racks (see Fig. 1) should be on all levels under-

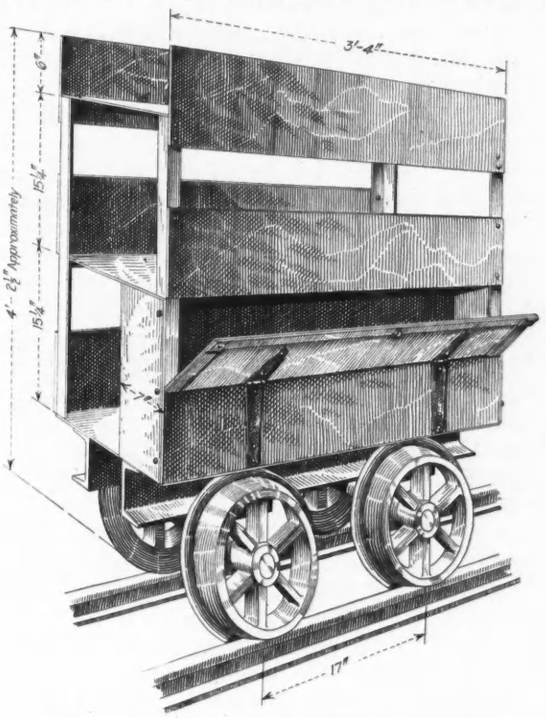


FIG. 2. LEYNER DRILL AND TOOL CAR

ground, at convenient distances from working places. The steel is taken to the racks from the shaft stations on trucks, and distributed to the different tool cars by the tool "nippers," who, in turn, take the dull steel back on small trucks to the shaft stations. Here it is put into the steel cars in which the sharp steel has been brought down, and sent to the surface. A surplus of sharp steel should always be kept in the central steel racks, so that a man who has not enough steel to finish his round can obtain more.

The central steel rack should be near the tool house and also close to the powder magazine, so that the powderman who gives out the powder, caps, and fuse can also attend to giving out the tools, supplies, and steel. He should also check all that comes out, in order that a record may be kept of the machines and other equipment.

Standard Equipment for Drifting Work

To have a complete outfit, so that the machine man will not find it necessary to seek additional tools or supplies during the shift, he should be furnished with standard equipment, consisting of: 1 machine; 52 pieces of properly tempered steel; one 50-ft. air hose, and connection; one 50-ft. water hose, water valve and connection; 1 column, arm, clamp, chuck wrench, a monkey wrench, and an 18-in. Stilson wrench; 1 blow pipe and valve; 1 oil can, filled with proper machine oil; 1 ax; 1 double jack; 1 shovel; 1 jack bar; 1 light 6-ft. bar; 1 pick; 1 scraper; 2 blocks; 6 wedges; 1 foot-block; gaskets, side rods, nuts and springs; 1 powder sack; 1 cap and fuse sack; 1 tamping stick. This equipment should be sufficient to drill a standard round, and the list includes everything needed by the miner during the shift, with the exception of the powder, and is equally applicable whether large or small machines are used.

The equipment should be assembled at the tool house on the level of the mine on which the work is to be done, loaded on the tool car designed for that purpose, and sent to the working place before the miner arrives. Then, as soon as he comes on shift, he can begin setting up and drilling.

Standard Type of Tool Car

The tool car should have four compartments—the two larger compartments for the machine, steel, bar, hose, blocks, and like material, the two smaller ones for wrenches, oil can, gaskets, side rods, and smaller appliances generally. This car should be designed to hold the entire equipment in a small space, and its adoption will obviate the necessity of using several trucks or ore cars. At the end of the shift, the equipment should be loaded on the tool car, everything being put in its original place, and moved to a siding, where it should be attended to by the tool "nipper" on the next shift. He should look over the car, refill the oil can, replace dull with sharp steel, and see that everything

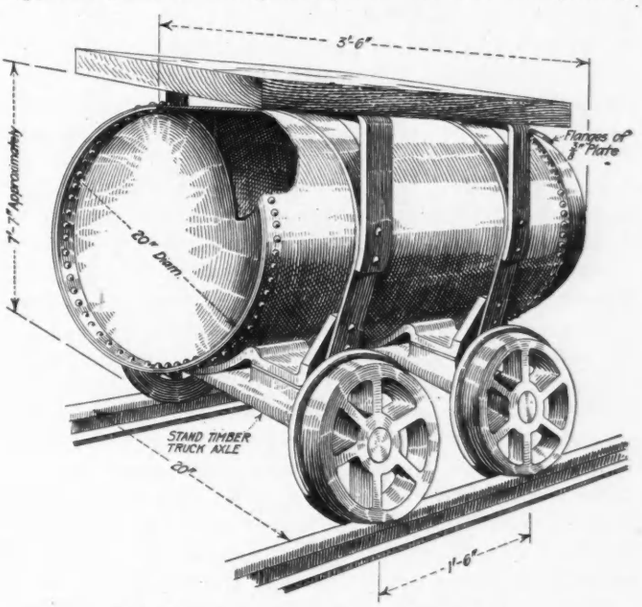


FIG. 3. LEYNER DRILL WATER CAR

is in first-class order. If water lines are not provided in the drift, water cars should be used. Figs. 2 and 3 are drawings of practical tool and water cars in use in several mines in the Southwest.

Standard Equipment in Raising and Stoping

A standard equipment unit for raising or stoping should consist of 1 stoper machine; 52 pieces of selected stoper steel; one 50-ft. air hose and connections; 1 oil can, filled with proper machine oil; 1 pick; 1 foot-block; 1 monkey wrench; gaskets; 1 scraper; 1 powder

sack; 1 fuse sack; 1 tamping stick. If the stoper is a water machine, then 50 ft. of water hose, water valve, and connection should be included. The equipment should be loaded on the tool car or small truck, and handled as in drifting.

Shoveling

When the mucker enters the drift he should have the following equipment, which he has obtained from the tool house on the level: 1 short-handled scoop or 1 square-pointed shovel; 1 round-pointed shovel; 1 pick; 1 double jack; 1 six-ft. bar; 1 light car, obtained at the working place. Turnsheets should be laid in all drifts before blasting, so that the mucker will be more efficient in his work. Exhaustive studies have been made of mucking on the surface, and many of the principles evolved could be advantageously applied to underground work. Little attention has usually been paid to the kind of shovel which is given to the mucker, or whether its size, shape, design, or length of handle are suitable for the load it has to carry. Too much emphasis cannot be laid on this important feature, upon which depends the efficiency of the worker and the cost of the operation.

Shovels, Shoveling Machines, and Scrapers

In most drifts a short-handled, large scoop is preferable, provided turnsheets have been first laid so that the mucker can shovel from a smooth bottom. In rare cases, where sulphides are to be handled, a smaller, square-point shovel should be used, as the specific gravity of this material is high. If no turnsheets have been laid, and the mucker must shovel from a rough bottom, then a small, round-point shovel should be used. This is expensive practice, as it requires far greater exertion to shovel from a rough bottom than from a smooth surface, experiments showing that it costs approximately 40% more than if turnsheets are laid and a short-handled, square-pointed, 21-lb. shovel is used.

Shoveling machines are used in large stopes and motor drifts. Though a large amount of material per shovel can be handled and loaded in cars, serious delays are frequent, owing to breakdowns which require the services of expert mechanics in making repairs. Scrapers, when operated by small tugger hoists, are used to advantage in horizontal top-slice stopes to shovel and transport into raises the ore which has been broken in the headings driven to open up the stopes. After these headings are opened, a large number of stulls must necessarily be put up, which would interfere with the action of the scraper and prevent its use in the stopes. As much as 80 tons has frequently been handled with one of these scrapers by two men in an 8-hour shift, but such a machine can be used to advantage only in soft ground. In stopes where there is hard ground which breaks into large boulders it is not practicable unless an excessive amount of explosive is used to break the boulders, and this adds materially to the cost. The cars used should be light. Considerable effort is required to move a heavy car, and if one man must handle it alone it is impossible for him to transport much ore.

Frequent sidings and switches should be laid in long drifts to lessen the distance for hand tramming. Mule or electric haulage should be used from these sidings to transport ore or waste to its destination.

Where short trams are planned for the mucker to tram either ore or waste into raises or stopes, the bosses should always see that there is sufficient room to contain all the material which will be trammed there during the shift, so as not to cause a delay on the part of the mucker in waiting for chutes to be drawn.

The Metric System in Russia

According to the *Ironmonger*, the Soviet Republic has ordered the abolition of the present system of Russian weights and measures and the introduction of the decimal system, the decree to come into force on Jan. 1, 1919. The standards to be used for the decimal measures are the standard meter and kilogram which were presented to Russia at the International Weights and Measures Conference in Paris in 1899, and which are kept at the Central Office for Weights and Measures at Moscow. If for technical reasons it should be found impossible in any particular department or locality to enforce the decimal system on Jan. 1 next, the use of the old measures may be temporarily continued, but Jan. 1, 1922, is the latest date for the introduction of the decimal system. The Commission for Trade and Industry is ordered to supply new weights and measures, and the Education Commission to see that practical instruction in the decimal system is given in all the schools. From Jan. 1, 1922, the manufacture of old Russian weights and measures is prohibited, from Jan. 1, 1923, none may be sold, and from Jan. 1, 1924, their use will be illegal.

War Prices Prevent Normal Business*

In peace this country cannot do business on a basis of war prices. When our Government and all the governments of Europe were paying whatever they had to pay for steel, for coal, for copper, for leather, for foodstuffs—when they were draining the markets of all commodities—ordinary industry and ordinary business, buying in the same markets, were compelled to pay the same prices or even higher. They could do this and get out alive. They could do it because nobody else was going to underbuy them and therefore undersell and ruin them.

With the war over, with all inflated prices due to come down to a dead certainty, industry and business are not going to buy at the top. They don't need to be warned, they know, that if they do stock up with material and goods at two, three, and four times normal values, the concerns that come along after them and buy much lower down will drive them out of their selling market unless they are willing to clean up at whatever loss they must take to meet competition and get rid of their stocks.

Get back to ordinary business. It is the only way. The Government can begin by releasing its surplus wool at such prices that manufacturers can take, and merchants can give, orders now. Let supply and demand regulate the price just as if there had never been any war. Let the Government charge up the difference to the war. There will be plenty of business for everybody on that basis. On the war inflation basis there cannot be. Let the Government lead the way.

*From the New York *Sun* of Dec. 6, 1918.

The Berdan Pan for Amalgamation

By A. W. ALLEN

THE simplest type of machine for amalgamating gold in ores, and at the same time effecting the final comminution necessary in most cases to free the metal from the encasing gangue and expose it to the action of the mercury, is the Berdan pan, a diagram of which is shown herewith. It is used extensively in countries where prospectors and small owners need some machine to cleanse their pannings and recover the gold in a salable form. Under such conditions it is realized that most of the losses take place during the final stages of hand panning, dry blowing, or mechanical concentration, in an endeavor to get an absolutely clean product. There is no question that its use could be still further extended if its design were more gnerally known and the simple principle on which it operates better appreciated.

The standard size of Berdan pan is about 5 ft. in diameter. The pan consists of a circular trough which carries a large ball, in the manner shown. The trough is mounted in a steel driving shaft, set at an angle and so arranged that the pan can be driven by suitable gearing at a speed of from 10 to 15 r.p.m. The material to be ground is fed into the pan either continuously, by means of an automatic feeder, or periodically, by hand; and a stream of water enters with the feed and overflows at the lowest point of the lip, carrying with it the treated material. The fineness to which the latter is ground can be regulated, within certain limits, by adjusting the amount of water passing through the pan.

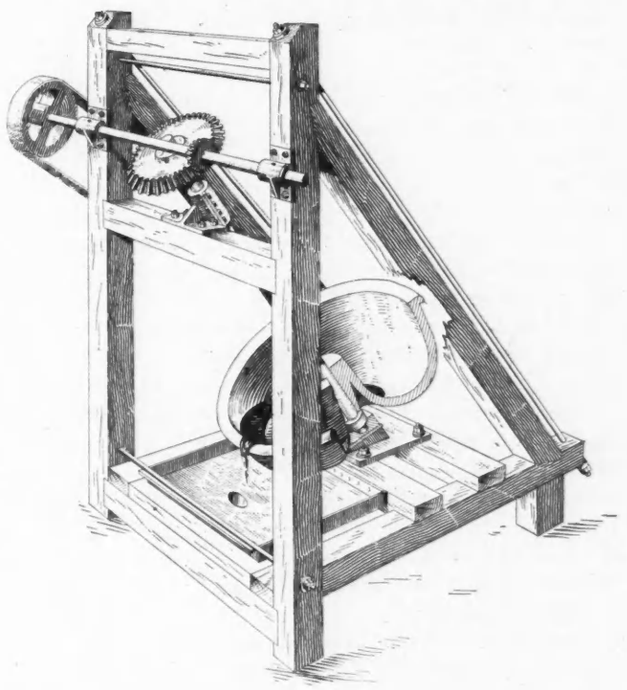
The ball rolls in a pool of mercury, so that any metallic particles that are freed by its crushing action are immediately brought into contact with the quicksilver, and amalgamated. The speed of the pan is so low and the action so quiet that practically no mercury is floured during the operation.

The capacity of the pan for actual grinding is, of course, small, as the ball weighs only about 120 lb., and the power consumed is negligible. It is highly advisable to break the material in a dolly pot or sample crusher before feeding to the pan, so that all will pass ¼-in. mesh. If an even finer feed can be arranged, the duty will be proportionately greater. The secret of success as regards capacity is to maintain an even and minimum bed of ore or other material in the pan. Like the stamp mill, the Berdan pan will do practically nothing when overfed.

In place of the steel ball an iron drag is sometimes used, but is not to be recommended. The power consumption is increased out of proportion to the increase in tonnage ground; and it is difficult to maintain the proper thickness of feed bed between the drag and the pan bottom. Liners are sometimes employed to reduce wear under such circumstances. These are, however, unnecessary when a ball is used, when the pan body can be made as a stout casting, of extra thickness where there is abrasive action; and even after continuous operation it will be found to be little worn. It will certainly last for several years. The smooth surface of the trough will permit an effective clean-up to be made, whereas when liners are used the amalgam is likely to lodge between the pan body and the liners, and can be recovered only with difficulty.

The Berdan pan is an invaluable adjunct in a mill, especially where amalgamation is being, or has been, practiced. It has been responsible for the recovery of many tons of mercury since the price of the metal advanced under the stimulus of a war shortage. Many operators have found that the débris around an old amalgamating plant often contains sufficient mercury to make its treatment in a simple machine of this type a highly profitable undertaking.

Millmen will find this amalgamator far more convenient than the amalgam barrel for cleaning up accumulations of mill refuse containing mercury or amalgam. They will appreciate the fact that by withholding



BERDAN AMALGAMATING PAN

the feed for an hour or so before they are free to attend to the clean-up, and by allowing a stream of clear water to pass through the pan during this time, the mercury will be thoroughly cleansed, the iron can be easily removed, and the amalgam can be pressed in a minimum of time. Compared with the messy procedure necessary with an amalgam barrel, and in view of the fact that practically no mercury is floured during the operation of a Berdan pan, there is little doubt as to which is the more convenient machine. It will also be found particularly handy and suitable for cleansing and grinding chippings, scrapings, and scalings from copper plates, and producing an even grade of amalgam for retorting.

In addition to its use in connection with battery clean-ups, the Berdan pan will be found invaluable for reducing shot metal and fine gold and silver from slag

resulting from the smelting of cyanide zinc-box precipitates and retorted metal.

The Berdan pan is seldom used as a unit of milling equipment, on account of its limited grinding capacity; but on small "one-man" properties, equipped with a battery or mill of some description and a concentrating table, the addition of a pan of this type would involve little expense, absorb practically no additional power, eliminate a great proportion of the labor necessary with apron plates, and insure a greater recovery of gold. Where a middling product, obtained from the concentrating table, needs regrinding, the Berdan pan will be found suitable for this purpose, although it is not to be recommended where very fine grinding is not required, or where an even grade of sized product is expected. By modifying the inclination of the pan so that the depth of liquid is varied, it is sometimes possible to regulate the size of the product delivered, but only within comparatively narrow limits.

What Alsace-Lorraine Meant To Germany

Dr. Felix Pinner, who from time to time contributes articles on economic questions to the *Berliner Tageblatt*, recently enlarged on the importance of Alsace-Lorraine to Germany as a source of raw materials. The following summary is taken from the *Ironmonger* of Nov. 9:

The loss of the manufacturing industries of the two provinces, states Dr. Pinner, would mean far less to Germany than being cut off from sources of certain raw materials with which she herself is not too well provided. The three most important of these are iron ore, potash, and petroleum. Without the 10 Alsatian potash mines, Germany would still hold potash deposits and works from which not only her home requirements but an unlimited export demand could be covered. Nevertheless, the world monopoly in potash which Germany now holds, except for some minor deposits in Spain and the United States, will be broken if Alsace is lost, and this would deprive Germany of one of her few weapons of economic defence.

But the iron-ore question is still more serious. The huge development of the German iron industry would have been impossible without the acquisition of the Lorraine ore deposits in 1871. The Lorraine steel output (2,286,354 tons in 1913), considered in relation to the total German output of 18,958,819 tons, is small, but the fact must be taken into account that not only the Lorraine works but all the West German iron works drew to a large extent upon the Lorraine minette ore. The Luxemburg iron industry is economically bound to that of Lorraine, and if Lorraine is lost Luxemburg cannot continue in the German Customs Union.

Now, the Lorraine and Luxemburg iron-ore output combined in 1913 amounted to 28.5 million tons of the total German output of 35.9 million tons, or, expressed in iron content, to 77% of the total. The loss of Lorraine would, therefore, make Germany dependent upon foreign ore supplies for the greater part of her iron output. She would still be able to obtain ore from Sweden, Spain, Russia, and perhaps even from France, yet the basis of her industry would be so narrowed as seriously to hamper development of her iron industry.

Liquid Crystals

Evidence has been accumulating during the last few decades that there is justification for speaking of "liquid crystals," according to *Engineering*. The term certainly does not appear to accord with the time-honored distinction of the three states of aggregation—solid, liquid, and gaseous. Nor do bodies like pitch and wax and others which gradually soften without having a definite melting point exactly fit this classification. But crystals, substances which in solidifying assume definite though varying shapes, with straight edges and plane faces, and which are characterized by peculiar optical and other physical properties not found in either amorphous or in liquid substances, seem to be the perfect examples of solids, and it is difficult to imagine such substances to partake simultaneously of the characteristic properties of solids and of liquids. Yet it is known that there are a large number of crystal-like bodies of more or less constant shapes, which unite when they meet, forming twins, which may split again, which may be distorted into spirals, and which not only possess some of the specific properties of crystals to an enhanced degree, but actually display certain optical properties for which scientists have so far been looking in vain in solid crystals. These liquid crystals may drift in a trough across which wires have been stretched, and float right through the wires to close up again and to reassume their original shape and properties, much like the proverbial ghost floats through the walls, and is left unharmed by bullets and sword thrusts. The liquid crystals are real, though they are best studied under the microscope and polariscope.

White Arsenic in Rhodesia*

The manufacture of white arsenic on a commercial scale was brought to a successful stage in Rhodesia early in 1918, says the *Board of Trade Journal*, in quoting the report of the Munitions and Resources Committee. One unit of a plant is at present in operation, the output from which is about 14 tons per month. The plant is now being increased, and it is hoped to produce about 100 tons per month before the end of 1918. The product is of excellent quality, assaying about 99% As_2O_3, and it is interesting to note that this grade is obtained from the ore in one operation. For the time being all the arsenic produced is exported for the Union of South Africa for the manufacturing of arsenite of soda, but it is the intention of the syndicate now carrying on the work to turn out sheep-dips itself at a later date. Experiments in the recovery of arsenic as a byproduct have been conducted.

A considerable amount of attention was devoted during 1917 to prospecting for arsenical ores, and bodies of mispickel ore are now known to exist within reasonable distance of the railway line, which could supply South African requirements for arsenical compounds for many years. White arsenic recovered as a byproduct in gold mining would doubtless find a ready sale if the manufacture of dips and of arsenite of soda is begun, but the regular source, the committee states, would necessarily be from high-grade mispickel ores such as are known to be available in the country.

*Commerce Reports, Nov. 16, 1918.

Destruction of the French Coal Mines*

The French Departments du Nord and Pas-de-Calais have suffered severely through the depredations of the invader. The Germans, in their customary manner, destroyed the greater part of the machinery used at the coal mines. Thanks to their ruthlessness, France is deprived of one-third of her normal output of coal for a period of three or four years to come, and Germany will now be called upon to make good this shortage. Whether the German debt shall be paid by occupying the district of La Sarre or by a coal tax upon the Rhine and Westphalian districts is unimportant, but fuel must be one of the most important considerations in the peace treaty.

What strikes the visitor most forcibly is that the city of Lens, now called Lens le Neant ("Lens the Nothing"), is a vision of horror that cannot be erased from the memory. Everything is pulverized, only a few walls stand, and nothing remains of a once happy population of 355,000 souls. Toward Courrieres are a few stumps of walls and empty houses; further to the east the wrecks of Salloumines, Henin-Lietard, Courcelles, and Auby. Still further to the east is Douai, but here the aspect changes somewhat. The town is nearly intact, and few houses are destroyed, but they are unoccupied except for a few soldier police. The sweeping has been clean. After the inhabitants had left, officers and privates looted thoroughly. The camions have carried off linen and furnishings, leaving shells and war supplies by the roadside. Toward the pits of Aniche and Anzin the Germans destroyed the bridges and blew up the crossroads, but they are still accessible over the side roads where the enemy did not use his heavy trucks. All over the country are the remains of the Decauville portable railway, and by the side of it heaps of barbed wire gratings and helmets.

The destruction of equipment was thorough at Lens, Courrieres, Dourges, l'Escarpelle, and Douai. At Aniche and Anzin it was hoped, for a moment, that less destruction would be apparent, but it is just the same. Steam cylinders and air compressors were dynamited. A few cartridges carefully exploded in screen and washing plants have made them useless. Switchboards were carried away, and no trace of copper is to be found. Here and there are a few cars still loaded with coal, but most of them lie around partly destroyed by nearby explosions.

In the district of Lens the mines were flooded thoroughly, by turning surface water into them. In other districts only the lower levels of the mines are now flooded, owing to the cessation of pumping. By the middle of October scarcely a single inhabitant of the coal districts remained. A few miners hid themselves and stayed behind the retreating Germans, and others, escaping from the retreating enemy, are now slowly coming back, and civil life is beginning again. The engineers and superintendents who had remained at the mines during the war were taken to Belgium in the retreat and are still prisoners. A few engineers formerly connected with the mines are in France, and these are now returning to take such care of the property as is possible and to begin restoration.

