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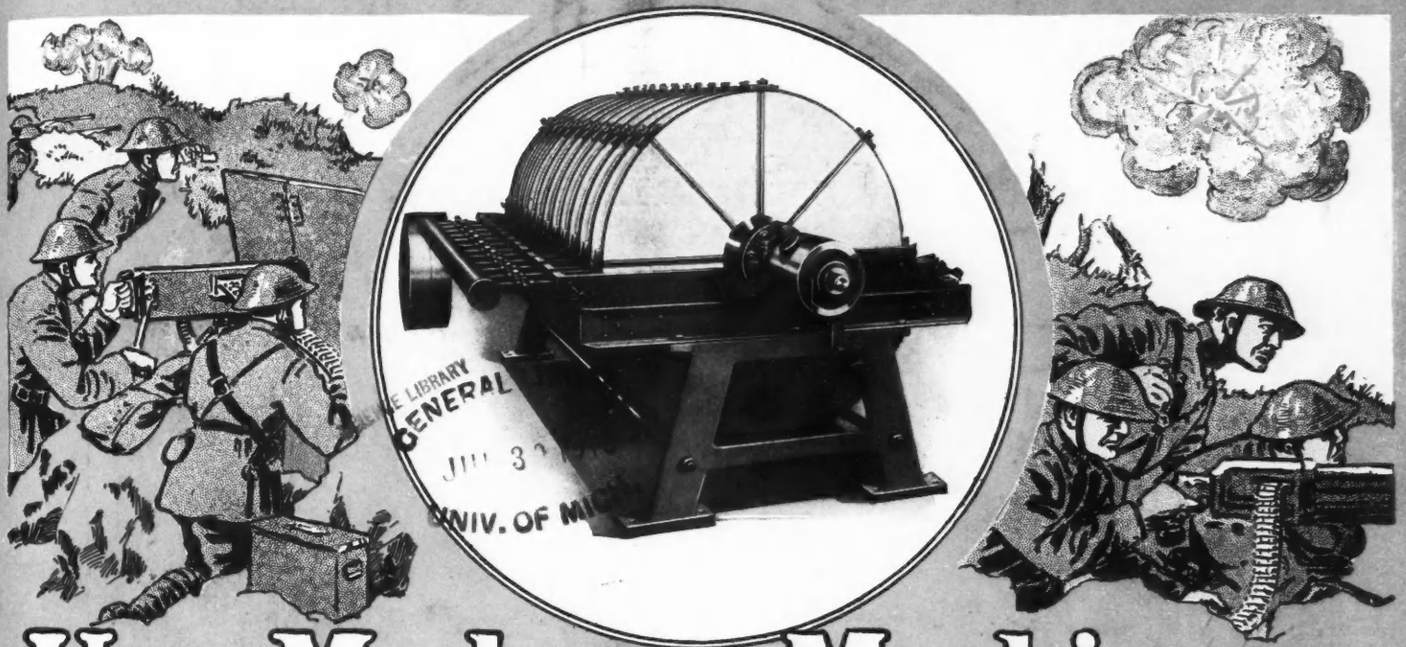

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LOWER VEIN OF ALUNITE, DEPOSITS OF WHICH OCCUR NEAR SULPHUR, HUMBOLDT COUNTY, NEVADA

Recently Recognized Alunite Deposits At Sulphur, Humboldt County, Nevada

BY I. C. CLARK*

Alunite, the sulphate of potash and aluminum, is a valuable source of the salts of both elements. The grade of alunite found at Sulphur, Nev., in certain fissures, is high, and the deposit shows considerable promise. The only other known commercial deposits of alunite are in the Marysvale district of Utah. The treatment of alunite is a comparatively new industry in this country, but has been practiced abroad for many years. At Marysvale the Minerals Product Company recently installed a plant and worked out the details for the commercial extraction of potash.

THE alunite deposit near Sulphur, Humboldt County, Nev., was discovered and located in the spring of 1917. Depressions marking the outcrops of the veins were prominent and had for years been known to exist. Several small cuts and tunnels had been driven into the fissures, but the prospectors, not finding gold or silver, soon abandoned their work. Alunite was known locally as "burnt lime," and was considered worthless. It seems unusual that such pronounced deposits escaped detection for so long; apparently no one tried to find out the true nature of the material.

Upon returning from the examination of a cinnabar prospect in April, 1917, I noticed the outcrops of alunite and the small dumps from the cuts and tunnels. Samples were taken and the material was definitely classified as alunite. The first sample analyzed con-

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tained 10.5% K_2O. Immediately after this determination, the claims were located and surveyed, as shown in Fig. 1, under the direction of the U. S. mineral surveyor of that district. Arrangements were made for the purchase of several claims previously located for silver, antimony, or other deposits, which were in conflict with the alunite group. The required location work on each claim was performed, and all location notices and deeds were recorded at Winnemucca with the county recorder of Humboldt County, Nevada.

The alunite group of 22 lode-mining claims covers an area of more than 400 acres. The ground is situated about two miles northeast of Sulphur, Nev., a station on the Western Pacific R.R. Sulphur is about midway between Salt Lake City and San Francisco and is 45 miles west of Winnemucca, county seat of Humboldt County. This district is known locally as the "Black Rock mining district," the Humboldt range of mountains bordering the Black Rock Desert on the east.

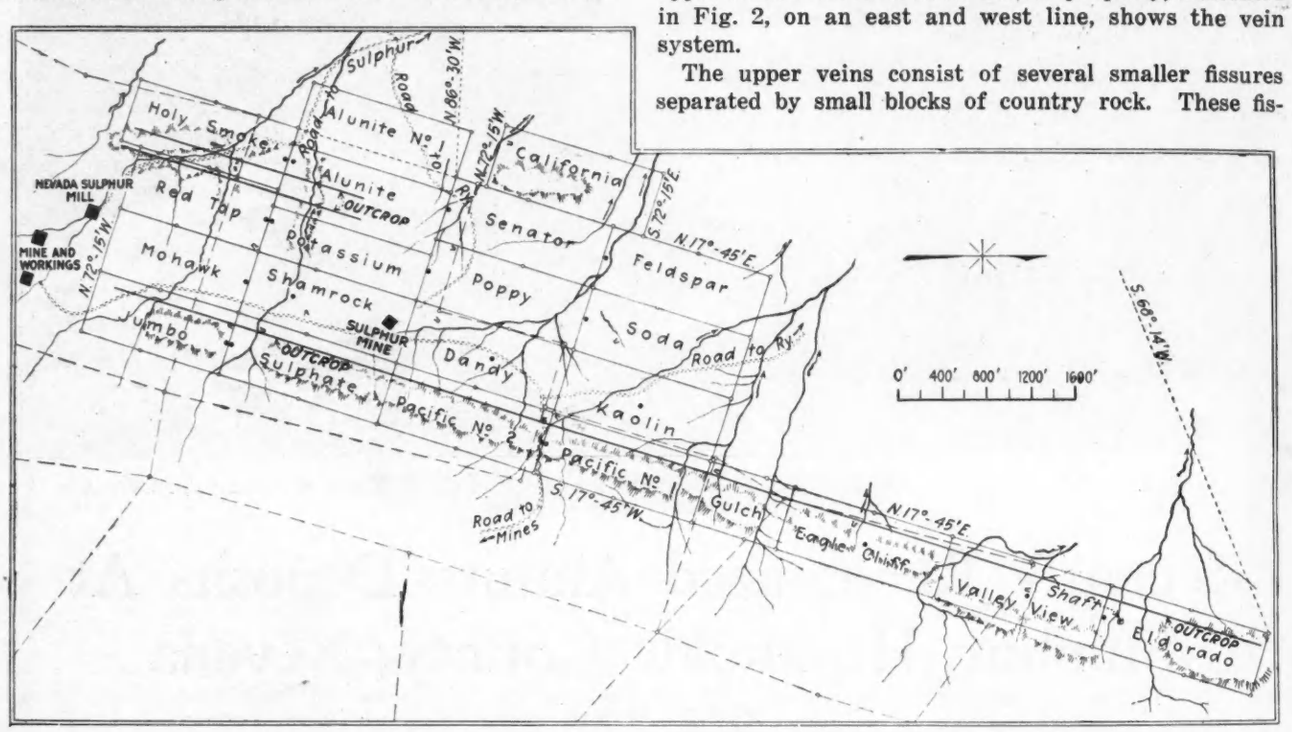


FIG. 1. TOPOGRAPHY OF ALUNITE CLAIMS, BLACK ROCK MINING DISTRICT, HUMBOLDT COUNTY, NEVADA

Unusual transportation facilities are afforded by the geographical position of the property. Eight thousand feet of track will connect the mine ore bins with the Western Pacific main line. It has been estimated that this road can be built for about $15,000, using good second-hand ties and rails, which can be procured in the vicinity. Comparatively little grading will be necessary for the construction of the roadbed. The grade is less than 2% for the most part, the maximum for a few hundred yards near the mine terminus not exceeding 4 per cent.

Sulphur is 4000 ft. above sea level. The mine is situated in the foothills of the Humboldt Mountains, the highest point on the property being less than 5000 ft. elevation. The absence of rough mountain conditions greatly diminishes the difficulties of operation. Although cold in winter, the climate is dry, and little snow falls. The summer days are dry and hot, but the nights are cool. Sufficient water for domestic purposes can be obtained without difficulty, but large quantities for a reduction plant are not available without development. Mining timber is shipped in from the west, coal from Utah or Wyoming and oil from California.

The Humboldt range of mountains was formed by a volcanic uplift during the Tertiary period. The principal rock on the alunite property is a rhyolite breccia, covered over in part by volcanic ash or tuff and wash. The shore line of ancient Lake Lahontan is traceable along the foot of the mountains, accounting in part for the wash deposited in such quantities. The rhyolite is a hard, brittle rock, resistant to erosion. It has been fractured in a direction nearly magnetic north and south, and some faulting is to be noticed parallel to the main fractures. Three parallel veins have been determined thus far, each with unusually strong outcrops, persisting for great distances on the surface. An approximate cross section of the property, indicated in Fig. 2, on an east and west line, shows the vein system.

The upper veins consist of several smaller fissures separated by small blocks of country rock. These fissures are from two to five feet wide, and are filled with a pure, hard, white, lustrous alunite having a fibrous or woody texture. This alunite contains from 9 to 11.6% K_2O, closely approximating the theoretical composition of alunite in its potash, alumina and other constituents, and the lime, silica and iron content is low. The fissuring of this vein system can be traced for two miles, alunite itself being exposed on the surface for several thousand feet.

The middle vein, about 1400 ft. west of the upper series, is 15 ft. wide at the surface and 20 ft. wide at the bottom of a 65-ft. shaft. On and near the outcrop the ore has been partly decomposed by weathering and the potash leached from the alunite. The ore at the surface is rather soft and powdery, but becomes harder with depth. Samples from the outcrop contain about 2% K_2O (as sulphate), but at 65 ft. depth the ore averages 4% K_2O over the entire 20-ft. width. The alumina

content varies from 15 to 30%, the lower results coming from the surface ore.

It is probable that at greater depths this fissure will contain alunite unaltered by surface agencies, for it is readily apparent that the upper portions of a vein of such width could be acted upon by atmospheric agencies, and this is especially evident when the vein matter is more easily decomposed than the surrounding rock.

The third or lower vein is from 7 to 10 ft. wide and contains a high-grade alunite, though the ore is somewhat softer than that found in the upper series. The potash content of this alunite varies from 7 to 10.5% K_2O and the alumina content is about 33%. These last two veins can be traced at least 2000 ft. south from the point of discovery. Wash and volcanic ash have buried the outcrops north of this point, but prospecting can be expected to prove their continuity for a similar distance in that direction.

The composition of alunite as given by Dana is: Al_2O_3, 37.0%; SO_3, 38.6%; K_2O, 11.4%; H_2O, 13.0%. Some analyses made of Sulphur alunite are as given in Table I (the soda content in these is abnormally high).

TABLE I. ANALYSES OF THREE SULPHUR ALUNITE ORES

	No. 1	No. 2	No. 3
Insol. (SiO_2)	0.9%	1.6%	2.0%
Al_2O_3	37.4	37.52	37.9
Na_2O	2.31	2.36	2.27
K_2O	8.63	9.54	9.10

When exposed to atmospheric conditions for long periods alunite gradually decomposes into a white, chalky, powdery mass. The potash is replaced partly by ferric oxide, staining the rock a reddish brown. This action is clearly shown on the several small alunite dumps on the property that have been exposed to the weather for years, and along old water courses in the various alunite fissures these brown stains are also noticeable.

The depressions marking the outcrops of known alunite fissures are characteristic. Other similar depressions have been noted on the property, though they have not been prospected. Indications lead to the supposition that other fissures of alunite will be discovered between the veins already proved. Large areas of the rhyolite have been covered with a comparatively shallow deposit of volcanic ash, cemented together with impregnations of silica, sulphur and other minerals as fumerole deposits. Similar deposits in this district have been mined for their sulphur content for years. The deposits of ash on the alunite property may have buried alunite fissures which can be discovered only by underground prospecting.

The probable origin of the Sulphur alunite deposits may be from deep-seated feldspar formations or from beds that were subjected to the action of hot, sulphurous vapors. The feldspars were partly decomposed and the vapors enriched with potash, alumina, silica and other minerals. The hot vapors and solutions ascended through the open fissures, depositing their potash and alumina content as sulphate, forming alunite as the temperature and pressure decreased. Silica was also deposited, as shown by a quartz lining on the walks of the alunite fissures. Similar vapors no doubt account for the sulphur deposits in the volcanic ash. The alunite deposits are thus probably of deep-seated origin, and may continue to considerable depths without change. Alunite is known to exist at the Marysvale, Utah, deposits over a vertical distance of 1100 ft., taken from the different elevations of points on outcrops.

The specific gravity of alunite is 2.82, a cubic foot weighing 175 lb. in place. Assume the Sulphur alunite to weigh approximately 165 lb. per cu.ft., or 12 cu.ft. per short ton, and a column of alunite 1 x 1 x 12 ft. will weigh one ton. Assuming a fissure width of 12 ft., a block of ore 1000 ft. long and 100 ft. deep will contain 100,000 tons. The middle fissure alone, and the upper and lower fissures combined, have a greater width than 12 ft. If the length of the fissures is assumed to be 1000 ft., 200,000 tons of alunite will be developed for each 100 ft. gained in depth.

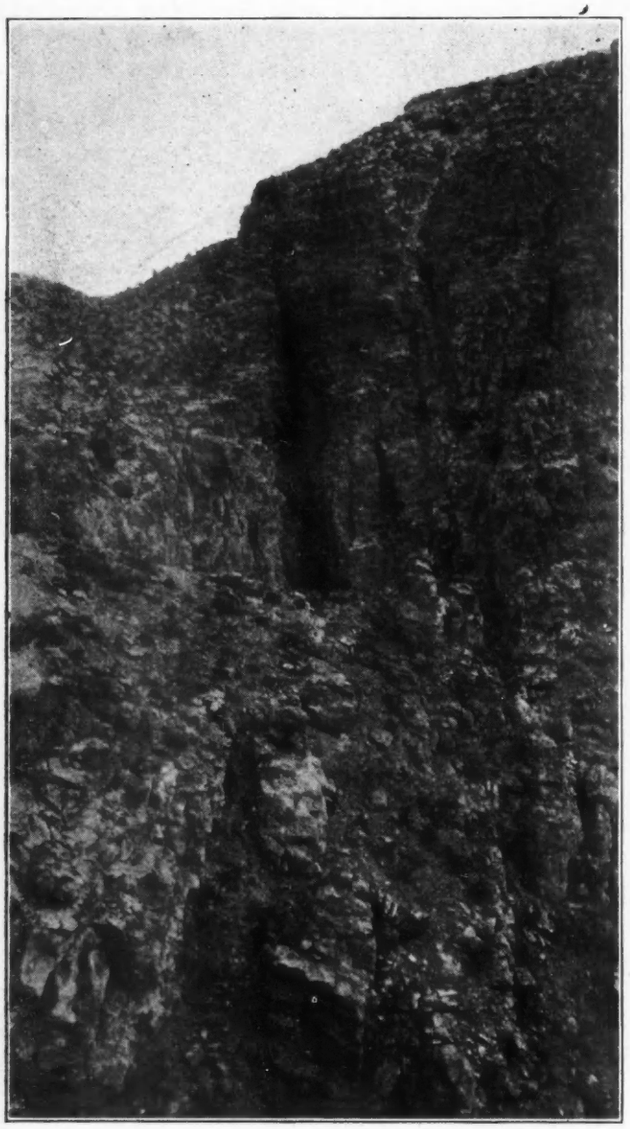
OLD PROSPECT TUNNEL IN MIDDLE VEIN, LOOKING NORTH

Developed by 65-Ft. Shaft and 325 Ft. in Adits

Approximately 500 ft. of development work has been done underground during the last year. This has been more largely from the standpoint of prospecting than for permanent development, but several thousand tons of alunite averaging from 7 to 11.5% K_2O have been opened up. The principal work is 150 ft. of tunnel on upper veins, exposing 3000 tons of ore; 175 ft. tunnel

on lower vein, showing 7000 tons of ore; 65-ft. shaft (vertical) sunk on middle vein, exposing large quantities of low-grade ore, a cross-cut at the bottom of this shaft showing the vein to be 20 ft. wide; prospecting pits and trenches sunk on outcrops of the veins to prove their continuity.

The proposed adit development, as shown in Fig. 2, would prove excellent for future mining as well as prospecting. It would cut the lower two fissures at a depth of 50 to 175 ft. (depending upon contour of surface) within a distance of 275 ft. The total length of this



OUTCROP OF ALUNITE FISSURES ON SIDE OF BOX CANYON, NEAR SULPHUR, NEVADA

cross cut to cut all the veins would be less than 1700 ft. The known fissures would thus be developed and the probable fissures, already mentioned, prospected. A large tonnage of ore could be mined above this tunnel level by means of drifts driven on the strikes of the veins at their intersection with the main crosscut. The present work has all been done above this level along the strike or dip of the veins. Greater depth for future operations can readily be obtained by sinking a working shaft near the portal of the proposed tunnel.

Several processes have been developed for the commercial reduction of alunite to a marketable product. A partial calcination will convert it to the soluble potash alum. Calcination at a higher temperature will render the potash soluble as K_2SO_4 and the alumina insoluble as Al_2O_3. The calcined material may be marketed directly after calcination, or the potash leached out as high-grade potassium sulphate and a residue formed of nearly pure alumina. Both of these products are of commercial value. Other processes combine various roasting and water leaching methods, leaching with sulphuric acid, and other metallurgical treatment. The plant of the Mineral Products Co., at Marysvale, Utah, is described by V. C. Heikes, of the U. S. Geological Survey, in Bull. 620 (1915) p. 265:

> From the ore bins at the mill the alunite passes through a gyratory crusher, then through a set of rolls, and thence is delivered to a storage bin. This material is mixed with powdered slack coal and is fed into a rotary kiln, in which it is roasted. The roasted material is elevated to a storage bin, from which it is drawn off into a digester. In the digester it is mixed with water, and the sulphate of potassium dissolved out. The charges from the digesters are stored in wooden tanks. From these tanks the mixture is pumped into a filter press, where the insoluable alumina and the water-soluble potash are separated.
>
> The solution is then evaporated in triple-effect vacuum pans. The sulphate of potassium crystals are separated out, drained, and dried. The dried powder is pulverized, screened, and sacked for shipment.
>
> The boiler plant uses slack coal for fuel. Boilers having a rating of 600 hp. produce steam for driving three engines, running the machinery of the plant. The exhaust steam is used for evaporating the solutions and drying the product.
>
> The capacity of the first unit of the plant is estimated to be from 25 to 35 tons of sulphate of potassium a day. In addition to the valuable sulphate of potassium, the operators expect to gain some return from the filter cake left after the potash solution has been removed from the calcined material. This cake consists of nearly pure alumina and may be used for making refractory brick, for it is reported to withstand temperatures as high as 2020° C. It may also prove to be available for making aluminum.

The plant described has been in operation for some time and is the largest plant of its type in the country. At least one other plant has been operated at Marysvale, and several plants are either contemplated or in the process of erection.

Byproduct of Sulphuric Acid Yielded in Ore Treatment

Alunite has been mined for many years in foreign countries as a source of potash alum. Its production in this country is comparatively recent, and so far principal attention has been given to its potash content. Potassium sulphate is now being extracted from alunite on a commercial scale. The alumina residue and sulphuric acid byproducts will no doubt find commercial use in the near future. W. T. Schaller, of the U. S. Geological Survey, has made the following observations (Bull 620, p. 264):

> Laboratory experiments showed that on igniting the powdered alunite all of the water and three-fourths of the sulphuric acid are volatilized. On leaching the residue with water, the potassium sulphate is dissolved, leaving the insoluable aluminum oxide behind.
>
> The average amount of potassium sulphate leached from the ignited mineral powder is 17.9% of the original material used. As the coarsely crystallized alunite was found to contain 19.4% of potassium sulphate [about 10.5% K_2O] 92% of the total potash present was obtained by simple ignition and subsequent leaching.
>
> It is worth noting that, according to the laboratory experiments, 32.7% of the ignited alunite consists of available potassium sulphate, which can be extracted by simple water leaching and evaporation. The remaining 67.3% consists of nearly pure aluminum oxide.

The manufacture of metallic aluminum from the alumina residue of calcined alunite is feasible if the siliceous content of the ore is low and cheap electrical power is available. Certain grades of the Sulphur alunite are well suited for this purpose, and it is probable that metallic aluminum will be one of the products from this ore if suitable arrangements can be made. Other products now obtained from bauxite may also be derived from the alumina residue of alunite. Among these are the various aluminum salts, refractory bricks, alundum and calcium aluminate for use in certain high-grade cements and plaster.

Theoretically 28.9% SO_3 is driven off during calcination of the alunite to render the potash soluble. This amounts to 578 lb. per ton of crude alunite. During the present emergency especially, the sulphuric acid byprod-

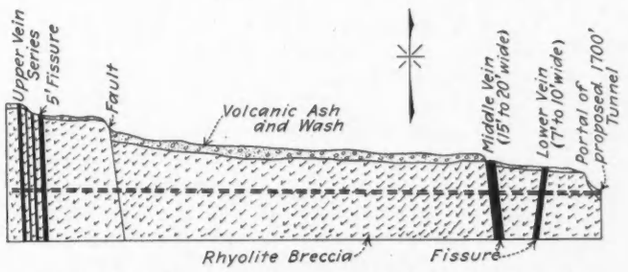


FIG. 2. CROSS SECTION THROUGH ALUNITE FISSURES NEAR SULPHUR, HUMBOLDT COUNTY, NEVADA

uct derived from the reduction of this ore should be a valuable asset. Comparatively little additional equipment is needed to save the acid and produce it in commercial form.

Sulphur Alunite Deposits Promise Large Tonnages

The alunite deposits at Sulphur are still in a prospective stage. No large tonnages of ore have been blocked out, and no work at depth has been performed. However, the small amount of development work already accomplished has proved a considerable tonnage of ore of value in potash. Large paper profits may be easily figured from this source, but how these will work out in practice is purely speculative. It seems probable, however, that a profitable commercial enterprise should result from the operation of the property and the reduction of its ores.

Alunite production and reduction are still in their infancy in this country. However, much of the experimental stage has been passed, and several plants are reported to be in operation. Although commercial alunite has so far been found in only two localities in the United States, large tonnages for many years' operations seem assured. Many commercial products may be obtained from this ore, some of which are now urgently needed.

Tungsten Has the Highest Melting Point of all known metals, namely 3350° C.; it is one of the hardest of the metals; it has the highest equiaxing, or recrystallization temperature after strain hardening, of all pure metals known. It is particularly distinguished because, when composed of small equiaxed grains, it is extremely brittle and fragile at room temperature, and when possessing a fibrous structure it may be ductile and pliable at room temperature. The common ductile metals act in exactly the opposite manner in this respect, according to Zay Jeffries in an article on the "Metallography of Tungsten," in the June Bulletin of the American Institute of Mining Engineers.

Macquisten Tube Flotation Machine

By C. T. Rice

The Macquisten tube was the first flotation machine to prove a practical success in the United States. In 1907 it was tested in Nevada, but it was not until the design had been modified at the Morning plant, Mullan, Idaho, in 1910, that it really became of commercial importance. This ingenious device, which consists of a screw thread turned on the inside of a tube, works well on a granular feed between 30 and 150 mesh, the best results being obtained with 60-mesh pulp. At the Morning plant, where 85% of the feed sent to the Macquistens is plus 100 mesh and half of it plus 60 mesh, but where all will pass a 16-mesh (0.032-in.) wire screen, 200 tons of pulp are treated daily in the 248 tubes with which the plant is equipped. These tubes are arranged in two units of 124 tubes each, and the second unit re-treats the tailings from the first unit. The tubes are arranged in banks of eight to a frame, being divided in two vertical rows of four each. The feed to the bank is split between the two rows, and therefore goes through four tubes in series before being discharged. It then flows to the second unit, where it undergoes similar treatment in another bank of tubes. The tubes are set level in the banks and revolve at 30 r.p.m. It is the lifting of the pulp above the surface of the water that permits the sulphides to be floated by surface tension.

In order to promote this action, a small quantity of sulphuric acid is added, together with a small amount of 28° Beaumé crude California fuel oil. This serves to keep down the siderite and copper sulphate and to increase the floatability of the sulphides, especially of zinc. Though these liquors are recovered and re-circulated, only a trace of any one of them is ever present in the feed, which is sent through the tubes at a dilution of between 4 and 6 to 1.

The machines need delicate adjustment, and in order to get good work out of them the pulp and liquors must be fed evenly and equally to the various tube banks. A close watch must also be kept on the gooseneck by which the height of the pulp in the tube is regulated. Both the lead and zinc sulphides in the feed are lifted, but as most of the lead has already been removed by gravity concentration, so that it assays 7 to 8% zinc and only 2% lead, comparatively little lead is saved by the tubes. The concentrate obtained from the Macquistens is taken to James tables, where it is separated into two products, one containing 50% lead and 8% zinc, and the other 49% zinc and 6% lead. The tailings from the Macquisten tubes contain 1.0% lead and 2.3% zinc, which is mainly occluded mineral, as great care is taken to keep slime out of the feed.

Though the Macquisten tube is a delicate and rather complicated machine, it has a special field—that of separating zinc from siderite or other heavy non-metallic gangues; and this field it fills admirably and well. When the operation of the machine is once mastered, it gives little trouble, and one man can watch a unit of 124 tubes, and also attend to other machinery, such as dewatering classifiers and the like. In dewatering the feed going to the Macquisten installation, both Dorr and Akins classifiers are used, but the Akins seems to be somewhat better for this work, giving less moisture in the product.

The Crisis in Gold Production—Congress Must Act

By B. L. THANE*

The gold-mining industry is in a critical condition. Production costs—labor and materials—are mounting daily. Value received for the product remains stationary and at the pre-war basis. The writer of this paper draws attention to the absurdity of the situation, and calls for an immediate consideration of the question by Congress and the Allied governments, with the idea of advancing the price of gold to compensate for greatly increased cost of production, to preserve the industry from collapse, and to insure the commercial supremacy of the Allies after the war.

THE attention of the Treasury Department of the United States, and, in a limited degree, of members of Congress and the banking industry of the country, has recently been called to the serious situation in which the gold-mining industry of the world finds itself. This is due to the materially increased cost of labor and supplies resulting from the war and to the unique fact that the product—gold—being fixed in price by the Government, has had no proportionate increase in its market value.

By far the greater quantity of gold now produced necessarily comes from low-grade deposits in which the margin of profit, even in normal times, over and above working costs, is comparatively small. This is true because of the unusual occurrence of gold as found in nature. Though it is widely distributed, such distribution occurs, as a rule, in minute quantities; and high-grade deposits resulting from unusual concentration, are, by the very nature of things, rare. In addition to this fact, the high-grade deposits are the first to be found, mined and depleted. The active and persistent search for gold as conducted in the past has resulted in a complete knowledge of its occurrence in nature, and the discovery and subsequent working out of the higher-grade deposits. Those engaged in the industry and familiar with the occurrence of gold are agreed that the future of the gold-mining industry will be dependent, mainly, upon low-grade deposits. Taking this into consideration, and in view of the present fixed value of gold and the rapidly increasing costs of material and labor, it is obvious that the entire industry as now constituted is threatened in its very existence.

Bonus for Producing Mines Necessary

The situation has been developing for the last four years, and has become so acute that the actual production of gold from the majority of the low-grade deposits is now being made at a loss. Last month 300,000 oz. of gold produced on the Rand—the most substantial producing area in the world—was sold to the government at less than cost, and this same condition is true of several of the largest operations in Alaska, Canada and the United States.

It is inevitable that unless some form of bonus is given to the producing mines or an actual increase in the value of the products itself is made by the several countries in the world in which gold is now being mined, the important producers will be compelled to discontinue operations, and the present decreased production of gold will be still further seriously curtailed. It is obvious, likewise, that the calculated profits on ore based on pre-war conditions, and on which operations were established, have ceased to exist. Tonnages of developed ore in the mines today which were carried as an asset because profits were indicated on pre-war basis, have, under present conditions, to be entirely written off. Only the higher-grade and less extensive sections of the operating mines can now be safely carried in the form of reserve. In other words, no low-grade gold-mining operation conceived, financed and developed under pre-war conditions can possibly work out as originally planned; nor can its owners or managers hope to continue their operations for any length of time unless a bonus is offered by the Government to compensate for the increased operating costs, or the actual value of the gold, fixed by the Government, is materially increased.

Gold as a Basis of Credit and Exchange

The problem therefore presents itself thus: Is the production of gold a necessity and is gold mining an essential industry? In order to determine this matter, some of the operators from Alaska, through Delegate Charles Sulzer, from that territory, raised this question with William G. McAdoo, Secretary of the Treasury, who, in a letter addressed to Mr. Sulzer, dated June 10, 1918, very clearly and forcibly defines the position of the gold-mining industry as next to that of the production of food and ammunition, pointing out at the same time the necessity of increasing the gold reserve of the country to sustain the great credit structure now being developed in order to finance the war.

