

The Engineering and Mining Journal

VOL. LXXXIII.

NEW YORK, FEBRUARY 23, 1907.

NO. 8.

MINING ON THE KIRGHESE STEPPES

Conditions in Southern Siberia—Ancient and Modern Workings—Extensive Deposits

BY H. E. WEST*

There is today a country of vast proportions, in area roughly comparable to the United States, or about 4¾ million square miles, where there are stores of treasure of all kinds as yet practically untouched. This country is known to contain great mineral wealth. It comprises almost a half of that continent that was the cradle of the world and fashioned its

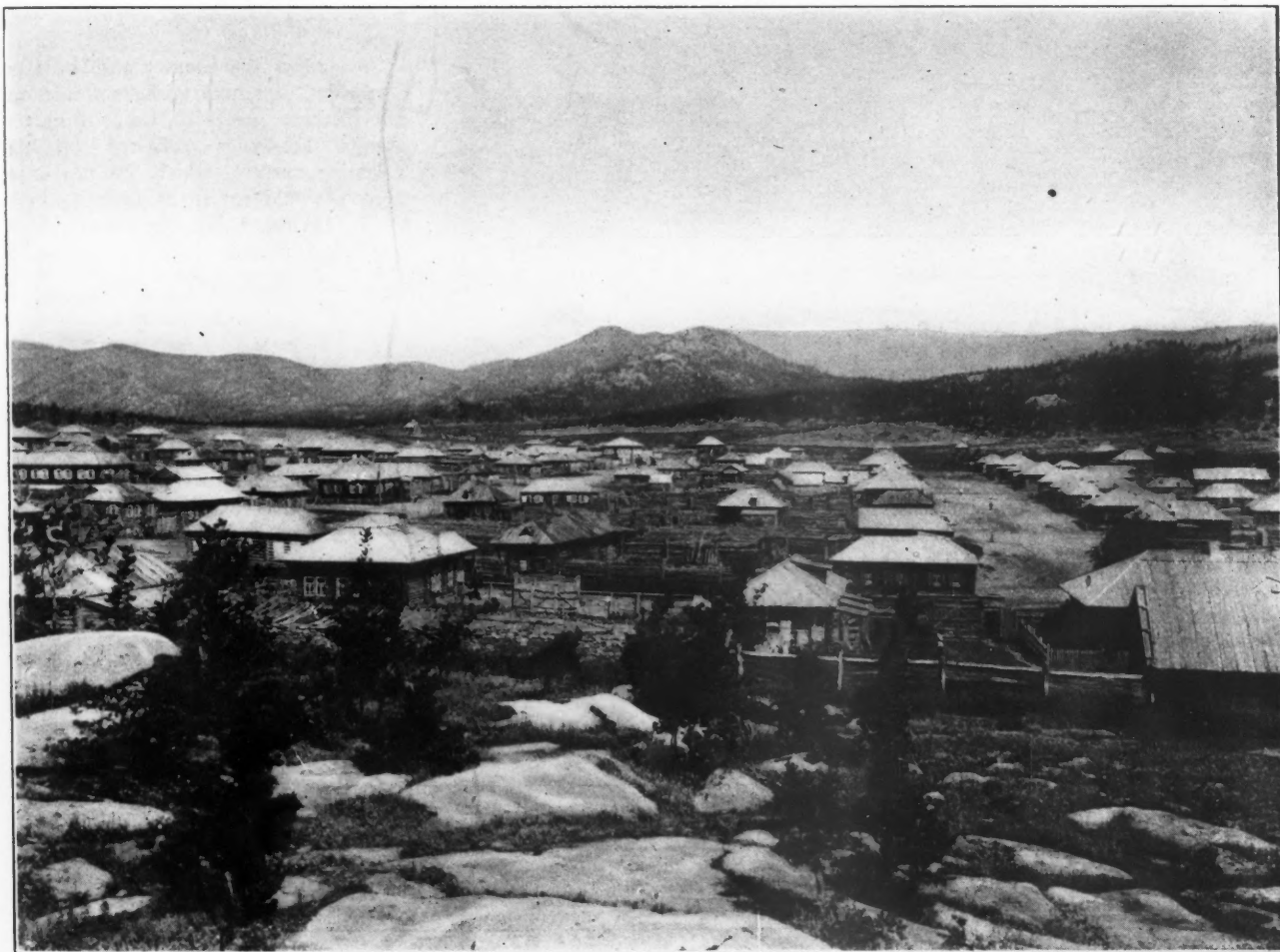
entirely in flat country. Near the railroad there is considerable land under cultivation, but away to the south, beyond the timber patches and the more fertile lands, the country is still for the most part destitute of any growing thing save bunchgrass and the small sage-bush, the habitat of the prairie dog and the great bustard.

All this country is included in the

distant. The Cossack is a Russian who is not of the serf class and who has settled on lands given him by the government.

CROSSING THE STEPPES

It was my fortune some months ago to undertake a trip "away down south" in this Kirghese country; farther than any Cossack village, farther even than the



COSSACK VILLAGE IN THE TIMBER COUNTRY

most ancient civilization. I refer to that dominion of the Tsar in Asia, "Siberia."

The Siberian railroad from Moscow to Omsk is, with the exception of one day through the Ural mountains, where the greatest altitude attained is about 3000 ft.,

*Mining engineer, Spassky Zavod, Akmo-linsk, Siberia.

Kirghese steppes, since it is inhabited by numerous tribes of this nomadic and interesting people. The Russian element, represented by the Cossacks, dwells entirely in the small towns and villages on the communal system. They are prohibited from living on their farms by law, although the farms may be many versts

last Kirghese zamofka, or winter-quarters. Foreigners who travel in these parts are rare. Indeed, the whole of this section is included in what is spoken of as "the forbidden country," for there are political reasons why this section should not become too popular with foreigners. The countries immediately south include the

buffer states of Beloochistan and Afghanistan, with the Mongolian empire to the east and Persia to the west.

Leaving Petropavlovsk at midnight in "korabok" and "troika," the journey south began. The korabok is constructed on the principle of the buck-board, with a wicker basket large enough for two persons to recline at full

the care of strange drivers and horses at almost every stage, we had no serious accident.

In 36 hours we were at Atbasar, the principal town of that district, a distance of 358 versts. Here we parted company with the telegraph, and all postal facilities.

The way south lay over a post road lit-

member of the party had visited one of the mines.

The Russian villages we had passed were mostly desolate agglomerations of low log or stone houses flanking wide, naked streets, and all had the look as if life in these parts were a pretty hard proposition out of doors; while within it was necessary to economize space in order to keep warm.

THE KIRGHESE TRIBES

But now even the smallest village was long past, and the only dwellers were the wandering tribes of Kirghese, with their countless flocks of goats, camels and oxen. This is the Kirghese country, or steppe. The ant-hill structures, which serve as dwellings, are "yuarts," a collapsible framework of wood, covered with a thick felt, the summer homes of these people. Camp is easily moved from water to water as the feed is consumed, until at length, on the approach of winter, they arrive at their "zamofka," or winter-quarters, a low stone hut, with a turf roof, for all the world like a wart on the open face of the steppe.

Some days the country would be perfectly flat, and here mirages would open out pleasant sheets of water with tree-fringed headlands reflected on their gleaming surface, which, on nearer approach, would vanish or form again beyond. On other days the country would be undulating, the hills rising to about 2700 ft. above sea-level; but neither in hill



KORABOK AND TROIKA

length. Hay and rugs are spread on the bottom, on which one can lie and sleep with considerable comfort. Indeed, for the very long journeys, traveling both night and day, it is probably the most comfortable conveyance devised. The "troika" is essentially the Russian method of harnessing three horses, and consists of one shaft-horse, bearing the yoke and troika bells, whose gait is that of a fast trot, with a horse on either side running free at a gentle canter, with neck and head thrown outward. It is a very pretty and effective system when everything goes well; but, as often happens, when one of the side horses is new it is surprising to see what complications can arise in an incredibly short time. But, here again the situation is saved by the Russian harness, which is so scientifically proportioned and intimately associated with sundry odds and ends of string, that it parts on the least provocation; hence, one's comparative safety.

The Russian driver always starts and finishes a trip with a vigorous gallop, and rarely, if ever, does a good troika walk, even on stages of 30 versts and more.

On the stage-roads the troikas were usually good, but the farther south we went the worse they became, and at times there were none at all. We had many thrilling moments as may be imagined, but despite one minor accident, during the whole of our 1500-mile drive, entrusted to



A KIRGHESE ZAMOFKA

tle frequented. This, in turn, connected with the caravan route to Tashkent, near the borders of Afghanistan. The mines, of which there were three groups, copper, lead and coal, appeared to be most indefinitely located; they lay about 200 versts across country from each other, unworked and unconnected with roads—not altogether an assuring outlook. Only one

or plain did a friendly tree offer the slightest shade or serve to break the monotonous landscape.

In appearance the Kirghese somewhat resembles the Mongolian, with flat face and high cheek-bones. They are short of stature, for the most part, and very bow-legged, suggesting long generations of horsemen ancestors. The Kirghese are

great lovers, as well as judges of horses, and scorn walking as much as any Spanish caballero. Indeed, with their heavy felt boots and countless quilted wrappings, in summer as well as winter, it would be a hard matter for them to walk any distance. They are, of course, Mohammedans, and very strict members of the faith. They neither smoke nor drink, and are extremely tractable, and in most respects make ideal workmen. They work every day in the week, and have but two recognized holidays, of some three days each, in the year. They are a docile, childlike race, in whom there is no guilt, except in the trade of horses, when all the latent cunning of their Oriental mind is at once awakened.

GEOLOGY OF THE COUNTRY

There was not much opportunity for examining the structural geology of the dis-

and many evidences of underground working. The shafts were so badly caved that it was foolhardy to attempt any examination below. On the dumps were found some very promising piles of fine-grained galena, and also steel galena, but, strange to say, the silver contents were very low. Usually past experience has taught me to associate a fine-grained galena with silver contents. In the lead deposits near Lake Balkash, now being opened by the Siberian Syndicate, the galena is a coarse-cube variety and runs high in silver value. So it is apparent that the grain of the galena is not a safe guide as to argentiferous contents, except in each separate and particular locality. In the store were some piles of pig lead that the former workers had not apparently considered worth shipping, after the immense trouble of production in that out-of-the-way portion of the globe.

tary life, the sentry-box of a mighty empire, today a solitary policeman in a faded green coat and tawdry braid represented law and order.

It was now "up to" the Kirghese to take care of our further journeyings, as we were at the end of our resources and without horses. It was not long before the neighboring chiefs paid us their respects, and with much talk and the consumption of quantities of "chai," or tea, from the obliging samovar, everything was definitely arranged for an early start next morning. There were about ten in the party, including Kirghese interpreters, guides, spare saddle-horses and attendants, altogether forming a most imposing cavalcade. We had not proceeded far before we were joined by several Kirghese families, also "en trek," with their scores of camels and horses, the women riding the camels together with their household



HORSE WHIM AND VLAD SHAFT HOUSE IN WINTER TRIM

trict until we arrived at the rolling hill-country. From the presence of sandstone buildings in most of the villages, it was evident that large beds underlay a great part of the steppe. In the hills shales were much in evidence, and some interesting limestone beds, carrying an abundance of fossils, were encountered. Sandstone conglomerates were also of frequent occurrence. An interesting occurrence of selenite, the clear crystalline gypsum, was encountered in considerable quantity.

The higher hills, from 3000 to 4000 ft. in altitude, were almost entirely of granite or granitoid rocks, usually of a coarse crystalline texture, and without any apparent valuable mineral deposition.

LEAD MINES

After sundry adventures, and many misgivings as to our location, we at length sighted the lead mines. Here a small smelter had been built and considerable work had been done on the deposits. There were a number of shafts

The lead veins were both numerous and high grade, but small. The country was entirely composed of gneiss, rather an unusual habitat for galena ores, the veins cutting obliquely the lines of foliation.

AMONG THE KIRGHESE

There were copper mines 200 versts to the south and coal mines 200 versts to the west still to be examined. Owing to the absence of roads to the latter we decided to proceed to the copper properties, as a korabok could be driven most of the distance. At Yulutahoo, 181 miles south, we reached the end of the stage-road, or rather, military road. This is a quaint old town, built of slabs of granite from the nearby hills, said to have been the dividing line with Persia fifty years ago. The frontier today lies many hundreds of miles to the south, an interesting occurrence of contact-metamorphism of a distinctly recent period. There in that square verst of what was once a town bristling with mili-

equipment, the *tout ensemble* giving the impression that we were the leading float in some gigantic circus procession.

Progress was slow as we had no change horses; consequently we had to camp about six hours during the heat of the day, under the shade of the wagons, as there was no other. At night we camped in the open.

On the second day at evening we arrived at the copper properties, situated in a regular "never-never" country, apparently on the confines of the deserts to the south. For some time the water had been brackish and salt pans were common. The district to be examined comprised some 8 miles long by 5 miles broad, in 6 blocks of two versts each, a long day's work to even ride the boundaries, much less make any attempt at examination. It was soon apparent that the deposits, which were easily traced by the green carbonates at the surface, comprised the softer bedded sandstones impregnated with copper minerals,

of very considerable magnitude and apparent value.

EXAMINING THE COPPER PROPERTIES

It was decidedly an onerous undertaking for one individual—especially when unable to speak a word of the language, and with a scant supply of tools, and not even a forge to point a pick. Added to which it soon became apparent that the representative of the owner had a most hazy idea of the individual blocks, which were often several miles apart. However, this gentleman could speak a few words of French, and although my knowledge of this useful language is by no means profound, we found it to a certain extent a happy medium of exchange. By dint of hard riding and considerable work in the blazing sun, after a few days I was able to

200 versts to the west, to be examined. A horseback trip of some ten days through an uninhabited barren country with a few wells of brackish water, during the heat of summer, and with a very scanty larder, was now before us. This we had reluctantly to abandon, as we realized it was about all we could manage to extract ourselves successfully from our present position. The Kirghese are flesh eaters entirely, mostly living on mutton. Horseflesh is a delicacy. Their principal drink is "koomis," or mare's milk. When fresh this is palatable, but when fermented and drunk in quantity, it is capable of rendering its devotee quite intoxicated. They never eat vegetables, nor appreciate the eating of "grass," as they term it. The difficulties of the position are therefore apparent, as our provisions were



A KIRGHESE YUART

approximately estimate the possibilities, having cut representative samples of the several exposures for subsequent assay.

The Russian requirements as to development are curious; their special import seems to insist on a certain poodage of ore extracted annually and suitably stacked for measurement. The consequence was that although the properties had been worked in the past, and developed for several years previously, all that was to be seen were numerous apple-green funeral-pyres dotting the low hills, with corresponding holes in the ground, which afforded a most unsatisfactory knowledge of the deposits. There was an open-cast of considerable area that had been worked from time immemorial, as the richer ore was easily mined, and could be reduced to copper in our camp-fires, consisting of horse, or camel droppings, the only fuel of these parts.

There still remained the coal properties,

reduced to little more than dried bread, or "rusks," and a few cans of meat.

We arrived once more at Yulutahoo, where we camped with the hospitable policeman and paid off our retinue, and eventually reached Atbasar, where we again connected with the outside world, learning for the first time of the dissolution of the Duma, and the expected troubles that might ensue.

A bill now before the French chambers contains a provision reducing shareholders' profits to a dividend of 10 per cent., after a 50 per cent. share on the original capital has been reserved; the rest to be divided between the workmen and the pension fund. Some of the older French coal companies pay large dividends; for instance, the Compagnie de Dourges last year paid 1050 fr. per share of 500 fr. par value.

Mineral Resources and Mining Laws of Cuba

Consul Max J. Baehr writes as follows from Cienfuegos on the mining industry of Cuba: The mineral resources are represented by the following products: Gold, silver, iron, copper, manganese, lead, asphalt, petroleum, naphtha, graphite, amianthus, asbestos, zinc, mercury and coal. These minerals are found in most of the provinces, but the richest district is the province of Oriente, followed in importance by Santa Clara, Camaguey, Pinar del Rio, Matanzas and Habana.

The total number of mines surveyed, and the boundaries marked in the island up to Dec. 31, 1905, was 386, containing 20,871 hectares (hectare = 2.471 acres), divided among the provinces, and classified as follows: Asphalt, 78; copper, 77; iron, 63; pit coal, 11; manganese, 84; gold, 13; graphite, 2; lead, 5; zinc, 2; asbestos, 1; other kinds, 49; total, 386. The total area of the mining regions of Cuba is 56,395 acres, of which 44,586 belong to the province of Oriente, 4288 acres to Santa Clara, 5202 to Camaguey, 1361 to Pinar del Rio, 444 to Matanzas and 514 to Habana.

Of the above number of mines very few of iron, manganese and copper in the province of Oriente are in operation. The others can be considered only as concessions waiting for funds for exploitation. The administration, according to the laws in force, cannot compel the miners to operate their claims.

The applicants for mines can, according to law, ask for one or several claims at the same time. A claim (pertenencia) is 300 m. (984 ft.) long by 200 m. (656 ft.) wide (6 hectares, or 14.8 acres), except when the mines are of iron, coal, anthracite, lignite, turf, asphalt, or bituminous clays, when the pertenencia is 500 m. (1640 ft.) long and 300 m. (984 ft.) wide (15 hectares, or 37 acres).

The taxes to be paid to the government are \$5 yearly per hectare (2.471 acres), or \$30 for each claim containing 6 hectares (14.8 acres), when the mines are of precious stones or metalliferous substances. In the other cases the tax is \$2 per hectare, and therefore the total to be paid for the pertenencia may be \$12 or \$30, according to the surface of the claim.

The annual production of the mines actually operated, namely, 5 asphalt, 3 copper, 12 iron, 3 manganese and 1 naphtha, give a total output valued at \$1,446,000, as follows: Asphalt, \$122,900; copper, approximately, \$13,068; iron, \$1,146,892; manganese, \$163,140.

In the pamphlet published by the Bureau of Insular Affairs of the United States War Department, entitled "The Mining Law," is quoted the law in force, which is that of July 6, 1859, with the modifications introduced March 4, 1868.

THE COST OF A GOLDEN AGE*

The Debit Side of the Patent Account

BY A. S. FITCH

The last half of the past century together with the early days of the present, covering a period of some sixty or seventy years, is popularly considered the most brilliant era in either history or tradition; an era in which the greatest achievements in science, discovery and invention have been made, yielding a larger and more general betterment to the human race, in the conditions in which it now exists, than ever heretofore attained. During this golden age the telegraph, wired and wireless, the submarine cable, the sewing machine, the mower, the reaper, harvester and binder, the modern steam engine, the manifold appurtenances of land travel, the ocean greyhound, the telephone, the phonograph, the marvels in electrical appliances for the generation and utilization of the fluid for illumination and power, and the wonders in automatic and labor-saving machinery, have all been conceived and brought to their present perfection. Things of which our forebears never dreamed as possibilities, and many which even those still living looked upon as little less than miraculous when first announced as accomplished facts, are now the ordinary necessities of daily life on every continent and in every land under the sun.

THE OTHER SIDE OF THE ACCOUNT

While it may not be denied that this age of materialistic wonders has bestowed innumerable blessings upon mankind from an ethical viewpoint, in that never before in the history of this planet could man get so much of comfort and luxury in life by so small an expenditure of labor, either with hands or brain, as now, there is another aspect in which it may properly and profitably be viewed, weighed and measured, which has seldom, if ever, been seriously considered. How little thought has been given to the actual cost of this great era? Not in the brain-fag of the thinker; not in the muscle-weariness of the explorer, the experimenter, the laborer; not in the bitter sorrow and despair over unrequited zeal; but in the monetary cost—the cost in the gold that has been wrested from the bosom of our old Mother Earth to deck her with the glories of her golden age—in hard, metallic coin, the final and definite measure of value of everything in these practical days.

PATENT-OFFICE RECORDS OF COST

Apart from the revelations given to men by philosophers and great scientists, whose labors were largely speculative, involving

*From *The American Machinist*.

little of material cost, and whose voices were more as of those crying in the wilderness than like the lusty ring of the blows of the smith at his forge, there is no surer index to the financial cost of modern achievement than the records of the governmental patent offices of the world. There we find facts which are unassailable and unquestionable; for through them have passed myriads of scientific and mechanical inventions and discoveries, among them all that we call the great inventions, as well as the hundreds of thousands which have played minor parts in the world's work, or have been lost in the oblivion of failure and disuse. From these facts may be deduced further facts of approximately equal reliability, so that a tenable basis may be constructed for a reasonable and conservative estimate of the actual cost of this golden age.

Since the foundation of the patent system, over three and a half million applications for patents have been made to the various governments of the world, and very nearly two and one-half million letters patent have been granted. These figures do not include copyrights, trademarks or the registration of labels, all of which are, however, in some measure, more or less linked with or concomitants of "inventions." Of the total number of patent applications, about one-half have been made to our own government, and the United States of America has issued, up to date, about one million patents. Moreover, nearly, if not quite, seven-eighths of this activity in invention has occurred during the past fifty years.

THE AGGREGATE OF GOVERNMENT FEES

The filing of these applications for patents in this country has involved the payment to our government by inventors and applicants of about \$50,000,000, and to the other governments of the world from about \$85,000,000 to \$90,000,000. But these fees payable to governments are only a drop in the bucket in comparison with the other expenses involved in obtaining patents. The fees and charges of the solicitors or agents who prepare and prosecute these applications must be taken into account. There are hundreds, yes, thousands, of instances in this country, especially during the past thirty or thirty-five years, in which expert attorneys of high standing have charged and received anywhere from \$1000 to \$3000 for the preparation of the specification and drawings of a single intricate and important invention. A case is on record in which the solicitor labored for one entire year exclusively on one specification, receiving, as his fee, a check for \$10,000. This was exceptional

to be sure; but very heavy fees are frequently charged in difficult cases.

