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RESIDUAL ORE IN THE WALLS OF RETIMBERED CAVED STOPES IS SHOT OUT BEFORE FILLING WITH WASTE

Recovering Caved Stopes in Narrow Veins—I

By CLAUDE T. RICE

The reopening of a caved stope has two objects—recovery of the caved ore, and preparation of the ground for the resumption of stoping operations. The width of the caved area and the ability of the ground to arch itself over the cave are controlling factors that determine the method used in reopening the working. Stopes often cave because of extraordinary and unforeseen physical conditions of the orebody. In the Coeur d'Alenes the narrow vein-like lodes are characterized by the occurrence occasionally of enlargements of the lodes, or kidneys of ore, accompanied by highly fractured walls, a common cause of caving. At the Hecla mine, which is timbered with stull sets, caved stopes are recovered by working down through the broken ore from above. The back is first caught up and then retimbered from top to bottom as the caved ore is withdrawn from below. The retimbered stope is subsequently waste filled, and normal conditions are thereby reëstablished. The process has proved practicable, safe and efficient.

IN THE most carefully stoped mines, caving will occur at times if the ground suddenly becomes heavy. If the ore widens in the vein, and it becomes necessary to stope greater widths than previously, a much greater weight is thrown upon the timbers than before, as the weight of ore or back, supported either by timbering or self-supported by the cohesion of the ground itself, increases rapidly in proportion to the length of span over which the back must arch itself. The sub-arch, or zone of ground below the natural arch or dome to which the ground would slough in order to support itself, represents the weight that is coming upon the timbers of the stope, as shown in Fig. 1.

Often, in wide orebodies, stopes cave below a flat fault, the presence of which is wholly unsuspected, for no special precautions are taken in order to hold the working. So long as the block of unshattered ground between the stope and the fault is thick enough

to allow the back to arch itself across the opening, the load upon the timbers is little greater than usual. But just as soon as the arch encroaches upon the fault, there is a collapse, and a great mass of rock is released, the weight coming so suddenly upon the timbers that the pressure exceeds their power of resistance. Usually the weight comes so suddenly that it is impossible to rush in cribs and reinforcing timbers quickly enough to save the stope. But occasionally, if an abundant supply of timbers is kept on hand upon the different levels, it is possible even then to prevent a cave.

Narrow Stopes Cave Because of Top Weight

In mining narrow steeply dipping veins that require timbering it is not usually a weak back that causes the trouble, except as a consequence of weak walls. When stopes cave along narrow veins, it is

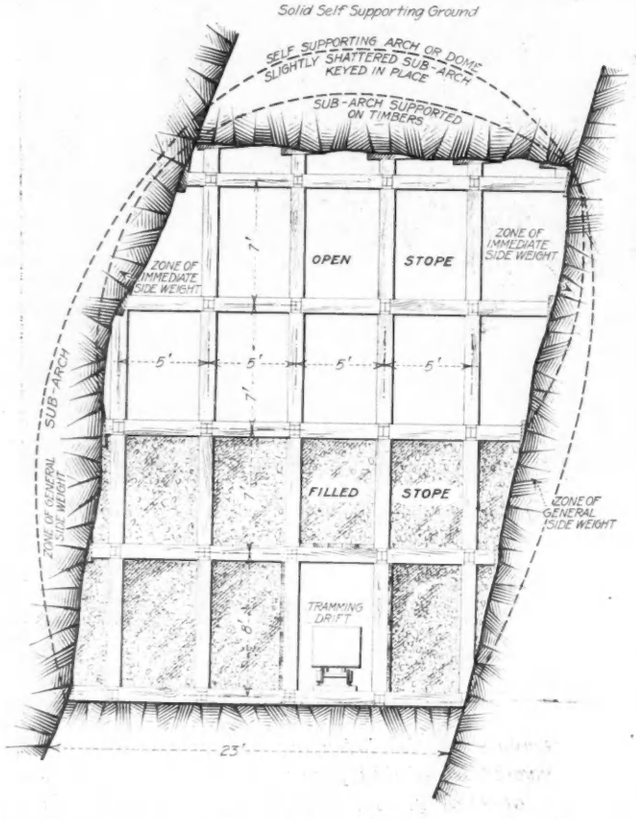


FIG. 1. CROSS SECTION OF TIMBERED AND PARTLY FILLED STOPE, SHOWING ZONES OF WALL AND BACK ARCHING

almost always the effect of top weight coming suddenly from the back that crushes and collapses the timber sets. Occasionally, and then only when the walls are highly fractured and filling has been permitted to lag behind the back so that five or six floors are left open, does the unsupported arch which extends into the side walls, as shown in Fig. 1, become too great for the strength of the wall rock. Still, even in narrow veins that have never been faulted, and which are characterized by fairly strong walls, the ore itself is often so greatly shattered by subsequent movement along the plane of the vein, and frequently as a result is so broken up by slickensides, talc seams and clay gouges, that a cave results. For in such ground the weight is likely to come suddenly and erratically upon the timbering, as the talc and gouge, especially if damp, act as excellent lubricants to cause the ore to slip upon itself when the back tries to arch itself across the stope. Especially is this somewhat peculiar condition of ground to be met when the ore occurrence, as in the Cœur d'Alenes, is the result of the mineralization of a fractured zone rather a single open fissure.

Occasionally when a fault cuts through the vein or when the ore itself is much shattered, the timbers in a narrow stope will hold even with several floors of the stope unfilled. But in order to minimize the occurrence of caves the filling should be kept as close to the back as is consistent with efficient mining and economical handling of the ore in the stopes. In the past there was much greater inclination to let filling lag far behind mining than at present, but even now it is not amiss to remind mining men of the great importance which waste filling has in preventing the weight that is thrown upon the timbering of a stope from becoming excessive.

When narrow stopes cave it is frequently the result of a peculiar combination of conditions not previously understood. Often the ore along comparatively narrow veins "makes out" into the walls in the form of wide kidneys or lenses, enlarged to two or three times the average width of the vein, and such kidneys of ore are usually accompanied by considerably fractured walls. These lenses usually are found either where the vein crosses an earlier fissure that permitted the ore solutions to mineralize both it and the broken-up ground between, or at points where brittleness caused the wall rocks to shatter more than usual. In either instance the walls of the stope will be much weaker than elsewhere on the vein, and, unfortunately, this condition occurs at stoping widths where it is most essential that the walls be strong.

Swelling of Lodes and Widening of Stopes, Sources of Frequent Caves

Often wide kidneys along narrow veins can be stoped without great difficulty. Little trouble is experienced usually in working out the lower part; but in stoping the upper portion, when the width of the stope is rapidly diminishing, the conditions, as shown in Fig. 2, are such as to make a cave extremely probable. In the lower part of such a kidney or lens the width of the stope increases rapidly, but fortunately the shape of the walls is such as to prevent the stope from caving, for the back arches itself from the walls much as if they were the buttresses of a bridge, while whatever top weight may come upon the timbers tends simply to tighten them more securely in the blocking. Unfortunately, in the upper part of the kidney, mining conditions are reversed.

Between the converging hanging walls the full effect of wall and back fracturing combines to destroy the arch, and the back becomes a bridge from which the buttresses have collapsed, with resulting caving of the unsupported arch. The consequence of this condition is that, instead of the back being able to arch itself across the stope from the walls at points immediately above the timbers, it has to find a footing higher up in the walls, throwing a greater weight of sub-arch upon the timbers, and the stope begins to collapse. When only one or two floors are open, frequently the timbers

will stand long enough to permit cribs and reinforcing sets to be rushed in, and the stope to be saved. But usually the weight comes so suddenly that nothing can be done to prevent caving of the stope. Once the ground is really in motion, it is useless to try to save a stope, although even then it may be possible to rush cribs and doubling-up sets in fast enough to hold the bottom floor open when several floors of the stope have been left unfilled.

Caving Ceases When Caved Ore Supports the Walls Enough for Back To Arch Itself

In a narrow vein, it is seldom that ground will continue to cave until the stope fills itself clear to the back. Generally the ore caves just enough to give sufficient support to the walls for the back to find footings strong enough to enable it to form an arch across the top of the cave. But usually the cave will have by then eaten up into a narrower part of the vein or else to a point where both the walls and the ore itself are much less fractured. Typically considerable open space will remain between the pile of caved ore and the back.

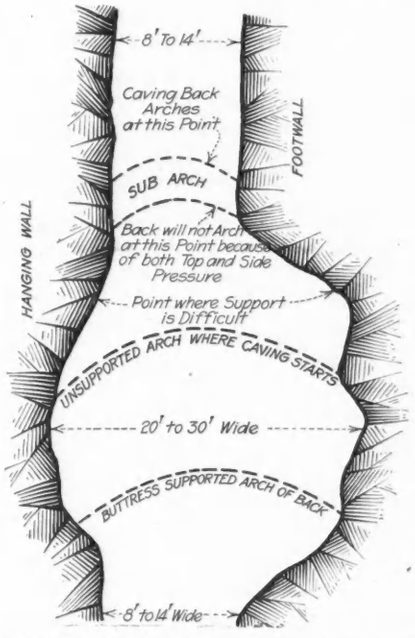


FIG. 2. CAVING STARTS WHEN THE ARCH OF THE BACK FAILS TO RECEIVE PROPER WALL SUPPORT

Sufficient time for establishing this state of equilibrium must be given before attempting to reënter the stope. When the back and walls are naturally strong, and the orebodies narrow, though occasionally even in orebodies so wide as to require square setting, it is possible to begin this in a few weeks after the cave occurred. If the ore is weak, however, and the orebody wide, it may be necessary to wait several years before it is safe or economical to reopen the stope.

The time-honored method of reopening caved stopes, whether they be in narrow or wide ore occurrences, is to begin at the bottom and work up through them. This is true largely because practically all our methods of reopening caved workings are based upon methods developed in the course of recovering caved stopes in wide orebodies. But this practice is fundamentally wrong. It is wrong no matter whether the caved working is wide or narrow, as I hope to prove in this and another series of articles dealing with the problem. For not only is it safer, but, taking everything into consideration, it is also cheaper, to work down through the caved ore than it is to try to come up through it from below, with runs of ore and serious accidents always imminent. Moreover, this is true whether the ore has arched itself over the cave, as is generally the case when the cave has occurred along a vein characterized by narrow stoping widths, or the stope has been so wide and the walls so weak that the back could not arch itself over the opening, and so both walls and back have closed in completely. This discussion will not be theoretical, but it will be based upon mining practice under widely differing conditions that have come under my own personal observation. Therefore while most mining men will no doubt think it rather absurd to argue that ore can be obtained not only much more safely but also fully as cheaply by working down through a caved stope in such a camp as Bisbee or Butte, I believe that my observations will go a long way toward making many readers resolve to try at the earliest opportunity the methods that I outline. As the reopening of a caved stope in a narrow ore occurrence is much less difficult than the recovering of a caved working in a wide deposit, I will discuss that problem in this series, and leave the other for the next.

Back Timbered From Top of Caved Ore

The procedure to follow in recovering narrow caved stopes is to work in to the top of the caved ore pile from one end, usually by stoping to the necessary height in the undisturbed ore next the cave.

With ore that is strong enough to arch itself securely over the caved area, the back can be caught up with temporary timber supports. By this means miners are protected from a sloughing back, and the timbers will give ample warning if the back again begins to take weight. The problem thereafter is to support the walls as the height of the "muck pile" is lowered. The more usual procedure is to begin mucking out the ore from the edge, drawing it out from below at one end of the pile and securing the walls with timber sets as fast as room is made. If the walls can be supported promptly and at regular intervals during removal of the fill, so that the span of the arch is not permitted to increase, the back will stand indefinitely.

In the case of caved stopes in veins of stulling widths, there is far more latitude in the method used in getting out the ore and catching up the back than in the case of a caved stope in a naturally wide ore occurrence; for when a square-set stope has caved, it is either a case of booming out the ore by means of suspended square sets, working downward from the top in sections, or of waiting for several months until disintegration of the gangue minerals and the weight that comes upon the pile from the walls and back consolidate the broken ore sufficiently for it to stand over an opening a set or two in area while room is being made for timbers.

Ore Conditions in the Hecla Mine, Burke, Idaho

As the methods of recovering caved stopes in narrow veins are based upon the practice that has been developed at the Hecla mine at Burke, Idaho, in the

Coeur d'Alene district, I will outline the ore conditions which characterize that mine as well as the method used in mining the ore. In the western part of the Coeur d'Alene the lodes dip close to 80° and show a tendency to "make out" into the walls at certain points, thereby forming large kidneys of ore ranging from 20 to 30 ft. or more in width, along vein-like deposits usually only from 8 to 10 ft. wide. The walls are quartzite, and generally stand fairly well, although often showing tendencies in places to slab off as they take weight.

The orebodies which have made the Hecla mine famous occur along fracture zones that generally follow a 2-ft. porphyry dike. Some ore occurs independently of this dike, but the main ore occurrence follows it closely. The mineralization makes out laterally into the crushed quartzite walls, with indefinite limitations. Generally the ore zone is from 8 to 14 ft. wide, but frequently it expands laterally to form rich lenses. When such lodes widen out into large kidneys of ore, and there is a clay selvage or gouge at the boundaries of the minable width, it is almost impossible to carry up a stope without having it cave. A regular system of handling caves has been evolved at the Hecla by working downward and using spliced stull sets up to widths of 30 ft. and for distances as great as 100 ft. along a vein caved to a height of 60 feet.

Ore Mined With Stull Sets and the Stopes Filled Later

Caved stopes occur more frequently at the Hecla than at most of the mines in the Cœur d'Alenes. The reason for this is the system of mining. The endeavor is to mine the ore at as low cost as possible, with due regard to the safety of the stopes, so as to get a maximum tonnage at a minimum cost, rather than a clean product.

But the method has not been developed merely to get the ore out of the stope cheaply. Owing to the manner in which the ore has been formed, it is not unusual to break into a rich seam of galena on an upper floor which comes into the stope from the side and below, and so has not been found in mining the ore on the lower floors. Unless a considerable height of stope were kept open, it would be expensive to go back to get this ore. In fact the expense would be prohibitive, and either a great deal of money would have to be spent in prospecting the walls of the stopes or much rich ore would be left in them. Indeed, with all the prospecting, much ore would be lost, so I believe that the method of mining which has been developed at the Hecla mine has had more to do with making it the important producer that the property has been in the last few years than any other one thing, for in all my mining experience I have never seen a method so admirably adapted to the ore occurrence as the Hecla stull-set and waste fill method.

Briefly, the method consists in mining the ore overhand in horizontal slices three floors high, with subsidiary stope tramming for each slice. As soon as a slice has been mined across the block, the stope track is raised three sets, and the floors below are filled with waste. This waste filling is obtained either from the surface or from development work, as all the rock broken in a stope is sent to the surface and sorted, the waste being sent back into the mine for use as filling in the stopes through a waste raise. As there is a tramming floor always open, and as the floor above is always left open so as to aid in getting the ore through the cross-boards, there are five and sometimes six floors open by the time that three floors have been mined across the stope.

Instead of putting in simple stulls to hold the stopes open, stull sets are used; that is, the stulls are carried by posts and braced sideways by girts from one another. This is done for two purposes: First, in order to keep the floors level in the stopes, for otherwise the stulls would have to be carried at right angles to the dip of the vein; and, second, so that when a seam of ore is found on an upper floor to be making down into a wall, that wall can be shot out on the lower floors without stulls dropping out, as would be the case were they not carried by these posts.

Round timbers from 10 to 16 in. in diameter are used for the stull caps in these sets, and stulls are put in up to 16 ft. in length. Above that width of stope the stulls have to be spliced, as it is difficult to get longer timbers through the manways. The stull caps are put in at 5-ft. centers horizontally, and at 9-ft. centers vertically. They have headboards both along the foot and the hanging wall. Always two and usually three 3-in. planks, 2½ ft. long, are used at each end in forming these "headings," so as to provide a cross-grain cushion from 6 to 9 in. thick at each wall to protect the stull from being broken by the initial creep of the ground, which is heavy, as 45 ft. is left open vertically along the vein, and occasionally 54 ft., by the time that the tramming tracks are raised to take out another slice along a stope.

The posts of the stull sets fit into 1-in. daps cut into the stulls in the stopes with hand saw and adze. These posts are generally about 10 in. in diameter, as they do not have to carry much top weight except when it is necessary to shoot out one of the walls or a stope begins to take weight owing to bad ground. As the stulls are much larger than the posts, separate girts or collar braces are used to brace the caps and posts of the different stull sets from one another.

The level interval varies throughout the mine, but is usually 250 or 300 ft. Stopes vary greatly in length, being usually several hundred feet long. Raises for sending waste filling down into the stopes are generally from 250 to 300 ft. apart, while manways and chutes are carried up at 50-ft. intervals. These are arranged rather peculiarly. They are made three sets wide, and the manway is placed on one side, the timber slide on the other, and the chute—a box chute of special design—in the center.

An effort is made at the Hecla to minimize the handling of ore in the stopes. Therefore, instead of adhering to the older practice of the district, of carrying the filling close to the back and of keeping a mucking floor immediately below the mining floor, the present method is to drop the ore down several floors to a cross-board system of lagging immediately above the tramming floor, and to run most of it into a car and thence to the nearest chute, with little, if any, shoveling.

The floors in the stopes are laid with single 3-in. planks of random widths. The cross-board floor is of

peculiar construction. It consists simply of ordinary 3-in. planks with a plank 12 in. wide taken out directly over the center of the track on the tramming floor. The two planks forming the side of this opening are nailed to the stull caps to prevent them from slipping. Then this opening is closed with a series of 3-in. planks, 12 in. wide and about 18 in. long, placed crossways with the opening, and therefore side by side. Pieces of 3x10 in. plank 10 in. long are then nailed to the under side of the cross-board pieces, so as to keep them from being kicked out of position. The ore is worked through to the car below by removing the cross-boards one at a time, at the edge of the pile. This is a mucking development somewhat similar to the Australian "Chinaman" chute system that originated independently to meet the requirements of the method of mining at the Hecla.

As not only the wall rock but also the ore is strong, being a mineralized quartzite, no trouble is usually experienced in holding a stope open even for five floors, and for considerable periods, when, owing to shortage of waste, delayed filling is unavoidable. Occasionally, however, the stopes will cave, and often this occurs soon after the tramming tracks have been raised and the lower three floors filled. Now that it has been found that these caved stopes can be mined at little, if any, greater cost than those which do not cave, and that often the lowest-cost ore comes from caved stopes, no great precaution is taken, as there is no especial danger.

Usually caving will continue until the ground has stoped itself up to narrow widths in the lode, as shown in Fig. 2, and after the caving ceases there is usually an opening 4 to 10 ft. high between the caved ore and the arched back. While this back must be securely caught up by timbering before any of the caved material can be safely drawn, it is generally found strong enough to require blasting after the stope has been filled with waste and normal stoping operations have been resumed.

At the Hecla, caves do not come without considerable warning, and generally ample opportunity is afforded in which to reinforce the timbers sufficiently at least to hold the tramming floor open, and often there will be time left also to reinforce the cross-board floor above.

As it is top weight oftener than side weight that gives the trouble, more posts are required. Reinforcing posts are stood, as shown in Fig. 3, on stringers laid crosswise to the stulls between the original posts, and directly support the stulls above. Sufficient floor lagging is removed to make room for the stringers. These stringers do not tie together the stull caps above, for if a stringer were interposed under the stull caps and on top of the helper posts, it would interfere with intermediate stull sets, should such become necessary to hold the ground. If time still permits, and there is enough old timber lying along the level, bulkheads may also be built on the tramming floor. Stringers and helper posts, also intermediate sets if they seem necessary, may also be placed on the cross-board floor. If time remains after this much has been done, attention is directed to strengthening the rest of the stope.

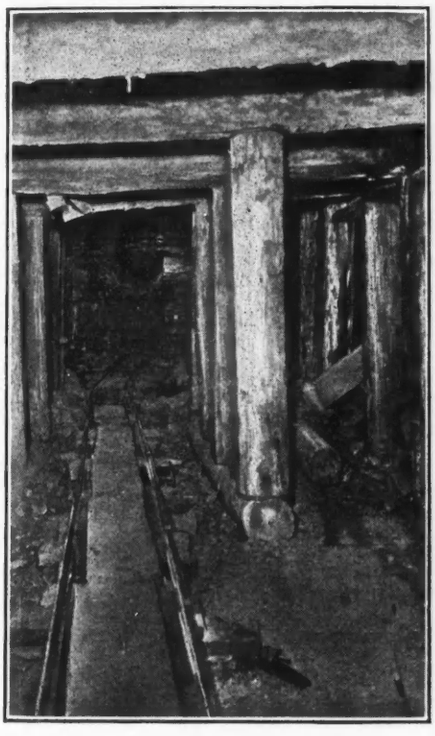


FIG. 3. TIMBER REINFORCEMENT ON TRAMMING FLOOR

FIG. 4. THE BACK IS CAUGHT UP OVER TOP OF CAVED FILL

FIG. 5. THE WALLS SOMETIMES SLOUGH AWAY FROM TIMBER

First Step of Recovery, Access to Top of Cave

When it is found impossible to hold the stope open, it is abandoned for several days, or until the first period of caving has ceased. Then, if still open, whatever additional reinforcements that may seem necessary on the tramming and cross-board floors will be put in, and an attempt made, as soon as serious sloughing of the back has stopped, to get in on top of the pile. Sometimes the caves are not so high but that

it is possible to get in to the top of the pile from the top floors of that part of the stope which did not cave. Generally, however, it will have extended to such height that this is not possible.

Success in recovering caved stopes by catching up the back and then working down on the muck pile depends mainly upon proper placing of the stulls. In catching up the back, the stulls must be put in with long headboards and as closely spaced as required. These stulls must hold the top weight that will first come upon them until the nip of the walls sinks them deep into their headboards. The headboards used for this purpose are 3-in. planks 5 ft. long. The reason for using such long headboards on these catching-up stulls is to provide grip on the walls. Generally the stulls are of such diameter that two planks have to be put in side by side to fully cover the end area. The stull is usually cut in length so as to take between it and the walls at each end a thickness of three planks and the tightening wedges.

Any irregularities in the walls are, of course, filled in tightly with blocking, although it is best to get the headboards themselves against the ground for as much of their length as possible. The headboard scheme A, as shown in Fig. 6, is put in so that about three feet of plank extends below the stull; then the wedges are driven so that the lower part of the headboard is keyed out appreciably to allow for possible top weight, before the side pressure has compressed the ends firmly into the headboards. Such top weight will then tighten the stull in its headboard, blocking instead of kicking it out. In Fig. 6, B, C and D, three typical examples of stulls put in to catch up the back over caved stopes are shown. It will be noticed that their purpose is not so much to hold the walls apart as to keep up the back. Blocking, short sprags, or even small false sets are used to prevent possible slabbing of the rock from above, and, occasionally, when the stulls are some distance apart, the back between them is securely laced up with plank.

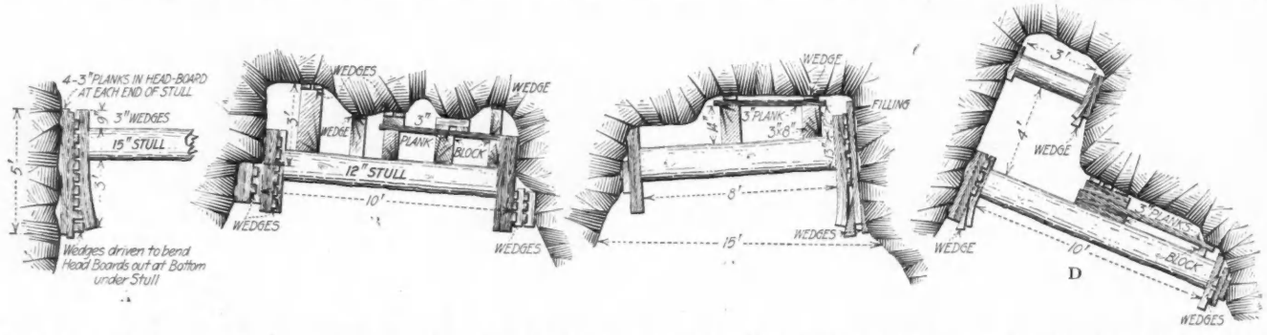


FIG. 6. DETAILS OF CATCHING-UP STULLS AND BLOCKING UNDER BACK IN STOPES WHERE CAVING HAS CEASED

Stull Sets Put in as Fast as Caved Ore Is Taken Out

The permanent stull caps of the regular stope timbering are put in below the catching-up stulls, just as fast as sufficient wall is exposed to permit of their being placed at 5-ft. centers horizontally and 9-ft. centers vertically with respect to the timbers in the part of the stope alongside which has not caved.

Occasionally the stope is so open at the top, when it is first entered, that two stulls, one above the other, can be spaced at the vertical interval forthwith, after which posts are placed between them. After all open spaces along the stope have been caught up, the permanent stulls of the stopes are worked in singly, no more wall being left unsupported at any one time than is absolutely necessary. Then, as soon as a stull has been worked in under one above, the posts are entered in the 1-in. daps between, as in regular stope sets. Longitudinal braces are also put between the stulls and also between the posts. When the stope gets wider than 16 ft. in the caved workings, spliced stulls are used. These are put in by butting two together, either over a single or double post, using one of the stulls full length. Two posts are always used when the shorter stull or butt block is longer than about three feet, for, with stulls of differing lengths, the top weight is unequally distributed, and a single post would tend to split as a consequence.

Moreover, spliced stulls are put in with the spliced ends a few inches higher than the wall ends, so that with side pressure they will yield upward rather than downward. To resist this movement, the butted ends are firmly blocked by posts to the upper timbers and then to the back. Thus, any top weight transmitted from above through the posts tends to settle the wall end more securely into the headboards. For the same reasons, all stulls put in singly or spliced are placed with any existing warp or bend curving upward.

The stulls for catching up the back are put in wherever ground conditions seem to demand them and at whatever angle the shape of the walls at these points requires them to be placed in order to hold, for the ground is in such ticklish condition that little picking can be done to get them in, but the permanent stulls are always placed horizontally, except for the slight trussing effects mentioned. This is possible because the walls are nearly vertical, and it has the advantage of floors level across, as well as along the stope, the posts dispensing with the necessity for footwall hitches and usual angle of underlie. No trouble is experienced maintaining stulls, even when they are far from being perpendicular to the walls.

The "headings" for permanent stulls consist of a thickness of three, and generally four, 3 x 12 -in. planks, but in this case the planks are only 2½ ft. long, as the main function of these headboards is to provide cross-grain cushions as protection against excessive wall pressures. As the permanent stulls have to be placed according to definite position, no matter what the wall conditions may be, considerable blocking must often be worked in back of the headboards, as indicated in Fig. 7.

Whether the ore pile is to be removed by drawing it down on the slope of the caved ore from one end of the tramming floor, or the material removed in vertical slices from wall to wall, starting at the top and coming down, the back must be caught up well. If the stope has caved to a considerable height compared to its length, and the muck is coarse, so that it will not have a tendency to run, the probability is that it will prove less expensive if sliced vertically from top to bottom. If the cave has caught itself up with a long arch from end to end along the vein, and the ore is broken comparatively fine, so that it will run without difficulty, the best method is probably to draw the material on a long receding slope, putting in the stull sets above as fast as proper wall space becomes exposed.

In order to gain access to one of these caves it is often necessary to stope up alongside one end until

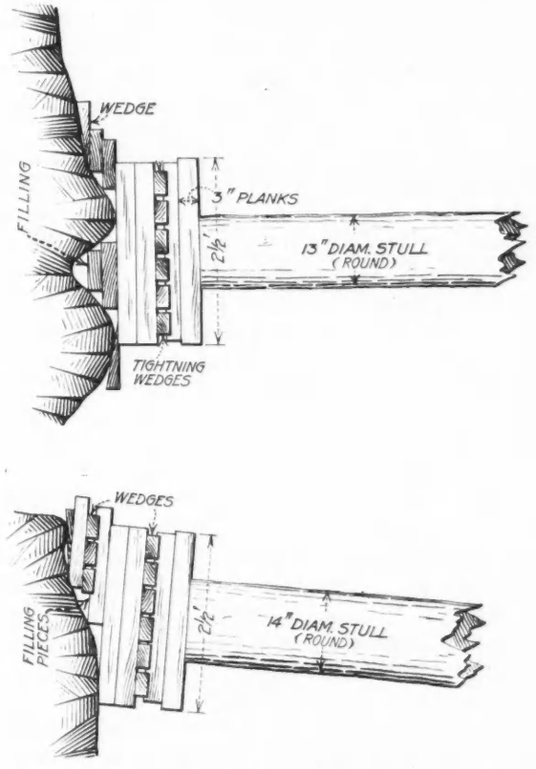


FIG. 7. STULLS ARE CUSHIONED AT BOTH ENDS BY 3-IN. PLANK TWO TO FOUR LAYERS DEEP

a shot breaks into the opening at the top. Usually is it better to do this only at one end, and to leave the mining of the ore overhanging the other end until all the caved ore has been removed and the cave has been filled completely. Then, after the filling has settled, the sloping back at the far end of the caved stope is worked out at the time that part of the lode is stoped. This, however, is a matter depending largely upon local conditions in the stope itself, and not infrequently the back at the far end of the caved stope is taken out at the same time that the arch at the other end of the cave is squared up.

Generally, once work has started in the caved stope, blasting in and near the cave is avoided as much as possible until after the stope has been refilled with waste. Whenever it becomes necessary to blast a boulder, it is holed half way through with a plugger drill, and then loaded with only sufficient dynamite to split it open, shaking the pile as little as possible. For, as the caved ore is quite likely to have many open spaces in it of considerable size, especially if many large slabs are scattered through it, a heavy blast might cause the pile to shift considerably, and that might easily prove disastrous. The work of recovering these caved stopes is not as dangerous, however, as might at first be thought, for the ground is securely timbered and the muck pile kept under close control from sudden runs. In fact, during the whole life of the Hecla mine, only one man has been killed in a caved stope, and comparatively few men have been injured. Moreover, this man was killed years ago, before the present method of reopening caved workings had been systematized.

There is usually some ore left in the walls of caved stopes. Generally this ore is not mined until the cave has been completely caught up. Then, when everything has been made secure, the ore is blasted out, drilling it either with stoper drills or plugger, and working in new timbers, if necessary, when the width between walls requires it. Sometimes, however, the ore that is found in the walls is shot out in the ordinary course of working the cave. But this is done only when the amount of ore in the wall is so small that it would not pay to come back after it. In a cave everything depends upon conditions. If the walls are strong and the back is giving little if any trouble, considerable blasting can be done in the cave without any danger. But if the walls and back are weak, no chances are taken, and little blasting is done either while the ore is being got out or after the cave has been completely retimbered, for it is much cheaper to leave a little ore in the walls than to run risk of the stope caving again.

(To be continued)

Japanese Weights, Measures and Money, With English and French Equivalents*

Distance and Length

Ri = 36 cho = 2,160 ken	= 2.44030 miles	= 3.92727 kilometers
Ri (marine)	= 1 knot	= 1.85318 kilometers
Ken = 6 shaku = 60 sun	= 7 ft. 5½ inches	= 1.81818 meters
Shaku = 10 sun = 100 bu	= 1 ft. 2½ inches	= 0.30303 meters

Tan (cloth measure) = a roll of about 25 shaku
Shaku (cloth measure) = 1.25 shaku.

Land Measures

Square ri = 1,296 cho	= 5.95505 square miles	= 15.42347 kilometers carres
Cho = 10 tan = 3,000 tsubo	= 2.45064 acres	= 99.17355 ares
Tsubo or bu	= 3.95369 square yards	= 3.30579 centiares

Ko (Formosa) = 2,934 tsubo

Quantity, Capacity and Cubic Measures

Koku = 10 to = 100 sho	= 4.96005 bushels / 47.65389 gallons (Liquid) U. S. A. / 5.11902 bushels (Dry) U. S. A.	= 1.80391 hectoliters

Go (10th of sho)
Koku (capacity of vessels) = 10th of a ton
Shakujime (timber) = about 12 cubic ft.
Tana (fagot, etc.) = about 3 x 6 x 6 ft.