The use of gold as the basis of credit and exchange has been firmly established and has proved universally satisfactory. Its occurrence in nature and its physical and chemical characteristics are such that it may be positively stated that no other commodity compares with gold for this particular purpose, and there is no other likely or possible substitute; nor will there be so long as there are separate nations and governments on the face of the earth. All balances in international trade must be paid for in some fixed and unchangeable medium like gold. Nations will not accept the paper of other countries in payment for credits unless it be backed up with proper gold reserve; and, as a rule, will not accept payment other than in gold itself.

The necessity of finding a fixed basis for credit became pronounced as international trade developed to

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large proportions. The first country to adopt gold as the standard of value was Great Britain, and this was later accepted and adopted by all the principal nations of the earth.

One of the most important and interesting questions arising in this discussion is the value of gold as now fixed and accepted by the leading nations of the world. The price of pure gold in our standard of money is uniform at $20.67 an ounce. This value was arbitrarily fixed by the Bank of England, when, as a nation, Great Britain decided that it was advisable to fix the value of gold in order to standardize exchange. Prior to this, though the British government had adopted gold as a standard, it had been in the habit of purchasing the metal in the open market at a variable range of prices. This necessarily affected, from day to day and from purchase to purchase, the very basis of exchange. Hence the necessity of establishing a fixed price.

It is generally conceded that the price, as fixed, was taken from the last purchase made by the Bank of England for gold in the open market, which in U. S. currency, as stated above, happened to be $20.67. Soon all of the other leading nations in the world accepted this gold standard, and likewise the price which had arbitrarily been fixed by the Bank of England and sustained with the approval of the British government.

The important fact regarding this, in so far as the present discussion is concerned, is that the price as fixed was purely arbitrary.

Even if measured in the currency of the time at which the price was fixed, when gold was calculated to be worth $20.67 an ounce, it is evident that because of the very great increase in the demand for the metal, and the increased cost in producing it, this valuation is now incorrect and much too low.

Accepting gold as the basis of all credit structure, there has never been a period in the history of the world when the demand has been as great as now, in order to sustain a reasonable reserve against government issues of bonds, certificates, and like evidences of indebtedness.

E. M. Patterson, of the University of Pennsylvania, discussing the national financial situation of the United States, points out that although the amount of gold held by the Reserve Banks has almost doubled, the ratio of gold to net deposits and Federal Reserve notes combined has fallen in the last year from 83 to 61 per cent.

Trading With Neutrals and Allies

The quantity of gold coming into the United States and now held by the United States has doubled because of the tremendous quantities of war materials and supplies sold to the foreign governments, which had to be paid for in gold. This gold, heretofore held in reserve by England, France, and other countries, temporarily found its way to this country. It is unlikely that this condition will continue now that America has entered the war. Our large armies now in France require huge expenditures and purchases made in foreign countries, which must be paid for in gold; and as Mr. McAdoo has pointed out in the letter already referred to, the country is, at least for the time being, compelled to pay in gold for purchases from neutrals, because our own supply of needed commodities is required for home consumption. There is, therefore, no balance of trade with them.

Combining this fact with the circumstances that the producing and operating gold mines of the country will be compelled to discontinue operations unless assistance is given, it can be seen that the gold reserve held by the United States (because of the necessity of additional issue of new bonds, certificates, and like fiduciary obligations, in order to finance the war) will experience a further and material decrease in the immediate future.

As a matter of actual fact, the United States is paying out gold today to neutrals for purchases at a fixed value which is considerably less than the cost of production of the gold.

The International Situation

There is an international phase to this gold situation which apparently has been lost sight of, but which has a direct and most important bearing on the war itself. As has been pointed out by Hennen Jennings, consulting engineer to the Bureau of Mines, 91% of the gold and gold-mining districts of the world is owned and controlled by France, England, and the United States; approximately *only* 1% *is owned and controlled by the Central Powers, with whom we are at war;* and 9% is in the hands of neutrals. This is not only an interesting fact but one which, if properly handled as a war measure, can be used to very great advantage by the Allies in affecting the credit structure of the Central Powers.

It is a well-known fact that the issue of paper credit by the Central Powers to their own people and the adjacent neutrals has been, necessarily, in far greater proportion to their gold reserve than in the case of the Allies. So long as these countries are dealing with themselves only, and are unable to engage in international business, and just so long as their governments remain strong enough to compel the people to accept such paper issue on its face value, their actual gold reserve is not important; but the instant the war is ended, and the Central Powers are again compelled to enter foreign trade in order to replenish their exhausted supplies of material, their paper credit structure will have to be maintained by a proper gold reserve; otherwise it will fall to pieces and a tremendous financial disaster will result. The German financiers are aware of this, but expect to build up their gold reserve through their ability to sell, in the world markets, materials and supplies at a much lower figure than that for which they can be produced in the Allied countries.

There is grave danger that this condition will actually develop so far as this country and the Allies are concerned. One of the results of the war has been a greatly increased cost of labor in these countries; that is to say, labor has demanded—and received—a much larger wage—approximately 100% greater than before the war. As a net result of this, the cost today, in gold in the United States, and, to a lesser degree in England and France, of producing all commodities, has increased approximately 100%. Pig iron is selling at $33, as against $15 before the war, and the cost of almost every other important commodity has risen in like proportion.

The danger from this is that the Central Powers in general, and Germany in particular, have not increased

the wage scale in like proportion; so that the cost, measured in gold, of producing all articles in Germany after the war, or even now, is less than it is in this country. German financiers have boasted of this condition repeatedly. To balance this inequality it would be necessary to place a premium on our gold supply equivalent to the difference in the average cost of labor between the Central Powers and the United States and her allies.

Though tariffs and trade agreements may be developed and arranged which will offset this difference to some degree, the easiest, most sensible, most practicable, and quickest way to place German labor and industry on a parity with that of the United States and her allies will be to *arbitrarily increase the value of gold* in an amount sufficient to offset the average difference in wage scale now existing between the Allies and the Central Powers. This is feasible only because of the condition mentioned earlier in this discussion, namely, that 91% of the gold and gold-producing properties of the world is controlled by the Allies, and less than 1% by the Central Powers. It is evident that if the governments of the Allies owning and controlling this gold resource would arbitrarily double its value, the Central Powers would have to do twice the amount of work and sell twice the quantity of material in order to obtain the gold supply necessary to establish a proper reserve against the paper credit structure which has been developed by them on account of the war. In other words, the governments of the Allies would compel Germany to pay twice as much for her necessary gold supply.

It has been argued that such change in value of the basic metal would derange credit structure, but this can be obviated by agreement of the governments of England, France and the United States, which, as pointed out, control the gold supply of the world. It would be necessary, of course, first for them to not only draw in all gold coin and hereafter command the entire existing supply, but all gold produced in the future. In a very large degree this has already been done, and gold coins are rapidly going out of circulation. The issue of the Federal Reserve certificates is an illustration of what would take place in lieu of the issuance of gold coin. It would not derange the value of the currency as issued, because it is apparent that the value of gold behind this currency is in any case arbitrarily fixed by the Government.

For instance, if the Allied governments arbitrarily agreed that gold should be fixed at $40 per ounce, instead of the present price of $20.67, the holders of certificates or bonds would receive half as much gold as they now receive in return for their paper; but if half an ounce of gold were worth twice as much as it is now worth (and this would be the case) there would be no actual derangement or change in the value of the currency or paper issues. In other words, half an ounce of gold worth $40 would be just as satisfactory to the holder of paper as an ounce worth $20.67, because in both cases the value itself would be arbitrarily fixed by the Government. Moreover, this value would be more in keeping with the actual cost of production of the gold.

Fineness of gold should not be considered in this connection, because fineness has to do only with the purity of gold. The fixed price of $20.67 an ounce, as now established, refers to pure gold only. Gold of lower fineness than pure gold is obviously worth less than $20.67 per ounce in proportion to the quantity of other alloys or impurities contained therein. For instance: In the twenty-dollar goldpiece as now issued there is not quite an ounce of pure gold—the difference between the $20 and the $20.67 being made up of copper added for the purpose of making the coin harder and more serviceable. This is mentioned because, in general discussion of this subject, it is apparent that those who are not familiar with gold are inclined to confuse the element of fineness with the fixed price of gold, with which it really has nothing to do.

Though this conception of the situation, and the remedial suggestion, may at first seem radical, it is interesting to note that the entire gold-producing industry of the British empire called a meeting for this identical purpose on July 4 and appointed a committee of six immediately to bring this situation to the attention of the British government. So far as the United States is concerned, the first and immediate necessity is legislation which will permit the continuation of the present gold-mining industry. This can be accomplished temporarily by establishing an adequate bonus sufficient to offset the increased cost of labor and materials as against pre-war conditions; by the formation of an international commission to act jointly with the committee now formed in London and with the proper representatives of the governments, for the purpose of reëstablishing a proper fixed price for gold, commensurate with present conditions; the enactment of such legislation as will protect all paper issues which have been made on the present gold basis; and the taking of such steps as are necessary to see that the international gold asset controlled by the Allies is properly utilized in order to place the Central Powers on a parity with us so far as the cost of production is concerned. In this way they will be prevented from drawing out the gold supply of the Allies, through neutrals or other channels, by selling materials in the world markets at a lower gold cost.

It is hoped that this discussion, together with a general consideration of the subject, may lead to the immediate enactment of legislation necessary to protect the present operative gold-mining industry of the Allied countries; and that the latter will take full advantage of the control of this metal, in dealing with the credit structure of the Central Powers.

Given the realization of the fact that the United States and her allies actually control 91% of the gold and gold-producing areas, these questions arise:

First—Why should we continue to pay for supplies purchased from neutrals in gold at less than its actual cost of production?

Second—Should not the United States and her allies immediately recognize the possession of gold as a great international asset and take steps to prevent Germany and the Central Powers from entering the world markets, and so draining from the United States and her allies the gold necessary to preserve the very paper credit structure developed for the purpose of carrying on the war against us?

Third—Why should the gold-mining industry perforce be compelled to sell its product at a price less than that which it is actually worth?

Kennecott Copper Corporation

The third annual report of the Kennecott Copper Corporation embraces the operating reports for 1917 of its mines at Kennecott and Latouche, Alaska, and for the Braden unit, in Chile. At the Kennecott property 265,579 tons of ore, averaging 13.78% copper, was produced, and 89,799 tons of it, averaging 38.57% copper, was shipped direct to the smeltery. The metallurgical efficiency at this plant was 94.65%, as indicated by the copper contained in the ore mined and the products shipped. The concentrator yielded 29,559 tons of concentrates, averaging 53.52% copper, from 206,253 tons of ore, averaging 8.92% copper, indicating a recovery of 85.98%. The ammonia leaching plant treated 98,075 tons of mill tailings containing 0.90% copper in the carbonate form, and yielded 1,244,200 lb. of copper, which increased the total average milling recovery for the year to 89.4 per cent.

The mine at Latouche produced 273,523 tons of ore, assaying 2.44% copper, and 49,141 tons, averaging 11.48% copper, was shipped direct to the smeltery. The metallurgical efficiency at this plant was 84.53%. Ore milled amounted to 253,805 tons, averaging 2.06% copper and 29,423 tons of concentrates was produced, containing 14.20% copper. The mill recovery for the year was 80.28%. Mining development work totaled 10,770 ft. at Kennecott and 5320 ft. at Latouche, and, in addition, 14,419 ft. of diamond drilling was done.

There was received at the smeltery of the combined properties, after allowing for smelter deductions, 78,211,429 lb. of deliverable refined copper and 933,573 oz. of silver. Of these receipts 56,904,650 lb. of copper and 681,641 oz. of silver were settled for during the year, the remainder being inventoried at cost. The copper was sold at 27.015c. per lb., the silver at 95.848c. per oz., and the combined revenue from these metals amounted to $16,026,105. Operating charges totaled $4,208,909, and other income, including $7,147,801 received from dividends on Utah Copper Co. stock, amounted to $7,466,285. Charges for interest, commissions and taxes amounted to $1,318,579, and left a balance of $17,964,902 for net earnings. A total of $6,419,482 was charged for depreciation and depletion, and $10,311,665 was distributed in dividends.

At the Braden mines a total of 1,799,694 tons of ore, averaging 2.32% copper, was treated. The ore supplied by the Teniente workings averaged 3.07%, and increased in volume during the year so that 21.5% of the total ore was from this source. The mill treated an average of 4931 tons per day, an increase of 32% over its performance for the previous year, and recovery was 81.61%, as against 78.97% in the previous year. Tonnage smelted was 158,275, of which 71% was nodulized. The net weight of charge was 193,290 tons. The converters averaged 87.6 tons of blister copper per day. Development work totaled 43,003 feet for the year. Ore reserves as of the end of the period were:

149,192,000 tons positive ore averaging 2.42% copper
90,000,000 tons probable ore averaging 1.88% copper

239,192,000 tons total ore averaging 2.21% copper

Operating revenue from the sale of 41,010,502 lb. of copper at 31.88c. per lb. was increased by miscellaneous income amounting to $876,937. Operating charges totaled $6,699,726, taxes, interest and miscellaneous charges $1,110,749, and items of depreciation, including $1,182,746 for plant superseded or abandoned during the year, amounting to $3,245,276 were charged, leaving a net surplus for the year's operation of $2,863,111. The surplus of $6,738,705 previously reported at the end of 1916 is adjusted and reduced to $2,193,628, and the total obtained by crediting the 1917 surplus is further reduced by $1,170,000, being the balance of unamortized discount on bonds, so that the net earned surplus as of Dec. 31, 1917, is $3,886,739.

Old Dominion Co.

The 1917 report of the Old Dominion Co., previously a holding company for the Old Dominion Copper Mining and Smelting Co. and the United Globe Mines, copper producers of Globe, Ariz., indicates that early in the year the organization was simplified by direct purchase of the operating companies by the parent company. Operating conditions were normal during the first half of the year, but subsequent to the calling of the strike on July 1 results were poor. After September, conditions became nearer normal, but high costs of labor and supplies and the comparatively low price for copper kept profits down.

The production of smelting ore, amounting to 81,728 dry tons, came mostly from the west side orebodies, and the east side orebodies furnished most of the concentrating ore, which totaled 114,217 tons; small amounts of siliceous and iron ores brought the total tonnage up to 199,888, of an average grade of 4.97% copper, compared with 152,059 tons, averaging 5.88% copper, in the previous year. Development work totaled 24,321 ft., as compared with 42,018 in 1916. Favorable developments were made on the lowest level, the 18th; on the west side of that level an orebody 140 x 110 ft. was shown to average 5.8% copper over its entire length of 140 ft.; on the east side one vein 33 to 61 ft. wide was developed and proved to connect with ore on the 16th level.

Copper produced totaled 32,365,795 lb., and was sold at an average price of 25.91c. per lb. The extraction for 1917 was 88.01%; 30.5% of this total being secured by flotation, 69.0% by water concentration, and 0.5% from overflow slimes sent to the smeltery. The concentration cost was $1.25 per ton milled, the smelting cost $3.13 per ton for the 198,548 tons of charge, and the converting $8.96 per ton of fine copper produced in bullion. All of these operating costs show considerable increases over the corresponding results for 1916, but the cost of power decreased to $65.17 per hp. year from $74.14 in the previous year. Sales of metals amounted to $8,595,444, miscellaneous income was $39,727, and total operating and administrative expenses were $6,258,662. Charges for taxes, depreciation of plant and depletion of mines amounted to $1,155,244, and reduced net surplus for the year to $1,221,264. Dividends totaling $2,376,262, or $8 per share, were paid, and $4,820,403 remains at the credit of surplus.

South African Asbestos Supply is now assured, an ample supply having been discovered in the Asbestos Mountains and in the lower Griquatown beds. The deposits have been developed as far north as the Bechuanaland Protectorate. The work is carried out by the aid of Kafir labor, and the fibre produced averages 25% 1 in. or over.

Tall Chimneys in Metallurgical Plants

A summary of data concerning the notable chimneys of the leading metallurgical plants in North America and the Saganoseki chimney in Japan, until recently the tallest in the world. Illustrations of important structures are presented, including the recently completed chimney at Tacoma, Wash., built of paving brick, and holding the present world's record for height.

AMERICAN engineers have built not a few great chimneys. The large scale on which metallurgical operations in the United States have developed has made the metallurgical industry a fertile field for the talents of experts in the building of tall chimneys, the highest of which has recently been completed at Tacoma, Wash. There are probably more chimneys of the first magnitude in the United States than in any other country, though until recently the record for the world's highest stack was held by Japan. However, it is worth noting that even the 570-ft. Saganoseki chimney was designed and built under the direction of American engineers.

To record adequately the creation of these engineering monuments, for such they are, would require a volume. Each of the chimneys illustrated in this issue is of itself an engineering poem, worthy of a special article devoted solely to its design and construction. It is possible to present here only some miscellaneous and necessarily incomplete data that accumulated in the course of securing a group of photographs originally intended for the department of "Photographs from the Field." The data have come mainly from the constructors, and, so far as possible, are presented practically as received. The endeavor has been to secure important examples of each type of chimney and, wherever possible, the highest one known.

In discussing chimneys, one of the features of most interest is the height; hence it is practically necessary in writing of tall chimneys to violate one of the *Journal's* rules and use the superlative freely. To eliminate it would destroy to a considerable extent the interest in these great structures. For example, to read of the "highest chimney in the world at Tacoma, Wash.," is more interesting and, in a general way, more informative than the possibly prosaic description of the "chimney at Tacoma, Wash., 572 ft. 10 in. high by 23 ft. 11 in. inside diameter at top." "The world's highest reinforced-concrete chimney at Saganoseki, Japan," is likewise a more expressive and suitable caption of the splendid monument, illustrated on another page, than the mere statement that it is 570 ft. high. Hence, we are taking the liberty of indulging in superlatives, with

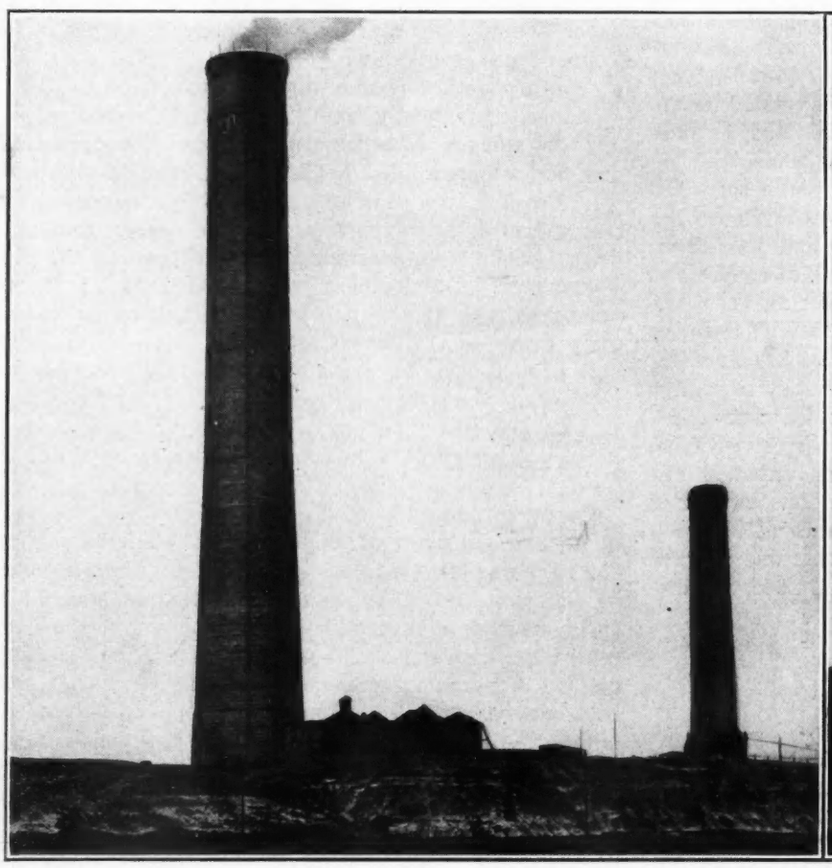


FIG. 1

TALLEST PERFORATED RADIAL BRICK STACK

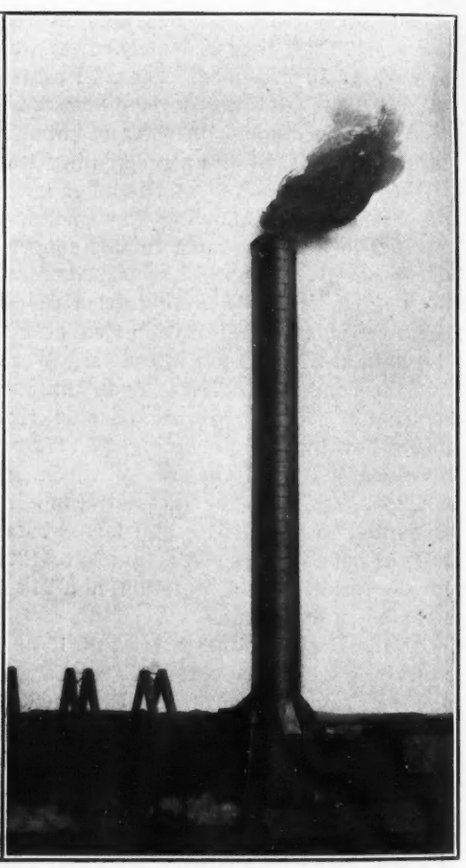


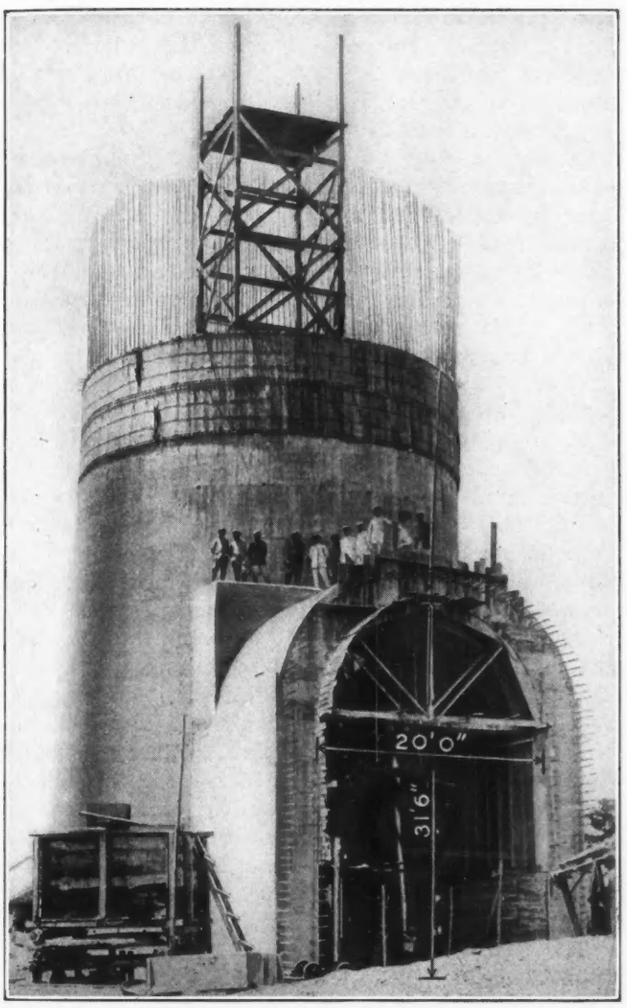
FIG. 2.

WORLD'S HIGHEST STEEL STACK

Fig. 1—This stack was erected at the Great Falls, Mont., works of the Anaconda Copper Mining Co. by the Alphons Custodis Chimney Construction Co. It is 506 ft. high and 50 ft. inside at the top. Fig. 2—When the United Verde Copper Co. erected its new smelting works in 1913, its engineers, Repath & McGregor, decided upon a 400 x 30-ft. steel stack, which was erected by the Chicago Bridge and Iron Works.

a full appreciation of the dangers of being wrong and the possibility of correction by some observant and meticulous reader. This usually happens when one says anything is the greatest, smallest, or longest in the world. If the superlative is not correct as here set forth, the notes may prove ultimately informative by eliciting correction and amplification.

The chimney which naturally engages attention first is the latest one to enter the lists as "the highest in the world." The Tacoma stack was placed in operation about the first of March, 1918. As built, it is 572 ft. 10 in. high and 23 ft. 11 in. inside diameter at the top and 38 ft. 11 in. inside the lining at the base. The outside diameter of the stack shell at the base is 50 ft. 2 in. The shell is built of paving brick on a concrete footing. Owing to the unevenness of the hardpan, the concrete base was put down to a depth of 30 ft., where the hard blue clay extended under the entire area of the concrete block. Details of the foundation have been discussed by Charles Evan Fowler in *Engineering News-Record* of Apr. 4, 1918. The superstructure was built by the Alphons Custodis Chimney Construction Co., of 95 Nassau St., New York. The brick shell ranges in thickness from 5 ft. 1 in. at the base to 13½ in. just below the bell at the top. The stack has a 4-in. sectional firebrick lining, separated from the shell by a 2-in. air space. Over 2,500,000 bricks were used in the construction of the stack shell, and, including the brick lining, the total weight on the foundation is over 12,000 tons. An accompanying view shows the recently completed stack, which is built on a ridge about 150 ft. high, making the top of the chimney about 725 ft. above tidewater, a few hundred feet away. A better appreciation of the height of the new stack is obtained when it is known that the other chimney shown in the same illustration is 300 ft. high and 18 ft. in diameter.



STARTING THE SAGANOSEKI CONCRETE STACK

The smaller reinforced-concrete stack was built in 1905 by the Weber Chimney Co., 1452 McCormick Bldg., Chicago, and was of a standard type of construction at that time, referred to as cylindrical chimneys, being of uniform inside diameter from base to top; it cost about $30,000 and was built on a reinforced-concrete base, 39 ft. 6 in. square and 6 ft. 6 in. thick, made with 1:3:5 mix, stone not over 2-in. size. The wall thickness was 9 in. up to a height of 90 ft., where the shell wall was reduced to 7 in. in thickness. The lower 90 ft. of the chimney has a double wall, the inner shell being 4 in. thick; it is separated from the outer wall by a 4-in. air space. The calculations allowed for a compression of 600 lb. per sq.in. on the concrete and a tension of 21,000 lb. per sq.in. for the steel, assuming maximum wind conditions of 100 miles per hour. The 1905 chimney was constructed with 1¼ x 1¼ x $\frac{3}{16}$-in. T-bars for horizontal reinforcing. More recent coniform chimneys, built by the Weber Chimney Co., such as the Blackwell, Okla., stack, have "horizontal" reinforcing of ½-in. round bars, spaced at 14-in. centers, but wound spirally for the entire height of the stack and lining. The usual vertical bars are, of course, used. The maximum tension allowed for the steel does not exceed 16,000 lb. per sq.in. The compression in these stacks varies from 350 to 450 lb. per sq.in., depending on the dimensions of the chimney.

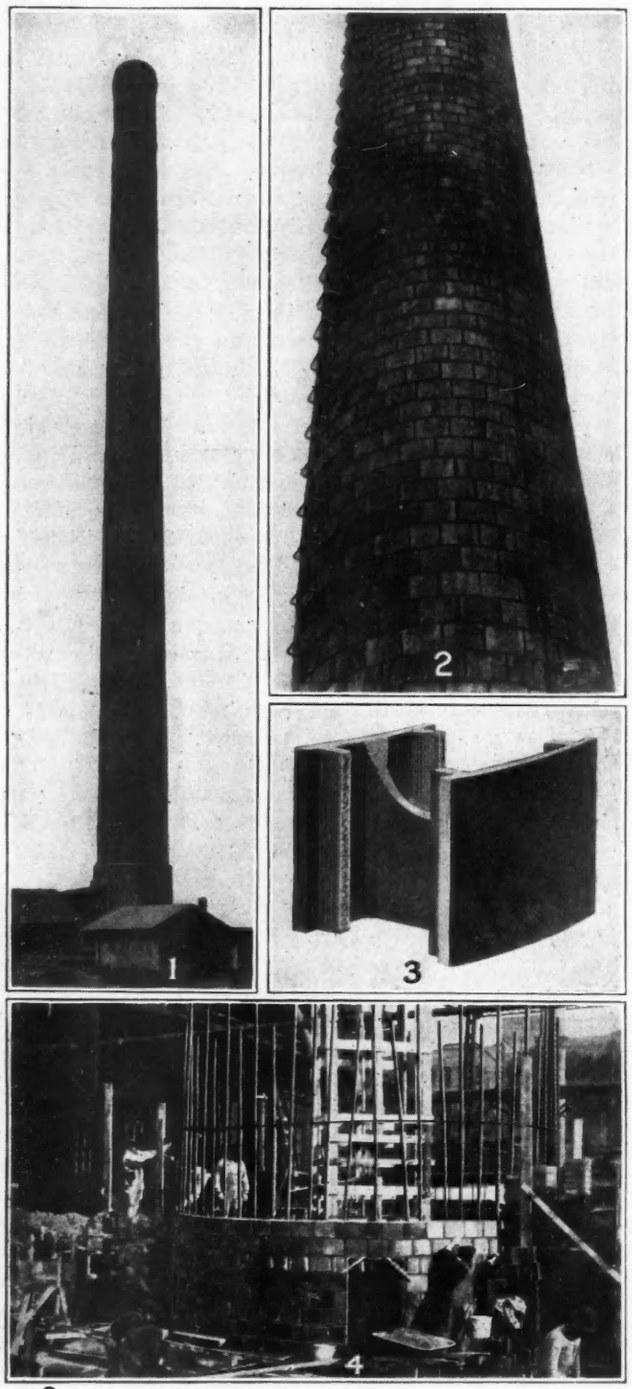
The chimney built for the Saganoseki copper smeltery until recently held the record as the highest chimney in the world; it is still the highest reinforced-

TALL CHIMNEYS FOR METALLURGICAL WORKS

Situation	Works	Material	Height, Ft.	Inside Diam. at Top, Ft.	Builders
Tacoma, Wash.	Tacoma Smelting Co.	Paving brick	572.8	23.9	Alphons Custodis Chimney Construction Co.
Saganoseki, Japan		Reinforced concrete	570	26.25	Weber Chimney Co.
Anaconda, Mont. (a)	Anaconda Copper Mining Co.	Perforated radial brick	525	60	Alphons Custodis Chimney Construction Co.
Great Falls, Mont.	Anaconda Copper Mining Co.	Perforated radial brick	506	50	Alphons Custodis Chimney Construction Co.
Murray, Utah (a)	American Smelting and Refining Co.	Perforated radial brick	450	20	
Clarkdale, Ariz. (a)	United Verde Extension Mining Co.	Perforated radial brick	425	30	Alphons Custodis Chimney Construction Co.
Clarkdale, Ariz.	United Verde Copper Co.	Steel	400.1	30	Chicago Bridge and Iron Works
East Helena, Mont.	American Smelting and Refining Co.	Perforated radial brick	400	16	Alphons Custodis Chimney Construction Co.
El Paso, Texas	El Paso Smelting Works	Perforated radial brick	400	30	Alphons Custodis Chimney Construction Co.
Collinsville, Ill.	St. Louis Smelting and Refining Co.	Reinforced hollow tile	375	16	Wiederholdt Construction Co.
Bayonne, N. J. (b)	Orford Copper Co.	Perforated radial brick	365	10	Alphons Custodis Chimney Construction Co.
Port Colborne, Ont. (b)	International Nickel Co., Canada	Reinforced concrete	350	12	General Concrete Construction Co.
Anaconda, Mont.	Anaconda Copper Mining Co.	Brick	300	30	
Blackwell, Okla. (c)	Bartlesville Zinc Co.	Reinforced concrete	307.5	12	Weber Chimney Co.
Tacoma, Wash.	Tacoma Smelting Co.	Reinforced concrete	300	18	Weber Chimney Co.
El Paso, Texas (d)	El Paso Smelting Works	Reinforced concrete	300	16	General Concrete Construction Co.