SOLICITORS' FEES

Without attempting to itemize these larger fees, it is not unwarrantable to state that, in at least one-half of one per cent. of all the applications filed in the United States patent office, the fee paid the solicitor in each case has amounted to not less than \$1000; in another 17,500 cases to not less than \$500; in 5 per cent. of the total number, or 87,500 cases, not less than \$250; in 10 per cent., not less than \$100; in one-third of the entire number, \$50; and that, in the remaining one-half of all cases, the ordinary fees of \$25 to \$30 has been charged. These figures, if they err, do so in their moderateness rather than excess; and thus reckoned, the total sum paid to American solicitors foots up nearly \$100,000,000, or an average of about \$60 per application. Anyone familiar with the profession of patent soliciting will recognize the conservatism of these figures and the probability that the average cost of a solicitor's services has been nearer \$100 in each case than the \$60 above given; so that the nearly 2,000,000 applications for United States patents, including government fees paid, has undoubtedly aggregated about \$200,000,000.

But, as about one-half of the total number of applications filed at Washington has been rejected and patents thereon have never been granted, this total cost of \$200,000,000 is properly chargeable, in reckoning the debit side of this great account, against the million patents which have been granted in this country. Thus, the charge for this item against issued United States patents would average \$200 each, a moderate figure when all circumstances are considered.

THE COST OF EUROPEAN PATENTS

Until within a very few years, the fees, both governmental and to solicitors for applications in European and other foreign countries, have been considerably greater than those averaged in the United States; besides which, fees for the prolongation of these foreign patents year after year have had to be paid. It is entirely safe to state that the cost of procuring and maintaining the nearly 2,000,000 patents granted in foreign states has been at least three times the cost of the like number of patents in our own country, or about \$600,000,000. This gives a grand total of very close to one billion dollars expended by inventors throughout the world during, say, about 100 years, for governmental and solicitors' fees alone in connection with the applications filed in that period.

ABANDONED CASES

This billion of dollars covers only the instances in which the attempts to protect inventions has proceeded thus far; but the records and files of the host of solicitors throughout the world, and especially in this country, will disclose a vast number

of cases in which, because either of change of purpose or of lack of funds on the part of the inventors, the applications have been cast aside or abandoned after entire or partial payment for their preparation; so that it is entirely reasonable to add to the total debit of this item of cost a further sum which will swell the amount already named to nearly two billions of dollars.

PRELIMINARY EXPENSES

But, even yet, we have only begun to count the cost. There are other items of such colossal proportions that they are appalling in their magnitude. These are the expenditures involved in the preliminary or embryo stage of an invention or discovery, and necessary to demonstrate or at least indicate its probable practicability and worthiness to be made the subject of an application for a patent. Under this head, as well as any other, may be placed the cost of models illustrating, in miniature, the features of the invention. For many years the model halls of our patent office contained tens of thousands of models which represented the expenditure of millions of dollars in their construction by or for inventors. Of late only the more important of this great array of models have been retained by the office; and while the filing of a model of an invention for which application for a patent is made is now no longer compulsory, except in certain special instances, the production of models by inventors still goes on, as many of them think it a necessary step in development.

DEVELOPMENT EXPENSES

Then there is the cost of thoroughly and practically developing the invention and getting it into final condition for commercial or public usage. Further than this are the disbursements for legal advice, in very many instances, concerning the scope and validity of the patent, and the still greater fees and expenses connected with litigation in court to enforce, defend or maintain the patent right. And, further again, is the capital drawn into partnerships or corporations formed for the purpose of exploiting and selling the patented thing in the markets of the world, a large part of which is lost through the failure of the invention to meet the popular demand. We have heard much of some few great fortunes made from certain radical inventions; but it is only now and then that we learn what it has cost in litigation and other expenses to protect the patents on these inventions, and to realize the advantage the monopoly is supposed to bestow upon its possessor; and we rarely notice or consider the scores of thousands of invention and patent wrecks which strew the shores of the commercial seas, gaunt witnesses of failure, disaster and financial loss.

In the preliminary stage, many inventions, notably those that have first blazed a trail through some theretofore unex-

plored jungle of physics, have involved years of labor and the expenditure of thousands of dollars before their feasibility and utility were demonstrated. But grouping these greater and fundamental inventions with others of large importance in like fields of discovery, it is not unwarrantable to assert that at least 1 per cent. of all have averaged over \$10,000 each in preliminary development, although a great number have thus cost ten or twenty times as much; that another 1 per cent. has averaged \$15,000; 5 per cent., \$2500; 20 per cent., \$1000; another 20 per cent., \$500 each; still another, \$250; and the remaining third, \$100 each. The total of these figures is close to two and one-half billions of dollars; and this total is probably below rather than above the true sum.

Another item comprises the expenditures involved in this preliminary development of those inventions which fail of satisfactory demonstration, and consequently never appear as subjects of applications for patents. There can be no absolute accuracy in estimating the exact number of these cases, but they have occurred over and over again and are witnessed daily. That they almost, if not quite, equal those which have proved practical there can be little doubt. But if they are set down as only one-half such number, these abandoned efforts will add at least another billion and a quarter of dollars to our debit.

The final development of patented inventions has certainly exceeded in cost that of their preliminary demonstration. At this stage inventions are brought to practical form and generally demand the construction of machinery or apparatus. Hundreds of thousands of dollars have frequently been thus expended in individual instances only to be totally lost in the end. We can easily count the great or even ordinary successes of exploited patents; but their financial wrecks are as the sand on the seashore. But, disregarding individual cases and applying the same percentages and ratios of expenditure for this item as are given for preliminary development, we have a total of two billions and a half of dollars for this additional debit. It can, by a little figuring, be proven that this item more nearly approximates five billions of dollars than the sum first named.

THE COST OF LITIGATION

Litigation has called for the expenditure of enormous sums. Not one of the great, fundamental inventions has escaped this outlay for the enforcement or defense of its rights under patents. From 1867 to 1885 the United States courts were crowded with these cases all over the country, and the eminent counsel engaged received from \$100 to \$1000 per diem for their services, which continued in many cases for several years. Instances of very large fees, some as great as \$100,000, or even \$250,000 were known. Since 1880

the litigation concerning electrical inventions has greatly increased. Of course, all patents have not been litigated; but certainly, at least, one-half of all granted here or abroad have called for some expenditure on this account, or, at least, for legal advice, and it cannot be far from the truth that, taken together, they have averaged \$1000 in each instance, and that the total of this expenditure aggregates at least one and one-half billions of dollars.

PROMOTER'S CHARGES

The final item should cover the losses suffered by investors in patents whose money has gone, not into development or actual exploitation of inventions, but into the pockets of promoters and schemers for worthless title interests in the patents themselves, or for the inflated stocks of corporations holding the patents. This sum must be enormous, but can only be surmised from known facts. In a single State in our Union corporations capitalized in stock to over twenty-five millions of dollars were dissolved during a single year, and most of them were closely related to some patented monopoly. One patent scheme drew, in one year, over £3,000,000 out of Great Britain, and fell to pieces before another twelve months. Two other American inventions were exploited there in the early eighties, which proved a total loss within two years of £1,000,000 to the stockholders. That the loss to investors in patent rights all over the globe during the past sixty years has been billions of dollars cannot be doubted, when the fact is recognized that not over 10 per cent. of all patents ever actually yield a financial profit any greater than that derivable from an unprotected article in the open market. It is more probable than not that this item of lost capital put into patents which have proved chimerical or been abandoned for other reasons, amounts to not less than three billions of dollars.

THE GRAND TOTAL

When the items of this great debit against our golden age are added up, they give a grand total of nearly fifteen billions of dollars; and, adding interest at 6 per cent. per annum for a term of thirty years, as nearly all this vast sum has been expended for the purpose stated during the past sixty years, we have a final total of debit to the account of modern invention of almost forty-five billions of dollars. This almost inconceivable sum is greater than the national debts of all the countries of the world.

A serious contemplation of these facts naturally suggests the question: Have the successful inventions of our golden age in and of themselves yielded to their inventors and owners an actual money-profit adequate to offset this colossal debit and show a balance on the right side of the world's great ledger?

MAKING OPEN HEARTH STEEL AT PUEBLO

Basic and Acid Furnaces at the Colorado Fuel and Iron Company's Steel Works

BY LAWRENCE LEWIS *

Open-hearth steel was first made at the Minnequa works of the Colorado Fuel and Iron Company at Pueblo, Colorado, June 29, 1903. The original open-hearth plant consisted of six furnaces only. Owing, however, to chemical constituents in the ore found in the new deposits of the company now being opened at Sunrise, Wyoming, the open-hearth process is becoming more and more important. For 22 years the works depended exclusively upon the bessemer process. It is likely that, although the bessemer process will always be a very important feature, the open-hearth process will hereafter overshadow it. Indeed, at present a large sum of money is being expended upon the

placed immediately under the charging floor. Gas is supplied by 48 large-size water-seal Duff producers, the building for which is provided with cranes and mechanical coal-handling arrangements. The main flue into which the producer gas is delivered is parallel with the line of furnaces and is 10 ft. high by 6 ft. wide, and is easily accessible from one end for cleaning. Flues 5 ft. high and 3 ft. 6 in. wide, at right angles to the main flue, deliver the gas to the furnaces.

The plant was built after plans of the Garrett-Cromwell Engineering Company and the erection of the structural material was done by the Riter Conley Manufacturing Company. The main building,

equipped with three 5-ton electric overhead traveling cranes, three standard-gage tracks and three narrow-gage tracks for charging cars. The three standard-gage tracks are at a lower level than the narrow-gage, so that the top of an ordinary railroad car is on a level with the tops of the charging buggies to facilitate the handling of scrap, ore, etc.

THE OPEN-HEARTH PROCESS

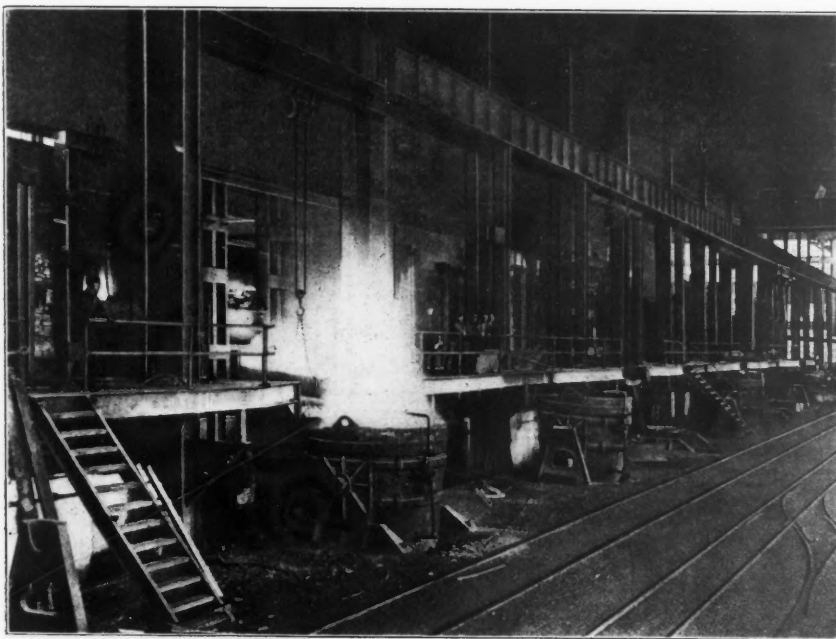
In manufacturing finished steel products from the raw ore, several processes are necessary. These processes may be divided into two classes: first, reducing the ore to pig iron, and refining pig iron to steel; second, rolling and working the ingot steel into various finished shapes. For reducing the ore to pig iron the blast furnace is employed, but the pig iron contains impurities which must be eliminated in order to produce steel. For this purpose either the bessemer or open-hearth process is used. In these processes we must have either oxidizing or reducing conditions. This statement is apparently highly technical, yet it is simple enough. Oxidizing means adding oxygen to a substance; reducing means removing oxygen. Consequently it is impossible to have both oxidizing conditions and reducing conditions in the same place at the same time.

Iron ore is metallic iron combined with oxygen. The blast furnace removes the oxygen by the use of carbon in the form of coke. Coke at a high temperature has a greater attraction for oxygen than has iron, but there are impurities in the iron ore—such as silicon, manganese, sulphur and phosphorus—combined with oxygen in the same manner as in the iron of the ore. These are also reduced and go with the pig iron. These impurities must now be removed from the iron or oxidized, and this constitutes the process of making modern "steel." Chemically speaking, the so called "steel" of commerce today is comparatively pure iron, more so than pig iron.

The open-hearth furnace consists of the hearth, the gas and air ports and the regenerative chambers. There is also a stack for draft and valves for reversing the currents of air and gas. There are also various mechanical appliances for handling raw material and products.

THE HEARTH

The hearth is in shape an oblong basin. It is inclosed by a roof and side walls, but is readily accessible by doors and for this reason takes the name open hearth. Fig. 1 gives a plan, Fig. 2 a longitudinal section, and Fig. 3 a cross section of the



TAPPING FLOOR, OPEN-HEARTH DEPARTMENT, MINNEQUA WORKS

construction of six additional 50-ton open-hearth furnaces, a 300-ton hot-metal storage reservoir and a calcining plant for calcining the dolomite used in the lining of the furnaces and limestone used as flux.

THE FURNACES

All of the open-hearth furnaces are of the stationary type with basic bottoms. Each is 60 ft. 6 in. long by 17 ft. wide. Each is of 50 tons capacity and is equipped for the use of producer gas. The regenerative chambers are extra large and are

*The writer of this article is indebted for the material herein contained to J. A. Durfee, formerly superintendent of the open-hearth department of the Minnequa works, and now assistant manager of the Minnequa works.

Note—The Minnequa did not run continuously during the coal trouble of 1903 as erroneously stated in a previous article of this series.

when the six new furnaces are completed, will be 1005 ft. long, 95 ft. high and 203 ft. wide, including the lean-to over the stock yard, all of steel construction. The charging floor is 10 ft. above the pit-floor level and is equipped with two low-type Wellman charging machines and two 40-ton Shaw electric overhead traveling cranes to handle hot metal from the storage reservoir. The pit is 55 ft. wide and is equipped with three 75-ton electric overhead traveling cranes, three pouring stands, two tracks for ingot buggies and one standard-gage track. The pouring tracks are fitted with three center pushers. The ingot stripping is done by means of two Aiken duplex hydraulic strippers.

The stock yard, 72 ft. wide and of the same length as the main building, is

hearth and ports. The hearth is shown as the bottom of the open space. Each half of the furnace divided on the line *AA* (Fig. 1) is the counterpart of the other. The hearth is 32 ft. long and 14 ft. wide inside the walls, which are of silica and magnesite brick in the basic furnaces. In acid furnaces they are of silica brick only. At each end of the hearth are the ports, uptakes or flues, which lead the gas and air into the furnace to be burned; *cc* are the gas ports and *aa* are the air uptakes.

The gas ports are nearly horizontal, extending from the vertical flues *oo* and *dd*, which are called the uptakes—thus *oo*

and *CC'*. *B* and *B'* are gas chambers, *C* and *C'* are air chambers. They are placed below the level of the furnace and hearth and back of it, or between it and the stack and under the charging floor, as shown in the cross-section elevation, Fig. 2. Each chamber is 21 ft. long and 15 ft. high. The two gas chambers *B* and *B'* are 7 ft. wide. The two air chambers, *C* and *C'* are 10 ft. 9 in. wide. This makes the capacity of the air chambers practically one and one-half times that of the gas chambers. Each chamber is filled with fire brick piled so that spaces and bricks alternate.

The valves are shown at *F* and *F'* of

culate all through the slag pockets and uptakes into the ports *oo* and *dd*.

The gas enters the hearth through two ports, but the air, after leaving the uptakes, sweeps down from the top from one broad port so as entirely to surround the gas. The gas and air unite at the mouth of the ports. The gas burns in two long flames reaching nearly the length of the hearth to the opposite ports. The heat produced is absorbed partly by the charge in the hearth, but a large part of it passes out through the air and gas ports on the opposite side.

This current of hot gases passes through the ports and down the uptakes through

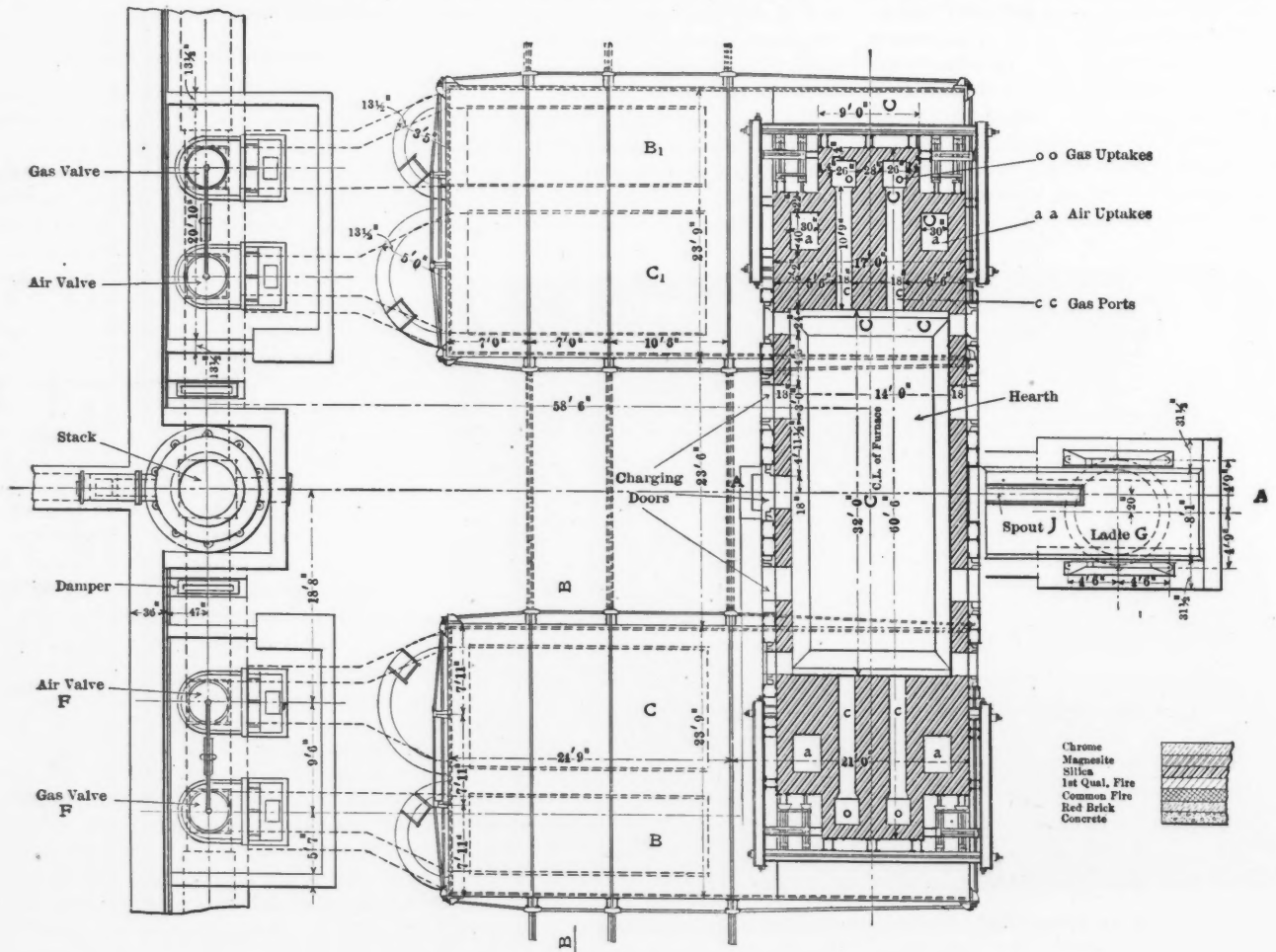


FIG. 1. PLAN OF OPEN-HEARTH FURNACE, MINNEQUA WORKS

are the gas uptakes and *dd* are the air uptakes.

At the bottom of each uptake is a slag pocket, so called because it catches the slag or cinder drippings which come over from the furnace. These flues, the vertical parts of which are called "uptakes" and the horizontal parts "ports," lead from the regenerators to the hearth with the slag pockets acting as a sort of catch-basin between the regenerators and uptakes.

THE REGENERATORS

The regenerators are large chambers, variously called "regenerators," "chambers," or "checkers" by the furnace men. They are shown in plan in Fig. 1, *B B'*

Fig. 1. *F* is the valve for the gas chamber, *F'* the air chamber valve. They are for the purpose of directing the currents of gas and air into the furnace or the spent gases to the stack. While one set of air and gas valves is directing the current into the furnace, the other set is directing it out to the stack. But the current may and does go through the furnace in either direction.

PRINCIPLE OF THE REGENERATIVE PROCESS

The gas from the producers and the air are admitted by the valves *FF'* to flues leading to the bottom of the regenerative chambers *B C*, shown at the lower part of Fig. 1. The air and gas spread and cir-

the slag pockets and into the checker brick work of the chambers at that end of the furnace, the checker work absorbing and retaining much of the heat. The current of gases passes to the bottom of the chamber, by which time it has given up most of its heat, and then goes to the valves, which are directing the current out by way of the stack.

In a short time the checker work becomes thoroughly heated, whereupon the valves are changed, and the current is reversed in direction. The air and gas now enter first through the valves to the bottom of the preheated chambers. As they rise through the checker work they absorb much of the heat and pass on through the

uptakes and ports into the furnace and burn as before, except that this time the flame is directed in the opposite direction. On their way to the stack they heat the chamber first mentioned.

In this way a constant see-saw or reversing of the direction of the gases is maintained. The reverses under ordinary conditions are made every fifteen min-

The glare of the furnace, through the open door, is so dazzling that nothing can be distinguished by the naked and untrained eye. The skilled furnaceman uses dark blue glasses, and constant practice enables him to judge with great precision the degree of heat that the brick work will stand. The open-hearth furnace is not a contributor to the smoke nuisance. This

four doors at the tapping side of the furnace for the same purpose. The doors are shown in Figs. 1, 2 and 3.