At a few mines the destruction was not so complete as intended, and many inhabitants still remain; the Germans, with bayonets at their backs, could not always complete their tasks.

The big problem of today is to decide on the manner of reviving the business. It is a technical and economic problem requiring the maximum production in the shortest possible time. In its solution efforts will probably be limited to certain chosen points where destruction is less complete, but nothing is yet definitely decided upon—the question is still being studied.

*Extract from *L'Echo des Mines et de la Metallurgie*, Nov. 3 and 10, 1918.

Manganese at Kaslo, B. C.

An interesting geological survey of the manganese deposits of Kaslo, B. C., has been issued by the Mines Department, Ottawa, which reads in part as follows:

Three claims, the Harp, Collingwood, and Black Diamond, are situated five miles from the town of Kaslo at 2690 ft. elevation, on the northeast side of the valley of Kaslo Creek. . . . The workings examined were at an elevation of 2630 ft., where a quartz vein 3 to 4 ft. wide has been explored by open cut and tunnel for 33 ft. The vein occurs in the Kaslo volcanics group of rocks. It conforms with the strike of the formation and dips 80° west.

The immediate hanging wall is a banded, compact, argillaceous and somewhat graphic schist. The foot wall is a 2-ft. band of chlorite schist, an altered eruptive. Both walls have gouge material and are well defined. The rhodonite in the vein is massive, dull gray to deep pink in color. It occurs along the foot wall in fairly continuous bunches, which were probably at one time joined together in a continuous band of rhodonite varying in width up to 18 in. The gangue consists of vitreous smoky quartz, carrying pyrrhotite, pyrite, and chalcopyrite. The sulphides impregnate the wall rock and cause the foot wall in particular to weather to a rusty brown. The vein has been formed by hydrothermal solutions ascending along a contact fissure and those associated with the sedimentary members, where the fissure is along a contact or bedding plane, from the prevailing type in the Kaslo volcanics.

The secondary deposits of manganese occurring on the valley terraces and slopes flanking the Kaslo volcanic area of the Blue Ridge are the most noteworthy yet discovered in British Columbia. The ore consists of different forms of wad or bog manganese. A sample of this material proved to be a good grade of wad, containing 48.14% of Mn and 1.65% Fe. Six claims were staked for wad in July, 1917, at a point two miles beyond Murphy's property and seven miles from Kaslo. On three of these claims, owned and prospected by A. J. Curle, of Kaslo, wad was found in segregations or layers associated with calcareous tufa and limonite.

A study of the distribution and character of the wad deposits on the northeast side of Kaslo Creek valley points to the fact that mineral springs and swampy ground with sluggish drainage played an important part at one time on this valley slope. Deposition must have been in progress for a considerable period, as layers of wad attaining a thickness of three feet have been encountered in shallow holes and ditch-like excavations. Beds of wad averaging 6 to 10 in. in thickness, separated by tufa or limonite bands, are typical of the occurrence.

Extraction of Mercury With Sulphide*

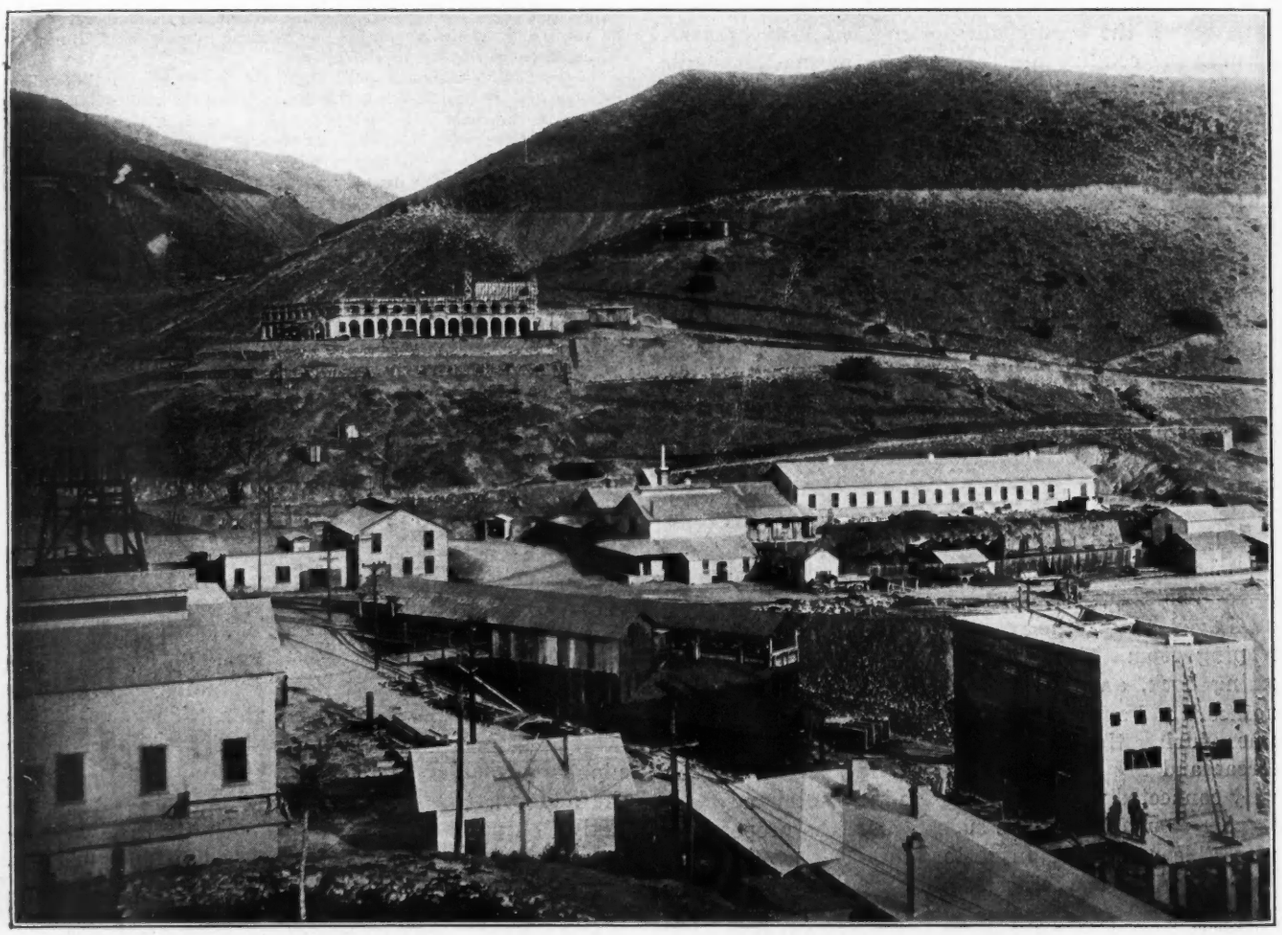
By C. H. Holland

One part of an ore containing cinnabar, ferric oxide, and a hydrocarbon is crushed, and agitated with 4.5 parts of an aqueous solution containing 4% sodium sulphide and 1% sodium hydroxide. The solution is filtered, and mercury is precipitated from the double sulphide of mercury and sodium by aluminum shavings. The mercury is obtained partly in metallic form, and partly as a powder mixed with foreign matter, which is heated in a retort with manganese dioxide and lime. The total yield of mercury is 84.5 per cent.

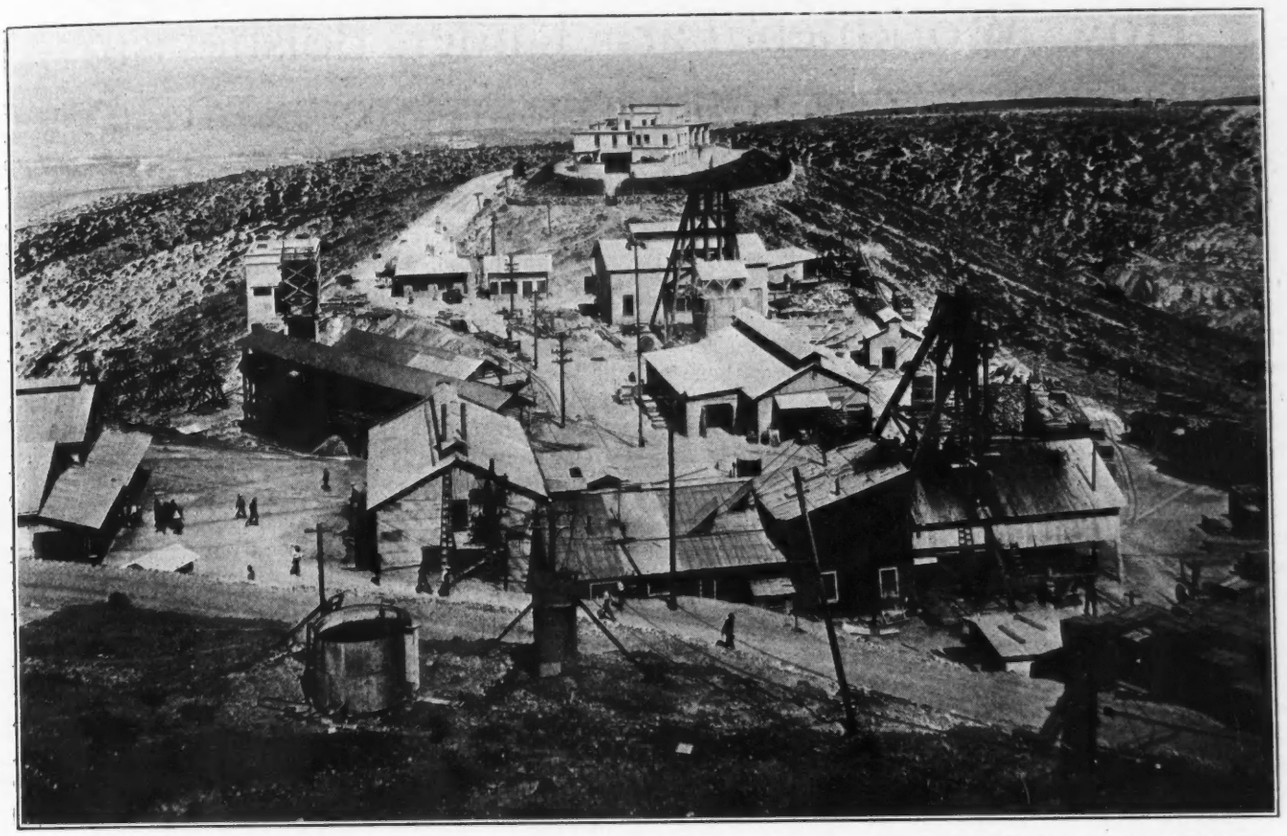
*Abstracted from *New Zealand Jour. Sci. Tech.*, and *Jour. Soc. Chem. Industry.*

Photographs From the Field

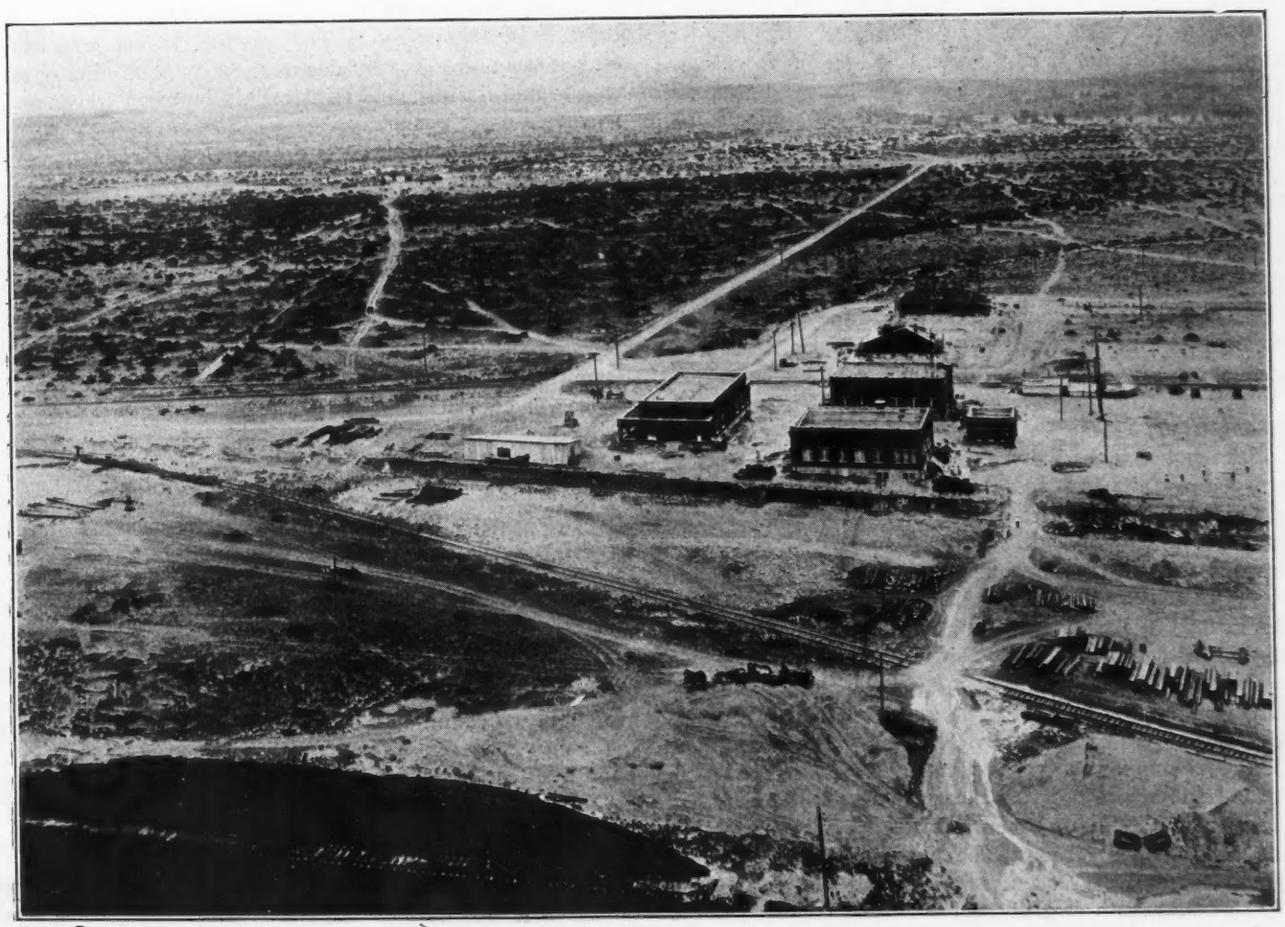
TEMPORARY TOWN SITE OF VERDE, NEAR JEROME, ARIZONA



HOIST, TRANSFORMER HOUSE, CHANGE HOUSE AND MINERS' HOTEL, UNITED VERDE EXTENSION MINE



SURFACE PLANT AT UNITED VERDE EXTENSION MINE, WITH JAMES DOUGLAS' RESIDENCE IN BACKGROUND



GENERAL OFFICE AND LABORATORY AT SMELTERY OF UNITED VERDE EXTENSION MINING COMPANY

How Workmen Fare Under Bolshevism

THE following comprises some illuminating paragraphs from an article by Hans Vorst, the Russian expert of the *Berliner Tageblatt*, Oct. 8, 1918, a translation of which was published in the New York *Times:*

The signs of destruction are still more prominent in Petrograd than in Moscow. I was already convinced of this on my short route from the railway station, and the following days finally revealed to me a dying city. The crumbling pavements, the neglected houses, spoke an impressive language. There is no house without a sign announcing the hurried sale of house furnishings. At every corner so-called "liquidation bureaus" have been established, in which household articles of all kinds, furs, clothing, linens, furniture, objects of art, and antiques are sold. All of these things, often fondly gathered for decades, are now thrown upon the market, and must be auctioned off at ridiculously low prices, if, indeed, they can find a purchaser at all. For who cares to buy, when the requisitioning of bourgeois homes, the confiscation of their furnishings, is in full swing?

The bourgeoisie are fleeing from the city, as the constantly growing distress and increased cost of living, besides the persecution which is threatening them at present and in the future, make life unbearable. Panic-stricken, these people try to gather their possessions at the eleventh hour, and, as far as possible, to turn them into cash. For possessions have become a burden and a hindrance. Now the better middle classes also are fleeing.

But the working class, too, is fleeing, because the city can no longer offer it employment and support. Toward the end of 1917 the population of Petrograd was still 2,700,000; in June, 1918, it was only 1,400,000. In about a half a year, therefore, the population decreased to half its former size, and since then it has doubtlessly fallen off even more.

The eye witnessed signs of this breaking up and destruction of the once so brilliant city, no matter where it looked, even on the short trip from the railway station through the streets. The workingman at my side, meanwhile, told me the old story of being out of work, in distress and hungry. With bitter irony he added:

"For all this, everything is now ours. The houses belong to us, the factories and banks belong to us. But we are not able to live more easily because of it, and everything falls to pieces."

These words, which the plain workingman learned from his own experience, show, in fact, the scarcely enviable lot of the Russian proletariat. The working class has achieved full control in the state, and yet there are groups in its midst who have been deluded, because of this fact, into forgetting that their economic position has not been improved because of it, but rather has begun gradually to decline. The average wage of the industrial and transportation worker, of the clerk, and the municipal employees in Russia in the year 1914 was about 32 rubles a month. According to the reports of the People's Commissioner of Labor, Larin, recently published in the *Isvestia*, the present earnings of the same class of workers amount to about 325 rubles per month—that is to say, about 10 times as much as formerly. This tenfold increase in wages was perhaps the cause of the stiff prices which were current this summer, and which amounted to about 10 times the prices paid in free trade before the war, exclusive of the fact that the commodities, which may be obtained at fancy prices, are not present in sufficient quantities, and that the workingman, too, must often pay a hugely exorbitant price to the profiteer.

Meanwhile, though, the administration has this autumn again raised the prices so much that on the average they amount to about 20 times those paid in peace times. Thereupon was based the demand, presented by Larin, to double the wages again. Larin said:

"One cannot double the prices and let the earnings remain the same or only increase them by half. The working class does not relish such jokes."

Yet the administration, in coalition with the Central Executive Committee, could not decide in favor of a 100% raise, but ordered a 50% raise instead. The increase in wages therefore remains quite a pace behind the increase in prices, and the position of the working class becomes more difficult still because of the lack of provisions and commodities. But even this increase in wages only constitutes a passing palliative measure, as it is a positive economic fact that wages and prices stand in an essentially alternative position, and as soon as wages are raised prices must jump higher, too.

The only possibility of improving the condition of the working classes is by increasing production. But this, too, failed, and, by the course that is being followed, cannot succeed. The productiveness of work sank lower and lower by degrees. It is thus impossible even to maintain the old relationship between wages and prices.

The Soviet government is desirous of introducing expedients into this situation, which, like the partial payment of wages in kind, can only lead to an irreparable confusion, if, indeed, it should come to be realized at all. In the meanwhile, to keep alive the impression among the working class that they are enjoying material benefits from the "dictatorship of the proletariat," steps are being taken to isolate the middle class from its dwellings, to requisition its house furnishings, and to place the proletarians in its stead. A committee at the Council of the People's Commissioners formed a resolution in which was stated:

"Parasitic elements, capitalists, manufacturers, bankers, speculators, property owners, entrepreneurs, and, in fact, persons who do no specially paid work, are liable to exile."

Arrangements have also been formulated for the requisitioning of homes. In Moscow these measures "for the establishment of wholesome shelter for the workingmen" are already in progress. Petrograd is preparing to follow this example.

Though a certain system is being followed, and exceptions are being made in the capitals, it seems that in the provinces the task is being done in a more summary fashion. One number of the official *Isvestia*, that of Sept. 15, contains the following news items:

"In Nikolajevsk the Executive Committee has resolved to confiscate the altogether excessive possession

of the capitalists and to turn it over to the common national fund.

"The Soviet in Ostashkov has, in conjunction with the Red Terror, prescribed a contribution of 469,000 rubles to the bourgeoisie of the community.

"At Voronesh the bourgeoisie is being excommunicated from the central part of the city to the suburbs at the will of the Soviet; their dwellings in the city are being occupied by the workingmen."

In this way the social revolution in Russia has begun at present to realize just what socialism always brought as a charge against its enemies. Instead of organizing production, possessions are being taken from their owners and divided among the masses of the poor.

How long will this last, and where will it lead? The working class will soon realize that they will have to starve and freeze in the dwellings of the rich as well, so long as economic destruction continues.

Metallic-Electrode Arc Welding

By O. S. Escholz*

A reliable method for determining the character of welded joints is of prime importance, and the lack of one has been responsible to a large extent for the hesitancy among engineers with regard to the adoption of arc welding.

Manufactured apparatus is practically all accepted on the basis that it should comply with a process specification, rigidly enforced, in conjunction with the successful reaction to certain tests. Riveting seriously impairs the strength of the jointed plates; yet, with a proper layout and intelligent inspection, the completed structure possesses certain definite features which do not require further examination. The inspector of a finished concrete structure is practically helpless, as the weakest sort of construction may be concealed by a sound surface. With a careful supervision of the process, however, the physical properties of the completed structure can be reliably gaged, and the use of concrete may be justified even in ship construction.

Electric-arc welding is susceptible to better control. The four factors which determine the physical characteristics of the metallic-electrode arc welds are fusion, slag content, porosity, and crystal structure. Some of the more important methods for determining these characteristics are:

1. Examination of the weld by visual means to ascertain: (a) finish of the surface as an index to workmanship; (b) length of deposits, which indicates the frequency of breaking arc, and, therefore, the ability to control the arc; (c) uniformity of the deposits, as an indication of the faithfulness with which the filler metal is placed in position; (d) fusion of deposited metal to bottom of weld scarf, as shown by appearance of under side of welded joint; (e) predominance of surface porosity and slag.

2. Chipping the edges of the deposited layers with a cold chisel or calking tool to determine the relative adhesion of deposit.

3. Penetration tests to indicate the linked unfused zones, slag pockets, and porosity by: (a) X-ray penetration; (b) rate of gas penetration; (c) rate of liquid penetration.

4. Electrical tests (as a result of incomplete fusion, slag inclusions and porosity), showing variations in: (a) electrical conductivity, and (b) magnetic induction.

The utilization of these methods to the best advantage involves their application to each layer of deposited metal as well as to the finished weld. This, excepting in unusual instances, would not be required by commercial practice in which a prescribed welding process is effected.

Visual examination is of more importance than is generally admitted; and in conjunction with failure in the case of the chipping and caulking tests, is of particular usefulness. The last mentioned test serves to indicate gross neglect, by the operator, of cardinal welding principles, owing to the fact that only a poor joint will respond to the tests.