(a) Building. (b) Two chimneys of same dimensions. (c) Wislicenus top. (d) Wislicenus top, but openings have since been closed.

concrete chimney. Tetsurow Komakine has stated[1] that a 1000-ft. concrete stack was being constructed in Japan, but builders in the United States are under the impression that Mr. Komakine had reference to the stack at Saganoseki. The stack proper is 570 ft. high and is built on a hill 430 ft. above the sea, the sum of these two figures just equaling the 1000 ft. mentioned by Mr. Komakine. According to the builders of the Saganoseki chimney, the Weber Chimney Co., the Japanese stack is 570 ft. high, 42 ft. 8 in. outside diameter at the base and 26 ft. 3 in. inside diameter at the top. The chimney is of the coniform type and with appurtenances cost about $250,000. The flue connecting the smelting furnaces with the chimney is 2500 ft. long. The foundation block contains 2711 cu.yd. of concrete and is 95 ft. in diameter. The double wall in this stack runs to a height of 150 ft. The shell thickness at the base is 29½ in. and tapers to 7 in. at the top. Compression on the concrete is figured at 550 lb. per sq. in. The mix used for the builders' later concrete chimneys is 1:2½:4, which they consider superior to the old dry, tamped mix of one part of cement to three parts of sand.



A 375 FT. SMELTERY STACK AT COLLINSVILLE, ILL., BUILT OF REINFORCED HOLLOW TILE

No. 1—General view of the completed stack. No. 2—A closer view of the shaft and ladder. No. 3—A part sectional view of the Wiederholdt tile. No. 4—Beginning of construction work on the Collinsville chimney, the highest of its type.

The Great Falls stack, 506 ft. high by 50 ft. inside diameter at the top, probably offers the greatest gas-carrying capacity of all chimneys now operating. It will soon be surpassed by the new Anaconda chimney, 525 x 60 ft., which is just being started at the Washoe works of the company, at Anaconda, Mont. The Great Falls stack, which has been fully described[2], was designed to remove 4,000,000 cu.ft. of gas at a temperature of 600° Fahrenheit.

The United Verde Copper Co.'s steel stack, 400 ft. 1 in. high by 30 ft. diameter, is unique among large smelting stacks, no other works of the first magnitude in this country using steel as the material for its main stack. This chimney was designed to handle 2,000,000 cu.ft. of gas and has been described at length by C. W. Cromwell[3]. Several smelting-works stacks have been erected in this country with Wislicenus tops—a lattice or openwork effect to assist in diffusing the gases with the air. There is some difference of opinion as to the value of the Wislicenus dissipator, but American practice is trending toward high stacks and delivering the gases into the air at a high temperature, rather than to reduce the draft in the stack through the Wislicenus openings. It is worthy of note that the openings in the 300-ft. concrete stack at El Paso have been closed, and at some other works the Wislicenus arrangement is regarded as more useful for its moral effect than for superior dispersion of the gases.

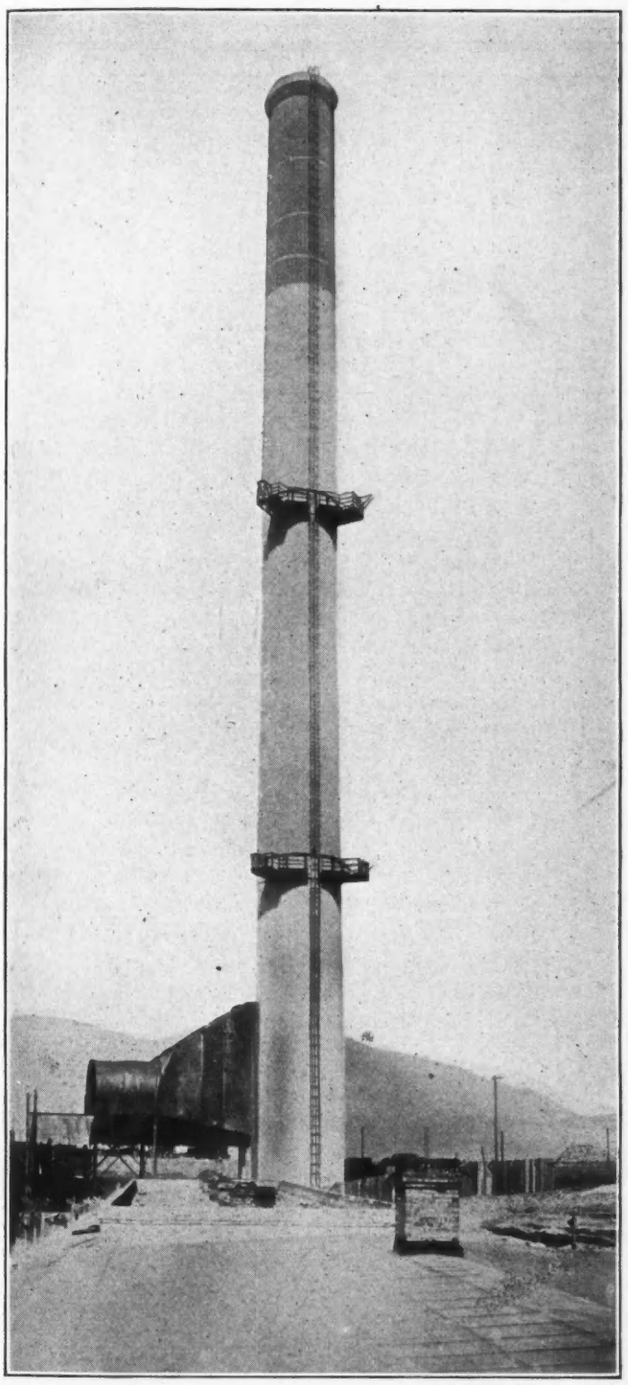
The twin 350-ft. chimneys recently erected at the International Nickel Co.'s refinery at Port Colborne, Ont., are stated by the builders, the General Concrete Construction Co., of 30 Church St., New York, to be the tallest reinforced-concrete chimneys in North America. They are 29 ft. 4 in. outside diameter at the base and 12 ft. inside at the top. Flue conditions were unusually severe, there being four flues, each 7 x 20 ft. in the clear. On this account the concrete shell was made 51¼ in. thick at the bottom. The chimneys are lined with firebrick to the tops, which have special terra-cotta caps. The vertical reinforcing in these chimneys is ¾-in. square twisted rods and the horizontal reinforcement is wire mesh consisting of ¼-in. longitudinal rods spaced at 4-in. centers, laced triangularly and placed around and wired to the vertical rods. Altogether, five concrete chimneys were erected at the Port Colborne refinery, their application being to a variety of conditions. The concrete was mixed in the proportion of one part of cement, 2½ parts of sand and three of

[1] "Met. and Chem. Eng.," Oct. 15, 1917; abstr. "Eng. and Min. Journ.," Nov. 24, 1917.

[2] "Eng. Record," Nov. 29, 1908.

[3] "Eng. and Min. Journ.," Dec. 6, 1913.

gravel; it was prepared in a batch mixer and poured wet in special steel forms, adjustable to the taper of the chimney. The forms and several of the Port Colborne chimneys are shown on p. 173 of this issue.



CONCRETE CHIMNEY AT EL PASO SMELTING WORKS

The chimney, built at El Paso, Texas, by the General Concrete Construction Co., is 300 ft. high by 16 ft. inside diameter. The peculiar perforated effect at the top of the chimney is the Wislicenus top, which was made by inserting rows of 2-in. pipe in the concrete for about 50 ft. from the chimney cap. The Wislicenus "dissipator" was found to reduce the draft so much that the openings have since been closed.

Besides these metallurgical chimneys, there are several industrial chimneys in America over 300 ft. in height. Two of these are noteworthy for their height and some special features. One is the chimney at the paint works of C. K. Williams & Co. at Easton, Penn. This radial-brick chimney is 375 ft. high, but tapers to only 7 ft. inside diameter at the top. A 300 x 19 ft. radial-brick chimney was recently erected for the Arlington Mills, at Lawrence, Mass. It has as a special feature two superimposed hoppers in the base for the purpose of collecting and discharging soot, thus keeping the opening at the chimney base practically free from accumulations of soot and ash and preventing dangerous temperatures from the burning of a large accumulation of soot. Difficulties from this source, however, do not arise in metallurgical chimneys.

Water Tanks and Piping in Cold Climates

At mines and mills where severe winter conditions prevail, precautions must be taken with exposed tanks, pipes and launders. The following notes on experience at a mill where the thermometer frequently goes to 40° F. below, and where zero weather is continuous over long periods, may be of interest:

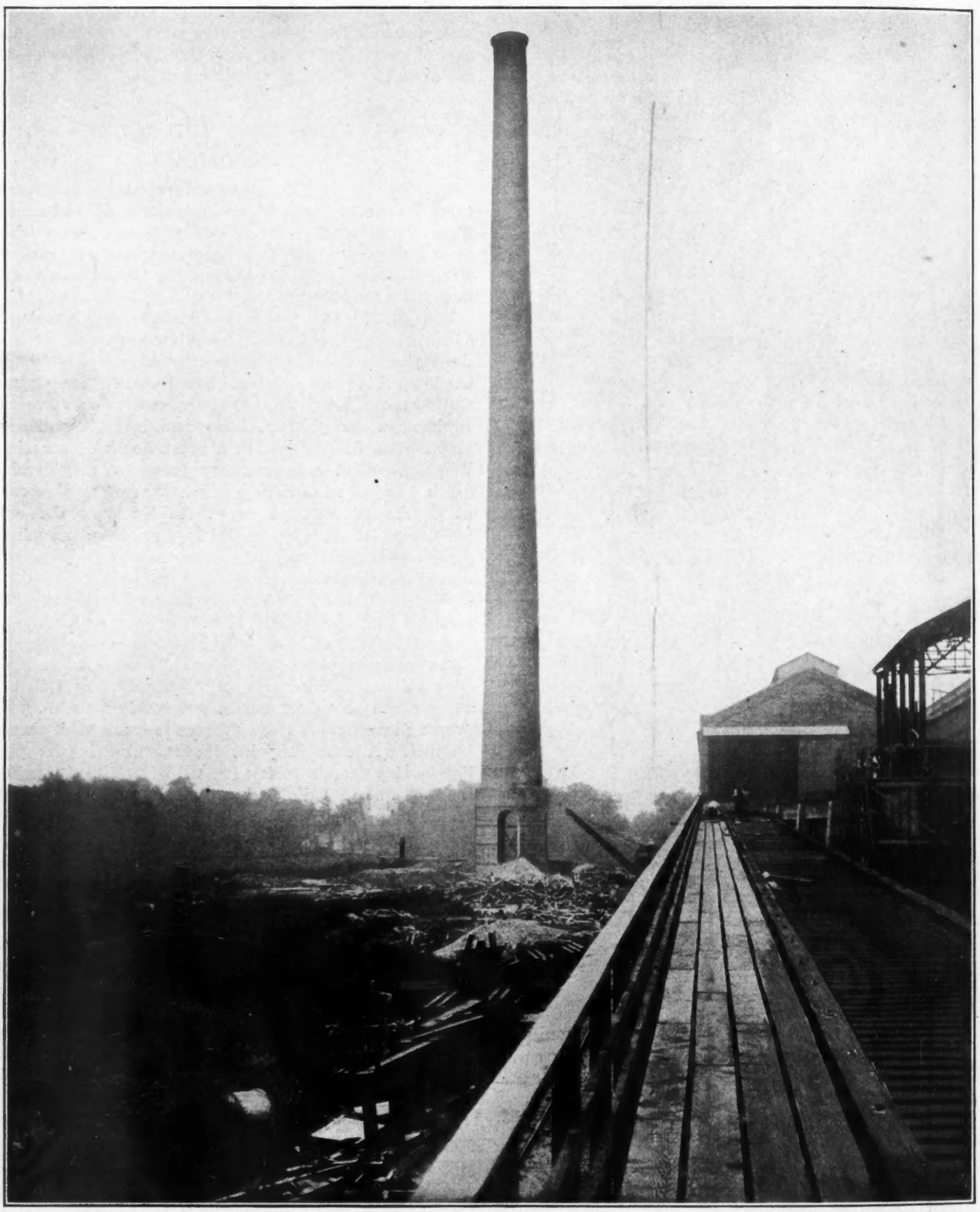
Pipe lines, when buried, should have sufficient depth of covering to avoid any possibility of freezing, even if the water in them should become stagnant. If doubt exists on this point, they had best remain above ground and be provided with an easily removable covering. Light snow is a good insulator; and, in regions of deep snow, pipes do not require a great depth of covering. Where snowfall is scant, they freeze at considerable depth, as at Leadville, Colo., where this occurs at depths of six and seven feet beneath the surface. Special attention should be given to points where pipes cross under wagon roads or trails, where the soil over them becomes compacted and transmits cold several times more readily than where not so compacted. Put the pipe in a box and fill in with a poor conductor.

Avoid wherever possible the placing of valves and drain cocks outside of buildings. The usual box filled with stable manure is frequently a necessary evil, but many times all valves can be put inside a building by proper planning. If extra expense is involved, it should be met. A case in point is the valve in the pipe line leading from a tank. Instead of putting it outside the tank and providing a box, it will be found far preferable to put the valve inside the tank, where it will be immersed, and to provide it with a long handle extending up through the water.

Tanks must be given some protection to prevent bursting, as the formation of ice in any considerable thickness exerts great pressure. An economical method is to enclose the tank in a rough board, hip-roofed housing with a minimum clearance between tank and housing of, say, one foot, the outside being papered and the space filled with hay, sawdust, or other light, dry and cheap non-conducting material. The opening under the roof and over the surface of the water is small, and can be heated easily in the severest weather with a kerosene burner or electric heater.

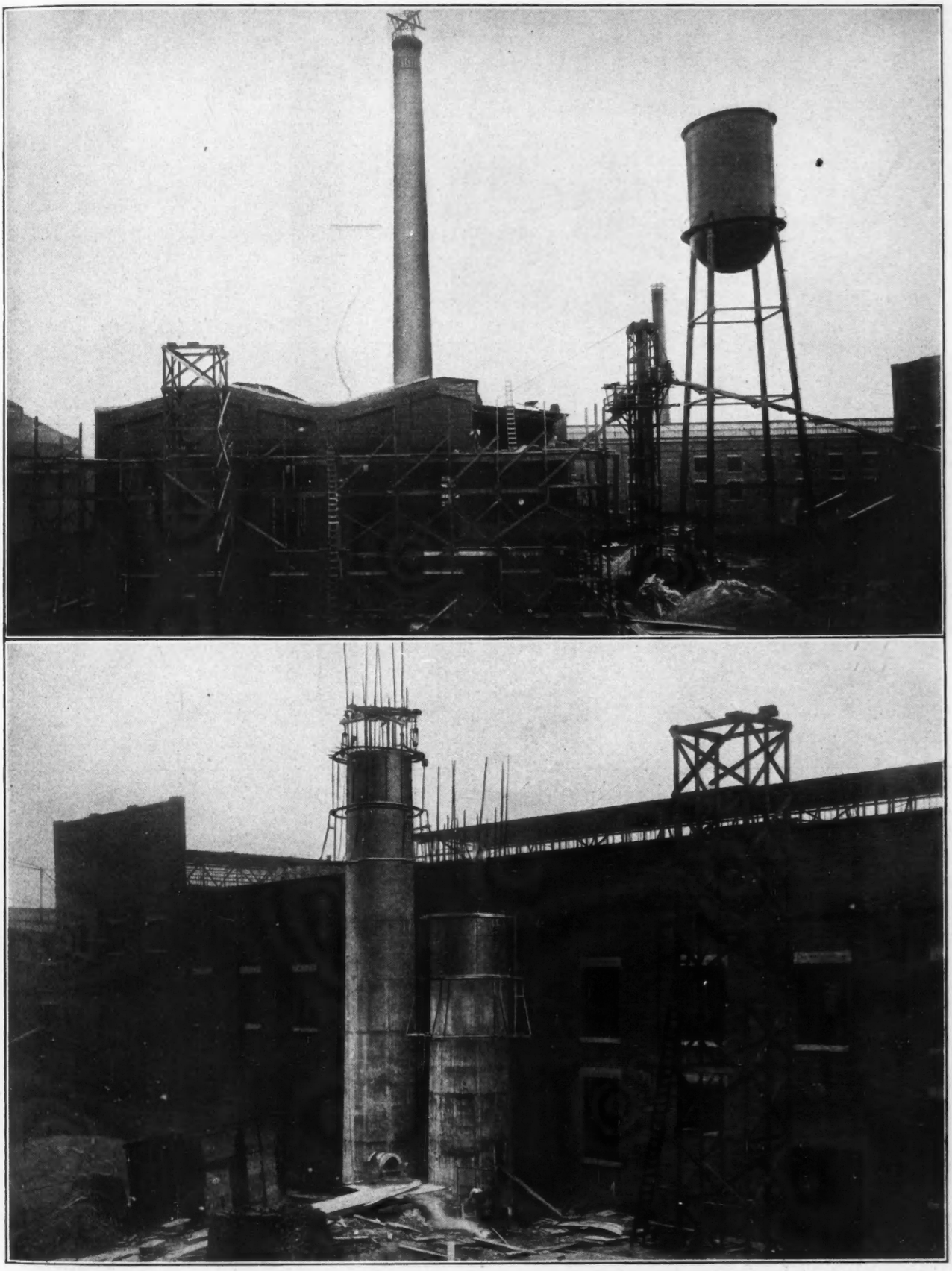
Exposed iron-pipe lines require a high velocity of water. The contents of an exposed 4-in. pipe line delivering water at 250 g.p.m., i.e., with a velocity of about 5 ft. per sec., were found to freeze when the thermometer remained at or below 15° F. The difficulty was overcome by enclosing the pipe in a box with a 3-in. clearance filled with sawdust.

Notable Smelting Works Chimneys

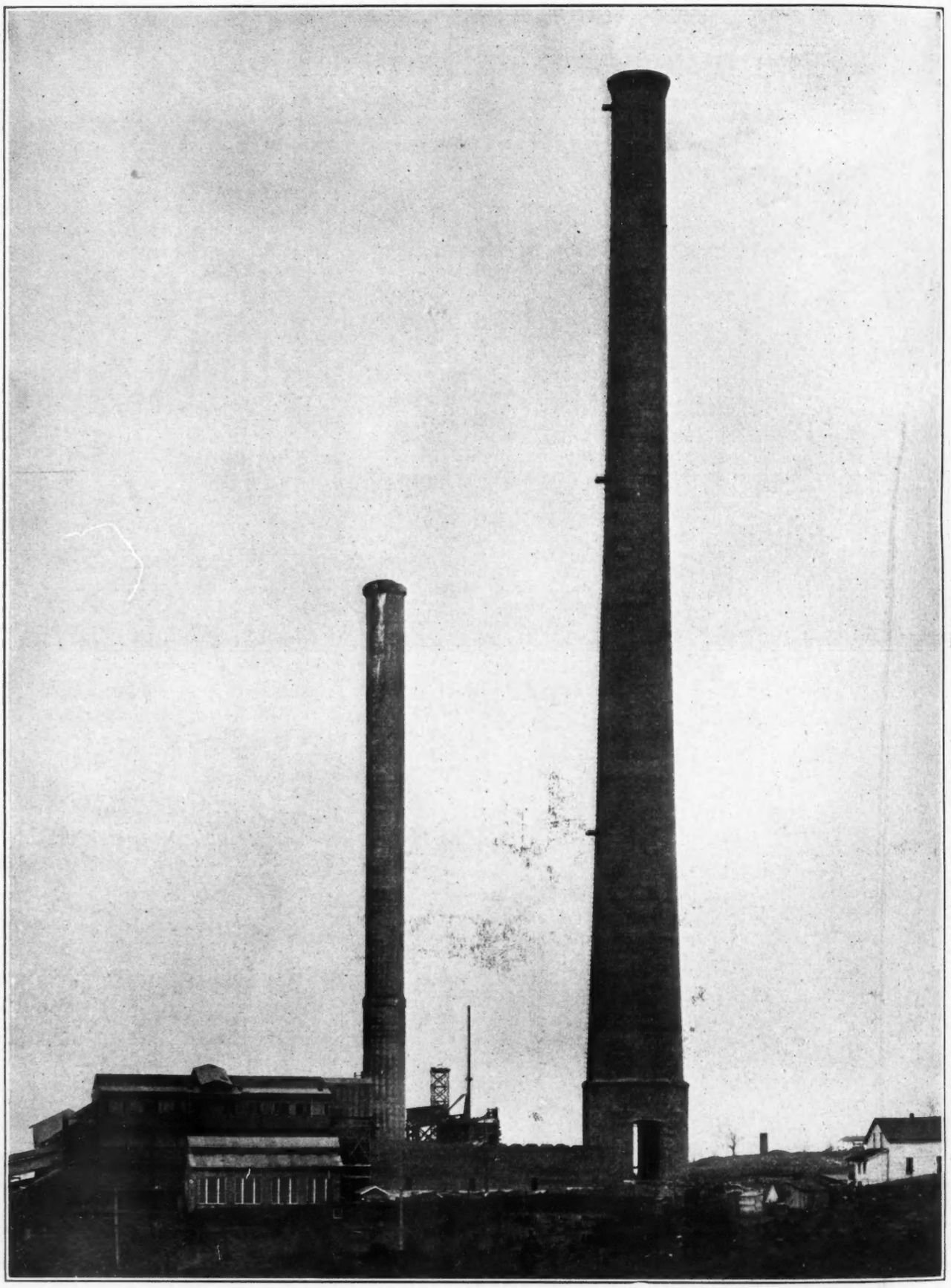


ONE OF TWO 350-FT. CONCRETE CHIMNEYS AT INTERNATIONAL NICKEL CO.'S REFINERY AT PORT COLBORNE

These are the highest reinforced-concrete chimneys in North America. They are 350 ft. high, 12 ft. inside diameter at the top and 29 ft. 4 in. outside diameter at the base. Five reinforced-concrete chimneys were built at the Port Colborne refinery by the General Concrete Construction Co. of New York and Chicago. The chimneys were built of a 1:2½:3 mix poured in the special steel forms shown on the opposite page. These forms are adjustable to the taper of the chimney.

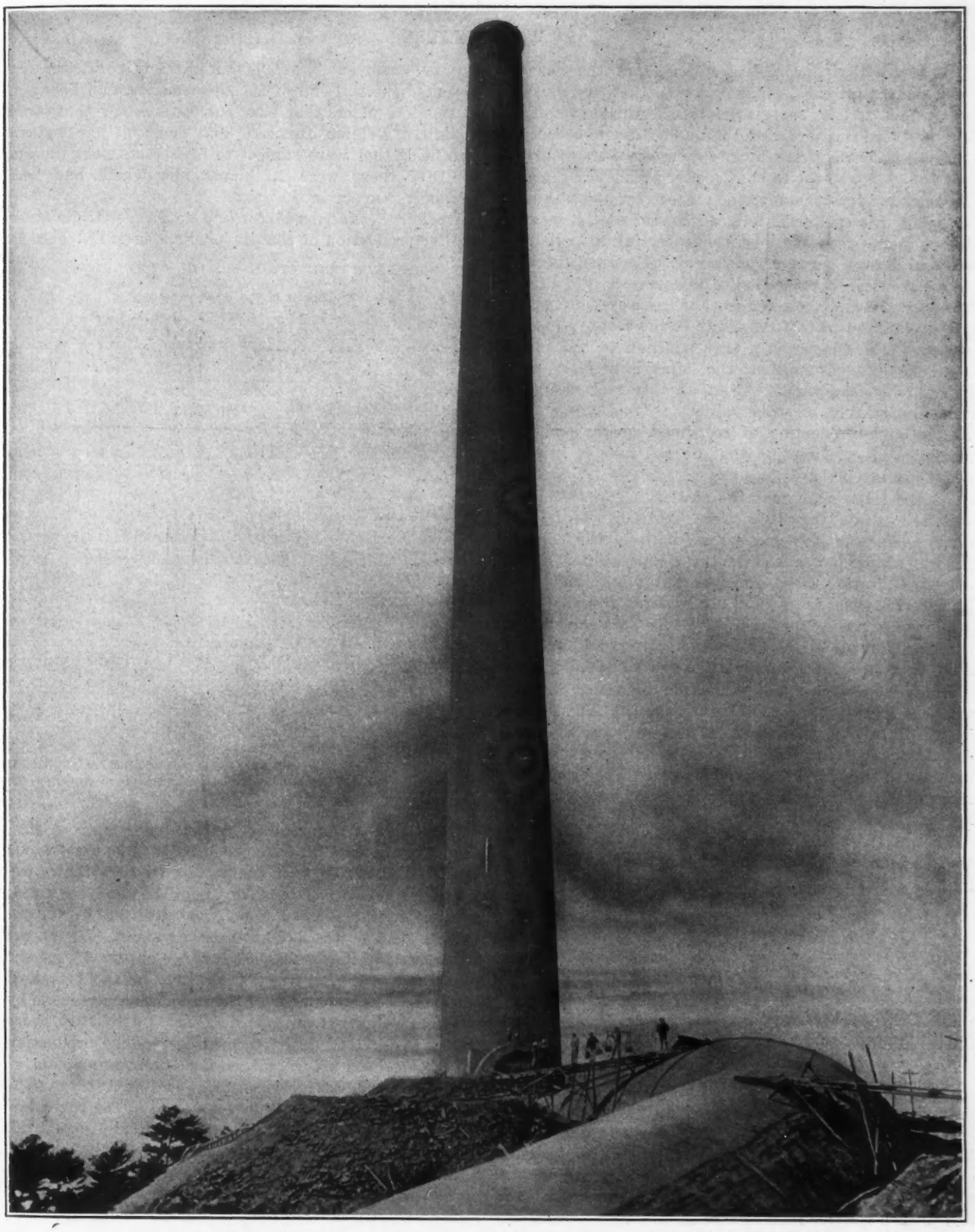


CONCRETE CHIMNEYS UNDER CONSTRUCTION AT THE PORT COLBORNE, ONT., NICKEL REFINERY, WITH SPECIAL ADJUSTABLE STEEL FORMS



THE TALLEST CHIMNEY IN THE WORLD, AT TACOMA, WASH.—572 FT. 10 IN. HIGH

This chimney was completed in February, 1918, for the Tacoma Smelting Co. and is erected on a ridge or hogback about 150 ft. high, making the top of the chimney about 725 ft. above tidewater. It was built of paving brick on a concrete footing extending 30 ft. in the ground through a bed of sand and into hard blue clay.



THE WORLD'S HIGHEST REINFORCED-CONCRETE CHIMNEY, AT SAGANOSEKI, JAPAN

This chimney was until this year the world's highest chimney, being 570 ft. high and 26 ft. 3 in. inside diameter at the top. It is now eclipsed by the newly completed brick chimney at Tacoma, Wash., which is 572 ft. 10 in. high. The Saganoseki chimney was built by the Weber Chimney Co. and is on the top of a hill 430 ft. above the smelting works, making the top of the stack about 1000 ft. above the smeltery site, or the adjacent sea. It has been stated by Tetsurow Komakine that a 1000-ft. concrete stack was being erected in Japan, but American builders are under the impression that Mr. Komakine had reference to the stack at Saganoseki, which is 570 ft. above foundation. With the 430-ft. elevation of the hill, the total height above sea level would total the 1000 ft. mentioned by Mr. Komakine.

Spelter Statistics for 1917

BY W. R. INGALLS

REVISED and complete statistics of the zinc industry of the United States in 1917 are given in this article, reports having been received from all of the ore smelters. I did not undertake to collect the statistics of production by the dross smelters either in 1916 or 1917, and the total of spelter production reported as available for consumption is short by just so much. Some of this spelter is as good as, some of it is even better than, prime Western, this referring to redistilled spelter. Simple remelted spelter is, of course, inferior. In a statistical investigation of this subject it is difficult to draw the line between spelter recovered *after use* and spelter reworked from waste *in the course of manufacture*. The former is a true addition to the supply available for consumption; the latter is merely an incident to consumption. About all that may safely be said statistically on this subject is that there is a rather large production of reclaimed spelter and that statistics of consumption that do not take it into account are incomplete.

At the same time that the statistics for 1917 were collected, those for 1916 were revised. There are always likely to be some errors, both in the original reports of producers and in the computations in this office. However, these are generally slight and quite immaterial with respect to the general results. Corrections are made from year to year. This explanation accounts for the slight alterations of figures for 1916 from those that have previously been published.

Production—The total production of spelter by ore smelters in 1917 was 682,411 tons, against 680,018 tons in 1916. In 1917 there were 17 ore smelters who produced spelter from dross to a more or less extent, an increase of three over the previous year. The production from dross, skimmings, etc., was 16,166 tons in 1917, against 11,681 tons in 1916.