THE CHARGE

The charge of the furnace consists of pig iron—either cold or molten—and scrap steel or iron together with limestone and sometimes iron ore. The amount of pig iron varies from 35 to 75 per cent, ac-

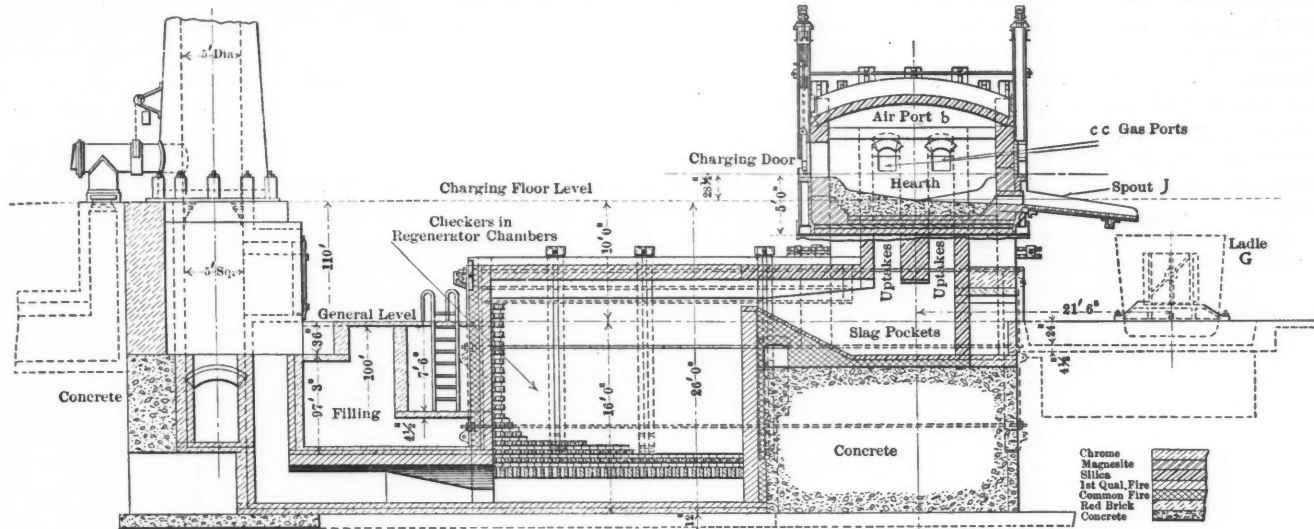


FIG. 2. LONGITUDINAL SECTION OF OPEN-HEARTH FURNACE

utes. The regenerative chambers act as a reservoir for the storage of the heat of combustion which would otherwise pass off through the stack. In a sense the heat, stored in the checkers, is carried back into the furnace at each reverse.

HIGH TEMPERATURES

The preheated gas and air from the checker work give a more nearly perfect

is due to the perfect combustion obtained by the regenerative process. Except for a short time during charging, when the cold material lowers the temperature of the gas flame and consequently renders combustion less complete, no black smoke is ever seen at the top of the stack.

Although the furnace is built of brick, it is held in place or supported by a

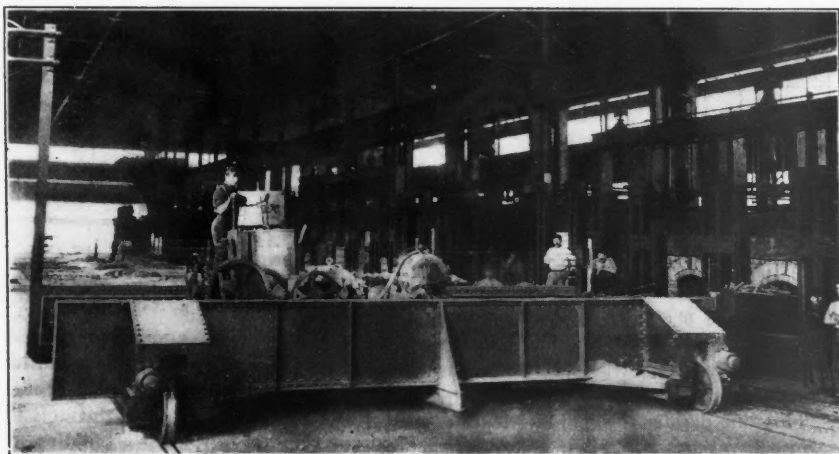
ording to conditions. It is usually 50 to 75 per cent. for basic furnaces. The cold pig iron and scrap iron and scrap steel are loaded in pressed-steel boxes 6 ft. long, 27 in. wide and 2 ft. deep. The loaded boxes are thrust through the doors of the furnace by the charging machine and by rotating the arm supporting the box dumped in a large pile on the hearth where the charge slowly becomes a molten mass. The mass assumes a level and boils like water, the slag or cinder formed floating on the top of the heavier molten metal. This "boil" facilitates the removal of the impurities, the carbon being the last to leave the metal. When the carbon is nearly gone the steel must be "tapped" into the ladle, for otherwise the iron also would combine with oxygen, practically returning to its original state of iron oxide. If any trace of oxygen is left in the molten metal the addition of ferromanganese during the pouring removes it.

The period between charging and tapping varies largely with different mills and practice. About two charges or heats each 24 hours may be taken as an average.

ACID AND BASIC STEEL

There are two kinds of soft steel in commerce, basic steel and acid steel. There is also a basic as well as the acid bessemer converter.

The hearth of a basic open-hearth furnace is made up or lined with magnesia—in the form of magnesite brick and dolomite. When the raw material for making steel is placed in a basic furnace, lime in the form of limestone, also a base, is charged with it. When the metal melts,



MECHANICAL CHARGING OF COLD MATERIAL INTO OPEN-HEARTH FURNACE

combustion than could be secured by burning cold gases, and this added temperature is an indirect result of the system. With proper conditions so great is the heat that the attention must be directed not so much to keeping up the temperature as to keeping it under control so that it does not melt or "burn" the brick work of the furnace.

framework of channels, beams, rods, etc., for which the shop name is the "binding." On the charging side of the furnace are three large doors and two smaller ones. Through the larger doors the material is charged. These, together with the two smaller doors, are also used after each heat for repairing the "scorification" or wearing away of the hearth. There are

the limestone melts also, and forms a slag or cinder, which floats on the surface. The two bases, the magnesia of the hearth, and the lime of the charge, do not attack each other, but if any acid is in the charge it will immediately combine with the lime, the more active base.

Phosphorus and sulphur are very injurious in steel. Fortunately, all the more deleterious elements have a greater attraction for oxygen than has iron. Phosphorus and sulphur uniting with oxygen form well known acids during the "boil." These are instantly attracted by the base, lime, and enter the slag. Thus, in the open-hearth process the phosphorus and sulphur are removed permanently from the steel.

duced in the acid furnace. It is owing to the fact that some of the Colorado Fuel and Iron Company's largest new ore deposits run comparatively high in sulphur and phosphorus that the basic open-hearth process has lately assumed so much importance at the Minnequa works.

Considered from the standpoint of mere cost of refining, the acid furnace offers the cheaper process. It is partly because ores and other material (scrap, etc.) running low in phosphorous and sulphur are becoming more and more scarce that the basic process has of late assumed such prominence. Ten or fifteen years ago there was scarcely a basic open-hearth furnace in America.

are the regenerative chambers and the valves for operating them. On the right of the line of columns *D* is the "pit" or "tapping side," covered by three 75-ton cranes *F*. The ground level of this pit, or tapping side, is 10 ft. below the level of the charging floor on the other side of the column. It contains the ladles *G G*, into which the steel is delivered from the furnaces, also the ingot molds *H*, into which the steel is poured from the ladle *G*. Railroad and ingot car tracks run the entire length of the building.

CHARGING COLD METAL

At the left of the charging side is the stock yard into which all the cold pig iron, scrap iron and steel and limestone are

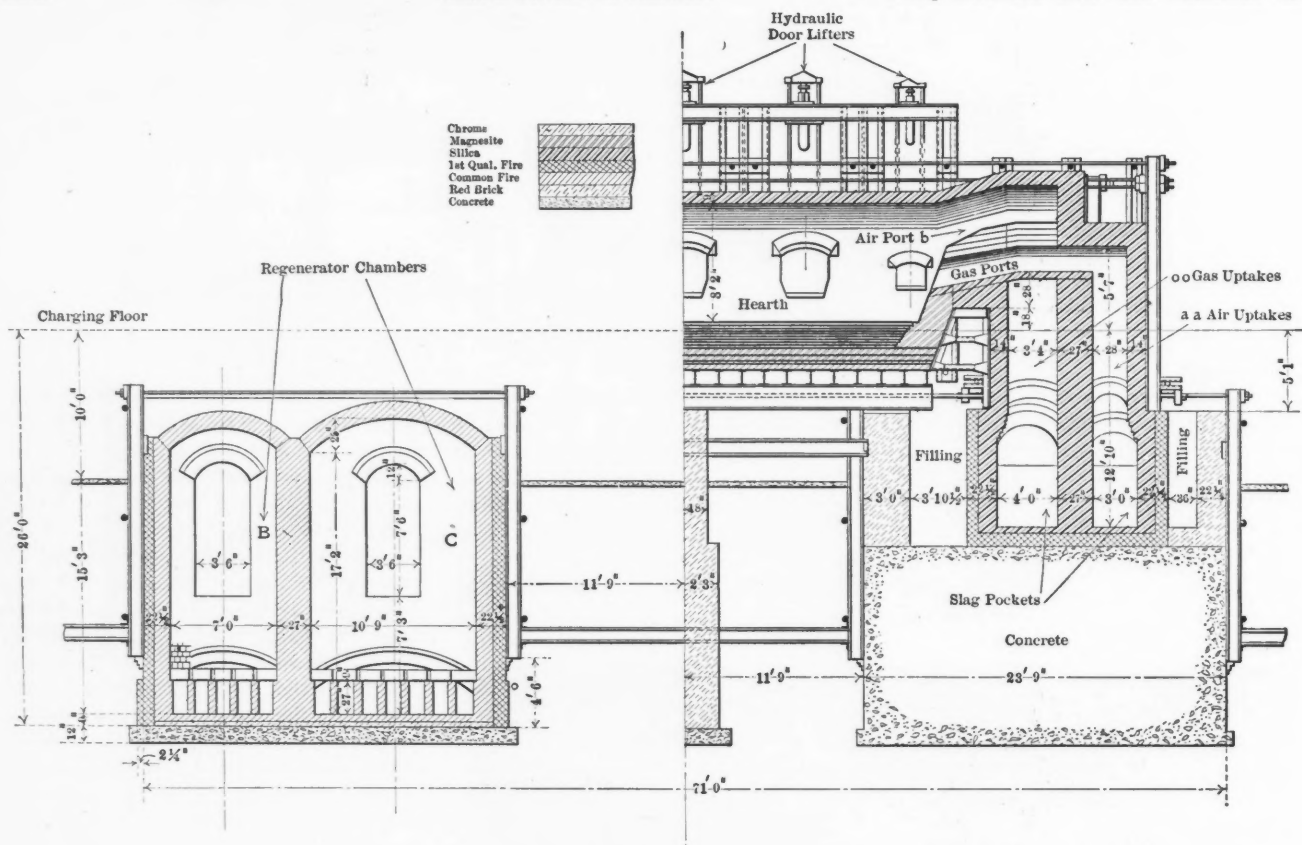


FIG. 3. TRANSVERSE SECTION OF HEARTH AND PORTS

THE ACID FURNACE

The hearth of an acid furnace is lined with pure sand, silica sand, which is an acid. If the base, lime, were charged in this furnace it would attack or combine with the acid, silica, forming a fusible slag and thus cutting or wearing away the hearth very quickly. In the acid furnace there can be no basic slag. The phosphorus and sulphur may take oxygen and thus go to form acids just the same as in the basic furnace, but there can be no base to receive them. All of the phosphorus and most of the sulphur again give up the oxygen and remain in the steel.

The virtue of the basic furnace is that it can use material containing higher percentages of phosphorus and sulphur and still make a purer product than that pro-

MOVEMENT OF MATERIAL THROUGH PLANT

The new main building, exclusive of the stock yard, is 131 ft. wide, including the stack line, and 1005 ft. long. It has three gables or roof-trusses. There is also a line of columns nearly in the center. This line divides the building lengthwise into two parts. The left side of the columns at *D*, Fig. 4, contains the charging machine *B*, the buggies and boxes *A*, and the furnace *K*. This, the charging side, is covered by two 40-ton cranes, shown at *E*, which carry the ladles of molten iron from the hot-metal storage reservoir to the charging doors of the furnace.

From the charging floor all the work of filling the furnace and manipulating its contents after it has been charged is performed. Under this charging floor

brought in open railroad cars. The stockyard has a framework of columns and girders extending the entire length of the open-hearth building, and supporting the three 5-ton cranes. Each of these three overhead electric traveling cranes covers the entire yard. Lengthwise through the yard and parallel to the main building are three standard-gage tracks and three narrow-gage tracks. These tracks are separated by a retaining wall, the standard gage being on a lower level. The top of a railroad car is on a level with the top of the boxes on the narrow-gage cars or buggies.

The buggies carry three charging boxes. At one end each box has a slot into which fits the flaring end of the ram of the charging machine. A buggy with a box resting upon it is shown in sectional view

in the main building at *A*. The boxes are lifted from the buggies by a 5-ton crane and placed in the railroad cars.

Laborers in the standard-gage cars, load the boxes which are then returned by the crane to their respective buggies. The buggies are then run to the scales, are there weighed and then switched to the track directly in front of the furnaces.

The charging machine *B*, Fig. 4, is worked by electric motors and runs along the entire length of the charging floor. It has a carriage which runs at right angles to the floor travel. The carriage carries a revolving ram. The whole machine moves in front of a buggy, the ram picks up the box from the buggy, runs it into the furnace, revolves, dumps the contents, brings the box out again from the furnace and replaces it on the buggy.

CHARGING HOT METAL

Hot metal, before the erection of the hot-metal storage reservoir at Minnequa, was charged by running the metal, contained in blast-furnace ladles and mounted on cars, directly into the open-hearth building, where they were handled by the 40-ton cranes and poured directly into the furnaces. Now the metal is poured from the blast-furnace ladles into the 300-ton storage reservoir, where it is kept in a molten state by oil burners. As needed it is drawn off into ladles, which in turn

cast iron lined with fire-brick. Each ladle has a two-inch hole in the bottom for pouring. A steel rod covered with fire clay covers the nozzle and extends up through and out of the ladle in a crook over the side to a lever by which a man on the pouring platform raises or lowers, as desired.

The molds are long shells of cast iron 18x20 in. in sectional area, and 6 ft. deep. Each rests upon a block of cast iron, which is a part of the ingot car. The molds are slightly larger at the bottom than at the top. This gives a slight taper to the ingot, which facilitates removing.

After the molds are filled they are hauled by a pony engine to the stripper building. The stripper, or stripping machine, is a device for lifting the molds from the steel ingots. It consists essentially of a pair of powerful jaws—by which the sides of the ingot mold are gripped—

struction and the other improvements and additions in this department are completed, it is expected that the open-hearth steel department at the Minnequa works will have a capacity of at least 1500 tons per 24 hours.

The Nourse Mines, Limited

The report of the Nourse Mines, Limited, for the year ended July 31, 1906, shows that the ore development of the year amounted to 381,050 tons of an average assay value of 7.68 dwt. The crushing duty of each of the 145 stamps employed was 5.284 tons per 24 hours. The value per ton of ore was 9.25 fine dwt., and the yield per ton was 5.335 dwt. The cyanide works treated sand, slime and concentrate amounting to 258,852 tons for a return of 3.458 dwt. per ton. The theo-

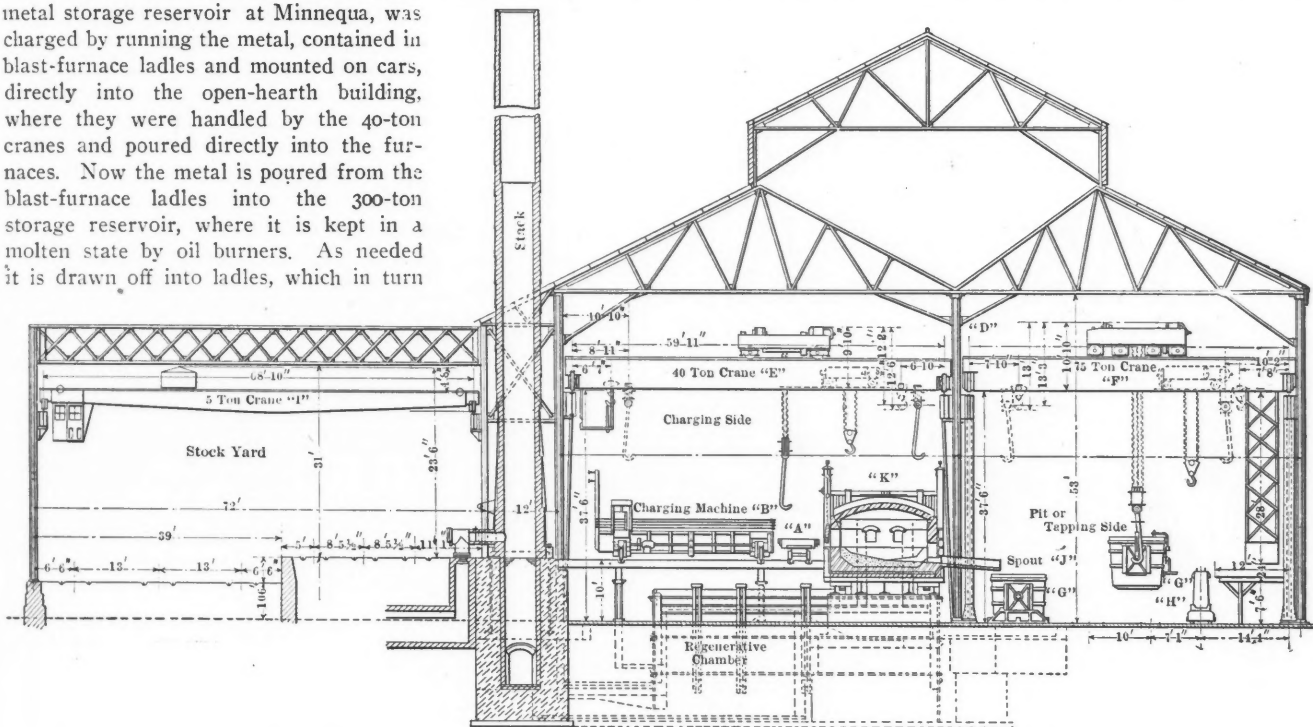


FIG. 4. ELEVATION AND CROSS SECTION OF OPEN-HEARTH BUILDING, MINNEQUA WORKS, PUEBLO

are hoisted by a crane to a point immediately in front of the furnace. The contents are then poured slowly into the furnace by means of a spout, which is temporarily thrust through the charging door by means of the charging machine. This facilitates the melting of the cold charge to a considerable degree. Usually the limestone, ore and scrap are charged in the furnace and heated for a short period before the molten iron is added.

DISPOSAL OF THE PRODUCT

When the charge has been melted and refined to the proper point, the tapping hole is picked open and the steel runs out through the spout *J* into the ladle *G* (Fig. 4). The large crane *F* then picks up the ladle, as at *G*, and moves it over to a point above the top of the mold *H*.

The ladles are large vessels of steel and

with a powerful ram between. The jaws grip the sides of the mold and lift it from the base on the car. At the same time the ram presses down, forcing the mold from the ingot.

The ingots are taken to the soaking pits of the 40-inch blooming mill or of the rail mill, where they are kept hot until they are taken out and rolled into billets or rails.

Steel castings are also made at the open-hearth plant. There are iron cupolas but no steel furnace at the foundry of the Minnequa works. Accordingly narrow-gage cars carrying the molds for the castings are run to the pouring floor, or pit, of the open-hearth plant, where the pouring is done while the molds are still on the cars.

When the six furnaces now under con-

retical extraction was 82.28 per cent., and the actual extraction 86.9 per cent. The total working costs were £1 5s. 5d. per ton, comprising 18s. 2d. for mining, 5s. 3d. for development, and 1s. 11d. for office expenses. Milling and cyaniding cost 5s. 4d. per ton.

The two tube mills erected during the year proved an unqualified success. One of them increased the duty per stamp from 4.9 tons to 6.25 tons, while the residues from the cyanide plant were decreased in value from 0.99 dwt. to 0.5 dwt. gold per ton.

The shipments of phosphate rock from the Gafsa field, Tunis, in 1906, amounted to 593,276 metric tons. The total production of Tunis is estimated at 800,000 metric tons.