Weights

Kwan or Kan = 1,000 momme	= 8.26733 lbs. (Avoir.) / 10.04711 lbs. (Troy)	= 3.75000 kilograms
Kin = 160 momme	= 1.32277 lbs. (Avoir.) / 1.60754 lbs. (Troy)	= 0.60000 kilograms
Momme = 10 fun	= 0.13228 oz. (Avoir.) / 0.12057 oz. (Troy)	= 3.75000 grams

Moneys

Yer. (Y) = 100 sen (Nominal)
= 1,000 rin. = 2s. 0d. 582 = 2.583 francs
= 0.4984 dollars (U. S. A.) = 2.0924 marks (German)

* From the "Japanese Salesman," April, 1918.

Manganese at Butte, Montana*

The presence of manganese ores in the Butte district had long been known, but during the silver-mining period whatever manganiferous material was mined found its way to Colorado smelters, where it was used as a basic flux. The shipment of these ores from the silver mines ceased in 1894, and since then little manganese ore has been mined. The demand for manganese ore created by the war has again directed attention to these deposits and to their future possibilities.

THE country rock at Butte contains a small percentage of manganese, of no commercial value as a source of the metal, but manganese occurs otherwise only as an original constituent of the quartz veins, which are regarded as the product of a deep-seated intrusive magma. Rather curiously, manganese minerals are scarce in the veins that yield copper ore, and in fact they are not found in those of an area that surrounds Anaconda Hill and was called by Sales[1] the central copper zone. Outward from this zone manganese minerals appear, but they are not plentiful within the area that produces ores predominantly valuable for copper. Beyond this area on the north, west, and southwest, in a peripheral zone commonly known as the silver area, manganese minerals are plentiful in all the veins. Outward from this zone, manganese is again generally less abundant, and the outer as well as the inner limit of the manganiferous zone is therefore rather indefinite. The width of the zone in which the veins are strongly manganiferous, however, ranges from one to two miles approximately, being greatest toward the west. Owing to the general lack of underground work and the mantle of wash that conceals the bedrock in the valley of Silverbow Creek, the extent of the manganiferous zone on the east and southeast is not known. Presumably its ends lie beyond its present known limits, which are near Meaderville and the Northern Pacific Ry. station, but they do not necessarily meet so as to form a closed ring. However, many of the veins of East Ridge, across the valley, are moderately manganiferous.

About half of the manganiferous zone lies north of the copper area and east of the rhyolite, and is referred to as the northern section; the remainder lies in what are locally known as the southwestern and western sections. Though manganese is widely distributed in all parts of the zone, it appears to be relatively most abundant in the southwestern section. It occurs abundantly as deep as the workings have gone, though according to Bard and Gidel[2] it seems to be less plentiful in the deeper parts of the veins.

Two main types of manganiferous ore are found in the Butte lodes—the black or oxide ore of the outcrops and the oxidized zone, and the pink or carbonate and silicate ore that occurs below. Although differing in origin and occurrence, the high-grade oxide ore at Butte is essentially similar to that produced in foreign countries and the eastern United States, upon which the industries have heretofore chiefly depended. The low-grade ore, which composes all but a small part of the deposits, differs, however, from the low-grade deposits worked in Arkansas and other states east of the Rocky Mountains, in that the matrix of the manganese minerals is hard vein quartz instead of rather soft clay or a similar residual material.

Manganese carbonate is new to the trade in the United States, though it has been mined and utilized for a considerable time in Europe, and, so far as known, silicate ores have not yet been used as a source of manganese, except some mixed ores mined in the Province of Huelva, Spain. In accordance with the trade customs that were most common in the Northwestern States in 1917, the manganiferous material of the Butte lodes is somewhat arbitrarily subdivided into high and low grade, according to whether it contains more or less than 40% of manganese, and into high and low silica ores according to whether it contains more or less than 10% of silica. The pink ore may be further classified as carbonate, silicate, or mixed carbonate and silicate.

Manganiferous Material Is Siliceous

By far the most of the material in the manganiferous lodes is highly siliceous and contain less than 40% of manganese. Iron is present in small amounts only—generally less than 3 or 4%. Therefore the classification of material containing as little as 5% of manganese as a manganiferous ore, which is possible with some iron ores because they can be smelted directly to manganese-iron alloys, cannot be applied unqualifiedly to the Butte deposits. Owing to the more complicated metallurgic treatment required for those deposits, the amount of manganese necessary to permit definition of the material as ore is presumably considerably more than 5%. In August, 1917, the operators who were experimentally concentrating the oxide ores considered tentatively that the smallest amount of manganese permissible in the raw ore was about 20%, and that figure was therefore adopted to define one of the grades of ore estimated in the field. Considered as having a possible future value, material containing from 10 to 20% of manganese was also estimated as a separate grade.

With reference to their probable adaptability to mechanical concentration, the low-grade oxide ores may be broadly classified into two groups—coarse-textured ores, in which the manganese oxides and the quartz occur in somewhat distinct masses, rather easily separable from each other, and jaspery ores, in which the constituents are intimately associated and form a strongly coherent mass. Fortunately the great bulk of the ore reserves as estimated come under the first of these groups.

The pink or unoxidized manganiferous material of the Butte lodes has not yet, (Oct., 1917,) been utilized in the United States, and its designation as ore is therefore somewhat uncertain. Rhodochrosite, however, which, as found in the Emma mine, forms bodies that contain about 40% of manganese and little silica, and presumably offer slight metallurgic difficulties to their

*Excerpt from Bull. 690-E, "Manganese at Butte, Montana," by J. T. Pardee, U. S. Geological Survey.

[1]Sales, R. H., "Ore Deposits at Butte," Trans., A. I. M. E., Vol. 46, p. 59, 1914.

[2]Bard, D. C., and Gidel, M. H., "Mineral Associations at Butte, Montana"; Trans., A. I. M. E., Vol. 46, p. 126, 1914.

utilization, is without doubt a valuable ore. The probability that large amounts of ore of this kind exist at Butte is indeed the most promising feature of the manganiferous deposits. Pure rhodonite, which may also form considerable bodies at Butte, is possibly to be classified as a high-grade silicate ore. It differs from the high-grade siliceous ore of the oxidized zone in that its silica is chemically combined instead of free. The great bulk of the deposits below the oxidized zone, however, are composed of rhodochrosite, rhodonite, and free quartz in various proportions and contain less than 40% of manganese. They are arbitrarily classified as low-grade carbonate and low-grade mixed carbonate and silicate ores, the lower limit of manganese for each being assumed at 15 per cent.

It should be borne in mind that the classification of the manganiferous material at Butte as ore is based on the high prices paid for manganese in 1917, and the continuance or possible increase in those prices. Should the price drop to its former level, probably all the manganiferous material, certainly that portion containing less than 40% of manganese, would again be regarded as waste rock.

Occurrence and Distribution of High-Grade Ores

Oxide ore containing 40% or more of manganese and varying from low to high in silica forms bodies near the surface, chiefly in low situations or portions of the lodes that do not crop out prominently. Such bodies were seen in all parts of the manganiferous area, but are most numerous in the southwestern section, though nowhere can they be said to be abundant. In dimensions these bodies range from inconsiderable deposits to some a foot or two in width and 40 or 50 ft. in length, and most of them pinch out within a depth of a few feet. Some are fairly well defined, but most of them grade rather indefinitely into leaner material.

The most common variety of the high-grade ore is rather compact but not homogeneous, being evidently a mixture of the different manganese oxides. Small black lustrous crystals that appear to be chiefly manganite generally form a considerable part of the mass. Soft black or brown oxides that stain the hands readily and are presumably to be classified as wad are moderately abundant. Psilomelane was identified in a few of the orebodies as thin mammillated crusts lining cavities. Concretionary psilomelane forms the bulk of an orebody worked by lessees on the North Pole claim, near the Germania mine.

Some free quartz is intimately associated with the manganese oxides, occurring generally either as visible grains or as a cellular skeleton or "honeycomb" more or less completely covered with the manganese minerals. Small masses of a yellowish-brown clay that are apparently residues from the decomposition of granite are commonly present. From several analyses reported, some of which represent orebodies in place and other ore selected for shipment, it appears that the manganese content ranges from 40 to 49%, silica from 4 to 26.5%, iron from 1.3 to 3.2%, phosphorus from 0.006 to 0.043%, alumina from 2.4 to 7.3%, and silver from 0.3 to 6.2 oz. a ton. Lime, sulphur and gold occur in traces only. No analyses are available of the psilomelane ore from the North Pole claim, but a representative specimen appears to be very pure. It is soluble in acids without a residue and shows no reaction for barium.

Only 10 bodies of high-grade ore sufficiently large to be worthy of consideration were seen during the examination of the district. These bodies, seven of which are in the southwestern section, are estimated to contain a total of 2600 tons. Individually they contain from 100 to 800 tons; the largest ones are in the Ancient, Minnie Jane, and Star West lodes. Though their silica content averages high, it varies from place to place, so that it is possible by careful sorting to obtain from most of them a little ore that runs less than 10% silica. It is believed that 1000 tons is a liberal estimate of the available amount of this ore.

Other bodies of high-grade oxide ore may be found, particularly in low places where the outcrops are not now exposed, but no large additions to the estimated ore reserves are expected.

Occurrence of Low-Grade Ores

Oxide ore containing from 20 to near 40% of manganese forms bodies that range from 1 to 35 ft. in width and from 50 to 400 ft. in length. In the narrower lodes these bodies commonly occupy the full width, but in the wider lodes they generally occur as one or more streaks separated by leaner material. Their boundaries, except where formed by the walls of the vein itself, are rather indefinite, as is to be expected from the arbitrary limits placed on their manganese content.

Parts of the lodes containing less than 20% and more than 10% of manganese are somewhat larger than the richer parts mentioned in the preceding paragraph, but otherwise are similar. Bodies of both grades extend from the surface down through the oxidized zone, which is generally from 20 to 100 ft. deep. As a rule the outcrops of the richer parts of the lodes are less prominent than those of the leaner parts, the more conspicuous reefs, such as those of the Ancient and Tzarina, being relatively barren quartz, though they contain enough manganese to color them noticeably. In these particular lodes the best ore occurs in streaks on either side of the main reef.

Veinlets of manganese oxides are common in the wall rocks, and in places they are so numerous as to form stockworks or stringer lodes. Opencuts expose bodies of this description 20 or 30 ft. wide adjoining the Ancient and Nettie lodes. These are estimated to average between 10 and 20% of manganese.

Character and Composition of Low-Grade Ores

A common variety of the oxide ores classed as coarse textured consists of fractured vein quartz cemented with a mixture of manganese oxides considered to be largely pyrolusite. For the most part this variety is of coarse texture, and the manganiferous portions appear sharply distinct from the quartz.

Analyses are available for most of the bodies estimated and range from 10 to 37% of manganese and from 28.8 to 79.1% of silica (determined as insoluble residue). In round figures the general average of the higher of the two grades of ore considered is 24% of manganese and 50% of silica, and that of the lower is 11.5% of manganese and 73% of silica. In both grades iron varies little from an average of 3.5%. Generally the ores contain 1 or 2 oz. of silver to a ton,

and exceptionally 10 or 15 oz. or more. More than a trace of gold is uncommon. No analyses for phosphorus are available, but the ore under consideration presumably contains no more phosphorus than the high-grade oxide ore.

Although manganese oxides stain all the lode outcrops in the area described as manganiferous, the distribution of material rich enough to be considered ore is by no means uniform. Of the amount of ore averaging 24% of manganese, as indicated in the estimate, less than 5% occurs within the northern section, the remainder being about equally divided between the other subdivisions. If in addition the lowest-grade material (containing 11% of manganese) is considered, the relative distribution remains almost the same, only 13% of the whole being found in the northern section. It is possible, owing to the concealment of much of the outcrop of the Rainbow lode by waste dumps and mill wreckage, that considerable ore was overlooked, though even if allowance is made for that contingency the fact remains that the western and southwestern sections contain by far the greater part of the oxide ores.

The preponderant coarse variety of ore is widespread, but the jaspery variety is essentially confined to the eastern half of the Rainbow lode and a section of the Nettie about 200 ft. long. It is interesting to observe that 40% of the total manganese oxide ore estimated for the district occurs along the significantly named Black Chief, the principal lode of the southwestern section.

Reserves of Low-Grade Ores

In round figures, 132,000 tons of oxide ore that averages 24% of manganese and 50% of silica is estimated to be present in the outcrops and upper portions of the Butte lodes. Considerable additional ore is probably to be found, because at only a few places was the full depth of the oxidized zone used in the calculations. Part of the amount given above was estimated by Paul Billingsley, A. C. Grimes, and M. H. Gidel in collaboration with me, but I am responsible for the total.

The ore included in this estimate can be more quickly and cheaply mined and is therefore of greater present value than the low-grade ore occurring in the deeper levels, though its utilization at all under present conditions seemingly depends on a successful method of concentration. Experiments with ordinary jigs and tables so far reported by the mining companies show a concentration of 3 or 4 into 1; the product contains from 43 to 52% of manganese and 7 to 15% of silica, and the amount of manganese recovered ranges from 40 to 75%. If, for example, an average recovery of 65% could be attained, at a concentration of 3 into 1, the reserve estimated would yield 44,000 tons of concentrate containing about 46% of manganese.

In addition to the ore reserve estimated, the lodes contain at least 270,000 tons of oxidized material that averages 11.5% of manganese and 73% of silica. Whether this material should be called ore and considered valuable for manganese depends on market conditions as well as successful concentration. It has the advantage of being readily available to mining, and it might be made to yield 45,000 tons of a 46% manganese concentrate.

Rhodochrosite almost free from impurities other than quartz occurs in the lower levels of the Emma mine, where it forms bodies of high-grade ore large enough to be workable. In August, 1917, their form and limits had not been determined, but according to the latest reports received (December, 1917), a little exploratory work has shown that they are to be measured by thousands of tons, at least.

Specimens said to be from a body on the 800-ft. level 10-ft. wide range in color from pinkish gray to deep rose-pink and are coarsely crystalline, some of the rhombohedral cleavage faces being an inch across. Galena and zinc blende, together with subordinate amounts of pyrite and quartz, form mineral aggregates of an older generation sparingly scattered through the rhodochrosite. Cavities are lined with rhombohedrons on the free faces of which minute crystals of clear quartz and small grains of chalcocite and pyrite are deposited. Analyses of samples from a certain level show about 41% of manganese, 1% of silica, 0.6% of iron, and 0.28 oz. of silver to a ton. The bulk of the ore, however, averages from 34 to 38% of manganese and 6% or less of silica. According to tests by the Anaconda Co., this ore is converted into oxides by gentle roasting, and the manganese percentage is thereby increased nearly one-third. The product, being light and friable, probably needs briquetting before it can be smelted—a small matter, however, considering the value of the material.

Orebodies in the Emma Mine

The probability that bodies of carbonate ore other than those in the Emma mine exist at Butte is so strong as to be almost a certainty. In the southwestern section the lode outcrops are generally richer in manganese than elsewhere. They contain the coarse-textured variety of oxide ore to the exclusion of the jaspery variety observed to be derived from rhodonite, and the only unoxidized manganese mineral found in the dumps of the old workings is rhodochrosite. Although these facts should not be pressed beyond a certain limit in support of a contention as to the tenor of the veins in depth, they nevertheless shed valuable light on the character of the veins. Finally, the rhodochrosite bodies of the Emma are in the eastern part of the largest lode of the southwestern section, the Black Chief, whose outcrop nowhere shows any indication of a change in the vein mineralogy. Therefore it is concluded that a large amount of carbonate ore is to be found below the oxidized zone, of which a considerable part will prove to be as rich as that in the Emma.

In the western section the evidence is less complete. Both rhodochrosite and rhodonite occur in the lower levels of the Nettie, whose outcrop contains both the jaspery and coarse varieties of oxide ore. Elsewhere the outcrops contain chiefly the coarse variety, but there is no positive evidence to indicate the exclusive occurrence of rhodochrosite. In the northern section the great Rainbow lode, whose character to considerable depths is fairly well known, contains mixed carbonate and silica ore, little of which apparently is of high grade. The authors familiar with this lode, however, mention rhodochrosite as occurring alone in places, and the possibility of finding workable bodies of it cannot be absolutely denied.

By far the most of the manganiferous material of the Rainbow and presumably many others of the Butte lodes consists of a mixture of quartz, rhodochrosite,

and rhodonite associated in diverse proportions. Whether this material can be made to yield manganese profitably is problematical.

None of the reports of these ores gives analyses representing any bodies of the manganiferous material under consideration, but from the descriptions given the inference that moderately high percentages of manganese are common may be safely drawn. Such an inference is further supported by analyses recently (November, 1917,) reported by the operator of the Black Rock mine, which show from 13 to 29% of manganese in bodies occurring on different levels down to the 1700-ft. level. The deposits in the southwestern section, which are more richly manganiferous in the oxidized zone than those in the northern section, are probably also more richly manganiferous below that zone.

Though no good basis exists for computing exact tonnages of the bodies of manganiferous material under consideration, the descriptions given by those who have had opportunity to observe them leave no room for doubt that the aggregate amount of such bodies is very large. Such terms as "abundant," "large quantity," "great quantities," and "one of the chief constituents of the gangue," are commonly used by the authors of the reports cited when mentioning this material.

A few more precise descriptions are given also. W. P. Blake mentions widths of 12 to 30 ft. of manganiferous material in the Alice mine, and R. G. Brown observes that in one place the Rainbow lode is more than 100 ft. wide and composed almost entirely of rhodochrosite and quartz, though it is apparent from the content that he uses the term rhodochrosite to include both the carbonate and the silicate of manganese. W. H. Weed records the occurrence of 6 to 10 ft. of solid pink ore without quartz on the 600-ft. level of the Ella mine (east of the Leonard), a statement which also implies a manganese content of at least 30 to 40%. The bodies reported in the Black Rock mine range from 4 to 6 ft. in width, and 6 ft. is one dimension of a body that contains 19% of manganese.

Graphite in 1917

The total production of crystalline graphite in 1917, according to H. G. Ferguson, of the U. S. Geological Survey, was about 14,000,000 lb., including stocks at mines, against about 10,900,000 lb. in 1916. Of the total sales of 10,584,080 lb., about 54% by weight, or 6,816,913 lb., was flake graphite containing 80-90% graphitic carbon, suitable for crucibles in large part. The remainder, or 3,767,177 lb., was dust or low-grade flake, probably averaging under 50% graphitic carbon. A larger proportion was saved as flake in 1917 through improved milling methods.

Alabama was the largest producer of crystalline graphite in 1917, the amount marketed being 6,223,095 lb.; New York was next, with a production of 2,941,040 lb.; and Pennsylvania third, with a production of 804,945 lb. California, Montana and Texas also made a combined production of 545,000 lb. The production of amorphous graphite in 1917 was 8301 tons, coming from Colorado, Michigan, Nevada and Rhode Island mines.

According to figures furnished by the Department of Commerce, the imports of graphite in 1917 amounted to 42,609 short tons, compared with 28,885 short tons in 1913. The exports in 1917, principally to Great Britain, France, Canada and Italy, amounted to 2576 short tons, compared with 798 tons in 1916.

Domestic flake graphite brought slightly higher prices in 1917 than in 1916. The prices received at the mines ranged from 13 to 18c. a lb. for No. 1 flake, according to its grade; from 6 to 10c. a lb. for Nos. 2 and 3; and from half a cent to 1½c. for dust. Flake graphite containing 90% or more of graphitic carbon sold for higher prices than the usual product, which contains about 85% of carbon. The prices reported by purchasers were, in general, from 14 to 17c. a lb. for No. 1 flake and occasionally prices as high as 20c. a lb. for special lots; 9½ to 12c. for No. 2; and from 1 to 9c. for lower grades.

In 1917 the prices of Ceylon graphite in the Eastern market were approximately as follows: lump, 27 to 30c. a lb.; chip, 19 to 24c.; dust, 7 to 14c., according to grade. Madagascar graphite is a flake graphite similar to the crystalline graphite produced in this country. The price in 1917 ranged from 11 to 17c. a lb. Korean graphite, which sold at about $22 a ton before the war, brought $45 to $60 a ton in 1917.

About 30,000 tons of graphite suitable for crucible manufacture will be needed in 1918. If freight and market conditions and an improved labor situation favor the shipment of domestic graphite, about 8000 tons of flake of crucible grade, exclusive of dust, can be marketed in this country in 1918, an increase of more than 100% over the production in 1917. The situation is more favorable with respect to non-crucible graphite. The requirements for 1918 will be between 28,000 and 32,000 tons, which may probably be supplied by domestic, artificial, and Mexican production.

Phosphate Rock in 1917

The quantity of phosphate rock marketed in 1917, according to R. W. Stone, of the U. S. Geological Survey, was 2,584,287 long tons, as compared with 1,982,385 tons in 1916. Of this total, Florida produced 2,022,599 long tons, South Carolina 33,485; Tennessee, including several thousand tons from Kentucky, 513,107; Idaho, Utah, Wyoming, 15,096. There are now four producers in the Western field, instead of one or two a year ago.

Before the war the exports were nearly half the domestic production, but in 1915 they decreased from about a million and a quarter tons, the quantity usually exported before the war, to only a quarter of a million tons, and were only one-seventh of the domestic production. In 1917 the exports were 166,003 long tons, or only 6% of the quantity marketed. The rock exported went principally to Spain, France, England, Ireland, Scotland, Canada and Cuba.

Zirconium Steel is said to be particularly suited for making armor plates, armor-piercing projectiles, and bullet-proof metal, according to *Mineral Resources;* a new patented alloy of zirconium with nickel, called cooperite, is extremely hard and is particularly well adapted for making cutting tools. Zirconium compounds are used also as incandescent material, as an opacifier in enamels, and in making paint and abrasives.

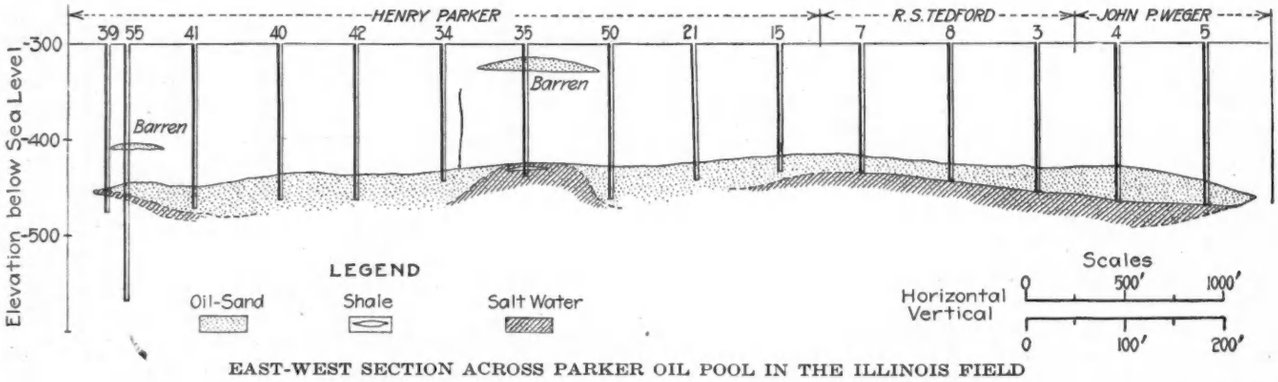
Cementation in the Illinois Oil Field

By M. L. NEBEL*

Cementation of oil wells to exclude water increases the immediate production of oil from the well and probably the total extraction from the oil sands. The life of the casing and other equipment is also increased, as the salt water of the main Illinois field is corrosive. Cementation lowers operating costs and increases production.

THE use of cement for the exclusion of water from oil wells has now become general in the oil fields of the United States. The method practised in the Illinois field differs somewhat from the processes employed in other oil districts. Local conditions have resulted in the development of the Illinois method. The first wells drilled in prospecting for oil were sunk with little or no casing, and the holes filled with water when drilled into the sand. The results were disappointing and retarded the development of the Illinois oil field for many years. After the use of casing had become general, later tests were made with gratifying results. The casing was successful in shutting out water from above the productive sands.

In the Illinois field, however, water is commonly present in the oil sand itself, and lies immediately below the oil. This is true not only of wells along the edges of the pools, but also of those in the center. In the Crawford County field, in particular, the sands are lenticular and of limited horizontal extent, and are not always saturated with fluids. The upper parts of the sand bodies are frequently dry and the lower parts saturated with salt water, while the oil lies at the upper surface of the water, as shown in the sketch.



EAST-WEST SECTION ACROSS PARKER OIL POOL IN THE ILLINOIS FIELD

Maximum Oil Recovery Without Water Difficult

Before these conditions were generally recognized, it was common for wells to be drilled completely through the oil-bearing horizons and into the salt water. Even now, it is difficult for drillers to penetrate far enough into the sand to insure a maximum recovery of oil and yet stop short of the water, and many wells have considerable trouble with salt water, which flows into them, frequently under considerable pressure, and prevents the maximum recovery of oil. The amount of oil is almost always reduced when the water comes in, and the cost of handling the large quantities of water has been prohibitive in the past, especially for small producers. Two strings of 3-in. tubing in a single well were not uncommon in some of the pools before cementation came into general use. Sometimes wells are shot into water, and unless it can be shut out, they may have to be abandoned. Scores which might otherwise have become fair producers have been so abandoned.

Various methods of shutting off the bottom water were tried, including the use of wooden plugs, lead plugs, combinations of wood and lead, etc. The holes were usually filled up the desired distance by crushed rock, scrap iron, or any other material available and the plugs inserted. Sometimes the water was successfully shut out, but in many if not most cases it was always a source of trouble. Finally a cementing process was devised which has been almost universally successful if properly carried out. It has been in use for several years, both on new wells which are drilled too deep or shot into water, and on old wells which have been producing large quantities of water for years.

This method of cementation has been called the McDonald method, because it was largely developed by W. W. McDonald, of the Ohio Oil Co. It has been thus described briefly by F. H. Kay.[1]

A string of tubing, closed with a wooden plug, is lowered to the bottom of the oil pay. The plug is used to keep the oil from entering the tubing; it is knocked out after the tubing is in place by filling the latter with water and striking the upper end, or if necessary by use of sucker rods. The tubing is left open, and water (either salt or fresh) is pumped down it. After pumping has continued 15 or 20 minutes, dry cement is introduced into the tubing, a handful at a time, and pumping is continued as at first. This process is continued until the water backs up in the well materially, which means that the pores in the salt sand have been closed.

It should be remembered, however, that sands above the water sand and below the casing may take water and prevent a marked rise in the level of water, even though the shattered salt sand is cemented. No more cement should be introduced than would fill the cavity up to the bottom of the oil sand. Ordinarily not more than three sacks of cement are required, and it should be put into the well not faster than one sack per hour.

When sufficient cement is in place, a small stream of water is run into the tubing so that the level of water in

*Geologist in charge of oil studies, State Geological Survey, Urbana, Illinois.

[1]Illinois State Geological Survey, Bull. 33, pp. 87-88, 1916.

the well will be maintained above normal, and a downward pressure be secured thereby. Unless this is done, the water pressure from the sands into the well will force the cement out of the pores before it sets. The water level in the well is kept above normal for a period of seven days, to allow ample time for the cement to harden. The well is then pumped, and, if the work has been properly done, no further trouble follows.

McDonald Method Not Uniformly Followed

The present practice varies somewhat from that described by Kay, depending upon the previous experience of the man in charge of the work and the condition of the well upon which the work is to be done. For example, one field superintendent allows the cement to harden only 48 hours before pumping the well. Another waits ten days to two weeks.

Each well presents an individual problem. The water conditions are rarely the same on two successive jobs, and the details of manipulation must be varied accordingly. The simplest and the usual case is that in which the well has been drilled or shot a few feet too deep and the depth of the bottom of the oil pay is known within a foot or less. Then the procedure is as above described. The tubing is lowered to the bottom of the oil pay and the well cemented up to that point.

In the case of old wells which have changed hands the actual depth of the holes is frequently unknown until measured by the owner, and the depth to the base of the oil pay is rarely known. The cementation of such a well is a distinct problem. Great care must be taken to avoid cementing up too high in the well and shutting off the oil, and it is usually necessary to proceed by trial. The depth of the hole is ascertained, and the tubing, which has been prepared for the job, is lowered to within 4 or 5 ft. of the bottom. Enough cement is put in to fill the hole up 4 or 5 ft. The cement sets hard enough to hold a measuring line about 30 minutes after it is in. After a few days the well is tested, and if the water has not been stopped the process is repeated. Sometimes it may be necessary to repeat it eight or ten times. If too much cement is added and oil production stopped, it is necessary to drill out the upper few inches of the cement plug. This is usually effective in restoring production. Little trouble from this source has been reported.

Cement Occasionally Fails to Harden

In rare cases the cement may fail to harden properly, but only one such instance has come to my notice. Efforts were made to cement this well three different times, but each time the cement failed to set, and it was finally given up as a bad job. Later the property changed hands, and cementation was attempted by the new owners. In an effort to keep the water level in the well above normal, and thus counteract the upward pressure of the salt water below the cement, the entire contents of a 1600-bbl. tank of fresh water were run in without appreciably raising the water level. The initial effort was a failure. Four additional attempts were made to cement the well, and finally this persistence was rewarded. The fifth effort, the eighth in the history of the well, was successful. The cement finally hardened, the water was excluded, and a good producer was the result. In spite of the large amount of cement introduced into the hole, it was filled up for a distance of only five feet. It is fortunately true that such troublesome wells are rarely encountered.

The advantages of cementation are the following: Actual increase in the immediate production of oil; decrease in operation costs; increase in life of working barrels, tubing, and lead lines; probable increase in total extraction from the oil sands.

Cementation Increases Production Immediately

The effect of cementation in increasing the immediate production of oil is well illustrated by the Parker pool, and, particularly, the Henry Parker farm, in that pool, in Honey Creek Township, Crawford County, Ill.

TABLE I—WEEKLY PRODUCTION OF OHIO OIL CO.'S LEASES IN THE PARKER POOL

Date	Number of Wells	Production in Barrels
Before cementation and other repair work:		
Week ending Feb. 7, 1913	175	5399
Weekly average for October, 1913	175	5300
After cementation of the most troublesome wells:		
Week ending Feb. 2, 1917	175	5322
Week ending Nov. 2, 1917	181 (a)	5096
Week ending Nov. 9, 1917	181 (a)	5228

(a) Six small producers were drilled beside wells which had been reported dry or which were abandoned on account of water.

Early in 1913, the Ohio Oil Co. bought most of the production in the pool from scattered owners, and soon set to work to standardize equipment and improve operating conditions. Large quantities of water were being handled, so cementation of the most troublesome wells was effected. The result is shown by the production figures in Tables I and II.

TABLE II—MONTHLY PRODUCTION OF HENRY PARKER FARM

Month and Year	Number of Wells	Production in Barrels
Before cementation		
February, 1913	54	7526
After cementation:		
October, 1916	54	7583
January, 1917	54	7115
May, 1917	54	8369
July, 1917	54	8140
October, 1917	54	7921
November, 1917	54	7896

One must be cautious, perhaps, in attributing the rather remarkable staying qualities of this pool, as evinced by the above figures, to the cementation of the wells. That must have been an important factor, but the other factors which must be considered are the viscosity of the oil, which is heavier than most of the Illinois oils, and the improvement in mechanical efficiency which resulted when equipment and methods were standardized. The immediate increase in daily production of oil by individual wells after cementation is shown in Table III.