The statistics of spelter production by quarters show the maintenance during the first half of 1917 of the high rate attained toward the end of 1916. Indeed, the output in the second quarter of 1917 was but little inferior to the maximum recorded for any quarter in the history of our industry. With the third quarter came a decline, however, which has continued during 1918, the output of spelter for the last year having been less in each quarter than in that immediately preceding.

PRODUCTION OF SPELTER
(In Tons of 2000 Lb.)
By Ore Smelters Only

States	1913	1914	1915	1916	1917
Arkansas	.....	.....	.....	7,637	25,701
Colorado	8,637	8,152	8,984	8,908	7,735
Illinois	111,551	130,587	161,665	181,495	176,071
Missouri-Kansas	85,157	53,424	111,052	154,396	86,505
Oklahoma	83,230	92,467	111,405	169,064	204,587
Electrolytic	.....	.....	.....	10,963	27,245
East and others (*a*)	69,687	85,682	114,036	147,555	154,567
Totals	358,262	370,312	507,142	680,018	682,411

(*a*) Includes Anaconda and other electrolytic production in 1915.

The closing of plants began in the second quarter of 1917, when two dropped out. Operations were ceased in five in the third quarter and in five more in the fourth quarter. As an offset, two new plants went into operation, these being the Athletic, which began smelting in the second quarter, and the Terre Haute plant of the Grasselli company, which began in the third. These represented the tail end of the new construction begun in 1916. The plants that blew out were chiefly those with coal-fired Belgian furnaces and some in the natural gas fields that were subject to high costs. At the end of 1917 there were 12 plants idle which had been producers earlier in the year.

Spelter Production According to Fuel—Of the total spelter production of the ore smelters in 1911, concerns using coal as fuel produced 119,989 tons, or about 40% of the total. In 1912 they produced 134,077 tons, which was only about 38% of the total. In 1913 their production was 157,653 tons, or about 44% of the total; in 1914 it was 173,520 tons, or about 48% of the total; in 1915 it was 227,143 tons, or about 45% of the total; in 1916 it was 289,007 tons, or about 42% of the total; and in 1917 it was 282,498 tons, or about 41% of the total. The remainder of the production was made by smelters using natural gas as fuel. Up to 1915 there was a general tendency toward increasing production by the smelters using coal as fuel, their proportion of the total output having risen from 40% in 1911, to 48% in 1914. In 1915 it fell to 45%, in spite of the revival of smelting at Pittsburg, Kan., which is easily explained. There were a lot of inactive natural-gas smelteries that could be put quickly into operation, which was done, and, moreover, it was quicker and easier to build new plants in the natural-gas fields than in the coal fields. The same conditions continued in 1916, and the ratio of the spelter produced by smelting with coal fell to 42%, which took us about back to the situation of 1912.

SPELTER PRODUCTION, 1913–1917, BY QUARTERS
(In Tons of 2000 Lb.)
Reports of Ore Smelters Only

District	I	II	III	IV
1913				
Illinois	27,924	28,523	26,118	28,986
Kansas-Missouri	22,006	23,820	19,204	20,127
Oklahoma	21,430	21,840	18,502	21,458
Others (*a*)	20,722	20,153	19,238	18,211
Totals	92,082	94,336	83,062	88,782
1914				
Illinois	31,005	32,482	32,512	34,588
Kansas-Missouri	13,939	14,659	13,193	11,633
Oklahoma	22,563	22,960	22,945	23,999
Others (*a*)	22,717	22,715	24,106	24,296
Totals	90,224	92,816	92,756	94,516
1915				
Illinois	35,786	39,511	41,791	44,577
Kansas-Missouri	14,090	24,554	32,152	40,256
Oklahoma	24,713	26,984	28,613	31,095
Others(*a*)	26,255	30,575	31,360	34,830
Totals	100,844	121,624	133,916	150,758
1916				
Illinois	45,344	45,547	41,953	48,651
Arkansas	.....	.....	2,977	4,660
Kansas-Missouri	38,513	42,488	39,447	33,948
Oklahoma	34,994	38,786	42,604	52,680
Others (*a*)	37,853	39,873	41,514	48,186
Totals	156,704	166,694	168,495	188,125
1917				
Illinois	48,756	47,237	40,379	39,699
Arkansas	5,597	6,847	7,596	5,661
Kansas-Missouri	26,350	25,621	19,443	15,091
Oklahoma	53,280	57,227	48,478	45,602
Electrolytic	7,950	8,362	5,096	5,837
Others (*a*)	42,013	41,700	39,736	38,853
Totals	183,946	186,994	160,728	150,743

(*a*) With the exception of one plant in Colorado, these are all Eastern works. In the fourth quarter of 1915 and in 1916 is included Anaconda and other electrolytic production.

Electrolytic Zinc—The production of electrolytic zinc in the United States in 1917 was 27,245 tons, against 10,963 tons in 1916. The Consolidated Mining and

Smelting Co., of Canada, at Trail, B. C., produced 9956 tons in 1917 and 2986 tons in 1916. The American producers in 1917 were the Anaconda, River Smelting and Refining Co., Judge Mining and Smelting Co., and the Mammoth plant of the United States Smelting, Refining and Mining Co. One other concern was engaged in the electrolytic refining of crude spelter, whose output does not appear in these statistics, for the reason that it duplicates the report of distilled spelter.

The Electrolytic Zinc Co. of Australia, which has built a plant at Risdon, near Hobart, in Tasmania, for the treatment of Broken Hill ore, began production early in 1918, and since then has been producing about 10 tons of spelter per day.

Fine Zinc—It was reported from 11 works in 1917 that they had been engaged in the redistillation of common spelter. The aggregate production of refined spelter reported by them was 41,468 tons. This was spelter of high grade, probably assaying in the main from 99.75 to 99.90% of zinc. The production of redistilled spelter in 1916 was 63,000 tons. Among other fine spelters is the Mascot brand of the American Zinc, Lead and Smelting Co., produced directly from ore. Spelters running above 99.9% zinc are the Horsehead and Bertha brands, directly distilled; and the electrolytic metal. Altogether, the output of fine zincs in 1917 was probably close to 100,000 tons.

Late in 1917 an investigation of the suitability of spelter for the manufacture of cartridge brass and other high-grade brass was made, which investigation led to the following representations to the War Industries Board, jointly by nine large smelting companies:

Failure of cartridge cases by seasoning-cracking and splitting is due, according to the consensus of opinion among brass metallurgists, to the release of mechanical strains introduced during the manufacture. Possibility of impurities, especially cadmium, as a contributory factor, is by them dismissed. Cartridge brass made from the highest grade, non-cadmiferous spelter is subject to seasoning-cracking. Experiments with brass into which cadmium in varying amounts has been purposely introduced exhibit no increased tendency toward seasoning-cracking, as compared with brass free from cadmium. There is some evidence to indicate that cadmium in brass may improve its mechanical properties; and the opinion is entertained by some brass metallurgists that some cadmium in spelter may be beneficial in brass manufacture. However, in making brass with spelter containing high cadmium, but little cadmium —not more than 0.02%—is to be found in the brass, and its effect is regarded as inappreciable one way or another. The bulk of the cadmium is volatilized from the brass pot and is found largely in the flue dust therefrom. The entire subject of cadmium is practically ignored by the most experienced brass-makers. The influence of lead and iron in brass is well understood, and these impurities are covered by precise specifications. The French government has supplied American contractors for cartridge discs with large quantities of spelter containing up to 0.4% lead plus iron, without any specification as to cadmium. The British government, which, in the early years of the war, required "High-Grade" spelter, has recently liberalized its specifications, and for cartridge brass now takes spelter containing up to 0.3% lead and does not stipulate anything as to cadmium. American producers have supplied both of these governments, and also the Russian and Italian, with large quantities of spelter, without receiving any complaint. If the manufacture of cartridge brass during the war had been limited to "High-Grade" spelter, the supply would have been far from sufficient. Finally, and most conclusively, the Brass Committee of the Advisory Council of National Defence, comprising the leading brass manufacturers of the United States, advised the United States Government that with the use of spelter containing not more than 0.10 to 0.12% lead, 0.02% iron and up to 0.05% cadmium, they could make good cartridge brass, and included brands of spelter refined by redistillation among those which they considered suitable. This recommendation by the Brass Committee is in itself considered a sufficient reason for the liberalizing of the spelter specifications of the United States, and by comparison with what the French and British are actually doing is regarded as being very conservative. Indeed, such spelter will make brass coming within the limits of toleration of impurities in the existing specifications of the Ordnance Department of the Army of the United States.

The above representations led to a liberalizing of its specifications by the Ordnance Department of the Army early in 1918. I may say, further, that there has since then been full confirmation of the representations by the British munitioning authorities.

I think that the practice of classifying spelter among grades is insufficiently definite and ought to be discarded, except, perhaps, for general expressions. The common impurities of spelter are lead, iron and cadmium. The iron content is easily controlled and is nearly constant. Cadmium, as has been shown, is harmless for most purposes, and may even be beneficial for some. The controlling factor in the quality of spelter in general is therefore the lead content. Spelter should be bought, I think, upon specifications limiting lead plus iron, say, to less than 0.05%, from 0.05 to 0.1%, from 0.1 to 0.15%, and so on. If a restriction upon cadmium be really necessary—and for a few purposes it is—let the toleration of it also be specified.

General Conditions of Ore Supply—The reports as to ore receipts give interesting indications as to practice in smelting and as to market conditions. The smelters who make sulphuric acid continue, as in the past, to draw their ore mainly from Wisconsin and from the Joplin district (including Oklahoma). For the manufacture of sulphuric acid this ore is recognized to be superior, but it is noteworthy that several of the zinc acid makers are using a larger and larger proportion of Western ore. Of the total number of works—48—there were 16 in 1917 that used nothing but ore from the high-grade districts, viz., Missouri, Kansas, Oklahoma, Wisconsin and Arkansas, the total quantity taken by them from those states being 290,026 tons.

There were nine works that did not use any ore from the high-grade districts, their chief supply being ore from the Rocky Mountain region and from foreign countries. Imported ores were smelted by 20 works. In 1917 Australian ore was received at three smelteries, all of which were east of the Mississippi River.

These figures do not show any great change from the previous year, except with respect to the use of Australian ore. The arrivals of the latter in 1917 were only the fag end of the contracts made in 1915-16, the increase in freight rates having checked further importations from that source.

Ore Smelted—The smelters, as distinct and separate from the electrolytic producers, reported that in 1917 they treated 1,149,172 tons of blende and 424,311 tons of calamine, a total of 1,573,483 tons. In 1916 they smelted 1,203,839 tons of blende and 510,075 tons of calamine, a total of 1,713,912 tons. As I remarked last year, it should not be attempted to draw too fine distinc-

tions from these figures respecting either the quantity or the average yield of the ore smelted, some smelters apparently having reported "ore received" as "ore smelted," and there was probably some other confusion respecting this inquiry. However, we may draw some rough deductions.

In 1914 the calamine smelted was about 26½% of the total; in 1915 it was about 28½%; in 1916 about 29¾%; and in 1917, about 26.9%. The tendency to use a larger proportion of calamine in smelting that was exhibited in 1915 and 1916 was checked in 1917, when the smelters were forced by adverse market conditions to seek high-grade blende rather than low-grade calamine, as in 1915, but the increase was not so marked as it was between 1915 and 1914.

Grade of Ore Smelted—In the accompanying table an attempt has been made to estimate the average grade of the ore smelted during the last few years. The most uncertain factor is the percentage of metallurgical extraction, which has been assumed at 83.3% in 1915-17 and at 86% in 1914. These assumptions are purely

ORE SMELTED AND YIELD

	1914	1915	1916	1917
Total production of spelter, tons	370,312	507,142	680,018	682,411
Ninety per cent. of production of zinc dust	938	1,299	2,086	4,424
Total production of zinc, tons	371,250	508,441	682,104	686,835
Less production of electrolytic, tons	.....	.....	10,963	27,245
	371,250	508,441	671,141	659,590
Less production from dross, tons	12,355	12,538	11,681	16,166
Net production of spelter, tons	358,895	495,903	659,460	643,424
Amount of ore smelted, tons	855,435	1,188,075	1,713,912	1,573,483
Average spelter per ton ore, per cent.	41.96	41.74	38.49	40.88
Estimated average recovery, per cent.	86.0	83.3	83.3	82.0
Estimated grade of ore, per cent.	48.8	50.1	46.2	49.9

arbitrary. Of course, the calculated grade of the ore is too low in just the proportion that the estimate of metallurgical recovery is too high. However, the figures afford a sort of an index as to the nature of the raw material purchased by the smelters.

Receipts of Ore—The receipts of ore by smelters in 1917 showed a decrease, the grand total having been 1,613,272 tons, compared with 1,777,891 tons in 1916. These totals include the receipts of ore by the smelters only, and do not include the ore that was taken by the manufacturers of zinc oxide or what was used by the producers of electrolytic zinc. Such a decrease was, of course, to be expected, in view of the large number of plants shutting down, using up their ore stocks and not taking any more.

In my report last year I said:

> The aggregate of ore receipts in 1916 was considerably larger than the aggregate of the ore smelted, just as was the case in 1914 and 1915. The explanation of this feature in 1916 must in the main be the same as in the previous years, namely, the stocking up of new plants. A large tonnage of ore must always be carried in the bins for a working reserve, a sort of balance wheel, so to speak. Not until a considerable number of plants go out of operation, and not until there be a general contraction in smelting, shall we see statistics showing a greater quantity of ore smelted than received. However, I desire to point out in this connection that extremely fine deductions should not be drawn from these statistics, for, although they are compiled from returns made by all the smelters, it is possible, nay, even probable, that some smelters misunderstood the inquiry and unintentionally made incorrect returns. This, of course, is a factor that enters into all statistics.

Following the above reasoning, we should have expected a larger quantity of ore smelted than received in 1917. The statistics show 1,573,483 tons smelted and 1,613,272 tons received. It is likely that statistical inaccuracies are responsible for this exhibition.

The zinc-ore statistics for the United States do not require any extended comment. In the case of every state there was decreased production, except in the Joplin district and Wisconsin. It has been necessary to group Arkansas, Missouri, Kansas and Oklahoma,

RECEIPTS OF ZINC ORE

(In tons of 2000 lb. This table includes the receipts of ore by the smelters only and does not include the production of ore exported or what was taken by the electrolytic producers or by the manufacturers of zinc oxide.)

State	1912	1913	1914	1915	1916	1917
Arizona	11,937	9,347	6,357	14,718	17,243	14,837
Arkansas	1,567	1,500	1,737	7,017	12,854	(c)
California	6,639	6,796	8,827	27,445	41,291	12,444
Colorado	212,423	220,166	164,739	148,359	194,418	184,304
Idaho	19,482	31,835	57,001	78,767	104,575	86,172
Kentucky	947	441	434	1,863	2,460	2,019
Missouri-Kansas	289,177	280,000	247,723	278,099	369,397	(c)
Missouri - Kansas-Oklahoma - Arkansas	(d)	(d)	(d)	(d)	(d)	475,069
Montana	34,034	91,257	125,663	200,528	233,645	171,904
Nevada	20,654	22,313	20,447	24,949	51,670	35,045
New Mexico	25,889	14,593	15,369	37,042	35,734	16,353
Oklahoma	4,325	23,500	26,247	25,231	42,799	(c)
Tennessee	6,635	8,297	18,708	38,527	43,309	38,488
Utah	24,539	27,073	20,322	21,535	43,240	21,381
Wisconsin	90,762	89,662	74,311	90,128	91,561	137,248
Others and undistributed	56,099	57,241	57,936	122,490	111,273	192,393
Totals	805,109	884,021	845,821	1,116,698	1,395,469	1,387,657
Mexico	29,436	19,965	16,414	49,171	142,687	135,368
Canada	9,707	6,012	10,532	14,000	31,877	21,502
Australia	.....	.....	.....	68,448	134,464	37,031
Other foreign	.....	.....	.....	9,211	73,394	31,714
Grand totals(b)	844,252	909,998(b)	872,767	1,257,528	1,777,891	1,613,272

(a) Including Illinois and Iowa. (b) In addition to the ore reported from Canada and Mexico, zinc smelters received a few thousand tons from Europe and Eastern Siberia in 1913. (c) See "Missouri-Kansas-Oklahoma-Arkansas." (d) See under separate states.

as some producers were unable to report them separately. The totals of those who did report separately were as follows: Arkansas, 7047; Missouri-Kansas, 204,781; Oklahoma, 97,518. The grouped reports aggregated 165,723 tons.

Spelter Stocks—The stock of spelter at works on Dec. 31, 1917, being the aggregate of the reports of all the smelters, was 56,591 tons, compared with 16,085 tons at the beginning of 1917. These figures include both high-grade and common spelter.

Sulphuric Acid—In 1917, there were 12 smelters who produced sulphuric acid from blende, one more than in 1916. The enumeration is, however, open to some criticism, owing to complications that are developing in the industry. It is often good business to roast the blende at a good center for the distribution for sulphuric acid, and reship the roasted ore to a good point for zinc distillation. The Western Chemical Co. has for a long time roasted ore at Denver, Colo., and sold the product to smelters. The National Zinc Co. has no roasting furnaces at its smeltery at Springfield, Ill.,

STATISTICS OF SPELTER-SULPHURIC ACID WORKS

(In Tons of 2000 Lb.)

	1913	1914	1915	1916	1917
Ore received	364,741	434,666	614,565	752,021	779,941
Spelter produced	148,188	196,529	244,252	293,525	313,433
Sulphuric acid, basis 60 deg.	305,167	355,424	475,740	683,514	817,573

which gets its ore from the roasting plant of the company at Argentine, Kan. Similarly, the Grasselli Chemical Co. roasts at Canton, Cincinnati, Newcastle, Cleveland and Grasselli the ore that is needed by its smelteries at Clarksburg, Meadowbrook and Terre Haute. The New Jersey Zinc Co. has a roasting plant at Tiltonville, Ohio, which supplies other smelters. With the movement of the zinc-smelting industry to the eastward, the separation of blende roasting and zinc distillation is becoming more marked, as it has been for a long time in Europe.

It will appear from this that the definition between zinc smelters' acid and acid derived from other sources is becoming more and more uncertain. The statistics that I offer are to be regarded, therefore, as more valuable for comparative purposes than as indicative of precise results, although in the latter respect they are probably not far out of the way.

It is to be remarked that no attempt should be made to determine from the accompanying statistics any ratios between ore received and sulphuric acid produced or between spelter produced and sulphuric acid produced, for the reason that certain concerns received and smelted a good deal of calamine, which, of course, never went through the blende-roasting department at all.

Smelting Capacity—The capacity of the zinc-smelting works of the United States at the end of 1917 is

ZINC-SMELTING CAPACITY OF THE UNITED STATES
(Number of Retorts at End of Years)

Name	Situation	1916	1917
American Spelter Co. (a)	Pittsburg, Kan.	(b) 896	(b) 896
American Steel & Wire Co.	Donora, Penn.	9,120	9,120
American Zinc and Chem. Co. (a)	Langeloth, Penn.	7,296	7,296
American Zinc Co. of Ill.	Hillsboro, Ill.	4,864	4,864
American Zinc, Lead and Smg.Co.(a)	Dearing, Kan.	4,480	4,480
American Zinc, Lead and Smg.Co.(a)	Caney, Kan.	6,080	6,080
American Zinc, Lead and Smg. Co. (c) (a)	Neodesha, Kan.	3,760	3,760
American Zinc, Lead and Smg. Co.(c)	E. St. Louis, Ill.	4,864	5,620
Arkansas Zinc and Smelting Corpn	Van Buren, Ark.	2,400	3,200
Athletic Min. and Smelting Co.	Fort Smith, Ark.	(d)	1,664
Bartlesville Zinc Co.	Bartlesville, Okla.	7,488	5,184
Bartlesville Zinc Co.	Blackwell, Okla.	8,800	9,600
Bartlesville Zinc Co.	Collinsville, Okla.	13,440	13,440
Bartlesville Zinc Co., Lanyon-Starr Branch	Bartlesville, Okla.	3,456	3,456
Chanute Spelter Co.	Chanute, Kan.	1,280	(g)
Cherokee Smelting Co.	Cherokee, Kan.	(h) 896	(h) 896
Collinsville Zinc Co. (a)	Collinsville, Ill.	1,984	(b) 1,984
Eagle-Picher Lead Co.	Henryetta, Okla.	3,000	(b) 3,000
Edgar Zinc Co.	Carondelet, Mo.	2,000	1,982
Edgar Zinc Co.	Cherryvale, Kan.	4,800	5,040
Fort Smith Spelter Co.	Fort Smith, Ark.	2,560	2,560
Grasselli Chemical Co.	Clarksburg, W. Va.	5,760	5,760
Grasselli Chemical Co.	Meadowbrook, W. Va.	8,544	8,520
Grasselli Chemical Co.	Terre Haute, Ind.	(d)	3,360
Hegeler Zinc Co.	Danville, Ill.	5,400	5,400
Henryetta Spelter Co.	Henryetta, Okla.	3,000	(a) 3,000
Illinois Zinc Co.	Peru, Ill.	4,640	(b) 4,640
Iola Zinc Co.	Concreto, Kan.	(b) 660	(h) 660
Joplin Ore and Spelter Co.	Pittsburg, Kan.	(j) 1,792	(g) .....
J. B. Kirk Gas and Acid Co. (a)	Iola, Kan.	3,440	3,440
Kusa Spelter Co.	Kusa, Okla.	3,720	7,520
La Harpe Spelter Co.	Kusa, Okla.	4,000	(k) .....
Lanyon Smelting Co.	Pittsburg, Kan.	448	(h) 448
Robert Lanyon Zinc and Acid Co.	Hillsboro, Ill.	3,200	(b) 3,200
Lanyon-Starr Smelting Co. (e)	.....	.....	.....
Matthiessen & Hegeler Zinc Co.	La Salle, Ill.	6,168	6,168
Mineral Point Zinc Co.	Depue, Ill.	9,068	9,068
Missouri Zinc Smelting Co. (a)	Rich Hill, Mo.	(j) 448	(b) 448
National Zinc Co.	Bartlesville, Okla.	4,970	4,256
National Zinc Co.	Springfield, Ill.	3,800	4,480
Nevada Smelting Co.	Nevada, Mo.	672	(h) 672
New Jersey Zinc Co. of Penn.	Palmerton, Penn.	7,200	7,200
Oklahoma Spelter Co.	Kusa, Okla.	(j) 1,600	(h) 1,600
Owen Spelter Co.	Caney, Kan.	1,920	1,920
Pittsburg Zinc Co.	Pittsburg, Kan.	910	(h) 910
Prime Western Spelter Co.	Gas City, Kan.	4,866	4,866
Quinton Spelter Co.	Quinton, Okla.	1,340	2,016
Sandoval Zinc Co.	Sandoval, Ill.	672	(a) .....
Tulsa Fuel and Manufacturing Co.	Collinsville, Okla.	6,232	6,232
United States Smelting Co. (a)	Altoona, Kan.	4,600	4,640
United States Smelting Co.	Checotah, Okla.	4,480	5,120
United States Smelting Co.	La Harpe, Kan.	1,926	(g) .....
United States Zinc Co. (l)	Henryetta, Okla.	1,200	2,400
United States Zinc Co.	Sand Springs, Okla.	8,000	8,000
United States Zinc Co.	Pueblo, Colo.	1,984	2,200
United Zinc Smelting Corpn.	Moundsville, W. Va.	(d)	(m) 1,728
United Zinc Smelting Corpn. (i)	Clarksburg, W. Va.	3,648	3,648
Weir Smelting Co.	Weir, Kan.	448	(a) 448
Totals		213,510	218,090

(a) Closed during latter part of 1917. (b) No report received; entered the same as previous year. (c) Formerly Granby Mining and Smelting Co. (d) Under construction. (e) See Bartlesville Zinc Co. (g) Dismantled end of 1917. (h) Idle. (i) Formerly Clarksburg Zinc Co. (j) Idle latter part of 1916. (k) Absorbed by Kusa Spelter Co. (l) Formerly Western Spelter Co. (m) Not yet in operation.

given in the accompanying table. This statement falls short of measuring the real increase of zinc-producing capacity, for it takes no account of the electrolytic plants.

At the end of 1917 the listed smelters of the United States possessed a total of about 218,100 retorts, of which operating smelters had 196,560. Of these the number in use on Dec. 15 was 127,193.

At the end of 1917 new furnaces, comprising 840 retorts, were reported as being in process of construction, the corresponding figure at the end of 1916 being 14,108.

Imports and Exports—The imports and exports of ore, spelter, sheet zinc and zinc dust are given in an accompanying table, the figures of which require no explanation. It will be observed that the Government

IMPORTS AND EXPORTS, BY QUARTERS

	1914		
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	3,355	500,253	1,288,249
II	4,727	512,123	1,256,259
III	6,849	664,012	535,471
IV	13,607	83,191	1,524,128
Year	28,538	1,759,579	4,604,107
Exports	Ore, Long Tons (c)	Spelter, Lb. (a)	Dross, Lb.
I	2,883	842,465	572,477
II	4,297	872,511	.....
III	1,319	48,177,681	1,239,570
IV	1,421	90,591,936	3,259,020
Year	9,920	140,484,593	5,071,067
	1915		
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	14,909	480,949	502,008
II	44,449	496,601	316,073
III	33,863	461,957	355,431
IV	48,611	369,457	538,861
Year	141,832	1,808,964	1,712,373
Exports	Ore, Long Tons (c)	Spelter, Lb.	Zinc Sheet, Lb.
I	...	83,313,386 (a)	(e)
II	605	56,829,272 (a)	(e)
III	108	39,528,063 (b)	12,929,438
IV	30	58,318,807 (b)	11,836,786
Year	743	237,989,528	24,766,224
	1916		
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	110,293	435,896	779,253
II	98,497	492,823	477,425
III	74,855	243,186	273,899
IV	60,966	196,655	337,125
Year	344,611	1,368,560	1,867,702
Exports	Ore, Long Tons	Spelter, Lb. (b)	Zinc Sheet, Lb.
I	.....	66,840,110	7,174,116
II	30	78,645,760	3,748,914
III	40	113,997,791	6,399,813
IV	.....	128,219,039	7,701,339
Year	70	387,702,700	25,024,182
	1917		
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	65,087	153,127	112,199
II	123,859	119,005	304,638
III	39,392	99,868	228,510
IV	22,587	141,153	155,990
Year	188,925 (d)	513,153	801,337
Exports	Ore, Long Tons	Spelter, Lb.	Zinc Sheet, Lb.
I	.....	124,254,565	3,843,800
II	32	111,881,657	8,896,880
III	334	92,476,060	10,557,745
IV	814	75,970,949	8,331,372
Year	1,180	(d) 404,562,152	(d) 31,700,915

(a) Includes zinc in sheets. (b) Does not include zinc in sheets, which was reported separately from July 1, 1915. (c) In addition to the exports of ore here reported, there were exported ore and calamine of foreign origin, the zinc content of which amounted to 279,000 lb. in 1914 and 1,218,500 lb. in 1915. (d) The quarterly figures do not foot up to the total given. Both are from the report of the U. S. Dept. of Commerce, and the difference is probably due to corrections made after the monthly figures were published, of which we have no knowledge. (e) Included with spelter.

figures for the exportation of spelter are different from those representing the production of spelter in bond as reported by the smelters; also that there are discrepancies with respect to the importation of ore. These differences are explained in part by the difference of the periods comprised within the respective reports, the smelters reporting the spelter when it leaves their works and the Government reporting it when it is entered for export in the custom house. In 1917 the smelters reported the production of 82,530 tons of spelter in bond, of which 18,771 tons was exported, while the Government reported the exportation of 63,889 tons of foreign origin.

In addition to the figures given in the tables which accompany this article, the following data are of in-

terest: The zinc content of ore imported in 1916 was 148,146 short tons, whereas, in 1917, it was only 72,474 short tons. In 1916 the United States exported only 48 tons of zinc dross, but 13,305 tons of that byproduct was shipped abroad in 1917.

There have been some changes in the figures of exports of spelter and sheet zinc in 1916, which it is well to note. The total spelter exported in 1916 was reported by the Department of Commerce in its *Monthly Summary* for December, 1916, as 384,230,412 lb. In the December, 1917, issue of the *Monthly Summary* it is given as 387,702,700 lb., and our table is corrected in accordance therewith. Similarly, the sheet zinc exported in 1916 was first stated to be 28,501,869 lb., the revised figure being 25,024,182. It would appear that there had been an error in the classification of these forms of the metal, which was later on discovered.

Bonded Spelter—In 1917 there was produced 82,530 tons of spelter in bond. In 1916 the production in this way was 94,626 tons; in 1915 it was 15,781 tons; in 1914, 5630 tons; in 1913, 5904 tons, and in 1912, 15,781 tons.

Zinc Dust—The production of commercial zinc dust in 1917 was 4915 tons, as compared with 2318 tons in 1916; 1443 in 1915; 1042 in 1914; 423 in 1913; and 492 in 1912. In 1913 only two smelters were engaged in this manufacture, but when the outbreak of the war in 1914 cut off America's foreign supply and the price rose from about 6c. per lb. to 15@16c., several additional smelters engaged in the manufacture of it, until there are now nine.

The importation of zinc dust was 401 tons in 1917, compared with 934 tons in 1916; 856 in 1915; 2302 in 1914; 2200 in 1913, and 2400 tons in 1912.

Large Producers—A particularly interesting feature of the zinc business in recent years has been the entry of several general metallurgical companies into this field. I mean companies that are engaged in the production of other metals and have begun the production of spelter as a new feature of their business. Inasmuch as several of these companies make public reports, their outputs in tons in 1917 and 1916 may be stated as follows, the figures for 1917 being given first and those for 1916 in parentheses immediately following: United States Steel Corporation, 67,418 (55,898); American Smelting and Refining Co., 26,261 (23,904); United States Smelting Co., 26,795 (32,292).

Consumption—In my report for last year I explained the great difficulty in arriving at statistics of actual consumption, although in the main the large consumers are

CONSUMPTION OF SPELTER
(In Tons of 2,000 Lb.)