The Bullfrog Cyanide Mill

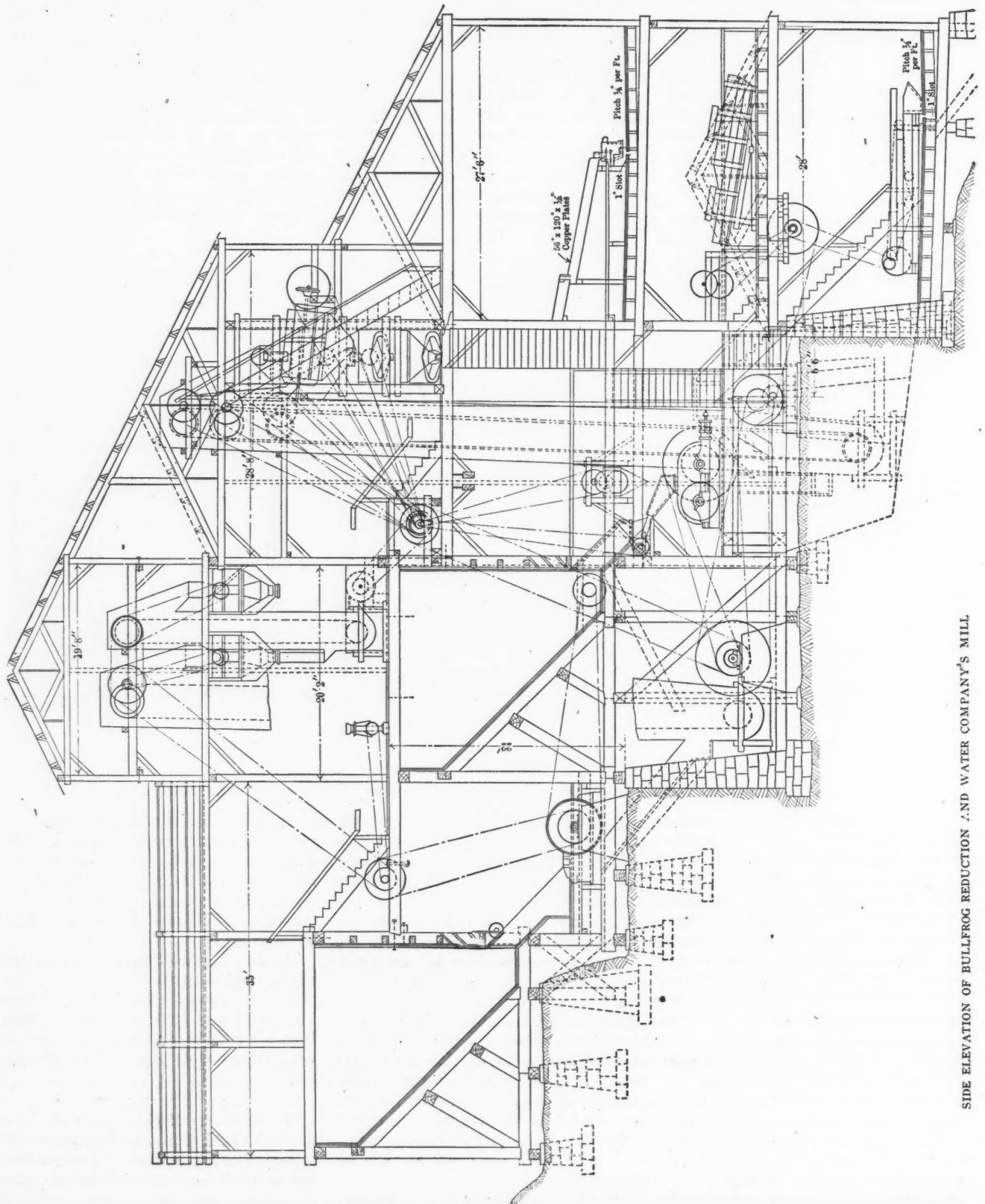
BY ENOS R. AYRES *

In the new mill which is being erected by the Bullfrog Water and Reduction Company, at Bullfrog, Nev., the ore goes first through a 15x24-in. Blake crusher,

*Engineer, 114 Liberty street, New York.

the product of which is elevated to a Vezin sampler, reject dropping to mill bin, sample elevated again to No. 2 sampler, reject dropping to mill bin and sample to sample bin, from which it is drawn to a sample crusher. From there it is dropped down to coning floor, quartered and run through sample grinder. From mill bin the ore is fed into No. 1 rolls, 42 in. diameter by 14 in. face, heavy-duty type,

product being elevated to trommel provided with punched steel plate of coarse mesh; under-size to single-unit dry screen, provided with 8-mesh scalping cloth and 16-mesh primary cloth; under-size to amalgam plates; over-size to No. 2 rolls, 42 in. diameter by 14 in. face, standard type. Product from No. 2 rolls is elevated and distributed to two 8-mesh, dry, centripact screens; over-size dropping to



SIDE ELEVATION OF BULLFROG REDUCTION AND WATER COMPANY'S MILL

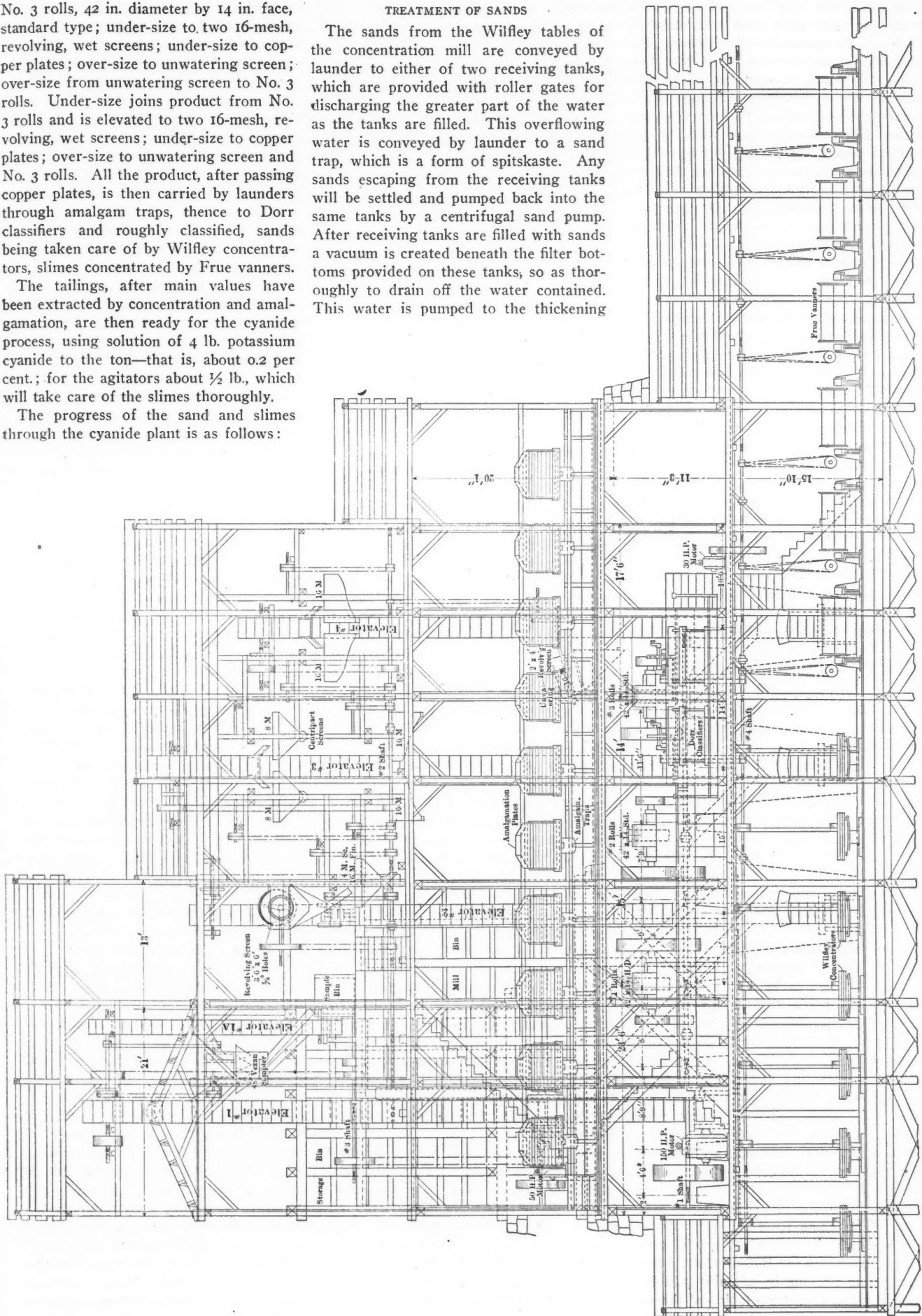
No. 3 rolls, 42 in. diameter by 14 in. face, standard type; under-size to two 16-mesh, revolving, wet screens; under-size to copper plates; over-size to unwatering screen; over-size from unwatering screen to No. 3 rolls. Under-size joins product from No. 3 rolls and is elevated to two 16-mesh, revolving, wet screens; under-size to copper plates; over-size to unwatering screen and No. 3 rolls. All the product, after passing copper plates, is then carried by launders through amalgam traps, thence to Dorr classifiers and roughly classified, sands being taken care of by Wilfley concentrators, slimes concentrated by Frue vanners.

The tailings, after main values have been extracted by concentration and amalgamation, are then ready for the cyanide process, using solution of 4 lb. potassium cyanide to the ton—that is, about 0.2 per cent.; for the agitators about 1/2 lb., which will take care of the slimes thoroughly.

The progress of the sand and slimes through the cyanide plant is as follows:

TREATMENT OF SANDS

The sands from the Wilfley tables of the concentration mill are conveyed by launder to either of two receiving tanks, which are provided with roller gates for discharging the greater part of the water as the tanks are filled. This overflowing water is conveyed by launder to a sand trap, which is a form of spitskaste. Any sands escaping from the receiving tanks will be settled and pumped back into the same tanks by a centrifugal sand pump. After receiving tanks are filled with sands a vacuum is created beneath the filter bottoms provided on these tanks, so as thoroughly to drain off the water contained. This water is pumped to the thickening



FRONT ELEVATION OF BULLFROG REDUCTION AND WATER COMPANY'S MILL

tank mentioned later on. After sands in receiving tanks have thus been drained, they are excavated by the Blaisdell excavating machine and carried by a belt conveyer running beneath these tanks to a cross conveyer, delivering the sands to another conveyer running past the leaching tanks, which are on a line with the receiving tanks. From this conveyer the sands are discharged by an automatic tripper to the Blaisdell distributing machine, with which the excavator is equipped; this permits any one of the five leaching tanks to be filled with the sand from the receiving tanks. These five leaching tanks are of the same size as the receiving tanks, 36 ft. diameter by 6½ ft. deep. The sand in these leaching tanks is then treated with the cyanide solution and the gold solution filtered off and conveyed by pipes to two tanks. The filters on the bottom of the leaching tanks are also provided with a vacuum pump for thoroughly draining the solution after washing. The gold solution is then run through zinc boxes and thence to the sump tanks and returned to the solution re-standardizing tanks, two of which are provided, 20 ft. diameter by 10 ft. deep. The extracted sands, after having been dried by the vacuum as far as possible, are excavated and discharged onto the same belt conveyer by which they came. From this they are taken by the same cross conveyer to the same conveyer, traversing the entire length of the tanks as before, and discharged onto the stacking conveyer and thence to the dump.

TREATMENT OF SLIMES

The slimes from the vanners, together with the overflow from the receiving tanks, which contains some slime, is allowed to pass through the sand trap before mentioned, to settle any sands which may be contained. The overflow from this trap is then pumped by a 4-in. centrifugal sand pump into one of two thickening cones, these being 20 ft. diameter by 18 ft. high, with cone bottoms; they are provided with launders around the top, into which will flow the clear water, this water being returned by a triplex pump to the main water-storage tanks. The slime from the apex of these cones is drawn off as thick as desired by an upwardly extending, adjustable connection, and re-conveyed by a launder to any one of four slime tanks, 28 ft. diameter by 16 ft. deep, in which tanks the slime is treated with cyanide solution and agitated by a four-arm revolving agitator of the Blaisdell type. The slime, after treatment with cyanide, is settled and decanted, the decanted solution running into an intermediate tank, 30 ft. diameter by 8 ft. deep, where it is further allowed to settle, and then decanted and run through the zinc boxes. The slime from the four slime-agitating tanks is pumped by a 6-in. centrifugal pump into the Butters filter. After filtering and washing in this, the gold solution is taken to a sump tank and thence to zinc boxes. A separate sump tank is

provided for receiving the solution from these zinc boxes, from which it is pumped into any one of the slime-agitating tanks requiring it. The cake from the Butters filter is washed and finally sluiced out to the dump. A clean-up room is provided for the gold precipitate, fitted with lead-lined acid tank, sand filter, receiving tank and sump tank, and a modern double-muffle furnace, with a double melting furnace annexed.

The plant was designed by the Traylor Engineering Company, New York.

The Geological Survey of Canada

SPECIAL CORRESPONDENCE

Owing to the growth of the mining industry of Canada in recent years, unusual interest attaches to the "Summary Report" of the Geological Survey for 1906, a volume of 206 pages, which has just been published. It deals with the latest results of mineralogical research by the officials of the Survey, and records some important advances in the information available as to the mineral resources of Canada. In the introductory pages Director A. P. Low calls attention to the need of more liberal appropriations for the work of the Survey, pointing out that while the value of the mineral production of Canada has risen from \$10,221,000 in 1886, to \$68,574,000 in 1905, the sums devoted by the Dominion government in aid of the mining and allied industries have only increased in the same period from \$115,053 to \$173,555. In the meantime there has been an enormous expansion of the area of settlement and industrial development, and the extension of mineral discoveries is increasing at such a rate that with the limited force at disposal it is only with the greatest difficulty that an intelligent track can be kept of them. A brief general summary of the mining industry in 1906 is presented, noting the increased activity prevalent in most of its branches, followed by reports of the work of the 24 field parties sent out during the year. This was mainly confined to economic subjects, being carried on either in mining districts developed or under development, or in districts along proposed routes of new railways. No parties were sent into the far north, or regions difficult of access, the chief idea being that exploratory work should advance from the known into the unknown. A few of the more important results of these investigations may be briefly noted.

The party in charge of R. G. McConnell was engaged in measuring the volume and estimating the values of the high-grade gravels in the Klondike district, the results of which will be published later. They report that dredging where the gravels are thawed presents few difficulties, the gravels being uniform in size and including few boulders. Hydraulic miners have had to depend so far on a small in-

termittent supply of local gravity water, or on water pumped up from the creeks, and consequently no large plants are in operation. The Yukon Consolidated Company has undertaken the construction of a ditch and pipe-line to bring water from a point on Twelvemile river to its camp. The line is 58 miles in length, with a capacity of over 5000 miners' inches. With 25 miles or more of proved dredging ground in the valley flats and tens of millions of cubic yards of low-grade, but still workable, gravels, on the benches, profitable mining is assured on the Klondike creeks for many years.

Explorations were carried on in a portion of the Yukon south of Whitehorse by D. D. Cairnes. Here a variety of valuable economic mineral deposits have been found, and quartz mining is progressing rapidly. Considerable work is being done on the Windy Arm silver and gold properties with good results. Quartz carrying free gold and telluride minerals was found between the Watson and Wheaton rivers. The first claim, the Gold Reef, was staked June 25 on Gold hill, 15 to 20 miles southwest from Robinson siding, and within 90 days over 700 claims had been located. In addition to occasional assays running as high as \$300 or over, a number of fairly average assays—from \$20 to \$60—were obtained in this section, but with the exception of a small amount of work done on the Gold Reef, no attempt has been made to prove to what extent the veins are mineralized, or what values they really carry. Taking into consideration the large quantity of mineralized quartz in this part of the country, and the small amount of prospecting done, the results appear encouraging, as there are certainly some rich ores in this section. Seams of anthracite coal are located in an area known as the Whitehorse Coal and outcrop 12 or 14 miles in a southwest direction from Dugdale siding. The general strike of the measures, which are quite regular, and were traced for over 12 miles, is about north 74 deg. west. The seams measured were 9 ft. 8 in., 10 ft. 4 in., and 2 ft. 6 in., respectively. The samples run high in ash, but they were from the surface and with depth the ash will be considerably less. At Tantalus mine, on the west side of Lewes river, about 190 miles down the river from Whitehorse, the coal outcrops on the banks. Most of the river steamers burn this coal, of which about 7000 tons were loaded last season. Three workable seams are opened up, the coal being worked by the stall-and-pillar system from two tunnels. The measures are regular, and can be traced for over 20 miles down Norden-skiold river to the south, and over 10 miles to the north, showing that there is an enormous amount of coal in this district. Only coal near the river is at present of economic value. Samples show the coal to be bituminous, yielding an average of about 75 per cent. of firm coherent

coke. At Tantalus butte, across the river from the Tantalus mine, the same measures again outcrop. A considerable amount has been shipped from Five Fingers mine, about 8 miles north of the Tantalus. Just to the north of the Windy Arm and Watson and Wheaton river properties are the rich and extensive copper properties west of Whitehorse. The Pueblo, in particular, after the season's development, presents an enormous surface showing of copper ores. A Whitehorse smelter is a probability in the near future.

The work of mapping the Rocky mountain coal districts was continued by D. B. Dowling, whose efforts resulted in the discovery of a large coalfield, extending northward from the Saskatchewan to past the Brazean river. The beginning of this field, south of the Saskatchewan, occupies but a small triangle opposite Bighorn range. The top beds only are exposed, but a few coal seams were found. Across, on the north side of the Saskatchewan, the whole set of measures is raised much higher, and all the formation can be got at either on the western slopes of the range or in the gorge of Bighorn creek, a tributary from the west behind Bighorn range. The tops of the measures are exposed at the falls, and many seams can be seen in this cañon. A 16-ft. seam was found, samples from the first exposure of which showed moisture 2.50; volatile combustible matter 27.10; fixed carbon, 64.00; ash, 6.40. This gives a ratio of volatile to fixed carbon of 2.36, placing it at about the grade of Blaremore and Frank coal.

A. E. Barlow was engaged in tracing eastward into Quebec province the formations containing the silver-cobalt-nickel ores now being mined in the Cobalt area. The area examined was confined to the region lying immediately east of Lake Timiskaming, including the townships of Guigues, Baby, Duhamel, Laverlochere and Fabre, and some unsurveyed territory to the east of those municipalities. This area was found to be geologically practically identical with the country on the Ontario side. On the Quebec side, however, large tracts were found to be overlaid by the quartzite and conglomerate of the Upper Huronian; or clay drift often continuous for miles with comparatively small outcrops of the underlying rocks. No mineral discoveries of significance were made.

An investigation of the oil and gas fields of Alberta and southern British Columbia by T. Denis disclosed the fact that the work prosecuted by numerous companies, in the hope of finding oil in paying quantities, had not been attended with results commensurate with the outlay. Nevertheless operations were being steadily carried forward under the stimulus of encouraging indications.

Sections of the route of the Transcontinental Railway, between Lake Nipigon and Lac Seul, and from Lake Abitibi eastward, were explored by W. H. Collins and

W. J. Wilson, respectively. The western portion of the first named section was reported as auriferous and iron bearing and worth the attention of prospectors. Mr. Wilson found molybdenite on an island in Seals Home lake and copper pyrites on the Harricanaw river.

The delimitation of the coal area in the Telkwa valley, British Columbia, undertaken by W. W. Leach, was found attended with much difficulty owing to the amount of faulting and folding in the coal measures.

Charles Camsell, who was engaged in survey work in the Similkameen district, in British Columbia, notes especially the large areas of low-grade ores abounding in this region, which may shortly be mined to advantage.

R. W. Brock, who during the season completed his examination of the mines in the Rossland district, in British Columbia, reports that while exact figures of production cannot be obtained, as nearly as can be computed Rossland has produced up to Jan. 1, 1906, a total of 2,247,295 tons of ore, containing 1,240,331 oz. gold, 1,723,249 oz. silver, and 60,753,330 lb. copper, valued at \$34,879,239. The year's production will be seriously affected by the slackening of shipments from the Centre Star, while alterations were in progress, and by the shortage of coke at the smelters, occasioned by the strike of coal miners at Fernie.

Hoisting in Small Zinc Mines in Wisconsin

BY GEO. S. BROOKS*

The operator, in considering the equipment of comparatively small zinc properties, finds no little difference of opinion as regards the proper system to be employed for the transportation of ore from the working faces to the mill hopper. To one who has had an opportunity of closely observing the restrictions placed upon this choice, there appear to be two governing factors which should largely control the adoption of either the cage or the tub. The first, and perhaps more important in the judgment of the average manager, is that of a minimum initial investment in mine equipment; the second, and of by far more intrinsic weight, is the general character of the formation to be attacked.

It must be at once apparent to those who are at all familiar with mining of this class that a separation of the hoisting and tramping systems is nearly impossible, and that their close relation to one another renders the consideration of either individually unwise.

PREVAILING CONDITIONS

As the Wisconsin deposits are gradually becoming better known, their general characteristics are influencing the methods

*Mining engineer, Platteville, Wis.

of breaking the ground. Intelligent churn-drill exploration enables the operator to plan a systematic opening up of his orebody, and it is upon this general system to be followed that the transportation facilities are in no small measure dependent. For example, in properties where the blende is known to lie in the familiar flats of considerable area, it is doubtful if any carrier will be found superior to the ordinary tub, and its accompanying platform truck. For a reasonable length of tramping, this system lends itself readily to the working of wide stoping faces, where there is ample room for sorting and shoveling the broken ore.

On the other hand, where the greater portion of the deposit is expected to be found upon steeply inclined pitches, with only minor "terrace" flats, economy can only be secured from handling the ore at the base of the pitch. It is at once obvious that, where the foot and hanging walls impose such limitations upon the width of the haulage way, it would be impossible to load the ore into many small carriers without congestion. It is, at the same time, true that, in order to accomplish anything like the requisite tonnage, the capacity of each tramping unit must be increased. These conditions are admirably met by the car.

With these pitch stopes, the ore is sorted and shoveled into light, portable, pocket chutes, which are set up temporarily near the face, roughly parallel to the dip of the orebody. These extend down to nearly the track level, and under them the cars are run and filled.

MERITS OF CAGE-CAR AND TUB SYSTEMS

My connection with two mines, one of the flat and one of the pitch type, has enabled me to make some detailed observations as to the relative merits of the cage-car and tub systems, and I am firmly convinced that each has a domain of utility. Naturally the cost of shoveling and tramping on the pitch stopes was a few cents in excess of that of the same service on the flats. Unfortunately, the item of shoveling and tramping is not yet subdivided and, as a result, the ratio of the two tramping costs is not known.

One point which has been emphasized by experience is that the car system responds more readily to a temporary forcing than is possible with the tub. This clearly arises from the fact that the hoisting units of the cage are nearly double those of the tub, and, with the frequent contingencies arising from delays or break-downs below, it is a common occurrence for the mill hopper, which is seldom of more than 75 tons' capacity, to become empty. To prevent a shut-down in the mill, it is necessary to crowd the hoisting capacity to its limit for a short time, and at these periods the cage and car appear to excellent advantage.

It often occurs that the working faces are from 500 to 1000 ft. from the shaft, so

that the time consumed in the trip to and from the shaft is 4 or 5 min. With these conditions, tramping costs with tub carriers are about double those of the car system. This would indicate that, were the operator assured of any such length of tramping, the cage and car should be adopted regardless of the form of the deposit. There are at present hardly any mines which are hoisting from more than one shaft, so that, as soon as the exploration and development work has established the extent of the orebody and the position of the shaft is definitely located, the possibilities of any such long hauls below can be predicted.

Aside from the hoisting of ore, there can be small doubt that the cage offers many advantages in the handling of men, machinery and supplies, over the tub.