TABLE III—COSTS AND RESULTS OF CEMENTING OFF BOTTOM WATER

Well	Cemented Ft.	From	To	Cost	Oil Production per 24 hrs. Increased From	To	Water Decreased From	To
A. N. Vinsel, No. 14	34	1034	1000	$403.00	0	4	150	6
G. H. Parker, No. 7	16	1046	1030	329.50	5	15	120	50
Henry Parker, No. 20 (a)	11	1006	995	245.00	20	25	340	70
Henry Parker, No. 27 (a)	10	993	983	.....	15	20	340	70
G. Taylor, No. 1	8	.....	.....	215.00	½	2	100	20
D. Conover, No. 2	42	1067	1025	.....	20	28	(Large Amount)	

(a) Well had 3-in. tubing and was on separate engine. After cementing 2-in tubing was used and well was placed on a power with several others

The cost of producing oil is obviously much greater when large quantities of water must be handled. This is especially true when the wells are producing only a few barrels or a fraction of a barrel of oil. In several cases wells which were fitted with one and sometimes two strings of 3-in. tubing, and were being pumped by a separate engine, have after cementation been fitted with one string of 2-in. tubing and placed on a power.

The decrease in amount of water handled by individual wells after cementation is also shown in Table III.

The salt waters of the main Illinois field are corrosive and rapidly attack any iron with which they come in contact. In some wells black iron tubing lasts only three or four months, while the average life is probably not over six months where large amounts of water are handled. Copperized tubing has been tried and found to be little better than iron. Galvanized tubing is much more satisfactory and is now widely used. It has been found to last 18 months to two years in wells in which iron tubing had to be replaced about every six months. Although it is not always possible to exclude all water from a well without injuring the oil production, it can usually be decreased to such an extent that the life of tubing will be prolonged. It is extremely doubtful that corrosion troubles could be entirely eliminated by this means, however.

Oil Decreases With Increase of Water

When large quantities of bottom water are pumped from a well for a long time, a water circulation toward the well is set up. The water level tends to become higher in the immediate vicinity of the well. It is a common experience that when wells are making water the amount gradually increases, while the oil production gradually decreases until the well may no longer be profitable. This is probably due not so much to the exhaustion of the oil as to the rise in the water level and the actual exclusion of the oil from the well. Between adjacent wells the water level may be lowered. If this condition is allowed to exist for considerable time—and in some Illinois pools it has existed for years—it may result in the trapping of considerable bodies of oil between drilled locations. If this happens, the trapped oil will never be recovered unless intermediate wells are drilled, and the total extraction from the sand will be much less than it should be. Thus exclusion of bottom water by cementation may be an important factor in increasing the final recovery of oil from the sands.

The cost of cementing a well depends upon the amount of cement used and the time required to do the work. A comparatively small amount of cement is required as a rule, so that labor is the principal item. In cementing a new well, where the material and equipment are already on the ground the cost is slight. In cementing an old well, it is much greater, especially if the process must be repeated several times before the water is successfully shut out. The average cost of cementing old wells which are approximately 1000 ft. deep is about $365. In Table III costs are given for a few wells in which conditions varied greatly.

Total Wolfram Production of Siam for the year ended Mar. 31, 1917, was 1,168,933 lb., as against 950,367 lb. the previous year, according to *Commerce Reports*. The destination of the wolfram exports from the Siamese Malaya has not been given officially, but it is understood that, with the exception of the 173,333 lb. which were exported through the port of Bangkok, the entire output for 1917 was shipped to Singapore. Of the wolfram exports from Bangkok during 1917, 134,533 lb. was consigned to firms in the United States, and large quantities of the ore were ready for further shipment, but owing to British war regulations trans-shipment for the United States could not be effected at Singapore or Hongkong.

Two Manganese Deposits in Northern Washington

By Olaf P. Jenkins*

All manganese deposits are of interest at this time, even those of low grade and remote from easy transportation facilities. I have examined two deposits in Okanogan County, Wash. One deposit near Omak, has been known for some time. The other, near Nespelem, was discovered by prospectors in that neighborhood, but the discoverers failed properly to identify the deposit. The first of these deposits is in a northeasterly direction from Omak, on the wagon road about four miles from the station on the Great Northern Railroad. It is on the western side of Pogue Flat, a broad bench about 400 ft. above the town, formed by the outwash of unconsolidated sands and gravels which were probably carried from glacial material during and since the time of the glacial retreat in that locality. Low hills of decomposed granite material stand like islands in the sands and alluvium of the flat.

The manganese mineral is of the dioxide type, containing some oxide of iron. In one particular area it stains the rocks prominently. An irregular hole 50 or 60 ft. deep has been made in this area, and it appears that most of the manganese dioxide is associated with an undefined quartz vein in the granite. In places the manganese is more than a surface strain. It forms bunches of black material intermixed with quartz, and fills the cracks in the rocks and the pores of the more decomposed portions. In fact, nearly every rock taken from the hole is filmed over with the black mineral. This condition was especially noticeable near the point of contact where the rock was covered with alluvium of the flat.

At the time I visited the property, in July, 1917, it was reported that 15 carloads, averaging 30 tons each, of 20% manganese ore, had been shipped from the opening to the Coast for experiment and treatment. About 500 tons of low-grade material was still on the dump. The property lies within a mile of an electric power line, and it was thought by those interested that the manganese dioxide could be extracted from the rock by a concentration process. An analysis of the higher grade hand-picked material records manganese, 25.1%; iron, 4.82; silica, 47.43; sulphur, 0.05; phosphorus, 0.05 per cent.

The second deposit is in the same county, but is 30 to 40 miles southeast, and far from any railroad, but within two or three miles of the Columbia River. It is about two and a half miles west of Nespelem, on a gold and silver claim known as the St. Paul. In several places manganese dioxide was observed on the hillside associated with decomposed granitic rock. In one place as much as two tons of black material had been removed from a prospect pit. In another, a shaft 24 ft. deep had penetrated a vein which contained quartz and rhodochrosite. On the dump from this shaft were two or three tons of material, composed largely of quartz and light pink rhodochrosite, weathered on the surface to a thin skin of black dioxide of manganese. This material was said to contain gold and silver.

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*Assistant professor of economic geology, State College of Washington, Pullman, Washington.

Disadvantages of Chrome Brick in Copper Reverberatory Furnaces

In a discussion that followed the presentation of a paper, "Notes on the Disadvantages of Chrome Brick in Copper Reverberatory Furnaces," by F. R. Pyne at the New York meeting of the A. I. M. E., Mr. Pyne said:

"In copper smelting, the atmosphere is generally neutral, or slightly oxidizing; we do not use highly reducing atmospheres at all, not even in the matting furnace.

"You can take the chrome brick and treat it as you would an iron ore, obtaining ferrochrome very readily, from which the copper will separate. We have done this; in fact, at one time we considered installing a small electric furnace for the production of ferrochrome."

Forest Rutherford contributed to the discussion by saying: "During the time I was general superintendent at the smeltery of the Copper Queen Consolidated Mining Co., at Douglas, Ariz., a great many experiments were made on the furnaces and settlers with different kinds of brick, and I agree with Mr. Pyne's statements about chrome brick. Their power to absorb metals is great, and as they cannot be smelted at any temperatures obtainable in a copper furnace, to get rid of the bats and extract the metal from them is a problem.

"We finally got down to using chrome brick only for lining the settlers, out of which we often got a life of upward of two years, and for lining the blast-furnace bottoms, for the reason that chrome brick can be heated and wet, or wet after being heated, without going to pieces, whereas under these conditions magnesite brick will break down rapidly. We also used a layer of chrome brick above and below an 18-in. band of magnesite brick put on the slag line of the reverberatories, in order to separate the magnesite from the silica brick, fearing that they would slag each other and let the wall drop. The idea worked, but became unnecessary on account of a change made in the method of feeding the furnaces.

"Chrome brick will not stand up under pressure so well as a good Grecian or Austrian magnesite brick, on account of the poorer bonding properties of the materials from which the chrome brick is made.

"On account of the difficulty of obtaining chrome brick since the United States went into the war, two settlers were lined with bauxite brick, which, as far as I have heard, are still in use, and the brick is proving satisfactory.

"Experiments were also made with magnesite brick on the side walls, in the center drop holes, and in the arches of the reverberatory furnaces, but failed in every case, as magnesite brick, no matter how dense, will not stand moisture or sudden changes of temperature. They spall badly under these conditions, and the wall or arch soon comes down. The new method, now generally adopted, of feeding reverberatory furnaces along the side walls has much simplified the brick problem in furnaces of this kind, and a straight silica-brick wall seems to be the best."

Bradley Stoughton closed the discussion with the statement: "It will be a patriotic act at the present time, especially for the non-ferrous metallurgists, not to use any more chrome brick or purified chrome ore than they absolutely have to use. There is a shortage of that material in this country, and the authorities are a good deal concerned about it. For certain purposes chrome brick is indispensable, but wherever it is not essential it is patriotic to get along without it."

[1]Bull. A. I. M. E., No. 132, p. 2025.

Refining of Zinc

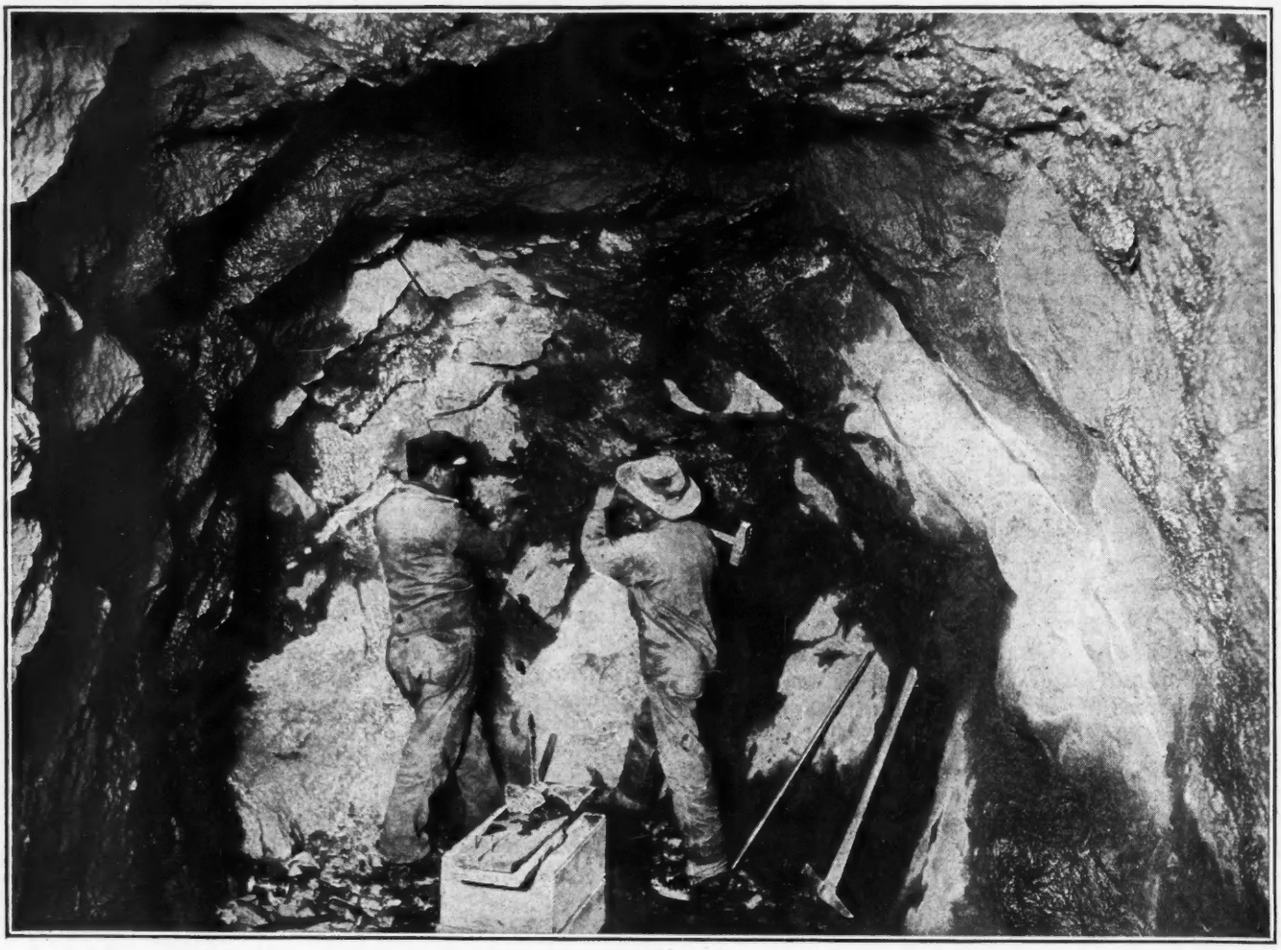
A British patent covering the refining of metallic zinc was issued to the Electrolytic Zinc Co. in 1917. A digest of the patent is given by *Chemical Abstracts* as follows:

"A slightly acid electrolyte is employed, and the anode slime is kept in contact with the anode in order to prevent dissolution of more electronegative metals such as cadmium. From 0.1 to 0.5% of free H_2SO_4 is a suitable proportion, but less may be used if the electrolyte is rapidly circulated. This acidity may be maintained by continuous or periodic additions, or by passing the electrolyte through a vat with an insoluble anode. The slimes may be retained by closely fitting anode covers of canvas, duck, etc. The temperature of the electrolyte should be about 40° or lower. Iron may accumulate in the electrolyte up to about 1%, and has beneficial effects on the deposit; any excess of iron may be precipitated by ZnO in neutral solution. If cadmium accidentally goes into the solution, it may be removed by circulating the electrolyte through a series of vats with insoluble anodes, to deposit the cadmium and part of the zinc. In a series of vats having either soluble or insoluble anodes, the first vat or vats may be used for the deposition of zinc contaminated with cadmium, and the rest for the production of pure tin, which is collected separately. Anode envelopes may in this case be dispensed with."

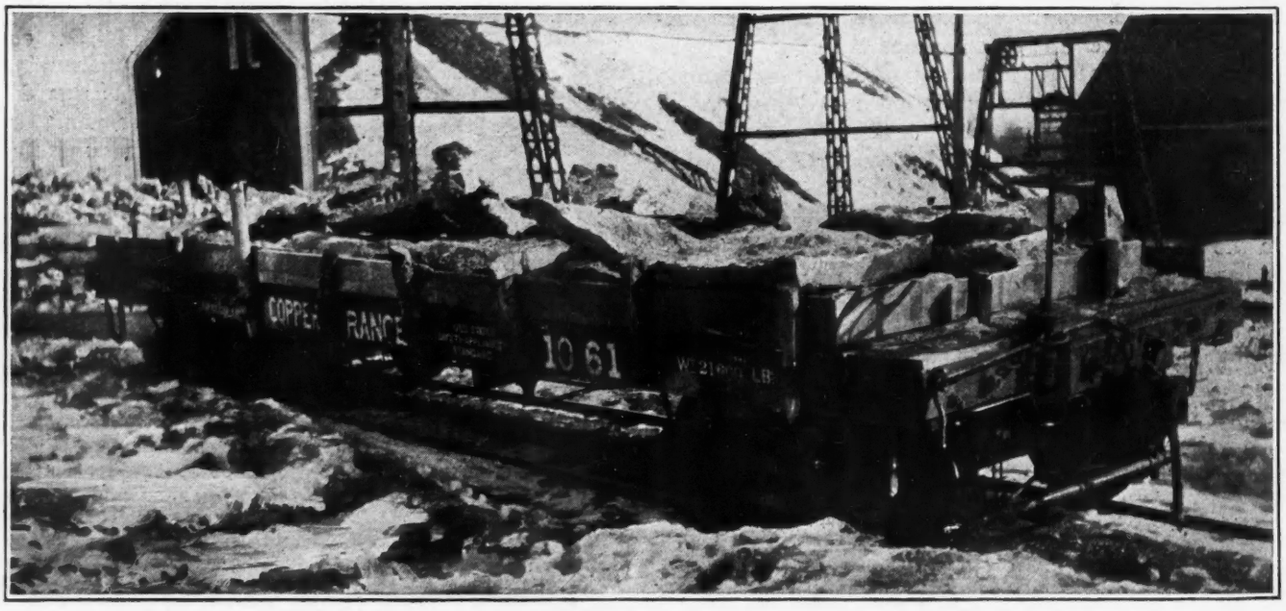
The company received another patent on the same date covering electrolytic separation of metals. As described, a soluble anode used in the separation of metals, for example, in zinc refining, is provided with a closely fitting envelope of canvas, duck, or other material. The slimes are thus held in contact with the anode, so that all the zinc is dissolved, while dissolution of cadmium, etc., is prevented. Portions of the envelope may be treated so as to protect the underlying parts of the anode from attack; for example, the envelope may be striped with non-conducting paint, or vertical or horizontal laths may be bound against the faces of the covered anode. Collection of the slimes at the bottom of the envelope is thus prevented. At the top the envelope may be tied by loops. The anode is cast with lugs resting, respectively, on a conductor and an insulator.

Trading in Bismuth Ores has been restricted in Great Britain, Consul General Skinner reported from London on Mar. 15. The Ministry of Munitions requires every merchant, importer, or broker who receives bismuth ores to make return showing shipments afloat and parcels landed or in warehouse during preceding month. The order does not affect persons whose total stock in hand and not intended to be used in manufacture or alloy of steel or other metal does not exceed 56 lb. bismuth salts or 14 lb. bismuth metal or alloy. Purchases of metal and salts permitted to extent of 10 lb. of metal and 56 lb. of salts if purchased for pharmaceutical or medical purposes.

Photographs from the Field



LOST DUTCHMAN MINE, ROWENA, BOULDER COUNTY, COLO., WHERE HAND DRILLING IS STILL DONE



MASS COPPER FROM TRIMOUNTAIN MINE OF COPPER RANGE CO. AT TRIMOUNTAIN, MICHIGAN

MILL BUILDING OF THE CONSOLIDATED INTERSTATE-CALLAHAN MINING CO., WALLACE, IDAHO

VILLAGE AT MINE OF THE CONSOLIDATED INTERSTATE-CALLAHAN MINING CO.

You Can Kill Business With Wrong War Taxes, but Only the National Income Can Pay the War Bills*

If the war is to go on for any length of time, everybody is face to face with all the taxes that anybody or anything can stand. Now, to come point blank to this greatest question of all, how much can we stand? Why, just as much as there can be left over from the national production, after the American people have fed themselves out of that production, have clothed themselves out of that production, have warmed their houses out of that production, have maintained schools for their children out of that production, have kept their cities, towns and villages sanitary and healthful out of that production—have, in a word, lived as they must live out of that production.

To meet the huge expenditures of this war, that production is all there is to tax over and over again—national income—as the taxes must be gathered over and over again if the war goes on. It doesn't make any difference whether it is a rich man or a poor man, whether it is a corporation earning excessive profits or a business only making a bare living: there can never be extracted from the one or the other more than there is to be extracted.

Now, where is the vast production of this country—estimated at some $40,000,000,000 a year—largely distributed? There is a political incitor who rants that it all goes to the few. There is a political imbecile who thinks that you can get enough taxes out of "big incomes" to pay for this war.

The hard, cold facts are that if the Government does not get the taxes to pay for this war out of the general public it will not get them at all, for the very reason that the great bulk of the nation's income goes to the many. Nothing better illustrates this actual division of income as between the few and the many than the payrolls of the railroads. On those payrolls there are a little short of 2,000,000 workers, from presidents and general managers down to track walkers. If it is conceivable that railroads could be properly operated without presidents or general managers or superintendents or treasurers or secretaries, then it is conceivable that all the money paid to them in salaries could be saved to the railroads or perhaps converted as taxes into the Government Treasury. But, as the recent report of the Railroad Wage Commission shows, if the salary of every railway "official" receiving from $5000 to $100,000 a year were wiped out or converted into the Treasury for war funds, the whole amount would not be 1½% of the total payrolls of the roads.

Under the new railway wage scale, the nearly 2,000,000 men will receive approximately $2,250,000,000 of wages and salaries a year. If, then, the Government took every penny from every single official now getting in the railway service $5000 a year or more, the Treasury would have from that source for a whole year about $30,000,000.

There is, then, no way to get the money which must be poured into this war to win it except to take it from everybody. There isn't a man, there isn't a woman, there isn't a child, there isn't a baby that can escape paying the economic penalty of the present war.

Why not face the truth? Why not begin on this problem of financing the war with the knowledge which ought to be clear to any brain that is not impenetrable, that if you are to go on with it everybody must stand all the tax burden he can?

Any tax that kills an industry or a business is going to stop the revenues which can pour into and ought to be made to pour into the Treasury from that industry or business. Likewise, it diminishes the very income of the many who have been working in that field, getting out of it their livings, and paying out of it their dues, direct and indirect, to the Government. Any tax that does not kill, yet throttles an industry or business, checks its flow of possible revenues into the Treasury. Any tax that merely prevents a business or industry from growing, deprives the Treasury of some taxes that might flow from a greater business with higher earnings and richer profits. Any tax that weakens the capacity of a business or industry to produce effectively and profitably, destroys its credit. Any tax that drains an individual dry, destroys his credit.

Without surplus income and without credit, a business, an industry, or an individual cannot lend the Government money, because such business, industry or individual without surplus income and without credit cannot get the money to lend to the Government. The financial capacity of this Government to win the war depends upon revenue measures which will tax, directly or indirectly, every soul in the country. There is no other way to gather in the necessary funds. There is no getting away from it. This means not only the full corporation taxes that are safe, the full excess profits taxes that are safe, the full individual income taxes that are safe. It means taxes on tea, coffee, sugar—on every luxury and on many more things that are not luxuries. It means, if necessary, more taxes on letters, on telephone and telegraph messages, on checks, on all kinds of tickets. It means direct taxation of that and similar nature and it means indirect taxation—the taxation which goes into the commodity or service itself. What else is the increase which the Government is now making in freight rates? The consumer eats the tax, so to speak, with his bread and potatoes, which were hauled at the higher freight rate on the railroad, the cost of that dearer service going into the price of the loaf and the potato.

Nobody can say now what the limit of taxation is, because nobody knows just how much of what our people have been accustomed to eating and drinking and wearing and otherwise using, the great American public, which divides the bulk of the national income, can do without. Nobody can say now what the limit of production of war material is, for the same reason. The American people, all working, cannot produce any more war tools than their total productive capacity as expressed in wheat, beef, steel, lumber and so on.

But anybody with just plain, ordinary sense can see that if the great bulk of the production of the nation goes to the great majority of the population, it is only from that same great majority of the population that the great bulk of the taxes must come, after the exceptionally profitable industry and business and the

*From the Sun of May 27, 1918.

inordinately rich individual have given up the greater part, all, if you please, of their share—mathematically trifling, as measured against the grand total of the whole of the national production out of which must come the treasure to win the war.

If, then, the men in Congress who make revenue legislation are going to try to finance this war largely with taxes, are they prepared to get those taxes—dare they try to get them—from the whole American people, the only source from which any power on earth could get taxes enough, or half enough?

Ontario Metalliferous Production

Returns received by the Ontario Bureau of Mines for the three months ended Mar. 31st, 1918, are tabulated below; also quantities and values for the corresponding period in 1917.

SUMMARY OF ONTARIO METALLIFEROUS PRODUCTION, FIRST QUARTER OF 1918

Product	Quantity		Value	
	1917	1918	1917	1918
Gold, oz.	127,692	113,387	$2,601,760	$2,265,521
Silver, oz.	3,945,957	4,114,856	2,831,873	3,740,843
Cobalt (metallic), lb.	84,710	37,545	78,668	75,625
Cobalt oxide, lb.	83,014	81,760	66,798	130,486
Nickel oxide, lb.	5,495	.....	550	.....
Nickel (metallic), lb.	.....	44,154	.....	17,662
Other cobalt and nickel compounds, lb.	118,292	143,381	13,695	18,386
Nickel in matte (*a*), tons	10,141	9,677	5,070,410	5,806,200
Copper in matte (*a*), tons	5,063	4,727	2,025,227	1,748,990
Copper ore, tons	1,507	.....	44,097	.....
Iron ore, tons	23,035	32,530	58,205	127,916
Pig iron, tons	163,020	148,752	2,743,441	3,948,209
Molybdenite, concentrates, lb.	25,073	17,410	32,202	24,548
Lead, pig, lb.	263,046	60,283	27,290	5,066

(*a*) Copper in matte was valued at 20c., and nickel at 25c. per lb. in 1917. For 1918 the values have been placed at 18½c. and 30c. per lb., respectively.

Production of gold for the quarter exhibits only a slight decrease, which is creditable, considering the various handicaps under which gold miners are laboring. The Hollinger Consolidated had an increase in production, which was offset, however, by the closing down of the Dome mill. The Crœsus mine, in Munro Township, has closed down temporarily. At Kirkland Lake a new producer, the Lake Shore, has been added to the list. During the quarter 262,577 tons of ore was milled, with a recovery of 113,387 oz. gold and 20,221 oz. silver, as compared with 350,916 tons milled during the corresponding period in 1917. Hollinger produced 68,804 oz. gold and McIntyre 21,461 oz., the next largest producer being the Porcupine V. N. T. The Patricia Syndicate at Boston Creek expects to have its new mill in operation about June 1st.

Shipments of Silver Increase

Shipments of silver for the first quarter of 1918 show a small increase in quantity and a considerable increase in value. The average New York price for the period was 87.5c. per fine oz., or nearly 12c. increase as compared with the corresponding period in 1917. The passing of the Pittman bill in the United States recently has established, virtually, a price of $1 per oz. Companies shipping one quarter million ounces or over are named in order: Nipissing, Kerr Lake, Mining Corporation of Canada, Buffalo, O'Brien and Coniagas. The Mining Corporation of Canada has been remodeling its mill in order to re-treat a large tonnage of tailings from the Cobalt Reduction mill. At the McKinley-Darragh, a new 200-ton oil-flotation plant has been put in operation. Of a total of 4,114,856 oz. shipped, 20,221 oz. are credited to silver recovered from gold ores.

There were treated at Southern Ontario refineries during the quarter 1242 tons of ore and concentrates and 1483 tons of residues from Cobalt and outlying silver camps. Silver bullion recovered was 1,610,989 oz., valued at $1,394,599. In addition, arsenic, cobalt and nickel oxides and sulphates, nickel carbonate, metallic nickel and metallic cobalt were produced. Of the latter, 22,752 lb. was used in the manufacture of "stellite," which is a cobalt alloy used for high-speed cutting tools. One feature of note is the great increase, 100%, in value of cobalt metal and oxide owing to the increasing uses and demand for these products.

Production of Nickel-Copper

Production from Copper Cliff and Coniston smelteries for the quarter shows a small decrease as compared with the same period in 1917. Ore was raised from the Creighton and Crean Hill mines of the Canadian Copper Co., from the Alexo and from the following mines of the Mond Nickel Co.: Garson, Victoria No. 1, Worthington, Nevack and Bruce. Of a total of 354,589 tons raised, about 70% came from the large and rich Creighton orebody. There were 325,386 tons of ore smelted in the period, with a resulting product of 17,992 tons of nickel-copper matte. The British America Nickel Corporation has acquired a site for a $1,000,000 refinery on the Quebec side of the Ottawa River, between Alymer and Hull. The new refinery of the International Nickel Co. of Canada, at Port Colborne, is reported to be nearing completion.

Iron Ore and Pig Iron

Shipments of iron ore were made from the Helen and Magpie mines of the Algoma Steel Corporation. Hematite ore from the Helen is shipped to the Magpie, where it is mixed with siderite ore and roasted. The entire shipments from the Magpie went to the Sault blast furnaces. From Moose Mountain, Ltd., Sellwood, shipments were made of magnetic concentrate, briquetted and converted to hematite in a kiln. Only 447 long tons were exported to the United States during the quarter. At Sault Ste. Marie, Port Colborne, Hamilton and Deseronto eight blast furnaces were in operation. The tonnage smelted was 34,552 tons of Ontario ore and 260,476 tons from the United States. As shown by the table, the output of pig iron was considerably less than for the corresponding period last year.

Molybdenite Shipped to France

Molybdenite ore amounting to 1295 tons was treated by the Mines Branch, Ottawa, and by the Renfrew Molybdenum Mines, Ltd., at Mount St. Patrick. The output of the last-mentioned company is shipped direct to France. There are works at both Orillia and Belleville for the production of ferromolybdenum.

Lead Mining and Smelting

The entire output of pig lead resulted from the operations of the Galetta lead mine and smeltery, owned by the James Robertson estate, Montreal. During the quarter 3347 tons of ore was mined. The smeltery operated during the last few days of March only. Operations by the Kingston Smelting Co. ceased in December, 1917.

Correspondence and Discussion

Should the United States Foster the Domestic Production of Antimony

The Magnolia Metal Co. has a plant at Matawan, N. J., for the smelting of antimony ores and the manufacture of antimony products. When erection of this plant was started, soon after the war began, the company was deluged with advice and warnings pointing to the fate that had overtaken practically every venture into this field. It was told that no American antimony smelter could live in the face of Chinese competition. The company is frank to admit that there are times when fortitude is needed to withstand the superimposing evidence that the tremendous difference between the price of labor in China and in this country is an insurmountable barrier without the help of a protective tariff.

Lack of Expert Advice

One of the first things discovered was that experts who really knew how to manufacture antimony economically could not be found. This was an entirely natural state of affairs. Men of ability had not turned to a business which invariably proved a graveyard of hopes and reputations. The company then set about educating its own experts at its own expense. Experience was purchased and the price was heavy; but the result was such that it gave great satisfaction. A new industry for this country was created, one that our Government will some day be proud of, especially if this war be prolonged, or another war be forced upon us. All that is needed is the prompt imposition of adequate specific duties upon antimony regulus and antimony products—duties that will compensate for the difference in American and Chinese wages.

The fact that the difference in manufacturing costs enables the Chinese to make such huge profits that they will write off the investments in their plants and will thus be in a position to greatly undersell us when this war is over must not be lost sight of. The Magnolia Metal Co. is face to face with the possibility of having to acknowledge defeat and leave the antimony business where it was before. Let us suppose that this has come to pass, and that another war be declared, a war this time in which the oceans would be made impassable by enemy submarines, a war in which some of our allies of today might not be our allies of tomorrow. If this should happen, the Government would be compelled to manufacture its own antimony or go without ammunition. A large antimony plant would have to be established at once. And yet the few experts who know how to treat this most difficult question, including the experts of the Magnolia Metal Co., would be scattered over the earth, and in other industries. Must our Government go through the months and years of disheartened experimenting, just as in the case of the Magnolia Metal Company?

We might as well realize once for all that we can never hope to find antimony ore anywhere at a lower cost per unit than is paid by the Chinese smelters. That is axiomatic. Any one who has seen an entire Chinese family, from children up, working its mines, will realize at once that American labor can never compete with that condition. How, then, can we compete with the Chinese smelters? We have seen it suggested that American smelters might cheapen mechanical methods and thus compete. Unfortunately the Chinese are just as much awake to this possibility as we are, and they have erected several plants which are the last word in manufacturing methods. The profits they are making enable them to engage the best talent in the world and to install any new device the moment it is known.

There is only one way in which we can equalize the difference, and that is by a specific tariff duty. Any *ad valorem* duty would be entirely inadequate, besides raising continual disputes between our Government and the Chinese shippers. There is no way in which we can arrive at the *ad valorem* duty as regards Chinese products. It is largely a question of taking the word of the shipper. A specific duty is positive and easy to collect, and our manufacturers can always know to a certainty how far to go. It is the ideal duty in this case. We are told that the Chinese can sell antimony regulus in this country at from 7c. to 9c. per lb. and that a Chinese workman receives 50c. a day. The claim is made that one American workman does the work of two Chinese. In other words, it costs us $4 and over for the same work that two Chinamen can do for $1. No industry can fight such odds.

I have tried conscientiously to figure out what the specific duty should be to equalize costs, and find this a difficult problem. The suggestion has been made that there should be a specific duty of 2c. per lb. on imported ores, that is, on the antimony content of these ores, and a specific duty of 7½c. per lb. on antimony metal. I think these figures just about represent a true balance between profit and loss.

Just because America produced only about 40% of the ore needed while prices went sky high in 1915 and 1916, it does not at all follow that enough antimony ore does not exist in this country. I know that the contrary is the truth. Actions speak louder than words; so it may be more impressive if the same truth were put in different form. If the protection asked is given, the Magnolia Metal Co. will agree to supply the demands of our Government and the entire United States with purely American antimony. There never has been a real antimony industry in this country. The Chinese saw to that. Antimony ores exist in vast quantities in American soil, but the low price that the Chinese maintained for the metal made it impossible for an American miner to work at a profit.