The most reliable indication of the soundness of the weld is offered by the penetration tests. Obviously, the presence of unfused oxide surfaces, slag deposits, and blowholes will offer a varying degree of penetration. Excellent results in the testing of small samples are made possible by the use of the X-ray. However, on account of the nature of the apparatus, the amount

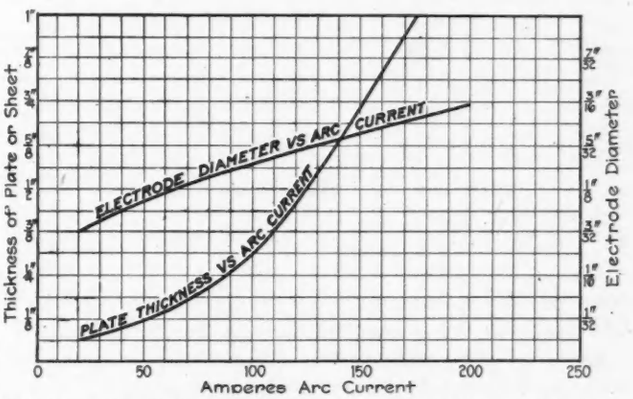


FIG. 1. CURRENT NEEDED AND ELECTRODE DIAMETER FOR WELDING PLATES

of time required, and the difficulty of manipulating and interpreting results, it can hardly be considered at present as a successful means of examination in operations involving large-scale production.

The rate that hydrogen or air leaks through a joint from pressure above atmospheric to atmospheric, or from atmospheric to partial vacuum, can readily be determined by cumbersome equipment. The slight advantage over liquid penetration in the matter of time saving is not of sufficient importance to warrant consideration.

Kerosene, of the various liquids that may be applied, has marked advantages, because of its availability, low volatility and high surface tension. When sprayed on a weld surface it is rapidly drawn into any capillaries which may have been produced by incomplete fusion between deposited metal and weld scarf, or between succeeding deposits, slag inclusions or gas pockets, penetrating through the weld and showing the existence of an unsatisfactory structure by a stain on the emerging side. A bright red stain can be produced by dissolving suitable oil-soluble dyes in the kerosene. By means of this test, the presence of faults that could not be detected with hydraulic pressure or other methods has

*Research engineer, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pennsylvania.

been indicated. By the kerosene penetration method a sequence of imperfect structures linked through the weld could be immediately discovered. It must be borne in mind, however, that this method is not applicable to the detection of isolated slag or gas pockets, nor of small, disconnected unfused areas. It has been shown by various tests, however, that a weld may contain a considerable amount of distributed small imperfections without modifying its characteristics to a great extent.

If a bad fault is betrayed by the kerosene test, it is advisable to burn out the metal with a carbon arc, before rewelding under proper supervision. Electrical test methods by which the homogeneity of welds is determined are still in the evolutionary stages, and obvious difficulties are yet to be overcome. Some of these are the elimination of the effect of contact differences, the influence of neighboring paths and fields, and the lack of practicable and portable instruments of sufficient sensibility for the detection of slight variations in conductivity or magnetic field intensity. No simple tests are available, except those which involve subjecting the metal to excessive stresses, for determining the crystal structure. Control of this phase must be determined by the experience obtained from following a prescribed process.

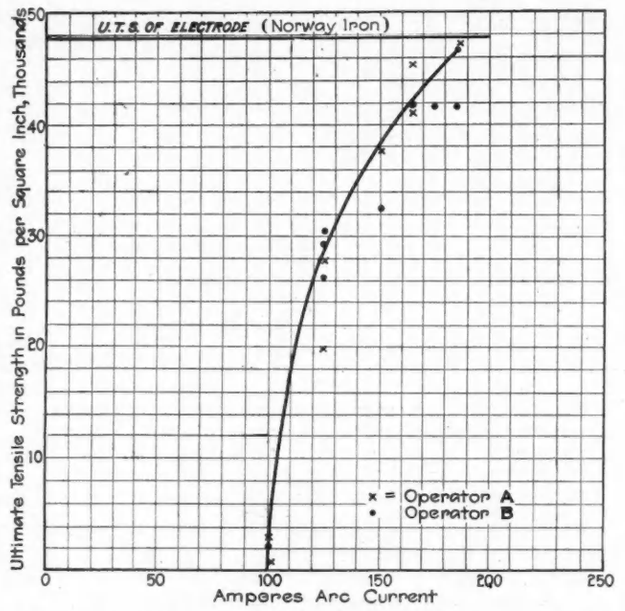


FIG. 2. VARIATION IN WELD STRENGTH WITH CHANGE IN ARC CURRENT

The inspector of metallic-electrode arc welds may consider that, by the proper use of visual, chipping, and penetrating tests, a more definite appraisal of the finished joint may be secured than is possible in either riveting or concrete construction. The operation may be still further safeguarded by requiring rigid adherence to a specified process.

It is unfortunate that most welders consider themselves pioneers in an unknown art. As the result, they are inclined to do their work under a mysterious camouflage, which is bewildering to the untutored. Once in a while, due possibly to a coincidence, one of these "experts" is successful in obtaining a good weld, but more often a successful job is attributable to the friction between slightly fused, plastered deposits.

In common with many other operations, the process of metallic-electrode arc welding is susceptible to analysis. Regardless of the composition of the metal welded with the arc, the cardinal steps are: (1) preparation of weld; (2) electrode selection; (3) arc-current adjustment; (4) arc-length maintenance; and (5) heat treatment.

Sufficient scarfing is involved in the preparation of the weld and in the separation of the weld slants, so that the entire surface is accessible to the operator with a minimum amount of filling. When necessary, to avoid distortion and internal stresses due to unequal expansion and contraction strains, the metal is preheated or placed so as to permit the necessary movement to occur.

The electrode selection is determined by the mass, thickness and the constitution of the material to be welded. An electrode free from impurities and containing about 17% carbon and 5% manganese has been found generally satisfactory for welding low and high carbon as well as alloy steels. This electrode can also be used for cast-iron and malleable-iron welding, although more dependable and more consistent results, permitting the machining of welded sections, can be obtained by brazing, using a copper-aluminum-iron alloy electrode with the aid of a simple flux. Successful results are obtained by brazing copper and brass with this electrode. The diameter of the electrode should be chosen with reference to the arc current used.

Many have attempted welding with too low an arc current, and the result has been a poorly fused deposit. This is due largely to the overheating characteristics of most electrode holders, thus leading the operator to assume that the current used is in excess of the amount needed. The approximate amounts of current to be used for a given thickness of mild steel plate, as well as the electrode diameter for a given arc current, are indicated in the curve in Fig. 1. The variation in the strength of 1-in. square welded joints as the welding current is increased is shown in Fig. 2.

Notwithstanding the fact that electrode development is still in its infancy, the electrodes available are giving satisfactory results, although considerable advance may yet be made in the ductility of welds, consistency in results, as well as in the ease of utilizing the process.

The maintenance of a short arc length is imperative. It is usually maintained by a skillful operator, as the work is thereby expedited, less electrode material is wasted, and a better weld obtained, due to improved fusion, decreased slag content, and porosity. By recording the arc current and arc voltage by meter deflection or other means, the inspector has a continual record of the most important factors which affect weld strength, ductility, fusion, porosity, and other features.

The method of placing the deposited layers plays an important part on the internal strains and distortion obtained on contraction. It is possible that part of these strains could be relieved by pre-heating and annealing, as well as by the allowance made in preparation for the movement of the metal.

The heat treatment of a completed weld is not a necessity, particularly if it has been pre-heated for preparation and then subjected to partial annealing. A uniform annealing of the structure is desirable, even in

the welding of the small sections of alloy- and high-carbon steels, if it is to be machined or subjected to heavy vibratory stresses.

The inspector, in addition to applying the detailed tests to the completed joint and effectively supervising the process, can readily assure himself of the competency of any operator by submitting sample welds to ductility and tensile tests, or by simply observing the surface exposed on cutting through the fused zone, grinding its face and etching with a solution of 1 part concentrated nitric acid in 10 parts water.

It is confidently assumed, in view of the many resources at the disposal of the welding inspector, that this method of jointing will rapidly attain successful recognition as a dependable operation in structural engineering.

Rhodesia's Mineral Output in 1917

Southern Rhodesia was fourth in rank as a gold producer in 1917, although the production was curtailed considerably, according to *Commerce Reports*. The decrease is the first since the beginning of the industry, with the exception of a small setback in 1910, and is attributed (1) to the cessation of operations at certain mines, owing to payable ore having been exhausted; (2) to increased cost of working, on account of enhanced value of stores; (3) to growing difficulty in purchasing necessary equipment for mines already developed; and (4) to stoppage of credit to small workers in several instances.

The total yield of gold decreased from 930,356 fine oz., of a value of $18,956,531, in 1916, to 834,231 fine oz., worth $17,010,320, in 1917. During the year 2,595,505 tons of ore was milled, as compared with 2,987,444 tons in 1916; and sands treated amounted to 1,358,065 tons, as against 1,245,547 in 1916.

The average value per ton of ore milled reached 26.90s. ($6.55), as against 26.08s. ($6.35) in 1916. Stamps in use decreased from 1172 in 1916 to 989 in 1917. In addition to gravity stamps, there were in operation 29 grinding pans, 23 tube mills, 6 gate rolls, 6 Chilean mills, 5 Huntingtons, 1 Lane mill, 1 waterfall mill, 1 roasting plant, and 1 smelting plant.

Production of silver showed an increase from 200,676 oz., valued at $106,659, in 1916, to 211,989 oz., worth $129,541, in 1917. The output of copper in 1917 amounted to 3911 tons, valued at $2,016,911, as compared with 3521 tons, worth $1,659,676, in 1916. The average price per ton amounted to £106 ($516). The greater part of the 1917 output came from the Falcon mine, but there were at least 16 other small producers.

On account of the shortage of shipping, sales of chrome ore were more restricted than during 1916. However, prices were considerably higher, and the 1917 output of 72,962 tons, valued at $1,593,034, was worth little less than the 88,871 tons of 1916, which sold for $1,621,372. Owing to the rise in the value of chrome, prospecting was more active in 1917 than in 1916.

During 1917 considerable development of the asbestos industry took place. The production for the year was 9562 tons, valued at $924,100, as against 6157 tons, valued at $482,071, in the preceding year.

The coal industry was also active during the year. In addition to meeting local requirements, the Wankie colliery supplied large quantities of coal and coke to the Belgian copper fields and to the railways throughout the country. During 1917, 548,954 tons of coal was raised, 326,026 tons sold, 124,410 tons used for coke, and 2188 tons employed in connection with brick kilns. The declared value amounted to $873,965, as compared with $639,789 in 1916.

The 1917 output and value of other minerals and metals were: 7072 tons of lead, $461,286; 143 tons of tungsten, $68,700; 53 tons of antimony, $4828; 76 tons of arsenic, $779; 20,749 tons of ironstone, $15,037, and 4 tons of tin, $2672.

Although there was a small decrease in the number of gold claims registered, there was an increase of 747 base-mineral claims. Among the latter were registrations for mica, talc, sulphur, aluminum, and wolframite.

Mining supplies were obtained with such difficulty from abroad that it was necessary to practice strict economy. This was particularly true with respect to explosives, and, owing to the shortage of glycerin, the use of which was decreased by 30%, lower-grade explosives were necessarily adopted. However, despite the obstacles which were encountered, no mine had to discontinue work on account of the shortage of stores.

Chrome Near Contact, Montana

Chrome deposits near Contact, Mont., have attracted the attention of prospectors for many years, and tests for gold, silver, and copper have from time to time been conducted, but it was not until March, 1918, that any attempt to exploit the deposits was made. The first locations were recorded by O. V. Miller, Tom Rowlands, and Charles Blakeley, who staked out eight claims. The chromite deposits occur in three distinct veins, having a strike N. W. by S. E., and they are cut by horneblende and serpentine dikes. Other claims were subsequently located on the extension of the veins, which have shown great persistancy.

The first, or Bonanza, group, consisting of five claims, and the Chancey group of four claims, on the south extension vein, were located and sold to Purdy and Parker, of Great Falls, Mont., in April, 1918. They proceeded with the development of the Bonanza group until the property was taken over by J. C. Gish, representing Colorado interests. This company built a 100-ton concentrating plant, consisting of stamps, classifiers, and Wilfley tables, in addition to bunk houses and office buildings, the work being in charge of O. V. Miller. The property is situated 34 miles from the railway. Transportation is by motor truck, and considerable work has been done by the company in improving the road. Power for the plant is furnished by oil-driven engines, but a hydro-electric installation is under construction, water-power being secured from the Boulder River.

High-grade ore mined from the vein averages about 42% and varies in width from 1½ ft. to 3 ft., and concentrating ore of about 18% occurs in widths up to 30 ft. Paralleling the deposit on the south contact of hornblende and slate is a large pyrrhotitic iron vein, carrying nickel, cobalt, and copper, which is now being prospected by Miller, Rowlands, and Blakeley.

Correspondence and Discussion

Dust Abatement in Mines

My paper on "Abatement of Dust From Drilling Operations by the Use of Water Drills," presented at the Seventh Annual Congress of the National Safety Council, and which you excerpted in the Nov. 2 issue of the *Journal*, was not intended to offer a solution of this trying problem, but I hoped that, by collecting and tabulating the practical experience of a number of mines, a discussion would result which would lead to improvement in the handling of this problem.

As my object was to promote discussion, I am naturally gratified with the thoughtful editorial comment which you accorded this paper, and with the letter of Charles A. Chase which appears in the *Journal* of Nov. 30. As with all problems which involve not only material factors but also the factor of human personality, which generally transcends in complexity and difficulty all the other variables entering the problem, the solution of this problem of dust abatement depends to a large extent on the attitude of the men.

It is unfortunately true that a solution which was satisfactory several years ago may no longer be so, or that a solution considered satisfactory this year may not be so a few years from now. The one great outstanding fact in connection with all safety work is the difficulty of securing coöperation from the workers who are to be protected, and I believe that all practical safety workers will agree that if a guard or precaution intended to promote the safety of workers interferes in any way with their comfort or habits it will either be ineffective, or else an entirely disproportionate amount of educative effort must be expended to make it effective.

Men who will work with respirators or wet drills under normal conditions of labor competition, with apparent contentment, will condemn both respirators and wet drills when wages are high and labor is scarce, although themselves unable to offer any better means for protection against the threatened danger. Though it is usually easy to convince the individual of the reality and seriousness of the danger, the unreasonable attitude of the men as a whole often persists.

It is not difficult for me to agree with your belief that much could and should be done to improve respirators, and so far as the mechanical improvement of respirators goes, it appears reasonable that they should, if properly developed, offer at least a partial solution of this problem. The real difficulty comes in attempting to get men to wear respirators regularly, and to keep them clean, or even to turn them in to the person charged with keeping them clean.

In general, inasmuch as air velocities sufficient to provide for adequate ventilation in the mine will also cause the continuous suspension of considerable dust, it would be necessary for practically everyone underground to wear respirators. I know that it is possible to get men to wear them in places where the dust is so thick that the accumulation obstructs the nasal passages, but to most men the danger which is unseen does not exist, and it would be difficult to get trammers, timber men, and station tenders, who do not see dust, to wear respirators, although it is true that the very fine dust is often the most injurious.

Referring to Mr. Chase's letter, I quite agree that the method of allaying dust by the injection of water through hollow steel, as at present conducted, has many objections. Reference to the table accompanying my paper will show the frequent occurrence of the symbol (a), meaning, "men prefer dust to getting wet." As Mr. Chase so truly says, "it is an unpleasant and a disappointing fact that the current models of mounted water drills atomize both water and lubricant to such extent that a fog of water vapor is now common about these drills when in operation." This is true also of the wet stopers, and in the questionnaires returned to me there were numerous comments on the promiscuous way in which these wet drills emit water, and on the frequently excessive use of water.

To a considerable extent the quantity of water used is within the miner's control, and I know that this control is frequently not exercised with intelligence. Drill manufacturers, however, have not yet applied to this portion of their task anything like the ingenuity and intelligence which they have, for example, devoted to the development of valve motions. Some drills inject water only, through the steel; others inject water and compressed air, or at least exhaust air, which is still under considerable pressure. I do not approve of the latter system, and I believe that eventually drill manufacturers will abandon the use of the water tube, which is, in most instances, an unmitigated nuisance, especially when it does not terminate in an anvil block, but has to run into the shank of the steel. There is now one wet stoper which uses no water tube, and experience with this has been extremely satisfactory.

It is strange that the drill manufacturers manifest so little interest in, or enthusiasm for, the subject of self-rotated stopers. To many mining men the self-rotated stoper is an interesting subject, because of the possibilities which it offers, but to the drill manufacturer it appears to be a problem filled with black difficulties. The table accompanying my paper will show that mounted water drills are used in raising in preference to wet stopers, and the sole explanation seems to be that, with the former, the operator does not get as wet as with a hand-rotated stoper. To many of us it seems probable that a self-rotated water-feed stoper would wet the operator less than a mounted wet drill, and we hope that eventually the drill manufacturers will produce machines of this type, and give us an opportunity to find out.

I believe that eventually a successful one-man self-rotated water-feed stoper will be produced, and that with it we shall reach an approximate solution of the abatement of dust from drilling operations, in the field

not now satisfactorily covered, while, at the same time, securing faster and cheaper work in raising than is possible with the mounted wet drill. I also believe that in overhand stoping, and even in drifting, this type of machine will, in many cases, displace the mounted wet drill.

W. O. BORCHERDT.

Austinville, Va., Dec. 6, 1918.

Panning as a Guide to Sampling

The following quotation from a letter recently received from a prospector recalls some interesting experiences in the way of preliminary testing by means of the pan:

"Not having a laboratory or very much chemical training, I took an iron mortar and pounded the specimens to a powder; then dropped a small amount of mercury into the mortar, agitated for 15 min., separated by washing, placed the mercury in a teacup, added nitric acid, got a residue which on the apothecary's scales weighed 1½ grains from 1½ lb. of sand, or $83 per ton. Do you think I arrived at the correct amount per ton in this way?

"You have discovered by this time that I am not much of a miner. I had $7500 worth of experience in ————, and am out of funds to follow up this prospect, but naturally I am very much enthused over the discovery. . ."

Seven thousand five hundred dollars for an experience, for an education, and what an education it was! This is not a comedy, it is a painful tragedy, and this prospector is not a rare example. Many another man has bought experience at even a higher rate when he might have used a tenth part of the sum to buy a broad education; or, lacking the time for that, have bought the experience or education of another for a fraction of what he paid for his own.

To return to the question asked. The prospector was advised to have assays made by a responsible assayer and not to attempt to use his $7500 worth of experience in competition with $2.50 worth of chemistry. Yet is there not something in his suggestion that other prospectors may use? Is he so far away from something that can be used by one who is not the possessor of $2.50? Just what can be learned through panning?

It is my custom in sampling to cut out a small portion of the final pulp from an occasional sample and pan it down to see what, if anything, can be learned from an examination of the concentrates. It is seldom that anything definite can be learned, and yet there are times when it is worth while. Gold, if present, is often visible, and sometimes the amount which is visible will be in proportion to the assay of the ore. Sometimes the silver minerals may be seen and recognized, or an unsuspected mineral may be found. The test is always worth trying and is sometimes of real value in determining the manner of conducting the more careful, detailed sampling.

I recall in this connection some work on the old Virginia mine near Coulterville, Calif. There was a wide variation in the grade of the ore which was not apparent to the eye. Fifteen or twenty assays were made daily to guide the work underground; but there was some complaint because of the time required before the returns were available. As some of the gold was fine, a series of experiments was conducted to ascertain if any definite information could be learned from panning the sample as soon as crushed. The outcome of these experiments was interesting. It was found that, when the sample was reduced to 30 mesh, and a measured quantity, equivalent to about five assay tons, was panned, an examination of the concentrate would enable one to guess at the contents within a dollar when the ore assayed less than $15 per ton. This was true except in one portion of the mine where the percentage of pyrite was rather high. The gold actually observed was not all that the ore contained, but bore such a constant relation to it that the test was extremely satisfactory as an indicator, and those in charge seldom went wrong by following it.

In the sampling of a silver-gold property in Idaho, where it would have required about 1000 samples to cover the developed ground satisfactorily, I was able to cut out areas representing about 400 samples through preliminary panning tests. This ore contained only a little free gold or silver, but both metals were present in proportion to the base-metal sulphides. In this instance, when we had taken and sent on to the assayer the 600 samples on which I felt sure an estimate of the value of the mine would be obtainable, I went back over the low-grade areas, and confirmed the preliminary tests by careful sampling and assaying, only to find that the assumption had been practically correct.

Several years ago I was called upon to examine the property of the Wallis Syndicate, a prospect on the West Coast of Africa in Ashanti. The demand for an early report was urgent, and no assay equipment could be collected and taken to the property, which was about six days' travel from the nearest assay office. No information was available as to developments or character of the ore, beyond the fact that it was an extensive banket outcrop.

Reaching the property, I found two outcrops, one practically continuous for a distance of six miles, with one 30 ft. hole in it, and the other about two miles long with perhaps half a mile of exposures, in which several small shafts had been sunk.

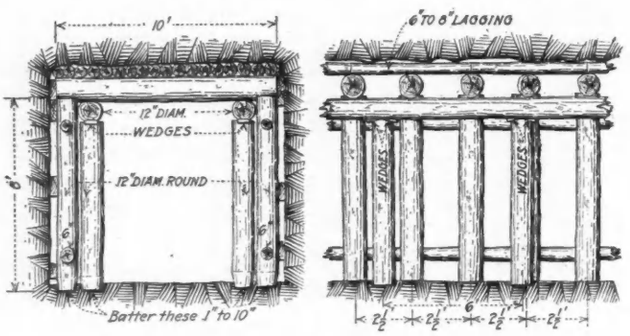
Cable messages continued to reach me asking that information be sent as rapidly as it could be secured, and I immediately began work on the six-mile outcrop, panning a portion of the samples as fast as they were taken, and reporting, by cable, my guess as to contents, pending definite returns from the assay office, which began to return two weeks after my first samples were sent out. In this instance my guess, based entirely upon previous experience in other localities, proved to be just about 100% too high. The assays on the outcrop ore were about half of what I had concluded that they would be from the pan tests. In this case the gold was practically all free and all so coarse as to be easily collected in a small concentrate; hence one saw in his pan about all of the gold that the pulp contained. Fortunately, in this case, the business was not concluded until the assays were available, but the instance goes to show that an old hand can easily be deceived by the pan, and that too much weight must not be placed upon what can be seen there. On the other hand, when used with appreciation of its limitations, when checked with a sufficient number of assays, it may be of considerable value in sampling or prospecting and serve a desirable end in a preliminary examination.

Details of Practical Mining

Method of Relining Timber Sets

A method of timbering which was employed effectively in ground that showed considerable weight after having been opened for about eight months is illustrated in the accompanying sketch. The original sets in the drift, which was used as a main haulageway, were of 12-in. round timber, with 10-ft. caps and 8-ft. posts, slightly battered, and placed at 5-ft. intervals. The back was lagged over with 6 to 8-in. lagging, and the sets were spragged. Little lateral pressure was encountered, most of the weight coming from the top, and though this was not sufficient to break the caps, many showed transverse cracks.