COMPARISON OF COSTS

The weight of a cubic foot of mine-run in Wisconsin varies enough to render any constant figure decidedly unreliable. The proper basis for computation should, therefore, be on volume. Naturally, the weight per cu.ft. is dependent upon the percentage of mineral, as well as upon the percentage of powder used in breaking the ore. I have found in my experience that the range in a dirt which has very nearly the same mineral content may be between 92 and 108 pounds per cu.ft. In this case, the variation was entirely due to the change in percentage of dynamite from 30 to 40 per cent.

The ordinary tubs have a nominal capacity of from 600 to 1000 lb., the latter being the more common. These are 28 in. in diameter by 30 in. deep, and therefore have a capacity of 10.7 cu.ft. The cars are built with a rather narrow gage, and have a capacity of 18.5 cu.ft.

Below is given the hoisting investment at mines A and B, A being equipped with cars and a cage, while B has the customary 1000-lb. tubs of this district.

EQUIPMENT, MINE A

Derrick and foundations, including cable and sheave.....	\$400.00
Engine Housing.....	50.00
7x10 Duplex geared hoisting engine.....	700.00
5 mine cars.....	125.00
1 cage.....	60.00

Total\$1335.00

INTEREST AND DEPRECIATION, MINE A

Interest on \$1335, 6 per cent.....	\$80.10
Depreciation on \$1335, 18 per cent..	240.30

Total for 300 working days...\$320.40

EQUIPMENT, MINE B

Derrick inclosed, including cable and sheave.....	\$480.00
7x7 Duplex geared hoisting engine..	470.00
5 tubs and trucks.....	110.00

Total\$1060.00

INTEREST AND DEPRECIATION, MINE B

Interest on \$1060, 6 per cent.....	\$63.60
Depreciation on \$1060, 18 per cent..	190.80

Total for 300 working days...\$254.40

At A the hoist is set up on the ground about 40 ft. back from the shaft, and the engine is of the horizontal type. At B the upright 7x7-in. engine is stationed

near the derrick top about 10 ft. below the sheave, and located so that the engineer may handle the throttle with one hand, while with the other he can attend to the dumping of the tubs.

OPERATING COSTS

The following operating costs are the result of monthly averages. In both cases, for the sake of comparison, the same charge is made per horse-power per hour, although in reality there was some 20 per cent. difference owing to the excessive line condensation at the B shaft. Neither schedule includes cost of administration. The approximate horse-power is computed from the following formula, to which an additional 0.25 h.p. is added for friction and inertia:

$$H.P. = \frac{\text{gross weight in lb.}}{33,000} \times \text{speed in feet per min.}$$

It is given as follows: A—Mine run, 1870 lb.; cage, 400 lb.; cable, 108 lb.; car, 300 lb.; total, 2678 lb.

The hoisting speed per minute is 360 ft. Then

$$H.P. = \frac{2678}{33,000} \times 360 + 0.25 \text{ H.P.} = 36 \text{ H.P.}$$

The same calculation applied to the case at mine B gives mine run, 980 lb.; tubs, 175 lb.; cable, 102 lb.; total, 1257 lb.; hoisting speed per minute, 295 ft.

$$H.P. = \frac{1257}{33,000} \times 295 + 0.25 \text{ H.P.} = 14 \text{ H.P.}$$

The actual hoisting performance per day of 9 hours at A is 120 tons, and at B 100 tons. With forcing, A has handled 600 cu.ft. per hour, while at B 450 cu.ft. is about the best that can be done.

HOISTING EXPENSE, 9-HOUR SHIFT

Mine A	
One hoisting engineer.....	\$2.50
One lander.....	2.25
36 hr. for 5 hr. at 1c. per h.p. per hour	1.80
Interest and depreciation.....	1.06
Repairs.....	0.70
Total.....	\$8.31

Ore hoisted.....	2590 cu.ft.
Cost per cu.ft.....	0.0032
Cost per ton approximately.....	0.06

Mine B	
One hoisting engineer.....	\$2.50
14 h.p. for 5 hr. at 1c. per h.p. per hour	0.70
Interest and depreciation.....	0.85
Repairs.....	0.70
Total.....	\$4.75

Ore hoisted.....	2140 cu.ft.
Cost per cu.ft.....	0.0022
Cost per ton approximately.....	0.044

Both of these cost accounts show what is possible when a steady output is made for a month. The average hoisting expense, month in and month out, has been a few cents above this.

It appears from the comparative figures that the tub is considerably the better on hoisting alone, and until the workings become extended to such a distance from the shaft as to materially increase the tramping costs, it will show a smaller operating expense in working flats. The initial investments in reality show only a difference of \$275, which amount deserves little consideration in the matter of a suitable hoisting and tramping equipment.

Production of Gas, Coke, Tar, and Ammonia

According to a supplementary report on the production of gas, coke, tar and ammonia at gas works and in retort coke ovens during 1905 by Edward W. Parker, of the U. S. Geological Survey, the total production of gas, coke, tar and ammonia in 1905 was as follows: 40,454,215,132 cu.ft. of gas (not including that lost or wasted), 5,751,378 short tons of coke, 80,022,043 gal. of tar, 46,986,268 gal. of ammonia liquor (equivalent to 22,455,857 lb. of anhydrous ammonia), and 38,663,682 lb. of ammonia sulphate; against 34,814,991,273 cu.ft. of gas, 4,716,049 short tons of coke, 69,498,085 gal. of tar, 52,220,484 gal. of ammonia liquor (equivalent to 19,750,032 lb. of anhydrous ammonia), and 28,225,210 lb. of ammonia sulphate in 1904. The total value of all these products in 1905 was \$56,684,972, against \$51,157,736 in 1904.

Returns from 477 oil and water-gas producing companies show that the total production of water gas in 1905 was 82,959,228,504 cu.ft. Of this quantity 5,547,203,913 cu.ft., or 6.7 per cent., were lost by leakage, etc., leaving 77,412,024,591 cu.ft. as the net production obtained and sold. As the quantity of gas made and sold at coal-gas and by-product coke-oven works was 40,454,215,132 cu. ft., it appears that the consumption of water gas and gas made from crude oil was nearly twice as much as that made from coal. It also appears that while the average price of coal gas in 1905 was 81.4c. per 1000 cu.ft., that of oil and water gas combined was a fraction of a cent in excess of \$1 per 1000 cu.ft. Still further comparison shows that, whereas 66 per cent. of the production of coal gas was sold as illuminating gas, 77 per cent. of the combined production of oil and water gas was used for this purpose.

Lake Freight Rates

The yearly tabulation of freight rates on the lakes made by the Cleveland Marine Review gives the following rates on iron ore to lake ports, in cents per gross ton:

From:	1905.		1906.	
	Wild.	Contract.	Wild.	Contract.
Escanaba.....	61.00	60.00	60.00	60.00
Marquette....	70.00	70.00	70.00	70.00
Duluth.....	77.00	75.00	75.55	75.00

The correspondence between the wild and contract rates last season was rather close. Rates on coal were as follows, in cents per net ton, soft coal being from Ohio ports and anthracite from Buffalo:

To:	Anthracite.		Bituminous.	
	1905.	1906.	1905.	1906.
Milwaukee.....	44.88	45.38	46.53	46.05
Chicago.....	44.58	46.20	.....	.....
Escanaba.....	.....	.....	41.53	41.97
Duluth.....	33.06	35.19	33.50	34.85

The lower rates to Duluth are explained by the number of ore boats going up light, unless they are able to secure coal cargoes.

DIAMOND DRILLS

Their Utility for Underground Exploration

BY JAMES HUMES *

The writer has charge of a mine that is now 1200 ft. in depth, and there is only one working shaft on the property, equipped with a geared engine and a single-deck cage. Our time was limited, and we found it necessary recently to do all the prospecting possible in a short time. For this purpose we bought a small diamond drill, selecting a "Sullivan E" 400 ft. capacity.

The shaft is a vertical one and was started on the footwall of the vein, which might properly be called a zone between two fault fissures 150 ft. apart, and has a dip away from the shaft of about 77 deg. to the north, so that when the shaft reached the 1200-ft. level, it was a considerable distance from the vein.

The previous management had followed the old custom of opening a level at each

order to help out the boilers we made a simple water heater to utilize the many units of heat escaping with the exhaust steam. This solved the boiler problem and we were able to sink the shaft to the 1200-ft. level, and to run a drift also.

We opened a drift at the 800-ft. level and also at the 1200-ft. level. It was at the 800-ft. level where we found the diamond drill of special advantage. As soon as we had the station cut we started a hole for the hanging wall of the vein. This hole was drilled 260 ft.; the bottom was far enough in the country rock to assure us that we had passed through the vein, and that there was no ore on the hanging wall at that point. This work was executed in a very few days, and while the drill was at work there we had the miners doing some very needful repair work

drifts a safe distance, about 100 ft., we started the diamond drill, putting in cross-cut holes every 50 ft. on the course of the vein. This drill work did not interfere with the drifting in the least. When putting in the air line for the use of the rock drills, we put in a tee every 70 ft. or so, and in this way the diamond-drill men could connect to the air line in a very short time, and it very seldom required the cutting away of rock to give room for the operation of the machine.

This particular machine is mounted on two columns, which are similar to rock-drill shaft bars, except that they are connected at the top and bottom by cross bars. On the top bar is a small worm-gear hand hoist for raising or lowering the machine, which is thus moved out of the line of the hole when putting the rods in or out. The rods are in 5-ft. lengths, so that a distance of 6 ft. between walls will give ample room. The columns can be set up within 6 in. of the rails; the machine is then raised until there is room for the loaded mine car to pass under it, and if there is a space of 3 ft. in front of the columns, breast high, that is all that is required.

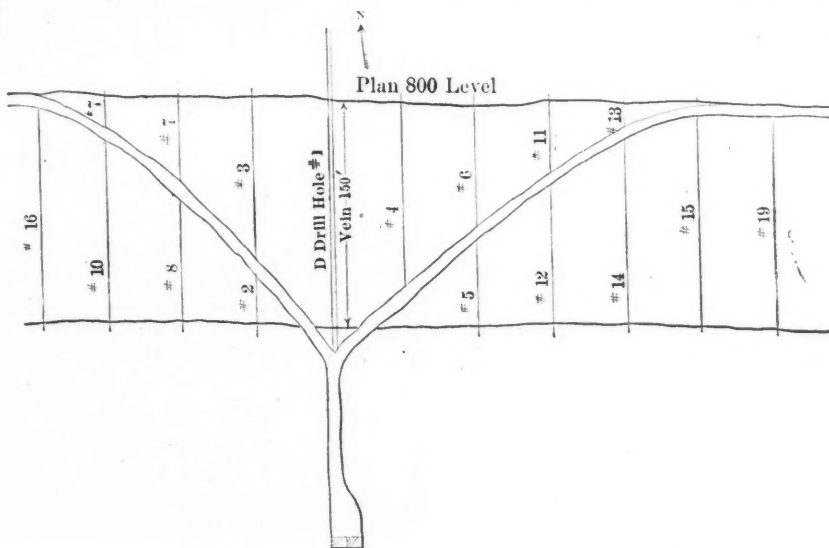
In the manner described we drilled about 4000 ft. of crosscut holes. Think what it would have cost to run as many feet as that in crosscuts, hoisting the broken rock, which in our case we could not have done. It certainly would have cost more than it did to operate this machine. The reader will notice that all holes were horizontal, and at right angles to the strike of the vein. Never allow anyone to persuade you to drill a prospecting hole with the dip or strike. There are a few cases in which that would be excusable. Of these we may have something to say in the future.

DRILL OPERATORS AND RESULTS

There is another point that deserves particular stress, and that is, that whoever the person may be who has the supervision of diamond-drill operations, he must never allow the drill operators to think that the management has not the greatest interest in the results of their work. Examine the core each day, inquire as to which of the operators make the highest percentage of core. Your inquiries will reach the proper ears and will act as an incentive to do better. Do not allow the operator to use his discretion as to what kinds of rock he may core. Have him core everything, and insist upon it.

In many cases we found ore where we least expected it, and only by adhering to the system outlined could we get results.

I have in mind a remark made to me by the manager of one of the largest copper mines in the world when beginning work of this class: "Now, Jimmy," he said, "we are not looking for small things; we want to know where the large bodies of ore are." That remark would



PLAN OF WORKINGS SHOWING DIRECTION OF DRILL HOLES

100 ft. in depth. In the work of opening up the first level the best ore was found on the hanging wall. After this a crosscut was run on each of the other levels directly to the hanging wall, thence turning the drifts, along the wall right and left. In addition to the drifts each level had a number of crosscuts amounting in all to about 2000 ft.

THE PLAN ADOPTED

When the writer took charge of this property the 600 was the lowest level, and the owners were desirous of sinking much deeper, but they had been informed that they had not boiler or compressor capacity enough to go any deeper, which appeared to be the case. We knew that to sink and drift at the same time we would very likely congest our hoisting rig. In

elsewhere. The advantage which we gained from the use of the drill in this one hole was that we obviated the necessity of running a long crosscut to the hanging wall, thus saving at least a month's time, and the fixed expenditures that keep pace with time, in this case about \$1700.

We started our drifts right and left from the point where we had started the drill hole; these drifts were each advanced at an angle approximately 45 deg. to the strike; this angle located the drifts in an easy curve, and facilitated the handling of timbers, rails and pipe, but our main object was to push along the strike of the vein, and also to get to the hanging wall as soon as possible.

DISTRIBUTION OF THE HOLES

As soon as the miners advanced the

*Mining engineer, Basin, Mont.

be enough to make the results of the average ease-loving drill operator nil. I happened to know that if a crosscut were to be run on any one of those holes, and anything appeared that had not been reported, it would be to the everlasting discredit of that particular operator. But, of course, the ordinary tramp drill operator does not care for honor or credit. He cannot be expected to exercise care unless compelled to do so.

The Hurricane Valve for Piston-inlet Air Compressors

BY FRANK RICHARDS

The piston-inlet device for air compressors has been extensively and successfully used for half a generation, yet there are many engineers who are not familiar with its principle and mode of operation. Fig. 1 is a section of an air-compressor cylinder with piston inlet, one of the inlet valves being

grooves are cast in the piston and are trued and finished in the lathe.

The body of the inlet valve rests in the annular groove with a full bearing surface and an easy, sliding fit, but with the outside cut away to leave a free passage for the air when the valve is opened. The valve has lips which overlap the annular groove both inside and outside and so close the passage. The outside of the valve body has thickened ribs or projections. In each of these is an elongated hole, through which passes a taper pin. The holes through which the taper pins pass in the valve are slightly larger than the pins and are elongated toward the interior of the piston to an additional length equal to the required lift or opening of the valve.

In Fig. 1 the piston is moving toward the left, the piston-inlet valve on the left side of the piston being in the closed position, while the valve on the right-hand side is open. Both valves retain their positions relative to the piston until the end

face, this ring overlapping each side of the annular opening in the piston, and a corresponding annular depression is turned in the cylinder head.

The details of the improvement embodied in the Hurricane valve are shown in Fig. 2. The essential change is in the valve itself. The annular openings in the face of the piston are carried close to the periphery, thus increasing the length and area. The passage is entirely unobstructed by the valve, and the valve allows the air to escape from the inner as well as the outer edge of the opening. The actual area of opening with piston-inlet valves of this type is from 10 to 12 per cent. of the piston area.

The valve is a thin annular plate of sufficient width to give a proper lap over the piston opening on both the inner and the

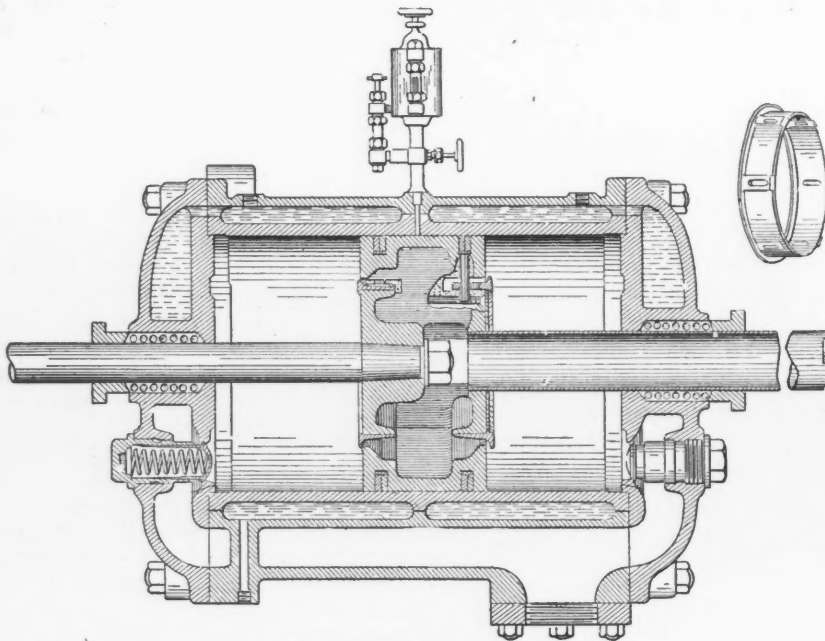


FIG. 1. AIR CYLINDER WITH PISTON INLET

shown separately. The entire air supply is taken into the body of the piston through the inlet pipe and passes through an annular passage on each side into the two ends of the cylinder. The function of the piston-inlet valves is to alternately close and open the annular openings in the piston.

The piston is unusually wide or thick, thus distributing the weight over about double the usual cylinder area, securing better lubrication and reducing the friction. This thickness of the piston provides a chamber for the air sufficiently large to permit it to move with freedom. The cutting of the annular grooves in the faces of the piston separates the periphery from the inner portions, the piston being cast with six or more radial webs which connect the parts. The annular

of the stroke, when the valve on the right-hand side of the piston is carried forward by its own momentum, closing the annular passage.

The indicator card from a piston-inlet compressor gives the highest practical indorsement of this device. It shows the cylinder full of air at or slightly above atmospheric pressure at the very beginning of the compression stroke. The explanation is simple enough. The column of air in the piston-inlet pipe has a momentum of its own, and when its rapid inflow is suddenly stopped, the entire column behind acts for the moment as a rammer.

The face of the piston on each side is flat and the inner surface of each cylinder head also is flat. The head of the valve is merely a flat ring against the piston

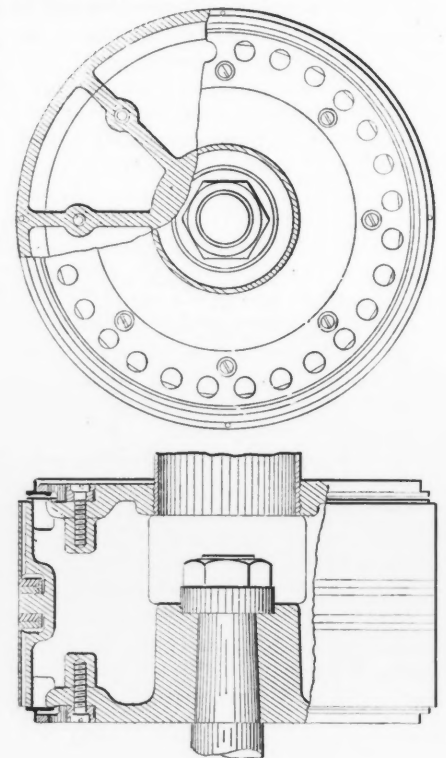


FIG. 2. PISTON WITH HURRICANE VALVE

outer edges, with a central stiffening and guiding rib. It is an unwelded, oil-treated ring of steel, turned and finely finished. The valve is guided and retained in position by a heavy steel ring fastened to the face of the piston by a number of screws. The ring has a number of holes around it, through which the air from the inner edge of the valve is delivered into the cylinder. These holes constitute the only addition to the clearance, the deficient outer corner of the piston when the valve is closed being made up for by an inwardly projecting lip on the cylinder head.

In regard to the recent activity in manganese mining in India, it is reported that no less than 32 licenses were issued in 1906 for manganese exploring and prospecting alone.

HANDLING THE COAL OUTPUT IN SOUTHERN ILLINOIS

The Successful Operation of a Combined Passenger and Coal Traffic Railway

BY E. J. WALLACE *

The Coal Belt Railway, in the southern Illinois coal field, is an example of how successfully a coal-traffic road can be operated as an interurban trolley line.

Constructed in 1902 by Frank P. Reed, an engineer of some note, it extends from Spillertown, two and one-half miles south, to Marion, the seat of Williamson county, thence in a northwesterly line to a point about eight miles from Marion, where it connects with the Carterville division, the main line continuing on to Herrin three miles north. The Carterville line is about the same distance west. Hourly service is given the three towns from 6 a.m. until 10 p.m.

Marion being the central point, five cars leave the public square between 6 and 7

conductors and motormen complete the force.

EQUIPMENT

The power-house for the line is situated three miles from Marion, within a few hundred feet of the Peabody Mine No. 3, and on the bank of a large pond, which furnishes a good supply of water. It is equipped with three Whitehead 60x18-in. return tubular boilers and one Wangler 60x18-in. boiler; one Erie City Tangye type, 200 h.p., 20x24-in. engine, and one Williams 225-h.p., 17x30-in. engine. The two generators are of the Edison bi-polar 550-volt, 175-kw. type. At the junction of the Carterville-Herrin line there is a storage-battery house of 240 cells complete. In addition there is a complete machine

TOTAL PRODUCTION

The largest mine on a Coal Belt connection is Peabody No. 3 with a record of 2570 tons in eight hours. The Chicago & Big Muddy Coal and Coke Company's mine No. 1 follows closely, while the smallest mine is Hampton, with about 40 tons per day.