A tentative suggestion for a duty on antimony appears in paragraph 144, page 16, of the U. S. Tariff

Commission's partial report, which reads as follows: "Antimony metal (regulus), antimony single-metal, and antimony double-metal, not containing more than 10% of lead, 10% *ad valorem*. Oxide, salts and compounds of antimony, 25% *ad valorem*."

It will be noted that it makes no provision for a duty on ores to protect our mines, nor does it provide for a specific duty on the metal and its derivatives and compounds. Please notice, however, that the same report, on page 15, next to the last paragraph, truthfully acknowledges that an *ad valorem* duty on Chinese products is "difficult to administer."

If the U. S. Government is willing to spend over $20,000,000 on a plant to extract nitrogen from air, although we can import the nitrate from Chile and save millions a year on the ultimate price of the fixed nitrogen, we should certainly show the same foresight in throwing a protective wall around our antimony mines and smelters. These could then guarantee to the nation that in times of war an essential metal, antimony, would be available, without weary months of delay.

It has been suggested that the United States might leave off the protective duty, and store up a sufficient quantity of the metal for an emergency. May we ask where this metal is going to be treated so as to reduce it to its various derivatives and compounds? If the nation has killed the smelters and plants handling this ore and its compounds, it will be forced to build the necessary plants, and, after the plants are rebuilt, where are we to find the highly trained experts who will transform this metal into its useful compounds? Having killed the industry by our warehousing plan, there will be no experts who will possess the necessary experience for this difficult work.

The mines and the miners of this country are undoubtedly entitled to adequate protection to enable them to make safely the necessary outlays in money and time to so develop the mines that mining for antimony can become a recognized business. Now, as to American antimony-smelting plants. If it is admitted that antimony is an essential to the conduct of any war, including the present one, the first principle of self-preservation should show us that it is entirely proper to ask consumers of antimony and its products to consent to a small protective duty on the ore and on finished products. As an illustration of how such a duty would work, consider an alloy consisting of 85% lead and 15% antimony. Taking lead at 7c. per lb. and antimony at 12½c. per lb., 7.825c. per lb. is the indicated cost of the alloy. Now let us suppose that the smelters have been granted the 7½c. per lb. specific duty; do we find that the consumers will be called upon to pay enormously for that added guarantee to our war necessities? In this case the price of antimony would be 20c. per lb., and, in the same alloy, the consumer would be called upon to pay 1.13c. per lb. for maintaining an indispensable industry, which would employ thousands of well-paid American laborers. Is this too much to ask?

Present Duties on Antimony Products

In order to refresh memories we give here the present duties on the antimony products for which protection is asked, and at the same time we state the specific duty which could be substituted:

Antimony ores, at present, no duty, no protection. About 2c. per lb. on the antimony content of imported ores seems fair.

Antimony regulus, or refined metal, present duty 10% *ad valorem*. A specific duty of 7½c. per lb. would be fair.

Antimony sulphuret, present duty 15% *ad valorem*. A specific duty of 10c. per lb. would be fair.

Antimony oxide, present duty 25% *ad valorem*. A specific duty of 7½c. per lb. would be fair.

Antimony salts, present duty 25% *ad valorem*. A specific duty of 10c. per lb. would be fair.

Tartar emetic, a product of antimony, present duty 15% *ad valorem*. A specific duty of 10c. per lb. would be fair.

These specific duties should be given a trial, and the interests of our country safeguarded against the present and future wars. The present low duties, if continued, will surely drive the antimony industry in this country to the wall, and the earliest possible consideration should be given to these changes, so vital to that reborn industry. No one knows how long this war is to last, and to defer this revision much longer will stretch to the breaking point that hope and faith which still repose with the smelters.

Producers of antimony are not beggars; this is a democracy where the interests of the majority must be paramount. If it should be found to the interest of the majority that the Chinese should continue to control our antimony market, and if it should be found that it is wrong to ask consumers to shoulder an increase of about 1c. a lb. in the ultimate product of antimony, then the Magnolia Metal Co. and others are ready to take their medicine and abide by the verdict without a murmur, even though it may mean the end of their efforts to fight the Chinese domination.

E. C. Miller,
President Magnolia Metal Co.

New York, June 7, 1918.

Precipitation of Copper from Mine Waters With Coke Breeze

Recent articles in the *Journal* on leaching of copper ores mention the use of metallic iron in one form or another for precipitation of copper from acid solution. A method of using coke breeze, charcoal or any other convenient waste material of carbon has been found economical and efficient. The process is so simple that an explanation of its requires no sketches.

Shallow troughs are filled with alternate layers of scrap wrought iron and coke breeze, forming a voltaic pile, and the copper solution is allowed to percolate through them. The quantity of iron is decreased until the copper comes down on the coke, and leaves the iron clean. There is practically no consumption of iron, and the copper deposits itself as a layer on the coke. Best results are attained when the coke particles are of pea size, which gives a precipitate containing about 18 to 20% copper. Smaller particles, ranging down to coke dust, give higher-grade precipitates, as they offer more surface, but there is danger of clogging. Larger pieces of coke may be used, but then the point soon comes when the coke is large enough for furnace use, and the method is no longer an economy.

The copper-bearing coke can be mixed with the ordinary furnace charge in the blast furnace. The solutions must of course be clear and free from slime, as copper deposits only on the surface of the particles of coke. The details of flow and boxes can be worked out by any practical metallurgist. ROBERT SLESSOR.

Sydney, N. S. W., Apr. 9, 1918.

"A Dietary for Miners"

Referring to Mr. Brockunier's article "A Dietary for Miners" in the *Journal* of Apr. 6, I have multiplied each item of food in Table II by 30.5, and then by 107 for 100 miners and seven caterers, and find the monthly cost would be $2925. This with butter at 50c. per lb., eggs at 40c. per doz. and meat at 25c. per lb., all freight paid, and the other articles at present prices with 2c. per lb. freight added, and including kitchen expense of first cook at $120; second cook, $100; dishwasher, $75; roustabout, $75; three waitresses, $60 each, and fuel and lights, $35. Eggs and milk for cakes and pudding, and vinegar, lard and soap, are included. The question of the boarding boss is left open. With a modern establishment and with every labor-saving device, perhaps the head cook could manage the kitchen and one of the maids the dining room.

A Suggested Ration

Middle-aged, economical men on light inside work can live nicely on a small ration. I recently obtained from two shop carpenters, who were boarding themselves, their butcher and grocer bills for twelve months, and carefully reduced them to a daily average in ounces as follows: Beans, 0.70; bread, 29; butter, 1.80; cake, 1.80; cereals, 5.20; cheese, 0.80; coffee, 1.06; eggs, (2), 5; fruit, 22; jam, 2.06; macaroni, 1.20; meat, 13.60; milk, 2.08; potatoes, 13.20; rice, 0.52; sugar, 6.60; syrup, 1.20; fresh vegetables, 6; total, 114.82 oz. Pickles, pepper, and salt, amounting to 70c., are not included. They used butter and milk only at breakfast —condensed milk on the cereal. In small purchases in a mining camp this menu would now cost them $20 per month each.

A British Columbia Boarding House

At the War Eagle-Centre Star mines, in British Columlumbia, in 1898, we attempted to furnish our employees with comfortable quarters such as were not obtainable in the town, which was also at that time a trifle too far away. We wished to make them attractive enough to gain a good class of men and to keep them in during the evening, so as to change from the local practice of two pay days a month to a single pay day. But, apart from this, I think the directors were glad to do what they could for the welfare and pleasure of the force, our fellow citizens, whose children's children would also be fellow citizens of our children's children, perhaps fighting shoulder to shoulder against a common enemy, as their fathers are doing today.

The War Eagle Hotel was built somewhat in the chalet style, and was designed by Prof. Theodore Simons, of the Butte School of Mines, who was then with us. It was a two and one-half story building with a 10-ft. basement. The basement walls and tower were of heavy rough stone (monzonite and augite porphyrite), pointed with cement; mortar was tried first, but proved too unsightly. There were three dining rooms, the men's seating about 125, the staff's about 40, and a private room 12 or more. The staff sitting room was at one end of the house; the men's at the other, near a tower window. Large bedrooms for the staff and guests and the housekeeper and his wife were on the second floor, and E. B. Kirby, a later manager of the mines, greatly improved the roof space for further bedrooms. The basement was divided by masonry walls into storerooms, vegetable cellars, coal and furnace rooms, and a refrigerating plant, which, as I remember, had four rooms: one large enough to receive a carload of fresh meat, another with the ice tank capable of making 2000 lb. of ice daily, and two other general storerooms. A Barbour five h.p. ammonia compressor was used. The little plant was entirely satisfactory. My first reason for installing it was to hang the fresh meat till tender to lessen the waste from tough scraps left on the plates, but it was useful for butter, eggs, and other perishables.

Cost and Operation

The cost of the hotel was about as follows: excavating for foundations, $500; masonry, $1500; completed building, $7000; heating plant, $1500; refrigerating plant, $2500; total, $12,500. Rough lumber cost $15 per M. All finishing and floor lumber was kiln dried Oregon pine, costing $50 per M. The whole inside was lathed and plastered. The contractor brought house carpenters from Seattle and provided return fares, paying them $5 per day. The job was a credit to himself and his workmen. The masonry walls were heavy and cost on contract $1.25 per cu.yd.; had they been only the usual thickness of brick walls, the cost would have been $2.50 per cu.yd. Broken rock and boulders were on the ground, for such material required. Afterward $5000 more was spent on the hotel to increase its capacity to 250 boarders.

The bunk houses cost $4000, and furnishings for both them and the hotel cost $9000. Then there was a nearby detached building with a steam laundry which cost $700. The laundry contained washers and mangles, so that everything and everybody could be kept clean with a minimum of effort. The bunk-house rooms were for two occupants, with the strongest individual hospital iron spring cots obtainable.

Wholesale Buying and Good Service

Practically everything was bought at carload rates; we did our best to get good goods and keep them so. There was 30% customs duty on all supplies except flour, potatoes and meat, which were that much proportionately higher than in the U. S., and there was also a long railroad haul. Soft coal was about $8 per ton in the bins at the houses. An office clerk and the housekeeper inventoried all stock monthly, and a statement was made showing cost and amount of each item used per capita; thus, every month was compared minutely with preceding ones. The proper proportion of administrative expense was charged. The crew and their monthly wages, including board and room, was as follows: housekeeper and his wife, $150; head cook, $100; second cook, $90; third cook, $75; night cook, $75; two

dishwashers, $60, and a roustabout, $60; four maids or waitresses, $45 each; three Chinamen on bunk houses and laundry, $30 each. With 240 boarders, the house cleared $1100 per month. This was done with every effort to have things as nice as is consistent with plain living. It included some Sunday chicken dinners, and always the regulation holiday chicken or turkey dinner, with ice cream and fruit, on the numerous British Columbia and international holidays, New Year's, Washington's Birthday, St. Patrick's, the Queen's Birthday, Dominion Day, Fourth of July, Labor Day, the American and Canadian Thanksgiving days, and Christmas. No pressure was used to make the men board at the hotel; in fact, we could keep only 250, and employed 600 at the mines.

To persuade a miner who is fond of sweet coffee to use only one spoonful of sugar, leaving the other for the Allies and saving cost to the company, seems hopelessly ethical. It might not be hard to teach men domestic economy by having a coöperative boarding house, allowing full power in the management to a committee appointed by the men. It is something they understand, from cooking alone or in groups—sometimes employing cooks on leases. In these days of large mines, a company wishing to make an attractive town and what miners call a "good boarding house," in contrast to a "beanery," might attain it by building for rent two equally comfortable and attractive small hotels, each accommodating about 150, designed by a good architect from sketches made by a successful restaurateur, and having bunk houses attached. The men would be better satisfied, and probably with reason, at having a choice. At the same time there should be two equally well-planned houses for mess clubs of 25 or more. The four houses should be furnished with plain, strong, comfortable, artistic furniture, and the kitchens and outhouses with the most approved fixtures, minus breakables. A rental of 15% of the total actual cost would not be excessive. In these days of refrigerating plants and Ford autos, a small, sheltered ranch, properly equipped, where pigs and chickens could be raised, and possibly beef fattened for killing, and a few vegetables raised, would pay, as one man would about take care of it.

J. B. HASTINGS.

Los Angeles, Calif., Apr. 29, 1918.

Chromite Production of Oregon One-Third U. S. Total

For some time we in this office have noticed statements in the *Journal* to the effect that the chromite production of the United States comes from California. We wish to call your attention to the fact that one-third of the production of 1917 came from Oregon. This amount is about equally divided between southwestern Oregon, where the production comes from Josephine and Coos Counties, and the eastern part, where the production is mostly from near Canyon City, Grant County. I trust that you will have this error corrected as soon as convenient.

HENRY M. PARKS,
Director, Oregon Bureau of Mines and Geology.

Portland, Ore., May 17, 1918.

American Business Men in London Oppose U. S. Trademark

Much anxiety is expressed by members of the American Chamber of Commerce in London concerning the proposed legislation known as H. R. bill 10,366, introduced by Representative Sims, providing for a distinctive national trademark, under Government license, to be attached to goods of American origin.

Present criticism of the bill by Americans in London is based entirely upon a reading of the bill itself—no other disclosure of the Government's objects is yet to hand; therefore, members of the Chamber restrict their criticism to the broad principle involved in any legislation to create a distinctive national trademark to be applied to American exports indiscriminately. Members of the Chamber, being vitally interested in the development of American trade abroad, view with alarm the suggestion of the proposed identification of American goods by means of a distinctive mark, as it is obvious that if such official mark be indiscriminately applied to good, bad and indifferent American products, it will operate to the detriment of efficiently produced standardized American goods of quality.

Responsible American producers are considered able to establish the preëminence of their products under their own marks of identification, and will be little interested in an "omnibus" trademark maintained by the Government to carry reputable or disreputable goods. Makers of unstandardized and dishonest goods would be especially eager to avail themselves of the opportunity, thus presented, to betray the confidence of foreign traders and consumers by the use of such common official trademark. Such practice would inevitably result in undermining American trade prestige abroad, to the serious disadvantage of legitimate export enterprise.

The American Chamber of Commerce in London has a membership of over 600, including representatives of most important American concerns engaged in commerce with Great Britain. Its members fear that legislation along the lines of the above-mentioned bill necessarily carries dangerous possibilities, demanding great caution and elaborate safeguards to protect American export trade interests in European markets. It is the current opinion of members that any common official mark is dangerous to export trade unless it be absolutely restricted to a standardized quality of goods only. Such restriction is believed to be impracticable and impossible of efficient application. Further, goods selling to the general public in the British and other commercially developed European markets would in no way be benefited by a displayed mark of foreign origin.

It is hoped by representatives of American trade interests in Great Britain that any proposed legislation dealing with this important matter will be closely scrutinized by all seriously interested in the welfare of American export trade, and that hasty action to achieve an immediate object will not be permitted to injure the permanent upbuilding of American trade interests abroad.

TRADE INFORMATION COMMITTEE,
American Chamber of Commerce in London.

London, May 17, 1918.

Company Reports

Utah Copper Co.

Gross production of copper in concentrates by the Utah Copper Co. for the year ended Dec. 31, 1917, amounted to 204,855,118 lb. and shipments of crude ore contained an additional 1,319,324 lb. of copper. Gold production amounted to 51,112 oz. and silver to 498,820 oz. Net producing cost of all copper was 10.995c. per lb., as against 6.95c. per lb. in 1916, the advance being attributed to increased prices for labor and supplies and reserves for taxes.

The following report shows comparisons for three years:

COMPARATIVE STATEMENT UTAH COPPER CO.

	1917	1916	1915
Operating revenue	$48,797,423.42	$50,280,073.37	$27,155,943.71
Operating expense	24,886,646.04	16,532,333.87	12,132,109.48
Net income	$23,910,777.38	$33,747,739.50	$15,023,834.23
Miscellaneous income	6,074,348.09	5,990,935.86	2,896,609.25
Total income	$29,985,125.47	$39,738,675.36	$17,920,443.48
Other charges	1,289,629.67	589,731.74	546,733.54
Dividends	20,712,247.50	19,493,880.00	6,904,082.50
Capital distribution	2,842,857.50	.....	(a) 6,962.14
Balance	$ 5,140,390.80	$19,655,063.62	$10,462,665.30

(a) Interest paid

Churn drilling developed an additional 1,906,442 tons to the reserves already estimated. A total of 4,271,868 cu.yd. of capping, equivalent to 355,989 cu.yd. per month, was stripped during the year. Average cost of mining concentrating ore, all of which was mined by steam shovel, was 45.42c. per ton.

Total quantity of ore milled at the Magma plant during 1917 was 7,077,200 tons, an average of 19,390 tons per day, with a cost of 62.28c. per ton, and at the Arthur plant, 5,464,800 tons, or an average of 14,972 tons per day, was treated, at a cost of 78.40c. per ton. Average grade of ore milled at both plants was 1.337% copper and average recovery was 61.10 per cent.

Nevada Consolidated Copper Co.

Net reserves of developed ore at the end of 1917, for the Nevada Consolidated Copper Co., amounted to 70,025,322 tons, containing 1.58% copper. In addition, three other porphyry areas were developed, as follows: Kimbley, 664,439 tons of 2.02% copper; Wedge, 43,960 tons of 3.12%, and Veteran, 155,800 tons of 3.89% copper. Also, not included in the above, 174,648 tons of carbonate ore averaging 2.5% copper. Sulphide ore mined and shipped to the concentrator during the year amounted to 3,076,285 tons, averaging 1.28% copper, from the pit, and 991,164 tons, averaging 2.013% copper, from the Ruth mine. There was also produced 59,176 tons of siliceous carbonate ore, averaging 2.84% copper. During the year 2,998,025 cu.yd. of capping was removed by steam shovels, a decrease of about 25% from 1916. Steam-shovel mining costs of concentrating ores were 33.38c. per dry ton, which, together with taxes and stripping suspense charge of 30c., amounted to 63.38c., an increase over the cost in 1916, which was 53.7c. Stripping costs were 34.43c. per cu.yd., as against 30.09c. in 1916. Underground costs in 1917 were $1.0251 per dry ton, as compared with $1.2021 during 1916. This decrease was due to increased tonnage and the adoption of a more economical system of mining.

Total sulphide ore milled during 1917 amounted to 4,064,095 tons, averaging 1.462% copper, with an actual milling extraction of 73.08%. Total milling costs were 74.8c. per ton, as compared with 55.9c. per ton in 1916. Total charge smelted in reverberatories during 1917 was 741,424 tons, as compared with 643,108 tons in 1916. The production of refined copper for 1917 amounted to 82,040,508 lb., at a net total cost of 10.84c. per lb. In addition, 9,259,104 lb. of copper were produced from treatment of ores on contract. The comparative statements of finances is as follows:

COMPARATIVE STATEMENT NEVADA CONSOLIDATED COPPER CO.

	1917	1916	1915
Operating revenue	$20,279,722.71	$24,366,291.50	$11,685,276.50
Operating expense	11,635,375.33	9,996,022.83	6,544,593.03
Net income	$ 8,644,347.38	$14,370,268.67	$ 5,140,683.47
Other income	1,293,251.29	1,065,090.47	764,918.40
Total income	$ 9,937,598.67	$15,435,359.14	$ 5,905,601.87
Dividends	7,298,018.05	7,497,963.25	2,999,185.49
Capital distribution	999,728.50	.....	.....
Depletion, depreciation, etc.	812,969.19	433,308.64	347,486.74
Balance	$ 826,882.93	$ 7,504,087.25	$ 2,558,929.64

Inspiration Consolidated Copper Co.

Inspiration Consolidated Copper Co., for the year ended Dec. 31, 1917, reports that 3,914,742 tons of ore were mined, 3,891,075 tons of concentrating ore and 4933 tons of oxidized ore from the Inspiration division, 3210 tons of oxidized ore from the Cordova group, and 15,524 tons of oxidized ore from the Live Oak division. These tonnages were equivalent to an average output of 17.26 tons per shift and covered an area of 4.16 acres. A total of 21.05 miles of underground openings were driven in 1917. No new ore was developed during the year, and reserves were 87,864,378 tons on Dec. 31, 1917. Production of copper amounted to 80,566,982 lb. and was sold at an average of 26.366c. per lb. Cost of copper derived from concentrating ores was:

COST OF COPPER PRODUCED FROM CONCENTRATING ORES INSPIRATION CONSOLIDATED COPPER CO.

	Cost Copper, Cents per Lb.	Cost Ore, Dollars per Ton
Mining	3.572	$0.7239
Coarse crushing	0.163	.0329
Ore hauling	0.101	.0206
Concentrating and royalty	2.931	.5941
Concentrates hauling	0.007	.0015
Production Cost	6.774	$1.3730
Smelting, freight, refining, marketing, etc.	3.665	.6369
Total	10.439	$2.0099

The mill, operated at full capacity for the first half of the year, was then closed down for two months on account of I. W. W. trouble. Because of shortage of labor following the strike, the company resumed operations with only six units, but attained full opera-

tion before the end of the year. The grade of ore dropped to 1.388% copper and recovery per ton to 20.39 lb. as the result of the plan to lower the grade of the ore when increased mill capacity was provided.

Income from sales of copper amounted to $21,242,217.28, and other income was $177,144.33. From this total, operating expenses and taxes of $9,588,629.67 are subtracted, also $750,000 for depreciation, leaving a balance of $11,080,731.94. Dividends were $9,751,227.75, leaving a surplus of $1,329,504.19.

Within the year the following improvements were made: New chemical laboratory, 50% addition to filter plant, and 200-ft. diameter concrete tailings settling tank at the concentrator; also the completion of two new units to the mill, an additional motor-generator set for the mine hoist, a block-signal system on the mine haulage ways, an addition to the hospital, more dwellings for employees, and an addition to the power plant.

The following mill statistics are reported for 1917:

MILL STATISTICS, 1917, INSPIRATION CONSOLIDATED COPPER CO.

Dry ore milled, tons	3,891,075
Milling operations, tons per day	12,884.4
Sections running, average number	13.756
Rate per section, average tons	936.7
Assay of mill feed, per cent. copper	1.388
Concentrates produced, per cent. copper	29.27
Flotation concentrates, per cent. copper	35.57
Table concentrates, per cent. copper	13.93
General concentrates, per cent. moisture	17.2
Concentrates produced per ton of ore treated, tons	.0359
Recovery of Cu in milling, calculated from assay only, per cent	75.34
Assays and weights of concentrates and ore, per cent	75.78
Assays and weights of concentrates and tailings, per cent	75.46
Assays and weights of ore and tailings, per cent	75.36
Recovery of copper sulphides in ore, per cent	89.73
Water used per ton of ore, gal	348
Water consumption for first six months of year per ton of ore milled:	
Reclaimed in tanks at foot of mill, gal	356
Reclaimed in tailings ponds, gal	475
New water from Kiser pump station, gal	277
Total, gal	1,108
Power used per ton of ore milled, first six months of year:	
Coarse crushing, kw.-hr. per ton ore	0.43
Fine grinding and concentrating, kw.-hr. per ton ore	10.87
Blowers for flotation air, kw.-hr. per ton ore	2.42
Filter and reclaiming water, kw.-hr. per ton ore	2.01
Lights, kw.-hr. per ton ore	0.07
Total, kw.-hr. per ton ore	15.80
Steel ball consumption, fine grinding per ton ore milled, lb	1.82
Flotation oils per ton ore milled:	
Coal tar, lb	1.21
Sundry oils, lb	0.11
Total, lb	1.32

Arizona Copper Co., Ltd.

The Arizona Copper Co., Ltd., reports for the year ended Sept. 30, 1917, that the surplus, after the year's business and after paying dividends of $119,221.15, amounted to $1,524,103.18. Production for the year was 42,482,000 lb. of copper, of which 27,440,000 lb. was refined, the rest being sold as bessemer metal. Ore mined amounted to 1,178,087 tons, which yielded 36.6 lb. of copper per ton.

The Boulder and Abbie B. mines were equipped with aërial tramways, a new electric hoist was installed at Yavapai, a mine-sampling mill and assay office were completed at the Coronado mine and a new two-story brick office building was finished in 1917. Ore treated at No. 6 concentrator amounted to 996,699 tons and showed an average grade of 2.44%, with an extraction of 73.02%. An Oliver filter plant and several Dorr tanks were added during the year. At No. 4 concentrator, 130,355 tons of ore was treated and an extraction of 71.33% was obtained. At the smeltery 812 dry tons was treated daily.

United Verde Extension Mining Co.

United Verde Extension Mining Co. in 1917 shipped a total of 115,064 dry tons of ore, containing 63,242,784 lb. of copper, 1656 oz. of gold and 332,536 oz. of silver, an average per ton of 549.6 lb. of copper, 0.0114 oz. of gold, and 2.89 oz. of silver. During the year 58,239,636 lb. of copper was sold at an average of 27.034c. per lb. No special prospecting work was done in 1917, and no new orebody has been discovered since the last report. Development operations for 1917 aggregated 12,266 ft. Net earnings for the year amounted to $8,256,117.17, and dividends to $1,680,000, leaving a balance of $6,576,117.17.

Calumet & Hecla Mining Co.

The total copper product of the Calumet & Hecla Mining Co. for the year 1917 amounted to 77,495,283 lb. Of this amount, 68,419,826 lb. was produced from mines and 9,075,457 lb. was recovered by reclamation. Production cost was 12.6c. per lb., and copper delivered brought an average of 28.39c. per lb. Comparative results are as follows:

COMPARATIVE RESULTS OF OPERATIONS CALUMET & HECLA

	1914	1915	1916	1917
Rock treated, tons	2,592,462	3,188,583	3,166,274	3,159,570
Mine cost (excluding construction), dollars per ton	1.85	1.71	2.03	2.52
Refined copper produced from mine, lb	53,691,562	71,030,518	71,349,591	68,419,826
Copper per ton of rock, lb	20.70	22.28	22.53	21.65
Cost per lb. of copper produced, cents	11.35	9.33	11.63	12.60
Price per lb. received for copper sold, cents	14.01	18.11	25.48	28.39

COMPARATIVE OPERATING RESULTS ON CONGLOMERATE LODE

	1914	1915	1916	1917
Rock treated, tons	1,439,986	1,739,984	1,727,794	1,751,621
Mine cost (excluding construction), dollars per ton	2.37	2.13	2.63	3.26
Copper produced, lb	37,996,045	51,738,588	51,785,016	50,415,860
Copper per ton of rock, lb	26.38	29.74	29.97	28.78
Shaft sinking, ft	228.3	201	0	0
Drifting, ft	4,339	5,522	5,142	2,942

An average of 89 drills operated during the year removing shaft pillars and cleaning up arches and the backs of old stopes. A total of 505,682 tons has been secured from these operations. In No. 6 and No. 7 shafts, Hecla branch, the drifts were advanced 197 ft., opening ground of fair quality. In No. 9 and No. 10 shafts, South Hecla branch, the drifts were advanced 1981 ft. and 1664 ft. opening a fair grade of rock, the rest being poor.

RESULTS OF OPERATIONS ON OSCEOLA LODE

	1914	1915	1916	1917
Rock treated, tons	1,152,476	1,448,599	1,438,480	1,407,949
Mine cost (excluding construction), dollars per ton	1.19	1.07	1.32	1.60
Copper produced, lb	15,695,517	19,291,930	19,564,575	18,003,966
Copper per ton of rock, lb	13.62	13.32	13.60	12.79
Shaft sinking, ft	103	0	139	338
Subshaft sinking, ft	0	0	0	0
Drifting, ft	6,698	10,206	16,443	16,352

The openings on this lode show the same grade of rock as last year. The product secured from foot-wall stopes was about 27% of the total product from this branch. Shaft openings are so far in advance of drifts that, with the exception of 338 ft. at No. 17, no sinking was done during the year.

Flotation experiments at stamp mills during 1917 were satisfactory, and a 50-ton experimental unit operated continuously for six months. It is the intention to install two 600-ton Minerals Separation units in addition to Dorr thickeners and Oliver filters, and

one stamp unit at a time will be converted to the new system, beginning with the Hecla mill and continuing into the Calumet mill. It is also purposed to build a 2000-ton slime-treatment plant.

Regrinding Retarded by Non-Delivery of Machinery

No changes were made in No. 2 regrinding plant, and at No. 1 plant the work of remodeling progressed slowly owing to the delay in delivery of machinery. During the year, 512,172 tons of coarse tailings was crushed, and, in addition, No. 2 plant treated 730,543 tons of tailings sands from Torch Lake. Results for 1917 at the leaching plant were satisfactory, and 643,911 tons was treated, yielding 5,250,311 lb. of copper, at a cost, excluding selling and smeltery charges, of 6.41c. per lb. At the reclamation plant operations were uniform, and 730,543 tons of tailings was treated and yielded 9,075,457 lb. of copper at a cost of 5.94c. per lb., excluding selling and smeltery expense.

Wages Upheld in Spite of Increased Costs

The greatly increased cost of supplies, the high scale of wages, and the general scarcity of laborers, with the consequent decreased product, materially added to the production cost for the year. The 10 per cent. premium and 50c. bonus for each day worked were continued throughout 1917, and notices were recently posted announcing the continuance of this premium and bonus until July 1, 1918. Dividends amounted to $8,500,000.

Copper Range Co.

The Copper Range Co. reports that during 1917, 978,015 tons of rock was stamped and 31,268,130 lb. of refined copper produced, which represents 31.97 lb. of copper per ton of ore stamped. The total cost per lb. of copper produced was 12.58c. and the average price received was 28.735c. Total expenses amounted to $3,933,222.05, net earnings were $4,966,824.97, and total dividends paid were $3,943,912.50. The report covers the operations of the following companies, stock in which is held by the Copper Range Co.: Atlantic Mining Co., 97,001 shares; Trimountain Mining Co., 99,690; Champion Copper Co., 50,000, and Copper Range R.R. Co., 42,443 shares. During 1917 the Baltic Mining Co. was dissolved and its assets were transferred to the Copper Range Co. The mine is to be operated as the Baltic mine of the Copper Range Company.

Quincy Mining Co.

The Quincy Mining Co. reports that 22,195,577 lb. of refined copper was produced in 1917. Income from sales of metal amounted to $6,350,500.30; operating expense, including taxes, was $3,486,774.56; other income was $52,336.12, and construction and miscellaneous expense amounted to $406,794.76. Income for the year totaled $2,509,267.10, out of which were paid dividends of $1,980,000. The year's production of copper was sold at an average of 28.6c. a lb. Among the improvements made in 1917 are included new dwellings and boarding houses for employees, automatic sprinkler system at the stamp mills, stokers and coal-handling plant at stamp mill boilers, and a new hoisting plant at No. 2 shaft. The mine produced 1,280,837 tons of copper rock in 1917, and this gained a yield of 17.33 lb. of metal per ton of rock. Openings throughout the mine total 26,900 lin.ft. and shafts were sunk totaling 499 ft. Twenty-five electric-haulage locomotives are now used in the mine.

Osceola Consolidated Mining Co.

Total copper produced during 1917 by the Osceola Consolidated Mining Co. amounted to 16,084,958 lb. at the cost of 13.49c. per lb. For 12,383,918 lb. of copper delivered, an average of 27.89c. per lb. was received. Gross income from 1917 operations was $1,777,625.26, taxes were $602,093.73, and dividends paid amounted to $1,346,100. Rock treated amounted to 1,237,805 tons, at a cost, including mining, transportation, stamping and taxes, of $1.63 per ton. Refined copper per ton of rock treated was 13 lb. Underground work during 1917 consisted of the following: Osceola, No. 6 shaft, 3898 ft. of openings; North Kearsarge No. 1 shaft, 137 ft. of shaft and 1187 ft. of openings; No. 3 shaft, 589 ft. of openings and No. 4 shaft, 634 ft. of openings.

Isle Royale Copper Co.