The first relining consisted of placing sets of the same dimensions between the original ones, and it was then only necessary to remove the old sprags, which were replaced by shorter ones. Though this was effective for a time, it was considered advisable to take



LONGITUDINAL SETS USED IN RELINING

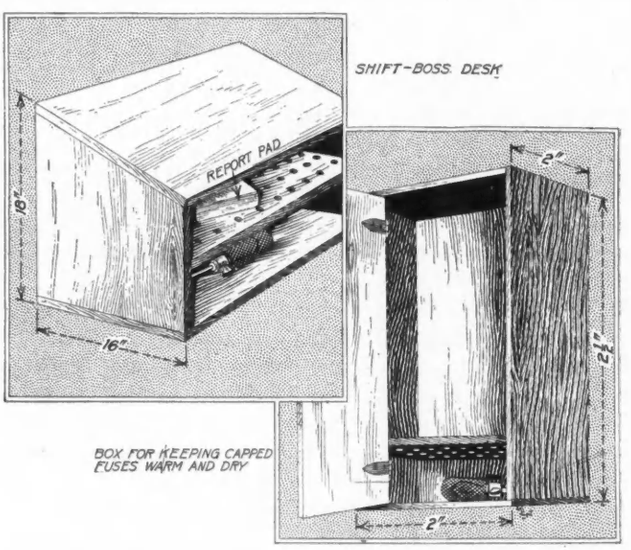
further precautions, which was done by means of "longitudinal" sets, placed parallel to the drift, the work being conducted in such a manner that it was not necessary to disturb any of the timbering already in place. Twelve-inch diameter caps, 12 ft. long, were used and were placed directly under the original caps at right angles and as near as possible to the old posts. The caps were supported by posts of the necessary lengths, which were placed upright at 6-ft. centers and wedged at the top. In this way, a better distribution of the top weight was obtained and no further trouble was experienced.

Shift Bosses' Desk for Underground Use

BY C. T. RICE

Mine shift bosses are usually required to make out daily reports of the work done by the men under them, and convenient places should be provided underground where it is possible for them to do so. This requires the keeping of report sheets in the mine, and there is often so much humidity in the mine air that the paper becomes moist and difficult to write upon. In the sketch is shown a desk that can be placed on a bench along the drift where it is convenient for the shift boss to make out his reports at the end of the shift. A 16-cp. lamp is sufficient to give the necessary heat to keep the paper dry, and may be kept burning all the time during the shift if the air is at all moist. In order to prevent fire, as well as to protect it from breaking, the lamp is incased in an ordinary wire guard.

In a similar manner can be made a box for keeping fuse perfectly dry in a moist mine, as well as flexible



DESK AND FUSE BOX FOR UNDERGROUND USE

in a cold mine. The bottom of the upper compartment in both instances is made of ½-in. or 1-in. boards with ¾-in. holes bored through at intervals so as to permit the warmth from the lamp compartment below to come up through it. A door is needed upon the fuse box, but the desk is probably more convenient if made without a door. In the cap box, if cheesecloth is tacked to the under side of the board, it would prevent any caps from falling through the auger holes.

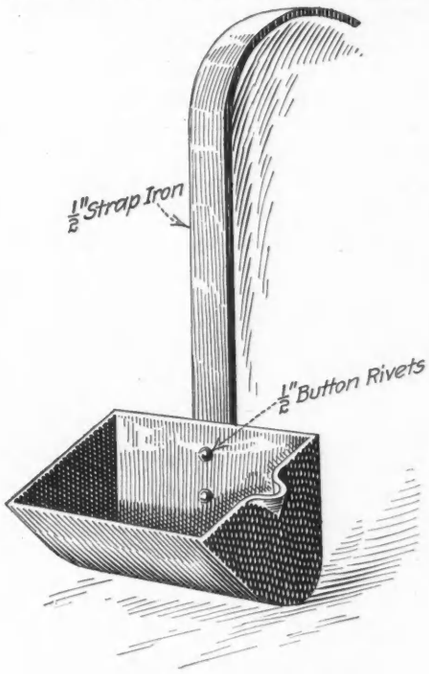
Care in Handling Primers

Many mine accidents, caused by explosions that occur while the miners are loading their holes, might have been avoided had more care been used, writes William H. Tremerwan in the *Anode*. Every miner should bear in mind, when loading holes, that the percussion blasting cap is a dangerous thing to handle unless all precautions are observed, and care should be used in making a primer, particularly in loading it into a hole. Many miners, some of them old-timers, use the tamping stick too vigorously in tamping the powder into the hole, and use the same method with the primer. As a result the jar of the tamping stick against the cap sometimes causes an explosion, and they are seriously injured, or killed.

In loading the holes the primer and powder should be carefully pressed into the hole, but the primer should not be tamped with hard strokes. It is not necessary to use great force in loading the holes so long as the powder is pressed sufficiently tight to prevent it from falling out. Often explosions occur because the miner is in a hurry to get his holes loaded, and he does not want to take time enough to do his work carefully. His partner may be the innocent victim. It is well for the miner to remember "It is better to be safe than sorry."

Simple Pouring Ladle for Mine Use

An easily constructed, serviceable grease or molten-metal ladle for use around the shop or mine may be easily made by any machinist or blacksmith from an old elevator bucket of the proper size by fastening



A HANDY POURING LADLE

thereon a handle of strap iron shaped to suit the requirements or the fancy of the user. As shown in the accompanying cut, two ½-in. button rivets hold the handle securely in position in the center of the cup. If desired, a lip may be shaped on one end of the cup for ease in pouring.

Rejuvenating a Worn-Out Pump

By H. H. Hunner*

An Allis-Chalmers single-stage pump making 1750 r.p.m. and pumping 1290 gal. per min. on a 165-ft. head was found to lose its water once or twice in 24 hours whenever the power-line voltage fluctuated to a point low enough to cause it to drop in speed; and when running the pump would pound with a continual end thrust. On examination it was found that the ring seats were worn away on both sides of the impeller and that the recess in the castings which accommodated the rings was gouged out on both sides, top and bottom. The sides of the casing next to the impeller were worn in places to a depth of over half an inch.

To repair the impeller, the ring seats were turned down to make a driving fit for two rings that had been previously made up. A ⅜-in. section was cut from these rings, the ends were drawn up and welded, and, after having been driven to a tight fit on the new seats cut on the impeller, they were turned down to give a running fit for the standard rings, which made an impeller as good as new.

The repair of the castings required two barrels of charcoal, 40 ft. of 42-in. asbestos paper, 75 firebrick, 150 cu.ft. of oxygen and 12 carbic cakes. An air line was extended to the place where the castings were to be heated, and five feet of 1-in. pipe was used for a nozzle to produce forced draft. The castings were stood on end on the ground, propped up with firebrick and walled in on all sides with the firebrick placed about 18 in. away from the castings, the brick being laid with about ½-in. spaces end to end.

The brick wall was built up to the height of the castings, and the charcoal then dumped in between the brick and castings on a kindling-wood fire. The top of the castings and the charcoal was then covered with two thicknesses of asbestos paper, cut into 42-in. square sheets; the air, turned down to about 10-lb. pressure, was used to give the charcoal a good start and the improvised furnace was left for three hours without artificial draft, after the charcoal had a start. On removing enough brick to reach the ring recesses it was found that the castings were easily brought up to a welding heat on applying the torch for a few seconds.

Both castings were repaired on one side, and the brick wall was torn down, using forceps to handle the bricks. The castings were flopped, the charcoal was heaped around their base, and the bricks were built up to hold the charcoal in place. By covering the entire work with asbestos paper, the operator was able to work at close range without undue exposure to the heat. When the time arrived to fill in the last piece of casting, it had cooled too much to work without reheating. The supply of charcoal was exhausted, but pine wood was available, and the bricks were covered with sheet iron and the air nozzle was used again, and this combination secured a better heat in an hour's time than had been possible by means of the charcoal, which is not essential where air is available.

The operation was finished in about eight hours and little hammer and chisel work was required to get a smooth job on the castings. At a moderate expense a new water end was provided, and a wait of six months for delivery on a unit that was absolutely essential was obviated. The castings were covered with the asbestos paper after the job was finished and allowed to cool slowly for several hours.

*Superintendent, Onahman Iron Co., Ironton, Minnesota.

Substitute for Tin.—The Advisory Committee on Science of the Commonwealth of Australia announces that a combination of carbolic acid and formalin produces a resin soluble in methylated spirit and suitable for varnishing cardboard containers for packing foodstuffs. Its use imparts no taint to the food, and it is claimed that containers so treated will serve for most of the food-packing purposes for which tin is now used, while the cost to produce is lower than that of tinplate at war-time prices.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Tungsten Embargo Refused

A request for a 90-day embargo on imports of tungsten has been denied by the War Trade Board. A committee representing the producers, importers, and consumers came to Washington in an effort to secure such an embargo, so as to give time for adjustments and stabilization. The War Trade Board has a well-defined policy to the effect that its curtailment of imports and exports must be based on shipping needs. To grant protection, the board holds, to one American industry, and possibly affect adversely other American industries, is without its province.

Relief Lacking in War-Minerals Act

If any remedy is applied to the war-minerals situation under the new conditions brought about by the ending of the war, it must be a new one. This is rapidly becoming the conviction of all who are interested in the subject. The War-Minerals Act, it is pointed out, was intended solely for Government relief during the war. The relief of producers of war minerals is a post-war—a reconstruction—problem. Therefore it is held by many that Congress should decide what relief should be granted. Though it is believed that there would be no objection from any quarter to the use of a part of the administrative fund carried by the War-Minerals Act to conduct an investigation of the situation, so as to enable Congress to obtain actual facts in the case, it is apparent that Secretary Lane is not convinced that such a procedure would be justified.

To Stimulate Engineering Research

The war having demonstrated in striking manner the need for stimulating engineering in all its branches, steps are now being taken to urge the adoption of legislation to create engineering experiment stations. Previous efforts in this direction have failed largely owing to disagreements as to where the schools should be situated. The Smith-Howard Bill, now before Congress, is a compromise measure, which, with some amendment in important particulars, can be made a suitable vehicle for the legislation desired. It is believed that the differences between land-grant colleges and state schools, which were the principal stumbling blocks heretofore, can be avoided. The matter has been given careful consideration by the National Research Council. That body is firmly convinced of the need of stimulating scientific research in each state of the Union, but believes that the kind of research to be undertaken at a station, and the situation of that station, are essentially state matters, which can be determined by a state board.

The Smith-Howard Bill provides that the experiment stations be directed by the U. S. Bureau of Standards. This provision meets with decided disapproval, as most of those who have studied the matter feel that Washington should help, rather than direct, the work. Some assistance from Washington would be necessary to prevent duplication of work and to give general aid. Opinion seems to favor, however, the placing of the Washington work in the hands of the Smithsonian Institution or the National Research Council, rather than turning it over to one of the departments.

Facts Wanted as to Profiteering in Ores

All information in possession of the Federal Trade Commission relative to profiteering in the smelting, reduction, and handling of metalliferous ores and metals is asked by Senator King, of Utah, in a resolution which has been referred to the Senate Committee on Interstate Commerce. The resolution reads as follows:

Resolved, That the Federal Trade Commission, be, and it is hereby, directed to furnish the Senate with the following information:

Any and all facts, figures, data, or information now in possession of the Federal Trade Commission relative to profiteering in the smelting, reduction, and handling of metalliferous ores and metals by smelting and refining companies and by metal-selling companies, and to investigate said companies for such supplementary information as may be required for a complete report in the premises, and to transmit such complete report to the Senate.

Lessen Import Restrictions

Import restrictions have been lifted by the War Trade Board in the instances mentioned in the following statement:

At the time the program of the War Trade Board for conservation of tonnage by restriction upon imports was determined upon, the tonnage situation was so acute as to render it impossible to make exceptions to the restrictions, even to cover purchases already made by American importers. Importers so affected, who were forced to make this sacrifice as their contribution to the winning of the war, were told that as soon as the tonnage situation was at all relieved the War Trade Board would permit shipment of these goods.

In fulfillment of this promise, the War Trade Board announces that applications for import licenses will be considered for all restricted articles included within lists of restricted imports Nos. 1 or 2, to cover purchases or contracts made by American importers before the date of the announcement of the restrictions. Such applications must be accompanied by proof of the purchase or contract.

Sulphur Litigation Expected

Intimation of developments which will have an important bearing on the sulphur situation are reaching Washington. The armistice having removed any patriotic scruples against hampering the production of sulphur, no surprise would be occasioned if the Union Sulphur Co. should attempt to take advantage of the recent favorable decision of the district court in Delaware in regard to the validity of its patents. Despite this decision, there is strong legal opinion that the court erred. As the Freeport Sulphur Co. and the Gulf Sulphur Co. have strong financial support, a legal contest of fair proportions is expected.

Interest is manifested in Washington as to whether

the Union Sulphur Co. will attempt to prevent the use of the Frasch patents by its competitors, or whether a licensing plan will be proffered. The company sued on the basis of its second patent, which was granted in 1905. The competitors hold that they are using processes covered by the original patent, which was granted in 1901 and which has now expired. Officials are outspoken in their praise of the accomplishments of the Union company during the war. By the most intelligent operation, the output of its wells was tripled.

Production of sulphur by the Gulf Sulphur Co. will begin in January, it is understood in Washington. This operation is in the vicinity of Matagorda. Drilling has revealed that this is the largest and most important known deposit of sulphur in the United States. It was not the plan of its owners to exploit it at this time, but at the direct request of the Government, during the war, they prepared to operate on a large scale. The company is now prepared to produce sulphur cheaply. The large investment which has been made probably will call for active operation of the property.

Bureau of Mines Work Summarized

Summarizing the work being done by the Bureau of Mines in the interest of the metal-mining industry, Van. H. Manning, in his report to Congress on Dec. 19, mentions the following activities:

Mining and milling problems at mineral deposits throughout the country were investigated to ascertain the available supply of metals and minerals especially needed in the conduct of the war.

A body of engineers and chemists was organized for war-minerals investigation, to determine how supplies of necessary commodities, such as nitrates, manganese, chrome, magnesite, nickel, tin, and platinum, could be obtained most readily.

In coöperation with the War Department, the production of artificial nitrates and the development of processes and plants for their manufacture were studied.

Representatives of the Bureau helped to devise a process for the production of nitric acid by the oxidation of ammonia, which is more efficient than any in previous use.

Means by which the supply of sulphuric acid needed in the manufacture of explosives could be increased were investigated.

A complete survey of the domestic and Canadian nickel deposits was made.

The extraction of molybdenum, tungsten, and vanadium from their ores was investigated with reference to the use of these metals in special steels for munitions and machine tools.

A leaching process and a chloride volatilization process for the treatment of oxidized lead ore have been developed. Tests have shown that the volatilization process can be used for lead sulphide ores.

A cheap and simple process has been developed for recovering zinc from a solution of zinc sulphate, making possible the treatment of low-grade and complex zinc ores by leaching.

Further work on the flotation process for treating ores has indicated the most suitable flotation agents or mixtures for certain ores and has shown why minerals float.

Through field demonstrations, operators and well drillers were shown how large wastes of oil underground may be prevented by cementing oil wells so as to prevent water from entering the oil sands.

A rocking electric furnace intended to prevent the metal losses that attend the melting of brass and bronze in crucibles was designed and is now in commercial operation.

As an outcome of its work on ferro-uranium, the Bureau undertook the operation of a series of steels containing uranium, tungsten, and molybdenum. These steels are to be tested for their suitability as cannon liners.

Experiments in the electric smelting of manganese ores have shown that usable grades of ferromanganese and silicomanganese, alloys needed in steel making, can be made from low-grade and hitherto unused domestic ores, and with far less difficulty than in a blast furnace.

The producing graphite mines of the country were examined, and methods of purifying crude graphite were studied to ascertain whether domestic graphite can be used satisfactorily in the manufacture of graphite crucibles.

The Bureau coöperated with the War Industries Board in measures to reserve an adequate supply of platinum needed in chemical manufactures for war requirements.

In administering the act regulating the manufacture, sale, possession, and use of explosives during the war, about 14,000 carefully selected licensing agents were appointed throughout the United States and its insular possessions; magazines for storing explosives were examined; and numerous prosecutions were started against violators of the provisions of the act.

With the coöperation of manufacturers of explosives, a campaign was started to eliminate food products as constituents of explosives.

Three new mining experiment stations, at Minneapolis, Minn., Columbus, Ohio, and Bartlesville, Okla., were established.

The metallurgy of quicksilver ore was studied with reference to the improvement of metallurgical practice. Quicksilver is used as mercury fulminate in explosives.

Manganese resources of the country were examined with reference to utilizing low-grade domestic ore to replace the high-grade ores formerly imported.

Practice at steel plants was investigated to determine how alloys low in manganese could be most readily substituted for the high-manganese alloys made from foreign ores, that have been used by steel makers in this country.

Chromite deposits were examined throughout the country to ascertain how the supply of chrome needed in steel making and in other industries could be obtained from domestic ores, rather than from ores that were formerly imported.

It was determined that the sulphur mines, pyritiferous ores, and pyrite deposits in this country can supply all the raw material needed by manufacturers of sulphuric acid.

Through a census of mining engineers, metallurgists, and chemists the Bureau aided the Government in obtaining the services of thousands of experts for special duties.

Black-sand deposits in California and Oregon were examined for their importance as possible sources of gold and platinum.

American Metal Company

The Alien Property Custodian this week made the following statement regarding the American Metal Company, Limited:

The Alien Property Custodian has completed an arrangement which will eliminate all enemy interest in the above-named corporation, and will place the control of the company in the hands of five voting trustees named by him, for a period of five years. The following trustees have already been named: Hon. Henry Morgenthau and Messrs. Berthold Hochschild and Joseph F. Guffey. Mr. Hochschild is chairman of the board of directors.

The outstanding capital of the company consists of 70,000 shares, of which the Alien Property Custodian has taken over 34,644 shares belonging to alien enemies. A further amount of 18,620 shares belong to American citizens who have had control of the management of the corporation. The remaining shares are held by a group of British shareholders, principally consisting of Henry R. Merton & Co., Ltd., and the Merton Metallurgical Co.

It is the purpose of the Alien Property Custodian to offer for sale at public auction at an early date the voting-trust certificates representing 34,644 enemy shares, and two additional trustees will be named by the Alien Property Custodian after the said sale has been completed.

In order to protect any part of this important enterprise from reverting to enemy ownership after the war, and to assure to American ownership the full control over the important ore supplies owned by the company, the Alien Property Custodian and the American shareholders, who are the officers and managers of the company, organized the voting trust above mentioned. The method of control which the Custodian deemed important in the public interest could not have been put into effect without the consent of the American shareholders, who have willingly cooperated with the Custodian in all his plans.

Some statements have appeared in the press indicating that the corporation itself has been taken over by the Alien Property Custodian. This is not correct, since he took over only the shares owned by alien enemies. In accordance with his custom, he appointed directors to serve on the board of directors in order to represent the shares held by him.

In pursuance of arrangements carried on between the Alien Property Custodian and the British Embassy, the owners of the shares held in Great Britain have also agreed to deposit their shares under the voting-trust agreement, and to sell the voting trust certificates within a year, to purchasers approved by the Alien Property Custodian or his appointee.

In this manner the complete Americanization of this important enterprise will shortly be accomplished, and all persons are invited to deal with the company accordingly.

New York Section of the A. I. M. E.

On Wednesday evening, Dec. 11, the New York section of the A. I. M. E. held its regular meeting at the Machinery Club. The meeting was excellently attended; in fact, the attendance was larger than that of any previous meeting held during the year. At the conclusion of the dinner, Allen H. Rogers, chairman of the section, introduced Dr. Waldemar Lindgren.

Dr. Lindgren discussed the copper deposits of the Chuquicamata mine. After a general sketch of the mineral deposits of South America, the positions of which were illustrated by a lantern-slide map, the surroundings of the approach to Chuquicamata, the topography and the general geology of the deposit were described. The aridity of the climate as a limiting condition was explained in detail. Dr. Lindgren then gave a description of the principal deposit, illustrating his remarks by plans and sectional drawings. He pointed out the similarity of many of the features of the deposit to those at Butte, Mont. The peculiar nature of the mineralization and the presence of chlorides, nitrates, and sulphates were mentioned briefly.

L. K. Rourke was next introduced. He described the methods of mining the Chuquicamata deposit. An abstract of his remarks follows:

The experience gained in mining is the outcome of two years of operation. The deposit is mined by steam shovels and is similar in many particulars, both as to equipment and methods of operation, to other steam-shovel copper mines. The engineers decided to operate by high benches, the unit height being 150 ft. This unprecedented height was possible both on account of the climatic conditions and the important fact that the ore stood well upon steep slopes. Little trouble has been experienced from slides.

Though well-drilling rigs had been used in determining the limits and nature of the deposit, they could not be used for drilling blasting holes except upon the initial bench, which ranged in height from one to sixty feet. Fred Hellman, consulting engineer for the company, devised a system of shafts and tunnels for blasting the standard bench. These shafts and tunnels were driven in such a position as not to interfere with the steam-shovel operations. The powder chambers are loaded with black powder manufactured at Calama. A powder ratio of 0.5 to 0.6 lb. per short ton of ore is used. The ore breaks large, and a considerable amount of secondary blasting is necessary. Jackhamers are used for drilling secondary blast holes. Secondary blasting interferes considerably with steam-shovel loading and reduces the efficiency of this part of the work.

The steam-shovel equipment consists of eleven 95-ton Bucyrus steam shovels, using either oil or coal fuel; four 100-ton Bucyrus electric shovels, two in operation and two in process of erection; and one 265-ton revolving Bucyrus shovel. All of the equipment is operated by native Chilean labor. From six hours to six months is required to train a good steam-shovel engineer. At present the efficiency is low, amounting to about 30% of the loading time. In spite of this, a record of 1350 tons per shovel has been made in 10-hour operation.

For transportation 60-ton ore cars are used. On the bench, eleven 55-ton Porter locomotives and ten old American locomotives, purchased at the Panama Canal, are used to handle the cars in trains of four on 3½% grades. After leaving the bench, the cars are made up into trains of 26 cars each and hauled down a 2.6% grade, a distance of 7 km., to the car dumper at the treatment plant. Operation is possible throughout the year, the only difficulty being an occasional windstorm.

There is an ample supply of the best labor. The company provides good houses and maintains a large commissary. One of the principal operating difficulties is the 5000 miles which separates the mine from its base for machinery supplies and equipment.

G. T. Bridgman, assistant consulting mining engineer of the Chile Exploration Co., was then introduced, and briefly discussed the labor problem. He pointed out the excellent character of the Chilean laborer and indicated the close coöperation between the company and the Chilean government in all labor matters. In closing the meeting chairman Rodgers stated that future subjects to be discussed by the New York section would deal principally with foreign mining.