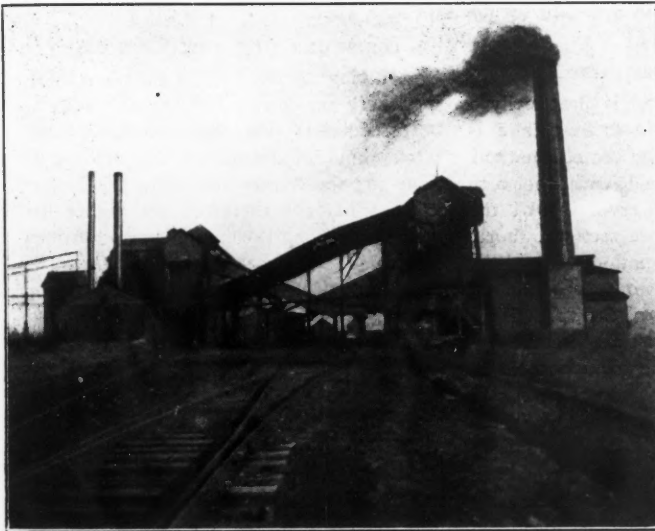
The average daily output for each of the fourteen mines is:

In the Marion district:

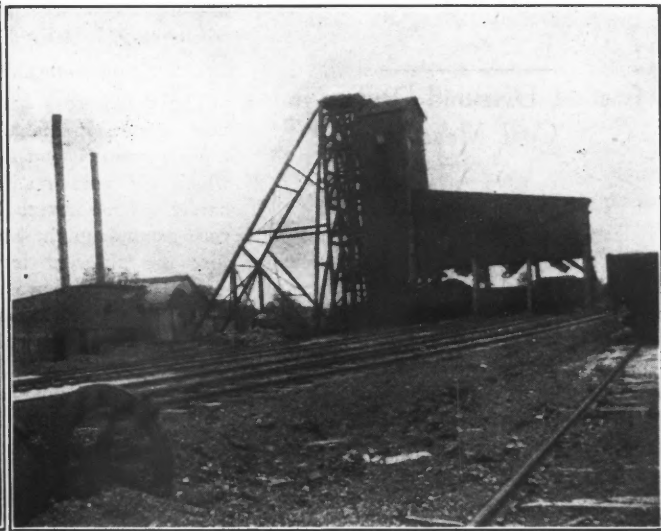
	Tons
Peabody Coal Co. No. 3.....	1800
Chicago & Big Muddy C. & C. Co....	1200
Carterville District.....	1000
Watson Coal No. 1.....	600
Watson Coal No. 2.....	250

In the Carterville-Herrin district there are:

	Tons
St. Louis Carterville Coal Co.....	600
Hemlock Coal Co.....	200
Carterville Mining Co. No. 1.....	700
Carterville Mining Co. No. 2.....	600
Carterville Mining Co. No. 3.....	700
Hampton Coal Co.....	40



PEABODY NO. 3 MINE—IRON TIPPLE AND COAL WASHER



"WHITE ASH" MINE OF THE CHICAGO & MARION COAL COMPANY

p.m., for the mines on the Carterville-Herrin divisions. The capacity of the cars is about 85 persons. A five-cent fare is charged, entitling the passenger to a ride of three miles. Nearly 2000 passengers ride daily, paying from one to three fares. Out of Marion, the railway furnishes transportation for the employees of five mines, a brick plant and a powder plant. It serves four mines out of Herrin and the same number out of Carterville, besides a machine shop and foundry.

On the Herrin-Carterville line there are four small villages, Fordville, Crenshaw, Pollard and Scotsboro. These with the exception of the first and last are mining settlements. There are twenty-one miles of track for electric service, with six passenger and two express cars, while twenty

*Fuel agent, Marion, Ill.

shop, with lathes, shapers, etc., where almost all the repairing is done.

At the time of construction there were three mines on the road; today there are fourteen, and several more planned. This addition calls for many miles of extensions, and recently the Johnson City group of mines have been connected, and a new extension north from Marion and east of Spillertown will tap another group. Connecting with this, a line is about to be built to the new mining town of Pittsburg, six and one-half miles east of Marion, where three mines are sinking.

During the past year five new operations with an aggregate of 1000 tons daily have been connected. At present only three mines depend entirely for transportation upon the Coal Belt, the remainder being connected with the Chicago & Eastern Illinois and Illinois Central railways.

In the Johnson City district:

	Tons
Carterville-Herrin Coal Co.....	600
Johnson City-Carterville Coal Co....	400
Johnson City Big Muddy Coal Co....	1000

This is a total daily production of 9480 tons, and requires about 316 cars, which are furnished by the Iron Mountain Railroad. Annually this would call for 94,800 cars, with a tonnage of 2,844,000 short tons. Within twelve months' time new connections will be made with other mines aggregating 3500 tons daily.

Two standard freight locomotives are in service, and a yardmaster and three train crews handle the coal traffic. The Coal Belt line connects with the Iron Mountain Railway at Herrin, and this latter road ships the greater part of the coal from the district southwest and far northwest. No fuel is hauled through

the streets of either of the three cities; tracks have been constructed around them for this traffic. The rolling stock owned by the Coal Belt company does not number over a dozen cars of all kinds, outside of the electrical department.

MERCHANDISE FREIGHT

Aside from the coal traffic, general merchandise freight is received and shipped from points on the road. For carload lots such as brick, powder and machinery, cars are set in. For small consignments, the express car picks them up and also delivers them. Marion being the shipping point for some few wholesale houses, a large business is secured in this way.

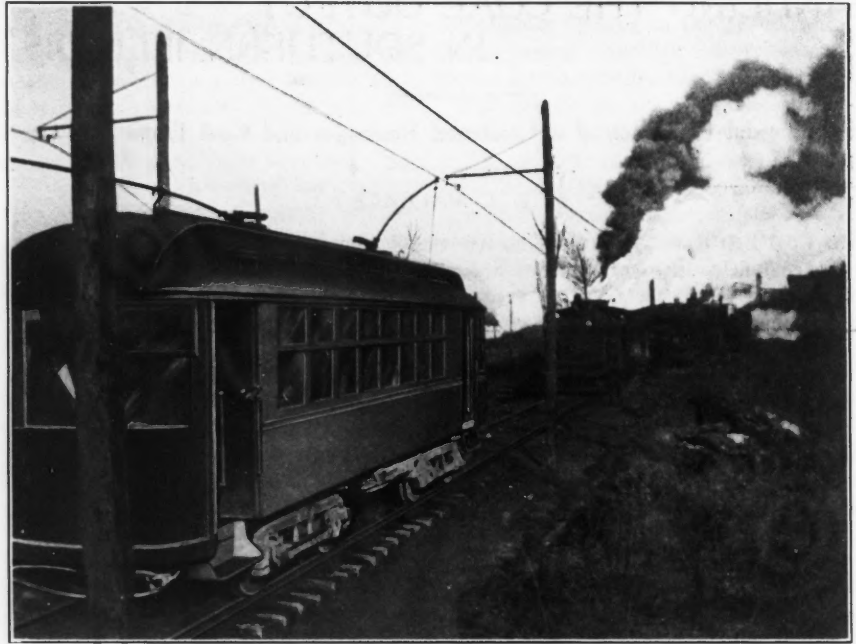
Considered as a whole, the Coal Belt Railway is a practical and financial success, and suggests a unique method for not only providing passenger transportation between the mines and adjacent towns but benefits the coal operators and affords the company a considerable freight revenue without any large additional cost. It is probable that many coal districts today would find such an electric system most beneficial. The accompanying illustrations show the general character and style of the mine tipples along the Coal Belt line.

Cost of Diamond Drilling in Coal Measures

BY W. F. MURRAY*

In exploring new ground, to determine whether or not there is coal or ore in workable quantities, there are several drills which may be used, but by far the cheapest, and most satisfactory one, is the diamond core drill using the double-core barrel. Diamond drills are probably used to a greater extent than any other drill on the market. They are operated by steam, electricity, hand and horse-power. The bits used are hollow and solid, the solid

*Engineer with Victor Fuel Company, Denver, Colorado.



COMBINATION BAGGAGE-PASSENGER ELECTRIC CAR AND LOCOMOTIVE

being used where a core is not wanted, and the hollow where an accurate section of the seam is desired.

THE DOUBLE-CORE BARREL

The double-core barrel is practically a new feature in diamond drilling, and is a great improvement over the old method, where the core revolved with the core barrel. The continual revolving of the core ground up the loose sections, therefore the different formations would be mixed, and there was no way of telling accurately the thickness of the vein. This occurred especially with coal, because being much softer than the formation above and below, it would be ground almost to powder. All this is eliminated with the double-core barrel because the core does not revolve, but remains stationary. The breaking of the core and the holding of it in the tubes is accomplished by means of a core-lifter, which consists of a ring so

constructed that it will grip the core near its base whenever the rods are raised.

CONDITIONS THAT INFLUENCE COST

In taking up the cost of diamond drilling, there are quite a number of things to be considered. The chief one, of course, is the kind of formation the drilling is done in; the harder the rock, the longer it takes to drill, therefore the higher the cost. In drilling through loose and broken formations, the wash water is liable to be lost, if the crevice cannot be stopped by casing, or seeding down bran, sawdust, cement, etc., in the hope that they will wash into the openings in the rock, and close them, thus forcing the water to the surface.

The distance water, coal, and supplies must be transported contributes greatly to the expense. Water is the most important item in diamond drilling; without it, the work must be suspended. Where



WOOD TIPPLE AT MINE NO. 7, BIG MUDDY COAL AND IRON COMPANY



1000-TON, WOOD TIPPLE, CARTEVILLE MINING COMPANY

water is scarce, and the distance that it must be hauled is considerable, it is a good plan to dig a pit, lining it with cement, and again use the waste water from the drill.

There are usually five or six men to a drill outfit. These include the day driller, assistant night driller, assistant, teamster and cook. The day driller is usually foreman of the outfit, having charge of the other men; he keeps the records, sets diamonds, buys supplies, etc.

AVERAGE COST OF ACTUAL OPERATIONS

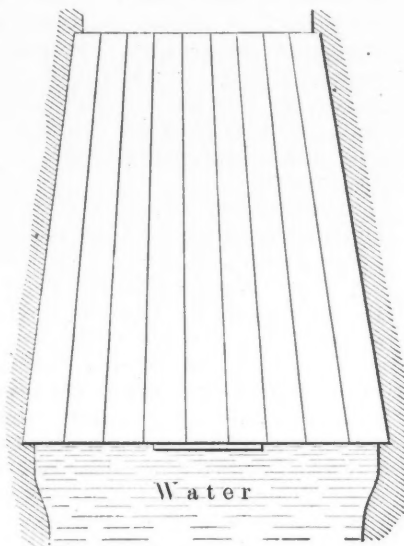
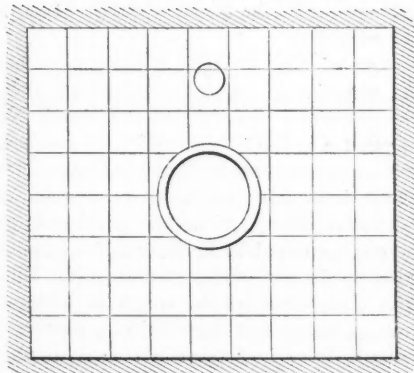
The average cost of diamond drilling in three separated districts in Colorado is shown in the following table. Column 1 is the average of 9 holes, which reached a total depth of 4736 ft. Column 2 is based on a record of 7 holes, reaching a total depth of 3040 ft. The last column is formed from data on 3 holes, which reached a depth of 1767 ft. The strata drilled through were formed largely of a compact sandstone, with layers of clay and shale:

	(1)	(2)	(3)
Foreman.....	\$0.070	\$0.068	\$0.180
Labor.....	1.150	0.814	1.700
Camp Acct.....	0.540	0.350	0.545
Supplies.....	0.080	0.021	0.128
Repairs.....	0.190	0.125	0.170
Carbon.....	0.866	0.221	0.650
Fuel.....	0.020	0.050	0.210
	\$2.917 per ft.	\$1.651 per ft.	\$2.583 per ft.

Wooden Dams in Coal Mines

BY RICHARD LEE

It is often necessary in coal mining to isolate a portion of the workings which is to become filled with water. In such cases, the quantity and head of the water to be shut in is often so great that the necessary dam must be built capable of withstanding a heavy pressure. Masonry stoppings of the arched type, with the convex side facing the pressure, are generally used; however, such stoppings will crush and break if movement takes place in the surrounding strata, and for this reason some mine managers advocate the con-



WOODEN DAM, ELEVATION AND PLAN

struction of wooden dams. A stopping of this latter type may be built of well seasoned timbers 10 ft. long and tapering from 12 in. square at the large end to 8 in. square at the small end.

After selecting a proper place for erecting the dam, the entry is carefully shaped by pick work to suit the taper of the blocks. No firing of shots should be permitted, as this latter method might frac-

ture the sides of the entry and render the entire construction faulty.

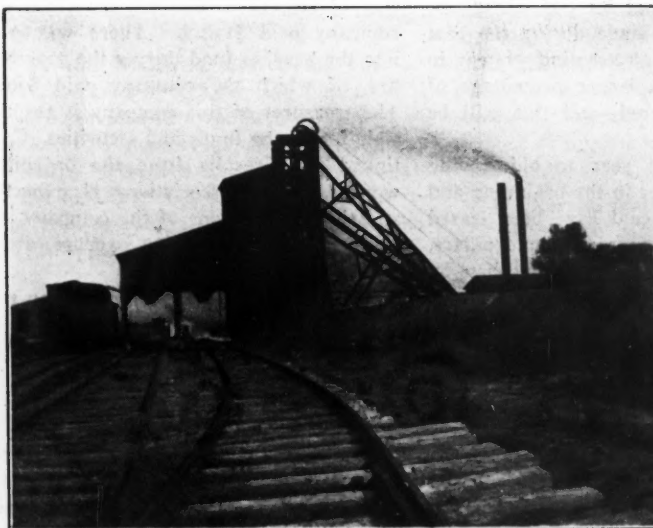
The place in the entry where the dam is to be located would be 10 ft. in length; the larger end, which would be in contact with the water, and consequently receive the pressure, would be 9 ft. wide and 8 ft. high. This would mean that the smaller end of this taper cut would be 6 ft. wide and 5 ft. 4 in. high; the entire dam therefore would require 72 blocks (nine blocks for its width and eight for its height; see Fig. 1.) The timbers should all be prepared and fitted on the surface before being erected underground. In most cases it is necessary to provide a small hole at the top for fresh air to pass through, and another larger hole for the workmen to get through after the building is completed; these holes are carefully closed with key, or taper plugs, when the construction is finished.

A dam of this sort has the advantage of being more flexible than a masonry stopping, and since the wooden blocks swell when in contact with the water, the dam becomes tighter after being put in use.

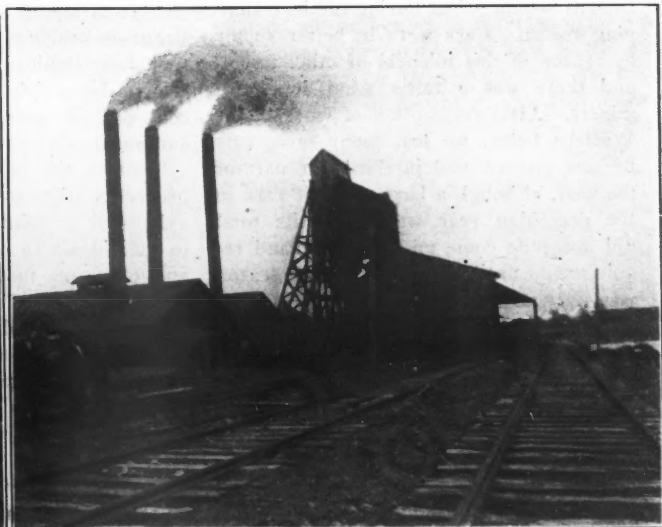
Quarrying Ice

A new industry of Switzerland consists of utilizing the glaciers by quarrying ice and transporting it to large cities remote from the Alps. Large blocks of ice are removed by blasting, using black powder for the purpose, and these are transported down the mountain sides in ice-slides or V-shaped troughs. To prevent excessive speed the chutes are constructed with many curves, which act as brakes, and the ice blocks reach the railroad in good condition and are loaded into specially refrigerated cars. The construction of the slides required much engineering skill and ingenuity.

At the Berlin School of Mines there are 213 students, at Clausthal 149 students, and at Freiberg 427 students.



WOOD TIPPLE AT DALE MINE, NEAR HERRIN



1500-TON WOOD TIPPLE, CARTERVILLE DISTRICT COAL COMPANY

Pittsburg Coal Company

This company is a consolidation of a number of companies in the Pittsburg district in Pennsylvania, and is the largest coal operator in this country. Its report is for the year 1906. Its capital account shows \$32,000,000 common stock; \$32,000,000 preferred stock; \$23,261,000 first-mortgage bonds; \$158,125 collateral bonds; \$1,975,248 bonds of subsidiary companies.

The income account for the year is as follows:

Net earnings from operation.....	\$5,297,123
Depletion of coal lands.....	\$ 743,020
Depreciation of plant.....	1,194,094
Interest on bonds.....	1,167,241
Total charges.....	\$3,104,355
Surplus for the year.....	\$2,192,768
Balance from 1905.....	1,896,443
Total undivided earnings.....	\$4,089,211

The surplus of cash assets over liabilities, as of Dec. 31 last, was \$1,606,146, which is the working capital of the company.

The production and sales of coal and coke were as follows:

	1905.	1906.	Changes.
Pittsburg Dis.....	14,084,682	17,628,396	I. 3,543,714
Hocking Dis.....	1,371,620	1,415,920	I. 44,300
Total coal.....	15,456,302	19,044,316	I. 3,588,014
Coke made.....	339,490	429,076	I. 89,586

The coal given above does not include that used in making coke; this would add about 640,000 tons to the quantity mined.

The report says: "In the beginning of the year conditions were unusual owing to uncertain miners' wage settlement; the consumers were all storing coal, cars were plentiful, men were working fairly well, and the output of the mines good. After the mining scale had been arranged, covering a term of two years, the mines in the Pittsburg district resumed work before those of other operators in this field, and the still longer idleness in the mines in the Western fields made a somewhat increased demand for our product; the greatest benefit realized was the maintenance of selling prices during the lake shipping season. Cars were in better supply by reason of this idleness of other mines, and there was a fairly good supply of miners. After resumption of work in the Western fields, we lost many men, cars became scarcer, and in the latter part of the year, although a larger output than in the preceding year was made, its total did not quite come up to our demand requirements until the lake shipping season was over.

"There were operated during the year upon an average 60 mines, including coking plants, as compared with the operation of an average of 50 mines during 1905; the average number of days operated was 242, or 78 per cent. of full running time. Chiefly by reason of scarcity of men and cars a number of mines have been idle during the year and when trade conditions required an increased output; the opening

of new mines in the near future will not be necessary.

"As of Dec. 31, 1906, the company had in commission 729 coke ovens, and there is now under construction at Colonial No. 4 plant a group of 214 additional ovens to be completed about April 1, 1907; and there is also in course of construction at Colonial No. 3 a further group of 350 ovens, expected to be done and in operation by the end of the current year. With the completion of the ovens at Colonial No. 3, there will then be in commission 1293 ovens; and there are two further plants to be constructed hereafter, when warranted by the demand. These plants are planned to exhaust the coking-coal acreage of the company, consisting of about 7557 acres of coking coal, which promise by this use, conversion into a steady, as it is a special, source of income and a large ultimate value to the stockholders.

"Labor costs for the period from April 1 (when the mining scale changed, causing an advance of 5 cents per ton in mining, with a corresponding advance in all day and dead work), compared favorably with 1903, when there was in effect the same price of mining and the same conditions. The installation of electricity has been of great advantage. It is cheaper to carry electric power from central plants than to operate a number of smaller ones, and whenever possible to do away with individual power plants, it is being done. Gradual substitution of haulage by electric motors of 10 to 20 tons, for animals, and of 45- to 60-lb. steel rail for light rail on roads, which together insure steady and enlarged haulage facilities, is being done. The result is that during the past year additional boilers, generating sets and extended mechanical haulage have been added in 31 of our mines. An automatic dump is now being installed on the tipples, which has been thoroughly tried and tested for the proper screening of the coal, thus insuring a standard percentage of fine coal and securing a better and cleaner article of coal for our customers. Progress has been made during the past year in installing a retreating system in mining by which a larger percentage of coal can be recovered—and this will be continued.

"During the past year 10 old mining properties taken over in the beginning and exhausted of solid coal have been leased to individuals to recover ribs and pillars, and on terms more satisfactory than by company mining. The total acreage mined out in Pittsburg district during 1906 was 2229 acres, with an average recovery so far of 8093 tons per acre. The total unmined acreage as of Dec. 31, 1906, was 143,796 acres owned and 24,225 acres leased, or a total of 168,021 acres of the Pittsburg or River vein, with a life, based on 1906 production of 76 years; and in addition there is owned in fee 42,425 acres of the Freeport vein. . . .

"Under a contract dated Oct. 14, 1903, the company purchased controlling interest in the capital stock of the Monongahela River Consolidated Coal and Coke Company, acquiring 50,000 out of a total of 200,000 shares of that company's preferred stock outstanding (par value \$50), and 300,000 out of a total of 400,000 shares of its common stock outstanding (par value \$50). The common stock has been paid for outright; the preferred stock is being paid for semi-annually based upon an allotment of 6c. per ton for each ton of run-of-mine coal which the Monongahela River Company mines from its properties. As of Dec. 31, 1906, 18,102 shares of the 50,000 shares preferred stock to be purchased have been so paid for and received by the company, at a cost of \$814,599, leaving 31,898 shares yet to be paid for, the balance of the consideration unpaid being \$1,435,400. . . .

"The tonnage and earnings of the New Pittsburg Coal Company, operating seven mines in the Hocking district of Ohio, are included in the general results shown. To take the places of mines Nos. 1, 3, and 6 nearing exhaustion, mines Nos. 9 and 10 were authorized begun during 1906, at an estimated cost of \$293,484, of which \$117,141, has been expended. The total exhaustion for 1906 was 164 acres of fee coal and 126 acres of leased coal. The total unmined acreage as of Dec. 31, 1906, was 8215 acres owned and 2033 acres leased, or a total of 10,248. . . .