Total copper produced by the Isle Royale Copper Co. in 1917 amounted to 13,480,921 lb., at a cost of 15.35c. per lb. Gross income from 1917 operations was $1,224,708.04 and dividends paid during the year amounted to $600,000. There were 922,160 tons of rock treated, at a cost of $2.02 per ton, including costs of mining, transportation, stamping and taxes. Refined copper per ton of rock treated was 14.6 lb. Total shaft sinking during the year was 996 ft., divided among shafts Nos. 2, 4, 5, 6 and 7. Underground openings driven amounted to 19,271 ft., divided as follows: Drifting, 9822 ft.; drift-stoping, 8636 ft., and crosscutting, 813 ft. Buildings at the Isle Royale stamp mills were equipped with automatic sprinklers for fire protection. During the year the main tailings launder was extended 600 ft. At the No. 1 mill, automatic sprinkling apparatus was installed. A 30,000,000-gal. motor-driven, centrifugal pump for furnishing water for the entire mill was ordered. The 10% premium and 50c. bonus for each day's work were continued throughout 1917 and will be in force until July 1, 1918.

East Butte Copper Mining Co.

East Butte Copper Mining Co. reports for 1917: Number of tons of ore mined (wet weight), 189,473, having an average assay value of 4.31% and mined at a cost, including development, of $8.29 per ton. Total number of tons of ore treated was 212,755, which resulted in a production of 20,013,900 lb. of copper, 581,190 oz. of silver and 1825 oz. of gold. Gross income from operations was $5,397,868.14, and with costs covering mining, treatment, freight, selling, refining, etc., of $4,089,710.10, there remained a balance of $1,308,158.04. The report shows a net surplus on operations of $1,021,960.83, after deductions for depreciation, depletion, exploration and development.

Events and Economics of the War

After several days' inactivity following their penetration of the Allied lines to the Marne, the Germans reattacked on a new front extending from Noyon to Montdidier, gaining about 5 miles in the center. During the week, in minor actions, brilliantly executed, American marines recovered ground northwest of Chateau Thierry from the Germans, including the villages of Torcy and Bouresches.

At home, three more vessels were reported sunk by raiding U-boats off the Atlantic coast. By proclamation of the President, June 28 was set aside as National War Savings day. The amount to be spent in the next fiscal year by the Government was placed at 24 billions by Secretary McAdoo, who suggested that loans therefor be limited to 16 billions and the balance raised by increased taxes. Steps to limit the retail prices of food were announced by the Food Administration involving the publication in each community of "fair price lists" to be followed by stopping supplies to profiteers. Authority to form one or more Government-owned aircraft corporations was asked of Congress by John D. Ryan. More than 700,000 American troops are now in France, it was announced.

Engineer Officers Wanted for the Army

Approximately 2000 additional engineer officers are immediately required for the army. To obtain these with a minimum of delay a board of examining officers will be sent out from Washington. All who are professionally and otherwise qualified may obtain the necessary blank forms of application by written request, addressed to the Chief of Engineers, U. S. Army, Washington, D. C. These applications should be filled out in strict compliance with the instructions thereon. If the application is accepted the applicant will be advised of the time and place where the examination, both mental and physical, will be held. Should he be found qualified, he will be commissioned in the Engineer Reserve Corps.

The Examining Board will receive applications for appointment only in the grades of first lieutenant and captain, and only those applicants meeting the following requirements will be considered:

Age limits: For the grade of first lieutenant, 32 to 36 years; for captain, 36 to 42. These limits may be slightly increased, or decreased, in special cases, except that no one who is within the draft age will be considered.

Applicants must be engaged in the active practice of the engineering profession, in one of its various branches, and be in good physical condition.

Professional qualifications and experience: No set rules have been established. An applicant's fitness for commission will be determined by the board.

All applicants must be citizens of the United States.

No application will be received from any one now in Government service.

Applications will not be considered from any one born in a country with which the United States is at war, or born in a country allied with a country with which the United States is at war, even though he be a naturalized citizen of this country.

All applicants accepted by the board will be commissioned within 10 days or two weeks, and within a few days thereafter will receive orders to report at an engineer officers' training camp, either at Camp Lee, Petersburg, Va., or at Camp Humphreys, Va., near Washington, where they will be given a course in military training previous to being assigned to duty with engineer troops.

Applicants must understand, however, that it is required of an engineer officer that he not only be professionally qualified, but must also possess the requisite qualities of leadership and temperament to fit him for the command of troops. The case of each student officer will be carefully considered by a board of officers of the Corps of Engineers of the Regular Army, just previous to the completion of his course of instruction (unless circumstances necessitate an earlier consideration) and, as a result of the showing which he has made, he will either be allowed to retain his commission, or will be honorably discharged.

The Government will allow traveling expenses at the rate of 7c. per mile to applicants who may be commissioned, and they will also receive, while in the training camp, the regular pay of an officer of their rank.

Applicants who receive commissions and are ordered to camp should provide themselves only with the usual engineer officers' uniform, cap, puttees and tan shoes. For training purposes, the camp authorities will issue them, on memorandum receipt, equipment, and will provide the necessary sleeping accommodations.

Tin Control in Great Britain

Entire control of trading in tin was taken recently by the British Minister of Munitions, according to the *Iron and Coal Trades Review*. The order, which was issued under date of Apr. 26, 1918, prohibits all persons from purchasing, selling, or—except for the purpose of carrying out a contract in writing existing prior to the date mentioned—entering into any transaction or negotiation in relation to the sale or purchase of tin situated either inside or outside the United Kingdom, except under a ministry license. Likewise, no tin may be used, except under license, for the purpose of any manufacture or work except for the purpose of a contract or order for the time being in existence certified to be within class "A" in the order of the Minister of Munitions as to priority dated Mar. 8, 1917.

In the first seven days of each month all persons are to send in to the director of tin supplies, monthly returns of:

1. All tin held by them in stock or otherwise under their control on the last day of the preceding month, specifying the quality.
2. All tin purchased or sold by them for future delivery and not yet delivered on such last day, specifying the names of the sellers to or purchasers from them, and the quantity and quality, and time and place of delivery in each case, and the position of the tin at the date of the return.
3. All tin delivered to them during the preceding month, and from whom purchased.
4. All contracts or orders existing on the last day of or entered into during the preceding month requiring for their execution the use of tin, specifying the purposes thereof and the quality of the tin to be used.

This became effective on May 1. No return is, however, required where the total stock of tin in hand and on order has not at any time during the preceding month exceeded 5 cwt. For the purpose of the order, the word

"tin" means tin of all qualities, and includes sheet and rolled tin, tinfoil, scrap tin, tin ores, and concentrates, and tin residues.

Applications for licenses are required to be made to the Director of Tin Supplies, Metal Exchange Buildings, Whitington Ave., London, E. C. 3, and marked "Tin License." Every applicant for a license must state the amount and quality of metal required by him per month, and the use to which it will be put.

Germany Controlled Australian Mines

How Germany had benefited Australia, though seeking her conquest, was recounted by Premier Hughes, of Australia, in a recent speech before the Harvard Club in New York.

"Our mines," said Mr. Hughes, "which are extensive, were entirely under the control of German capital when the war came. It gives me pleasure to say that they no longer are under that control and also that arrangements have been perfected by which for 25 years to come the control cannot possibly be reëstablished. But to be fair, the German energy and capital were very beneficial to us. After we took over the mines ourselves we found the plants and organizations so excellent that we were able to begin at once the making of ships and munitions with which to help defeat Germany. Without the German pioneer work we never could have got going so well or so fast."

Taxation

In a recent interview in the Boston *Post*, C. W. Barron remarked:

"Henry B. Endicott is right when he proposes to tax his car and my car and every other fellow's car according to size. Of course, this taxes the farmer's horse, the smaller and lighter motor. But even the farmer has the opportunity of doing more business with his motor, thus increasing his earning ability, or of running his motor slower and saving expense. It is a question of what his time is worth.

"Taxes justly come from fruitage. You should tax the fruit either as produced or consumed. Tax production or consumption when you wish to limit them. Therefore you tax alcohol both at the still and the bar. Tax honey after the hive is full or before it is consumed, but do not tax the bee. When you tax the fruit, do not cut off the limb of the tree. Tax the fruit or the honey in consumption, but be careful how you tax it in production. In war, you want to stimulate production and reduce consumption. Lay all possible taxes on consumption, and only as you must on production.

"The wrong in the present socialistic system of taxation is that we are endeavoring to avoid taxes on consumption. In the Civil War we raised two-thirds of our taxes by imposts upon consumption. If a man wants to consume silks, champagne, or luxuries, put the tax upon them, both on imports and, where this is not possible, on consumption. Then the man who wants to consume selfishly will pay the tax. You must in all systems of taxation deal with human selfishness. Tax it where you can and stimulate it when you must, to produce a public service."

Skilled Enlisted Men To Be Returned To Necessary Industries

In response to appeals from all over the country, the War Department has decided upon a policy which will permit the return to necessary industries of highly skilled men taken from such industries, under a system of furlough which will be automatic, and which will not in the future, as in the past, leave to the discretion of company and other subordinate commanders the question of whether such furloughs shall be granted. Thousands of applications for such furloughs are now being sent out of Washington by the War Department. The application blank is as follows:

Application for Return of Enlisted Man.
In Highly Skilled Class of Labor to "Necessary" Industry
Dated at.....191
Application is hereby made for the return of following enlisted man:
Name....., Residence.....
Exact description of trade.....
Registered Local Board.....Order No.....Serial No.....
Last reported to Camp.....Unit.....
Taken into Army.....191 , because.....
.....
.....
We ask that he be directed to report to.....
.....
We have the following direct Government contracts:

Date	*Gov. Order No.*	*Quantity*	*Description*	*Dept. of Gov.*
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

We are under contract with the following, who have direct Government contracts from.....Dept.
.....
.....
We have established our status as "necessary" industry with District Board No. ..... of State.....
located at.....
.....
By.....(Title)
Sworn to before me at.....
this.....day of.....191
.....
.....
Title of official administering oath.
I have checked the foregoing statements and have found them to be correct.
.....
.....
Local representative of.....Dept.

Adoption of this policy means that enlisted men are to be returned only where the employer is willing to swear that they are badly needed, and that no others can take their places. The Government department for which the manufacturer or other employer is working will, upon application, send one of the blank forms to the employer, which he must fill out, swear to before a notary, and have a Government inspector who is conversant with the facts also sign. The signed application then goes to the Adjutant General's Office, with request from the interested Government department that the man wanted be granted an indefinite furlough, without pay, with the promise that after the need for the man's service has passed he will be returned to the Army and the Government notified.

While such men are on furlough they are not to be allowed to wear the uniform. The company employing such men must furnish the Government each month a report as to whether the men are still employed and the class of work in which they are engaged. In case such men leave their employment, the employers must immediately notify the Government.

Anthracite Allotted by States

It is estimated by the anthracite committee of the U. S. Fuel Administration that 54,345,783 tons of anthracite of domestic sizes will be available for distribution to consumers during the coal year ending Apr. 1 next. Such amount will be an increase of 2,668,323 tons, or more than 5%, over the actual distribution for the coal year 1916-17. Distribution to New England and Atlantic states will be materially increased because of their expanded population.

Government requisitions for the Army and Navy and war industries and utilities which require it will be fully met. To make possible such necessary increased distribution upon Government orders, and through those sections of the country where the people are dependent upon anthracite for heating and cooking, there is no alternative but to curtail shipments to other states and to bar anthracite entirely from many more where it has been used but in which bituminous and other fuels can be procured and substituted. The allotment:

ALLOTMENT OF DOMESTIC ANTHRACITE FOR CURRENT COAL YEAR

	1916-17 Distribution Tons	Allotment 1918-19 Tons	Increase %	Decrease %
Maine	556,683	660,000	18.56	.....
New Hampshire	314,945	375,000	19.07	.....
Vermont	316,850	330,000	4.15	.....
Massachusetts	5,027,993	5,689,000	13.15	.....
Rhode Island	664,008	800,300	20.53	.....
Connecticut	1,952,900	2,476,700	26.82	.....
New York	14,169,809	15,855,300	11.89	.....
New Jersey	4,961,622	5,460,784	10.04	.....
Pennsylvania	6,815,650	8,059,700	18.25	.....
Delaware	223,503	245,853	10.00	.....
Maryland	933,889	1,027,317	10.00	.....
District of Columbia.	517,760	665,800	28.59	.....
Virginia	256,000	102,400	.....	60.00
Ohio	585,626	246,250	.....	57.95
Indiana	710,274	284,110	.....	60.00
Illinois	2,215,122	1,750,585	.....	20.97
Michigan	1,589,002	1,201,000	.....	24.42
Minnesota	1,071,532	990,000	.....	7.61
Wisconsin	1,181,926	1,024,000	.....	13.36
N. Dakota	249,314	200,000	.....	19.78
S. Dakota	207,416	166,000	.....	19.97
Missouri	129,289	.....	.....	100.00
Kansas	15,907	.....	.....	100.00
Nebraska	130,273	.....	.....	100.00
Iowa	352,496	.....	.....	100.00

Besides the above, 2,481,754 tons have been allotted to railroads, 3,602,000 tons to Canada, 51,930 tons for miscellaneous exports and 600,000 tons to cantonments.

Coal Administrator for Alaska

The U. S. Fuel Administration is considering the request of the Territorial Council of Defense of Alaska, that a fuel administrator be appointed to take charge of the coal fields of that territory. At present the Alaskan coal fields are under the direction of the fuel administrator for the State of Washington. Though Alaska has extensive coal areas, the coal supply for the territory is to a large extent imported from Washington and British Columbia.

The Government railway extending from Anchorage to Fairbanks was completed last year to a point where the Matanuska coal fields can be developed, and with the completion of this road from Anchorage to Seward this summer there will be ample provision for bringing out Alaskan coal.

Decision Rendered on Income Tax

The U. S. Supreme Court, in an opinion handed down on June 3, held that dividends paid to stockholders in corporations out of surplus accumulated prior to the income tax law of 1913 are not income, and are therefore not taxable under the act.

The decision may have the effect of cutting off several million dollars in revenue under the present income tax law, since the principle involved in the 1913 act also would affect the newer measure. Many returns, it is said, included dividends paid from surplus accumulated before the new act was passed.

If it is found after examining the Supreme Court decision that the payments are exempt, provision will be made for deducting the sums, or refunding them if paid.

Navy to Train Engineering Officers

The Navy Department has perfected plans for the enrollment and training of engineering officers. A school for this training, known as the U. S. Navy Steam Engineering School, has been established at the Stevens Institute of Technology, Hoboken, N. J., under the guidance of Dean F. L. Pryor, as civilian director.

The course consists of five months' training, divided as follows: One month of military training at the naval training camp, Pelham Bay Park, New York; one month at the school mentioned; two months practical training on board ships and in repair shops in the vicinity of New York; one month finishing course at the school.

The school is open to men between 21 and 30 who are physically qualified, of thorough ability and officer-like character, and who have completed the engineering course at any recognized technical school. It presents desirable opportunities to the young technical man, both in affording him a proper outlet for his trained facilities during the war, and in rounding out his college work with a practical course and school experience.

The service that a graduate from the school will perform will be that of an engineer officer in the auxiliary service of the Navy, and a graduate will be commissioned an ensign in the U. S. Naval Reserve Force. Information has been sent to all registered technical schools and should be on file at the president's office. For any additional details application can be made to the civilian director, U. S. Navy Engineering School, Stevens Institute, Hoboken, New Jersey.

Any men, graduates or undergraduates, who are registered in the draft can enroll with the proper enrolling officer by securing from the draft board a letter of release, which in all probability can be obtained for this purpose, provided the men are not included in the current draft quota. Special provision has been made for the continuance of the school with proper material by a Navy regulation which permits undergraduates of the freshman, sophomore and junior classes in recognized engineering schools to enroll in the Navy with a rating of seamen, 2nd class, and continue their courses at the institutions where they have matriculated. Such men will be called into active service after their graduation, and can at that time, if they are physically qualified to pass an officer's physical examination, enroll for the course at the U. S. Navy Steam Engineering School.

Industrial News from Washington

By Paul Wooton, Special Correspondent

War Industries Board to Distribute Steel Supply

Through agreement with the American Iron and Steel Institute, the entire production of pig iron and steel is to be distributed by the War Industries Board. No. pig iron or products manufactured from steel are to be shipped or delivered except as follows:

1. By priority certificates issued by the Priorities Division of the War Industries Board; or

2. After priority certificates shall have been issued for or filled, then producers of pig iron and of steel manufactured products may utilize such raw materials and manufacturing capacity, if any, as they may have available, to fill orders of their customers not covered by priority certificates, provided such orders are embraced within the schedule of purposes entitled to preference treatment as determined by the Priorities Board as follows:

Ships, including destroyers and submarine chasers; aircraft; munitions, military and naval supplies and operations, building construction for Government needs, equipment for same; fuel for domestic consumption and for manufacturing necessities named herein; food and collateral industries, foodstuffs for human consumption and plants handling same; feeding stuffs for domestic fowls and animals, and plants handling same; all tools, utensils, implements, machinery, and equipment required for production, harvesting and distribution, milling, preparing, canning and refining foods and feeds, such as seeds of foods and feeds, binder twine, etc.; products of collateral industries, such as fertilizer, fertilizer ingredients, insecticides and fungicides; containers for foods and feeds, and collateral products; materials and equipment for preservation of foods and feeds, such as ammonia and other refrigeration supplies, including ice; clothing for civilian population; railroad or other necessary transportation equipment, including water transportation; public utilities serving war industries, Army, Navy, and civilian population.

A survey is to be made of the prospective iron and steel requirements of the U. S. Government and of the Allied governments. A study also is to be made of the capacity of plants in the United States with the idea that the recommendations may be made to stimulate and increase production.

Pause on Minerals Control Bill

A delay of two weeks in the consideration of the Minerals Control bill has been occasioned by the enforced absence from Washington of Senator Henderson. The death of his mother made necessary a trip to Nevada. Senator Shafroth, of Colorado, who took an active part in examining witnesses during the Senate committee's hearing, is opposed to granting the power to fix either maximum or minimum prices. He believes, however, that the bill should extend to the Secretary of the Interior the authority to make contracts where it is necessary to stimulate production. Senator Jones, of New Mexico, leans to the belief that some control of certain phases of the mineral situation is necessary, but thinks the greatest care must be exercised in the handling of legislation which is so likely to change the equilibrium of delicately balanced industries.

Directors of War Industry Named

Regional representatives who will direct war industry in the 20 zones into which the United States has been divided by the War Industries Board were announced on June 4 as follows:

George E. Crawford, Bridgeport, Conn.; William F. Morgan, New York; Ernest R. Trigg, Philadelphia; George S. Oliver, Pittsburgh; Harper Sibley, Rochester, N. Y.; Myron T. Herrick, Cleveland; Allen A. Templeton, Detroit; Lucius Teeter, Chicago; A. Clifford Shinkle, Cincinnati; Frank N. Hoen, Baltimore; W. H. White, Jr., Atlanta; M. W. Bush, Birmingham; Frank D. Crabbs, Kansas City; Jackson Johnson, St. Louis; August H. Bogel, Milwaukee; Louis Lipshitz, Dallas; Frederick J. Koster, San Francisco; A. J. Rhodes, Seattle; Henry I. Harriman, Boston; D. R. Cotton, St. Paul.

Each regional representative will remain in his district as the representative of the War Industries Board at Washington. They are instructed to reach all organizations and firms, whether affiliated with chambers of commerce or not.

Freight Increases on Copper and Lead

Exceptions in which the 25% increase of freight rates will not apply on base bullion (copper or lead), pig or slab and other smeltery products are as follows:

That rates from producing points in the states of Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Washington to New York, N. Y., shall be $16.50 per net ton, with established differentials to other Atlantic seaboard points; and

Rates from points in Colorado and El Paso, Tex., to Atlantic seaboard points shall be $6.50 per net ton.

Separately established rates used as factors in making through rates to the Atlantic seaboard shall be increased in amounts sufficient to protect the through rates as above increased.

Reclassifying Drafted Men

After having lost the services of the first several hundred thousand of the draft men in the activities for which they were best fitted, the War Department now has evolved an efficient system of occupational classification. To date more than 240,000 transfers of men from one unit to another have taken place. These transfers are being made at a rate of 40,000 weekly. At each camp where the new men are received trained interviewers secure full information regarding the draftee's education, experience and special qualification.

Germany is calling in her nickel coinage, the metal of which is needed for projectiles, says a dispatch from Amsterdam, and is substituting zinc for minting coins of this class. Authority has just been given for the minting of 10,000,000 marks' worth of zinc 10-pfennig pieces.

Recovery of nickel from Alaskan ores is being conducted at the Golden station of the U. S. Bureau of Mines, where some success has been obtained by fusion with niter cake.

When Patriotism Means Only Trifling Sacrifice

Patriotism—the word has at this moment a deeper significance to our country than any other, because upon the patriotism of its citizens hinges our nation's ability to remain free and untrammeled. Upon the degree of patriotism which prevails depends the future of our most cherished institutions, our liberty and our homes. An army fighting without it would be as useless as a spent bullet.

While the mining regiment is showing its patriotism to be of steel, what are we doing? We fill the breach between the firing line in France and the raw material in our mines, which must be converted into shells, guns aëroplanes and ships which are necessary to supply that firing line; surely as necessary a work as the battle itself. Yes, but carried on at home among home folks and cheer, with dry feet, and regular meals of regular food, and a safe bed to sleep in. For these reasons and others, no work that we could possibly do here could compare in sacrifice with that freely offered by our fellows in France.

To bridge, in a measure, that span between the limited service we can render and that noble service our more fortunate miners are giving, let us subscribe liberally to the Comfort Fund of the 27th. One engineer, following the dictates of his profession by having something tangible upon which to base his argument, keeps an expense account of his tobacco. He says: "I never kept an expense account of anything before, but I made up my mind that for every pipeful I smoke, some fellow over there can have one on me." That shows the right spirit, and similar trifling sacrifices upon the part of a sufficient number will help keep the mining regiment in good cheer. Can you do less?

Those who have contributed to the fund subsequently to the list given in our issue of May 18 follow. About 6000 members of the A. I. M. E. and 99.2% of the *Journal* subscribers remain to be heard from.

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Ellers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles le Vasseur (second contribution)	5.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
Total	$14,732.50

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund, contributions are acknowledge only by publication in the *Journal*.

Gas and Oil Fields of Western Canada

BY PHILLIPS THOMPSON*

Eugene Coste, of Calgary, Alta., president of the Canada Western National Gas, Light, Heat and Power Co. and of the Northern Alberta National Gas Development Co., and a leading authority on gas and oil, has given out some important details of the recent development of the oil and gas resources of the Canadian West. Three natural gas fields have been found in the Province of Alberta, two of which have produced large quantities of gas for many years. The Medicine Hat field, which supplies Medicine Hat and Redcliffe, has a tested area of about 30 square miles. The initial rock pressure was 600 lb. The depth of the gas sand varies from 1000 to 1200 ft.; it lies about 900 ft. above the Dakota sandstone of the Cretaceous formation. The Bow Island field is situated 40 miles west of Medicine Hat on the Crow's Nest branch of the Canadian Pacific Ry. The tested area is about 25 square miles, the initial rock pressure was 790 lb. and the depth of the gas sand varies from 1850 to 2150 ft. This sand is the Dakota sandstone of the Cretaceous, and the first 70 ft. of it affords from three to four pays in each well. This field supplies gas to the cities of Lethbridge and Calgary and a number of intermediate towns by means of a 16-in. pipe line, 175 miles long, laid in 1912, since which time a large gas business has been developed, with branch pipe lines connecting with other places. North of this district along the main line of the Canadian Pacific Ry. gas has been found in smaller quantities in sands respectively about 300, 800 and 1400 ft. above the horizon of the Medicine Hat sands. The town of Brooks has been supplied steadily for six years from one of these middle Cretaceous sands.

The third large gas field is situated about 200 miles north of Bow Island, near Viking, on the Grand Trunk Pacific Ry., 80 miles southeast of Edson. Gas is obtained from the Dakota sandstone at the depth of about 2350 ft., and from another sand, about 150 ft. above, which corresponds to the Grand Rapids sandstone of the Athabasca River section. An area of about 12 square miles has been tested in the Viking field, the wells averaging a flow approximately 4,400,000 cu.ft. each, with a rock pressure of 700 lb. The gas is of the ethane type, and, no doubt, will permit of the production of gasoline by absorption as soon as it is piped and is in use in Edmonton. A small quantity of dark oil, 22 B°, was obtained on the top of the Dakota sand in one of the Viking wells, and indications are that an oil field will be developed in the vicinity.

At Pelican Rapids, about 150 miles north of Viking on the Athabasca River, where gas has been discovered, the Grand Rapids sandstone and Dakota sand are shallower (600 to 800 ft.) and the gas has less rock pressure —from 250 to 300 lb. The volume of the first well put down was large, but unfortunately the gas was allowed to go to waste. A small quantity of heavy oil was found with the gas. Latterly, a deeper well has been drilled near Pelican Rapids and gas found in a deeper sand in the Devonian limestone. On the outcrops of the Cretaceous measures between Pelican Rapids and Fort McMurray and McKay enormous seepages of gas, heavy

* Oakville, Ontario.

oils and tar are found along the Athabasca River for a distance of 100 miles. On the Peace River, and in the region northwest of it along the Mackenzie River up to the Arctic Ocean, similar seepages occur at intervals in a region hundreds of miles long. East of the Rocky Mountains, and near Peace River Landing, oil, apparently in commercial quantities, has been found in two wells at depths of 900 to 1200 ft. In the district between Calgary and the mountains, and south from there to the United States boundary line, oil of a very light gravity has been found in seepages and deep wells, but so far not in large quantities.

The foregoing data indicate the existence of an oil and gas belt of great promise across the Province of Alberta for a distance of hundreds of miles, its extension north to the Arctic Ocean being marked by known seepages and the geological conditions. Mr. Coste is convinced that this oil and gas belt contains enormous reserves of petroleum.

Mineral Production of British Columbia in 1917

In British Columbia, the government has put diamond drills to work to determine the depth of orebodies whose surfaces would indicate extensive value, says *Commerce Reports*. Many millions of dollars have been expended on mineral indications in that province in trying to prove the existence of mines by tunnels and shafts.

The gold production in 1917 totaled 118,239 oz., against 221,932 oz. for 1916. It has suffered from the greatly increased cost of labor and supplies, though the price of the product remains stationary. On account of the greatly enhanced value of the baser metals, mines operating on the sliding scale of wages regulated by the price of the metals have been paying abnormally high wages, which have drawn miners away from gold mining, both placer and lode. About 75% of the gold production of the province is obtained from the smelting of copper-bearing ores and the remainder mainly from stamp milling. The production of placer gold is comparatively small, amounting to only about one-tenth of the total. Copper produced in 1917 was the highest recorded except for 1916, totaling 64,416,617 lb., valued at $16,693,037, compared with the 1916 figures of 65,379,364 lb., valued at $17,784,494. The average price of copper for 1917 was slightly lower than for 1916.

During the last three years copper mining has become the most important form of mining in British Columbia and probably will maintain this position. Last year it formed 60% of the total return of the metal-bearing mines and 45% of the total mineral production.

In 1917, 3,069,021 oz. of silver was produced, entirely from the silver-lead and copper ores. About 56% of this was produced in the Slocan district from argentiferous galena, the remainder being chiefly derived from the smelting of copper ores carrying silver. The total production of lead in 1917 was 38,661,811 lb., which was a slight decrease over the previous year, but owing to the high price the value of the 1917 output was the highest on record. The output of zinc for 1917 was slightly less than for the previous year. The high prices paid for zinc in 1915 and 1916 resulted in such an increased production that the supply far exceeded the demand, with the inevitable result that the market declined considerably.

Cost of Australian Copper

BY ROBERT SLESSOR*

The average cost of all Australian copper is high. Even before the war, the only cheap copper came from the Cloncurry district, North Queensland, where high-grade ores containing over 9% were smelted during the first few years of the life of the Mount Elliott and Hampden mines. Copper costs are not published in the periodical mine reports, and the real costs are known only to the various boards. An approximation, however, is possible from the net profits, dividends, gross returns, etc. Of the 40,000 (long) tons produced annually, more than 75% comes from seven mines, Mount Lyell, Wallaroo, C. S. A., Hampden, Mount Elliott, Great Cobar and Mount Morgan. These names are quoted in the order of the approximate costs and not in the order of the size of their output.

Approximately it may be taken that Mount Lyell's costs are something under £50 per ton and Mount Morgan's over £85 per ton for refined electrolytic copper in Sydney, where it will be sold to the Imperial Government at a fixed price until June 30 next. Each mine has its special causes of high costs and some advantages that work for lower costs. Mount Lyell, though having lower-grade ores, has the advantage of cheap hydro-electric power, and especially efficient metallurgical work, and its own coke works. It has besides, a source of profit from chemical manure works, but these, though increasing the profits, do not, of course, affect the cost of the copper. The Wallaroo has the advantage of its own refining works, an efficient process of milling, flotation and leaching, and a good working agreement with its employees that has so far prevented strikes. The C. S. A. has higher-grade ores containing up to 5 and 6%, being practically a new mine, and will soon have its own refining works. The Hampden and Mount Elliott had the advantage of high-grade ores, but today the average grade of the furnace input is fast falling toward 6%, and there is no longer a big margin over the other handicaps. The Great Cobar has a fine plant and its own fuel supply (not coke), but its ore supplies and grade and its financial circumstances make costs rise in spite of the hardest work of the management. Finally, the Mount Morgan has all of the handicaps recorded below, with the sole advantage of high gold contents of the blister. This latter, of course, though influencing the actual profits, has no bearing on the actual cost of making copper.

The disadvantages common to all are many, chief among them being the high cost of labor and low efficiency. The former is not objected to, as it is recognized that living costs have risen all round. It is the decreased efficiency and the frequent labor difficulties that are especially troublesome. Power costs have an influence, as practically all the mines cited except Mount Lyell depend upon imported coal or local firewood for

*Castlereagh House, Castlereagh St., Sydney, New South Wales, Australia

power making. High transport charges for coke affect Hampden, Mount Elliott, Mount Morgan and Wallaroo, as sea and rail freights are exceptionally burdensome.

There does not seem much hope of improvement during the next decade. The labor situation is uncertain, the grade of ore will fall rather than rise, transport and cost of materials will hardly decrease, and the only glimmer of hope is in improved methods of extraction and making power. Leaching is employed on a small scale at Wallaroo and Mount Morgan and elsewhere only for mine waters carrying copper. Milling of low-grade ores with flotation is practicable at Wallaroo, Mount Morgan and Mount Lyell, and must needs increase, and other mines now producing will have to employ these methods. There are, however, no really large low-grade copper ore deposits so far discovered that can compare in any way with American or Russian mines, and unless milling and flotation can be done on a really large scale there does not seem much probability of decrease in costs. The smaller, newer copper mines, that must some day become the big producers if Australian copper output is to be maintained, are not being encouraged. There remains the possibility of new mines and fields, which is certainly great, all over the unprospected portions of the central, northwest and northern parts of the continent. The recently completed East-West line from Port Augusta to Kalgoorlie will provide a base for prospecting parties to explore inland, and it is there that discoveries may be made. Should copper fall to £75 or £80 when peace is in sight, it is hard to see how more than two of the mines mentioned can continue to produce without loss.

The Tin Situation

Fresh trouble has arisen in the tin trade, says the *Ironmonger*, owing to the changes that have been brought about by the war and to the efforts of an official body to direct the course of trade. Previous to the war, merchants in London bought tin from the Straits and sold it to the Americans. Most of this tin was imported into England by a small number of firms, who also purchased metal in the Straits and shipped it direct to the Pacific Coast of America. The prices paid on the London Metal Exchange, however, practically ruled the rates at which tin was dealt in all over the world, but the war caused a large and increasing portion of the trade which had passed between this country and the United States to be conducted directly between the Straits and America.