Steel Price Fixing Ends Dec. 31

The War Industries Board has refused a request made on Dec. 11 by representatives of the steel industry that price regulation of their output be continued after Jan. 1. Similar action will be taken by the board, it is said, in regard to all commodities over which it has exercised control. At the meeting of representatives of the steel industry with the price-fixing committee of the board, continued Government supervision was urged by various members of the Iron and Steel Institute, including Judge Elbert H. Gary.

Hitch Over Mexican Oil Bill

The Association of Petroleum Producers in Mexico has broken off the negotiations that it had been conducting with the Carranza government with a view to having the latter modify certain confiscatory features of the bill, now before the Mexican Congress, providing for the nationalization of the oil industry in that country. The features of this bill were outlined in the *Journal* of Dec. 7. If the bill becomes law, it is said that title to reserve oil properties, in which a vast amount of American and foreign capital is invested, will revert to the Mexican government. The association represents 33 American and foreign companies. It is said that a movement is on foot to broaden the scope of the organization, so as to include other interests which are concerned in the efforts of Carranza to bring about state control of the subsoil natural resources of the country.

Fuel-Oil Priorities Abolished

All priorities as to fuel oil and gas oil were abolished on Dec. 8 by the U. S. Fuel Administration. Rule No. 1 of the order issued Sept. 24, 1918, establishing priorities for the entire country in respect to the delivery of fuel oil and gas oil, creating 12 classes, and providing for serving consumers' needs in the order named, is thus completely set aside. All consumers are now on an equal basis.

Rule No. 2 of the former order, providing for priorities in the use of natural gas, in which there is a general shortage, has been modified so as to place all industrial consumers on an equal basis. The priority, however, in favor of domestic consumers and for certain limited industrial uses is maintained.

The oil industry has likewise been asked to suspend its voluntary plan to stabilize prices and obtain an uninterrupted flow of crude oil, which plan was recently extended for three months. Outstanding licenses, according to an announcement made on Dec. 15, will remain in force until peace is declared.

Engineers' Service Bureau Created

In San Francisco an "Engineers' Service Bureau" has recently been established which is intended to serve as a clearing house through which engineers in search of employment and prospective employers may get in touch with each other. This bureau is being conducted

at the San Francisco Engineers' Club through the joint council of San Francisco engineering societies.

The bureau is to be provided with a complete list of engineering vacancies, and efforts will be made to keep this up to date. Applicants are to write their qualifications and experience on blank forms, which are to be sent in by mail. If a call is found by the bureau for a man with the qualifications given, applicant will be notified at once. Otherwise his application will be filed, without acknowledgment, awaiting a call. The bureau is to give information only by mail or telephone; no applicants are to be received in person.

The support of individual members of the various societies is hoped for. It is felt that, if general coöperation is secured in reporting vacancies, the bureau will be able to handle applicants effectively and the plan can be made permanent. Positions to be included within the field of the bureau's activities are such as could be filled by men with technical training and experience in the fields of the societies represented.

Metal Conditions in Central Empires*

Much has recently been said as to the use of substitute metals during the transition period after the war, and the opinion is generally held among those who have the best opportunities for judging, that Germany in particular intends to make a good deal of use of metals that have not hitherto been largely employed in manufactures. There is no doubt, for example, as to the German determination to produce and utilize aluminum to the fullest extent. Antimony will also be used more largely than formerly has been thought practicable, and zinc will be used for a rather large amount of work for which brass—and, to a lesser extent, copper—was employed before the war. Aluminum hollow ware will be placed on the market in considerable quantities, and that metal will be utilized largely for overhead conductors of electricity.

In the electrical industry, zinc and zinc-copper alloys will be employed extensively, and it is interesting to note that the possibilities of zinc are already recognized in Great Britain, and at least one electrical concern is considering to how great an extent it can be substituted for brass.

Some difference of opinion exists as to whether the Germans are as short of metals as they endeavor to lead the rest of the world to suppose, and many believe that they are busily engaged at present, by the aid of child and alien labor, in turning out hollow ware, bedstead tubing and fittings, brass-foundry (or, rather, zinc-foundry) tanks, cisterns, and similar products, so as to be in a position to rush supplies into oversea markets as soon as peace is declared and to seek to regain their lost commercial position at the earliest moment.

But, however doubtful the position may be in Germany, it appears certain that Austria-Hungary has experienced a great shortage of metals. The situation has been discussed at meetings of the Reichstat, and there has been little attempt to minimize its seriousness. This is despite the fact that Austria-Hungary was one of the first countries to take steps to conserve its metal resources. At the beginning of the war—and, according to some accounts, before that date—the Austrian Metal Co. began to buy as much iron, steel, and non-ferrous metals as possible from the Balkan States and the oversea market. During the occupation of Serbia, Austrian and German engineers and workers were rushed to the Serbian copper mines, the ore of which contains from 5 to 7% of the metal, so as to work them to their fullest extent. As a result, it is believed that the output of the mines, which was already fairly large, was increased by approximately 50 per cent.

Early in 1915 the Austrian Metal Co. increased its activities, and not only redoubled its efforts to bring in ore and metals from the Balkans and Asia, but began to buy up home stocks and turn its attention to the collection of scrap and used metal in the shape of tins, worn-out metal goods, and obsolete patterns and metal manufactures. All the metal received from these sources was remelted and supplied, presumably under some rationing scheme, to Austrian metal workers. More recently the whole business was placed under the control of the Minister of War, who became responsible for the public control of all metals, the apportioning of supplies to the various industries, and the general management of the metal business of the empire. The metal company was practically taken over by the state, and merely carried out the duties of collecting, transporting, and distributing the supplies as directed.

Some of the available figures are most illuminating. It appears that, under the new scheme of requisitioning, many, if not all, of the non-essential industries have been entirely depleted of metal. So far, no less than 8000 ordinary railway trucks full of metal have been collected, of which over two-thirds have been taken from ordinary workshops and factories. Domestic supplies have been requistioned wherever they could be found, and about 2700 truck loads of metal grates, baths, old utensils, and builders' ironmongery have been collected. The collection and utilization of this huge amount has been expensive, and in many cases it has been found necessary to remodel factory plants, take out old engines and machinery, and put in other prime movers and plant to make possible carrying on the work. In other factories all copper appliances, such as piping and vats, have been taken out and iron or lead appliances substituted. Naturally, the bulk of the supplies has been devoted to army purposes.

The following report refers to conditions in the Austrian metal industry immediately prior to the armistice, which will no doubt materially affect the appropriation of metals in Austria:

> The shortage now is such that it is believed that only sufficient metal exists to meet the army demands for a few months of 1919, and the metal used in churches and other ecclesiastical buildings is now to be drawn upon. Church fittings, door and pew furniture, rostrums and railings are all to go into the melting pot, but so far it is understood that monuments and grave ornaments are to be spared. The metal generally used for these is unsuitable for war purposes. The church bells will probably be spared for a similar reason. All door fittings of red brass, yellow brass, bronze, and copper are being collected, but it is felt that this step should have been taken earlier, as, owing to depleted staffs and inadequate methods of working, considerable delay occurs in the smelting, refining, and remanufacture of the metal thus obtained. Iron door locks and padlocks are being collected and replaced by wooden latches, wooden bolts and bars, and staples and hasps. It is reported that householders are being forced to sell their door fittings at a fixed price and replace them them-

*Commerce Reports. Prepared by an engineering correspondent of the *Hardware Trade Journal* (London) and designed to indicate the metal position in the Central Empires at the time of the armistice with Austria.

selves at their own cost, or failing this, the government will commandeer the fittings and provide and fix the substitutes. Most householders are believed to be adopting the first course. Incidentally, it may be mentioned that the government is practicing what it preaches, and the door fittings have already been removed from the public buildings and replaced with more or less suitable substitutes. It is expected that from 200,000 to 300,000 door latches can be collected every month from private sources. Shop fittings in the form of shelf brackets, lamp brackets, and electroliers, locks and bolts, and metal receptacles are also being collected, but it is not expected that more than a few dozen truck loads of metal can be obtained from this source of supply.

The Austrian government had other schemes in hand, it is believed, for obtaining and utilizing metal already devoted to other purposes, but there is no need to go deeply into these. Sufficient has probably been indicated to make it clear that Austria will not be in a position to export manufactured metal goods for some time after the war.

Remember the 27th Engineers

Some day the entire history will be written of the part played by the 27th Engineers in the war. At present, with the regiment still on the other side, though its return is hoped for at an early date, those who are interested in its affairs find it necessary to content themselves with the fragments of news that are received from time to time.

Company B of the mining regiment, it has been learned, sailed for France on June 30, arriving at Brest 12 days later. Three days after debarking, together with Company C, it was sent to the front and formed part of the 1st Army Corps Reserves in the Chateau Thierry battle. On Aug. 18, it was withdrawn from this sector and moved to the St. Mihiel sector, where again it had opportunity for distinguished service. A cable from Colonel Perry, dated Dec. 16 at Givry-en-Argonne, leads one to think that the regimental headquarters are at that place or near by.

The smokes and other things received by the men through the Comfort Fund have been very welcome, and it is hoped that they will be coming along without any let-up, for the need for them still exists. It is not too late to remember the mining regiment by contributing to the Comfort Fund.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Perú	176.29
Charles Le Vasseur (monthly)	5.00
F. Wartenweiler	10.00
Walter Douglas	100.00
Robert E. Dye	10.00
R. T. Hancock	1.00
Total	$19,180.56

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

Copper Export Association

The Copper Export Association, Inc., was organized at a meeting held Dec. 17. The following directors were elected: Murry Guggenheim, Simon Guggenheim, and F. H. Brownell, of the American Smelting and Refining Co.; John D. Ryan and Cornelius F. Kelley; Benjamin B. Thayer, of the Anaconda Copper Mining Co. and the Inspiration Consolidated Copper Co.; W. D. Thornton, of the Greene Cananea Copper Co.; Charles Hayden, of the Utah Copper Co.; Charles M. Mitchell, of the Nevada Consolidated Copper Co.; D. C. Jackling, of the Ray Consolidated and Chino Copper companies; Walter Douglas and James McLean, of the Phelps Dodge Corporation; R. L. Agassiz and James McNaughton, of the Calumet & Hecla Mining Co.; Stephen Birch, of the Kennecott Copper Corporation; William A. Clark, of the United Verde Copper Co.; Archibald Douglas, of the United Verde Extension Mining Co.; Adolph Lewisohn, of the Miami Copper Co., and Gordon R. Campbell, of the Calumet & Arizona Mining Company.

The association is incorporated under the laws of Delaware, with a capital of $250,000 7% preferred stock and 500 shares of common stock of no par value. The association was formed for the purpose of handling all the export copper business of this country, and one of its principal objects is to meet foreign buying with a selling organization.

The plans under which the association will work were explained by John D. Ryan, who has been chosen president of the export association. He said that all orders for copper obtained in the foreign market will be apportioned *pro rata* among the member companies of the association. The allotments will be based on the production of the various companies for the previous 12 months.

Though no definite steps have been taken toward the fixing of an export price, it is understood that an agreement will be reached for export purposes only, the price determined upon to be quoted f.o.b. New York.

Each company in the association will receive one share of common stock, which has neither market nor par value. The common stock will not have voting privilege, but, instead, one vote will be given to each 500 tons of copper allotted for export and based on the output for the 12 months prior to the formation of the organization.

The export association is not intended to be a profit-making concern, but will practically act as a broker for its various members, and will charge a nominal brokerage commission for handling the business. Should profits accrue, they will be distributed as dividends on the preferred stock. The entire plan of the organization has been submitted to the Federal Trade Commission.

The executive committee of the association will consist of the chairman of the board, Simon Guggenheim; president, John D. Ryan; first vice-president, Walter Douglas; second vice-president R. L. Agassiz, and the following directors: James McLean, Murry Guggenheim, Cornelius F. Kelley, William A. Clark, James McNaughton, and Adolph Lewisohn.

The executive committee will choose a selling committee, which will conduct the business. The determination of policies is in the hands of the executive committee, under the board of directors.

Editorials

The 27th Engineers

AMONG the troops assigned by General Pershing, Dec. 17, for early return home, is the 27th Engineers. It was their good fortune to get to France in time to participate in the active fighting. The regiment did good work, and was cited in orders for its efficiency. It has been the expectation of Lieutenant Colonel Perry, commanding officer, that the regiment would pass Christmas in France—so we sent over a liberal allowance from the Comfort Fund to provide remembrances of the day all around—and probably it will, but, anyhow, we may expect these boys soon to be home.

The officers and men write us right along of their high appreciation of how their industry has backed them up and what a great help to them it has been. Out of the Comfort Fund we have spent money as follows (in round figures): Athletic material, $2100; smokes, $2200; games, $100; typewriting machines, $300; instruments for the band, $2200; other musical instruments, $400; wool for sweaters, socks, etc. (which the ladies have generously knit), $1200; cash for company funds, $100; assistance of needy dependents, $100; cash for buying smokes, chocolate, etc., for Christmas, $2500; total, $12,100. Contributions have aggregated $19,180. By the way, let's make it an even $20,000. We have on hand the difference between the receipts and expenditures, for the *Journal* has been glad to throw in all the administrative expenses—clerical, postage, expressage, cables, etc.—but there are some considerable expenditures that Colonel Perry has made that have not yet been reported to us, and, anyhow, we shall still have need of a lot of money in welcoming the boys home and perhaps in giving them a helping hand.

This leads to another thought. We want to get these boys back to the mines just as soon as possible. With their new discipline and training they will be a wonderfully useful bunch of miners—about 1600 of them—who will comprise fine material for shift-bosses, foremen, and positions of higher responsibility. Some of them will naturally go back to their old homes and old places, but some of them may not know just what to do. We wish that our readers who need men and have places open would let us know, and be quick about it, so that we may head in the right direction any of these boys who need guidance. Some of the men in the ranks are graduated and experienced mining engineers, men who have held positions of responsibility before they went into the service. And in this connection, do not forget the officers. Some of them also will want jobs. Here is an opportunity for the men of the mining industry, who have had to remain at home, doing their bit by producing copper, lead, zinc, iron, etc., and have all the time wished they could be with the 27th Engineers, to step forward. They have been with the regiment in spirit, and they have supported it with their generous contributions of money. Well, now, let's finish a good job by helping the boys to get reëstablished, and incidentally let's put the fund up to $20,000.

More of the Tin Situation

WE HAVE previously reviewed the marvelously tangled situation existing in tin, up to the dates of writing, but the full story has not yet been told, for the simple reason that the course of events has not yet come to an end. When the Interallied Tin Executive was formed and began the exercise of its functions as a buying monopoly, persons experienced in the trade promptly prophesied that Uncle Sam would some day find himself long of the market and would lose a lot of money. The first part of this prophecy has come true, perhaps more quickly than anybody imagined. The second part is, or will be, true. The only question is, who is going to lose the money?

The United States is supposed to have bought from 10,000 to 12,000 tons of tin, which has cost 72½c. per lb. In addition thereto consumers in this country are supposed to have about 20,000 tons on hand, the supply (existing and coming) being therefore sufficient for all domestic requirements for three to six months, according to what the requirements are going to be and how much metal ought to be carried in stock, visible and invisible, for ordinary commercial safety. But, furthermore, American smelters are at present producing from Bolivian ore about 1500 tons per month, which will presently be increased to 2000 tons.

It was the intention of the authorities to distribute among consumers the purchases at cost, and so long as the Oriental sources of supply were barred off it was figured that consumers would have to pay the monopoly price. But the monopoly was not made complete, the American smelters being left free; wherefore they would presumably have preëmpted the market at prices just under that of the monopoly, which would have held the umbrella in the good old-fashioned way with which we are so familiar in copper and other things.

However, with the advent of peace, practically if not legally, the tin markets abroad were set free, the Interallied Tin Executive dissolved on Dec. 11, and the world-market price fell to a level corresponding with about 57c., New York. The problem is now what to do with the American purchases that cost 72½c. The several persons who participated in the arrangement of this business are now assiduously endeavoring to disclaim responsibility, and the War Industries Board is evincing a tendency to take other people of the tin trade into its confidence.

The Tin Importers' Association, which properly protested against the previous arrangement, is now responding to a suggestion from the War Industries Board that the importers and consumers coöperate in some way to relieve the United States Steel Products

Co. The Association has therefore submitted a plan for the disposition of the costly stock by a sweetening process. Without going into details, the idea in the main is to feed out the accumulation of dear tin to consumers and let them have a little cheaper tin bought in the open market to make the dose more palatable. To carry out this idea, it is, of course, necessary to put restrictions on the American smelters who are producing tin from Bolivian ore under natural conditions.

We think that this plan is fundamentally wrong and proposes a cure that is as dangerous as the disease. The authorities and interests that went into the great gamble in tin, and lost, ought to face the music. Assuming that the War Industries Board is the responsible party, the people of the country as a whole ought to foot the bill, and not alone the consumers of tin. The Government may properly invite the coöperation of tin importers and consumers with respect to marketing the surplus, in order that the liquidation may proceed with the least possible disturbance; but there ought to be established in this country a free and unrestricted market for tin just as soon as possible. The maintenance of a high artificial price here while the rest of the world is enjoying a free and much lower price would be not only preposterous but also hazardous to our broader economic interests.

Standard Mining Equipment

SUFFICIENT equipment, well cared for and accessible, is essential in efficient mine management, and the various points regarding standard equipment brought out by Charles A. Mitke in his article in this issue are examples of well-conducted operations. Not only is it necessary to supply proper tools, but a place to put them should also be provided, so that each operation may be conducted with speed and dispatch. Considering the old slipshod methods, which, unfortunately, still prevail in some districts, it is not difficult to understand the comparatively high costs, and why a low "tons-per-man" figure was so often to be found. Operators are frequently prone to attribute laziness to their employees, and though this may sometimes be true, not infrequently a close study of underground conditions will show that the men are not to blame, and that the shortcoming is due to lack of system in the transmission and distribution of necessary supplies. The distributive ideas suggested by Mr. Mitke are examples of successful administration, and cover a wide variation of conditions.

The modern machine shop or warehouse furnishes an excellent example of handling tools or supplies. The intricate yet simple manner of "checking out" or "checking in" is merely the outcome of conditions created by the necessity of managing an establishment economically and efficiently, and though this principle cannot be brought to such a fine point in underground mine work, the results that may be achieved by careful supervision of supplies are well worth considering by those who have given the matter little attention. It is not unusual for an examination of old mine workings to disclose a veritable treasure trove in the shape of old shovels, picks, and drill steel, some of which are worthless from the standpoint of further usefulness; but the finding of such tools and material demonstrates the sad lack of a "check" system, which, if enforced, might have saved considerable on the cost sheet.

Too much attention cannot be paid to a frequent use of the Paynter tester, for the practice of assuming that a drill is doing its best work merely because "it sounds that way" leads inevitably to misjudgment of the drilling machines. Any well-working machine must be kept in repair, and it is not to be expected that careless tinkering with a drill is conductive to good results. Both repair work and testing are best done at a well-ordered shop where the right facilities are provided.

Standard equipment for drifting and other operations will, of course, vary somewhat with localities, and can best be determined by the particular conditions encountered, but in the main it may be said that Mr. Mitke's lists are typical. In conclusion, the fundamental ideas are well emphasized and the article merits the attention of mining men. Each step should mesh with the subsequent one, and so build up a smooth-working, well-planned order of operation.

German Propaganda in Mexico

GERMAN propaganda still continues in Mexico. When news of the armistice was received in the capital, the German houses hoisted their national flag and published the news: "Victory has come to us. We have given peace to the world." The same sort of misrepresentation was made in the provincial cities, but it was so raw that the deception of even the most ignorant *pelados* lasted for only a few days.

However, the sentiment of the Carranza government seems to have been distinctly pro-German, and even more distinctly anti-American. That government is now promoting legislation leading to the confiscation of all foreign-owned property, and it is thought likely that such legislation will be consummated. In the meanwhile, interests owning property in Mexico have been holding meetings in New York for the organization of an association to take protective measures.

There is a movement to have the Mexican situation considered in the peace conference at Paris. It is thought that if there is going to be a general cleaning up of evil conditions the plans might as well be given a worldwide scope and include Mexico, where there is no doubt of the wickedness of the situation. Great Britain and France have extensive interests in Mexico, and they may well demand that America abolish the nuisances existing south of the Rio Grande.

The use of carbide cans for making fuse cans—receptacles for the carrying of capped fuses to working places underground—as described by Mr. Mitke in the Dec. 7 issue of the *Journal*, is not only an economy but a practice that is worth adopting. How often have we seen a miner loop a coil of capped fuses over his arm and start up a raise on his way to the stope? It is true that few accidents are directly traceable to the accidental explosion of caps handled in this manner, but the precaution advocated would not only prevent such accidents, but would keep fuse and cap in good condition, preventing mechanical injury to the fuse and precluding accidental wetting. We believe that the practice will materially lessen the number of misfires.

BY THE WAY

The U. S. Fuel Administration is preparing a compilation of all rules and regulations promulgated during its period of activity. It will be brought down to Jan. 1, 1919, will be issued as soon thereafter as possible, and will be a bound volume of perhaps 500 pages. Dr. Eliot's five-foot shelf must now be lengthened.

Westward the wave of welfare work wends its way—or is it coming eastward? Jerome, Ariz., has evidently decided to clean house, now that the war is over. Five hundred burros are wanted at once by the Street Commissioner, says the *Jerome News*, to consume the refuse scattered around the town. If he cannot get the necessary number of burros, he will take goats, but he prefers the meek, gentle, and appetiferous ass of the Scriptures.

All engineers should systematize and standardize their work, said Charles T. Main in his recent address before the American Society of Mechanical Engineers, when retiring as its president. True efficiency consists in the consolidation of interests, and not in segregation, so men of one branch of engineering should act in coöperation with other engineers. More attention must be paid to human engineering, or the arousing of the interest and enthusiasm of labor in its work, thus creating a contented construction unit instead of a discontented one.

The actual defenders of the red flag do not know or have forgotten that red was formerly the color of royalty, until the epoch when Henry VI, King of England, took the title of King of France, says *Financial America*. Then red came to be considered as an inimical color in France, and was replaced by white. During the French Revolution, the red flag was temporarily the emblem of order destined to safeguard the citizens. Opinion changed, however, during the Second Republic. In a circular of the French government to the prefects we read: "The red flag is an appeal to insurrection, recalling memories of bloodshed and mourning. To hoist this emblem means to excite disobedience of the law and acts of violence."