Purpose	1916	1917
Galvanizing	200,000	190,000
Brass-making	175,000	170,000
Sheet rolling	47,500	57,000
Lead desilverization	6,100	6,300
Castings	2,300	2,300
Other purposes	4,300	4,300
Unclassified	15,100	15,100
Totals	450,000	445,000

generous in their coöperation and just as willing to communicate their figures as are producers. However, there are exceptions, whose failure to respond prevents the figures from being complete, and there are numerous small consumers whose figures it is impossible to ascertain.

The consumers in 1917, as in previous years, were asked to state the amount of their *use*, not *purchase*, but there is doubt if this discrimination was in all cases understood. However, I am bound to assume that it was. Statistics computed on this basis will not tally with estimates of consumption arrived at in any other way, for the items of stocks in transit and in the hands of consumers, for which there are no statistics, intervene.

Galvanizers to the number of 92 reported the use of 136,079 tons of spelter in 1917, against 143,631 in the previous year. There were reports aggregating 8148 tons in 1917 from concerns from whom I had no information for 1916, and there were reports aggregating 11,218 tons from concerns which furnished reports for 1916 but did not do so for 1917. There were no reports from

DELIVERIES FOR CONSUMPTION
(In Tons of 2000 Lb.)

	1913	1914	1915	1916	1917
Stock, Jan. 1	4,264	40,115	23,500	14,300	16,085
Production	378,762	388,312	507,142	680,018	682,411
Imports	6,100	880	904	684	257
Totals	389,126	429,307	531,546	695,002	698,753
Exports, domestic	7,782	64,802	106,220	150,622	138,392
Exports, foreign	6,526	5,440	12,775	43,229	63,889
Stock, Dec. 31	40,115	23,500	14,300	16,085	56,591
Deliveries	334,703	335,565	398,251	485,066	439,881

three large galvanizers whose use of spelter in 1916 was estimated at 8650, and whose use of it in 1917 was probably less. Furthermore, we had on our list the names of 17 galvanizers from whom no reports were received in either year, and for whom no satisfactory estimates could be made. The definite statistics show one thing clearly, viz., the use of spelter for galvanizing in 1917 was less than in 1916, but the setback was not so great as was currently supposed. I think it probable that the total use of spelter for galvanizing in 1917 was in the neighborhood of 190,000 tons, against about 200,000 tons in 1916.

Treating the consumption of spelter for brass-making in the same way, 43 brass manufacturers reported the use of 136,278 tons in 1916 and 133,166 in 1917, also a decrease, although not so large as in the case of the galvanizers. Brass-makers who reported only for 1916, five in number, used 7918 tons of spelter, and eight concerns who reported only for 1917 used 847 tons. Four brass-makers who are large consumers and who did not report for either year were estimated as using 22,000 tons in 1916, and in 1917 they probably used about as much. There are about six important brass-makers who are not represented in the statistics, as they did not give information, and it is impossible to estimate for them. I think it probable that the consumption of spelter for brass-making was about 175,000 tons in 1916 and about 170,000 tons in 1917.

The consumption of spelter for sheet zinc by the concerns that reported for both years (four in number) was 44,399 tons in 1917, and 38,955 tons in 1916. One large consumer reported for 1917 only, and another, not so large, for 1916 only. Making an estimate for the missing year in each of these cases, we have a total of 57,000 tons for 1917, and 47,500 tons for 1916. In my report for last year there was an inadvertent omission of one large concern, wherefore the figure now given for 1916 is quite different from that of a year ago. The figures for sheet-zinc production include the manufacture of wide sheets and narrow sheets, or ribbons; also of plate zinc, but I think it likely that there is a considerable production of the latter that has escaped reckoning.

We can estimate the consumption of zinc used in lead desilverization with sufficient accuracy by reckoning the use of zinc to the amount of 1% of the lead refined. Computing in this manner, the consumption of zinc for this purpose in 1917 was 6300 tons, against 6100 tons in 1916.

Returns respecting the use of zinc for castings, for the manufacture of zinc chloride, zinc sulphate and other chemicals, for lithophone and other pigments (not with any reference to zinc oxide made directly from ore) are too incomplete to permit me to make any reliable deductions for 1917.

The above figures are summarized in the table headed "Consumption of Spelter," and in another table are given the "Deliveries for Consumption," computed in the usual manner. In the estimates of actual consumption, galvanizing is, if anything, reckoned too high, and brass-making too low, but these comments, if correct, are true of each year in about the same proportion.

Last year the consumption estimated on the basis of reports by consumers was about 40,000 tons less than the deliveries estimated by difference in the usual manner. It was remarked also at that time that "there was in reality a large increase of stock, which, however, was unavailable owing to delays in transit, and did not become released until 1917. Consumers then obtaining possession of what they had previously bought were able to reduce their buying." In view of this appreciation of the invisible stock a year ago, it is not surprising to find that in 1917 actual consumption was in excess of the deliveries.

L. Vogelstein & Co.—Beer, Sondheimer & Co. Boards Reorganized

The Alien Property Custodian, in view of the report which L. Vogelstein & Co., Inc., had made to him of their former connection with Aron Hirsch & Sohn, Halberstadt, Germany, has taken control of L. Vogelstein & Co., Inc., and has reorganized the board, which now consists of the following seven directors: Edward M. McIlvain, James N. Wallace, Louis A. Watres, Alfred E. Smith, C. C. Daniels, L. Vogelstein, E. G. Hothorn. The management was left in the hands of the former officers. Announcement of this was made in the morning papers of July 23.

L. Vogelstein & Co., Inc.—capitalization $5,000,000—was organized in December, 1916, under the laws of the State of New York, and is successor of the copartnership of L. Vogelstein & Co., of which L. Vogelstein and E. G. Hothorn were general partners and Aron Hirsch was special partner. This firm was a successor, since 1905, of L. Vogelstein, who established the business in this country in 1897 and worked it up from a small beginning to one of the largest metal distributors.

At the same time it was announced that the Alien Property Custodian had taken over the business of Beer, Sondheimer & Co., Inc., whose business was founded in 1904 as an American branch of Beer, Sondheimer & Co., of Frankfurt-am-Main, and has been conducted since then by Benno Elkan and Otto Frohnknecht. The new directors of Beer, Sondheimer & Co., Inc., are James N. Wallace, Edward M. McIlvain, Louis A. Watres, John P. Greer, Ford Huntington, Benno Elkan and Otto Frohnknecht.

The Winter of Discontent

THE TWENTY-SEVENTH ENGINEERS

The trend of events on the Western front makes those of us who are not active in war work feel rather out in the cold. Things have lost their old-time flavor, and nothing matters much save winning the war. The man who is not exerting himself to the utmost in this direction, but is drifting along in comfort, will surely regret it when the boys come home.

It should be as a pleasure that we lend a hand in every way in the great contest. For one thing, let us discount in part the cheer awaiting the mining regiment when it returns and give that part now when it is wanted. Not a man in the industry but will throw up his hat when the regiment passes, nor should he fail to throw something in the hat when it passes him. In calling attention to the Comfort Fund, we are passing the hat, and all contributions are welcome, no matter how they are made. You will feel better when you meet the men of the Twenty-seventh on their return if you seize this opportunity now.

HOW THE COMFORT FUND STANDS AT PRESENT

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)	20.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	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)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grepher	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Francis Thomson	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burral	25.00
Livingston Werneck	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund	10.00
W. Rowland Cox	10.00
Total	$15,754.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Correspondence and Discussion

Import Duty on Wolfram

The suggested imposition of an import duty of 10% on tungsten mineral and concentrate is of practical interest and importance alike to consumers and producers within the United States. On the assumption that the foreign producer is making a great deal of money and can produce cheaper at less than domestic cost, the proposition should have the support of all patriotic citizens. There is no particular reason why Americans should pay more than is necessary, thus enriching foreigners at the expense of the United States Government. The same argument applies to an import duty on antimony and silver and manganese, as all of these metals can be produced in this country. Before it is decided definitely to add this duty we should be sure that we are not trying to have our cake and eat it. In other words, there are several points which should be carefully settled.

First, is the home production sufficient for all our needs? Second, if not, could it be increased sufficiently to supply all our needs by fixing a minimum price? Third, if there is no way of obtaining sufficient wolfram from our home producers, will the proposed duty seriously decrease importation?

I have gathered a few facts bearing on these points which ought to be of interest. Aside from a few tons spasmodically imported from Portugal, the main source of foreign tungsten, so far as we are concerned, is Bolivia, from which country approximately 200 tons a month are imported. It is easy to see, therefore, that if our home production is increased by 200 tons, we will receive all that is required, in which case the duty could as well be made 50 or 100% or importation could even be prohibited. It is for the tungsten miners to say whether this increased output can be obtained, either at the present price or at a fixed minimum.

An interesting side light on the importation of wolfram is the fact that more than half of that shipped from Bolivia is owned by American and English producers such as Messrs. Dillon, Easley, Bruce, Penny & Duncan, Duncan & Fox, Mella, W. R. Grace & Co., and others, so that if we impose an import duty we will be robbing Peter to pay Paul. With the idea of imposing an import duty as much as the "traffic will bear," and simply as a revenue measure, it is advisable to recall the industrial conditions as they are at present in Bolivia.

Owing to the disproportion between exports and imports from that country, the exchange is against the exporter, the difference being over 20%, and, owing also to the same causes which have increased the cost of labor and supplies in our own country, these charges have increased in Bolivia in a still greater proportion. Wages are nearly three times what they were before the war. Such supplies as coal, oil, steel and dynamite and lumber are three times their former price. The distance of Bolivia mines from sources of supply of machinery makes it extremely difficult, if not impossible, for them to obtain suitable concentration equipment. One company that I have in mind is in the market for a small hydroelectric power plant, which will increase the production of wolfram about 50 tons monthly. Judging from replies received so far, no manufacturer will promise a delivery under a year on this equipment, unless the order is placed on a priority certificate. Of course, if there is a shortage of tungsten, there is no doubt that the War Industries Board will grant the priority, but if the contrary is the case—that is, if sufficient tungsten is produced in the States—there will be no object in assisting the foreign producer to compete with our own mines.

On the assumption that it is advisable to continue to receive at least a portion of the tungsten produced in Bolivia, it should be borne in mind that the wolfram deposits there are not similar to the tin deposits. The latter are well-defined dependable veins, whereas the wolfram mines are pockety. One example of this is a mine which during December produced 120 tons and during May produced 25 tons. The concentrate is shipped in a special paper-lined jute bag, which before the war sold for about 12c. and is now worth around 50c. owing to profiteering and difficulties placed in the way of exporting these bags by interested Americans.

Another point which is influential in limiting the production in Bolivia is the huge increase in freight, which before the war was $18 per ton and is now 6% of the value of the shipment, or, on the basis of the present value of the mineral, about $72 per ton, equivalent to 400% of the former rate. Lumber, which really should not have increased in price, is double pre-war prices.

In case it is decided that some protection should be extended to domestic producers without desiring to interfere with importations, the bonus system should be considered. If it be considered feasible to impose a duty and still not diminish importation, on the supposition that the Bolivian producer is making a great deal of money and would continue to import, even though his expenses were increased, it should not be forgotten that a large differential would result in diverting shipments to Europe. As in the States, tungsten is produced in Bolivia by the leaser and small miner who, at the present time, are working on a narrow margin.

Another fact that should be borne in mind is that the exportation of ores from Bolivia to this country always results favorably for the United States, for the reason that the majority of the mine owners in Bolivia, in order to get their money back and because of the prohibition in connection with the export of gold from the United States, find it necessary to buy merchandise here and export it to Bolivia in order to reimburse themselves.

Whether one is a producer in Bolivia or in California, whether a consumer in England or in the States, whether a user of tool steel or a manufacturer of mining machinery, the above details are pertinent and will be useful as a basis for an argument for or against an import duty.

MARK R. LAMB.

New York, July 3, 1918.

Cutting Timber on Public Domain

This letter is written in the hope that it will bring many mining concerns to the support of a bill that passed the Senate last February and is now before the House. The measure, authorizing the cutting of timber on the public domain for mining purposes by corporations formed in one state and conducting mining operations in another, is intended to amend a similar law enacted in 1878, but which specified "citizens of the United States and other persons, bona fide residents of" Colorado, Nevada, New Mexico and other mineral districts, and which failed to mention corporations, in particular those incorporated without the district in which they were operating.

At the time of the passage of this act, many corporations and individuals who had been trespassers upon the public domain, though unmolested as such, were greatly relieved. The law as enacted, however, forbids the cutting of the timber referred to unless application, in due form prescribed by the law, is first made to officials mentioned in the act for a permit to cut, fell and remove such timber as is needed. At the present time, the greater number of people engaged in mining and having cause to use timber from the public domain are unaware that they are technically trespassers and so liable to punishment, if they have not applied for such permits.

About 10 years ago, I was engaged in mining operations in Nevada at mines patented by a corporation with offices in New York and incorporated under the laws of Arizona. It was desirable to use wood, which was plentiful in the neighborhood, for fuel, as other fuels would have to be hauled from the railroad, 35 miles away. Boilers adapted to the use of wood were installed. An application to cut timber was made in due time to the Chief of the Second Forestry Division, in San Francisco. We were authorized to take such timber as we needed and advised that the permit would soon be mailed to us, subject to the approval of the Commissioner of the General Land Office. After having the permit in our possession for some time, imagine our surprise on being informed that the Commissioner had cancelled the permit, because our company was not incorporated in the State of Nevada.

It was pointed out to the Commissioner that a citizen of Arizona, or any other state, when living in Nevada, and doing business here for six months, was recognized as a citizen of Nevada, and that he enjoyed all privileges as such; that our corporation had been doing business in Nevada for some years, and that we should be entitled to the benefits of the act; that the citizen of no state or territory was in any wise interfered with, in going from one state to another at will and immediately thereafter availing himself of the rights to locate and own mining lands, and that within six months he could enjoy the privileges of the act referred to. He replied that he had no alternative under the wording of the act.

Accordingly, on Jan. 20, 1914, Senator Newlands introduced a measure in the Senate which was favorably reported upon by the Committee on Public Lands and then lost sight of. Later Senator Pittman introduced an identical measure that was similarly lost in committee. After a wait of another two years, the matter was again taken up with Senator Henderson, of Nevada, and through his personal attention the same bill was made to reappear as Senate Bill No. 26, which passed the Senate, on Feb. 5 last, through the joint efforts of the Senators from Nevada. This measure is now before the Committee on Public Lands in the House. It is earnestly hoped that all who may be interested will prevail upon their friends in Congress to get the bill before the House at an early date and secure its passage, to afford relief that should be forthcoming to corporations engaged in developing mines in the Western states.

JOHN T. REID.

Lovelock, Nev., June 29, 1918.

Trimountain's Copper Sheet

The article under the above title, published in the *Journal* for May 22, might lead one astray if unacquainted with the occurrence of mass copper in the Michigan copper country, in that it refers to that district as one "where mass copper abounds and is found in sizes ranging from small nuggets to large slabs weighing as much as 525 lb."

Doubtless the weight referred to should have been tons instead of pounds, and probably refers to the remarkable occurrence of this type of mineral deposit, which was uncovered in the old Minesota mine, now the Michigan, in 1856. That mass is described in some of the earlier editions of Stevens' "Copper Handbook," and is said to have been 12½ ft. x 18½ ft x 46 ft. long, and to have weighed 527 tons. Another fact brought out is the labor which was required to cut it into pieces small enough to hoist through the shaft. The combined efforts of 20 men were expended for a period of 15 months in the work. Native copper is extremely tough, and cutting such masses of it by hand with hammer and chisel presented tasks which remind one of the patient toil which produced the pyramids. Even modern methods are not as rapid as might be desired, as the miner who cuts a groove two square feet in area through a mass, by means of a chisel in a pneumatic riveting hammer, has accomplished a good day's work.

A few further notes on this subject may be of general interest. Although there can be no question of the profitableness of extracting mass copper once it has been disclosed by development operations of regular mining work, it might be noted that the mines which have depended upon the occurrence of mass for a livelihood have generally been failures. Moreover, the one great mine of the district, Calumet & Hecla, has never obtained revenue worth mentioning from mass copper. This point is emphasized in order to correct the tendency of strangers to overvalue the occurrence of large masses of practically pure copper, in comparison with the usual copper rock of the district, carrying 1%, more or less, of metallic copper. From the miners' standpoint, a vein of uniform copper content is much preferable to the occurrence of sporadic masses; and the financial performance of the various mines certainly upholds the miners' judgment in this particular. The economic value of this type of deposit is, however, of prime importance in those few mines where it forms a sweetener in a comparatively lean lode, and in cases it may be the factor which determines the dividend status of a mine.

ARTHUR C. VIVIAN.

Hancock, Mich., July 9, 1918.

Events and Economics of the War

The superior strategy of Foch was revealed in the mighty counter blow struck against the Marne salient during the week, completely surprising the Germans, while their efforts were concentrated in an assault on Rheims; attacking the enemy on three sides, the Allies drove in their right flank from seven to ten miles and also pushed them back over the Marne; Chateau Thierry was recaptured, and the German forces in the entire salient were threatened with envelopment; large numbers of prisoners and guns were taken; British forces in the north captured Meteren and also advanced near Villers-Bretonneux. Czech mutinies are reported to be spreading in Bohemia and Hungary. The Cunarder "Carpathia" was sunk by torpedo on July 17, five of the crew being lost. Honduras declared war on Germany on July 22.

On this side of the water, a German submarine shelled and burned a tugboat and sank three barges off Orleans, Mass., on July 19, the raider being finally driven under by seaplanes, after it had dropped four shells on the mainland. The U. S. armored cruiser "San Diego," of 13,680 tons, built in 1902, was sunk on July 19 off Fire Island, N. Y., probably by a mine. Four lightless nights a week, beginning July 24, were ordered by the Fuel Administrator. Seizure of certain metal firms by the Alien Property Custodian was announced on July 22, chief among them being L. Vogelstein & Co. and Beer, Sondheimer & Co., Inc., of New York.

Palmer Seizes Becker Steel Co.

Taking over by the Government of the German-owned Becker Steel Co. of America, with a plant at Charleston, W. Va., and offices in New York, was announced on July 18 by A. Mitchell Palmer, Alien Property Custodian. With the company American manufacturers will obtain a secret process for the production of "high-speed" steel, heretofore held exclusively by the Germans.

In the course of investigating the company's affairs, it was discovered that Adolph J. Becker, vice president, had bought and shipped to Germany in 1916, on the merchant submarine "Deutschland," 33,075 lb. of tungsten. The funds to make the purchase, it was found, had been supplied by Becker's brother, Reinhold Becker, of Germany, one of the real owners of the Becker Steel Co. Becker said that, in addition to the tungsten, he bought 22,050 lb. of ferrovanadium for $25,654. This he was unable to ship and later sold at a profit of $6000.

A new directorate for the company has been appointed by the Alien Property Custodian. The members are William H. English, vice president of the Empire Trust Co., who will be chairman; A. M. Sawtelle, a mining engineer of 5 Beekman St., New York; Paul T. Brady, of the Westinghouse Electric and Manufacturing Co.; George Dix, of the Midvale Steel and Ordnance Co.; W. A. McCorkle, president of the Citizens National Bank of Charleston, W. Va.; Royal H. Weller, of 31 Nassau St., New York, and W. E. Hilton, of Charleston, W. Va.

Gold Mining Classed as Essential

Gold mining has been listed as an essential industry, the War Industries Board announced on July 19, and all reasonable priority of material and supplies used in gold production will be given. The action was taken on request of the Treasury Department. The decision was interpreted by an official of the Priorities Committee to mean that every possible assistance would be given the gold mines in obtaining necessary materials.

Solving an Anthracite Labor Problem

To maintain production of anthracite, the industry has agreed to pay $150 to the nearest relative of an employee whose death was caused by an accident in a colliery and, in addition, has directed that the grievance committee and mine foreman elect six representatives of the colliery to attend the funeral. This plan, it is thought, will do away with the usual custom of all employees quitting work, thereby closing the mine, with its attendant crippling of the industry, for one or more days, and loss in output. The new rule has already gone into effect.

This plan of funeral attendance, it is said by the officials, appeals to the mine workers, as it was prepared by James Matthews, president of District No. 9, United Mine Workers, and adopted by the Anthracite Conciliation Board. It was also agreed by the operators that the wages of the six representatives shall be paid while the latter are in attendance at funerals.

Date Set for Sale of Koppel Plant

All the property, interests and assets of the Orenstein-Arthur Koppel Co. are to be sold at public sale by the Alien Property Custodian at 3 o'clock in the afternoon of Aug. 15, at the company's central office building, at Koppel, Penn. The property to be sold includes everything owned by the Orenstein & Koppel-Arthur Koppel Aktiengesellschafft, registered in Pennsylvania as the Orenstein-Arthur Koppel Co.; the Koppel Land Co.; the Beaver Connecting R. R. Co.; the Koppel Water Co.; the Pennsylvania Car and Manufacturing Co.; the Universal Railway Products Co.; and the Koppel Sales Company.

No bid will be received for the property and assets, which are to be offered in one parcel, unless the person offering to bid deposits with the Alien Property Custodian, or his representative, a check for $50,000 certified by an acceptable bank. The property will be sold only to American citizens and companies properly incorporated within this country and in no part controlled by enemies. The right has been reserved to name a minimum price prior to the sale. The successful bidder will be required to pay 25% of the purchase price in cash at once and the balance within 90 days.

It is provided that the purchaser shall assume all

leases, carry out all contracts for purchase of supplies, fill all orders and sell and deliver all materials contracted for previous to the sale. The latter is made by authority under the Trading with the Enemy Act.

Bar Mexicans From Border Coal Mines

It was recently stated in the press that the Department of Labor on July 6 had refused requests of bituminous coal operators of Arizona to modify emigration restrictions so as to permit the importation of Mexican labor to work in the Arizona coal mines. This is interpreted by *Coal Age* to refer to certain Arizona corporations mining coal outside that state, presumably in New Mexico. Mexicans will be admitted only for farming, railroad labor and lignite mining. As to this, the journal mentioned further comments:

"In the south of Texas is a large body of cannel, with lignite near by, and this cannel is probably included under lignite in the classification of the Department of Labor, for the basis of the order of the emigration officials is really not the character of the industry but the question whether on the entrance of Mexicans into that industry they will compete with American labor."

Chlorine Distribution Now Regulated

Owing to the shortage of chlorine in the United States, the War Industries Board, with the approval of the President, has passed a resolution taking over control of the production and distribution of the gas, according to an announcement made on July 16. For the present, however, the board is doing no more than allocate the product, under the direction of H. G. Carrell, chief of the alkali and chlorine section. Chlorine has a wide range of uses, the most important from the present Government point of view being in the manufacture of gas shells and in carbon tetrachloride, which is the basis of one of the most effective smoke screens and also of the best fire extinguishers. One of the most important commercial uses of chlorine is in the bleaching of paper and various cloth fabrics.

Steel Needs Rechecked

The actual steel needs of the United States and Allied governments for the last six months of 1918 will approximate 21,000,000 tons. The greatest production in the history of the industry for the same period is recorded as only 16,500,000 tons. To make up this shortage the War Industries Board is considering means for increasing mill capacity. The steel tonnage required was determined by a careful rechecking made by the governments and agencies concerned, at the request of the director of steel supply. The revision showed no lessening of war demands. All non-war industries consuming steel will be required to submit to the director sworn inventories of stocks on hand. The Government is prepared, it is said, to commandeer any surplus stocks, should it become necessary to do so.

Despite the demands made upon the domestic iron and steel industry to supply material for the Government's construction program, close coördination between all interests resulted in the shipment abroad of iron and steel and manufactures thereof, in the fiscal year ended June 30, valued at not less than $1,000,000,000.

Ruling on Copper Concentrates

Owing to some uncertainty regarding the application of the restriction imposed by the War Trade Board upon the importation of copper ore, the board has, by a new ruling, No. 169, altered the original one to read that hereafter no licenses will be issued for the importation of copper concentrates containing less than 60% of copper, except for shipments from Cuba, Canada, and Mexico. All outstanding licenses for the importation of copper concentrates containing less than 60% of copper have been revoked as to shipments from abroad after July 20, 1918, except from the three countries specified, from which copper ore may be imported.

This restriction, the board has announced, is not to be construed as affecting the importation from any non-enemy country of copper matte or blister copper or copper concentrates containing 60% or more of copper. The purpose of the new ruling, as of the former one, is to bring about the ocean transportation of copper in a concentrated form, rather than as the bulkier ore.

English Channel Tunnel Urged

Strong support for the English Channel tunnel scheme from the French and Italian delegates was voiced at the International Parliamentary Conference held in London on July 5. A resolution in favor of constructing the tunnel was carried unanimously.

It was estimated by the sponsors of the resolution that the passenger traffic from France alone would be 3,000,000 persons annually, instead of the 100,000 that traveled by steamer before the war. The probable passenger and freight traffic between Great Britain and the Continent was figured at a profit of £1,118,000, or 7% on the tunnel company's capital of £16,000,000.

The tunnel, which should be completed within five years of its beginning, would be worked, ventilated, and pumped by electricity supplied from a power station in Kent, possibly 10 miles or more inland. It was suggested that the tunnel should be maintained under the authority of the War Office, and a dip in the level of the rails forming a water lock, by which it could, in case of emergency, be flooded from floor to roof for a mile, would be under the control of the commandants at Dover Castle and the neighboring forts. Against the danger from enemy submarines, depth bombs or mines, the tunnel would be protected by a covering of the chalk bed of the Channel of a minimum thickness of 100 ft. The water depth at any vulnerable point would be no less than 180 feet.

Warning that all business firms in the United States should strike from their mailing lists names that have been placed upon the Enemy Trading List was given on July 18 by the Post Office Department at the request of the Censorship Board.

Resales of steel made by manufacturers who are on the preference list for steel supply, without the approval of J. Leonard Replogle, director of steel supply of the War Industries Board, will result in the dropping of such manufacturers from the preference list, the board announces, and will prevent their obtaining further priority assistance.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Chemists and Jewelers at Odds Over Platinum

A defence of the American Chemical Society's platinum campaign was made by Dr. Charles H. Herty at the hearing on that metal before the House Ways and Means Committee recently. The society's propaganda to induce American women to discourage the use of platinum in jewelry and to arouse citizens to the need of conserving it was bitterly assailed by Meyer D. Rothschild and others, representing the jewelry trade, as a tissue of "half truths and misrepresentations." Jewelers are said to regard the campaign as an effort to injure their business, inasmuch as it is the permanent disuse of platinum that is aimed at.

Dr. Herty criticized in no uncertain terms the "insufficiency and the inadequacy of the measures taken" in commandeering platinum. His position is that no platinum ought to be where it can be taxed and that all of it now in the hands of dealers should be put in the vaults of the sub-treasuries of the United States. He told the committee that he does not think it necessary for the Government to call in platinum articles from individuals. "I think," he said, "if the Government made it known, each loyal citizen would hold on to the platinum, without expense to the Government, until it is needed." Dr. Herty made it particularly clear that he thought that jewelers' stocks should be commandeered and paid for on an equitable basis. He also said that any chemist who sells his platinum to any one other than the Government would be just as unpatriotic as any jeweler.

Members of the committee expressed the keenest desire to know why the War Industries Board called for only 75% of the platinum in the face of a recommendation, which the jewelers say they made, that all unmanufactured platinum be commandeered. Representative Oldfield said: "It seems to me that the place for the jewelers' lobby work would be with Mr. Baruch and the War Industries Board. It seems to me that they have got by with it, whether right or wrong."

In the course of the running discussion, Representative Rainey said:

> In the last two years, since the Russian supply has been shut off, we have been getting some supplies from Colombia, but on account of the fact that we have diplomatic difficulties with Colombia that supply may not come in the future. . . . Leaving out the Colombian supply, in the year 1916 we received in the United States from all sources 16,462 oz. of manufactured crude platinum. It is just as important to our Allies to have platinum as it is for us. In 1916, although we were not at war, our Allies were purchasing their explosives in this country, and in 1916 of crude platinum we took from England and France 15,282 oz. in order to manufacture the explosives which we were sending and other war material, which left us with only 1180 oz. that we got from all other sources. In 1915 both England and France had stopped the manufacture of platinum jewelry entirely and were conserving platinum. In that year we secured of the manufactured platinum, ingots and bars which, I presume, is the refined platinum, 12,248 ounces.
>
> We got none of that from Colombia, but we did take from England and France 11,482 oz., leaving only 766 oz. that we got from all other sources. We were at war in 1917 ourselves, and leaving out the Colombian supply of crude platinum we only received 3001 oz., of which we took from our Allies, England and France, 2236 oz.—at that time both of them were conserving platinum and had stopped the manufacture of platinum jewelry—leaving only 765 oz. that we got from all other sources. Of ingots and refined platinum in 1917 we brought in altogether 4170 oz. Of course, none of that was from Colombia. Three thousand two hundred and seventy-five ounces came from England and France, and from all other sources we only got 895 oz. In other words, with the Colombian supply shut off, if we had not succeeded in getting platinum from our Allies during these two years that they were conserving platinum, we would not have had any platinum to carry on this war, which leads us to the conclusion that in carrying on this war, in so far as the manufacture of war material is concerned, England and France have been wise in their policy of conserving platinum and that we are not entitled to any of the credit.

Work on Sulphur for Chemical Alliance

Charged by the War Industries Board with an important part of the work of allocating sulphur materials, the Chemical Alliance already is deep in the enormous work that it has undertaken. The committee to have charge of the work is known as the Committee on Production-Distribution-Control of sulphur materials. It is composed of A. D. Ledoux, chairman; W. D. Huntington, and C. G. Wilson. In addition to the allocation of brimstone, the committee is charged with a similar duty with regard to pyrites and coal brasses.

Butte Trouble Involves Copper Price

Since the matters involved in the labor controversy at Butte cannot be dissociated from the question of the price of copper, the entire question has been turned over to the War Industries Board by the National War Labor Board, to which it had first been referred. The Metal Mine Workers' Union of Butte alleges discrimination against union miners by the Anaconda Copper Mining Co. and other companies in the Silver Bow Association. Wage questions also are in dispute.