Recently the exports of Straits tin to America were entirely prohibited, although the export of English tin under license is still allowed. The exports from Great Britain and from the Straits are both controlled by the Tin and Rubber Committee, and as that committee declines to grant permission to export tin from the Straits to America to firms which were not in that branch of business before the war, merchants in London who a couple of years ago had a fair proportion of the whole American trade in their hands find themselves not only debarred from exporting tin from this country to the United States but also from participating in the direct trade between the Straits and America. As a result, the whole of the American trade has been diverted into the control of some half-dozen firms, known in the trade as "importing houses," and to those firms the American customers of the merchants who were engaged in the transatlantic trade must now go if they want tin. Another development in the situation is the fact that two American firms are able to buy direct in the Straits.

Monthly Copper Production for 1918

This table is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo and Katanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	February	March	April	May
Alaska shipments	6,249,456	8,014,059	3,579,920	6,069,642
Arizona:				
Arizona Copper	3,600,000	4,000,000	4,200,000	4,130,000
Cons. Ariz. Smelting	1,780,000	2,270,000	2,000,000	(*b*) 2,000 000
Inspiration	6,200,000	8,750,000	9,350,000	10,250,000
Magma	800,000	900,000	1,050,000	1,000,000
Miami	4,502,905	5,174,365	4,913,590	5,100,408
New Cornelia (*a*)	2,522,000	3,218,000	2,806,000	2,880,000
Old Dominion	2,841,000	2,872,000	2,814,000	3,239,000
Ray	6,860,000	7,585,000	7,350,000	8,120,000
Shannon	788,000	962,000	827,000	802,000
Shattuck Arizona	854,042	1,013,593	842,790	840,999
Other Arizona	28,587,020	29,575,371	25,007,820	.....
California:				
Mammoth	1,370,000	1,620,000	1,530,000	1,328,000
Michigan:				
Calumet & Hecla	12,077,320	13,784,569	11,734,820	.....
Other Lake Superior (*b*)	7,000,000	7,000,000	7,000,000	.....
Montana:				
Anaconda	24,100,000	28,000,000	26,500,000	28,400,000
East Butte	2,324,040	2,395,940	1,811,360	2,208,300
Nevada:				
Mason Valley	1,253,000	1,455,200	1,058,400	1,822.000
Nevada Cons.	6,250,000	6,060,000	6,900,000	7,000,000
New Mexico:				
Chino	5,882,581	7,833,046	6,290,513	5,987,340
Utah:				
Utah Copper	11,900,000	16,380,000	16,690,883	18,200,000
Eastern smelters (*b*)	1,750,000	1,750,000	1,750,006	.....
Total reported	139,491,364	160,613,143	146,007,096	.....
Others, estimated	20,520,000	24,912,025	17,200,000	.....
Total United States	160,011,364	185,525,168	163,207,096	.....
Imports, ore and concentrates, etc	14,996,443	18,392,301	12,047,453	.....
Imports in blister, etc.	41,016,225	36,514,548	31,294,232	.....
Grand total	216,024,032	240,432,017	206,548,781	.....
British Columbia:				
Canada Copper Corpn.	336,000	.....	.....	.....
Granby Cons.	3,843,686	3,807,600	3,689,982	.....
Mexico:				
Boleo	1,576,400	1,631,500	1,818,880	.....
Cananea	3,960,000	4,480,000	4,100,000	4,100,000
Other Foreign:				
Braden	4,754,000	5,248,000	4,722,000	6,758,000
Cerro de Pasco	5,332,000	6,966,000	5,952,000	6,166,000
Chile	6,326,000	10,192,000	7,770,000	.....
Katanga	2,645,520	3,086,440	4,695,798	.....

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated.

The production of the United States by months since the beginning of the year was as follows:

	1918
January	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production for February, March, April and May was 5,888,000, 5,772,000 4,794,000 and 3,404,000 lb., respectively.

Editorials

The War Industries Board

THE War Industries Board has been reorganized, by order of the President, as an independent entity, with powers corresponding to those outlined some time ago in a letter by the President to Mr. Baruch. The recent working of things in Washington, especially with respect to the metals, has been complicated and difficult to understand. The War Industries Board fixes prices by "agreement." There is no legal authority for price-fixing except for wheat and coal (under the Lever act), but there are plenty of big sticks in the shapes of licenses, priority orders, shipping permits, etc., to make producers "agree," so it comes to the same thing.

The War Industries Board is supposed to buy for the Allies, and apparently it does arrange for their copper and steel, but apparently they buy lead and spelter independently. American Army and Navy orders for copper and lead are placed with the producers at the prices arranged by the War Industries Board, but their purchases of spelter are negotiated by themselves, usually by captains and lieutenants in the case of the Army. Some day it will be appreciated that the bugaboo of profiteering, in so far as the metal producers are concerned, was a very disastrous conception.

Some day, too, we hope that military men will be divorced from the idea that they ought to be merchants and manufacturers. Their business is to fight, just as that of a baseball team is to play ball. The baseball team buys its bats and balls, masks and mitts, and does not think it has to make them, much less to purchase the raw material. We wonder if the War Industries Board, under the new Presidential order, will become a real munitions department.

Government vs. Corporations.

MUCH as we dislike the use of the word efficiency, we are nevertheless beginning to realize in an overwhelming manner that true efficiency is a most necessary asset to the nation's well-being and existence. Germany has taught us many things concerning the benefits of organization in the business of war, and though we feel that certain adaptations of our enemy can be purged, there are various ways in which we have benefited by her example.

Fundamentally the Government is a business, and is to be conducted along business lines, so that is is only natural that the methods and ideas developed by big business are examples which may well be imitated. And big business has been developed through the far-sightedness of able and big men, many of whom are now at the head of things at Washington. They have already demonstrated that their ideas of administration are successful, and in placing the stamp of approval on their accomplishments the nation must realize that these men are merely duplicating or modifying ideas which they have always upheld and practiced in a business way. This one fact alone should bring the realization that corporations are not creatures of mismanagement, but are the result of well-thought-out campaigns which aim at an efficient administration and are examples to be followed rather than condemned. In the case against the United Shoe Machinery Corporation, the dissolution suit was dismissed, and therewith the Government placed its stamp of approval on a well-conducted and efficient business. And we venture to say that similar actions will produce similar results, for the cries of "soulless corporations" are growing less as investigation shows that political spite and venom have no real place in the conducting of Governmental affairs, and that constructive business must go on.

Industrial Housing

THE sudden creation of new industrial communities and the necessity for greatly expanding housing facilities in the near vicinity of manufacturing centers as an outgrowth of war demands have brought into prominence a subject which under normal conditions receives scant attention from engineers and those engaged in planning industrial expansion. A conspicuous example of intelligent planning is to be observed in the new suburb of Duluth, Morgan Park. The town was formed in connection with a new iron and steel manufacturing center established by the U. S. Steel Corporation. It was developed in an orderly and systematic manner; town-planning principles were observed, educational and recreational features were provided, and the houses erected were of a permanent and substantial character.

Though concrete was the chief building material, variety was secured by using both block and stucco construction in different designs. Both in number of rooms and character of dwellings, a generous expenditure resulted in excellent house types. In all, there were 437 dwellings and 36 types of buildings. Of the whole number, there were 125 single dwellings, and the remainder detached flats, double flats or rows of houses. Both high- and low-rental dwellings were provided. The equipment of the individual houses is modern. Ample lawn space is provided.

The club house and its equipment cost $127,000; the recreation grounds $26,000. Opportunities for outdoor sports are afforded on both school and club-house grounds. A modern hospital at a cost of $70,000 is also provided.

We commend the wisdom of those who planned this community of more than 3000 workers. The retention of the title and administration of the town in the company operating the steel plant will insure an efficient and broad handling of the affairs of the community. We need more of such centers, and take pleasure in calling the attention of works managers to this latest effort.

Safety Measures of the Right Sort

FAILURE of a cager in the Sudbury district to pull the chairs on the 11 level of the Mond No. 1 mine resulted recently in an accident, which, fortunately, was without serious results. The cage in one compartment of the shaft had been hoisted to surface, and, after the cager had stated that the chairs were out on the 11 level, the engineer proceeded to lower to the 13 level. When reaching the 11 level, the cage was held by the chairs, so that the piled-up cable dropped into the adjoining compartment and coiled around the other cage, which was just being hoisted. The safety dogs of the cage were also meshed and failed to work when the coiled cable became taut, and the hoisting cable broke. Fortunately the men on the cage received no serious injury, as the coiled cable acted as a brake between the dogs and the guides, and the cage slid slowly down the shaft. The cager was brought before a magistrate, fined $50 and sentenced to three months in jail.

Such occurrences merit the attention of mining men, and especially at this time, when man conservation means so much to the nation. The safety efforts of many companies have done much to eliminate carelessness in mining operations, but punishment of this sort has, we believe, a more lasting effect than mere dismissal or suspension from service, frequently meted out as punishment for similar offenses. Today the latter is insufficient and spells little when work is so plentiful and a job may be had merely for the asking. In this particular instance, as is frequently the case, the offender received no bodily injury, but his carelessness might have resulted seriously, if not fatally, for several. That it did not is indeed fortunate, but the fact lessens in no way the seriousness of the offense, and we can commend the action of the Canadian authorities.

The Recovery of Caved Stopes

IN THIS issue we present the first of a series of articles dealing with the reclamation of stopes that have caved. Ordinarily this would be a difficult subject to treat, inasmuch as caving and the procedure of reopening caved stopes for the continuance of operations offer such a variety of conditions that each must be solved by methods depending upon the ingenuity of the executive staff. In the Cœur d'Alene mines, however, where the veinlike lodes are mined by timber-and-fill methods, and the caving of stopes is of more or less frequent occurrence, considerable experience at reclamation has evolved processes that might well be recognized as having distinctive merits.

Several methods have been developed, depending upon the character of ground in back and walls, dimensions of the cave and other local conditions that constitute governing factors. Mr. Rice, in recognizing the possibilities for application of these methods elsewhere under like or similar conditions, wholly or in part, has classified the reclamation operations, and has given us considerable valuable detail, and, as well, has expounded sound underlying principles that we believe must be understood and considered in the successful solution of problems arising under conditions noted. The subject is undoubtedly of interest to mine operators, not only because of the description of operations in this old and established district, but because of the suggestive value to miners who may be confronted with problems where such ideas may find application or lead to the evolution of new methods.

As in all mining problems, the ultimate solution rests with the man in charge, and it is upon his experience and judgment that the success and safety of mining, which is always attended by more or less hazardous working conditions, depend. It is only by a knowledge of what the other fellow has done under similar conditions that we may hope fully to profit by whatever previous experience has evolved. In mining, probably more than in any other branch of engineering, the essential things to know are possibilities. By this we mean a knowledge of what has been done and what may be expected under extraordinary conditions. For instance, it is useful to know the maximum open spans of roof that have been opened up under known conditions, the greatest heights of vertical and inclined walls that have stood unsupported in mines, and other facts of equal importance, as well as interest, such as the largest surface areas that have been undermined for various depths and the manner of support in each case.

Only by the collection of such data and by classification in a practical form can we profit by the experience of others and avoid the inexcusable blunder of repeating mistakes. We therefore commend this series of papers to all those whose problems involve underground excavations, believing that in the mining practice of the Cœur d'Alene there is much of general interest and practicable value.

Make Every Stroke Count

NECESSARILY, in the mining industry, so vitally important to the winning of the war, the embarrassments attending the period of mobilization and business readjustment have been especially trying and difficult. Many thousands of expert mine, mill and smelter men have enlisted or been taken by the draft, and it has not been possible to fill their places with substitutes of comparable ability and experience. Though like conditions have no doubt confronted other industries, few, if agriculture be excepted, have been so hard hit as mining and allied activities. The situation therefore imperatively demands that full and complete service and advantage be exacted from such resources of men and material as are available. Three methods suggest themselves:

1. Elimination of all waste. Clean up while speeding up. Let no valuable equipment remain idle that by the exercise of diligence might be put to work.

2. Look to the neglected tailings dump, and to perhaps forgotten reserves of lean ore piled on the surface or in abandoned stopes and other workings. Investigate old mines. The science of metallurgy has made notable progress recently, and new processes and methods are winning values from ores and slimes but yesteryear considered too lean to treat.

3. Institute efficiency methods *at the top*. Instil enthusiasm and patriotic ardor into your business. Example is more potent than time clocks and stop-watches

can ever be made to be. In office, mill, smeltery and mine a spirit of interest, coöperation and unified effort to a common end—costing nothing, but beyond price—will accomplish more than all the paper systems ever created.

About Washington, price-fixing, embargoes, etc., one word: A condition—not a theory—confronts the industry. There is lack of agreement as to the wisdom of certain policies. There was bound to be. The situation must work itself out. And while it is working itself out, patience and restraint, and devotion to our country and our cause, must be cultivated as never before. Let no one doubt that Washington hopes and earnestly strives to achieve justice toward all legitimate business, although its steps are not always well directed.

Meanwhile, patriotic Americans will produce to the utmost those things known to be essential, confident that honesty, wisdom and commonsense—and time—will solve the problems now perplexing, irritating and, in some cases, retarding a great and necessary industry.

Chino Copper Co.—Erratum

In our abstract of the 1917 report of the Chino Copper Co. in the *Journal* of May 11, the figure $567,160.28 as representing the value of gold and silver production is in error. This should read $56,160.28.

BY THE WAY

The German depredations in Belgium have a double aim: To furnish material for the Kaiser's army and to ruin Belgian industry. In order to carry out this second purpose, says a bulletin of the Committee on Public Information, the invaders have not hesitated to steal manufacturing secrets. We still remember how the secret of the manufacture of artificial silk was appropriated at the factory at Obourg by a German rival, with the consent of the higher authorities at Berlin. Now it is announced that they have removed from the great Cockerill steel works at Serning not only the entire equipment, leaving only the walls of the buildings, but also the plans, designs, archives, and secrets of manufacture.

Sir Robert Hadfield, at the Society of British Gas Industries, according to the London *Mining Journal*, showed speciments of steel—parts of one of the shells fired by the Germans into Paris—which had been in the air at a height of 20 miles. The weight of the shell, he said, was estimated at 350 lb. In order to get the enormous range required, the muzzle velocity of the gun must be about 4600 ft.-sec., and the pressure inside the gun was about 28 tons per square inch. At the muzzle of the gun a shell at that velocity would perforate 6 ft. of wrought iron, or about 54 in. of mild steel, and when the shell left the gun it would have locked up in it as much energy as our 15-in. shell. Sir Robert Hadfield said there was nothing extraordinary in this accomplishment, as guns of double the energy have been constructed, and the late Sir Andrew Noble produced a velocity of 5000 foot-seconds.

Labor on the Mother Lode is no joke. But the apparent unwisdom of a recent inquiry by a New York mining syndicate makes humorous reading. The syndicate, in a businesslike manner, inquired as to the situation in Calaveras County: "What is the mining man-power of your county? Can you guarantee, say, 100 practical miners on a two months' notice?" The New York syndicate should have been reading the *Journal* instead of writing letters. Mother Lode mining men do not close down producing mines nor delay development of promising properties when there is a mining man-power equal to 100 men within two months' notice. Operating mines do not voluntarily increase wages at a time when the purchasing value of gold is steadily diminishing, if there is an abundance of labor.

A certain mining school sent out a number of students each year to absorb some of the many details of practical mining in the Michigan iron districts. The trip usually included a visit to the famous X Mine, where the party, escorted by the Cornish mine captain, were taken underground. It happened that a number of years before a drift was being driven on one of the lower levels when a vug was encountered, and the rush of water was such that it was necessary to bulkhead the drift some distance back, put up a raise and drift over to a point where the cavity was again encountered at a higher level but without any rush of water. Concrete was then poured into the opening, the water pumped out and work on the lower drift resumed. The concrete that had been poured in the vug was struck in the driving of the drift and, for a short distance, formed one of the sides of the tunnel. The difference in the structure of the enclosing walls was such as to be hardly noticeable to the ordinary observer, but to the mine captain, who loved his little joke, it was of more than passing interest. " 'Ere, naow, Professor, is remarkable h'accurance, an' I'd bloody well like to naw wot they young fellers think on it." And, pointing to one wall, a prospective engineer informs him that the rock is plainly igneous, while that on the other side appears to be sedimentary. "So I 'as been tol', m' son. But see 'ere: 'Ow is it, naow, that down 'ere in the bowells of Mother H'earth, where all about is this 'ere h'igneous rock, it 'appens that this bloody bit o' sedimentary rock is foun'? 'Ow dost thee h'explain it?" And Simpkins, pride of the class in applied and mining geology, proceeds to explain that phenomenon of nature. After perspiring heavily for twenty minutes, Simpkins feels that he has acquitted himself nobly and that the mine captain must, of course, understand now just how it all happened. "Very good, m' son," says the captain, with an approving nod. "An' naow 'ere, I'd like to h'ask one moor question. 'Ow ol' dost thee suppose that there bloody san'-rock be?" "Well, Captain"—Simpkins by this time feels that he is heights above the rest of the class—"I should say in the neighborhood of several million years." "No, m' son; no. I can't very well agree with thee. Why, dam-me, young feller, we brought down they bloody concrete six year ago."

NEW PUBLICATIONS

Maps and Sections to Accompany Report on the Geology and Ore-Deposits of Meekatharra Murchison Goldfield. Plates I to XXV. Bull. 68, Western Australia Geological Survey, Perth, West Australia.

Manufacturing Opportunities in the State of Washington. By Harry F. Giles. 6 x 9, pp. 240, illus., paper. State Bureau of Statistics, Olympia, Wash.

Combustion of Coal and Design of Furnaces. By Henry Kreisinger, C. E. Augustine, and F. K. Ovitz. Pp. 144, illus. Bull. 135, U. S. Bureau of Mines, Washington, D. C.

The Use of Permissible Explosives in the Coal Mines of Illinois. By James R. Fleming and John W. Koster. Pp. 110, illus. Bull. 137, U. S. Bureau of Mines, Washington, D. C.

Mineral Springs of Canada: Part I, The Radioactivity of Some Canadian Mineral Springs. By John Satterly and R. T. Elworthy. Pp. 60, illus. Canada Department of Mines, Mines Branch, Ottawa, Canada.

Powdered Coal as a Fuel. By C. F. Herington. 6 x 9¼, pp. 211, illus.; $3. D. Van Nostrand Co., New York.

A general treatise on an important subject. It is well written and illustrated.

Catalog and Table of Contents of the Michigan Geological and Biological Survey, With List of Publications of the U. S. Geological Survey Relating to Michigan, 1838-1917. 6¼ x 9, pp. 30, illus., paper. Michigan Geological and Biological Survey, Lansing, Mich.

Mineral Resources of Michigan, With Statistical Tables of Production and Value of Mineral Products for 1916 and Prior Years. Prepared under direction of R. C. Allen. 6 x 9, pp. 291, illus. Publication 24, Geological Series 20. Michigan Geological and Biological Survey, Lansing, Mich.

Estadistica Minera en 1916. By Carlos P. Jimenez. Pp. 221. No. 86, Boletin del Cuerpo de Ingenieros de Minas del Peru, Lima, Peru.

A bulletin issued by the Peruvian Bureau of Mining Engineering and dealing with mineral statistics and mining in Peru during 1916.

Lubricating Engineer's Handbook. A Reference Book of Data, Tables and General Information for the Use of Lubricating Engineers, Oil Salesmen, Operating Engineers, Mill and Power Plant Superintendents and Machinery Designers, etc. By John Rome Battle. 6 x 9, pp. 333, illus. J. B. Lippincott Co., Philadelphia, Penn.

The Chemist's Pocket Manual: a Practical Handbook Containing Tables, Formulas, Calculations, Information, Physical and Analytical Methods for the Use of Chemists, Chemical Engineers, Assayers, Metallurgists, Manufacturers and Students. By Richard K. Meade. 4 x 6¼, pp. 530, illus.; leather. Third edition. Chemical Publishing Co., Easton, Penn.

American Lubricants From the Standpoint of the Consumer. By L. B. Lockhart. 6 x 9, pp. 236, illus.; $2. Chemical Publishing Co., Easton, Penn.

A handy book of moderate size that thoroughly covers the field and is of value not only to the users of lubricants but to the engineer who may have to be informed about lubricants or who may be required to draft specifications for lubricating oils.

Chemical French: An Introduction to the Study of French Chemical Literature. By Maurice L. Dolt. 6 x 9, pp. 398; $3. Chemical Publishing Co., Easton, Penn.

The subject of scientific German is an old one in American college curricula, but it is seldom that the scientific side of other foreign languages receives attention. The book under review deals with scientific French as applied to chemistry. It is interesting and thorough, and worth the attention of students of chemistry.

The Geology of the Oamaru District, North Otago, Eastern Otago Division. By James Park. Pp. 124, illus. Bull. 20 (New Series.) New Zealand Geological Survey, Wellington, New Zealand.

The area described is at Oamaru, on the southeast coast of South Island, New Zealand, and lies south of Waitaki River and northeast of Dunedin. The geological epochs are Recent and Younger Pleistocene, Older Pleistocene and Miocene.

The Chemical Analysis of Iron: A Complete Account of All the Best-Known Methods for the Analysis of Iron, Steel, Pig Iron, Alloy Metals, Iron Ore, Limestone, Slag, Clay, Sand, Coal and Coke. By Andrew Alexander Blair. 6 x 9, pp. 318, illus. Eighth edition. $5. J. B. Lippincott Co., Philadelphia, Penn.

The eighth edition of this well-known book is up to former standards. Much has been rewritten, and in its present form it is one of the best handbooks for the steelworks chemist.

Reports of the Progress of Applied Chemistry, Vol. I, 1916. Issued by the Society of Chemical Industry. 5¾ x 8½, pp. 335, illus.; 3s. to members; 5s.6d. to non-members. Society of Chemical Industry, London, England.

The contents are: Fuel and Heating; Gas-Destructive Distillation; Tar Products; Mineral Oils; Coloring Matter and Dyes; Acids, Alkalis, Salts, etc.; Glass and Ceramics; Building Materials; Oils, Fats and Waxes; Paints, Pigments, Varnishes and Resins; India Rubber, etc.; Leather and Glue; Fermentation Industries; Water Purification and Sanitation; Fine Chemicals, Medical Substances and Essential Oils; Photographic Materials and Processes.

Finding and Stopping Waste in Modern Boiler Rooms, Vol. II. A Reference Manual to Aid the Owner, Manager and Boiler-Room Operator in Securing and Maintaining Plant Economy. 4¾ x 7, pp. 274., illus.; $1. Harrison Safety Boiler Works, Philadelphia, Penn.

This is an excellent little book. It is described by the publisher as a reference manual to aid the owner, manager and boiler-room operator in securing and maintaining plant economy. Sections are devoted to fuels, including classification of coals, coal sampling, purchase of coal under specifications, storage, oil fuels and gaseous fuels; combustion; heat absorption; boiler efficiency and boiler testing; boiler-plant proportioning and management.

The Principles, Operation and Products of the Blast Furnace. By J. E. Johnson, Jr. 6 x 9, pp. 551, illus. McGraw-Hill Book Co., New York.

This is a good book. It will be read not only by students, metallurgists, chemists, managers of iron and steel plants, but by foremen and workers in blast-furnace plants. The author has made an exceedingly happy combination of theory and practice. He treats the subject in three main divisions, Principles—Operation, Commercial Consideration, and the Future Possibilities. Each division is thoroughly but briefly treated.

Mr. Johnson's work on "Blast Furnace Construction in America," in conjunction with this book, represents an unusually comprehensive review of the field of pig-iron production.

The Mining Manual and Mining Year Book. By Walter R. Skinner. 5 x 8½ in.; pp. 1120; 17s. 6d. Post free in England, 18s.; post free abroad, 19s. Walter R. Skinner, London, E. C., England.

The 1918 edition of this well-known reference book was published in March, and the publisher is to be congratulated on its prompt appearance and his enterprise in getting out such a work, in spite of labor difficulties, high costs, paper shortage, and other adverse conditions. It is not remarkable that it was found necessary to make a small increase in the price. About 1500 mining companies, operating in all parts of the world, are covered, the data regarding capitalization, officials, operations, financial positions, etc., being brought up to date. The usual lists of directors, secretaries, engineers and mine managers are included; also the supplementary index of dormant companies or those that have ceased to be of public interest; the crushing tables and output of the principal gold mines; and the dictionary of mining terms.

Personals

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

J. R. Finley, who has been in the West, has returned to New York.

Simonds & Burns, mining engineers of New York, have dissolved partnership.

A. P. Allen is with the engineering department of the Magma Copper Co., at Superior, Arizona.

Willis Lawrence is mining engineer and general superintendent of mines for the Columbia Consolidated Mines Co., Washington, Nevada County, California.

Benjamin G. Harmon, general manager of the Northern Light Mining and Milling Co., of Wallace, Idaho, has entered the Ordnance Department of the Army.

R. E. Parks, assistant general manager of the Aluminum Co. of America, Maryville, Tenn., has been promoted to the position of general manager of the company's plant at Vadin, North Carolina.

L. H. Goodwin, formerly manager for the Ely-Copperfield Associates, at West Fairlee, Vt., has joined the staff of the "Engineering and Mining Journal." He is succeeded by **K. A. Schleifer.**

H. H. Hodgkinson has resigned his position as superintendent of the Scrub Oak mines of the Wharton Steel Co. and is now general superintendent of the Moose Mountain, Ltd., Sellwood, Ont., Canada.

Percy Hopkins, of the Ontario Bureau of Mines, is making a geological survey of Coulson Township, which adjoins Munro Township, and the Painkiller Lake district, where prospecting is being actively carried on.

Roger Taylor has been appointed to the Ordnance Reserve Corps, and has therefore severed his connection with Frederic deP. Hone & Co., of New York, of which firm he has been a member for the past 2½ years.

William M. Burton was the recipient of the Willard-Gibbs medal for 1918, which was conferred on him on May 17 by the Chicago section of the American Chemical Society for distinguished work in petroleum chemistry.

D. G. Evans, mining and civil engineer of Denver, Colo., has severed connection with the F. A. Fair Engineering Association and will devote his time to private practice. The Denver office of the company will be closed.

Prof. C. W. Drury, of Queen's University, Kingston, Ont., has been awarded the degree of Ph.D. by Columbia University. His treatise on the "Occurrence, Metallurgy and Alloys of the Metal Cobalt" is being published by the Ontario Bureau of Mines.

E. H. Hamilton, formerly metallurgical manager of the Trail smeltery of the Consolidated, Mining and Smelting Co. of Canada, has been made smeltery superintendent of the Midvale, Utah, plant of the United States Smelting Co. to succeed **L. D. Anderson.**

Howard Waldo Kitson, of the editorial staff of the "Engineering and Mining Journal," has enrolled as provisional ensign, (Engineering) U. S. N. R. F., to proceed to the U. S. Naval Academy at Annapolis, Md., for four months' training preparatory to active service.

Charles Chamberlain, of Winnipeg, has organized and equipped an exploration party of eight, who have gone north to explore the north shore of Hudson Bay, where valuable mineral deposits are believed to occur between Port Nelson and Chesterfield Inlet. Mr. Chamberlain is 73 years old.

Orville R. Whitaker, who conducted the recent investigation into the smeltery schedules in force in Colorado, has been appointed by the Canadian government to be an independent judge on a commission to investigate the new schedules of the Consolidated Mining and Smelting Co. of Canada, operating the Trail smeltery. The appointment of this commission followed representations from the mining men of British Columbia that the new rates would mean wholesale closing of mines in their province.

Dwight E. Woodbridge has resigned as consulting engineer of the Big Ledge Copper Co., of Arizona, and **W. W. Litzen,** consulting engineer of the Consolidated Interstate-Callahan Mining Co., of Wallace, Idaho, has been appointed to the place. Mr. Litzen for more than 10 years prior to his present position was consulting engineer and geologist with the Anaconda Copper Mining Co. Interests identified with the Consolidated Interstate-Callahan Co. recently obtained control of the Big Ledge company, and the appointment of Mr. Litzen is the first step of the new interests in the latter company.

William G. Mathias, general superintendent of the Tennessee Coal, Iron and Railroad Co.'s works at Ensley, Ala., has been appointed assistant to the vice president, with offices in the Brown-Marx Bldg., Birmingham. He is succeeded by **Karl Landgrebe,** formerly assistant general superintendent. **A. W. Allen,** former superintendent of openhearth furnaces, has been appointed assistant general superintendent to succeed Mr. Landgrebe. **C. J. Barr,** general superintendent of Fairfield works, has been made assistant to the vice president of the Fairfield Steel Co., Birmingham, a subsidiary of the Tennessee company. **G. A. Miller** succeeds Mr. Barr.

Obituary

Milton E. Pinney, one of the best known of the old-time mining men of the West, died at his home in Oakland, Calif., on June 1, aged 82 years. He is said to have owned the first stamp mill installed in the Black Hills region of South Dakota.

Societies

American Chemical Society will hold its annual meeting on Sept. 10 to 13 in Cleveland, Ohio.

National Exposition of Chemical Industries (fourth) will be held in New York on Sept. 23 to 28 at the Grand Central Palace.

Chemists' Club elected the following officers for the current year at its annual meeting in New York: President, Ellwood Hendrick; vice presidents, Charles H. Herty (resident) and Charles L. Parsons (nonresident); secretary, J. R. M. Klotz; treasurer, H. M. Toch; and trustees, T. R. Duggan and H. G. Mackenzie.

American Institute of Chemical Engineers will hold its summer meeting at Gorham and Berlin, N. H., June 19 to 22, 1918. Headquarters will be at Mt. Madison House, Gorham. The program of papers includes the following: "Chemical Stoneware and Its Properties," A. Malinovszky; "Expansion of the Coal-Tar Industry in the United States," F. E. Dodge; "Expansion of the Byproduct Industry of Coal and Water-Gas Plants in the United States," W. M. Russell; and "Multiple Tangent System for the Manufacture of Sulphuric Acid," L. A. Thiele. Several plants of the Brown company will be visited.

Duluth Engineers' Club. The engineers of Duluth, Minn., took the first step to form a club at a dinner on May 20 at the Kitchi Gammi Club, Duluth. Members of the four national engineering societies in the Duluth district were invited to be present and take part in the discussion. The call was sent out by a committee, consisting of W. H. Hoyt, W. B. Patton and W. H. Woodbury, which had been appointed by the Duluth Association of Members of the American Society of Civil Engineers to develop a plan for an engineers' club. At the dinner, which was attended by about 70 engineers, a joint committee of eight representative engineers was appointed as follows to carry out the plan: American Institute of Electrical Engineers, W. N. Ryerson, chairman, Walter F. Schwedes; American Institute of Mining Engineers, Edwin J. Collins, Walter C. Swart; American Society of Mechanical Engineers, Oscar B. Bjorge, W. H. Gallagher; American Society of Civil Engineers, W. H. Hoyt, W. H. Woodbury.

American Mining Congress. An Oklahoma chapter is being organized. John T. Burns, the western secretary, has been coöperating with the organization committee composed of P. C. Dings, Ardmore, chairman; Edgar Z. Wallower, Oklahoma City, secretary; Wirt Franklin, Ardmore; J. R. Cottingham, Oklahoma City; R. J. Tuthill, Miami; John H. Capelli, Joplin; C. F. Colcord, Oklahoma City; Charles N. Gould, Oklahoma City; Dorset Carter, Oklahoma City; D. J. Jorden, Oklahoma City; J. K. Dale Shafer, Oklahoma City; Victor Rakowsky, Joplin; Charles H. Taylor, Oklahoma City; Marshall D. Draper, Tarr River; R. T. Price, Muskogee; W. A. Evans, McAlester; D. C. McAlpine, Halleyville; C. F. Dike, Century; Otto Ruhl, Joplin; O. F. Brinton, Century; W. B. Shackelford, Joplin; Judge J. J. Shea, Tulsa; and Frank Phillips, Bartlesville. More than 100 zinc and lead operators have already met in Picher to consider the matter, and a special zinc committee, of which Victor Rakowsky is chairman, is at work among the zinc men. The action of the Administration in deciding that there must be a new war-profits tax law, a new form of income tax and added revenue measures is the impetus back of the organization of the Oklahoma chapter.