The hepar test for sulphur is brought to mind by a recent press dispatch from Paris. Gassed money, it seems, is refused in trade by the townspeople. A Young Men's Christian Association secretary in a village protested when an aged woman storekeeper refused the jet-black coins he offered, briefly explaining, "No good." "But," insisted the Red Triangle man, "those coins are perfectly good. They were new and shiny when I put them in my pocket. I have been through a gas attack, and the fumes have turned them black. See—" He took out his knife and scraped until the bright metal was revealed. "Non," replied madame, still unconvinced. "Ce n'est pas bon." And she went on to explain that after a coin had been gassed she did not want to have anything to do with it.

"Hoisting machinery of novel construction," installed in 1876 by the Savage company on the Comstock lode, is described by Dan De Quille as having a reel 15 ft. long, 22 ft. in diameter at one end and 13 ft. at the other. "It was suspended upon a wrought-iron shaft about 16 in. in diameter, the ends of which revolved in ponderous bearings. The shell of the reel was covered with thick wooden staves, over which were bolted heavy iron plates. In this iron armor was a deep groove, which ran in a spiral manner from the smaller to the larger end, just as the thread of a screw is seen to run. The cable was round, 4000 ft. long, and weighed 25,190 lb. For 1500 ft. it was two inches in diameter, then tapering gradually till at the lower end it was one and three-quarter inches. The taper was made by drawing each wire slightly smaller for the last 2500 ft. of its length."

A museum and library, to be known as the Thompson Hickman Memorial, is to be erected by Col. William B. Thompson and Mrs. Thompson at Virginia City, Mont., to the memory of their parents. The site selected is on the main street of the town and the motor route from Yellowstone Park to the West. The ground, acquired from various owners, will form a small park, when completed, in the center of which the memorial will stand. In style, the building is a simple, classic Neo-Colonial structure, comforming in design to that of several good examples of early work in Virginia City. The stone of which the memorial is to be built was quarried near the site and was all cut by hand. Thus the building, though answering every modern need, will completely conform to the spirit of the locality. Situated on a slope, it will be two stories high on the main street and one story high on the street above. The lower level will contain the museum, and the library will be on the upper. The library will consist of a long, large room with fireplaces at each end built of stone taken from the famous gold area just outside the town. Frank A. Colby, of New York, is the architect.

"So 'ere's Christmus raound again, m'son," remarked Cap'n Dick. "Dam-me, do take one back some'ow; although I tell'e these 'ere 'apnin's now-a-days do differ from times we 'ad back long we. 'Ow's it come thee young fellers ar'nt h'out singin' Christmus curls? W'y, dam-me, back Redruth, tha 'ol bloody mine shif' 'd be h'out by naow, in groups, an' singin' curls. Mean to tell me thee never 'erd Christmus curls—' 'Ark tha 'Erald H'angles Sing' an 'ymns like they? Gos' along do; thee mus' 'ave. Well, any'ow, m'son, I'll 'ave to tell 'e this 'ere bit. One Christmus, thirty year h'ago, h'out we started; h'eight o' we there were. Firs' we'd gaw to one 'ouse, then to t'other, singin' laoud an lusty, an h'each time tha master o' tha 'ouse 'd call in all o' we an treat us 'andsome. Finally we reached Squeer 'Odges 'ouse, an 'e, min' you, bloody near h'owned tha mine w'ere ussen worked to. So coorse we was boun' to make h'our bes' h'efforts 'ere. An h'off we started, singin' laoud an lusty. 'Long baout time we struck second verse, 'ere come a gert bloody 'ound 'oo perched long side o' we, 'is 'ead h'up in tha h'air, an started 'owlin' sumpthin h'awful. Jan Trevarthan, 'im 'oo wuz leadin' we, e gaws h'over an 'its 'im a gert clout on tha 'ead an' sez 'e, 'Gos along do, what's tha matter with 'e? Th'art never been to practus.' "

NEW PUBLICATIONS

Johnson's Standard First Aid Manual. Edited by Fred B. Kilmer. 6 x 8½, pp. 143, illus. Johnson & Johnson, New Brunswick, N. J.

A valuable treatise on the subject of First Aid to the Injured. The book contains suggestions, expressed in simple terms, for the relief of injured persons and the saving of life and limb in accidents, and also advises on methods for preventing the spread of communicable diseases.

Twenty-Third Annual Report for 1917 of the Rhodesia Chamber of Mines, Inc., Bulawayo. Pp. 79. Argus Printing and Publishing Co., Bulawayo, South Africa.

The report of the executive committee of the Rhodesia Chamber of Mines for the year 1917 contains extensive information in connection with all matters relating to the mining industry in the country. The total mineral production for 1917 was valued at £4,639,335, as compared with £4,829,704 for 1916.

Chief Sources of Metals in the British Empire. Maps and diagrams; 26 x 31½; 5s. 6d. Mounted on linen. The Imperial Institute, London, S. W., England.

The map shows the occurrence in each British country of important metallic ores and the existence of deposits at present unworked, and the attached diagrams give the production of each country, the total British output and the world's output of each important metal or ore. The publication has been carefully prepared with the advice of the Imperial Institute Committee on Mineral Resources.

Maximum Base Prices, Differentials, and Extras on Iron, Steel, and Non-Ferrous Products. Fixed under U. S. Government supervision. 6 x 8¼, pp. 128, illus., paper; third edition; $1. The Penton Publishing Co., Cleveland, Ohio.

A manual of price regulation embracing the complete record of official announcements covering prices and distribution, personnel of Government price authorities, comparative price data, war service committees, preference list of industries, and other original features. The data are well arranged, classified, and conveniently indexed.

Manganiferous Iron Ores of the Cuyuna District, Minnesota. By Edmund Newton. Pp. 126, illus. Minnesota School of Mines, Experimental Station, University of Minnesota, Minneapolis.

The bulletin contains a brief history of the Cuyuna Range, with reference made to the geology, character of the ores and mining conditions. Experimental data on various methods of beneficiation of the iron-manganese ores bear out the statement that little economic improvement is afforded by present methods. The latter part of the edition is devoted to information on the metallurgy of manganese, of iron and steel and that of Cuyuna ores.

The Zinc Industry. By Ernest A. Smith. 5½ x 8½, pp. 223, illus.; $3.50. Longmans, Green & Co., London and New York.

This is a compilation treating of the history of zinc, its ores and sources of their supply, marketing conditions, methods of zinc smelting, and other metallurgical processes, the physical and chemical properties of the metal, general commercial conditions, and industrial applications. As a general survey of the present status of the industry as a whole, it affords a good idea of things as they are. It will undoubtedly be a useful book to the layman, to the student, and as a convenient reference book generally, but the expert should not expect to derive any new ideas from it. The book concludes with an elaborate bibliography, which ought to be useful, but in which we discern some glaring errors.

American Engineers Behind the Battle Lines in France. By Robert K. Tomlin, Jr. 8½ x 12, pp. 91, illus. McGraw-Hill Book Co., New York.

This series of articles prepared by Mr. Tomlin, who was formerly managing editor of *Engineering News-Record* and more recently war correspondent of the McGraw-Hill engineering publications, deals with various problems encountered by American engineers in France. The treatment of each subject is pioneer work, as no other technical publication in this country was similarly represented at the front. The many details relating to roadbuilding, railway development and construction, water supplies and other industrial problems indicate the immense labor necessary in carrying on this important part of the great conflict.

Report on the Sources and Production of Iron and Other Metalliferous Ores Used in the Iron and Steel Industry. Pp. 180. 2s. Advisory Council, Department of Scientific and Industrial Research, London.

A revised and enlarged edition of a previous report of the same nature. It does not claim to give the results of independent research, but will be of value in providing, in condensed and classified form, information already published in many separate papers and returns.

The report is in three parts, as follows: I—Notes on the Iron Ores of the United Kingdom and British Dominions. II—Notes on Iron-Ore Deposits in Foreign Countries. III—Notes on the Ores of the Principal Metals Other Than Iron Used in the Iron and Steel Industries.

Part I deals with statistics of production of iron ore and with notes on the iron ores of the United Kingdom and British dominions. Much of this information is already available to the public in well-known statistical publications, but it has been included in Part I. of the report because it is felt to be supplementary to that contained in Parts II and III and to be necessary to a comprehensive review of the sources and production of iron and steel within the British Empire.

Parts II and III have been compiled from a large number of sources and have been brought as far up to date as possible. They contain information which hitherto has not been available in collected form.

The Flotation Process. By Herbert A. Megraw. 6 x 9, pp. 359, illustrated; $3.50. Second edition, revised and enlarged. McGraw-Hill Book Co., New York.

A second edition of this well-known treatise will be welcomed by metallurgists and engineers who are anxious to keep abreast of recent developments in this most fascinating branch of concentration practice; and readers will share with Mr. Megraw the regret that two important phases of the question remain in an aggravating condition of indecision. The theory of the process is still beclouded and unstated. Patent litigation is still in progress, and no definite conclusion can be anticipated.

A small amount of matter has been deleted from the previous edition, but in spite of this a net gain of about 100 pages is to be noted. The new matter will greatly enhance the value of the treatise. Considerable space has been taken up in completing the account of all patent litigation to date. The chapter dealing with the theory of flotation has an additional section on "Films and Their Action." and another on "Froth Formation." The information with regard to oils has been supplemented with some extra matter on sagebrush oil; and additional data on the quantity of oil to be used are noted. Sundry new equipment is described under "Flotation Processes and Apparatus," and important facts have been added to complete the chapter which deals with the testing of ores for the process. New chapters have been written dealing with petrography in flotation, and with details of equipment and practice at the plants of the Magma Copper Co., the Burro Mountain Co., and the Consolidated Arizona Copper Company.

This new edition should be in the hands of all who are interested in the flotation process. It will prove an invaluable aid to the professional engineer, and a reliable textbook for the student.

Personals

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

Fred J. Pope, of New York, is making an extensive metallurgical examination in Nevada.

Mark R. Lamb, mining engineer, sailed on the "Adriatic," Dec. 16, on a business trip to France.

Wilbur Van Evera, manager of mines for the Hill Mines Co., Ironton, Minn., was in New York recently.

G. H. Dudley, former manager of the Standard mines, is now in charge of leases near Metcalf, Pinal County, Arizona.

Huntington Adams, mining engineer, has gone to Antofagasta, Chile, to begin development work on a nitrate property there.

Preston Locke, resident engineer for the Northwest department of the American Smelting and Refining Co., has moved his office from Spokane to Seattle, Washington.

F. H. Skeel, mining engineer of Wallace, Idaho, has returned from Camp Humphries, where he had been in training for service in France as captain in an engineer regiment.

A. J. Thompson, manager of the Kitelas Mountain Copper Co., of Usk, B. C., is visiting Portland, Ore., to spend the holidays and to confer with officials of the company.

Ott F. Heizer, mining engineer, has resigned as superintendent of the Sheepranch mine, Sheepranch, Calif., and is now manager of the Grizzly Mining Co., Tuolumne, California.

T. Ernest Godson, mining commissioner for Ontario, and **T. F. Sutherland,** chief inspector of mines for that province, have been inspecting mining districts of British Columbia.

A. A. Hassan is examining manganese deposits in Hants and Colchester counties, Nova Scotia, with a view to development there. He will return to New York the latter part of December.

W. L. Creden, general manager of the Davis-Daly Copper Co., has resigned to give more time to his practice of consulting engineer. He will remain with the company in an advisory capacity.

F. E. Blackwell, of Ironwood, Mich., has been appointed chief engineer for the McKinney Steel Co.'s operations on the Menominee, Gogebic, and Mesabi ranges. For some years he had been superintendent of the Newport Iron Co.

William Pascoe, superintendent of the Merritt Development Co. and the Cuyuna-Minneapolis Iron Co., at Ironton, Minn., has resigned. **C. E. Ober,** superintendent for Coats & Tweed, on the Cuyuna Range, is his successor.

Dr. Horace B. Patton is in Wyoming for the purpose of securing data of oil and gas production and valuation. He has undertaken emergency war work for the Government under the Commissioner of Internal Revenue.

John W. Sherman, of Tonopah, Nev., manager of the West End, MacNamara and Halifax mines, has resigned to become manager of a Searles Lake potash company with headquarters at Oakland. **H. D. Budelman** has become his successor at Tonopah.

E. H. Dickenson, formerly with the Mond Nickel Co.'s Bruce Mines, Ontario, the Beatson Copper Co., LaTouche, Alaska, and the Nevada Consolidated Copper Co., at Ely, Nev., has recently been appointed general manager of mines for the Tata Iron and Steel Co., Ltd., Sakchi, India.

W. H. Staver, mining engineer, has returned from Brazil, where he was engaged in mining manganese and chrome ores for E. J. Lavino & Co., of Philadelphia, and the International Ore Corporation, Ltd., of Canada. He has opened an office in the Mills Bldg., 15 Broad St., New York.

C. A. Burdick is now in British Columbia, having taken over the work of consulting engineer and general manager of the Nechako River Mines, Inc., in the Prince George district. When the affairs of the company are straightened out there, he will probably continue as consulting engineer.

Francis A. Thomson, dean of the Idaho School of Mines at Moscow, has recently been in the Coeur d'Alene district arranging for a vocational system of training for miners under the supervision of the School of Mines. In this he has the cordial coöperation of the local operators, and he expects to have the system in working order at an early date.

J. C. Barr, general manager of the Pittsburgh Steel Ore Co., Riverton, Minn., has associated himself with **Frank Hutchinson,** chief engineer of the company. They will open an office at 801 Alworth Bldg., Duluth, Minn., as consulting engineers. Mr. Barr will continue to look after the interests of the Pittsburgh Steel Ore Co.'s Rowe mine at Riverton.

T. C. Roberts recently registered at the office of the American Institute of Mining Engineers. Others who registered during the last week were W. E. Ruder, of Schenectady, N. Y.; Frank L. Cole, of Manila, P. I.; Bennett R. Bates, of Berkeley, Calif.; Lieut. E. Ross Housholder; D. C. Gilbert, of Fort Wayne, Ind.; Warren D. Thompson; and Lieut. Don Carlos Billick, of the U. S. Ordnance Department.

Obituary

Waterfield Painter, mining engineer of Nevada, died recently at Packard of pneumonia, aged 24 years. He was a graduate of the Mackay School of Mines.

E. H. Wilson, mining engineer, died Nov. 27. He was graduated from the Washington University of St. Louis in 1870 and began at once to practice civil engineering. In 1884 he went into general engineering practice with John Gillie, now general manager of the Anaconda Copper Mining Co. Some years later he became connected with the Heinze interests in Butte, Mont., and for the last 10 years had been an examining engineer for many properties. In 1891, Mr. Wilson was elected president of the Montana Society of Mining Engineers.

Thomas T. Walters, of Ishpeming, Mich., died on Dec. 11, of heart failure. Captain Walters was one of the best-known mining men in the Lake Superior iron districts. He was born in Devonshire, England, on June 23, 1847, and started work in the mines there at the age of 7 years. In 1872 he came to the United States, and, after a year's work in the Pennsylvania coal mines, moved to Ishpeming, Mich. He was active in the development of the Saginaw, Mitchell, and St. Lawrence mines, and in 1885 accepted the superintendency of the Lake Angeline mine, which was considered one of the most successful mines in the Lake Superior district. Captain Walters became general superintendent for the Jones & Laughlin interests in the Lake Superior district in 1897, and held that position until a few years ago, when he retired from mining.

Societies

American Society of Civil Engineers met in New York on Dec. 18. Major Leonard S. Doten, Q. M. C., was announced as the speaker of the evening, his subject being "Sewage and Wastes Disposal for the U. S. Army."

Mining and Metallurgical Society of America will hold its annual meeting at the Engineers' Club, 32 West 40th St., New York, on Jan. 14, 1919. The December meeting of the New York section of the society was held at Columbia University Club on the evening of Dec. 16. The subject discussed was, "Methods of Combating Influenza and Pneumonia." The speakers of the evening were Dr. Charles T. Baldwin, of Derby, Conn., and Dr. William H. Park, of the New York City Board of Health.

Industrial News

Utah-Apex Mining Co. held its annual meeting recently. The following directors were elected: R. F. Haffenraffer, John J. Murphy, M. P. Duvally, M. W. Saugy and George F. McGahey.

Verde Combination Copper Co. at its annual meeting of stockholders on Dec. 2 elected the following board of directors: John L. Dyer, David Morgan, James F. Primm, J. C. Callahan, James M. Layman, John S. Eberman and William N. Richards. The following officers were elected by the board: John L. Dyer, president; David Morgan, vice-president; James F. Primm, treasurer; J. C. Callahan, secretary, and W. B. Kennedy, assistant secretary and treasurer. David Morgan will continue as general manager of the company.

Trade Catalogs

Cutters. Cleveland Milling Machine Co., Cleveland, Ohio. 3½ x 6; pp. 48; illustrated. monthly stock list, Dec. 15, 1918.

Mallet Articulated Locomotives. Baldwin Locomotive Works, Philadelphia, Penn. 9 x 6; 44 pp.; illustrated. A pamphlet descriptive of Mallet locomotives.

Ruth Flotation Machine. The Ruth Co., Box 57, Denver, Colo. 6 x 9; 12 pp.; illustrated. A bulletin giving the details of the machine and its operation.

Adamite. Pittsburgh Iron and Steel Foundries Co., Pittsburgh, Penn. 5½ x 8; 32 pp.; illustrated. A pamphlet descriptive of adamite, a high-carbon alloy of chromium and nickel.

Lift Trucks. Barrett-Cravens Co., 711 Transportation Bldg., Chicago, Ill. Thirty-two pp.; illustrated. A pamphlet entitled "How to Save Handling Expense in Factory, Warehouse, and Stockroom," describing in detail the modern development of the lift truck as a means of handling material in factories, warehouses, and stockrooms.

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.

Boring Tool. Edward W. Clark, Los Angeles, Calif., assignor of one-half to Alvin Wells, Los Angeles, Calif. (U. S. No. 1,281,519; Oct. 15, 1918.)

Casting Metals, Mold for. Michael Smith, Passaic, N. J. (U. S. No. 1,281,679; Oct. 15, 1918.)

Concentration, Apparatus for Ore. Frank Groch, Cobalt, Ont., Canada. (U. S. No. 1,281,351; Oct. 15, 1918.)

Furnace for Annealing or Heat Treating. William N. Best, Brooklyn, N. Y. (U. S. No. 1,281,489; Oct. 15, 1918.)

Furnace, Electric. Jens Orten Boving, London, England. (U. S. No. 1,281,280; Oct. 15, 1918.)

Galvanizing-Pot. Luther L. Knox, Bellevue, Penn., assignor to Blaw-Knox Co., Pittsburgh, Penn. (U. S. No. 1,282,862-863; Oct. 29, 1918.)

Oil from Shales and Other Carbonaceous Materials, Apparatus for Recovering. George W. Wallace, East St. Louis, Ill., assignor, by mesne assignments, to Wallace Coke, Oil and Byproducts Co., East St. Louis, Ill. (U. S. No. 1,283,000; Oct. 29, 1918.)

Oil Shales—Process for Distilling Carbonaceous Materials. George W. Wallace, East St. Louis, Ill., assignor, by mesne assignments, to Wallace Coke, Oil and Byproducts Co., East St. Louis, Ill. (U. S. No. 1,283,001; Oct. 29, 1918.)

Ore Reduction, Machine for. Richard P. Park, Melbourne, Victoria, Australia. (U. S. No. 1,281,646; Oct. 15, 1918.)

Phosphorus, Phosphoric Acid, Etc., Process for Making. William H. Waggaman, Cary R. Wagner and Harry Bryan, Washington, D. C. Dedicated to the public. (U. S. No. 1,282,994; Oct. 29, 1918.)

Potash—Decomposition of Refractory Alkali-Metal-Bearing and Aluminiferous Minerals. Waitstill H. Swenarton, Montclair, N. J. (U. S. No. 1,277,773; Sept. 3, 1918.)

Precipitation, Apparatus for. David Creel Walker, Anaconda, Mont. (U. S. No. 1,281,443; Oct. 15, 1918.)

Pump, Centrifugal. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,281,478; Oct. 15, 1918.)

Rock Drill, Power Driven. Moses Kellow, Penrhyndeudraeth, Wales. (U. S. Nos. 1,281,391 and 1,281,785-6-7; Oct. 15, 1918.)

Silica Brick, Machine for Making. Vincent H. Soisson, Connellsville, Penn. (U. S. No. 1,282,970; Oct. 29, 1918.)

Sluice Box. John C. Lesher, San Francisco, Calif. (U. S. No. 1,281,596; Oct. 15, 1918.)

Tin—Chlorine Detinning Process. Walther Zacharias, Pittsburgh, Penn., (U. S. No. 1,283,016; Oct. 29, 1918.)

Zinc Retort Furnace. Archibald Jones, Langeloth, Penn., assignor to Metallurgical Co. of America, New York, N. Y. (U. S. No. 1,282,847; Oct. 29, 1918.)

Editorial Correspondence

SAN FRANCISCO—Dec. 13

A Meeting of Chrome Producers of Siskiyou County was held at Yreka the first week in December, having been called at the instance of the Northern California Counties Association, which is striving to help in the chrome situation. About 20 of the smaller operators were represented. They are holding 2500 tons of ore ready for shipment. For various reasons none of the large producers were present. The opinion was generally held that assistance should be lent the Pacific Coast Chrome Producers' Association in stabilizing market and price.

Hydraulic and Placer Mining will be greatly augmented in California by the abundant rains during November. In northern California the rains have been abnormally heavy. The total precipitation at San Francisco, which may be taken as representative of the northern part of the state, was 5.6 in. in November, as compared to the normal of 2.47 in. The records show only two years in the last 47 years when the November rains have exceeded the present. December is also making a record at the beginning. This will aid mining and metallurgical operations and assures an abundance of electric power for mills, mines, and dredges. With the possible relief to gold miners from the unusual burdens of high freight costs and scarcity of labor, the coming season should show an improvement in mining in the state.

The New Oil Field Near Casmalia, developed within the last two years, has 63 wells producing a total daily output of 8500 bbl. Fifty of these wells have been brought in during the last year. They are about 2000 ft. deep and required from two to five months drilling. R. J. McLaughlin, state oil and gas supervisor, reports that the water conditions offer a serious obstacle to development, about 3800 bbl. of water being produced daily, or 61 bbl. per well. Unique geological conditions account for the trouble. The oil-bearing formation appears to be fractured shale, which lacks distinct beds of clay or other formations impervious to water. All wells were tested after cementing, and yet many later developed water. The operators were advised that simple mechanical work should be supplemented by thorough geologic and engineering studies. The advice was acted upon, and their engineering departments are now coöperating with the state supervisor.

BUTTE, MONT.—Dec. 13

The I. W. W. Element recently demonstrated to the public once again that it is unable to control the labor organizations of the Butte district. Believing there was an opportunity to shut the mines down through a strike, to be declared on the strength of the Mooney case, an effort was made to have the local unions vote on the question of protesting against Mooney's imprisonment. The leading locals, such as those of the engineers and machinists, refused to do so, though the I. W. W. miners' union voted unanimously to strike. When it was found that the support of the other groups could not be obtained, a statement was issued at the last minute declaring the strike off until a conference could be held in Chicago.