"The directors have continued the Employees' Association on the grounds of mutual benefit, and under such conditions as will strictly limit its conduct within its proper functions and will not again permit liabilities to be incurred against the company. The work of the Accident and Death Association has been conducted through the year with interest and success. The average number protected by this insurance during the entire year was 16,628. The ratable coöperation between the company and its employees at the mines during 1906 resulted in the distribution of \$85,114 in benefits, of which the company paid \$13,129. There was paid into the pension fund during the year \$7,727, of which the company paid \$2025. The treasurer of this company is responsible for all the funds and securities. Continued good results from the organized work of these associations is expected and the contributions of the company, including all administration expense, are a duty and an investment.

"The general plan of administration was changed during 1906 by the constitution of an active executive committee. This change has resulted in great benefit to the company."

According to the Queensland *Government Mining Journal* a discovery of tin is reported from Waratah, Tasmania. The lode is said to be 12 ft. wide and 30 per cent. ore has been taken out.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

In testing for coal with a hand-drill machine it is thought advisable by many superintendents to use a bortz bit, while a diamond bit should be used for a steam-power outfit.

In a mine where the water is acid, it is not advisable to discharge exhaust steam into the sump, as the chemical activity of the acids is greatly augmented by the rise in temperature of the acid water, which latter condition causes it to readily attack the pump and iron pipes.

In very cold weather when mixing concrete for use in a shaft or other mine purpose, better results will be obtained if the sand and gravel are stored in bins, where, by suitable heating pipes, the material may be gently warmed. It is also wise to use water that has been warmed to at least 100 deg.

Eminent investigators claim that black-damp is chiefly produced by the action of the oxygen of the air on iron pyrites. ($Fe S_2$) contained in the coal. These same authorities state that the men, horses and light in a mine, only account for about one-fiftieth of the consumption of oxygen in the air.

The United States Steel Corporation is now making provision for the establishment of about 400 by-product coke ovens near their new plant at Gary, Indiana. Careful tests are now being conducted both in this country and Europe to determine the style of oven that will be most satisfactory to install.

In preparing mine shafts, if the timber is carefully dried, the strength is increased 100 per cent. If the props are soaked in cold water, the strength is reduced below that found in the green wood; when the timber is soaked in heated water, it absorbs still more moisture, and its strength is further reduced.

In 1890 statistics showed that on an average in our country, 158 tons of coal were required to manufacture 100 tons of coke; this quantity of coal necessary has steadily decreased, until during the past year less than 148 tons of coal were required to manufacture 100 tons of coke. This speaks well for the growth of the industry and the efficiency of operation.

It is not generally known that the State of Michigan contains a workable coal area of more than 6000 square miles. The coal seams are reached by shafts, and at present only those veins lying within 250 ft. of the surface are being worked. Michigan produced less than 2,000,000 tons of coal in 1906; however, conservative estimates place the available coal tonnage of this State at more than 15,000,000,000 tons.

Recent experiments have shown that by washing coal which has gone over a three-quarter-inch screen, the washed product contains 40 per cent. less ash, 15 per cent. less sulphur and 5 per cent. more fixed carbon than the unwashed coal. The amount of water used in washing was about 36 gal. per ton of coal, and the cost of the operation was 2.5c. per ton, for a plant whose capacity is more than 350 tons per day.

In driving a rock-heading, the best results will be obtained when the line of least resistance is three-fourths of the depth of the hole; also when the powder fills the hole to about one-third its depth. If a 3-inch hole is drilled 8 ft. deep, with its line of least resistance 6 ft., the hole should be loaded to a depth of about 31 in., which would need about 7 lb. of powder. In this connection it may be said that 1 lb. of blasting powder will occupy about 28 cu.in.

Some geologists have claimed that coal is produced by the decay under fresh water of plants belonging to the conifer, fern and palm varieties; these grew during the carboniferous age. The density of the vegetation may be taken at 100 tons per acre per century, and if the vegetable matter thus formed was to be compressed to the density of coal, it would give only 0.6 in. acre of coal; however, four-fifths of this is lost as gaseous product, leaving only one-eighth inch per acre, or 1 ft. of coal in 10,000 years.

The results of recent investigations tend to contradict many of the long accepted theories dealing with the subject of coal. It has generally been believed that the amount of sulphur in a coal is an indication of the tendency of the ash to clinker. Now comes the emphatic statement that in some of the Illinois seams, where the sulphur content is highest, the ash produces the least clinkering, and that as a consequence, conclusions regarding the behavior of the ash, when based on the amount of sulphur in the coal, are not justified.

The average contents of carbon dioxide (CO_2) in flue gases has been found to be about 8 per cent., where coal is used as fuel. If the coal used at mines contains 75 per cent. of combustible matter, then to burn one ton of the coal requires 23 tons of air. If the percentage of CO_2 is 6 per cent. instead of 8 per cent., then 30 tons of air are needed for each ton of coal burned. This latter amount of air occupies 32,530 cu.yd. of space under ordinary conditions. A comparison of these figures with those required to satisfy the conditions of theoretically perfect combustion

shows how widely theory differs from practice.

The most important consideration in the successful operation of a briquetting plant is the selection of a suitable binder. The cost of this latter material often decides how profitable the operation will be. In this connection it should be remembered that a binder such as pitch, tar, asphalt, creasote, petroleum, etc., may give good results with one coal and at the same time prove most unsatisfactory with other fuels. To test whether a certain pitch is suited for use as a binder, put a piece of pitch the size of a pea, into the mouth and chew it; if the results are the same as when chewing spruce gum, that is, first crumbles and then becomes plastic, the pitch may be considered of the proper quality for briquetting purpose.

The costs of sinking shafts are so entirely dependent on local conditions that only general figures are available for basing an estimate. The principal factors influencing costs are, nature of strata, depth of shaft, and the cost of coal and timber. Where the ground is of the nature of that generally found in a coal district, the cost of sinking a shaft from 100 to 200 ft. deep, will vary from \$45 to \$60 per ft., while if the depth is more than 200 ft., the cost will likely vary from \$60 to \$90 per ft. At one operation where a 200-ft. shaft was sunk, the cost of installing the sinking plant was \$1100; the dynamite averaged \$4 per foot in depth; coal for power purposes cost \$2.25 per ft.; 400 ft. of lumber, b. m., were required to timber each foot in depth. The shaft was 14x22 ft.

The plan of collecting the coal dust that results from the dumping of coal over screens or its preparation in a breaker or washery, is one of the newer innovations that is destined to become widely used in handling anthracite and bituminous coal. All that is necessary is to have an exhaust fan connecting to a main flue or tube, about 2 ft. in diameter. Smaller branch flues can be projected from the main flue to various points where it is desired to catch the dust. In catching the dust the mouth of the flue, or collecting chamber, should be placed just over the point of dumping, since the dust naturally tends to rise of its own accord. The fan should be run only fast enough to produce a 2½ or 3-in. water-gage in the main flue. At one plant where such an installation is already at work, the collected dust is being sold to advantage; which item, however, is really of least importance. At one mine where the dust from the washery, tripples, etc., is caught, there are six branch flues connecting to a main pipe, and the cost of the entire apparatus was less than \$2200.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

505 Pearl Street, New York.

London Office: 20 Bucklersbury, London E. C., Eng.
CABLE ADDRESS "ENOMINJOUR, N. Y."

Subscription, payable in advance, \$5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; and the leading hotels in the principal cities.

Entered at New York Post Office as mail matter of the second class.

During 1906 THE ENGINEERING AND MINING JOURNAL printed and circulated 462,500 copies, an average of 8896 per issue. Of this issue 8000 copies are printed. None sent regularly free. No back numbers beyond current year.

Contents	PAGE
Editorials:	
The Federal Coal Lands.....	388
Consumption of Copper.....	389
The Calumet and Hecla.....	389
Mining Fraud Legislation.....	389
*Mining on the Kirghese Steppes.	
<i>H. E. West</i>	365
Mineral Resources and Mining Laws of	
Cuba	368
The Cost of a Golden Age.....	A. S. Fitch 369
*Making Open-Hearth Steel at Pueblo.	
<i>Lawrence Lewis</i>	371
The Nourse Mines, Limited.....	375
*The Bullfrog Cyanide Mill.	
<i>Enos R. Ayres</i>	376
The Geological Survey of Canada.	
<i>Special Correspondence</i>	378
Hoisting in Small Zinc Mines in Wisconsin.....	Geo. S. Brooks 379
Production of Gas, Coke, Tar and Ammonia	380
Lake Freight Rates.....	380
*Diamond Drills.....	James Humes 381
*The Hurricane Valve for Piston-Inlet Air Compressors.....	Frank Richards 382
*Handling the Coal Output in Southern Illinois.....	E. J. Wallace 383
Cost of Diamond Drilling in Coal Measures.....	W. F. Murray 384
*Wooden Dams in Coal Mines.	
<i>Richard Lee</i>	385
Pittsburg Coal Company.....	386
Colliery Notes.....	387
Public Ownership of Coal Lands.....	390
*Cylindrical Wheels for I-Beam Trolleys.	391
The Dominion Copper Company.....	391
Correspondence:	
Mining Frauds and — Frauds.	
<i>Bromide</i>	392
Estimating Weight of Ore at Kalgoorlie.....	Ralph Nichols 392
Concrete Foundations for Stamp-Mill Mortars.....	John P. Fuller 392
Iron Balls for Jig Beds.	
<i>Robert H. Richards</i>	393
Relative Importance of the Mineral Mica.....	H. M. Wilson 393
The Prevention of Mine Frauds.	
<i>H. L. Holt</i>	393
Disposal of Hydraulic Débris.	
<i>G. E. Alexander</i>	393
The Outlook for Mining in Bolivia.....	393
New Publications, Patents.....	394
Personal, Obituary, Industrial.....	395
Societies and Technical Schools, Trade Catalogs, Construction News.....	396
Special Correspondence.....	396
Mining News.....	400
Markets, etc.....	405

*Illustrated

The Federal Coal Lands

The President, following up his recent recommendation concerning the public coal lands, has sent to Congress a special message, further outlining his policy and urging the enactment of laws to carry it out. He advocates the leasing of these coal lands, and reservation by the Government of the right to supervise their development.

In support of his argument, the President refers to the successful operation of this policy in certain foreign countries. This reference was entirely unnecessary, inasmuch as in our own country, examples of such a system may be readily observed. In Colorado, where thousands of acres of public coal lands have been taken up by corporations which are at present operating and developing mines, the State retains possession of a certain section (640 acres) of land in every township. In coal districts, this square mile of land, generally known as a "school section," is leased to and developed by the operators who control the adjoining area. The State retains engineers who examine the mining operations carried on under school lands, and check up by measurement the advances of all entries and rooms, thus forming the basis for estimates of the monthly tonnage extracted. The estimates prepared by the State engineers are compared with those made by the engineers of the company, and from this comparison a basis for the monthly settlement is determined. The royalties accruing to the State from leases on such coal lands amount to a considerable figure.

The President, in his message, did not specify the rate at which these coal lands ought to be leased, but suggested that the same liberality be extended as has already been shown by the Government in its dealings with the public. In the meanwhile, the House Committee on Public Lands has reported favorably upon a bill conforming somewhat to the President's recommendations, which authorizes the President to lease coal lands at a royalty of not more than two cents a ton.

The idea of liberality on the part of the Government will certainly be carried out if two cents per ton is to be the maximum royalty. Thousands of acres of coal lands throughout the United States are being worked today on the royalty basis, and in no instance is the minimum royalty so low

as that, so far as we are aware. In most parts of West Virginia the royalties range from 8 to 10c. per ton; in Ohio, from 6.5 to 12.5c. per ton; in Pennsylvania, Kentucky, Illinois and Colorado, the average royalty is about 8c. per ton. In metalliferous mining, royalties are rarely less than 10 to 15 per cent., even in the case of the lowest grade of ore, such as the zinc ore of the Joplin district, which is worth only about \$1.50 per ton. The average value of coal in the Western States is about \$1.25 per ton at the mines. Thus it will be observed that even the existing custom is decidedly more favorable to the lessee in coal mining than in metalliferous mining, and, as everyone is aware, the collieries exploited under current royalties are in most instances profitable to the operators. If the public coal lands are to be leased, why should the maximum royalty be so low as 2c. per ton?

However, even that low rate will produce an income that will show in strong contrast with the present policy of giving away these resources. If we consider that the average thickness of the workable coal seams underlying the Government land is 5 ft., and that only 4000 tons of coal will be produced from each acre, the Government will receive \$80 in royalties for each acre of coal that is worked under lease, less the cost of administration. Up to date about 30,000,000 acres of public coal land have passed under private control. There is no doubt that a large part of these holdings were acquired by the present owners at a price not exceeding \$2 per acre, and in many cases for less than \$1 per acre. It is conservatively estimated that the Government still controls 40,000,000 acres.

As to the amount of land to which one lease is limited (2560 acres) in the bill before Congress, this area is sufficiently large to justify the installation of a substantial plant, and since such an area would produce from 6,000,000 to 10,000,000 tons of coal, the life of the operation would extend over a period of from 8 to 15 years. The chief question to be considered is the rate of royalty. Inasmuch as the value of the remaining coal lands is largely dependent upon their proximity to existing or projected railways, or upon their situation in districts likely to be developed by railways in the near future, it would appear that the rate of royalty ought to take this into consideration.

Consumption of Copper

We now have the Government statistics as to imports and exports of copper for the 12 months of 1906. These do not differ much from our estimates of Jan. 5; the imports were almost exactly as we estimated. They amounted to 225,843,281 lb. The exports were 467,839,041 lb. The imports showed a small increase as compared with 1905; the exports showed a large decrease.

Assuming the production of the United States in 1906 as per our preliminary statement, viz., 915,000,000 lb., the domestic consumption was 667,179,240 lb., against 616,125,695 lb. in 1905. We think that the final statistics will show it to have been really a little larger in 1906 than above figured, inasmuch as the actual production will probably turn out to exceed slightly our first figure, some large producers having done somewhat better in December than they estimated. It is probable that the final figure for consumption will be in the neighborhood of 675,000,000 lb., which will be about 9.5 per cent. gain over 1905.

When all the statistics for 1906 become available, it will be possible to compute the consumption of copper in the United States in 1906 with unusual accuracy, the stocks at the beginning and end of the year having been substantially the same, and chiefly the crude material that is always in transit and process of refining.

The domestic consumption increased at a considerably greater rate than the production, but not so much as many have thought. Obviously, when we start with no stocks we cannot consume more copper than we produce. In the case of a single country, like the United States, the increased demand for consumption is met by a diminished exportation. As to the whole world, however, when the stocks have gone, the consumption cannot be greater than the production. Under such conditions, the anxiety of consumers to secure their necessary supply leads them to bid up prices against themselves as they have done in 1905 and 1906.

The actual consumption of copper is always greater than the statistics show, because a rather large amount of manufacturing scrap and old material is constantly coming back into the market. If it were possible to collect statistics for it, we think that the junk business would prove surprising in its magnitude. However, in times of excessively high prices the

sources of old material are carefully scoured and sooner or later this supply diminishes largely, all of which adds to the stringency of conditions until consumers can no longer stand the pace and stocks begin naturally to accumulate again. As yet there is no evidence of this. Probably there will be no great increase in production in 1907. There will be in 1908. The great question is as to the demand for consumption during the next 12 or 15 months.

The Calumet & Hecla

Last year we noted with interest the first departure of the Calumet & Hecla company from its traditional policy of confining its operations to its own territory. This was first manifested by the acquirement of several new properties in Keweenaw county, in the Lake district, and the organization of subsidiary companies, which at once began active work in the development of the new mines. This was accepted as evidence that the company was looking ahead to the provision of new sources of production in the future, as its present mines should gradually be exhausted, and there were many surmises made, whether the policy of expansion would stop there; the general opinion being that it would.

Now, however, it seems to be apparent that the company's ambitions extend much further. The managers are not in the habit of taking the public into their confidence, but some facts have already come out, and in other cases inferences can be drawn to establish a strong probability. It is known, for instance, that large—probably controlling—interests have been acquired by Calumet & Hecla interests in Centennial and Allouez, both of which have recently developed into valuable properties. Reports, with strong support, have it that recent heavy buying of Osceola is in the same interest; that Tamarack is also sought after; and even Quincy is mentioned in the list. These include all the more prominent Lake mines outside of the Copper Range group.

If these reports have a basis of truth—and what is known makes them at least probable—the object aimed at is a great consolidation of Lake copper interests under Calumet & Hecla leadership. The consolidation of copper interests in other districts has doubtless pointed the way to such a movement. The company is in a

position to carry it through successfully, if such a combination has really been definitely decided on, and a short time only will be needed to show the results.

Mining-fraud Legislation

Three bills, Nos. 44, 45 and 46, designed to correct the mining-fraud evil, have been favorably reported by the committee on corporations of the lower house of the Colorado legislature. These bills provide that when stock of a corporation is issued in payment for property, there shall be filed a statement of the persons from whom purchased, the amount paid, and other conditions. The second bill makes it unlawful for an officer of a corporation authorized to sell its stock, to sell private stock in the same corporation without declaring the fact. The third bill requires foreign mining corporations to file a certificate showing what proportion of their capital stock has been paid for in money, and what proportion by the purchase of property.

These bills appear to us to be meritorious and may safely be passed by the Colorado legislature. They will provide for some salutary restrictions, to which no honest promoter can object. However, they are by no means broad enough to correct the mining-fraud evil as it exists today, which probably even their sponsors do not expect. Nevertheless, they will do something toward securing a square deal.

ACCORDING TO CABLE advices just received from Australia, the litigation between the owners of the Potter and the Delprat processes, which has been pending for a long time, has been decided in favor of the latter. Further particulars are not yet at hand. It will be remembered that this litigation concerned the priority of invention of the acid flotation process, which is now extensively in use for the treatment of the mixed sulphide ore of Broken Hill. C. V. Potter invented a process in which use was made of an acidulated bath. G. D. Delprat altered the composition of the bath and made other improvements in the working details of the process. Potter sued the Broken Hill Proprietary Company, which has been using the Delprat process, for infringement of his patents. Hence the recent litigation.

PUBLIC OWNERSHIP OF COAL LANDS

Special Message of President Roosevelt Recommends Conservation of Mineral Fuels

The President sent to Congress, on Feb. 13, a special message urging legislation to cover the different phases of the public-land situation. He said in part:

"In the first place, I wish to speak of the conservation of the mineral fuels belonging to the United States. In my annual message of Dec. 4, 1906, and special message of Dec. 17, your attention was called to the importance of conserving the supplies of mineral fuels still belonging to the Government. I recommended to Congress the enactment of such legislation as would provide for title to and the development of the surface land as separate and distinct from the right to the underlying mineral fuels in regions where these may occur, and the disposal of those mineral fuels under a leasing system on conditions which would inure to the benefit of the public as a whole.

"I again call the attention of Congress to the importance of enacting such legislation. I care little for the details; the prime need is that the system should be established; that from henceforth the nation should retain its title to its fuel resources and its right to supervise their development in the interest of the public as a whole.

THE LEASING SYSTEM

"Such a leasing system as that proposed represents by no means an untried policy. In the Australian countries during the last fifteen years coal has been mined under a system of government leases and on conditions so favorable to development that their coal and coke are today being sold on the Pacific coast of both American continents. In all the great coal-producing European countries, except Great Britain, coal is being mined under government leases.

"In Great Britain leases are granted almost entirely by the private landowners, but there, as in other countries, the surface culture and the mining operations are conducted independently of each other. In Nova Scotia, British Columbia, India, and other British colonies a government leasing system has been adopted and is working satisfactorily.

"In the United States, although conveyance of the mineral rights with the surface has been the common practice, the separate development of the two interests is increasing; and in the Eastern and Middle States a large part of the coal is being mined under a system of private leases. It is gratifying to note that in these States, as in foreign countries, these two great industries, agriculture and mining, are conducted within the same boundaries, and the country thus attains its highest dual

development without conflict of interests. Indeed, the mining industry and the factories using these fuels create larger local markets for the products of the farm.

"Mineral fuels, like the forests and navigable streams, should be treated as public utilities. This is generally recognized abroad. In some foreign countries practical control of a large portion of the fuel resources was allowed years ago to pass into private hands, but the existing governments are endeavoring to regain this control in order that the diminishing fuel supply may be safeguarded for the common good instead of being disposed of for the benefit of the few—though the mistake of the preceding generation in disposing of these fuels for a nominal return cannot always be corrected by the present generation, as the cost may be so enormous as to be prohibitory.

"In our own Western States and Territories the scarcity of both water and forests has rendered necessary their preservation as public utilities, and the preservation of the forests for the purpose of conserving both the waters and the timber supply has come to be recognized as the wise and proper policy of the Federal Government.

"The quantity of high-grade mineral fuels in the West is relatively much smaller than that of the forests, and the proper conservation of these fuels is a matter of far-reaching importance. This Government should not now repeat the mistakes of the past. Let us not do what the next generation cannot undo. We have a right to the proper use of both the forests and the fuel during our lifetime, but we should not dispose of the birthright of our children. If this Government sells its remaining fuel lands, they pass out of its future control. If it now leases them, we retain control, and a future Congress will be at liberty to decide whether it will continue or change this policy. Meanwhile, the Government can inaugurate a system which will encourage the separate and independent development of the surface lands for agricultural purposes and the extraction of the mineral fuels in such manner as will best meet the needs of the people and best facilitate the development of manufacturing industries.

ANSWERS TO OBJECTIONS

"I am aware that objections to this system are being urged. It is claimed that so large a part of the coal in some of the Western States has already passed into the hands of certain large corporations that parties endeavoring to operate under a lease system other than coal deposits

would be unable to compete with these corporations, and, therefore, that the fuel deposits still belonging to the Government should also be allowed to pass into private ownership, presumably into the hands of the same or other large corporations. It is also claimed that reservation of the fuel supplies still belonging to the Government would raise the price of coal in the West, and; as an argument in favor of this contention, it is claimed that the reservation of the natural forests is raising the price of lumber in the West.

"It should be remembered that the best and most accessible bodies of timber in the West passed into private holdings before the forest reserves were established; that while the price of timber has advanced in the West, it has advanced still more in the East, where there are no forest reserves; that supplies of timber are today being shipped from the West to the markets of the Mississippi valley, and even to foreign countries; and that the probability of obtaining future supplies of both timber and mineral fuel in the West at reasonable prices will be much greater with a large portion of both the forests and the fuels under the control of the Government, than if this control should pass to private parties. To secure cheapness of timber and fuel for the moment at the cost of ruin to our own children would surely be a suicidal policy.