Industrial News

Sullivan Machinery Co. has established a branch office at Washington, D. C., Room 210, Union Trust Bldg., at 15th and 8th Streets; long distance telephone number, Main 2800. Ralph T. Stone will have charge.

Denver Fire Clay Co., Denver Colo., has recently been reorganized as a result of the purchase of the entire interest held by Willis W. Case, Jr., by Mrs. Leonora Bosworth, wife of the founder of the business, and her three sons, Arthur H. Bosworth, senior member of the firm Bosworth, Chanute & Co., Denver; Harold O. Bosworth, of New York, and Capt. Robert B. Bosworth, an attorney of Denver now in the American military service in France. The officers of the new company are as follows: President, Harold O. Bosworth; vice president, J. Claire Evans; and secretary-treasurer, Herman Landenberger. George W. Lindsay will be factory superintendent.

Trade Catalogs

"Economy in Cold Sawing." Earle Gear and Machine Co., Philadelphia, Penn. Booklet. Pp. 16; 4 x 9 in.; illustrated. A description with specifications of the "Lea Simplex" cold cutting-off saws.

Blasting Caps and Electric Blasting Caps. Aetna Explosives Co., Inc., 120 Broadway, New York. Booklet. 3½ x 6 in. Pp. 12. Illustrated. Descriptive of "Lion" brand caps, with uses, composition, strength, etc.

Nonpareil Cork Covering. Armstrong Cork and Insulation Co., Pittsburgh, Penn. Folder, 3½ x 6¼ in. Under the title of "Satisfaction or ——" is discussed the problem of supplying drinking water to employees in a sanitary and economical way.

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.

Aluminum Alloy—Charles Vickers, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,264,459; Apr. 30, 1918.)

Chilean Mill. Charles C. Lane, Los Angeles, Calif., assignor to Lane Mill and Machinery Co., Los Angeles, Calif. (U. S. No. 1,264,532; Apr. 30, 1918.)

Concentration—Mineral Separator. Willon Perceval Alderson, Timmins, Ontario, Can. (U. S. No. 1,264,135; Apr. 30, 1918.)

Concentration—Ore Washer and Separator. James M. Longan, Chicopee, Kan., assignor of one-half to Wallace R. Wright, Chicopee, Kan. (U. S. No. 1,264,667; Apr. 30, 1918.)

Hoisting—Means for Manipulating Skips or Buckets. Thomas Garmondsway Wrightson and Justus Magnus Ringquist, Thornaby-on-Tees, England, assignors to Head, Wrightson and Co., Ltd., Thornaby-on-Tees, England. (U. S. No. 1,264,739; Apr. 30, 1918.)

Lithopone—Method of Rendering Lithopone Light-Proof. Gilbert Rigg, Palmerton, Penn., assignor to the New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,260,811; Mar. 26, 1918.)

Petroleum, Recovery of from Oil Sands. Frederick Squires, Marietta, Ohio, assignor to Walter Squires, Zanesville, Ohio. (U. S. No. 1,263,618; Apr. 23, 1918.)

Phosphate, Iron—Process of Producing Iron Phosphide from Iron Phosphatic Material. Hyleman Alison Webster, Columbia, Tenn., assignor to John J. Gray, Jr., Rockdale, Tenn. (U. S. No. 1,264,237; Apr. 30, 1918.)

Rock Drill—William A. Smith, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,264,217; Apr. 30, 1918.)

Editorial Correspondence

SAN FRANCISCO—June 8

Yuba Manufacturing Co. is removing main offices from San Francisco to Marysville. Formerly known as the Yuba Construction Co., it has for many years been the chief builder of gold dredges of the California type. Company has completed Yuba No. 17 dredge for the Yuba Consolidated Gold Fields in the Yuba Basin field at Hammonton, which is the second 18-cu.ft. bucket, all-steel dredge and is practically of the same dimensions and design as Yuba No. 16, but is equipped with a single stacker, whereas Yuba No. 16 has two stackers.

Requisition of Platinum, iridium and palladium by the Government was made public in California through a notice received by S. B. Gracier and other dealers in these and other minerals and metals. All metals mentioned now in hand and remaining June 30, 1918, will await order of the War Industries Board. Mr. Gracier and other San Francisco brokers have been advised that whatever of these metals may be taken by the Government will be paid for at the set prices. California is a large producer of platinum, both in separate occurrence and in association with other minerals. In most instances the occurrence is in the black sands of the rivers and beaches, and it has also been observed in the concentrates from the quartz mines. The commercial product comes from the dredges in Butte, Calaveras, Merced, Sacramento, Stanislaus and Yuba counties and the hydraulic and surface-sluicing placer mines of Del Norte, Humboldt, Nevada, Siskiyou and Trinity counties.

A Topographical and Geological Map of Inyo County, recently issued by the State Mining Bureau, is announced as ready for distribution, by Fletcher Hamilton, state mineralogist. A report describing in detail the mineral resources of the county is also ready for distribution. Inyo is one of the most interesting counties in the state, in topography as well as in mineralogy. It contains an area of 10,019 square miles and an estimated population of 7500. The topographical interest is found in the fact that within the county are the highest and lowest points of altitude in the United States: Mount Whitney, which has an elevation of 14,501 ft. above sea level, and Death Valley, which sinks 280 ft. below sea level. The interesting mineral features include the Cerro Gordo silver-lead-zinc mines; Darwin silver-lead mines; Death Valley borax mines, forming a part of the extensive holdings of the Pacific Borax Co.; tungsten deposits in the Bishop region; the potash deposits forming a part of the Searles Lake formation; the soda and other chemical deposits of Owens Lake; the salt production of Saline Valley, and the large copper deposits lying in the extreme eastern edge of the county. The map is lithographed in 17 colors. The price is 60c.; the total price of map and report, $1.25. Application for map and report may be addressed to the State Mining Bureau, Ferry Bldg., San Francisco.

DENVER—June 8

Deferred Payment of income and excess profit taxes has been agitated by certain mining men of Colorado, but this movement appears to be ill advised, since these payments are required to meet Government obligations. Secretary McAdoo has issued a request that these payments be made promptly in June, as provided by the law.

The Lever Bill, under which the oil industry is operating, will probably put a stop to the practice of profiteering by jobbers in certain oil-well supplies, the prices of which have been advanced over 300% in some cases. The embargo on exportation of casing and wire cable which has been declared by the Government will foster oil production and help to maintain an output sufficient to meet requirements.

Changes in Mining Laws as proposed by Senator Henderson, of Nevada, may not be considered by Congress until war legislation is disposed of, which means that the bills that he has introduced are unlikely to receive serious consideration during the present session. One of Senator Henderson's bills provides for a commission of three experienced mining men, authorized to prepare amendments to Federal mining laws and to recommend to Congress such changes as they might deem advisable. Another bill would amend the present law relative to extralateral rights and abolish the apex law.

Petroleum War Service Committee at Washington has made the following appointments for a committee of the Rocky Mountain district: Henry M. Blackmer, president of the Midwest Refining Co., chairman; Fred W. Freeman, Texas Co.; F. B. Hurley, secretary Ohio Oil Co.; E. T. Clark, president Northwestern Refining Co.; Martin McGrath, director E. T. Williams Oil Co.; B. B. Brooks, president Consolidated Realty Oil Co.; E. T. Wilson, president of the Continental Oil Co.; A. H. Richardson, president Standard Oil Co. of Nebraska; and John C. Howard, Utah Oil Refining Co. As chairman of this committee, Henry M. Blackmer, of Denver, becomes a member of the Petroleum War Service Committee.

Argo Reduction and Ore Purchasing Co., at Idaho Springs, has just issued a new schedule for the purchase of ores, f.o.b. mill, Idaho Springs.

FOR COPPER AND SILICEOUS ORES

Gold: $19 per oz. if 0.05 to 1.50 oz. per ton; $19.50 per oz. if over 1.50 oz. per ton.

Silver: If 1 oz. to 10 oz. per ton, deduct one-half oz. from assay and pay for remainder at 95% of New York quotation on date of assay. If over 10 oz. per ton, pay for 95% of New York quotation on date of assay.

Copper: For dry copper (one unit off for wet) 6c. per lb. off New York quotation for casting copper, which is ½c. less per lb. than electrolytic cathode quotation.

Lead: Pay 25c. per unit flat when ore assays over 3% dry (1.5% off wet.)

Zinc: No pay, no penalty.

TREATMENT, SAMPLING AND FREIGHT CHARGES

Up to $8 gross value per ton	$4.00
Over $8 to $11	5.00
Over 11 to 14	5.25
Over 14 to 20	5.50
Over 20 to 26	6.00
Over 26 to 30	7.00
Over 30 to 35	7.50
Over 35 to 37	8.00
Over 37 to 40	8.50
Over 40 to 45	9.00
Over 45 to 50	9.50
Over 50	10.50

FOR LEAD ORES

Gold: $19.50 per oz. if 0.05 oz. or over per ton.

Silver: 95% of New York quotation date of assay.

Copper: As above.

Zinc: No pay, no penalty.

Lead: Dry assay, 1.5% off wet. Prices per unit based upon quotation of $4 per 100 lb., 1c. up or down for each change of 5c. in quotation which shall be 90% of the New York sales price of the A. S. & R. Co. on date of assay, when price does not exceed $4 per 100 lb.; when it does exceed $4, add to $3.60 per 100 lb. three-fourths of the excess of New York sales price above $4.

Per Cent of Lead Gross Value Per Ton. Inclusive	Price Per Unit Cents	Treatment, Freight and Sampling Charges Per Ton
Over 3 to 5	29⅓	$9.00
Over 5 to 10	39⅓	8.50
Over 10 to 15	42⅔	7.50
Over 15	44⅔	7.00

All treatment charges include freight and sampling except transportation from mine to mill, and upon lots of less than seven tons a flat sampling charge of $5 will be made. Upon classes of ore, advances in treatment charges will be equalized with advances in gross value, so that a higher-grade ore will net the mine not less than a lower-grade ore. The schedule figuring best for the shipper to be used in all cases. The right is reserved to refuse to receive ores which are not applicable to the treatment process used at the mill. This schedule cancels all previous schedules and is subject to change without notice.

SALT LAKE CITY—June 7

Utah Council of Defence has appointed a committee on minerals to aid in the search for and production of minerals such as manganese, chromite, molybdenite and tungsten. The committee consists of George H. Dern, chairman: Victor C. Heikes, Edward R. Zalinski, Ernest Gayford, and A. G. Mackenzie.

Payment of Wages by the Knight properties in Tintic—Iron Blossom, Colorado, Dragon Consolidated, Tintic Drain Tunnel and others—will remain on a monthly basis, as a vote taken among the men showed them by a three-fourths' majority to be in favor of this system. Most of the men are loyal to the companies, and the greater proportion of the force continues at work.

First Unit of Ohio Copper's new flotation plant at Lark was placed in operation May 10 and the second unit begun a few days later. A third section is to be started this month, and the fourth and fifth units were to be in operation in July or August. Each unit has a capacity of 600 tons, or a total of 3000 tons daily for the mill. The two units are at present treating about 500 tons each, and two of the old table concentrating units are also used by the company and treat 2400 tons daily. New concrete foundations of the new flotation sections have been strengthened.

The Strike on the 1700 level of the Ontario Silver, at Park City, is of especial interest in that the wall rock is, in part, the lower Carboniferous Pennsylvanian underlying the Ontario quartzite. Ontario No. 3 shaft and older workings were in quartzite to the 1660 level. Heretofore practically all orebodies of any importance at Park City have been found in the upper limestone beds which lie directly on top of the Ontario quartzite, with the exception of the Ontario vein, which was a fissure in the quartzite, and it may be that ore will be found at a new or lower horizon than has yet been known. At any rate, the new find indicates that these lower limestones, which outcrop on the east side of the camp and dip under it, may be worthy of more extensive projecting at depth. Heretofore, most of the work done on the east side by the New York, Wabash, Naildriver and others, has been in the upper beds of the limestone in question and, while some ore has been extracted, none of the bonanza orebodies of the camp have been found here to a depth 600 ft. from the surface.

GLOBE, ARIZ.—May 31

The Famous Anti-blacklist Law of Arizona has been declared unconstitutional by Judge G. W. Shute of the Superior Court of Gila County. In a case of the state against J. J. Keegan, secretary of the Globe Loyalty League, Keegan was accused, while acting as employment agent for mining corporations, of asking applicants questions prohibited by the Arizona statute. This statute, passed at the demand of the labor unions, sought to make criminal the questioning of any applicant concerning prior services, capability or society affiliations. Keegan's arrest was on complaint of the local miners' union, which had insisted that the Inspiration Mining Co., especially, had not carried out the spirit of an agreement with the Presidential Mediation Commission. The anti-blacklist law was passed by the first state Legislature, at the same time as the 80 per cent. law, short-train, and electric-headlight laws, the latter being sustained on submission to a referendum vote. The 80 per cent. law has been killed on appeal to the Supreme Court.

HOUGHTON, MICH.—June 10

The Shutting Down of Smaller Mines which are producing at a loss with the price of copper fixed at 23½c. is under consideration. Such a step would release miners for work in the larger and richer mines, but before any such decision is reached there is to be a meeting of the local managers of the smaller mines with the presidents of the corporations, and the matter will be taken up with Washington authorities. Local representatives who attended the recent price-fixing meeting at Washington are of the opinion that there is no hope of any change of attitude in official circles there,

and that the smaller high-cost mines will have to suffer. In fact, they express the opinion that all exploration work may be suspended during the war and the men be put to work on the direct task of increasing the output of copper.

JOPLIN, MO.—June 8

The Essential Producing Co. has leased 600 acres in the Chelsea-Nowata oil field. With the oil and gas secured there, it purposes to operate a zinc smeltery, sheet metal works, rolling mill and a wire mill. The company has purchased several tracts in the Joplin district, one at Waco, Mo., equipped with a 150-ton mill, and a lease between Hockerville and St. Louis, Okla. These will be developed immediately. A small town is to be built near the smeltery. Dr. W. B. Hudson, of Yale, Okla., is president, and C. R. Hemmenway is general manager.

Oklahoma Zinc Mine and Oil Operators have been asked to support a movement to organize in the western states for the betterment of their industry through the American Mining Congress. An organization committee, with headquarters at Oklahoma City, has been appointed. P. C. Dings, of Ardmore, is chairman, and Edgar C. Wallower, of Oklahoma City, is secretary. Among mining men of the district on the organization committee are Victor Rakowsky, John H. Capelli, and W. B. Shackelford, of Joplin; Marshall D. Draper and O. F. Brinton, of Baxter Springs; C. F. Dike, of Century; and R. J. Tuthill, of Miami.

A Market for Iron Pyrites has been established. The Grasselli Chemical Co. has authorized the payment of 26c. per unit of sulphur per long ton of 2200 lb., laid down at its consuming plant, with a penalty of deduction of one-half a unit of sulphur or 13c. for every 1% of metallic zinc contained in the ore. This applies to high-grade ores containing in excess of 45% sulphur, and less than 5% metallic zinc. Twenty-five cents a unit, with the same deduction for zinc, will be paid for low-grade ores concontaining in excess of 45% sulphur and with as much as 12% zinc. On this basis, an average high-grade ore will bring the producer about $7 net for a 2000-pound ton, and he must pay the loading charge out of that.

SPOKANE, WASH.—June 5

British Columbia Mine Owners will receive $400,000 a year additional if the proposed bounty of two cents a pound is granted on zinc by the Dominion government. The Consolidated Mining and Smelting Co. of Canada produces at its Trail smeltery practically all the spelter in British Columbia. It is estimated that this bounty will enable the company to get more a pound for its first-class zinc metal. Company is also one of the heaviest producers of zinc ore in the province. Other producers are the Standard Silver-Lead, the Rambler-Cariboo and Lucky Jim companies. Until the war began no zinc was produced in Canada.

TORONTO—June 7

Rich Discovery of Gold is reported to have been made near Goudreau, 177 miles north of Sault Ste. Marie, on the Algoma Central Ry. Gold deposits occur in a porphyry dike five miles in length and one mile wide, running northeast and southwest. The property, situated near Goudreau Lake, is owned by J. P. Cline, of South Porcupine, and D. J. McCarthy, of Sault Ste. Marie. Prospectors are flocking into the district.

Excitement in the Sudbury District has been created by a reported find of oil at a point about 20 miles east of Sudbury near the Canadian Northern Ry., and close to the boundary between Street and Scadding Townships. Surface indications consist of numerous oozings and patches. Samples are being exhibited in Sudbury, and many claims have been taken up. This is the first record of a petroleum discovery in the district.

Representatives of Gold Mining Interests recently held a conference with the government officials at Ottawa respecting the shortage of labor, which is seriously curtailing the production of gold. The increased stringency of the Military Service Act has depleted the working forces at Porcupine and the other gold camps, and the shortage is estimated at 2000 men. No definite arrangement has as yet been made, but in view of the importance of maintaining gold production it is firmly believed that the government will take some action to enable the mine operators to secure additional labor.

The Manufacture of Raw Peat into commercial fuel is receiving attention. Seventeen peat bogs in Ontario have been inspected and found to contain peat of good quality. The chief of these, and the one likely to be selected, is the Holland bog, lying north of Toronto and favorably situated for transportation. Experiments are being carried on with the peat deposits near Cochrane, in Northern Ontario, where quantities of peat are being cut and piled to ascertain if a good fuel can be produced by sun-drying. Two machines which will cut, turn and harvest peat, lessening the labor required, are being manufactured at Montreal, and the industry of preparing peat fuel is expected to be in active operation in two months.

VICTORIA, B. C.—June 5

Agitation for a Celebration of the 60th anniversary of the discovery of gold in the Cariboo district, and the building of the famous Cariboo road, is being made by mining men in the interior of British Columbia. The movement started at Clinton, B. C., and is meeting with favor, it being felt that something should be done to mark and commemorate an event of so much importance and interest as to merit a few pages in Canadian history, particularly in the mining history of Western Canada.

Silversmith Mines, Ltd., is the name of the property situated at Sandon, B. C., previously known as the Slocan Star. A certificate of incorporation has been issued to the Silversmith Mines, Ltd., (non-personal liability) for $750,000. The shareholders have decided upon a reorganization, and R. H. Stewart, formerly general manager of the Consolidated Mining and Smelting Co. of Canada has been appointed manager of the new company. It is announced that the mine will begin operations at an early date.

PEKING, CHINA—May 15

A Rich Silver Mine has recently been discovered at Ha-la-sun-hu-cha, Inner Mongolia, according to reports. China's Ministry of Agriculture and Commerce is being petitioned by a Mongolian prince for the privilege of working the mine.

The Mining News

ALASKA

ALASKA GOLD MINES CO. (Juneau)—Milled 101,200 dry tons during May.

ALABAMA

Franklin County

SLOSS-SHEFFIELD S. and I. (Russellville)—Agreement reached between officials and striking miners.

ARIZONA

Maricopa County

ARIZONA-CALIFORNIA (Phoenix)—Tunnel driven 250 ft. follows vein.

DRAGON M. & D. (Wickenburg)—To build mill and assay office.

Mohave County

EMERALD ISLE (Kingman)—Thirty more cells installed in leaching plant.

ARIZONA MOSSBACK (Oatman)—To sink shaft to 500 or 600 level and explore vein. C. W. Maier is superintendent.

BIG JIM CONSOLIDATED (Oatman)—To sink shaft to the new level. Plant installed. J. W. Henderson is superintendent.

GOLD ORE (Oatman)—Ore transported to mill by four trucks.

GOLD ROAD (Oatman)—Installation of new crushing plant progressing.

TOM REED (Oatman)—Producing from Ben Harrison and Aztec shafts. Crosscutting on Bald Eagle body.

UNITED OATMAN (Oatman)—To crosscut vein from winze on 400 level.

Pinal County

RED CHIEF M. & M. (Casa Grande)—Completed 50-ton plant for milling silver-lead ore. Using Elsol type of dry concentrator.

Yavapai County

CALUMET & JEROME (Jerome)—Completed 4500 ft. of development on the 600 level. Sufficient funds on hand to carry out development work planned.

DUNDEE-ARIZONA (Jerome)—Stripping overburden from reef of carbonate ore. During the year ended Jan. 31, 1917, shipped to smelteries, 2200 dry tons of carbonate ore.

GRAND ISLAND MIN. CO. (Jerome)—Prospecting by diamond drill to tap vein cut by crosscut from shaft at 208 ft. level, at depth of 700 to 800 ft. Hole now 500 ft. deep.

JEROME SUPERIOR (Jerome)—Shaft sunk 13½ ft. in 19 hours. Foundations for new hoist laid.

JEROME VERDE MINING (Jerome)—Resuming operations. Raise has been started to connect new drift on 140 level of the United Verde Extension with the Maintop stope.

PITTSBURGH-JEROME (Jerome) — Seven headings now being driven, two on the 500 and five on the 900 level.

SQUAW PEAK M. CO. (Jerome)—Tunnel in 450 ft. and expect to cut orebody.

VERDE COMBINATION (Jerome)—Shaft sunk 152 ft. between Apr. 8 and May 8.

BEEHIVE (Octave)—Operations suspended pending machinery repairs.

UNITED CHINO O. & R. (Prescott)—Drill cut sandstone strata on 650 level.

BIG PINE MINE (Senator)—Several men now at work, and mill expected to start up in June.

BLACK DIAMOND (Walker)—Shaft is opening up rich orebody. The erection of a mill is planned.

ARKANSAS

Baxter County

CRAWFORD ANSELL (Mountain Home)—New strike of blende reported. Shallow deposit of zinc carbonate mined.

Boone County

BROOME COUNTY (Zinc)—Mill overhauled and new set of jigs installed.

BROWN MINES (Zinc)—L. L. Brown sold leases on zinc properties and concentrating plant to the Boo-Gra-Loo Mining Co., of Pawhuska, Okla.

Marion County

MORNING STAR (Rush)—Purchased by Muskogee, Okla., company.

CALIFORNIA

Amador County

FREMONT (Drytown)—Operations consist of shaft repairs and pumping.

CENTRAL EUREKA (Sutter Creek)—Pumping discontinued from the 2000 level on account of burning out of motor. Bailing with skips. Repairs progressing and pumping soon to be resumed.

Calaveras County

PIONEER (Angels Camp)—Unwatering shaft. Steam to be displaced by electric power plant. Shaft to be deepened from 135 ft. to 600 ft. and station cut at 300 level. J. C. Benson is manager.

ROUGH DIAMOND (Mokelumne Hill)—Work resumed by M. C. Hazel and C. A. Kuhmeyer, of San Francisco.

Del Norte County

CHROME SHIPMENTS from Smith River district are made to Eureka by gasoline schooner for reshipment by Northwestern Pacific R. R. to San Francisco and direct from Crescent City to San Francisco by steamers.

Inyo County

PINE CREEK TUNGSTEN (Bishop)—Operated by Cooper Shapley, James Seager, Fred Close and associates. Building 14-mile wagon road and installing 225-ton mill.

Madera County

GREEN MOUNTAIN (Raymond)—Consists of eight mineral claims, situated on Chowchili River, eight miles by wagon road northwest from Raymond, Madera County. First claims, located in 1861, have been worked and shut down at various times. Ores are copper oxides and carbonates. To be reopened and shipments to be made to Selby.

Nevada County

BIRCHVILLE CONSOLIDATED MINES (Graniteville)—First developed in 1858 by tunnel at depth of 200 ft. below the croppings to be reopened.

SIERRA ASBESTOS (Washington)—New road built from Washington to Fairview mine and mill, where ore is mined and crushed. Three-span bridge constructed across South Yuba River, with concrete piers. Tramway being built from mine to mill. Mill remodeled and equipped for handling asbestos.

CHROME MINING and prospecting active along the two serpentine belts in the county, one between Grass Valley and Nevada City, the other between Washington and the Sierra County line, the latter extending into Sierra County as far as Alleghany. Thomas Hogan and George Hothersoll, of Nevada City, are mining chrome ore on the Hulseman ranch north of Grass Valley. The Oustamah 10-stamp mill is treating chrome ore hauled to the mill by motor trucks from the Waite place, on Deer Creek. The Red Ledge mine, near Washington, is producing high-grade chrome under management of Clyde Cole and Williamson brothers. Near the Red Ledge, Flynn brothers and Jerry Woods, of Alleghany, are mining chrome ore and shipping to Grass Valley by motor trucks. Alfonse Schwartz and associates are prospecting on Poorman Creek.

Sacramento County

ELDORADO LIME & MINERALS CO. (Sacramento)—Incorporated. Capitalization $100,000. Directors are Emerson W. Reed, Robert H. Schwab, A. B. Warner. Lime quarries near Shingle Springs.

COLORADO

Clear Creek County

GEORGETOWN TUNNEL (Georgetown)—Vein of high grade recently cut by tunnel. Development in progress. Company building new power plant at portal of tunnel. A five-drill, Imperial type, Ingersoll-Rand compressor, driven by electric power, to be installed. New plant to run in 30 days. Tunnel to cut veins in Columbia and Democrat mountains.

TEDDY BEAR (Lawson)—Developing recent strike of gray copper ore containing silver.

San Juan County

COLUMBUS (Animas Forks)—Development work to be resumed under direction of Arthur Johnson.

HAMLET (Howardsville)—Developing milling ore. Milling has been resumed.

CONGRESS (Silverton)—Operated all winter. Twenty cars of ore now ready for shipment when railroad opens from snow blockade.

SILVER LAKE MILL (Silverton)—Leased to D., L. & W. Mining and Reduction Co. Remodeled and treating ore from Lackawanna mine. Regular shipments of concentrates made to Durango.

TERRY TUNNEL (Silverton)—Contract to drive 600-ft. raise awarded to Andrew Coyle. Work has been started.

San Miguel County

BELMONT-WAGNER (Telluride)—Remodeled mill. Mixed sulphide ore has been developed.

BLACK BEAR (Telluride)—Drift on fourth level cut vein of milling ore with streak of gold quartz. Sinking 100-ft. shaft from fourth level to drift in both directions on vein.

CARRUTHERS (Telluride) — Lessees have developed ore, which is being treated at mill. James Olson is mill superintendent.

Summit County

FRENCH GULCH GOLD DREDGING CO. (Breckenridge)—First shipment of gold made. Boat working in French Gulch.

GOVERNOR (Breckenridge)—Development under way all winter. Winze being sunk.

JESSIE (Breckenridge)—Mill operating 20 stamps. Shipping bullion and concentrates. George F. Roth is manager.

LIBERTY M. & L. CO. (Breckenridge)—Operating Monte Cristo mine and mill on upper Blue River. Iron-lead and zinc concentrates to be made. Frank Peabody is superintendent.

MOLLY B (Breckenridge)—Development progressing satisfactorily. New drill installed for stoping, and making regular shipments copper ore. Some bismuth is hand-sorted from copper ore.

POWDER RIVER GOLD DREDGING CO. (Breckenridge)—Dredge, of 4000 cu.yd. capacity, now operating successfully in Blue River Valley.

ROYAL TIGER (Breckenridge)—Development shows ore containing silver, lead and bismuth. Construction of mill contemplated. Property formerly known as I. X. L. mine.

TONOPAH PLACERS CO. (Breckenridge)—To dredge Westerman river-bed ground on Blue River, south of town. Dredge will later work Magnum Bonum ground, which has been churn drilled.

WASHINGTON PLACER (Breckenridge)—To be operated by C. S. Westerman.

WELLINGTON (Breckenridge)—Shipping crude zinc ore and zinc and lead concentrates. Some ground worked by lessees through Ella tunnel.

MOLYBDENUM PRODUCTS CO. (Buffehrs)—New 250-ton molybdenum milling plant in operation.

FRISCO MINES now operating are King Solomon, Chief Mountain, and Excelsior.

KING SOLOMON (Frisco)—Stoping on tunnel level.

SILVER AGE (Kokomo)—Shipping one car per day from Iron Mask mine.

PENNSYLVANIA (Montezuma)—To be developed by Liberty Mining and Reduction Co.

Teller County

AJAX (Cripple Creek)—Operated under bond and lease by Carolina company. Shaft sunk from 1400 to 2000 level and considerable lateral development done. Stoping mostly on 1600 and 1800 levels. Development on 2000 level progressing satisfactorily. In addition to company work, seven sets of lessees working above 1300 level.

CAMP BIRD (Cripple Creek)—Operating Rose Nicol mine under lease, recently cut on 800-ft. level shoot four feet wide of smelting-grade ore. Orehouse at shaft and aërial tramway to Eclipse station to be built. Ore also opened in Rose Nicol ground by Roosevelt tunnel at depth of 2000 ft. This ore to be moved through Roosevelt tunnel and Elkton shaft.

COLUMBINE-VICTOR (Cripple Creek)—Dump on site of old Economic mill worked by lessees.

C. K. & N. (Cripple Creek)—Shipping from mine dump west side of Beacon Hill.

CRESSON (Cripple Creek)—Car of high-grade ore shipped recently from Eclipse station to Golden Cycle mill at Colorado City.

DANTE (Cripple Creek)—Cobb sub-lease sold recently to Big Toad Gold Mining and Milling Co., the original lessee.

DEADWOOD (Cripple Creek)—Reopened by lessees. Formerly a large gold producer from "flat" veins.

ELKTON (Cripple Creek)—Labor shortage limiting production of lessees.

EL PASO GOLD KING (Cripple Creek)—Development has opened milling ore. Shipments made to Golden Cycle Mining and Reduction Co., at Colorado Springs.

EXCELSIOR LEASING CO. (Cripple Creek)—Crosscut from Llewellyn shaft on 500 level cut vein of shipping grade.

FAIRFAX GOLD MINING CO. (Cripple Creek)—Notice of dissolution has been published.

INDEX (Cripple Creek)—Rich oreshoot opened on 1050 level by El Paso Extension Corporation, operating under lease with option to purchase. Ore reached by a 150-ft. winze from the 900 level of Index shaft. The vein 10 ft. between walls and well filled with streaks and spots of sylvanite. Assays range from 3 to 6 oz. gold per ton. Oreshoot opened for 120 ft., with 150 ft. virgin ground above drift. Best ore found near south breast. Shipments indicate an average of $60 per ton. In addition to company development, four sets of sublessees are operating above the 5th level. During April ore in excess of 500 tons was mined and shipped.

JERRY JOHNSON (Cripple Creek)—Lessee, P. H. Denham, to develop on 950 level.

KITTY WELLS NO. 2 (Cripple Creek)—Idle for some time; now being worked by lessees.

MODOC CONSOLIDATED (Cripple Creek)—Shipping six to eight cars per month. Large reserve of broken ore in shrinkage stopes. New hoisting plant to be installed at incline shaft to increase production.

PATTERSON-BRADLEY LEASING (Cripple Creek)—Company operating Specimen and Sacramento mines of Stratton estate under lease. Deep development work is contemplated. H. McDonald is manager.

PORTLAND (Cripple Creek)—Two women employed in laboratories, one each in the Portland and Independence mills, to take place of men who have gone into military service.

SIX POINTS (Cripple Creek)—McLeod & Kessey are lessees. Shipments made.

UNITED GOLD (Cripple Creek)—Wild Horse mine being developed and operated on company account, and low-grade milling ore shipped to Independence mill of the Portland Gold Mining Co. Trail and W. H. P. properties are operated under lease, and product shipped to the Golden Cycle Mining and Reduction Co. at Colorado Springs. Bonanza mine operated under lease by the Granite Gold Mining Co. Lessees are working over dumps of Delmonico property.

VICTORY GOLD MINING CO. (Cripple Creek)—Shipping from Howard shaft workings of Mary McKinney and Beacon mine of Prince Albert group on Beacon Hill.

VINDICATOR (Cripple Creek)—Flotation mill treated 20,114 tons dump ore during April; actual milling costs, 49.4c. and net saving, 24.9c. per ton.

BIG TOAD (Victor)—Operating Dante mine under lease from the Dante Gold Mining Co. To remodel Reid mill to treat low-grade ores. A. E. Chapman is general manager, and Thos. Kavanaugh is mill superintendent.