SPOKANE, WASH.—Dec. 13

Activity at the Trail Smeltery of the Consolidated Mining and Smelting Co. of Canada is not expected to decrease. The Canada Copper Corporation, it is expected, will soon produce from its 2000-ton concentrator now under construction at Allenby. It is understood that the latter company has made arrangements to ship the concentrates to Trail. This may require an enlargement of the Trail copper refinery. More copper ores are also expected from the Consolidated company's mines at Rossland.

Magnesite Mining must be protected by a tariff or receive other Government aid in the opinion of Spokane mining men, who have sent three representatives to Washington to see what can be done. Approximately $1,000,000 was expended in Stevens County, Wash., in the last two years in magnesite plants, besides the building of a railroad to some of the quarries. Before the war Austrian magnesite was landed in New York as ballast for $7 to $8 a ton. Upon shutting off this supply the price rose, and the Stevens County industry was developed hastily but at large expense. The delegation to Washington consists of Roy Bishop, manager of the Northwest Magnesite Co.; Charles A. Irwin, manager of the International Portland Cement Co., which is calcining magnesite; and H. F. Wierum, manager of the American Mineral Production Company.

SALT LAKE CITY—Dec. 12

Inspection of Utah Mines for the coming year will be under the supervision of Carl A. Allen, of the U. S. Bureau of Mines, according to an agreement to this effect between the State Industrial Commission and the Federal Government. John Crawford will continue as coal-mine inspector, and William T. Harrison has been appointed for inspection work in metal mines.

Taxable Property in Utah in 1918, as given by the State Board of Equalization, shows an aggregate value of $644,203,919, divided as follows: Real estate, $199,630,625; improvements, $11,318,239; livestock, $47,233,882; personal property, $129,452,144; public service corporations and mining companies, $156,568,929. As a separate item, the property on which the occupation and privilege tax is levied is valued at $32,962,103.

A List of Utah Mining Companies and operators who have failed to pay the occupation and privilege tax and 3% tax on the proceeds of mines has been completed by State Treasurer D. O. Larson. The properties are being advertised and will be offered for sale on the third Monday of the current month. There is a penalty of 5% for unpaid taxes. The mining companies will undoubtedly ask for a restraining order enjoining sales, and the matter will be taken into the courts and the constitutionality of the act determined.

Before the Mine Taxation Amendment to the State Constitution can become effective, it will be necessary for the next Legislature to pass a law fixing the multiple or submultiple of net proceeds of mines to be used as a basis in determining the valuation of the metalliferous mines and the manner of assessing coal lands. This action will be necessary, as stated by the State Board of Equalization, in a report to the Governor filed Dec. 11, which settles the question brought up before the election in November as to whether the amendment would be self-executing. With regard to the amendment, the board says: "At the recent election Section 4 of Article 13 of the constitution was amended, changing the basis of assessment of mining property. This class of property cannot be assessed until the Legislature shall have passed an act fixing the multiple or submultiple of net proceeds of mines to be used as a basis in determining the valuation of the metalliferous mines and the manner of assessing coal lands. It is extremely important that the Legislature should act early in the enactment of a law upon this subject, so that the board may make the assessment within the time fixed by law for completing these assessments. In connection with this matter, we desire to recommend that the Legislature require mining companies to include in their reports the net proceeds of all lessees operating under contract with the respective companies." The assessment of the net proceeds of mine lessees has been one of the difficult features of the enforcement of the occupation tax, and the board is desirous of obviating it in the future. The law requires all property to be assessed as of the first day of January. "Under our present laws there is some uncertainty as to whether reduction mills and smelteries operating in connection with mines, and yet situated some distance from the mines, shall be assessed by the county assessor or by this board." The State Board of Equalization recommends that the laws be amended to make it clear whose duty it shall be to assess this property. The next meeting of the Legislature will be early in January, when the matters referred to above will undoubtedly be acted upon.

DENVER—Dec. 14

The Community Sampler movement is gaining headway. The committee in charge of organization has formulated general plans for action, and the following pledge is being circulated among subscribers who intend to give the project financial support: "We, the undersigned persons, hereby agree to organize the Boulder Ore Sampling Co., under the laws of Colorado, with a capital stock of 2500 shares of the par value of $10 per share, for the purpose of taking over the ore sampling works of the W. J. Chamberlain Ore Co., and we hereby agree to subscribe for the capital stock of said company at par in the amount set opposite our respective names, provided that this subscription shall not be binding and subject to the call of the treasurer of said company until the full amount of 1000 shares has been subscribed at par." A number of the leading merchants and mining men of Boulder have already subscribed their names, and others have promised to do so. The coöperative features of the enterprise appeal to those interested.

DULUTH, MINN.—Dec. 16

Cuyuna Shipments for season of 1918 totaled 2,432,838 tons, as against 2,422,884 tons in 1917. It is estimated that approximately 700,000 tons of manganiferous iron ores was shipped this year, as compared with 500,000 tons in 1917. Of the 1918 shipments, the Soo handled 1,756,365 tons and the Northern Pacific 676,473 tons.

The Cuyuna-Duluth, Croft, Thompson, Preston and Gloria Mines closed early in December. All are underground mines, the Gloria and Preston being new developments of manganiferous ore, and the Croft, Thompson and Cuyuna-Duluth producers of straight iron ore. High cost and present inefficiency of labor, coupled with the uncertainty in regard to ore prices, are given as the reasons for shutting down. It is believed shut-downs are only temporary.

Claiming That the Oliver Iron Mining Co. has been using an ore washer for 10 years on the basic principles of one he designed, Capt. Alexander McDougall, president of the McDougall Shipbuilding Co., brought suit on Dec. 16 for $40,000,000 against the mining company in the Federal Court. Captain McDougall asked for an injunction, contending that John C. Greenway, of the Oliver company, obtained on Apr. 7, 1908, a patent on an ore washer after seeing plans of one which Captain McDougall himself had patented a few weeks before. He holds that Greenway's contrivance, though identical with his own, owed its origin to the plans which he exhibited. In asking damages Captain McDougall stated that the machinery of the Oliver company had been in operation 10 years and estimated that 20,000,000 tons of ore had been washed, the process enhancing the valution of each ton $2. The court took no action.

HOUGHTON, MICH.—Dec. 18

The Influx of Common Labor into northern Michigan has been rapid, and all mines in the copper district, except two, have all the trammers that can be used. For the last year there has been no difficulty in securing all the skilled laborers needed, but trammers were always in demand. The wages paid the latter and the contracts made were so attractive that many miners became trammers. Now the situation has changed. A limited number of additional miners could still be used at practically all the mines, and their employment would necessitate more trammers. Production of rock has not reached the total which might be looked for if the labor situation could be arranged satisfactorily to all concerned, but the change for the better is pronounced.

The Osceola Consolidated Mining Co. and the Isle Royale Copper Co. are both without representatives upon their boards of their largest individual shareholding interests. Three years ago, James M. Turner, of Lansing, Mich., owner of a few shares of Osceola stock, secured an injunction restraining any Calumet & Hecla directors from serving on the Osceola board. The

injunction is still in force. Calumet & Hecla owns 33,560 shares of the Osceola's total of 96,150 outstanding. There was some effort to adjudicate the case, but the understanding now is that the Calumet & Hecla management will continue without such direct representation. The property continues under direction of James McNaughton, who likewise is managing head of the Calumet & Hecla and subsidiaries. Practically, Calumet & Hecla interests in the Osceola corporation are being looked after, yet the opportunities for using legal process to the detriment of shareholders is readily discerned. It must not be understood that the courts have ruled that Calumet & Hecla is prohibited from voting its stock at elections of officers, but simply that it cannot elect Calumet & Hecla directors to the Osceola board. It is the practical working out of the interlocking directorate law. In theory the law seemed idealistic. In practice it actually puts men on directorates who are not vitally interested, directly or indirectly, in the corporation's success. It makes so-called "dummy" directors, instead of abolishing them. The Federal courts have taken the same position as the state courts, acting, of course, under a different statute. The Federal action was secured through Judge Sessions, whose injunction was upheld by the U. S. Court of Appeals. A new hearing relating to the directorate of the Isle Royale company comes up in January before Judge Sessions, who will sit at the Soo. It is believed that the action will be dismissed by agreement with the applicant for the injunction.

VICTORIA, B. C.—Dec. 13

Sales of Crown Granted Mineral Claims which are in arrears in respect of taxes are being advertised in different sections of British Columbia. Since the outbreak of the war the regulations in regard to provincial dues have not been rigorously applied, but from now on the authorities are likely to demand strict compliance with the laws. This, of course, does not mean that the terms of the Allied Forces Exemption Act, which protects soldiers, sailors, and their relatives while the former are on active service, are to be cancelled or in any way disregarded.

TORONTO, ONT.—Dec. 14

Mining Districts of Northern Ontario are receiving large numbers of laborers, owing to munition plants closing down. At Cobalt, where labor shortage a month ago was estimated at 10%, the deficiency has been nearly made up. There is still a shortage at Porcupine and other gold camps, but men are being taken on every day, and there is every prospect that the mines will be well supplied with labor during the winter. The improvement in the situation has already increased production at some of the Porcupine mines.

The Mining News

ALASKA

KENNECOTT PRODUCTION for November reported in issue of Dec. 14 included Braden output.

ARIZONA

Cochise County

GOLD RIDGE (Dos Cabezas)—A. J. Wilson, lessee, hauling ore to Golden Rule mill at Dragoon.

ARIZONA UNITED (Johnson)—Planning 800-ft. two-compartment vertical shaft. Will install new hoist. J. M. Libbey, manager.

KEYSTONE COPPER (Johnson)—Copper ore cut in fifth level crosscut from main shaft.

Gila County

IRON CAP (Copper Hill)—Plans to build high-tension transmission line to Inspiration power plant and to buy power of latter. Expect to install new crushers, skips, headframes, etc. Ten months' production in 1918, 7,800,000 lb. of copper.

ARIZONA COMMERCIAL (Globe)—Will drain 16 level and open drift. Working all levels from surface to 12th. Ore found east of Budget fault above 7 level. New three-compartment shaft down 130 ft. Raising from 12 level to meet it.

Greenlee County

GOLDFIELD EXTENSION (Duncan)—Work stopped on Ash Peak property, after two years' development.

Mohave County

EMERALD ISLE (Chloride)—Completing incline to tap ore pocket of gloryhole producing carbonate ores for electrolytic plant. Latter turning out 2500 lb. of copper a day. Estimated 300,000 tons of 3 % ore in sight.

HACKBERRY (Hackberry)—All machinery of mill on ground and assembly to be complete in January.

CONNELLY (Kingman)—J. J. Connelly shipping 3000 sacks of $140 gold ore from mine near Cerbat.

CATHERINE (Oatman)—Mine west of Oatman, near Colorado River, to be worked by Arizona Pyramid Mines Co. Will open developed orebody on 400 level. R. S. Billings and Charles Foster, latter of New York, in charge.

Pima County

GUNSIGHT (Ajo)—Five-stamp concentrator running on silver-lead ore.

NEW CORNELIA (Ajo)—Steam shovels working into undrilled ground find leaching carbonate ore continuous. Ajo Consolidated shaft workings in 4% sulphide ore, shipping grade. Influenza cuts output.

OLD HAT DISTRICT (Tucson)—Litigation affecting Daily-Arizona and Stratton properties settled. Stratton Copper Co. and Old Hat Copper Co. will be succeeded by Stratton Mining Co., with C. N. Wilson, president and general manager. Daily-Arizona has let contract for development work. W. H. Daily is manager and secretary.

Pinal County

BROKEN HILL (Ray)—Work started on 5000-ft. tunnel, with portal half mile from Ray, to cut present workings at about 900 ft. Most of way through Ray Consolidated ground. Large water flow to be tapped.

RAY CONSOLIDATED (Ray)—November production was 7,020,000 lb. of copper.

Santa Cruz County

HARDSHELL (Patagonia)—Bonded by R. R. Richardson to W. H. Welch and others. Producing silver and manganese ores.

HERMOSA (Patagonia)—Silver property in Harshaw camp, owned by James E. Corcoran, of Bradford, Penn., under lease to R. R. Richardson. Preparing to ship silver ore.

WEILAND & WILSON (Patagonia)—Leased to August Brodine, who has struck new copper deposit.

Yavapai County

KAY (Cañon)—Work concentrated on sinking to 650 level, on which main exploration plans will be worked out. George W. Long is managing director.

STERLING (Humboldt)—Sold by C. P. Wingfield to Usona Gold and Copper Mining Co., which has been operating property.

GADSDEN (Jerome)—Preparing to install 1000-gal. pump, to handle increased flow expected when 1200-level drift reaches objective fault. Now lifting 300 gal. a minute.

VERDE COMBINATION (Jerome)—Annual meeting decided to sink 200 ft. from present 1100 level and then start lateral development. During last year 5441 ft. of work done. John L. Dyer, El Paso, Tex., reëlected president.

VERDE SQUAW (Jerome)—Crosscut from 175 level in schist with much iron oxide.

YEAGER CANYON (Jerome)—Shipping ore to Clifton smeltery of Shannon Copper Co., owner.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Winze being sunk from 3500 level in good ore.

McGEE MINES (Sutter Creek)—Amador Queen, Aetna, and other properties of W. J. McGee, U. S. subtreasurer of San Francisco, to be incorporated and developed.

OLD EUREKA (Sutter Creek)—Deepening shaft to 3100 ft. by contract system. Now at 2860 ft. Extensive development to follow. Good ore on 1200, 1600, and 2100 levels.

Inyo County

MONTEZUMA MINES (Bishop)—To develop lead carbonate ore eight miles south of Big Pine on west slope of Inyo Mountains.

Kern County

ARMADA TUNGSTEN (Inyokern)—Sold to Los. Angeles syndicate by James Halsey and Peter Hughes, of Kernville.

Nevada County

MURCHIE MINES (Nevada City)—Sold to satisfy judgment held by C. F. Humphry, of San Francisco. Includes 325 acres, mill, hoist, and surface improvements. In litigation several years.

Placer County

EXCELSIOR GRAVEL (Forest Hill)—Closed because of high mining costs.

Riverside County

NEW LA PAZ (Blythe)—Machinery arriving for new installation; will also build 1,750,000-gal. reservoir. Sixteen men employed. Edwin York, manager.

San Bernardino County

POMONA OIL (Los Angeles)—To install equipment and drill for oil on north slope of Puente Hills.

Shasta County

BALAKLALA CONSOLIDATED (Coram)—Daily production of 300 tons shipped to Mammoth smeltery at Kennett.

KEYSTONE COPPER (Kennett)—Sold to Mammoth Copper Co. Long under development.

MAMMOTH (Kennett)—Smeltery production in November is estimated at 1,140,000 lb. of copper.

Siskiyou County

SUGAR HILL (Etna Mills)—Twenty-four quartz and placer claims sold to A. Ronalds, of Seattle, Washington.

COLORADO

Boulder County

NATIONAL ORE AND METALS (Boulder)—Mill producing 40 tons of fluorspar concentrates daily.

VICTOR (Boulder)—Sinking main shaft to be resumed. Will drift northeast to prospect Master Key property. N. G. Olsen, manager.

GOLDEN AGE (Springdale)—Producing daily 15 to 20 tons of fluorspar concentrates running 87-90% CaF and 5-7% SiO_2. Enlarging mill and adding six Wilfley tables. George W. Cheseboro, manager.

Mineral County

AMERICAN FLUORSPAR (Creede)—Mill producing about 50 tons of fluorspar concentrates daily. Mined at Wagon Wheel Gap. S. B. Collins, manager.

Ouray County

McLENNAN-DUNMORE (Ouray)—Tungsten property on Mount Hayden secured under bond and lease by M. de Golyer. Small crew developing; Carl Skoog, superintendent. Will treat ore in Gold Crown flotation plant at Ouray. Latter to be overhauled and remodeled to treat tungsten ore and miscellaneous custom ores.

San Juan County

SILVERTON SHIPMENTS during November were: Mayflower Leasing, 8 cars; Sunnyside and Gennessee, 6 cars each; Iowa-Tiger, 5; Pride of the West, 2; Mears-Wilfley, S. D. & G. Leasing, King

Leasing, Dives Leasing and Highland Mary, one car each; miscellaneous small lots, 13 cars; total, 45 cars.

IDAHO

Boundary County

IDAHO LEAD AND COPPER (Leonia)—President E. J. Merrin reports strike in tunnel No. 3 on Eureka claim. Work resumed since armistice was signed.

Shoshone County

PINE CREEK R. R.—After repairing two and one-quarter miles of washed-out track, work suspended until spring. Rails and ties on hand sufficient to complete branch to Constitution mine.

NABOB CONSOLIDATED (Beeler)—Instead of building new mill, as announced, company is moving Stewart 150-ton mill from Government Gulch, near Kellogg. Nabob controlled by Stewart.

COEUR D'ALENE ANTIMONY (Kellogg)—Mill closed because of poor market. Will continue development. Eighty tons of concentrates on hand.

ST. LAWRENCE (Saltese, Mont.)—Copper ore cut in lower tunnel. Raising in ore 200 ft. to upper workings. Upon connecting, will begin shipping, hauling six miles to railroad.

HECLA (Wallace)—Station at 2000 level nearing completion.

WESTERN UNION (Wallace)—Drift into Aurora ground has about 500 ft. to run to point under old workings. Ore indications favorable.

YANKEE BOY (Wallace) — Palmer, Newton & Co., lessees of upper workings, shipped two cars of ore, one averaging 200 oz. silver and the other 340 ounces.

MICHIGAN

Copper District

FRANKLIN (Demmon)—All rock coming from No. 1 shaft, where 30 drills are working. Drifting north and south at No. 2 shaft, four drills running. Will install mechanical haulage in No. 2 when ready to stope.

MINNESOTA

Cuyuna Range

PORTSMOUTH (Crosby) — Formerly known as Gordon. Being stripped by Gordon Mining Co., a Coates & Tweed enterprise. Will be 1919 producer.

NORTHLAND (Cuyuna)—Property, carrying both manganiferous and iron ores, being developed by shaft by Northern Minnesota Ore Co. Will start drifting Jan. 1. Mine buildings completed and machinery installed. Grading of railway spur in progress. Sixteen substantial dwellings built on town site of Pershing, platted and improved by company. Will be 1919 producer. Charles W. Potts, president.

ARMOUR NO. 2 (Ironton)—Sinking shaft to deeper level.

CUYUNA-MILLE LACS (Ironton) — Shipped 175,000 tons of manganiferous iron ores this season.

CUYUNA-SULTANA (Ironton)—Shipped 63,000 tons of manganiferous iron ore this season.

HOPKINS (Ironton) — Shipped 75,000 tons of manganiferous iron ore in 1918. Breitung & Co., owner.

JOAN NO. 4 (Ironton)—Producing 100 tons high-grade manganiferous ore per day.

MAHNOMEN (Ironton)—Largest producer on Cuyuna Range; shipped 340,000 tons this season, approximately 150,000 tons being manganiferous. Stripping stopped Dec. 1 on Mangan No. 2 property, on which option was taken recently.

SAGAMORE (Riverton)—John A. Savage & Co developing Ash Iron Co.'s manganiferous iron property on Section 19-46-29. Circular excavation made to ore with centrifugal pump. Shaft will be sunk in this excavation and drift run in orebody for drainage, in connection with proposed open pit to be stripped by Winston-Dear, of Hibbing. John Murphy, general superintendent.

ADBAR DEVELOPMENT (Trommald)—Sinking on Section 5-46-29, and will develop body of manganiferous iron ore.

ONAHMAN IRON (Trommald)—Shipped 100,000 tons manganiferous ore from Ferro and Algoma mines this season.

WILCOX (Woodrow)—Hoisting 400 tons per day. Will increase to 600 tons, if labor can be secured.

MONTANA

Silver Bow County

ANACONDA (Butte)—Work resumed at Alice and Emma mines, both zinc producers. Former down three months; latter, three weeks. Gas from fire in old stope on 900 level of Never Sweat, on Dec. 11, stopped work temporarily in this and Anaconda mine adjoining. Fire brought under control and damage slight. Fireproof cement shaft in High Ore mine practically complete. Labor scarce. Coal properties producing steadily. Brickwork on new Washoe stack recently completed. Great Falls plant producing 125 tons zinc daily; cleaning up zinc concentrates on hand; custom shipments from Butte & Superior and other properties temporarily stopped. Ferromanganese plant at Great Falls shut down Dec. 6.

BUTTE COPPER AND ZINC (Butte)—Work resumed Dec. 11 after temporary halt due to hoist accident.

NORTH BUTTE (Butte)—Nineteen damage suits for deaths of miners in fire of June 6, 1917, thrown out of court by District Judge J. J. Lynch. Montana compensation law provides $4000 for death. Minimum sued for was $10,000. November output was: Copper, 1,802,885 lb.; silver, 72,748 oz.; and gold, 115 oz.; all less than October output.

NEVADA

White Pine County

NEVADA CONSOLIDATED (McGill)—November production was 6,601,000 lb. of copper.

NEW MEXICO

Grant County

CHINO COPPER (Santa Rita)—November production was 6,464,285 lb. of copper.

SOUTH DAKOTA

Lawrence County

HOMESTAKE (Lead)—Installing two I-R direct-connected, motor-driven compressors, each with capacity 4500 cu.ft. free air per min., to replace 7500-cu.ft. compressor and others now in use, thus saving power. Brig and Golden Gate hoists electrified. Labor situation easier. Golden Star mill to resume about Jan. 1; Mineral Point will probably resume soon after.

Pennington County

AMERICAN TIN AND TUNGSTEN (Hill City)—Installing 60-hp. hoist and one-ton skip at Cowboy mine. Stoping between 300 and 400 levels. Deepening Mohawk shaft and developing. Will ship from both properties to company plant. Remodeling of latter calls for Telsmith gyratory, Hardinge mill, three Richards Pulsator classifiers, Deister Plato slimer, and electric furnace for smelting tin concentrates. Mill running by Mar. 15 on 75 tons daily. Ralph A. Mayer, general manager.

BOB INGERSOLL (Keystone)—Leased by A. T. Roos and associates. Shipping columbite-tantalite to Eastern market. Amblygonite also recovered, but has no market.

UTAH

Beaver County

UTAH SULPHUR (Morrissey)—First unit of plant ready for production. Situated at Morrissey, on Arrow Head trail near Cove Fort. Railroad shipping point, Black Rock. Office, Salt Lake City. Directors: M. P. Morrissey, Jacob Karlen, Jr., C. W. Peterson, Caspar Staub, and Charles Daniels.