Graphite Crucible Imports Restricted

All licenses for the importation of graphite crucibles have been revoked by the War Trade Board as to ocean shipments after July 15. No further licenses will be granted for the remainder of the calendar year. A significant feature of the announcement is that the War Trade Board formally makes the following statement: "Imports of graphite already are prohibited, the result of this restriction having been to develop an adequate supply of graphite within the country." This statement has given great hope to Alabama producers, and is interpreted as meaning that the War Trade Board finally has come to their view, which is that graphite for all needs can be produced in this country.

Mining in "No Man's Land"*

By Capt. H. D. Trounce

Our work in the Flanders trenches was almost entirely confined to mining. As soon as the Germans had been halted in their drive in August, 1914, they entrenched themselves, and wherever the trenches of the Allies were within 100 yards of their own they proceeded to start mining across "No Man's Land." Early in 1915 they exploded a large number of mines underneath the Allied trenches. The French and British immediately organized tunneling or mining companies and proceeded to countermine. During 1915 they were mostly engaged on the defensive in these operations below ground, but toward the end of 1915 and in 1916 and 1917 the Allies succeeded in reversing the state of affairs and were active with offensive mining.

When I reached the trenches early in the first week of January, 1916, the British company I was with had succeeded in sinking a number of shafts (not, however, without having several of them destroyed by the enemy during their construction) and had driven a number of galleries well over toward the Hun lines. Our trenches here opposite Fromelles averaged from 80 to 150 yards apart. On account of shallow water level, we averaged a depth of about 25 ft. below the surface, and only by constant pumping with hand pumps were we able to keep up the progress in our galleries. The soil was generally a blue plastic clay. At intervals we would strike running sand, and when this happened we usually found it wise to abandon the drive and start new workings. At the outset many of our tunnels also were destroyed by enemy "blows," but we succeeded in putting in quite an elaborate system in the course of time. The sector we were operating on had a frontage of approximately half a mile, and on this front we had about 16 shafts. From the shafts we drove a complete system of defensive galleries. Our main galleries were about 5½ ft. by 2½ to 3 ft. in cross section; branch galleries about 4½ ft. by 2½ ft. and with listening galleries or "rabbit holes," were usually in the form of a Y from the end of branch galleries and these were used principally for listening purposes.

Can Detect Enemy Easily if Working in Chalk or Flint

There is a marked difference between mining in clay and chalk. Later on in the Vimy Ridge area we had considerable mining in chalk. In clay it was possible for the Germans and ourselves to tunnel to within a few feet of each other before we could hear any sound of mining; and elaborate precautions were taken to insure silence. In chalk it is possible to hear from much longer distances, especially where the chalk contained any amount of flint.

To insure silent working in the clay we would use grafting tools instead of shovels. No nails were used in the timbering, all sets being wedged with sand bags. Blankets were hung in the end of galleries to deaden the noise. As we approached nearer to the enemy, the men working in advanced tunnels would have to use canvas shoes or work in their socks. No talking was allowed. Every precaution was taken to insure silent work. As the life of every one in the galleries depended on this, the work was conducted almost noiselessly. When we reached within striking distance of the enemy, we would build a charge chamber and load it with guncotton, connecting up with detonators and a double set of leads to the charge, and at the right moment fire these charges from the trench above by means of blasting machines. From this clay soil and at a depth of from 20 to 25 ft., we would blow craters 60 or 70 ft. wide with a small charge of 600 or 700 lbs. of guncotton. As a matter of fact, when we met the Hun below ground under "No Man's Land" we would endeavor to fire "camouflets," that is, a charge calculated to destroy enemy galleries but not to break the surface of the ground. We would usually carry on our work until we heard the Germans talking. When you can hear the enemy talking in clay you can bet they are pretty close. On some occasions we have in this way fired our mines when within three or four feet of enemy mines. In March, 1916, we broke into a German gallery and had a fight with them underground.

Mining Work at Depth of 150 Feet

Trench mining in clay is much more dangerous than in chalk, on account of the fact I have mentioned—the difficulty of hearing operations until one is almost on top of them. In the chalk country further south, in the Vimy Ridge trenches and the Somme area, we were mining at much greater depths. Some of our mines were 150 ft. deep, and after the battle of the Somme we found the Germans at Fricourt had a mine system 200 ft. deep. For these chalk mines we used a different and much stronger high explosive than guncotton. With the British, we used individual mine charges as large as 100,000 lb. These would blow cone-shaped craters several hundred feet in diameter and well over 100 ft. deep. Some idea of the terrific force of these mines can be obtained when you compare the bursting charge of the Mills bomb, which contains 4 oz., or ¼ lb., of ammonal, with the single mine charges of 100,000 lb., or 400,000 times that amount. You cannot see a hand bomb, like the Mills, burst without having some respect for its destructive qualities—particularly if you are close up.

Nearly all of our work on these Flanders mines was done by hand. At times our galleries and tunnels would be half full of water, and it required constant pumping, day and night, to carry on the operations. Hand water pumps and hand air pumps were used. Vertical shafts were sunk in this clay, usually of case timber, and light pit-prop sets were used for the galleries. All the dirt was handled in sand bags from the face, and brought out from the main galleries on rubber-tired mine cars and hoisted to the surface by windlasses. The sand bags were used for reveting and repairing trenches, which are being continually destroyed by enemy fire and action of the weather, and the surplus bags were emptied at night into shell holes and old mine craters.

We were fortunate, in our work below ground, in not losing more men than we did, but it required constant and careful listening to avoid casualties. We could distinguish in time the nature of the sounds of the enemy miners when charging their mines, as distinct from everyday work, and mighty useful it was that we could do so. When we suspected the enemy were about to fire one of their mines, we would warn the infantry

*Reprinted from "The Castle," published at Camp A. A. Humphreys, Virginia.

and have them withdraw any of their men who were on guard on top at threatened points. Sometimes they would keep us guessing, and would hold their mines, just as we did ours, for several days, or even a week or two before firing them. The fact that mining is going on between the trenches is easily established after several weeks' work, but every effort is made to conceal the exact location of the galleries.

Although it was our business as engineers to carry on the work we were responsible for, we would occasionally find time to do what we called "strafe the Hun," which, interpreted, means to open fire on them and their trenches with any weapon that was handy. On top at the time we were using the Vickers machine gun, the Lewis automatic rifle, hand grenades and several kinds and weights of trench mortars and a number of hand bombs. The Mills hand bomb had not yet been issued, but we threw a number of other varieties, from the old handle bombs with cloth streamers attached to guide their flight, to the cricket-ball bomb with a quick match which is lit from a brassard on your arm. Bomb throwing in 1916 was not the comparatively safe amusement that it is now. We also made up a number of bombs with different kinds of jam cans, filling them with pieces of shrapnel, iron, nails, any old thing with a kick, using powder and a small piece of fuse. Many accidents happened because of these crude methods. Our first trench mortars were made of pieces of cast-iron pipe. The trench mortar fellows would always use a long lanyard and carefully take cover themselves before they fired the mortars; in fact, so often did the mortar gun itself burst, that the invariable question when any trench mortar landed in the trench, was, "Whose is it; ours or theirs?" At the very best of times and with the scientific development of trench mortars, it is not a very healthy branch of the service. When trench mortar officers came snooping around the trenches in order to find a place to set up their guns, we would invariably refer them to desirable sites at least a hundred yards distant from any of our mine shafts. Like the "gas merchants," trench mortar batteries are more popular when they give you a wide berth.

Chilean Currency and Exchange

The establishment of a printing plant in the capital of Chile for the manufacture of the state's own banknotes recalls the marked improvement that has of late years taken place in the value of the paper peso, states the *Economist*. The unit of value in Chile is the gold peso, valued at $0.365 U. S. currency, but the circulating unit is the paper peso. In March, 1914, this note was worth no more than 19 or 20c. U. S. currency, and, at the end of June, 1915, its value was 16.1c. By the end of the same month of the following year, the value had risen to 18.7c., advancing in September, 1916, to 21.7c. Thereafter the rise continued to be fairly steady, and the explanation of the advance is found in the fact that the value of Chilean exports is considerably in excess of the country's imports, with the result that there is an over-supply of foreign credits and only a slight demand for foreign bills of exchange. The fluctuation in the value of money has long proved an obstacle in the economic advance of Chile. The exports of the country are customarily paid for in gold, but labor is paid in paper.

The working classes are sufficiently intelligent to realize—or, at least, to suppose—that the capitalists reap the benefit of the instability in the currency. This fact explains the political unrest that manifests itself at not infrequent intervals, and the many reconstructions of the Ministry. The recent official recognition of dollar exchange as a means of making international payments, through the adoption of a plan whereby part of the export duties on nitrate of soda shipped from Chile to the United States may be paid in approved 90-day sight bills on New York drawn in United States dollars, is expected to have important results. Until recently, export duties were payable only in gold and in sterling bills drawn on London. It may be remembered that the whole subject of exchange received the careful attention of, and was very fully discussed in all its aspects by, the Pan-American Financial Conference that met in Washington in 1915. The adoption of the dollar exchange for Latin America was one of the first practical results of that assembly.

The significance of the new regulations to the United States may be recognized when it is known that since the war the exports of Chilean nitrate to the United States have trebled in volume, and last year the value was put at $60,000,000. The first sale of nitrate in dollars took place in Valparaiso early in 1916; and soon afterward the first sale of tin concentrate was also contracted in dollars. A number of locally represented American companies then gave instructions that all quotations henceforth were to be made only in dollars and not in pounds, pesos, marks, or francs. The movement to establish regular trading in dollar exchange in South America has thus been consistently progressive.

Exploiting Dalmatian Bauxite Deposits

The *Board of Trade Journal* publishes the following extract from *Die Zeit* (Vienna, Austria):

The war has brought Dalmatia a source of wealth in the exploitation of the rich deposits of bauxite. These ores are not far inferior to the French, as they yield 25 to 30% of pure aluminum. The German aluminum factories have had to fall back on Austrian bauxite. Bauxite has been obtained for years past in the northern islands of Dalmatia, but on the mainland not until October, 1916, when mining began near Sebenico. At present the work is confined to the neighborhood of Drnis. The mines further inland are not yet worked, owing to transport difficulties. There are rich deposits near Trau.

An aluminum industry might well be developed in the country by means of the existing water power, especially the falls of the Cetina. Coal is also to be found. Herzegovina, which also possesses coal fields, is especially rich in bauxite. At present bauxite is being mined by a German firm and the Bauxite Co. in Vienna.

Carlos E. Restrebo, former president of the United States of Colombia, was recently quoted by the *Evening Post* as denying the reports that Colombia had taken steps to make platinum a government monopoly to prevent its exportation to this country. The reported action was supposed to be in retaliation for the failure of the U. S. Senate to ratify the treaty between the two republics, under the terms of which the United States was to pay Colombia $25,000,000.

Remember the Comfort Fund of the 27th Engineers.

Editorials

Zinc in the Second Quarter, 1918

LAST week we reported our statistics of the production of zinc in the second quarter of 1918, the stocks on hand at the end of the quarter, the number of retorts in operation, etc. The figures were about what was expected in the industry, reflecting, as they did, the consummation of developments that had begun in the first quarter. Thus there was a further closing of plants and a further contraction of production. But most satisfactory was a substantial reduction in the stocks on hand. The comparative figures for the two quarters of 1918 are as follows.

Production in short tons:	First Quarter	Second Quarter
Distilled	125,572	117,512
Electrolytic	8,096	9,404
Total	133,668	126,916
Stock at end of quarter:		
At works	(a)	43,149
Elsewhere	(a)	2,932
Total	64,443	46,081
Total number of retorts	198,894	196,580
Number retorts in use	124,072	110,956

(a) Not segregated in reports.

The reported stocks as of Apr. 1 and July 1, respectively, include only what was in producers' hands, either at their works or held elsewhere.

During the second quarter of 1918 four more plants became idle, some of them, perhaps, to be abandoned. Among these was the historic Glendale works of the Edgar Zinc Co. Almost all of the zinc smelteries of the country were operated at reduced capacity, in some cases at less than 40%. At the midyear there were only three plants being operated at full capacity, two of these small ones. Naturally, in each of these cases there were special reasons that permitted a scale of operations superior to that of the average of the industry. The great zinc smelteries of the country, without exception, had a large number of furnaces either cold or on dead-fire.

In the aggregate, only about 60% of the retorts of the United States were in use on July 1. This figure may not be just right, for some smelters may not have reported furnaces at work in redistilling. But, anyhow, it is manifest that even after the elimination of the mushroom plants of 1915-17, there is a very large proportion of idle capacity among smelters who are producing and intend to remain in the business. Some fear has been expressed lest the closing of smelteries would make it hard to get enough spelter to meet a sudden increase in demand. That is not a fear that is to be lightly disregarded, but the danger is rather on the side of personnel than on that of physical capacity. The statistics show the existence of ample capacity among those works that are still in operation, but their working forces have become disorganized. The labor situation will probably improve after completion of the harvesting of crops, but even at the best it is likely to continue troublesome.

The Position of the Gold Miners

THE unhappy position in which the gold miners find themselves need not be reviewed at length. Rather should we direct attention solely to the problem of amelioration. Everybody is agreed that something should be done, but nobody has been able to suggest anything very effective.

The War Industries Board, at the request of the Secretary of the Treasury, has already declared gold mining to be an essential industry, to be granted reasonable priorities in its requirements for material, etc. This is helpful, but is far from being a cure.

Congress might also be helpful in exempting gold miners from military service and exempting the industry from taxation. The levying of a war-profits tax on a gold-mining company is a painful joke. Not only are there no war profits, but soon there will be no profits at all. Exemption from taxation would be important, however, in removing the check upon prospecting. A company that has been spending its money for years in the hope of striking a bonanza cannot feel any enthusiasm over good luck in developing a bonanza in 1917 or 1918 and having to pay 80% in taxes on the profits realized in one year, which may, in truth, be only the deferred profits of many years. Many would figure that it would be far better not to hunt for bonanzas. The exemption from taxation would be, therefore, the removal of a check on gold mining, even if it were not a stimulus to it.

In this connection we must think how to define gold mining. There is no question that the Rand, Black Hills, Mother Lode and Alaska mines are gold mines pure and simple. A great deal of gold is derived from such mines as Anaconda and United Verde, but nobody would class them as anything other than copper mines. But how about such mines as those of the Comstock, in which gold and silver, or gold and something else, are nearly equal elements of value?

When we go beyond the helps that have been suggested above, most of the expedients for aiding the gold miners that have been proposed are dodges of the main point. The price for gold is not fixed. Commodities are exchanged for a certain quantity of gold, and it does not matter whether that be expressed in ounces, dollars, or pounds sterling. Any change in the basis of exchange would be like a modification of the yardstick. A decree that the yard should be henceforth 72 in. long, instead of 36 in., would not induce anybody to part with twice as much cotton cloth for the same money.

So far the financiers of the Allied countries have kept gold from going to a premium. It is doubtful if they can maintain their position. As Hennen Jennings has conclusively pointed out, the total quantity of gold in the world is now a dangerously small percentage of the indebtedness that is payable in gold. As soon as a debtor wants gold and finds he cannot readily obtain it,

he may bid for it, and gold will then be at a premium. If it be admitted that this is likely to happen, and if it be desired to get all the new gold that is possible in order possibly to avert it, a bonus on new production would not be uneconomic, providing the Government held and could continue to hold all the gold existing. Any bonus it might pay for new gold might then be chargeable to war expense.

But we fear that such a project would be impracticable, if not chimerical. What would prevent dishonest miners, or quasi-miners, from buying gold as jewelry or plate, or as coin and bullion in foreign countries, and clandestinely delivering it as new gold? A general premium for gold would be quickly established.

Gold miners may properly feel the pinch of conditions now affecting them, and may reasonably cry for assistance, but beyond the relatively trifling things that the Administration and Congress may do to help, the problem is one for the determination of international financiers. The question really at issue is the maintenance of the gold basis.

Construction and Uses of Chimneys

NO APOLOGY is necessary in drawing attention to the article on notable chimneys on another page of this issue. The paper was originally intended for the Annual Smelting Number, published last week; but the extensive space occupied by the numerous full-page illustrations made this impossible without excluding a great deal of technical matter of more vital importance, although possibly of less general interest.

The chimney, even in its primitive form, is comparatively recent. The excavations at Pompeii and elsewhere disclose the fact that chimneys were unknown to ancient architects. In early English times there were still no chimneys, and fires were built in a pit in the middle of the rooms; and all that was done to abate the smoke nuisance was to provide a hole in the roof directly above, through which the fumes escaped. Conflagrations were common, and this probably led to the introduction of the curfew bell ordinance by William the Conqueror —a statute which insisted that all fires were to be extinguished at a certain hour every evening. Chimneys were probably introduced about the thirteenth century, but, as in many other phases of human endeavor, practically all the progress in theory, design, and construction has been achieved during the last hundred years.

A chimney has two main functions. It removes and disseminates—at a sufficient height to obviate or minimize danger or discomfort to individuals, or damage to crops—the waste products of combustion. It also provides the air supply on the hearth needed to insure satisfactory burning of the fuel.

Tall chimneys are not erected—as a number of people no doubt suppose—merely to break existing records for height, but to achieve a definite result. In calculating the various dimensions it is necessary to take into consideration the temperature and composition of the gases, the altitude above sea level, and various other factors, including the resistance to gas flow caused by the unevenness of the inner surface of the chimney.

In the matter of cheap production of draft, the chimney has wide application. In point of efficiency, however, it has its limitations; and preference may well be given, in certain instances, to the substitution of mechanical means for inducing draft. With regard to the disposal of solid matter, its position is being challenged by the Cottrell system of electrical precipitation whereby a recovery of a valuable byproduct is often achieved, in addition to the complete or almost complete elimination of the solid matter that forms fume and smoke. The adoption of the baghouse in this connection involves the imperative use of fans before filtration and their optional use afterward; but the availability and value of the chimney for the dispersal of the gases resulting after baghouse separation are sometimes overlooked.

Whatever the advance made in methods to eliminate fume or smoke, or to recover byproducts, it is doubtful whether one result will be the superseding of the tall chimney as an economical and satisfactory means of inducing draft and dispersing gases, and as a subsidiary to the efficient operation of an electrical system of precipitation or filtration in a baghouse.

Price for Copper in 1917

THE official reports of companies selling about 1,084,000,000 lb. of electrolytic copper in 1917 show that they realized an average of 26.13c. per lb. If we could have reports from all of the companies, it is probable that the average realization might be a little higher, for we may assume that the Anaconda copper and other metal sold through the Anaconda agency, which is not reported, fetched as much as the 26.366c. per lb. that was got by Inspiration. Lake Superior companies producing 204,546,500 lb. received an average of 28.124c. per pound.

The higher price received by the Lake companies is explained by their failure to participate in the huge sale to the Allies in the latter part of 1916 to the same extent as the electrolytic producers. Consequently, while the latter were filling great contracts during the first half of 1917 at 25c. per lb., other producers were able to take advantage of the higher prices created by the market having become unbalanced.

These chaotic conditions, together with others equally irregular that arose during the summer and fall of 1917, in connection with the fixing of price by the American Government, preclude any close comparisons. The selling of about 45,000,000 lb. by producers jointly to the Government at 16⅔c. early in 1917 is also a factor, although a minor one, that enters into consideration. Amid all this chaos any discrimination among the figures reported by the several companies, as to whether they represent gross prices or net prices, is next to impossible, and, anyhow, is relatively inconsequential. In point of fact, a great deal more copper was actually sold on the basis of net cash, New York, than ever before. The foreign business had previously resolved itself to that basis, and with the fixation of the price of 23½c. in September the old terms of "delivered, 30 days" in domestic business disappeared.

Conditions being as they were, any comparison between the price actually realized and the quotational average is meaningless. The most surprising thing is that they agree even within 1.05c. per lb., the quotational average being about that much higher than the actual

average for the sale of about 1,100,000,000 lb. of copper. Both figures tell the same story in one respect, however; viz., the price for copper in 1917 was only about the same as in 1916, and in both years was only about 30% higher than what was realized in 1906-07, a period of industrial expansion. The claim of copper producers that the prices they have received have been far less extravagant than those created by war conditions for many other commodities is clearly well founded.

COPPER SALES IN 1917 BY ELECTROLYTIC PRODUCERS

Company	Pounds	Proceeds	Average Price, Cents		
Chino Copper Co.	79,636,235	$20,554,112	25.81	(a)	(k)
East Butte Copper Min. Co.	20,013,900	5,095,539	25.460	(c)	(g)
Inspiration Consolidated	80,566,982	21,242,217	26.366	(b)	(g)
Kennecott Copper Corp.	56,904,650	15,372,765	27.015	(a)	(h) (j)
Magma Copper Co.	10,148,632	2,681,573	26.423	(b)	(g)
Miami Copper Co.	30,905,706	9,009,152	29.150	(d)	(h)
Nevada Consolidated	82,040,508	21,207,471	25.85	(c)	(g) (k)
North Butte Mining Co.	21,087,513	5,730,742	27.176	(c)	(i)
Old Dominion Cop. Min. Co.	32,365,795	8,385,977	25.91	(b)	(g)
Phelps Dodge Corporation.	290,522,569	77,482,369	26.67	(c)	
Ray Consolidated	88,582,649	22,944,678	25.902	(a)	(g) (k)
Shattuck Arizona Cop. Co.	14,775,391	4,183,947	28.317	(d)	(i)
U. S. Sm., Ref. & Min. Co.	29,043,242	7,900,051	27.201	(f)	(g)
United Verde Copper Co.	51,664,098	14,115,601	27.302	(f)	(h)
Utah Copper Co.	195,837,111	47,364,421	24.186	(a)	(g)
Totals	1,084,094,981	$283,270,615	26.130		
E. & M. J. average			27.180		

(a) Uncertain what price represents; not stated in report. (b) Probably net cash price, New York. (c) Net cash price, f. o. b., New York or Atlantic seaboard. (d) Average gross price. (f) Probably gross price. (g) Represents net 1917 production. (h) Represents copper delivered and less than 1917 production. (i) Represents copper delivered and in excess of 1917 production. (j) Price includes adjustments on 1916 deliveries. (k) Price of copper sold during 1917 applied to entire production for that year; the company reports lower proceeds on account of carrying some unsold metal at the nominal price of 13½c. per pound.

COPPER SALES IN 1917 BY LAKE COMPANIES

Company	Pounds	Proceeds	Average Price, Cents
Ahmeek Mining Co.	19,299,590	$5,180,901	26.84
Allouez Mining Co.	7,339,288	2,051,297	27.95
Calumet & Hecla Mining Co.	59,527,902	16,900,576	28.39
Centennial Copper Mining Co.	1,684,642	454,123	26.96
Copper Range Co.	45,043,301	12,943,157	28.735
Franklin Mining Co.	3,155,574	843,797	26.74
Isle Royale Copper Co.	10,236,619	2,750,627	26.87
La Salle Copper Co.	1,546,978	440,151	28.45
Mass Cons. Mining Co.	3,984,616	1,045,502	26.238
Mohawk Mining Co.	12,313,887	3,440,253	27.94
Osceola Cons. Mining Co.	12,383,918	3,453,758	27.89
Quincy Mining Co.	22,195,577	6,348,605	28.605
Superior Copper Co.	1,597,914	469,721	29.39
Victoria Copper Mining Co.	1,195,918	343,508	28.723
White Pine Copper Co.	3,040,776	860,523	28.30
Totals	204,546,500	57,526,499	28.124

PRODUCTION, SALES AND PRICE FOR COPPER FOR 12 YEARS (a)

Year	Total Production, Pounds	Pounds Reported	Average Realized, Cents	Quotational Average, Cents
1905	219,000,000	82,372,955	15.597	15.699
1906	224,071,000	113,411,645	19.146	19.616
1907	220,317,041	66,316,025	18.043	20.661
1908	222,267,444	125,949,248	13.348	13.424
1909	226,602,134	136,005,773	13.221	13.335
1910	221,400,864	126,710,763	12.96	13.039
1911	216,412,867	135,329,098	12.657	12.634
1912	1,228,333,298	552,155,308	15.841	16.341
1913	1,406,448,665	658,533,402	15.222	15.269
1914	1,342,634,206	566,687,750	13.458	13.602 (b)
1915	1,411,652,418	619,832,987	17.299	17.275
1916	2,300,000,000	1,217,014,743	25.710	27.202
1917	2,350,240,606	1,084,094,981	26.130	27.180

(a) Up to 1912 the figures represent Lake copper production and sales, but few of the producers of electrolytic making detailed reports in that time. Beginning with 1912, the figures represent electrolytic copper only. The figures for "pounds reported" and "average realized" do not include the United Metals Selling Co. (Anaconda), which does not publish these details. However, it is a reasonable assumption that its results were not very different from those of the other companies, for John D. Ryan has stated that in the 10 years ending with 1913 his companies sold 5,560,000,000 lb. of copper at an average of 14.82c., delivered to the buyers in Europe and America. This would be equivalent to 14.62@14.67c., net cash, New York. During the same 10-year period, Phelps, Dodge & Co., reported an average of 14.56c. per lb., net cash, New York, actually realized. The arithmetical mean of the qustational averages for electrolytic copper in this period is 15.06 cents.

(b) Average for nine months. No quotations in August, September and October. However, the bulk of the copper sold in 1914 was disposed of before and after those months; wherefore the comparison on the nine months' basis is approximately correct.

BY THE WAY

The engineers of the country will no longer have any excuse to emit tales of woe respecting the disfavor of fortune toward them. The income tax returns for 1916, compared with the number of persons engaged in the several occupations as shown by the census for 1910, exhibit the engineers (civil, mining, etc.) as leading the list. There were 6628 income-tax returns from this class, which was a little more than 61% of the total listed in the class. Insurance agents came next, with a representation of 28%. Then came brokers, with 20%; lawyers, with 19%, and mine owners, with 18%. Here we will stop. Shall we deduce that it is better to be a mining engineer than a mine owner?

A certain mining community in Australia was noted for the predominance of Cornishmen among its population, all of whom were ardent chapel-goers on Sunday, although their speech when working underground during the week tended to veil the religion that emerged on the seventh day. It happened that the local preacher was taken ill, and it became necessary to find a substitute. Most of the miners had, at some stage of their careers, indulged in rhetorical outburst at religious revivals or other times; and there was much discussion as to who should fill the pulpit on the following Sunday. Finally it was found that almost unanimous choice had fallen upon one of their number—Ned Trevanion by name—who had gained some notoriety by the ease and fluency with which either profanity or religion came to the tip of his tongue, as occasion demanded. He was cautioned to be careful and not to let his enthusiasm get the better of him; and he carefully prepared a series of notes for the forthcoming discourse, in which the terrors of hell were portrayed with the same emphasis as the alternative joys of heaven. When Sunday came, the tin chapel was filled to overflowing. A sympathetic congregation listened with appreciation to Ned's discourse, although his particular friends noted with apprehension that he was paying less and less attention to his notes and drawing more and more from his imagination. In the midst of a flowery description of the principal city of paradise he bethought himself of a mention of that emblem of all true rural success—a brass band. "An' down the street, paved with gold," he shouted, with an enthusiasm that gathered momentum at each word, "there comes a gert band, playing bootiful moosic. None of yer penny tin whistles, *but bloody gert trumpets.*"

The use of the title "captain" to those in charge of mining work seems to have originated in Cornwall. An incident in this connection is related as having happened after the visit of a man-of-war to a Cornish port, not far distant from an important tin-mining district. The captain of the warship was seen ashore, in imposing uniform, by a couple of miners, one of whom was doubtful as to the naval officer's rank. "'Oo is ut, Jan?" he said, in a stage whisper. "Cap'n Trewhella," replied his friend. "'Ow, 'cap'n'?" insisted Jan. "'Ee's cap'n of thicky gert hugeous ship," he was informed. "Aw! Now I zee. I thought 'er wasn't a real cap'n."

NEW PUBLICATIONS

Northwest Mines Handbook. By Sidney Norman. Pp. 366; 6¼ x 9½; illus. $5. Published by Sidney Norman, Mohawk Bldg., Spokane, Washington.

The first of what is expected to be a series of yearly volumes covering minute details concerning 1600 mining properties in Idaho, Washington, Oregon and British Columbia. Information is well indexed, and the book is a valuable one for reference purposes.

Poor's Manual of Industrials for 1918. Ninth Annual Number. Pp. CL plus 2735; 6 x 9. $10. Poor's Manual Co., New York.

The regular annual volume of this well-known manual, which covers manufacturing, mining and miscellaneous companies, has just been issued, the information being revised to April, 1918. The general arrangement and data appear to be the same as in previous editions, but a new feature is the insertion of complete information regarding the present income tax on industrial securities, stating whether the companies assume a 4% tax, a 2% tax, or no tax at all. We have always found this manual to be most useful for reference.

Sulphuric Acid Handbook. By Thomas J. Sullivan. Pp. 140. 5 x 7¼; leather. $2.50. McGraw-Hill Book Co., Inc.

The psychological moment has been chosen for the appearance of this book on sulphuric acid, which comes out at a time when maximum efforts are being made to stimulate production of the "king of acids." Much has been written on the subject, but the useful information is so scattered that it is not readily obtained. With this in mind, the author has confined himself largely to numerical data and tables generally adapted to American practice, omitting obsolete matter. The new standard specific gravity tables for sulphuric, nitric and hydrochloric acids are given and the methods of preparing them described. Other subjects included are hydrometers, acid calculations, boiling and melting points, analysis, flanges and flange fittings, cast and wrought pipe and lead pipe, as well as miscellaneous tables.

Oil-Storage Tanks and Reservoirs, with a Brief Discussion of Losses of Oil in Storage and Methods of Prevention. By C. P. Bowie. Pp. 76; illus. Bull. 155, U. S. Geological Survey, Washington, D. C.

This bulletin gives a general outline of the usual practice in designing and erecting tanks and reservoirs for oil storage. A complete set of specifications, with a detailed drawing, for a 55,000-gal. steel tank is given and discussed. The accessory equipment, such as swing pipes, stairways, explosion doors and relief valves, is touched upon, and wooden and steel roofs are described. Concrete-lined reservoirs are covered by presenting specifications and drawings of a reservoir 488 ft. in diameter and 25 ft. deep. Data on costs of tanks and reservoirs are given. Losses of oil by seepage and evaporation, and the prevention of such losses by means of water-seal tops, sprinkling and burying the tanks, are discussed.

Preliminary Report on a Part of the Pyrites Deposits of Georgia. By H. K. Shearer and J. P. D. Hull. Pp. 229; illus.; cloth. Bull. 33, Geological Survey of Georgia, Atlanta, Georgia.