PHILADELPHIA (Victor) — Development work under way. L. Beckwith is president.

VICTOR (Victor)—Shoot rich tungsten ore opened in drifting on 175-ft. level. Victor is new tungsten camp coming into prominence.

IDAHO

Boundary County

IDAHO CONTINENTAL (Porthill)—To haul ore with four three-ton automobile trucks. Milling lead-silver ores containing zinc.

Bonner County

ARMSTEAD MINES (Sagle)—Following ore along vein cut on 1600 level.

Custer County

EMPIRE COPPER (Mackay)—Completed three-mile tramway from mine to railroad.

KANSAS

Joplin District

DELAWARE (Joplin)—To build mill west of Baxter Springs.

MICHIGAN

Copper District

FEDERAL SYNDICATE (Calumet)—Shaft sinking delayed by caving of sides.

FRANKLIN (Demmon)—Intensive mining has reduced number of trammers required.

HANCOCK CONSOLIDATED (Hancock)—Discontinued work at No. 7 Quincy shaft under agreement which permits a six months' interim.

ISLE ROYALE (Houghton)—Mill operating three heads at Houghton plant and two heads at Point Mills.

NEW BALTIC (Houghton)—Shipped 5 bbl. of small mass copper to Michigan smelter. Northern drift on second level level on lode in which shaft is situated shows mineralization.

NORTH LAKE (Lake Mine)—Drifting discontinued on new lode, because of lack of men.

WHITE PINE EXTENSION (Pinex)—To discontinue drifting and sinking. Employees to be given employment at Mohawk and Wolverine mines.

MICHIGAN (Rockland)—To open mine and supply one stamp at Michigan mill.

WHITE PINE EXTENSION (White Pine Mine)—Closed down, although some drifting and pumping are being done.

MINNESOTA

Mesabi Range

STATE MINES SHIPMENTS for week ending May 25 were: Leonidas, 3285; Deacon, 4961; Hanna "A," 3311; Helmer, 12,784; Woodbridge, 4558; Frantz, 9045; Shiras, 6486; Pool, 37,600; Hill Annex, 23.575; Wanless, 3220; Majorca, 2000; Smith, 1350; Philbin, 10,920 and Missabe Mountain, 37,920 tons, a total of 161,015 tons.

DANUBE (Bovey)—Operated by Pickands Mather Co. A. Gutherie Co. are stripping open pit. A concentrating plant under construction at Riley Lake, two miles northwest.

BENNETT (Keewatin)—Shipping from open pit and underground. Pit has been extended.

BRAY (Keewatin)—Shipping from stockpile.

GORDON (Keewatin)—To be opened up by Republic Iron and Steel. Property south of Bray mine.

MISSISSIPPI (Keewatin)—Operating after extended shut-down.

SARGENT (Keewatin)—Open pit and shaft opened up by Wisconsin Steel Co. Four-compartment shaft to be sunk 180 ft. B. W. Batchelder is general superintendent.

ARCTURUS (Marble) — Development work still under way.

DRAPER (Marble)—Operated by John Savage and associates. Concentrating plant under construction.

HILL ANNEX (Marble)—To ship large tonnage.

CROSBY (Nashwauk)—Stockpile being shipped.

HAWKINS (Nashwauk)—To ship large tonnage from open pit.

MONTANA

Jefferson County

AMALGAMATED SILVER MINES CO. (Clancey)—Shipped carload of 100-oz. ore to smeltery.

Lewis and Clark County

FRICK (Helena)—Drift on lead has disclosed rich gold ore.

KATIE (Helena)—Four feet lead ore reported in face of drift.

SCRATCH GRAVEL GOLD CO. (Helena) Leasers sending gold ore to smeltery at East Helena.

TOWSLEY GULCH (Marysville)—Shipping galena ore from Towsley mine to smeltery.

SALLIE BELLE (Rimini)—To be reopened soon.

NEVADA

Esmeralda County

RED HILL FLORENCE (Goldfield)—Developing on 300, 400 and 500 levels. Regular shipments to be made.

Lincoln County

PRINCE CONSOLIDATED (Pioche)—New shaft being sunk by Walter Fitch, Jr.

Nye County

BIG PINE (Manhattan)—Milling of over-size dump begun.

MANHATTAN CONSOLIDATED (Manhattan)—Ore to be treated at Goldfield Consolidated mill. Mine making 55,000 gal. of water per day.

UNION AMALGAMATED (Manhattan)—Sinking shaft below bottom level.

TONOPAH DISTRICT ore production for the week ended May 25 totaled 9601 tons, of an estimated gross milling return of $163,217. Producers were: Tonopah Belmont, 1963 tons; Tonopah Mining, 3400; Tonopah Extension, 2159; Jim Butler, 521; West End, 1001; MacNamara, 326; Montana, 165; North Star, 52; and miscellaneous 14 tons.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operations during April were $135,164.69; current expenses, $81,297.02; leaving an operating profit of $53,867.67.

GOLD MOUNTAIN DISTRICT between Tonopah and Goldfield has 20 companies organized in last three months to develop ground, and six are equipped with machinery and sinking. The Divide Extension is controlled by Zeb Kendall and N. K. Cooper, and the shaft is down 60 ft. The Tonopah Dividend shaft is down 40 ft. Cal Brougher and George Wingfield are directing affairs of the Brougher divide, which has a 40 ft. shaft.

OKLAHOMA

Joplin District

J. C. COOPER (Depew)—Sinking shaft on lease south of Hockerville.

ELOOSA (Miami)—Sinking shaft preparatory to building 200-ton mill four miles west of Tar River.

LIGHTFOOT O. & M. (Miami)—Mill estimated at $100,000 cost to be erected. Sludge tables, crushers, engines and boilers to be purchased. William Lightfoot is in charge.

MIAMI THRIFT (Miami)—Will sink to cut 6-ft. coal vein on 60 level. Ralph C. Hardy, of Norman, Okla., is president; John Allen, of Miami, is manager.

MIAMI WONDER (Picher)—To build new mill. One shaft in ore. Fred D. Whiting, of Oklahoma City, is superintendent.

MINT MINING (Miami)—To build two 75-ton mills at estimated cost of $100,000. Sludge tables, crushers, boilers and engines to be purchased Julius Labsap is in charge.

PROSPECTORS (Miami)—Sinking shaft south of Hockerville. To build mill. Jas. M. Shackelford, Miami, is manager.

MUSKOGEE (Quapaw)—Completed new mill. Company coöperating with several others in draining watered tract southwest of Quapaw.

NEMO (Quapaw)—Sinking shaft and completing mill after several months' idleness. M. M. Kersh, of Galena, Kan., is superintendent.

SOUTH DAKOTA

Lawrence County

CUTTING (Deadwood)—To install hoist and compressor already purchased. To sink shaft 500 ft.

ECHO (Maitland)—Power line completed. To resume development and shaft to be sunk deeper.

CUSTER PEAKE (Roubaix)—Work to be resumed. Shaft to be sunk deeper. Has purchased Jungle property. Additional machinery for concentrator is contemplated.

TINTON (Tinton)—Resumed operations after idleness of ten years. Concentrator to be repaired and to treat low-grade tin ores.

UTAH

Juab County

TINTIC SHIPMENTS for the week ended May 24 were 169 cars.

EUREKA MINES (Eureka)—Mining silver ore below and on 700 level.

IRON KING (Eureka)—Preparing to ship iron ore for fluxing.

TINTIC STANDARD (Eureka)—Ore hauled to Denver and Rio Grande R.R. by truck. Railroad to be extended to serve this mine, Iron King, and other East Tintic properties.

ZUMA (Eureka)—Made initial shipment.

Salt Lake County

UTAH APEX (Bingham)—Mine on fire and reported as being flooded.

UTAH METAL & BINGHAM CANYON TUNNEL (Bingham)—Net profits for 1917 amounted to $40,992. Dividends amounting to $553,261 were paid. Production was: 5,348,610 lb. lead; 659,127 lb. copper; 242,003 oz. silver and 4612 oz. gold. During 1917, 15,632 ft. of development was done, capacity of the mill was doubled and new machinery installed.

LUCIN COPPER (Salt Lake)—Operating property near Lucin. Drifting on three foot of good copper ore and opened manganese ore in several places. Officers elected at meeting May 4 were: R. W. Powers, president; D. J. Wheeler, vice president; G. S. Morris, secretary and treasurer; Franklin Riter, P. K. Flynn and V. Ergmaga additional directors.

Summit County

PARK CITY SHIPMENTS for week ended May 24 were 3,127,380 lb. of ore and concentrates. Shipments for the first four months of 1918 were 40,537 tons, as compared with 34,081 tons same period 1917.

NAILDRIVER (Park City)—Crosscutting on 700 level, to connect with raise from 950 level. J. D. Fisher is in charge.

PARK CITY KING (Park City)—Developing by tunnel, and fissure showing mineralization has been cut.

JUDGE MINING AND SMELTING (Park City)—Changes made in zinc plant, including new stationary cells. John Ellsworth is superintendent of plant.

SILVER KING COALITION (Park City)—At annual meeting May 20, W. W. Armstrong chosen director to succeed David Keith, recently deceased. Other directors are Thomas Kearns, W. S. McCornick, N. C. Fox, James Ivers, Jr., W. M. Ferry, Henry Newell, Ezra Thompson, J. F. Judge.

WASHINGTON

Benton County

NEW GAS FIELDS being drilled for gas and oil.

Okanogan County

IVANHOE (Oroville)—To build 50-ton flotation plant. Crossout from the 3700 tunnel has cut four veins carrying silver.

Spokane County

INTERNATIONAL PORTLAND CEMENT CO. (Irvin)—Calcining magnesite from Valley.

Stevens County

ELECTRIC POINT (Boundary)—Building 2¼-mile tramway at a cost of $50,000. Shaft down to 700 level and discloses continuation of ore.

DEER TRAIL NO. 2 (Deer Trail)—W. A. Corey and associates have taken over property from J. D. Chaplin, of St. Catherines, Ontario. Mine worked 25 years ago for silver.

CANADA

British Columbia

GRANBY (Grand Forks)—Fourth furnace blown in to handle increased tonnage.

MANGANESE DEPOSITS near Kaslo, in Slocan district, purchased from Larson & Curle by B. F. Millard, of Seattle, being opened by stripping. Shipments to be made to different plants for tests.

ST. KEVERNE (Slocan)—To operate this summer. Oscar White, formerly of the Slocan Star, is manager.

CORK-PROVINCE (Slocan)—Has added a ball mill and flotation unit to concentrator. Flotation unit to dress silver-mine tailings. Zinc concentrates shipped to Kansas and lead to the Trial smeltery.

CONSOLIDATED M. and S. Co. (Trail)—Committee to investigate smelter rates held first session on May 22. Members are S. S. Fowler, of Riodel; James Anderson, of Kaslo, and Ivan De Lashmutt, of Silverton.

Ontario

ASSOCIATED GOLD FIELDS (Larder Lake)—Installation of 25-drill compressor nearly complete.

WALSH (Gowganda)—High-grade silver ore has been discovered.

ANKERITE (Porcupine)—Main shaft down 350 ft. Veins to be opened on this and also at 200 level. Four veins parallel and having aggregate width of 100 ft. have been opened.

HOLLINGER (Timmins)—Force decreased. Now 1096 men employed.

KINGSLEY CLAIMS (West Shining Tree)—Vein showing gold content has been discovered.

COBALT DISTRICT SHIPMENTS of silver ore over the T. & N.. O. Ry. in April, in tons of 2000 lb., were: Beaver, 36.23; Buffalo, 296.69; Coniagas, 162.05; Dominion Reduction, 141.50; Kerr Lake, 59.84; La Rose, 64.36; McKinley-Darragh, 149.22; Nipissing, 230.19; O'Brien, 32.32; Right-of-Way, 41.98; Trethewey, 82.32; total, 1296.70 tons.

GENESEE (Cobalt)—Active development resumed.

ELLIOTT-KIRKLAND (Kirkland Lake)—New 9 x 12 ft. hoist installed. Crosscutting at 500 level.

KIRKLAND LAKE (Kirkland Lake)—Shaft being pumped out. To resume underground work.

KIRKLAND LAKE GOLD (Kirkland Lake)—Construction of mill begun in fall now proceeding.

PORQUIS JUNCTION shipped from the Alexo mine in April 544.60 tons of nickel ore.

OTISSE (Fort Matachewan)—Camps under construction. Diamond drilling.

HILL (Munro Township)—Shaft being sunk to 200 ft. and 70-ton mill nearly ready for operation.

AFRICA

Transvaal

MODDERFONTEIN DEEP (East Rand)—Report for quarter ended Mar. 31 states 124,500 tons milled and mine development of 731 feet.

PRINCESS ESTATE & G. M. CO. (Western Witwatersrand)—Report for quarter ended Mar. 31 states 55,700 tons milled and mine development 1204 ft. Sinking at No. 1 shaft to be resumed soon.

The Market Report

SILVER AND STERLING EXCHANGE

June	Sterling Exchange	Silver New York, Cents	Silver London, Pence	June	Sterling Exchange	Silver New York, Cents	Silver London, Pence
6	4.7550	99⅛	48⅞	10	4.7550	99⅛	48⅞
	4.7550	99⅛	48⅞	11	4.7550	99⅛	48⅞
8	4.7550	99⅛	48⅞	12	4.7550	99⅛	48⅞

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

June	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
6	*23½	†	7.25 @7.45	7.17½ @7.27½	7.30 @7.35
7	*23½	†	7.25 @7.45	7.17½ @7.27½	7.30 @7.35
8	*23½	†	7.25 @7.45	7.17½ @7.27½	7.32½ @7.37½
10	*23½	†	7⅞ @7½	7.25 @7.35	7.32½ @7.37½
11	*23½	†	7.40 @7.50	7.35 @7.45	7.35 @7.45
12	*23½	†	7.45 @7.50	7.35 @7.45	7⅞ @7½

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

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

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

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

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 20c. per 100 lb. above St. Louis.

LONDON

June	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
6	110	110	125	331	331	29½	54
7	110	110	125	331	331	29½	54
8	...	...	...	...	...	...	...
10	110	110	125	331	331	29½	54
11	110	110	125	329	329	29½	54
12	110	110	125	329	329	29½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—June 12, 1918

The only ones of the major metals in which there are now free markets are lead and zinc. The increasing strength in lead, reflected by a sharp advance in price, was a special feature of interest this week. Zinc also was stronger.

Uncertainty respecting the new freight rates that come into effect July 1, and especially uncertainty respecting their commercial bearing, is a disturbing influence in all markets at present.

Copper—The refinery production in May was a little larger than in April, and the average monthly rate of 1917 has now been about attained. Foreign governments are slowing up temporarily in their demands, but the American Government has placed some large orders for June and July. Domestic consumption is very large. Some consumers seem to be running on a hand-to-mouth basis; that is, without any surplus supply in their yards, which frequently compels them to appeal to the refiners to hurry up their shipments. Domestic wire mills are reported to be very busy.

Refiners complain that copper is now frequently required in unusual shapes, which cost them more to furnish than do the standard forms.

Copper Sheets are quoted at 31½c. per lb. for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26½c. f.o.b. mill, carload lots.

Tin—The market was rather upset by the decline in Singapore. Monday's cable gave the quotation of £336, a decline of £17 from the last previous one. The market in Singapore having been understood to be strong, it was considered that there might have been an error in transmission. Tuesday's cable was missing. Wednesday's came £339, which was regarded as confirming the Monday cable. The reason for the decline is not understood.

A small lot of Straits tin in this market which was offered last week at $1.08@1.10 is still offered at the same price. Metal of 99% grade is to be had in small lots at 92@94c. Banka tin for June shipment is offered at 87c., and Chinese at 86c.

The new railway freight regulations, which abolish import rates, are going to produce new conditions that nobody is yet able to size up completely. The rate on tin from San Francisco to New York, which is now 56.2c., will become $2.70; that is, the present commodity rate increased by 25 per cent.

Lead—There is no doubt about the great strength of this market, in which most of the producers, large and small, are now well sold ahead. There was a widespread inquiry this week from corroders and manufacturers of munitions, which resulted in a considerable turnover, but, after all, it may be said truly that the market advanced on relatively small business. There were considerable transactions in lead for forward delivery, such contracts running as far ahead as September. Western smelters being unable to supply the demand in this market, consumers purchased in St. Louis at the market price there plus the estimated freight of about 25c. per 100 lb. Brokers and dealers bid above the market both in New York and St. Louis, but producers either avoided or flatly refused such business. There were some more Canadian inquiries, but that demand seems to have been satisfied for the present. Japan, however, continued to be insistent with its inquiries, and having purchased some bonded lead, endeavored to buy domestic lead, bidding, through brokers, above producers' prices. At the close, brokers were offering to pay 7⅛c. at St. Louis.

Zinc—Zinc showed increasing strength from day to day, with better inquiry from galvanizers and brass makers, which resulted in some transactions of moderate volume. The better tone in zinc probably reflects diminished production and shrinkage of stocks since Apr. 1, both of which may have been more than has been thought heretofore.

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

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Price established June 1 and continues to Sept. 1.

Antimony—Increased demand and larger sales, both the Government and private consumers having bought, stiffened this market materially. At the close of last week we quoted 12¾@12⅞c. On June 8 a rather large business was done at 12¾@13c. At the close of this week we quote 13⅛c. The business of the week was principally in spot. June shipments from China are quoted at 12@12½c., c.i.f., in bond.

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

Cadmium—This metal is quoted at $1.40 per lb.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Steady at $118@120 for California virgin. Mexican virgin is quoted around $115. San Francisco reports, by telegraph, $112.50, steady.

Gold, Silver and Platinum

Gold—Gold shipments to the United States for British account have been resumed. A consignment of $5,000,000 in bars was received at the Federal Reserve Bank of New York, the first gold shipment for British account, according to the "Tribune," since May, 1917.

Silver—The price of silver remains unchanged at 48⅞d. per oz. in London, with New York price 99⅛@100⅛c. per oz. 999. The demand for India continues, and China exchanges are up to current bullion prices.

Handy & Harmon, New York bullion dealers, have been designated to act as the agent of the British government in handling shipments of silver from the United States to India. To date, under the Pittman Act, 60,000,000 silver dollars have been melted into bars. According to the "New York Tribune," most of this has been shipped to India.

Mexican dollars at New York: June 6, 77; June 7, 77; June 8, 77; June 10, 77; June 11, 77; June 12, 77.

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

Ore Markets

Joplin, Mo., June 8—Blende, per ton, high, $76.80; basis 60% zinc, premium, $75; class B, $55; prime Western, $42.50@40; calamine, per ton, 40% zinc, $35@30; average selling prices: Blende, $45.45; calamine, $32.66; all zinc ores, $44.65 per ton.

Lead, high, $89.80; basis 80% lead, $87.50@85; average selling price, all grades of lead, $86.44 per ton.

Shipments the week: Blende, 7235; calamine, 490; lead, 1383 tons. Value, all ores the week, $464,450.

Buyers came into the market for light tonnage, and most of them found enough sellers to fill their orders on a market reduced from $3 to $5 per ton. Many sellers declined to accept the reduced price, arguing that spelter prices warranted no cut in ore prices.

The trend of miners to the harvest fields, in addition to the number sent away in the draft, has made all mines short-handed, and production is automatically lowering.

Platteville, Wis., June 8—Blende, basis 60% zinc, highest price reported for premium grade was $70 per ton; high-lead blende product sold down to $45 per ton base. Lead ore, basis 80% Pb, $85 per ton. Shipments reported for the week were 2423 tons blende, 134 tons galena and 745 tons sulphur ore. For the year to date the totals are 57,703 tons blende, 3013 tons galena, and 24,611 tons sulphur ore. During the week 2458 tons of blende were shipped to separating plants.

Chrome Ore—Unchanged from last week.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrite is selling at prices ranging from 25 to 30c. per unit, f.o.b. mine.

Manganese Ore—The schedule of the War Industries Board prevails for domestic ores. High-grade imported ore has been sold as high as $1.35 per unit, ex-dock, New York.

Molybdenum Ore—Unchanged from last week. Quotations are purely nominal.

Tungsten Ore—There is not much activity and quoted prices are $19 to $24 per unit of tungstic acid; only the very highest

grade wolframite and scheelite, free from impurities, bring as high a price as $24. Some sales of high-grade ore free from impurities were made at $23 for 65% grade. Low-grade ores, containing impurities, are approximately $19 per unit.

Iron Trade Review

PITTSBURGH—June 11

On June 6 the War Industries Board passed a resolution ratifying an agreement with the committee of the American Iron and Steel Institute, which provides a definite basis for the distribution of commercial steel. Steel may be divided into two classes, war steel and commercial steel, and commercial steel, in turn, may be divided into steel for the more essential industries and steel for the less essential. In the distribution of war steel, no change is made from practices in vogue for months, involving various priorities. Steel for the more essential industries comes next, and any steel remaining can be shipped to less essential industries, provided specific permission is obtained from the Director of Steel Supplies.

Under the pledge of 100% efficiency for war work taken by the iron and steel industry at the meeting of Apr. 26, the producers have been shipping to those they considered the more essential industries, a complete list of which is incorporated in the new regulations, entitled a "schedule of purpose entitled to preference treatment." Some manufacturers find the schedule a narrower one than they had constructed for their own use during the last few weeks, though others find it somewhat broader.

Production has suffered somewhat in the last three weeks on account of hot weather, and more in steel ingots than in pig iron. Production of pig iron in May was at the rate of about 40,900,000 tons a year, steel ingot production being at the rate of about 44,000,000 tons a year. The Carnegie Steel Co. blew in another blast furnace last Friday, and now has 55 of its 59 furnaces active. A Clairton stack will blow in this week, and two Edgar Thomson stacks will be ready late in the year. Zanesville, a small detached stack, is not to be operated. The company's production is running about 95% in pig iron and 85% of full capacity in ingots.

The Steel Corporation's unfilled obligations decreased by 404,259 tons during May. Shipments were about 1,200,000 tons, somewhat more than half of the total being on regular Government priorities. Government orders during the month approximated the shipments, while commercial bookings were light indeed as compared with commercial shipments, the latter being made almost entirely to the more essential industries.

Pig Iron—Distribution of pig iron continues, under the new regulations, substantially as for several weeks past, practically none being shipped excepting against Government work or to more essential commercial industries. Nearly all consumers have answered their questionnaires, showing the purpose to which they intend devoting such deliveries of pig iron as are made them against their orders, and shipments will be made only to cover the recognized purposes, and customers who do not answer the questionnaires will be cut off entirely. The market is quotable strong at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight to Pittsburgh from the Valleys being $1.10.

Steel—No soft steel is offered, and little is to be had even on requisitions. Shell-discard steel has become almost equally scarce, as the regulations practically prohibit the mills from offering it in most cases. Set prices remain on the basis of $47.50 for soft steel billets.

Ferroalloys

Ferromanganese—The market is firm at $250, delivered, for 70%, and $4 per unit extra is the usual quotation for higher manganese content. Spiegeleisen is strong at $70, furnace, for 16 to 18 per cent.

Coke

Connellsville Coke—Shipments have been running fairly steadily at 340,000 tons a week from the Connellsville and lower Connellsville region for nearly two months. The furnaces are fairly well supplied, the situation being helped by the increasing output of byproduct coke. Small tonnages of coke are now coming into the market, chiefly in foundry grade. The market remains quotable at the set limits: Furnace, $6; foundry, 72-hour selected, $7; crushed, over 1-in., $7.30, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	June 11
Alaska Gold M.	1½
Alaska Juneau	1⅞
Am.Sm.& Ref.,com	75
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf., A	89½
Am. Zinc	15½
Am. Zinc, pf.	46½
Anaconda	63½
Batopilas Min	1⅛
Bethlehem Steel	83½
Bethlehem Steel, pf.	88½
Butte & Superior	21⅛
Butte Cop. & Zinc	9⅛
Cerro de Pasco	31⅛
Chile Cop.	15⅝
Chino	37
Colo.Fuel & Iron	47½
Crucible Steel	61¼
Crucible Steel, pf.	91
Dome Mines	7⅛
Federal M. & S.	9⅛
Federal M. & S., pf.	30
Great Nor., ore ctf.	32⅜
Greene Cananea	40⅛
Gulf States Steel	84
Homestake	65
Inspiration Con.	49½
InternationalNickel	27½
Kennecott	31⅛
Lackawanna Steel	85½
Mexican Petrol	94½
Miami Copper	27⅛
Nat'l Lead, com.	58
National Lead, pf.	98½
Nev. Consol.	20
Ontario Min	11½
Ray Con	23½
RepublicI.&S.,com.	83½
Republic I. & S., pf.	99
Sloss-Sheffield	65
Tennessee C. & C.	19½
U. S. Steel, com.	98
U. S. Steel, pf.	1 0
Utah Copper	80
Va. Iron C. & C.	71

N. Y. CURB†	June 11
Big Ledge	1⅛
Butte & N. Y.	.75
Butte Detroit	⅛
Caledonia	.41
Calumet & Jerome	1⅛
Can. Cop. Corpn.	1 1/16
Carlisle	‡2
Cashboy	.07
Con. Ariz. Sm.	1⅞
Con. Coppermines	6⅛
Con. Nev.-Utah	‡⅛
Emma Con.	.21⅛
First Nat. Cop.	1⅛
Goldfield Con.	.25
Goldfield Merger	.02
Greenmonster	⅛
Hecla Min.	4⅛
Howe Sound	‡4½
Jerome Verde	⅛
Kerr Lake	5.60
Louisiana	‡1
Magma	‡30
Majestic	.17
Marsh	.04
McKinley-Dar-Sa.	.30½
Milford	‡1¼
Mohican	‡.06
Mother Lode	.39
N. Y. & Hond.	‡12¼
Nipissing Mines	8
Nixon Nevada	.56
Ohio Cop.	1/16
Rawley	‡2½
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.44
St. Joseph Lead	14½
Standard S. L.	⅛
Stewart	.21⅛
Success	‡.09½
Tonopah	2⅛
Tonopah Ex.	1⅛
Tribullion	‡.25
Troy Arizona	.14
United Cop.	‡⅛
United Verde Ext.	39
United Zinc	1⅛
Utica Mines	‡.08

SAN FRAN.*	June 11
Alta	.03
Andes	.10
Best & Belcher	.01
Caledonia	.04
Challenge Con.	.03
Confidence	.04
Con. Virginia	.31
Gould & Curry	.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.07
Mexican	.41
Occidental	‡.60
Ophir	.06
Overman	.02
Savage	.03
Sierra Nevada	.14
Union Con.	.68
Utah Con.	.01
Belmont	3.00
Jim Butler	.63
Mac Namara	.20
Midway	.06
Mont.-Tonopah	‡.12
North Star	.09
Rescue Eula	.08
West End Con.	1.15
Atlanta	.06
Booth	.03
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.09
Kewanaa	.03
Nevada Hills	.04
Nevada Packard	.24
Round Mountain	.23
Silver Pick	.04
White Caps	.34
Big Jim	‡.75
United Eastern	3.35

BOSTON EXCH.*	June 11
Adventure	.50
Ahmeek	.73
Algomah	.30
Allouez	49
Ariz. Com., ctfs.	13
Arnold	.20
Bonanza	.15
Butte-Balaklava	.25
Calumet & Aris.	66
Calumet & Hecla	432
Centennial	11
Copper Range	44⅛
Daly West	1
Davis-Daly	5
East Butte	8
Franklin	4
Granby	74
Hancock	5
Hedley	‡12
Helvetia	.20
Indiana	.50
Isle Royale	23½
Keweenaw	1
Lake	5
La Salle	2
Mason Valley	4
Mass	‡5⅛
Mayflower	2
Michigan	.75
Mohawk	61
New Arcadian	1
New Idria	‡14
North Butte	15½
North Lake	.60
Ojibway	.75
Old Dominion	40½
Osceola	47
Quincy	69
St. Mary's M. L.	49
Santa Fe	.60
Seneca	10
Shannon	3⅛
Shattuck-Ariz.	‡16
So. Lake	1
So. Utah	.10
Superior	‡4
Superior & Bost.	2
Trinity	3
Tuolumne	.99
U. S. Smelting	40
U. S. Smelt'g, pf.	43
Utah Apex	1
Utah Con.	9
Utah Metal	‡1
Victoria	1
Winona	‡1
Wolverine	25
Wyandot	.50

BOSTON CURB*	June 11
Alaska Mines Corp.	.12
Bingham Mines	10
Boston Ely	.80
Boston & Mont.	.49
Butte & Lon'n Dev.	.18
Calaveras	1
Calumet-Corbin	‡.01
Chief Con.	2
Cortez	‡.05
Crown Reserve	.15
Crystal Cop.	.22
Eagle & Blue Bell	2
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	17½
Mexican Metals	.30
Mines of America	1½
Mojave Tungsten	.09
Nat. Zinc & Lead	.20
Nevada-Douglas	.67
New Baltic	.50
New Cornelia	17½
Oneco	.29
Pacific Mines	‡.35
Rex Cons.	.09
Yukon Gold	1

SALT LAKE*	June 10
Bannack	‡.26
Cardiff	3.15
Colorado Mining	.08½
Daly	2.00
Empire Copper	‡.92
Gold Chain	‡.04
Grand Central	.47
Iron Blossom	.38
Judge	5.50
Lower Mammoth	‡.03
May Day	.01½
Moscow	‡.05
Prince Con.	.55
Rico Wellington	.11
Silver-King Coal'n	1.45
Silver King Con.	1.52½
Sioux Con.	.01½
So. Hecla	.65
Tintic Standard	‡1.62½
Uncle Sam	.01½
Walker Cop.	1.60
Wilbert	.08
Yankee	‡.02½

TORONTO*	June 10
Adanac	.08½
Bailey	.03
Beaver Con.	.23½
Chambers Ferland	.11
Coniagas	2.90
Hargraves	.07
La Rose	.40
Peterson Lake	.09½
Temiskaming	.28
Wettlaufer-Lor.	.04
Davidson	.33
Dome Exten.	.10½
Dome Lake	.15
Hollinger	4.95
McIntyre	1.26
Newray	.20½
Porcu. Crown	.14
Teck-Hughes	‡.45
Vipond	.09½
West Dome	.08½

STOCK QUOTATIONS—Continued

COLO. SPRINGS	June 11
Cresson Con.	4.43½
Doctor Jack Pot	.03
Elkton Con.	.04
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.65
Granite	.20
Isabella	.04
Mary McKinney	.05½
Portland	.85
United Gold M.	.15
Vindicator	.25

LONDON	Apr. 15
Burma Corp.	£4 0s 0d
Cam & Motor	0 11 0
Camp Bird	0 7 9
El Oro	0 8 6
Esperanza	0 8 6
Mexican Mines	5 5 0
Min. Corp.Can.	0 16 3
Nechi, pfd	0 10 6
Oroville	0 17 9
St. John del Rey	0 16 0
Santa Gert'dis.	0 12 9
Tomboy	0 17 3

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

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		31.060	39.065	
July	62.940	79.010		30.000	40.110	
Aug	66.083	85.407		31.498	43.418	
Sept.	68.515	100.740		32.584	50.920	
Oct.	67.855	87.332		32.361	44.324	
Nov.	71.604	85.891		34.192	43.584	
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, 0.925 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		130.000		142.000	
July	26.620		128.409		140.409	
Aug.	25.380		122.391		137.000	
Sept.	25.073		117.500		135.250	
Oct.	23.500		110.000		125.000	
Nov.	23.500		110.000		125.000	
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		242.083	
July	62.570		242.181	
August	62.681		243.978	
September	61.542		244.038	
October	61.851		247.467	
November	74.740		274.943	
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		11.123		30.500	
July	10.710		10.644		30.500	
August	10.594		10.518		30.500	
September	8.680		8.611		30.500	
October	6.710		6.650		30.500	
November	6.249		6.187		30.500	
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	6.800	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371		9.201		54.000	
July	8.643		8.473		54.000	
August	8.360		8.190		54.000	
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
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		50.05		50.14	
July	57.45		53.80		53.95	
August	54.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.