Juab County

TINTIC SHIPMENTS for week ended Dec. 6 were 134 cars, from 21 shippers, as compared with 106 cars the week preceding. Dragon Consolidated, Tintic Standard, and Chief Consolidated led in output, with 26, 23, and 15 cars, respectively.

Salt Lake County

UTAH COPPER (Salt Lake City)—November production was 16,500,000 lb. of copper.

Tooele County

WESTERN UTAH COPPER (Goodwin)—Completing superstructure of new 50-ton mill and assembling machinery. Will treat copper and tungsten ores from mine at Gold Hill and from Yellow Hammer property. Deep Creek R. R. building 400-ft. spur to plant. Duncan MacVichie, general manager.

CANADA

British Columbia

GOLD DISCOVERIES reported in Chu Chua district, on Thompson River, four miles from Canadian Pacific Railroad.

SKYLINE (Ainsworth)—Shipped first carload of ore. Owned by A. W. McCune, of Salt Lake City.

HOMESTAKE (Kamloops) — La Rose Mines, Cobalt, Ont., paid $2000 cash on option. Balance of payment spread over two and one-half years.

QUEEN BESS MINES (Kamloops)—New concentrator almost ready. Mine equipment purchased in last eight months cost $50,000. Shaft down 300 feet.

VOIGHT (Princeton) — Representatives of Consolidated Mining and Smelting Co. inspecting recently acquired claims.

LE ROI NO. 2, LTD. (Rossland)—Produced 19,000 tons of ore in year ended Sept. 30. Ore found in old No. 1 mine.

UTICA (Slocan)—Five carloads of ore shipped since Charles F. Caldwell resumed management.

CONSOLIDATED MINING AND SMELTING (Trail)—Smeltery handicapped by influenza in first part of December. Shippers asked to cut shipments temporarily.

Ontario

OCTOBER SHIPMENTS over Temiskaming & Northern Ontario Ry. were: Buffalo, 583; Beaver, 43; Coniagas, 86; Dominion Reduction, 84; Foster, 44; Kerr Lake, 31; La Rose, 57; Mining Corporation, 255; McKinley-Darragh, 274; Nipissing, 150; O'Brien, 64; Penn-Canadian, 33; Peterson Lake, 51; Right of Way, 35; Keeley, 40; and Casey Cobalt, 53. Total 1883 tons, of which Deloro S. and R. Co. received 732; Coniagas Reduction, 312; Metals Chemical (Welland), 150, and A. S. and R., 688 tons.

ADANAC (Cobalt)—Decided to increase working force, on account of favorable development.

ALLIED GOLD MINES (Boston Creek)—Organized by Detroit interests to operate various claims, including O'Donald and Cullen-Renaud groups. Contract let for 1500 ft. of drilling on O'Donald, and another for sinking 50-ft. shaft on Cullen-Renaud.

CONIAGAS (Cobalt)—Option dropped on Ankerite property at Porcupine after spending approximately $300,000. Plant moved to Maidens MacDonald property, adjoining, which Coniagas owns outright.

NIPISSING (Cobalt)—Treated 181 tons of high-grade during November and shipped refinery 401,552 oz. Low-grade mill treated 6345 tons and produced 171,607 oz. Exploration work during month encountered several low-grade silver veins.

KIRKLAND LAKE (Kirkland Lake)—New 150-ton mill completed and being tried out. Expected to be in operation by Jan. 1.

TECK HUGHES (Kirkland Lake)—Mill operating at reduced capacity. About 2000 tons treated during November.

BILSKY (Porcupine)—Property adjoining that of Davidson Gold Mines now controlled by latter.

DAVIDSON (Porcupine)—Large pumps installed to overcome recent heavy flow of water. Sinking expected to start again soon.

PITTSBURG-LORRAIN (South Lorrain)—Mine closed.

MEXICO

Sonora

MAUTO (Carbo)—Being reopened by a Nogales company, headed by J. C. Underwood, with D. L. Fain as manager.

SAN GERONIMO (Carbo)—Lead-silver property being reopened by an American company; M. P. Dalton, president. Mine has 200-ton reduction plant.

PROGRESO (Ures)—Building new mill and pushing development work. Andrew Macfarlane, manager.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—October production of copper was 3,306,900 lb.; November, 551,150 lb. Decrease in November due to influenza.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—November clean-up was $122,000. Ore milled above average.

SOUTH AMERICA

Brazil

COMPANHIA SIDERUGICA MINERIA (Sabara, Minas Geraes)—Will complete new iron and steel plant soon. Capacity of furnace 25 to 35 tons of ore. Largest in country. Equipment includes regenerators, two 300-hp. gas motors, air compressor, triphase A. C. 200-kw. dynamo, and apparatus for purifying furnace gases. Compressor driven by 150-hp. motor. Abundant fuel on hand.

Peru

CERRO DE PASCO (La Fundicion)—November production of blister copper was 5,398,000 pounds.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
12	4.7570	101⅛	48 7/16	16	4.7575	101⅛	48 7/16
13	4.7570	101⅛	48 7/16	17	4.7570	101⅛	48 7/16
14	4.7575	101⅛	48 7/16	18	4.7550	101⅛	48 7/16

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

Dec.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
12	*	†	7.05	6.75	7.90 @8.00
13	*	†	7.05	6.75	7.90 @8.00
14	*	†	7.05	6.75	7.90 @8.00
16	*	†	7.05	6.75	7.80 @7.90
17	*	†	7.05	6.75	7.75 @7.85
18	*	†	7.05	6.75	7.70 @7.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

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

* No market. Producers ask 26c. No buyers.

† No market. Major supplies held for distribution at an arbitrary price of 72½c.

LONDON

Dec.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
12	122	122	137	275	270	40½	39½	56
13	122	122	137	274	269	40½	39½	56
14	...	...	...	...	...	...	...	...
16	122	122	137	272	270	40½	39½	56
17	122	122	137	272	270	40½	39½	56
18	122	122	137	260	257	40½	39½	56

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

The situation remains in general about as reported last week. Special attention is being directed by the several producers to the matter of liquidation of Governmental stocks, so as to arrange for that necessary operation with the minimum of disturbance.

Secretary Baker said on Dec. 12 that in letting go of its considerable holdings of copper, steel, lead, and other products, the War Department will consult both the producers and the consumers of the commodities and will arrange for the sales at such times and at such prices as will not disturb the market or impede production.

Copper—No business was done by the producers, and the condition of "no market" continues. There was gossip about copper being offered for resale by oversupplied consumers at 22c. and even lower figures, but those reports were unconfirmed. According to dispatches from Washington today, the Government has sufficient copper on hand to supply Army and Navy requirements for more than a year.

The copper producers have been invited to meet in Washington with the price-fixing committee of the War Industries Board next Friday to consider the matter of fixing the price for copper after Jan. 1. It seems to us that the price-fixing committee is lacking in sense of humor.

Copper Sheets—The base price of copper sheets is 35½@36c. per lb. Copper wire is quoted at 28c. per lb. f.o.b. mill, carload lots.

Lead

Lead—The committee met last Friday. Many of the producers went to the meeting with full expectation that the committee would be dissolved then and there and that the market would be allowed to take its own course; but after consideration of the matter it was decided to postpone action until Dec. 20, and now it seems not unlikely that the existence of the committee and the maintenance of the present prices by agreement will be continued until the end of the year. During this week the committee received orders aggregating a few hundred tons.

The War Trade Board announces that List of Restricted Imports No. 2 (W. T. B. R. 98, issued Apr. 22, 1918), Item 115, restricting the importation of lead, has been amended to permit the issuance of licenses for the importation of lead bullion, as classified under Paragraph 153 of the Tariff Act of 1913, when originating in Mexico and coming by ocean transportation.

We reported the advance in lead price in London from £29 to £40 on Nov. 28, but there is some doubt whether the actual date was not Nov. 25 or 26. Cable dispatches are delayed and irregular in their coming, and it is difficult to determine the dates of filing. Full advices by mail have not yet been received. However, the reason for the advance was to adjust the London price to the approximate level of importing costs. This has thrown the London market out of joint with our own; but exporters of lead are now unable to ship anything from here, owing to what is practically an embargo.

Tin

Tin—There is no change in the general situation, which is discussed editorially. The Interallied Tin Executive dissolved on Dec. 11. Free buying is again permissible in primary markets.

Under the style of "Comptoir Français de l'Etain" a company has been formed in Paris with a capital of five million francs to control the tin trade in France. The company will sell tin on the conditions fixed in the agreement between the French government, the importers, and the producers.

Zinc

Zinc—The market exhibited increasing weakness during the week on free offers to sell, without much actual business resulting. At the close, January spelter was on the basis of 7⅞@7.80c., while contracts for delivery during the first quarter were available at 7⅞@7⅞c. December spelter was still held at a premium, but there were no buyers except for trifling quantities.

Zinc producers have been disturbed by the repudiation of Governmental orders given by telegraph, by letter, etc. In some cases shipments on such orders had actually been begun, but they have been repudiated nevertheless. Nothing but orders executed according to prescribed forms are being recognized.

High-grade spelter is quoted at 9c. and possibly would be available at a little less on any firm bid. Domestic consumers appear to be oversupplied.

The restrictive maximum prices for rolled plate and sheet zinc are to be abolished Jan. 1, 1919.

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. There is much aluminum on the market, but there are very few transactions.

Antimony—The market declined rather sharply on small business. During the early part of the week the metal was offered in carload lots at 8¼@8⅜c., on Monday it was 8c., and yesterday it was 7¾c. We quote 7⅞@7¾c. at the close.

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

Cadmium—Quoted at $1.50@1.75 per pound.

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

Quicksilver—The New York market was weaker. We quote $118. San Francisco telegraphed $117.50, unsteady.

All Government restrictions on the sale of quicksilver expire by limitation at the end of 1918 and producers and importers alike may sell freely in the open market thereafter.

Gold, Silver and Platinum

The general stock of money in the United States on Dec. 1 totaled $7,669,576,580; of this $3,080,043,323 was in gold coin and bullion, $414,514,930 in standard silver dollars, and $237,904,206 in subsidiary silver. The money in circulation on Dec. 1, 1918, was $5,993,627,863, or $56.23 per capita. On Dec. 1, 1917, the per-capita circulation was $48.50.

Silver—There has been no change in the silver quotation for London or New York for the last week, as price continues stabilized under Federal control. There is no prospect of any relaxation of the control of the market for some time to come, owing to the requirements of the Indian government for coinage. Exports from New York to London from Nov. 30 to Dec. 14 amounted to 2,258,615 ounces.

Mexican dollars at New York: Dec. 12, 77⅛; Dec. 13, 77⅛; Dec. 14, 77⅛; Dec. 16, 77⅛; Dec. 17, 77⅛; Dec. 18, 77⅛.

Platinum—In good demand and firm at $150@108.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 14—Blende, per ton, high, $76; basis 60% zinc, premium price dropped: Class B, $46; Prime Western, $45@42.50; sludge and flotation, $40@37.50; calamine, $38@30. Average selling prices: Blende, $44.16; calamine, $36.06; all zinc ores, $43.95.

Lead, high, $103.75; basis 80% lead, $100 @80; average selling price, all grades of lead, $85.39 per ton.

Shipments the week: Blende, 8694; calamine, 228; lead, 1577 tons. Value, all ores the week, $526,840.

Buying on the premium schedule as fixed during the war is ended, and the smelters are completing the taking of their allocation. Though there is no buying, settlements will still be made on the $75 premium basis next week, after which premium grades, or blende assaying above 60% zinc, under 1% iron, and under 0.15% lead, will go again upon the competitive market.

A large portion of the lead tonnage being shipped is still settled for on $100 basis, but purchases are made on an $80 basis.

Platteville, Wis., Dec. 14—Blende, basis 60% zinc, highest settlement price reported, $75; $60, base price; for premium grade, $75; base price for high-lead blende, $45 per ton.

Lead ore, basis 80% lead, $75 per ton. One buyer of high-grade blende stated that he was out of the market pending the readjustment to follow the expiration of the Government schedule. Shipments reported for the week were 1149 tons blende, 41 tons galena, and 65 tons sulphur ore. For the year to date, the totals are 118,853 tons blende, 7688 tons galena, and 39,425 tons sulphur ore. During the week 2364 tons blende was shipped to separating plants.

Other Ores

Manganese and Chrome Ore situation unchanged. Washington is not going to give any relief.

Molybdenite—A little business was done at 85c. per lb. of molybdenum sulphide contents.

Tungsten Ore—A little business was done in scheelite at $20@21 per unit, and later at $23.

Pyrites—Spanish pyrites is quoted, subject to the raising of the embago, at 16½c. on the basis of 10s. ocean freight. Restrictions still continue. It is predicted that they will be removed before the end of the year. Domestic pyrites in Georgia mines has sold at prices ranging from 25 to 32c. f.o.b. mine.

Iron Trade Review

PITTSBURGH—Dec. 17

The market for unfinished and finished steel has become quotable at the reductions which the general committee of the American Iron and Steel Institute had intended to propose to the War Industries Board at the conference of Dec. 11, but which the board refused to have read into the record of the meeting. The pig-iron market has not become quotable at the reduction, though doubtless the reduction will occur. The divergence is caused simply by the majority of steel producers announcing that they are ready to book business, for delivery after Jan. 1, at the reductions, though blast furnaces do not make similar announcements. There is practically no inquiry, and they are thus under no obligation to quote at all.

The suggested reductions are: $3 a ton on pig iron, making basis prices at furnace $32.20 for bessemer, $30 for basic and forge, $31 for No. 2 foundry (1.75 to 2.25 silicon) and $31.50 for malleable; $4 a gross ton on unfinished steel, except rods, making billets $43.50, sheet bars and small billets $47 and slabs $46, leaving rods at $57; bars, $4 a net ton to 2.70c.; shapes, $4 to 2.80c.; plates, $5 to 3.00c.; black sheets, $6 to 4.70c. for 28 gage; galvanized sheets, $4 to 6.05c. for 28 gage; tin plates, 40c. a box to $7.35, and steel tubular goods, $6 to a 54% basing discount. No change is to be recorded in wire products.

The market has been made still quieter by the reductions, as was to be expected, and it is regarded as fortunate that the change should come just before the holidays, when the market is always dull naturally. It is an advantage to buyers that the reduced prices are quotable as in force Jan. 1, the inventory date, as otherwise they might be forced to show profits in income-tax statements absolutely impossible to realize.

The manufacture of war material has almost entirely ceased, owing to rapid cancellation of contracts. Mills are shipping freely to commercial customers, who are becoming stocked up, and it will be necessary to curtail production. A fortnight's closing over the holidays may occur with many plants, though no formal announcements have yet been made.

Pig Iron—Doubtless the pig-iron market will decline, but it has not done so. There are practically no sales at any price, and no offerings at the suggested reductions. The market is therefore quotable nominal at the Government limits, as formerly: Bessemer, $35.20; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. basing point, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less. The only sale reported is 50 tons of off bessemer or basic, for use as malleable, at $31.50, Valley.

Steel—Offerings of discard steel have increased, and $40 is about the highest asking price, representing about $3 decline. Regular soft steel is offered at the reduced prices noted above, but there is practically no buying.

Ferroalloys—The market still fails to declare itself, the gap between ferromanganese and spiegeleisen values in war time and prospective values in future being so wide that neither sellers nor buyers are disposed to act. Resale ferromanganese has been offered at $240, delivered, $10 under the old price, without finding takers. Furnaces recently reduced spiegeleisen asking prices $5, to $70, furnace, but there is no buying.

Coke—Coke is scarce, and furnaces fear the Fuel Administration will relinquish its control, whereupon the price might go up when furnaces and steel mills are endeavoring to meet the situation by reducing their prices. Moreover, there are coke contracts for all or half of next year specifying Government price at time of delivery or, if no Government price exists, then the last Government price; hence furnaces hope the Fuel Administration will before it ceases to exist, make a reduction in coke commensurate with the reduction in pig iron that is practically certain to occur. At the moment the market for Connellsville coke is quotable firm at Government limits: Furnace, $6; foundry, $7; crushed, over 2-in., $7.30; clean screenings, over ½ in., $5.50, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	101.125	34.192	43.584	48.969
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500	.....	110.000	.....	125.000	.....
Year	27.180	.....	124.892	.....	138.401	.....

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	(a)	247.467	335.543
November	74.740	(a)	274.943	323.550
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	8.050	6.187	7.750	30.500	30.60
December	6.375	.....	6.312	.....	30.500	.....
Year	8.787	.....	8.721	.....	30.500	.....

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685	.....	7.510	.....	54.000	.....
Year	8.901	.....	8.813	.....	52.413	.....

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

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December	37.25	.....	33.95	.....	33.95	.....
Year	$43.57	.....	$39.62	.....	$40.83	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 17
Alaska Gold M.	4
Alaska Juneau	1½
Am.Sm.&Ref.,com.	82½
Am.Sm. & Ref., pf.	107½
Am.Sm.Sec., pf., A.	93
Am. Zinc	13¾
Am. Zinc, pf.	45½
Anaconda	65
Batopilas Min.	1½
Bethlehem Steel	64
Butte & Superior	20½
Butte Cop. & Zinc	7½
Cerro de Pasco	34
Chile Cop.	19½
Chino	34½
Colo. Fuel & Iron	39½
Crucible Steel	58
Crucible Steel, pf.	87½
Dome Mines	12½
Federal M. & S.	10½
Federal M. & S., pf.	39½
Greater Nor., ore ctf	33
Greene Cananea	46½
Gulf States Steel	62
Homestake	94
Inspiration Con.	47
International Nickel	32½
Kennecott	34½
Lackawanna Steel	69½
Mexican Petrol.	167½
Miami Copper	24½
Nat'l Lead, com.	65
National Lead, pf.	106
Nev. Consol.	17½
Ontario Min.	18½
Ray Con.	21½
Republic I.&S.,com.	75½
Republic I.&S., pf.	98½
Sloss-Sheffield	51
Tennessee C. & C.	14½
U. S. Steel, com.	96½
U. S. Steel, pf.	112½
Utah Copper	74½
Va. Iron C. & C.	56½

BOSTON CURB*	Dec. 16
Alaska Mines Corp.	‡.12
Boston Ely	.85
Boston & Mont.	.52
Butte & Lon'n Dev.	.14
Calaveras	1½
Chief Con.	3½
Contact	.05
Corbin	.25
Cortez	.16
Crown Reserve	.18
Crystal Cop.	.29
Eagle & Blue Bell	2½
First Nat. Cop.	2½
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.50
Iron Cap	16
Majestic	.25
Mexican Metals	.33
Mines of America	.75
Mojave Tungsten	.06
Nat. Zinc & Lead	.11
Nevada-Douglas	.35
New Baltic	1
New Cornelia	16½
Oneco	.25
Pacific Mines	‡.35
Rex Cons.	.05
Yukon Gold	1

SAN FRAN.*	Dec. 17
Alta	.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.09
Con. Virginia	.07
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.04
Mexican	.03
Occidental	.40
Ophir	.01
Overman	.01
Savage	‡.02
Sierra Nevada	.07
Union Con.	.06
Utah Con.	.01
Belmont	2.85
Jim Butler	.35
MacNamara	.20
Midway	.18
Mont.-Tonopah	.15
North Star	.07
Rescue Eula	.08
West End Con.	1.20
Atlanta	.05
Booth	.16
Comb. Frac.	‡.02
Florence	.15
Jumbo Extension	.12
Kewanas	.06
Nevada Hills	.04
Nevada Packard	.38
Round Mountain	.20
Silver Pick	.06
White Caps	.09

COLO. SPRINGS*	Dec. 17
Cresson Con.	4.93½
Doctor Jack Pot	.04½
Elkton Con.	.06½
El Paso	.15
Gold Sovereign	‡.02
Golden Cycle	1.75
Granite	.18
Isabella	.06½
Mary McKinney	.08½
Portland	.07
United Gold M.	.14½
Vindicator	.44

BOSTON EXCH.†	Dec. 17
Adventure	‡.60
Ahmeek	71
Algomah	‡.30
Allouez	‡46
Ariz. Com.	13
Arnold	‡.20
Bingham Mines	‡10
Bonanza	.10
Butte-Balakiava	.45
Calumet & Ariz.	65½
Calumet & Hecla	436
Centennial	13½
Copper Range	44½
Daly West	‡2½
Davis-Daly	5
East Butte	9½
Franklin	4
Granby	‡79
Hancock	17
Hedley	‡12
Helvetia	‡.20
Indiana	.80
Isle Royale	.25
Keweenaw	1½
Lake	15½
La Salle	‡3
Mason Valley	‡3½
Mass	4½
Mayflower	‡3½
Michigan	‡3½
Mohawk	54½
New Arcadian	11½
New Idria	‡13
North Butte	12½
North Lake	.75
Ojibway	‡1½
Old Dominion	35
Osceola	52
Quincy	63
St. Mary's M. L.	45
Santa Fe	.35
Seneca	15
Shannon	3½
Shattuck-Ariz.	‡16½
So. Lake	1½
So. Utah	11
Superior	7½
Superior & Bost.	3½
Trinity	3
Tuolumne	.80
U. S. Smelting	47½
U. S. Smelting, pf.	46½
Utah Apex	3½
Utah Con.	8½
Utah Metal	1½
Victoria	2½
Winona	.96
Wolverine	20
Wyandot	‡.50

N. Y. CURB†	Dec. 17
Big Ledge	1
Butte & N. Y.	‡.50
Butte Detroit	.03
Caledonia	.24
Calumet & Jerome	¼
Can. Cop. Corpn	2½
Carlisle	‡2
Cashboy	‡.09
Con. Ariz. Sm.	‡1½
Con. Coppermines	6½
Goldfield Con.	.28
Goldfield Merger	.08½
Greenmonster	¾
Hecla Min.	5¾
Howe Sound	4½
Jerome Verde	‡.50
Louisiana	¾
Magma	28
Marsh	.04½
McKinley-Dar-Sa.	.47
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.37
Ohio Cop.	.75
Rawley	‡2½
Ray Hercules	3½
Richmond	‡.56
Rochester Mines	.30
St. Joseph Lead	‡14
Standard S. L.	1
Stewart	.17
Success	.10
Tonopah	‡3½
Tonopah Ex.	1½
Tribullion	‡½
Troy Arizona	‡.10
United Eastern	4¾
United Verde Ext.	‡35½
United Zinc	‡½
Utica Mines	‡.08

TORONTO*	Dec. 17
Adanac	.08
Bailey	.04
Beaver Con.	.35
Chambers Ferland	.08
Coniagas	2.50
Hargraves	.02
Kerr Lake	‡5.75
La Rose	.31½
Lake Shore	.90
Min. Corp of Can.	‡2.50
Nipissing	8.87½
Peterson Lake	.08
Temiskaming	.29
Wettlaufer-Lor.	.03
Davidson	‡.65
Dome Exten.	.24
Dome Lake	.15
Hollinger	6.12½
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.22
Teck-Hughes	.25
Vipond	.20
West Dome	.13

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