An incomplete account of the pyrites deposits of Georgia published to help and encourage those engaged or interested in supplying the urgent need for the mineral at the present time. A second report is to be published at a later date, in which the technical and scientific aspects of the matter will be dealt with in greater detail. The present volume gives an interesting résumé of the occurrence, production, and imports of pyrites; also a list of sulphuric-acid plants in Georgia, which shows that the state produces nearly half a million tons per annum. The geologic features of the deposits are discussed and descriptions of the resources of the various properties follow; also details of the surface and underground equipment installed or contemplated. Flow sheets are given, showing methods of concentrating the pyrites.

The Mines Hand Book: A Manual of the Mining Industry of the World. By Walter Harvey Weed. Pp. 1896; 6 x 8½; cloth; illus. Vol. 13, 1918; supplementing former editions. $10. Published by W. H. Weed, 29 Broadway, New York.

The latest edition of this useful handbook has some marked improvements over former issues. The most important change is in the new arrangement of mining companies according to their geographical situation, instead of in alphabetical order, as hitherto. This rearrangement makes it possible to see how thoroughly each mining district has been covered by the author. A 46-page index, on colored paper to facilitate it use, has been added of necessity. Another new feature is a series of maps of the more important mining districts. As in former editions, there are also included a glossary of technical terms, a chapter on mineralogy, statistics of metal production and prices, and a list of obsolete securities and corporations. A list of state geologists and mine inspectors has been substituted for the long list of mining-company officials appearing in former issues. On the whole, Vol. 13 of the handbook is the best yet produced and a valuable aid to all who are interested in metal mining.

Mining Engineers' Handbook. Robert Peele, editor-in-chief, First Edition. Pp. 2375; 4¼ x 7¼; leather; illustrated. $5. John Wiley & Sons, Inc., New York.

Much credit is due the author for the service rendered the mining profession in the production of his new handbook, which fills what has been a noticeable gap in the list of technical works of reference, such as Trautwine and Kent. Written by a staff of specialists, whose names for the most part are guarantees of the work performed, the book is a valuable addition to the library of every mining man. Among those who have contributed the 44 sections of the book are: J. R. Finlay, W. Y. Westervelt, Robert H. Richards, James F. Kemp, H. V. Winchell, George S. Rice, Reno H. Sales, D. W. Brunton and H. P. Gillette. A valuable feature of the book is the bibliography that accompanies each section, which feature itself makes the volume worth having. If any fault may be found with a work of this sort on brief acquaintance, it is that it covers a field that some may consider too wide. It may be thought that the sections on metallurgy might better have been omitted and that various other parts duplicate to greater or less extent the work of existing handbooks. These, however, are minor points compared with the excellence of the work as a whole. The value of handbooks in general depends largely on the skill and care with which they are indexed, and it is apparent that the same thoroughness that is evidenced in the planning of the "Mining Engineers' Handbook" was also exercised in the preparation of the index.

Report of the Ninth Annual Meeting Held at Ottawa Nov. 27-28, 1917. Pp. 282; illus. Canada Commission of Conservation, Ottawa, Canada.

Mining and Concentration of Carnotite Ores. Karl L. Kithil and John A. Davis. Pp. 89; illus. Bull. 103, U. S. Bureau of Mines, Washington, D. C.

Onaping Map-Area. By W. H. Collins. Pp. 157; illus. Memoir 95. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Timiskaming County, Quebec. By M. E. Wilson. Pp. 197, illus. Memoir 103. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Bibliography and Index of Wyoming Geology, 1823-1916. By Gladys G. Bovee. Pp. 130. Bull. 17. L. W. Trumbull, State Geologist, Cheyenne, Wyoming.

Petroleum in 1916. By John D. Northrop. Mineral Resources of the United States, 1916-17. Part II. Pp. 207; illus. U. S. Geological Survey, Washington, D. C.

Contributions to the Mineralogy of Black Lake Area, Quebec. By Eugene Poitevin and R. P. D. Graham. Pp. 103; illus. Museum Bull. 27. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Personals

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

B. L. Thane, managing director of the Alaska Castineau Mining Co., is in New York.

A. B. Shepherd, of Pittsburgh, has been visiting the mines operated by the Jones & Laughlin interests on the Mesabi range.

Franklin Wheaton Smith has returned to Bisbee, Ariz., after an inspection of the Rival mine, at Steeple Rock, New Mexico.

W. P. Schumacher, superintendent of the Santa Barbara unit of the American Smelters Securities Co., is inspecting that property.

A. H. Brown has been appointed manager of the Hudson Bay and Dome Lake mines of Ontario in succession to **Douglas A. Mutch.**

William N. Fink has returned to Cusihuiriachic, Chihuahua, Mex., and taken over the management of the Cusi-Mexicana Mining Co. property.

J. W. Bennie, general manager of the Shannon Copper Co., Clifton, Ariz., is at the Yeager Canyon property recently acquired by that company.

A. C. Metz, superintendent of the Reforma mine, near Monclova, Coahuila, Mex., has entered the service. The work of this property is now being supervised by **S. F. Shaw.**

T. J. Harwood, manager of the Schumacher mine, Schumacher, Ont., has left Canada for the South, operations at the mine having been much curtailed for the present.

George Cannon, superintendent of the Brunt mine at Mountain Iron, Minn., for M. A. Hanna & Co., has been appointed assistant general manager of the company at Duluth.

A. G. Diampre, formerly manager of the Peterson Lake Mining Co., of Cobalt, has been appointed manager of the Associated Goldfields of Larder Lake, in the Kirkland Lake district of Ontario.

Guy C. Riddell, consulting metallurgical engineer for the U. S. Tariff Commission, is back in Washington from the West, where he has been looking into certain war-metal activities during the last month.

D. H. MacDougall has resigned his position as general manager of the Dominion Steel Corp., of Sydney, N. S., and has been appointed president of the Nova Scotia Steel and Coal Co., succeeding **F. H. Crockard,** who has resigned.

Oliver W. Krull, formerly of the metallurgical staff of the Chino Copper Co. and later associated with the mining department of the Cia Minera de Peñoles, at Ojuela, Durango, Mex., is now superintendent of the latter company's lead smeltery and white-arsenic plant at Mapimi, Durango.

H. S. Buck, vice president and general manager of the American Zinc Products Co., also of the Fort Smith Spelter Co., has resigned both of these positions. Mr. Buck had entire charge of building and operating the Fort Smith Spelter Co. since its organization in March, 1916. During October, 1917, the Fort Smith company purchased the Western Tin Plate Co.'s plant at Greencastle, Ind., and the conversion of the plant into a zinc rolling mill, now operating as the American Zinc Products Co., was supervised by Mr. Buck. Mr. Buck has not announced his future plans.

Obituary

Richard Inch, recorder of Tuolumne County, Calif., for the last 20 years, died at Sonora, Calif., on July 3, aged 65 years.

Byron E. Janes, mining engineer and graduate of the University of California, was killed on July 10 at El Tigre mine, in Sonora, Mexico.

Sydney W. Shattuck, a metallurgist and manager of the Shattuck Chemical Co. of Denver, Colo., died suddenly in Denver on June 24. He was 32 years old.

E. B. Hawkins, who has been identified with the development of the Mesabi range, died recently at Duluth, Minn., aged 54 years. He came to Minnesota 30 years ago as representative of the contracting firm of Drake & Stratton, of which he later became vice president. The Hawkins mine at Nashwauk, Minn., was named after him. Mr. Hawkins was prominent politically and was State Senator at the time of his death.

Societies

American Zinc Institute. The program arranged for the meeting to be held at the Statler Hotel, St. Louis, Mo., on July 29 and 30, is as follows: July 29—10 a.m., registration of representatives; 2:30 p.m., address of welcome by the president of the St. Louis Chamber of Commerce; reply by F. C. Wallower, manager of Golden Rod Mining Co., Joplin, Mo.; outline of plans and purpose of meeting by Victor Rakowsky, chairman; appointing of committees; addresses: "Benefits To Be Derived from Close Coöperation of Zinc Smelting and Mining Interests in Helping Win the War," by W. R. Ingalls, editor, "Engineering and Mining Journal"; "World's Zinc Resources and Their Political Control," by C. E. Siebenthal, U. S. Geological Survey, Washington, D. C. At 8 p.m. there will be a dinner on the Statler roof, with Victor Rakowsky as toastmaster. A patriotic address will be made by Charles T. Orr, president of the Athletic Mining and Smelting Co., Webb City, Mo., followed by after-dinner talks. At the session at 10 a. m. on July 30, there will be the following addresses: "New Uses of Zinc," by A. P. Cobb, vice president of New Jersey Zinc Co., New York; "The Value of Experimental Work in Developing New Uses of Zinc and Zinc Products," by Dr. John Johnston, National Research Council, Washington, D. C.; "Zinc Mining and Production in Western States," by J. L. Bruce, manager of Butte & Superior Mining Co., Butte, Mont.; "Zinc Mining and Production in Southeastern States," by J. N. Houser, vice president of American Zinc, Lead and Smelting Co., St. Louis, Mo.; "Sheet-Zinc Industry in United States and Benefits of Coöperation Between Mining and Smelting Interests," by E. H. Wolff, president of Illinois Zinc Co., Peoria, Ill.; "Zinc Mining and Production in Missouri-Kansas-Oklahoma and Arkansas," by Otto Ruhl, consulting engineer, Joplin, Mo. In the afternoon at 1:30 o'clock there will be two addresses: "Zinc Mining and Production in Wisconsin," by W. N. Smith, manager of Vinegar Hill Zinc Co., Platteville, Wis.; and "Zinc Mining and Production in Eastern States." This will be followed by the report of the committee on organization, the registration of permanent members, reports of other committees and the election of permanent officers.

American Institute of Mining Engineers will hold its annual summer meeting from Sept. 1 to Sept. 6 inclusive, in Colorado. The program is summarized as follows: Sunday, Sept. 1—Registration at temporary headquarters, Brown Palace Hotel, Denver. Monday, Sept. 2—Technical session at 9 a. m.; automobile trip at 11 a. m. to ferroalloy plants near Denver and other points of interest in the city, followed by a trip through the mountain parks west of Denver; luncheon at 1 p. m. at Hosa Lodge, Gennessee Park, Lookout Mountain; technical session at 4.30 p. m.; dinner at 7 p. m. at the Country Club. Tuesday, Sept. 3—Entrain at Denver at 8.15 a. m. for Colorado Springs; technical session at 11 a. m. at permanent registration headquarters at Broadmoor Hotel; luncheon at 1 p. m. at Broadmoor Hotel; technical session at 2 p. m.; reception and dance at 8.30 p. m. Wednesday, Sept. 4—All-day trip to Cripple Creek district, with visits to Portland, Golden Cycle, Vindicator, Cresson, and other properties, followed by a technical session in the evening. Thursday, Sept. 5—Auto trip at 8 a. m. to Pikes Peak; visit to Golden Cycle mill at 2 p. m.; technical session afternoon and evening. Friday, Sept. 6—Excursion at 8.30 a. m. to Pueblo; luncheon at 12.30 p. m. at Minnequa steel works, Pueblo; technical session at 4 p. m.; banquet at Broadmoor Hotel, Colorado Springs, at 7.30 p. m. On account of the abandonment of the Colorado Midland Ry., it may be necessary to alter the plans for the trip to Leadville. An optional trip will be arranged if considered advisable. Preparations for the entertainment of the ladies at Denver have not yet been fully completed. At Colorado Springs the ladies will be entertained by a committee headed by Mrs. Spencer Penrose, and a special trip to Glen Eyrie Park will be arranged for them. The arrangement committee at Denver will include Dave G. Miller, Frank Bulkeley and George E. Collins; finance committee at Denver, T. B. Stearns, Richard A. Parker and T. B. Burbridge; entertainment committee at Denver, F. H. Bostwick, F. E. Shepard, B. P. Morse, J. G. Perry and Howland Bancroft. The Colorado Springs committees are as follows: Registration committee, Loring C. Lennox, Horace F. Lunt and J. M. Tippett; finance committee, A. E. Carlton, Spencer Penrose, George M. Taylor and A. L. Bloomfield; arrangement and entertainment committee, George M. Taylor, A. L. Bloomfield, J. D. Hawkins, Thomas B. Crowe, A. E. Carlton, E. P. Arthur and Etienne A. Ritter.

Industrial News

E. J. Albert, for the last five years manager of the mining and power department of the Canadian Allis-Chalmers, Ltd., Toronto, has resigned to accept the position of sales manager of the Thwing Instrument Co., of Philadelphia.

Case Manufacturing Corporation was incorporated on June 26, 1918, at Denver, Colo. The new company has been granted the exclusive right to manufacture the Case oil burner, and will also build oil-fired furnaces, motor blowers and other allied products; it will also deal in metallurgical clay goods and specialties for assayers. The Case oil burner was marketed until recently by the Denver Fire Clay Co. on a royalty basis. Officers of the new concern are: Mrs. W. W. Case, Sr., president; Fred McL. Strout, vice president; Theodore W. Muckle, treasurer; and Seth Parlin, secretary. The firm is ready to submit quotations on any special type of furnace desired.

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—Preparing Aluminous Abrasives. Lewis E. Saunders and Ray Hill White, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 1,269,222; June 11, 1918.)

Aluminum—Producing Crystalline Alumina. Ray Hill White, Niagara Falls, N. Y., assignor to Norton Company, Worcester, Mass. (U. S. No. 1,269,141; June 11, 1918.)

Aluminum—Process of Purifying Aluminous Materials. Lewis E. Saunders, Niagara Falls, N. Y., assignor to Norton Company, Worcester, Mass. (U. S. No. 1,269,223-1,269,224; June 11, 1918.)

Borax—Method of Separating Borates From their Gangue. Herbert W. Faulkner, Ryan, Calif., assignor to Pacific Coast Borax Co., Reno, Nev. (U. S. No. 1,269,170; June 11, 1918.)

Concentrator, Mineral. Charles O. Michaelsen and William P. Michaelsen, Minneapolis, Minn., assignors to Michaelsen Machinery Co. (U. S. No. 1,269,198; June 11, 1918.)

Electrolytic Starting-Sheet Suspender. Henry S. Montgomery and Henry A. Tobelmann, Ajo, Ariz. (U. S. No. 1,269,485; June 11, 1918.)

Electrolytic Tank, for Electrochemical Reactions. Edward Henry Hamilton, Trail, B. C., assignor to the Consolidated Mining and Smelting Co. of Canada, Ltd., Toronto, Ont. Canada. (U. S. No. 1,269,078; June 11, 1918.)

Ore Dressing—Process of and Apparatus for Concentrating Ores. Cedric Judson Beatty Armstrong, Cobalt, Ont., Canada, assignor to Metals Recovery Co., Augusta, Me. (U. S. No. 1,269,150; June 11, 1918.)

Ore Dressing—Process of Concentrating Ores. John M. Callow, Salt Lake City, Utah, assignor to Metals Recovery Co., Augusta, Me. (U. S. No. 1,269,157; June 11, 1918.)

Phosphorus, Process for Making Alloys of. Lewis A. Jeffs, Salt Lake City, Utah. (U. S. No. 1,268,849; June 11, 1918.)

Rock Drill—Percussive Rock-Drilling Apparatus. Richard Henry Adams, Cobalt, Ont., Canada. (U. S. No. 1,269,147; June 11, 1918.)

Zinc, Lead—Continuous Process for Recovering Lead or Zinc from their Ores or from Slag as Metal Fumes. Friedrich Ohlmer, Griesheim, near Frankfort-on-the-Main, Germany. (U. S. No. 1,269,110; June 11, 1918.)

Alloy of Soft Metal and Method of Making. William L. Rice, Reading, Penn., assignor of one-half to Peter S. Braucher, Reading, Penn. (U. S. No. 1,269,000; June 11, 1918.)

Editorial Correspondence

SALT LAKE CITY—July 15

An Increase in Wages of 50c. a day has been granted by the American Smelting and Refining Co. in this section, and also by Utah Copper Co. As has before been mentioned, employees of the Garfield smeltery of the A. S. & R. have been asking an increase of $1 a day. The example of the smelting company and the Utah Copper will probably be followed by mines throughout the state. Capt. Charles T. Connell, Federal mediator of labor troubles, is expected in Salt Lake in the immediate future, to go into matters concerning the labor situation here.

Utah Mine Operators through the Utah Chapter of the American Mining Congress have sent a letter to the War Industries Board, asking for an increase in the price of metals.

Tintic District Shipments for the first half of 1918 amounted to 4547 cars of ore, as compared to 5500 cars for the same period in 1917. The tonnage is about 227,530 tons, of an estimated value of $6,000,000. This year there have been 40 shippers; the year preceding there were 49. In considering the tonnage of the camp this year, in comparison with the output of the first six months of 1917, it is to be noted that last year much more lower-grade ore was shipped. Only the best grade of ore has been shipped this year, and the falling off has been general throughout the district, and has not been due to curtailment on the part of any one property.

Three Bingham Properties are involved in a question of apex, Utah Consolidated, Utah Apex, and Bingham Metal and Tunnel. The Utah Consolidated a short time ago brought suit against the Tintic Mining and Development for ore extracted from the Yampa claims in Bingham, the amount of damages asked being $202,500, or three times the value of the ore extracted, in this case $67,500. The large new deposit opened at depth in the Utah Apex is claimed by the Utah Consolidated to apex in its ground, the latter company setting forth that the limestone bedding in this part of the Utah Apex is a continuation of the limestone bedding of the Yampa claim just mentioned. The Utah Apex is said to have added considerably to its reserves from the new body, and present net monthly earnings are given at from $75,000 to $100,000, also largely from the new find. The workings of the Utah Consolidated and those of the Utah Metal and Tunnel come together at a certain point, and the two companies are reported to have found themselves working at different levels in the same bedding.

BISBEE, ARIZ.—July 11

Two Hundred and Thirty-nine Suits, aggregating $5,465,000, as damages alleged to have been sustained through the deportation from the Bisbee-Warren district, July 12, 1917, were filed in the district court of Cochise County in behalf of the 1186 miners and their sympathizers deported at that time. W. B. Cleary, one of the deportees, at present at Chicago as one of the counsel for the I. W. W., and F. C. Struckmeyer of Pheonix, are attorneys for the plaintiffs. All except Cleary ask for from $10,000 to $12,500 actual damages and $10,000 to $12,500 additional punitive damages. Cleary alleges actual damages of $50,000 and punitive damages of $50,000 additional. It is predicted that between 300 and 400 suits will be filed before the expiration of the time limit.

DULUTH, MINN.—July 16

Recent Increase in Freight Rates on iron ore from the Minnesota ranges to the Duluth, Two Harbour, and Superior docks from 63½c. to $1 per ton means an increased revenue for the state. The tonnage this year will be about the same as 1917, which was 45,000,000. Up to the time the new rate went into effect, about 13,000,000 tons of ore had been forwarded at the 63½c. rate. Additional shipments this season are estimated at 32,000,000 tons, which will yield the transportation companies $1 per ton; so they will probably receive about $40,000,000 for their services. A 5% tax on this income means $2,000,000 revenue for the state, which is an increase of $650,000 over the amount paid by the carriers in 1917. The roads transporting the ore are the Great Northern, Duluth, Missabe & Northern, and the Duluth & Iron Range for the Mesabi and Vermilion ranges and the Soo and Northern Pacific for the Cuyuna range.

Active Iron-Mining Conditions were revealed in the annual report of the Great Northern Iron Ore trustees for the year 1917. Receipts for 12 months were $4,499,593. The royalties under the new leases made to the M. A. Hanna and Jones and Laughlin interests were $1,637,051. From the old leases there was turned over to the trustees $505,505. The Arthur Iron Mining Co. earned $308,772; stock pile shipments came to $646,502, and miscellaneous receipts were reported at $1,901,763. Total expenditures amounted to $255,279, leaving net earnings of the properties at $4,744,314, or the equivalent of $3 per share on the 1,500,000 shares. Dividends for 1917 amounted to $2,250,000. The report also states that the company has disposed of all of its developed properties and has withdrawn from active mining. The trustees still have under their control a number of undeveloped properties, which they will develop or lease. Royalties range from 55c. to $1.50 per ton.

HOUGHTON, MICH.—July 16

Cornishmen in the Copper Country have made exceptional records as good citizens and miners. Before the draft went into force in England many miners came here from Cornwall. When the first call came after the United States got into the war, volunteers were numerous. About 250 Canadian and British subjects who still remain in the district and are keeping out of the war are men with dependent families, who might secure exemption if they were citizens of the United States, but they are included in the demands of the British draft. This further exodus of 250 British subjects who will enter the war with the Canadian regiments is certain to have its effect on the production of copper.

JOPLIN, MO.—July 15

Demonstration of a Zinc-Soldering Acid that may increase the use of zinc was made before mine operators and business men at the Chamber of Commerce in Joplin on July 12. The acid was discovered by Oliver Greenstreet, of Baxter Springs. At the demonstration, tinners were called in from leading Joplin business firms, and they used the acid without previous knowledge concerning it and pronounced it all that could be desired. Great heat is not required, and zinc sheets were soldered to copper, tin and galvanized iron successfully, and to other zinc sheets. An attempt will be made by the Chamber of Commerce to help finance the acid, and make its use general.

Interest in Manganese Fields near Batesville, Ark., is growing in this district, and many mining men have gone from here to investigate, some of them investing. Three of the largest of the zinc-producing companies represented locally have obtained tracts of land there and will develop them. D. D. Adams, president of the Adams-Hicks Mining Co., at Joplin, owns several thousand acres of what he thinks to be manganese-bearing land, and he believes that district today is just about what the Oklahoma section of the local zinc district was three years ago.

TORONTO—July 13

Porcupine Mine Operators are anxiously looking for some definite assistance to the gold-mining industry from the Canadian Government in view of the unfavorable conditions created by the war, especially as regards labor shortage. They are encouraged in the hope that some remedial action will soon be taken, by the recent request of Sir Thomas White, Finance Minister, that the companies would make a definite recommendation as to what they consider the most feasible form in which aid could be given.

Returning Prospectors from the new gold area south of Lake Alitibi, in the Province of Quebec, report that a number of good gold discoveries have been made there during the last few weeks. The rock formation consists of schists with porphyry intrusions, and gold has in some instances been found to occur freely in well-mineralized quartz which bears similar characteristics to the surface outcropping in the Porcupine district. The Crown Reserve, La Rose Consolidated, Aladdin and other mining companies have interests in the district.

VICTORIA, B. C.—July 15

As a Result of Representations of the mine operators of the Kootenay district of British Columbia, it is expected that the Dominion government will appoint a royal commission to investigate the schedule of charges at the Trail smeltery of the Consolidated Mining and Smelting Co. of Canada. The committee appointed by the Associated Boards of Trade of eastern British Columbia to make the inquiry finds that the $3000 granted by the federal authorities is insufficient to meet the expense, and that, without the power to take sworn testimony, it would be handicapped in its work. The best way out of the dilemma is for the Ottawa government to provide a commission backed by a grant of approximately $10,000 and clothed with power to make the fullest possible investigation. Meanwhile O. R. Whittaker, mining engineer, of Denver, Colo., who was responsible for a report of similar character in Colorado, has been retained and, presumably, is awaiting instructions. It is thought likely, though no official announcement has been made, that the Dominion government will accede to the wishes of the operators. The federal administration has set aside $400,000 as a bounty on zinc production. The mine owners assert that, as the Trail smeltery is the only Canadian plant engaged in this work and equipped to do it, the financial support will go to it alone, and that it is not likely to aid them, as that company can obtain all the zinc ore it can take care of from its own mines. In their opinion it should have been provided that the bounty was to be paid on the contents of the zinc ore mined, the same to be fixed by assay. On the other hand, it is maintained for the company that its large investment in an electrolytic plant, without which the refractory ores of southern British Columbia could not be handled satisfactorily, entitled it to the support of the government.

Marked Interest in Oil Prospecting in British Columbia is manifest. Had it not been for the untimely death of B. T. Rogers, of Vancouver, B. C., the sinking of a test hole at Burnaby, where there are oil seepages, would have continued. The Empire Oil and Natural Gas Co., Ltd., has drilled about 400 ft. at Aldergrove, B. C., the latest log showing a sandy shale. Two companies have been organized at Vancouver, the Boundary Bay Oil Company, Ltd., and the Burnaby Oil Co., Ltd. The former intends to drill an area at Boundary Bay and the latter to carry out work at Vancouver Heights. The possibilities of Graham Island, of the Queen Charlotte group, also are engaging attention. It is understood that the Geological Survey station purposes this summer to make a thorough examination of the Fraser Valley to establish at what point a drill would be most likely to strike oil in commercial quantities.

Search for Platinum in British Columbia is to be vigorously prosecuted this summer. The Department of Mines, Ottawa, purposes to purchase two additional drills, and will operate on placer ground with a view to the establishment of platinum values in British Columbia. In the event of the mineral being found, energetic work in its recovery is to be inaugurated by the owner without delay. It is not expected that the government will demand a monetary return for the development of privately held property believed to contain platinum, because of the need of this mineral for munition purposes and the consequent necessity of giving the miners every possible encouragement to produce it.

The Mining News

ARIZONA

Cochise County

COPPER QUEEN (Bisbee)—New Cochise shaft down nearly 1500 ft., but has cut no ore and little water.

DENN-ARIZONA (Bisbee)—Mining on 1400 and 1500 levels and on 1600 level, where sulphides have been cut.

KEYSTONE (Johnson)—Installing new machinery.

PEABODY (Johnson)—New machinery installed.

CALUMET & ARIZONA (Warren)—Smeltery production during June amounted to 7,250,000 lb. of copper, of which 4,232,000 lb. was available for Calumet & Arizona.

Maricopa County

EYRICH (Phoenix)—Cut station on 300 level and drifting on vein of quartz hematite carrying gold.

DRAGON (Wickenburg)—Machinery has been received and is to be be erected at once.

Mohave County

GOLD ROAD (Goldroad)—New 300-ton crushing plant in operation.

ALCYONE (Kingman)—Shaft down over 200 ft. in rock.

GEORGE WASHINGTON (Kingman)—Mill to be put into operation soon.

HACKBERRY (Kingman)—Machinery installed.

RED LION (Kingman)—Shaft down 125 ft. and has cut oxidized vein matter and quartz.

WALNUT CREEK (Kingman)—Tunnel now driven over 300 feet.

MOHAWK CENTRAL (Oatman)—Diamond drilling completed.

TOM REED (Oatman)—Aztec shaft now 150 ft. below 525 level and will be sunk 30 ft. further for a sump and ore pocket. Drifting east on Bald Eagle vein.

Pima County

BLACK BOSS (Ajo)—Property sold and renamed Submarine to be opened soon.

BULLION BAR (Ajo) Has installed machinery. Operations to begin at once.

NEW CORNELIA (Ajo)—June production was 4,212,000 lb. of copper. Excavation started for experimental mill.

Pinal County

KELVIN SULTANA (Kelvin)—Has leased large tract of land on Gila River to Arizona Hercules Copper Company.

RAY KELVIN (Kelvin)—In addition to development work on its own ground, company is prospecting the Last Chance or Nieman-Elder group north of Kelvin.

TROY ARIZONA (Kelvin)—Operations to be resumed soon under direction of J. C. Devine.

U. S. VANADIUM (Kelvin)—Five new Wilfley tables installed in mill operated under lease by the Allied Metals Corpn., of Denver.

FORTUNA CONSOLIDATED (Superior) Diamond drilling.

QUEEN CREEK (Superior)—Shaft now down 720 ft.

Santa Cruz County

ARIZONA CONSOLIDATED (Nogales)—To sink 500 ft. shaft on El Paso group near old Mowry mine.

HARDSHELL (Patagonia) — Mill in operation and handling about 100 tons daily. Drill being used to prospect property.

Yuma County

MOLEIN-ARIZONA (Yuma) — Sinking two-compartment shaft. Compressor installed.

Yavapai County

BIG LEDGE (Huron)—Good progress made in drifting at Henrietta mine, with good ore showing on 300 level and lower grade on 450 level..

BLACK DIAMOND (Walker)—To build concentration and flotation mill. J. Irwin, Prescott, is superintendent.

ARKANSAS

Independence County

BLUE RIDGE (Cushman)—To develop and equip with washing plants.

HOLY SMOKE (Cushman) — Shipping first car of manganese ore this week.

LUCKY DEVIL (Cushman)—Under operation by J. C. Shepherd and associates and producing 100 tons chunk manganese per week. Development proving up large body of medium-grade manganese ore.

PAGE (Cushman)—Operated by Stanley Hanford. Making heavy tonnage high-grade ore. Development proving up good body of ore.

CALIFORNIA

Plumas County

DIVING APPARATUS is again being used in placer mining on the middle fork of Feather River. The divers send up the gravel, which is washed on the surface.

ENGELS COPPER (Engelmine)—Flotation plant operating regularly. Recent contract for construction of 70 new houses of late designs and modern equipment has been let.

Shasta County

BULLY HILL (Winthrop)—Flotation plant nearing completion and expected to be in operation by end of the summer. Old smeltery building used for housing the machinery. Large tonnage high-grade copper ore shipped daily to Mammoth smeltery at Kennett. High-grade ore disclosed at 1000-ft. depth in Anchor claim.

Siskiyou County

GROUSE SPRINGS (Hazel)—Shaft has cut high-grade ore at 18 ft.

Trinity County

PACIFIC DREDGE (Carrville)—To be closed down. Heavy gravel and boulders encountered.

ESTABROOK DREDGE (Trinity Center)—To haul 1200 tons machinery to be used in dredge construction from Delta station by trucks.

COLORADO

Boulder County

COMMONWEALTH (Boulder)—Secured control of Big Six, St. Elmo, and McKenzie properties in the Nederland district. Recent development at Big Six opened several promising shoots of tungsten ore. New mining equipment installed at St. Elmo and developing in progress. McKenzie tunnel to be advanced 500 ft. Construction of new mill contemplated. M. De Champlaign is manager.

YELLOW PINE (Boulder)—Ground below sixth level being developed under lease by Pherson & Saunders. A 300-foot winze is being unwatered and drifts are to be driven on lower levels. Trial shipments have been made.

BELCHER (Cardinal)—Being developed under lease by Todd, Dunston & Swearingen. Machine drills installed and air piped from Caribou mine.

CONGER CHIEF (Cardinal)—New compressor plant being installed, and working force to be increased.

Clear Creek County

CHARTER OAK (Idaho Springs)—To be developed under W. H. Maxton. Shaft cleaned out and retimbered.

Lake County

DOLD (Leadville)—To install machinery at Newell shaft and mine manganese ore. New compressor, drills and hoist have been purchased.

Saguache County

EAGLE (Bonanza)—Shaft being unwatered. To be reopened and developed under D. C. Kelso. Considerable milling ore available.

KAPI (Bonanza)—During June advanced Maybelle Tunnel 89 ft. to total distance of 982 ft. from portal.

San Juan County

EARLY BIRD (Animas Forks)—Development work progressing under the management of C. B. Blitzke.

HIGHLAND MARY (Howardsville)—Being developed and operated by J. H. Slattery. Mill in operation under superintendence of Louis Bastian.

ST. PAUL (Red Mountain)—Copper ore blocked out. Louis Shaffer and Edward Green are operators.

SUMMIT COPPER (Red Mountain)—Raising from Koehler tunnel to connect with lower level of Carbon Lake shaft. John Kennedy, of Ouray, is manager.

BUFFALO BOY (Silverton)—Being unwatered preparatory to resumption of development. Edward Haas is superintendent.

CALADONIAN MINING (Silverton)—To take over properties formerly known as Peerless-San Juan group. Mine and mill have been placed in operating condition. Charles McMillan is superintendent of the mill and D. W. Fleming is general manager.

COMING WONDER (Silverton)—Silver-lead ore shipments made from development by William Palmquist and associates.

MAYFLOWER (Silverton)—Being developed by J. H. Slattery and associates under lease. New compressor plant installed and trial shipments made to Durango smeltery. Alex Gillis is superintendent.

MEARS-WILFLEY (Silverton) — Mill, which treats tailing from Silver Lake Basin, being overhauled to operate soon.

SAILOR BOY (Silverton)—To be reopened under lease by Ed Lewis and W. A. Triplett soon. Trial shipments have been made to Durango smeltery.

UNITED STATES (Silverton) — Now free from litigation, and to be reopened and developed by E. C. Condit.

San Miguel County

SHIPMENTS FROM TELLURIDE during June were: Tomboy, 13 cars to Durango and 32 cars to Leadville; Smuggler-Union and Black Bear, 6 to Durango and 43 to Pueblo; total, 94 cars of concentrate. This is 30 cars less than for the same month last year, but does not represent a reduction in the output, which is actually larger than ever before in the history of the camp. Reduction in concentrate is due to the fact that the Liberty Bell Gold Mining Co. is reducing everything to bullion and is shipping by express.

ALTA (Ophir)—New air compressor and other equipment to be installed soon. Building recently destroyed by fire to be rebuilt.

SUFFOLK (Ophir)—Mill in operation and treating ore from the Suffolk and Favorite mines. James Real is manager.

Summit County

CLIMAX MOLYBDENUM (Climax)—To increase present 500-ton mill to 1000 tons. To install Otis elevator in shaft.

KANSAS

Joplin District

C. M. MITCHELL (Baxter Springs)—To build 200-ton mill and to purchase sludge and slime cables, boilers, crushers, and compressor. Buck Shelton is superintendent.

C. E. PHILLIPS (Baxter Springs)—To build 150-ton mill and to purchase sludge and slime tables, ore cars, drills, engine and boiler.

O. C. HAMILTON (Galena)—To build 200-ton mill. Requires crushers, ore cars, sludge and slime tables and compressors.

LUCKY JIM (Galena)—To remodel 200-ton mill and will purchase sludge and slime tables, crushers, compressors and drills. O. C. Hamilton is superintendent.

MIAMI-TEXAS (Treece) — Purchased mill in Webb City camp, and will move to lease northwest of Treece about Aug. 1. W. N. Walling, Bowie, Tex., is president.

PHOENIX (Treece)—To remodel 200-ton mill.

CRESCENT (Waco, Mo.)—Building 250-ton mill on lease southwest of Waco. Oil engines to be used for power. Lawrence E. Smith, of Kansas City, is president.

IDAHO

Shoshone County

SHERMAN DEVELOPMENT (Burke)—To repair old tunnel at Union mine and extend same to cut oreshoot.

NATIONAL COPPER (Mullan)—Has added to force. To sink winze from 1500 level to determine orebody.

MICHIGAN

Copper District

FEDERAL (Calumet)— Hauling 12-ton boiler to property, preparatory to sinking shaft in the pit, now 50 ft. deep.

MOHAWK (Gay)—A 100-ft. shaft is being sunk at mill. Drift will be driven to secure water supply from Lake Superior for the stamp mill. Present supply of water from Tobacco River inadequate.

AHMEEK (Kearsarge)—Fire broke out in crosscut on 1200 level July 15. No. 3 and No. 4 shafts have been sealed.

MINNESOTA

Cuyuna Range

CUYUNA DULUTH (Ironton)—To lower working level 80 ft. Shipping stockpile from Mille Lacs mine, and steam shovel will later be moved to Cuyuna-Duluth property.

Mesabi Range

CARSON LAKE (Hibbing)—Shaft sunk by Oliver Iron Mining Co. has reached solid ground after a year's work through quicksand at depth of 140 ft. Work to be rushed to 200 level, where station will be cut and pumps installed. Shaft to be concreted.

PILOT (Mountain Iron)—One steam shovel stripping overburden; ore to be mined by milling process. Operated by M. A. Hanna Co.

WACOOTAH (Mountain Iron) — One shovel stripping, but no ore this season.

COLUMBIA (Virginia)—Officially reported that no work will be done this year.

MISSOURI

Joplin District

FRANK STARKWEATHER (Duenweg)—To rebuild 150-ton mill burned down on June 27. To purchase sludge and slime tables, drills, boilers and ore cars. Frank Starkweather, of Webb City, is superintendent.

VACATION (Duenweg)—To build 200-ton mill and will purchase sludge and slime tables, ore cars, compressors and crushers.

STARK CITY (Stark City)—New 200-ton mill completed.

GEORGE BALL (Waco)—To build 150-ton mill and will purchase sludge and slime tables, crushers, jigs, compressors and conveyors.

MONTANA

Jefferson County

AMALGAMATED SILVER MINES (Clancy)—Silver ore coming from 250-ft. shaft to be shipped.

LEGAL TENDER (Clancy)—Silver property taken over by new corporation and will be operated.

Silver Bow County

BOSTON AND MONTANA (Butte)—Drifting on Elkhorn vein has cut ore on foot and hanging wall. Expect to cut Park vein soon.

NEVADA

Clark County

GOODSPRINGS DISTRICT shipments of zinc and lead ores and concentrates are decreasing. Yellow Pine Mining Co. is largest producer. Others shipping are Arentz & Perkins, lessees; Goodsprings Anchor Co., Boss Gold Mining Co., Bullion Mining Co., Goodsprings Mining Co., and various lessees.

Esmeralda County

ATLANTA (Goldfield)—Principal development work on 1900 level.

GOLDFIELD CONSOLIDATED (Goldfield)—Milling plant treating oxidized ores and tailings. Position of wire-rope excavator to be changed to reach another section of tailings pond. Some gold-copper ore being treated by flotation.

KEWANAS (Goldfield)—Good assays obtained from crosscut on 840 level. Development work progressing satisfactorily.

RED HILL FLORENCE (Goldfield)—Regular shipments of good-grade ore being made to Western Ore Purchasing Co., at Hazen.

SILVER PICK (Goldfield)—Good ore opened at depth of 640 feet.

Lyon County

NEVADA DOUGLAS (Ludwig)—Regular shipments good-grade copper ore being made to Mason Valley Co. smeltery at Thompson. Leaching plant operations discontinued.

BLUESTONE MINING AND SMELTING (Yerington)—Recently sold by J. R. DeLamar to Dominion Reduction Co., of Canada. Flotation plant now treating 400 tons daily of low-grade sulphide ore. Capacity to be increased. Large shipments ore made to Thompson smeltery.

YERINGTON CONSOLIDATED (Yerington)—Development work being done. Property lies between Mason Valley mine and Bluestone mine.

Mineral County

RICH SILVER STRIKE made recently four miles west of Mina. Oreshoot is in quartz vein, several feet wide, and carries a large quantity of silver chloride and some galena.

CINNABAR DISCOVERY made recently in Pilot Range east of Mina. Group of 14 claims sold recently to Tonopah men and development work will begin at once.

BELLEVILLE TAILINGS (Belleville)—Tailings dumps of old mills have been retreated at a good profit, and leaching plant now closed down.

NEVADA GOLD MINES (Luning)—Development work on Carbonate group west of Kinkaid station progressing with satisfactory results. Large tonnage of lead-silver ore carrying gold being opened. Larger hoist to be installed and shaft sunk to greater depth. James Houghton is superintendent.

Nye County

NEVADA CINNABAR (Ione)—Leased by L. L. Legg and Fred L. Davis who have begun work. Furnace fired up, and to be worked continuously.

MANHATTAN CONSOLIDATED (Manhattan)—Water troubles on fifth level necessitated putting crew at work on upper levels.

UNION AMALGAMATED (Manhattan)—To cut station and drift upon completion of shaft.

WHITE CAPS (Manhattan)—A new stope has been started from second level in hanging wall of orebody which shows good ore. W. L. Taylor is superintendent.

NORTH STAR (Tonopah)—Development work progressing satisfactorily. Ore found along fault line on 850 level.

TONOPAH EXTENSION (Tonopah)—Development work adding steadily to ore reserves.

WEST END CONSOLIDATION (Tonopah)—Development work being done on Ohio oreshoot.

OKLAHOMA

Joplin District

PRAIRIE (Commerce)—Operations have again been started after sinking shaft to water.

MAURICE (Douthat)—To build 300-ton concentration plant. To purchase sludge and slime tables, crushers, boilers and compressors.

MAXINE (Picher) — Completed power plant and to start erection 500-ton mill soon.

OTTAWA METAL (Picher)—To build 175-ton mill. Expect to purchase engine, jigs, boilers, crushers, compressors and ore cars.

PICHER LEAD (Picher)—To begin construction of 200-ton mill soon. Expect to purchase sludge and slime tables, ore cars engine, drills and compressors. George Potter is superintendent

RED GRANITE (Spavinaw)—To build mill at estimated cost of $25,000. To purchase crushers, engine, boilers and ore cars. W. E. Hudson, Tulsa, is superintendent.

COSMOS (St. Louis, Okla.)—To erect 300-ton mill. Property formerly known as Lucky Tiger.

UTAH

Beaver County

BEAVER COPPER (Milford)—Winze being sunk below 200 level to follow copper ore.

Box Elder County

OGDEN PORTLAND CEMENT (Brigham City)—To recover potash contained in cement dust. Cotrell apparatus probably to be installed.

Juab County

TINTIC DRAIN TUNNEL (Eureka)—Tunnel in over 7000 ft.

Piute County

CHAMBERLAIN POTASH (Marysvale)—Mill treating alunite ore from Florence and White Hills.

DEER TRAIL (Marysvale)—Mill operating and producing concentrates. New orebodies of direct shipping grade opened in deeper parts of mine.

FLORENCE (Marysvale)—New mill to treat alunite and produce potassium sulphate expected to begin operation about Sept. 1.

Salt Lake County

OHIO COPPER (Bingham)—First two units of new flotation mill treating 1200 tons daily and making 74% recovery. Third unit in operation, but not yet running with complete smoothness.

WOODLAWN (Salt Lake)—Big Cottonwood property has nearly completed tunnel. Stringers of copper showing at 865 feet.

Summit County

PARK CITY SHIPMENTS for week ended July 6 amounted to 1644 tons, of an approximate value of $85,000. Shippers were Judge Mining and Smelting, Silver King Coalition, and Daly West.

IOWA COPPER (Park City)—Water in shaft eliminated and drifting resumed.

NAILDRIVER (Park City)—Vein opened on 900 level being prospected by drift on 700 level. Crosscut being driven on 600 level for same vein.

ONTARIO (Park City)—Not to drift on 2000 level but to follow ore downward, and later possibly connect with shaft. Pumping equipment taking care of water on lower levels.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—To build 100-ton mill to treat copper ore from Calaveras group owned by company. Mill to be at Salt Springs.

WOODMAN (Gold Hill)—Frankie mine has cut copper ore in raise from main tunnel. Same vein expected within short distance below tunnel.

CANADA

British Columbia

BRITANNIA (Britannia Beach)—Mill handling about 2300 tons per day. Has opened Mammoth Bluff as a quarry.

MONITOR (Three Forks)—Ore on dump awaiting shipment.

SUNLOCH (Vancouver)—Building spur from property to tramway at Jordon River, and will ship ore to Tacoma smeltery.

CORK-PROVINCE (Kaslo) — Operating mill and two shifts of miners.

ROCHER DE BOULE (Tramville)—Vein of high-grade ore cut in raise 160 ft. above main level. Mill is to be built to treat lower-grade ores.

Ontario

TECK HUGHES (Cobalt)—To close property until conditions become normal.

LAKE SHORE (Kirkland Lake)—Mill operated 96% of running time during May.

SAVAGE (Cobalt)—To be reopened.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—Produced in June 3,505,315 lb. copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—June cleanings $144,000.

The Market Report

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling Exchange	Silver New York, Cents	Silver London, Pence
18	4.7530	99⅛	48 11/16	22	4.7530	99⅛	48 11/16
19	4.7530	99⅛	48 11/16	23	4.7530	99⅛	48 11/16
20	4.7530	99⅛	48 11/16	24	4.7530	99⅛	48 11/16

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

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
18	*26	†	8.05	7.75	8.35 @8.40
19	*26	†	8.05	7.75	8.35 @8.40
20	*26	†	8.05	7.75	8.35 @8.40
22	*26	†	8.05	7.75	8.25 @8.35
23	*26	†	8.05	7.75	8.22½ @8.27½
24	*26	†	8.05	7.75	8.22½ @8.27½

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

† No market.

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

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

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

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

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
18	122	122	137	368	368	29½	54
19	122	122	137	368	368	29½	54
20	...	...	...	...	...	...	...
22	122	122	137	373	373	29½	54
23	122	122	137	377½	377½	29½	54
24	122	122	137	380	380	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—July 24, 1918

None of the markets exhibited any features of particular interest this week.

Copper—There is nothing special to report. Producers are talking about the forthcoming meeting in Washington and the prospects of an advance to 27½c. Consumers report inability to keep their plants in operation at full capacity, owing to shortage of labor. Some large consumers are able to operate only at the rate of 75 per cent.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots.

Tin—Business is very light. There is no stock of spot tin available in this market. Banka tin for shipment from Batavia is worth 93c.; and in San Francisco 96c. would be asked, and in New York, $1. Straits tin was quoted from Singapore on the 18th and 19th at £363, c.i.f., London; on the 22d at £369; on the 23d at £373; and on the 25th at £377.

Lead—There continued to be a large inquiry, which producers were unable to supply. Japan still wanted to buy lead.

Zinc—The market was very dull, with offers at lower figures in the latter part of the week.

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

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—There were some transactions at 13½c., but, speaking generally, the market was dead. We quote spot at 13½ c., and futures at 11½@12c., 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 $1.50@1.75 per pound.

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

Quicksilver—Quiet at $125@127½. San Francisco reports, by telegraph, $117, firm.

Gold, Silver and Platinum

Gold—During the last fiscal year, it is reported from Washington, imports of gold into the United States showed a great decrease, compared with the previous year. For the last fiscal year gold imports amounted to $124,000,000; for the previous year they totaled $977,000,000. Gold exports for the last fiscal year amounted to $191,000,000, against $292,000,000 in 1917. In 1918 silver imports amounted to $70,000,000, against $35,000,000 in 1917, and silver exports increased from $78,000,000 in 1917 to $139,000,000 in 1918.

Silver—Market situation remains unchanged, with quotations stabilized at 48 11/16d. in London and 99⅛c. in New York.

China banks are still buyers, owing to rise in Chinese exchange rate, but find it difficult to obtain supplies in competition with government buying by the U. S. and England. There seems to be a question whether silver will be allowed to be exported if purchased at a price in excess of the Government price.

Mexican dollars at New York: July 18, 77; July 19, 77; July 20, 77; July 22, 77; July 23, 77; July 24, 77.

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

Zinc and Lead Ore Markets

Joplin, Mo., July 20—Blende, per ton, high, $77.10; basis 60% zinc, premium, $75; Class B, $60@65; prime western, $52.50@47.50; calamine, basis 40% zinc, $37.50@25. Average selling prices: Blende, $54.47; calamine, $34.38; all ores, $53.46 per ton.

Lead, high, $103.50; basis 80% Pb, $100; average selling price, all grades of lead, $98.10 per ton.

Shipments the week: Blende, 9685; calamine, 509; lead, 1365 tons. Value, all ores the week, $678,950.

Very weak buying, with a cut of $2.50 per ton in blende prices, marked the trading at the beginning of the week, but heavy buying orders on Thursday strengthened the market at the week end. Buying of premium blende has been slack for three weeks. There are indications of a possible rupture in the new system of grading and allocating sales. Producers of zinc ore having no lead object to the ruling that they must put 0.5% to 1% lead into all ore not taken by buyers at premium prices, and claim they can obtain a better average all around price selling on Class B basis. This much lead would put the blende with lead in the prime western class. Buyers of the Class B grade require 0.3% or less of lead. One objection of producers of no-lead blende is that in adding lead it holds on the jigs and affects subsequent sales with an overburden of lead. Another is that with a production of 160 tons, and an allotment of 40% premium, the sale of 64 tons at $75 brings $4800 and 96 tons at $50 brings another $4800, a total of $9600, though the whole lot can be sold as Class B at $65, or a total of $10,400, a net loss of $800, if sold by allotment, or $5 per ton, against the sale of the entire lot as Class B blende.

Platteville, Wis., July 20—Blende, basis 60% zinc, highest price reported paid for premium grade was $74 per ton, and quotations ranged down to $52.50 per ton base. For high-lead blende, one car blende, sold the week previous but settled for this week, brought $75.40, which is the highest price paid here since the Government schedule of price became effective. Lead ore, basis 80% lead, $90 per ton base. Shipments reported for the week were 2115 tons blende, 349 tons galena, and 653 tons sulphur ore; for the year to date the figures are 72.740 tons blende, 4200 tons galena, and 28.826 tons sulphur ore. During the week 2626 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Ore of 40% grade quoted at $1.40 per unit, f.o.b., California, with other grades at the usual differential.

Manganese Ore—Unchanged.

Molybdenum Ore—Sales of high-grade molybdenite reported at about $1 per lb. of molybdenum sulphide in ore containing 90% or over.

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 pyrites is selling at prices ranging from 20 to 25c. per unit, f.o.b. mine, according to delivery basis.

Tungsten Ore—The market was active, with prices ranging from $18.50 to $23.50 per unit. High-grade ores almost free from impurities are quoted at from $22.50 to $23.50 per unit; low-grade ores containing impurities are quoted at $18.50 to $20 on the basis of 60% or over.

Charles Hardy under date of July 23 reports the following:

"The demand for high-grade tungsten is exceeding the supply at the present moment. As a matter of fact, wolframite free from impurities is not to be had in the New York market. Buyers have been compelled reluctantly to take material which contained up to 1% of tin and pay for it $22.50 per unit, material that was formerly never bought by these concerns. Material free from all impurities would probably command readily $24 and even slightly above. On the other hand, there is quite a quantity of tungsten ore available, running high in tin and copper, and the market for this off-grade tungsten has not undergone a change. The scheelite position remains strong. Some of the Western producers are fully sold for the remainder of the year. Others are holding for price of $24.50 at the mine, which in these days of high freights, long duration of journey and consequent loss of interest is equal to $25.50 a unit delivered mill in the East."

Iron Trade Review

PITTSBURGH—July 23

The War Industries Board has announced that the steel requirements for the present half year are 20,000,000 to 21,000,000 net tons, though the industry has never produced more than 16,500,000 net tons in a half year. The estimate of requirements includes the various Government orders and the steel needed to supply the commercial industries that are recognized as helpful, being included in the preference list. Information is lacking as to how the latter items were made up, as the Government does not buy material for agricultural implement works, public utilities and like uses. A question is raised whether the various Government departments have not overstated their own requirements, not as to the total tonnage but as to the amount they will actually be able to utilize by the end of the year. In the steel trade there is a suspicion that some of the estimates are too high. Attention is also called to the fact that the 16,500,000 net tons mentioned as maximum production does not conform with official statistics showing 30,557,818 gross tons, or 34,200,000 net tons, though with steel ingot production at 43,500,000 gross tons a year, during June the rate of finished steel production would make about 36,000,000 net tons a year.

Steel supplies are not reaching clear through the preference list, and there is practically nothing left over in any line to constitute Class D material, which may be shipped, under permit, for purposes not on the preference list. Though the fact that the Government is not taking large tonnages of some descriptions of finished product would suggest that there ought to be a surplus in these lines, the fact is that they have had their steel supply cut down, in the interest of the manufacture of shell steel, plates, and similar requirements. The plate mills are running full, producing half a million net tons a month, and shell steel is being produced in about the same proportion. The tin-plate mills are making new production records. Rod, sheet and merchant bar mills are operating at an average of about 60% of capacity.

The Institute announces a revision of its report of ingot production in June, one of the companies reporting having originally understated its output by 46,516 tons. With the correction, it appears that the rate of ingot production in June was 43,500,000 gross tons a year. Since the low production of January, each month has recorded a successive improvement, and hopes are entertained that when the hot weather is over still heavier outputs will be secured. The chief difficulty is shortage of scrap and poor quality of what is available. There is an ample supply of pig iron to operate the steel works, if at the same time they had their normal supply of scrap, but somewhat more pig iron could be used in the circumstances. Blast furnaces are not operating at capacity, estimated on the basis of 1916 production with allowance of new furnaces since built, but perhaps output is restricted by absence of the large quantities of scrap that were used in the blast furnaces in 1916. Coke supplies are believed to be sufficient, and the coke situation is constantly improving with the completion of additional byproduct ovens.

Pig Iron—There is a little talk of buying for 1919, but buying does not count for anything, as deliveries are regulated by the War Industries Board, irrespective of purchases. For prompt delivery there is no activity. Furnaces are overshipping on some contracts and shipping nothing on others. The market is practically nominal, but is quotable at the set limits: Bessemer, $35.20; basic, $32; foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40, and somewhat less from six detached furnaces near by.

Steel—Shell-discard steel shipments are to be subject to permit, but the War Industries Board intimates it will be fairly liberal. Small lots are being sold to consumers whose operations are represented in the preference list. Sheet bars are now allocated according to a definite system intended to produce uniform operations at the different sheet mills, the tin-plate mills having first been given an absolutely full supply. Hardly any billets are moving. Prices remain at the Government limits, $47.50 for billets, $51 for sheet bars and small billets, $50 for slabs and $57 for rods.

Ferroalloys—The market is quiet, with most consumers fairly well stocked. Prices remain at $250 for 70% ferromanganese, delivered, with $4 a unit for extra manganese, and at $75 for 16-18% spiegeleisen, f.o.b. furnace.

Coke—The Clairton byproduct plant is producing more coke, but the whole 640 ovens of the first batch may not be operating full until late in the year. The American Steel and Wire Co.'s new 180-oven plant at Cleveland is now running practically full, and the 208-oven plant at Lorain of the National Tube Co. is warming up. Connellsville coke production is increasing a trifle. Government prices on Connellsville coke remain at $6 for furnace, $7 for foundry, $7.30 for crushed over ¾-in., $5 for crushed under ¾-in., and $3 for breeze.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	.....	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	23.500	130.000	110.000	142.000	125.000
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	(a)	242.083	331.925
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	6.742	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	.....	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	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	.....	8.473	.....	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	36.26	50.05	33.16	50.14	34.16
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.

STOCK QUOTATIONS

N. Y. EXCH.† July 23	
Alaska Gold M.	3⅛
Alaska Juneau	2
Am.Sm.& Ref.,com.	76⅛
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf., A	87
Am. Zinc	18½
Am. Zinc, pf.	50½
Anaconda	65
Batopilas Min	1½
Bethlehem Steel	‡81
Bethlehem Steel, pf.	‡88½
Butte & Superior	29½
Butte Cop. & Zinc	11½
Cerro de Pasco	34⅛
Chile Cop.	16⅛
Chino	39½
Colo.Fuel & Iron	44⅛
Crucible Steel	65⅛
Crucible Steel, pf.	90⅛
Dome Mines	8
Federal M. & S.	10½
Federal M. & S., pf.	33
Great Nor., ore ctf.	31½
Greene Cananea	43
Gulf States Steel	83½
Homestake	71
Inspiration Con.	52½
InternationalNickel	30⅛
Kennecott	33⅛
Lackawanna Steel	82⅛
Mexican Petrol.	98
Miami Copper	29⅛
Nat'l Lead, com.	58⅛
National Lead, pf.	101
Nev. Consol.	19⅛
Ontario Min	10⅛
Ray Con	23⅛
RepublicI.&S.,com.	90⅛
Republic I. & S., pf.	101
Sloss-Sheffield	61
Tennessee C. & C.	19
U. S. Steel, com.	104⅛
U. S. Steel, pf.	111⅛
Utah Copper	80⅛
Va. Iron C. & C.	70

BOSTON CURB* July 23	
Alaska Mines Corp.	.12
Boston Ely	.75
Boston & Mont.	.52
Butte & Lon'n Dev.	.15
Calaveras	.50
Calumet-Corbin	‡.01
Chief Con.	2½
Cortez	.05
Crown Reserve	.15
Crystal Cop.	.22
Eagle & Blue Bell	2¼
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	.19
Mexican Metals	.45
Mines of America	1⅛
Mojave Tungsten	.09
Nat. Zinc & Lead	.15
Nevada-Douglas	.50
New Baltic	.90
New Cornelia	18½
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.07
Yukon Gold	.90

TORONTO* July 19	
Adanac	‡.08½
Bailey	‡.03
Beaver Con.	.23
Chambers Ferland	‡.12
Coniagas	2.75
Hargraves	.04
La Rose	‡.35
Peterson Lake	‡.09½
Temiskaming	‡.30½
Wettlaufer-Lor.	‡.04
Davidson	‡.35
Dome Exten.	.09
Dome Lake	‡.14
Hollinger	‡4.60
McIntyre	1.31
Newray	‡.15
Porcu. Crown	.13
Teck-Hughes	.13
Vipond	.12
West Dome	.08

BOSTON EXCH.* July 23	
Adventure	‡.50
Ahmeek	76½
Algomah	‡.15
Allouez	50½
Ariz. Com., ctfs.	14½
Arnold	‡.20
Bingham Mines	19½
Bonanza	‡.15
Butte-Balaklava	‡.25
Calumet & Ariz.	‡68
Calumet & Hecla	460
Centennial	‡12½
Copper Range	‡48
Daly West	‡1½
Davis-Daly	6½
East Butte	9½
Franklin	‡4½
Granby	‡75
Hancock	6
Hedley	‡12
Helvetia	‡.15
Indiana	.40
Isle Royale	27
Keweenaw	1½
Lake	‡5½
La Salle	‡2½
Mason Valley	‡3⅜
Mass	5½
Mayflower	2½
Michigan	2½
Mohawk	58
New Arcadian	1½
New Idria	‡14
North Butte	14⅛
North Lake	‡.65
Ojibway	‡.60
Old Dominion	‡42
Osceola	51½
Quincy	‡69
St. Mary's M. L.	‡50
Santa Fe	‡.65
Seneca	‡10½
Shannon	‡4⅜
Shattuck-Ariz.	‡15½
So. Lake	‡1½
So. Utah	.18
Superior	‡4½
Superior & Bost.	‡2⅛
Trinity	‡3½
Tuolumne	‡1⅛
U. S. Smelting	42½
U. S. Smelt'g, pf.	44
Utah Apex	2⅛
Utah Con.	19½
Utah Metal	2
Victoria	‡2½
Winona	‡1½
Wolverine	‡28
Wyandot	‡.50

SAN FRAN.* July 22	
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	‡.03
Challenge Con.	.03
Confidence	.04
Con. Virginia	.31
Gould & Curry	.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.07
Mexican	.24
Occidental	‡.51
Ophir	.11
Overman	.02
Savage	.03
Sierra Nevada	.09
Union Con.	.39
Utah Con.	.01
Belmont	2.75
Jim Butler	.58
MacNamara	.32
Midway	.04
Mont.-Tonopah	.10
North Star	.06
Rescue Eula	.08
West End Con.	1.05
Atlanta	.05
Booth	.03
Comb. Frac.	‡.02
Florence	.12
Jumbo Extension	.12
Kewanas	.04
Nevada Hills	.01
Nevada Packard	.27
Round Mountain	‡.18
Silver Pick	.03
White Caps	.31
Big Jim	‡.75
United Eastern	3.00

N. Y. CURB July 23	
Big Ledge	1½
Butte & N. Y.	‡.75
Butte Detroit	.11
Caledonia	.48
Calumet & Jerome	1½
Can. Cop. Corpn.	1½
Carlisle	‡2
Cashboy	.03
Con. Ariz. Sm.	1½
Con. Coppermines	‡5½
Con. Nev.-Utah	‡⅛
Emma Con.	.20
First Nat. Cop.	2
Goldfield Con.	.28
Goldfield Merger	.04
Greenmonster	‡⅛
Hecla Min.	4½
Howe Sound	‡4½
Jerome Verde	‡.50
Kerr Lake	5½
Louisiana	‡.50
Magma	‡32
Majestic	.20
Marsh	‡.05
McKinley-Dar-Sa.	.40
Milford	‡.75
Mohican	.06
Mother Lode	.37
N. Y. & Hond.	‡12½
Nipissing Mines	‡8.65
Nixon Nevada	.45
Ohio Cop.	1½
Rawley	‡2½
Ray Hercules	4¼
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead	14½
Standard S. L.	‡
Stewart	.17
Success	‡.10
Tonopah	2½
Tonopah Ex.	1⅞
Tribullion	2⅞
Troy Arizona	.15
United Cop.	‡⅛
United Verde Ext.	35¼
United Zinc	‡1½
Utica Mines	‡.08

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