ADVANTAGES OF THE LEASING SYSTEM

"It may be fairly claimed among the advantages of the leasing system that: (1) it will facilitate the working, under favorable conditions, of coal deposits for local markets by miners without large capital, as no land-purchase money would be required, and the small royalties charged would be paid out of the earnings; (2) it will facilitate larger operations, as the leases could be made sufficiently liberal in the matter of time, area, and other conditions, to induce healthy competition and meet all real demands; and yet in all cases the general supervision of the Government could be such as to (3) prevent waste in the extraction and handling of these fuels; (4) the system can be operated in such manner as to prevent the evils of monopolistic control; (5) that it will permit the Government to reserve from general use, fuels especially suitable for metallurgical and other special industries; and (6) it will enable the Government to protect the public against unreasonable and discriminating charges for fuel supplies.

"Already, probably one-half of the total area of the high-grade coals in the West has passed under private control. In-

cluding both the lignite and the coal areas, these private holdings probably aggregate not less than 30,000,000 acres of coal fields. With the remainder of the lands containing mineral fuels reserved and leased by the Government, there will be ample opportunity to determine, in the near future, which of the two systems—private ownership, or the leasing system with general Government supervision—will best protect the interests of the people and thus promote the permanent development of the West.

DETAILS OF PLAN LEFT TO THE FUTURE

"In planning such a leasing system by the Government, the question of revenue, beyond that necessary to cover the expenses of administration and exploration, need not be seriously considered. The spirit of generosity which the country as a whole has shown in connection with disposal of the public lands and the use of the proceeds of the sales from these lands for the further development of the West through the reclamation service and in other ways, is of itself a sufficient guarantee that in the administration of both the coal reserves and the national forests this generous policy will be continued. It is safe to believe also that Federal supervision of both the coal lands and the forests will be reduced to a minimum, and that in the future even more than in the past this supervision will be limited to that necessary to carry out the policy of conserving these natural resources in such a manner as will best promote the permanent interests of the people, and above all of the Western people, of the people in the neighborhood of the mines and the forests which we seek to preserve for the public use.

NECESSITY OF CONSERVING FUEL SUPPLIES

"The necessity for care in the future management of these fuel supplies is further illustrated by the rapid rate at which the use of such fuels is increasing in the United States. This remarkable development and the certain continuity of this prodigious growth compel us to recast all estimates as to the life of our 'inexhaustible resources.' We can foresee the time when the Eastern industries will be much more largely taxed for supplying foreign markets.

"It would surely be greatly to the advantage of this country if some, at least, of the coal fields of the East, and especially of the anthracite fields, had been left under the control of the Government. Let us provide in the West against the recurrence of the conditions which we deplore in the East. At the outset the law would be administered in a spirit of the broadest liberality, with the least possible interference with the development of the coal fields.

"Moreover, I cannot too emphatically say that all laws which merely seek to prevent monopoly or the mishandling of the public by forbidding combination, are

certain to fail of their purposes. One experience with the interstate commerce and anti-trust laws shows that what is needed is not prohibition of all combinations, but such supervision and control over combinations, and over corporations entering into them, as will prevent the evils, while giving to the public the advantages of combination.

LAND FRAUDS

"Let me urge that Congress provide \$500,000, in addition to the present estimates, to be immediately applied to the clearing of the arrears of business in the general land office, as regards the detection and prevention of fraud in disposing of applications for patents to the public lands.

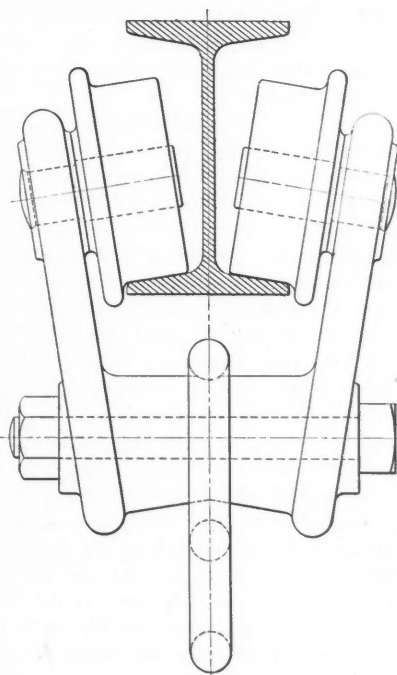
"I wish to express my utter and complete dissent from the statements that have been made as to there being but a minimum of fraud in the actual working of our present land laws."

The message concludes as follows:

"From the standpoint of the public interest, failure to prevent fraud of this kind is peculiarly serious, because in so many cases the success of the fraudulent claimants means the prevention of the establishment of a home by some honest home-seeker. The earnest wish of the administration is to discontinue the advertisement of fraud in connection with the public-land system; but the only way to accomplish this is by putting a stop to the fraud itself."

Cylindrical Wheels for I-beam Trolleys

W. Hoy Bradley, in the *American Machinist*, calls attention to a common fault in the design of rollers for I-beam trolleys, giving point to his criticism with the



AN I-BEAM TROLLEY

accompanying sketch. A roller larger at the outer edge of the flange than at the web produces friction by reason of necessary slip. In the sketch showing a better arrangement of rollers, the axis of the roll is parallel with that portion of the flange on which the roll treads, thus making a rolling cylinder instead of a cone.

The Dominion Copper Company

The report of the Dominion Copper Company for the fiscal year ended July 31, 1906, states that negotiations for the purchase of the Montreal & Boston Copper Company, including the smelter at Boundary Falls, B. C., and the Sunser, Crown Silver and C. O. D., mineral claims, were satisfactorily concluded on Jan. 31, 1906, and they are now solely owned by the Dominion Copper Company.

An analysis of the company's operations for the eight months from Dec. 1, 1905, to July 31, 1906, which was largely a period of construction and development, shows that 133,084 tons of ore were smelted for a return of 3221 tons of matte, valued at \$640,129. The operating costs, including mining, smelting, converting, marketing, and administration expenses, amounted to \$500,985. The net profit for the eight months during which the smelter was operated was \$139,144.

A new furnace is being installed by the Traylor Engineering Company, which will be the largest in British Columbia. It will have a daily capacity of 800 tons of ore, and on account of its superior appointments, a saving of 20 per cent. in fuel is expected to be effected. Its saving in fuel and labor expenses is expected to be upward of \$100 per day. When it is in full operation the company anticipates being able to produce its copper at a cost of not more than 8c. per pound.

It is believed that the Rawhide and Idaho claims will be able to furnish from 1200 to 1400 tons of ore per day as soon as the new furnace is in commission. The Rawhide workings are 130 ft. in depth, and the average value of the ore is 1.42 per cent. copper. The Idaho tunnel has been extended a distance of 476 ft. The first 200 ft. are in good ore. Ore has also been developed in a winze from the tunnel at a depth of 100 ft.

The mines have been equipped with electrical power in place of steam. The mines and smelter are using about 600 h.p. per day at a cost of from \$135 to \$140 per h.p. per annum. It is estimated that when the new furnace is in commission 1000 h.p. will be consumed daily, and the change to electric power will result in a saving to this company of not less than \$100,000 per annum.

In view of the favorable prospects of the mines the directors have taken steps to secure options on new mining claims, and should any of them on development prove valuable they will be purchased and regularly operated.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Mining Frauds and—Frauds

"I am glad to see this agitation about fraud in promoting fake mining schemes," I said to Colonel Quartzite, whom I found examining a jammed slag-pot wheel. "It is time this thing were stopped."

"Anything new?" the old gentleman inquired, without looking up.

"New! You surely have heard about the proposed law and the discussion in the papers."

"After you have lived as long as I have," he said, straightening up and thrusting his hands deep into his pockets, "you get used to these spasms of virtue. The only unusual thing about the present flurry is that it strikes the mining business."

"This is different," I interposed. "When the matter is taken up seriously by the Mining Congress and the leading journals something is bound to be done."

"Oh, I don't know," replied the Colonel. "The professional moralists, the preachers and others, have been at it ever since the days of Noah, yet it is not much trouble to find stories of fraud in the papers. Once in a while practical people take a hand. Then things are expected to happen. The practical man is used to action; it is his business to bring things to pass, and when he gets started he expects things to move at once." The old gentleman paused. "You can't make folks honest by main strength," he said.

"It used to work pretty well with horse thieves," I suggested.

"The horse thieves are not all dead," returned the Colonel. "Besides, this is not a parallel case. This is a blanket contract and the specifications are not all in. It reminds me of a rule that the teacher in a little red school-house back East once tacked on the blackboard. It prohibited deviltry in general. What he meant was stealing apples from Deacon Perkin's orchard; but all the boys thought it referred to chewing gum, gum being scarce in those days."

"I do not see anything so very indefinite about this," I said. "Everybody knows what fake promotion means."

"Nobody knows what it means," he replied quickly. "It would take the Supreme Court 17 years to figure that out, and then there would be 17 reversals. Fraud is a mighty general term. It may mean running smelter assays a little too hot, and it may mean selling cast-iron gold bricks."

"Legitimate promotion must have something behind it," I suggested.

"That is where the trouble lies," he said. "Who is going to determine whether the property is or is not good enough to be something? Take Jim Holloway's case, for instance. We thought he had nothing better than a gopher hole, and so did all the engineers sent out from New York. We called it robbing widows and preachers. Now look at Jim! He has paid over 200 per cent. dividends, and he rides in the biggest automobile in Denver. You can't afford to hang a man like that."

"And some beautifully recommended companies fail," I admitted.

"You can't draw the line," mused the Colonel, more to the distant mountains than to me. "As long as the working mottoes in successful business are, 'Get as much as you can and give as little as possible, in return' and 'A bluff well chucked is better than an ace,' there will be this same old question. Usually it is the fellows who are working too near the dividing line that howl loudest for more laws. You see, they want to know just how far they dare go."

BROMIDE.

Pueblo, Feb. 18, 1907.

Estimating Weight of Ore at Kalgoorlie

In the JOURNAL of January 5 under the heading "Metallurgical Progress in 1906" and the sub-head "Costs," on page 20, Alfred James makes certain statements in regard to operations at several of the West Australian mines. How were these results obtained?

I am quite familiar with the conditions prevailing in this district of Westralia, having designed, constructed and managed the largest combination mill constructed in that section, for roasting, amalgamating, cyaniding and filter-pressing the entire product. In the entire district up to the time I left the Kalgoorlie field, at the end of 1905, there was only one mill, i.e., the Great Boulder Perseverance, that was provided with the means of weighing the ore as it was delivered to the mill, while on the other properties the tonnages were estimated, generally by weighing the moist roasted product as it came from the filter presses, making allowances for moisture and the difference between the dry roasted ore and the original raw ore as delivered to the mill. This roasted ore when dry naturally varies considerably from time to time owing to changes in composition, the amount of sulphur, etc., expelled and oxygen ab-

sorbed, thus leaving a factor of uncertainty.

This method of approximating tonnages in the mills is not accurate and one is apt to infer from the statements in the article in question that the figures are based on actual weights of raw ore.

I am pleased to note, on the same page and column under the head "general," that Mr. James gives proper credit to the "all-roasting" product. In your pages about three or four years ago there was a long controversy on the subject of the two methods then in vogue, roasting and raw treatment of sulpho-telluride ores in Westralia on the Kalgoorlie field. At that time Philip Argall, of Denver, Colo., predicted that the all-roasting, amalgamation and cyanidation system would be found the most efficient and would ultimately prevail in the Kalgoorlie district.

RALPH NICHOLS.

Gabriel, Durango, Mex., Feb. 12, 1907.

Concrete Foundations for Stamp-Mill Mortars

Can you give me the benefit of some solid experience with concrete or other stone foundations for stamp batteries? My experience with them has not been extensive, and from what I gather those who are enthusiastic about them at first seem to cool off somewhat after they get the necessary time to observe results. Right here it is rather a serious question, for the white ant will tackle even the pile blocks; and as for the 3-in. staves of cyanide tanks, he seems to leave dry wood alone to get at them. A person who has not seen it himself can hardly believe it. That insect thrives on the wood even when the solutions are 0.5 per cent. KCN. Where we are here, you are also taking chances if you guarantee any woodwork that is not either always wet or the reverse. A discussion on the advantages or otherwise of concrete and anvil blocks would be much appreciated, as just now they are both much to the fore. However, from what I can gather, some of the most enthusiastic advocates of the great cast-iron anvil block are already finding out that it has also some vices as well as virtues.

For the last six years we have been using 9-in. anvil blocks which fill the bill well under 1050-lb. stamps, at 95 to 98 drops of 8 in. per minute, with wood pile blocks; but they take more holding down than the boxes on the wood direct, and I am

inclined to think that if fixed on top of concrete and more than 2 ft. thick, the mortar box, when everything is swinging along, will take a lot of keeping in place, and, if not attended to at once, would soon destroy the concrete bed. This would be a serious business, for grouting up the bedding faces in the ordinary way would only be wasting time.

I gather from an engineer who has just returned from the Rand that they have gone in largely for concrete foundations, but instead of the bolts passing through vertically, they are at an angle and pass outside the concrete, which should add much to the stability of the block. The block is therefore solid and not full of holes at the weakest place; also all bolts are accessible and can be attended to easily, also an important consideration.

JOHN P. FULLER.

Lebong, Sumatra, Dec. 4, 1906.

Iron Balls for Jig Beds

I note in the copy of the JOURNAL for Feb. 2, the question about iron balls for jig beds.

I have just received a letter from Albon P. Man, general manager of the Arminius Chemical Company, Virginia, in which he gives me some information in regard to his practice, and since it was sent to me for the appendix to my book, I feel sure he would permit me to give the information to you for publication.

The size of feed to his pyrites jigs is through a 9/16 in. wide slot when the crushed ore is moist, through a 7/16 in. wide slot when it is dry. The cast-iron balls are round and 1/2 in. in diameter; the screen of the jig has 1/4-in. square holes punched in the plate.

He gets these balls from the Canton Malleable Iron Company, of Canton, Ohio.

ROBERT H. RICHARDS.

Boston, Feb. 13, 1907.

Relative Importance of the Mineral Mica

I take the liberty of calling your attention to a most remarkable statement in the JOURNAL of January 19. On page 153, under "New Publications" you speak of mica as being an interesting, though comparatively unimportant, commercial mineral.

Now I have always regarded mica as of the utmost importance in electrical work, especially in the building up of commutators for dynamos and motors. Is there any known substance that will satisfactorily take its place for this work? Is there any doubt as to the great commercial importance of electric dynamos and motors? Does not our prosperity today depend largely upon the immense advances made in the application of electricity? If mica can be replaced by other sub-

stances having the same efficiency then your statement is correct; otherwise you certainly owe an immediate apology to that remarkable and indispensable mineral.

H. M. WILSON.

Latchford, Ont., Feb. 6, 1907.

We assure the friends of mica that no disrespect to that remarkable mineral was intended in the paragraph to which our correspondent takes exception. The idea of the relative unimportance which the writer meant to convey applies only to the position of mica in the world's commerce. According to "The Mineral Industry," the United States in 1905 produced minerals to the value of \$802,377,086 while the value of mica, both sheet and scrap, produced during the same period was only \$200,000. In view of this modest showing it should not be difficult to pardon a writer for losing sight, for the moment, of the great importance of mica in a single technical field.

The Prevention of Mine Frauds

In the JOURNAL of Jan. 26 you give the gist of the proposed law for the prevention of mining frauds. It seems to me that the proposed law would prevent also the formation of companies for developing properties of merit. Would not something of the kind shown below serve the purpose as well, and still leave the road open for developing properties which are legitimate risks? The proposed law should be:

MINING CORPORATIONS

"Any number of persons, not less than three, may associate themselves, to establish a corporation for mining purposes. Articles of incorporation of mining companies filed after the passage of this bill must show that the incorporators are *bona fide* owners of at least 20 acres of known mineral ground in the State, which is to become the property of the corporation. The articles of incorporation when presented for filing must be accompanied by the affidavit of three disinterested citizens of the State that the property of the incorporators contains valuable mineral deposits, and that at least \$500 has been spent in labor upon said deposit.

"The incorporators of any mining corporation formed after the passage of this bill who shall not conform to the requirements of this act or who shall make false affidavits in relation to same shall be subject to imprisonment, and be liable for the par value of all stock issued."

H. L. HOLT.

Edgemont, Nevada, Feb. 4, 1907.

Disposal of Hydraulic Debris

In your issue of Nov. 17, 1906, on page 914, there appeared a statement that a bill to appropriate \$200,000 had been intro-

duced in Congress, for the purpose of making a preliminary examination and survey of the project to convey the hydraulic debris of the placer mines of California to low-lying swamp lands. I wish to know if the bill passed.

G. E. ALEXANDER.

Denver, Colo., Feb. 9, 1907.

The bill has not passed.

The Outlook for Mining in Bolivia

In an illustrated lecture in Liverpool on trade possibilities in Bolivia, Sir Martin Conway described the character of the country, which he said was broken, divided, and contained both barren and fertile areas and was subject to every conceivable form of climate. Unfortunately for it, Bolivia had no sea coast at all, and its Swiss-like characteristics made the matter of communications a very serious problem. Brazil had bound herself to construct a railroad, which would make an immense area accessible from the Atlantic. The prosperity of Bolivia would depend on its railways. Before very long La Paz would be made the meeting point of three great railways from the sea. They would in time have a trans-continental route to San Antonio, the Madeira, La Paz and the Pacific. When these developments were accomplished a new situation would have been created in the country.

Sir Martin discussed the silver mines of Potosi. These are now practically exhausted, but they have been worked for 300 years, producing £800,000,000.

Along the range of mountains south of La Paz tin had been discovered in great quantities, and the enormous exports were still increasing. He had no doubt that before long this tin district would so develop that the output would rise to a second, or even first, place among the tin districts of the world.

A copper area was also being worked, but that industry was restricted by the difficulty of communications. Five or six mines had been prosperously worked for a number of years, and more of them were likely to be opened before long.

There is no doubt that the eastern valleys of the Andes are extremely rich in gold, but, excepting the San Domingo mine, nothing much had been done on account of the heavy rainfalls. The Incas had unlimited hand labor, and it was by most simple means that they managed to get their gold. There was plenty of gold there, but communications were extremely difficult. It was stated that gold existed from Bolivia to Colombia. The only question was how to get machinery to the spot. The distance from La Paz to this particular place was 160 miles. The route had been carried 130 miles in that direction, and when another 30 miles was completed a great gold region would be reached.

New Publications

"Die Zentrifugalpumpen, mit besonderer Berücksichtigung der Schaufelschnitte." By Fritz Neumann. Pp. 197; illustrated. 6x9 in.; cloth, 8 marks. Berlin, 1906; Julius Springer.

"Stream Pollution by Acid-Iron Wastes." A report based on investigations made at Shelby, Ohio. By Herman Stabler. Pp. 36; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Turbine Water-Wheel Tests and Power Tables." By Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper. No. 180. Pp. 134; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"The Geomorphic Features of the Middle Kern." By Andrew C. Lawson. Bulletin of the Dept. of Geology of the University of California, Vol. 4, No. 16. Pp. 13; illustrated. 7½x10½ in.; paper, 15 cents. Berkeley, 1906; University Press.

"The Geomorphogeny of the Tehachapi Valley System." By Andrew C. Lawson. Bulletin of the Department of Geology of the University of California, Vol. 4, No. 19. Pp. 32; illustrated. 7½x10½ in.; paper, 35 cents. Berkeley, 1906; University Press.

"Arbeitslohn und Unternehmengewinn im rheinisch-westfälischen Steinkohlenbergbau." By Dr. Jüngst. Reprinted from *Gluckauf*. Nos. 37—40, 1906. Pp. 34. 11 x 8½ in.; paper. Essen (Ruhr), 1906: Verein für die begbaulichen Interessen im Oberbergamtsbezirk Dortmund.

Annual report of the Chief of the Bureau of Construction and Repair to the Secretary of the Navy for the Fiscal Year ending June 30, 1906. Pp. 185. Paper, 5½x9 in.; indexed. Government Printing Office, Washington, D. C. 1906.

"Gold Mining Machinery; Its Selection, Arrangement and Installation." By W. H. Tinney. Pp. 308; illustrated. 6x9 in.; cloth, \$5. New York, 1906: D. Van Nostrand Co. London: Crosby, Lockwood & Son.

Contents. Introductory. Motive power. Engine erecting. Boilers. Chimneys. Management of motive power. Pumping machinery. Winding machinery. Air compressors. Rock drills. Crushing machinery. Concentrating and gold-extracting plant. Transmission of power. Transport. Piping and joints. Construction. Tackle and tools. Details for estimates.

The author of this work is a mining engineer, who was formerly in charge of the machinery at the Mysore mine, India, and was manager of other mines, in connection with which his experience has been extensive. He has been able therefore to write a book of highly practical character, which will be of general value. Naturally it will be found more useful by British and colonial engineers than by American, inasmuch as reference is largely to the materials and machines that are

supplied abroad, but American engineers will find many useful hints in it. The scope of the work is indicated by the table of contents given above. Our general impression of the treatment is distinctly favorable.

Mexico's Treasure House (Guanajuato). By Percy F. Martin. Cloth, 9½x6 in. Pp. 259. Illustrated. Price, \$3. New York, 1906: The Cheltenham Press.

The author of this book is special correspondent for the London *Financial News*. The book is beautifully printed and bound, and is well illustrated by excellent reproductions of photographs, but the general effect is marred by the incorporation of some poor reproductions of charts of figures, which have been reduced too much. In one case the author appends a note saying: "The above figures are very minute, but can be read by the aid of a powerful magnifying glass!"

The early chapters of the book are entertaining in their accounts of general conditions in the district, which are presented in a popular and rather naïve way, but when the author passes on to his descriptions of the mines and mining companies interest wanes. There is not much of value to the mining engineer, and as to the investor for whom the work is primarily intended, we are dubious about what he may be led to think. In the accounts of the various mines we had the uncomfortable feeling of reading some things of the nature of "write ups." However, Guanajuato is certainly a great mining district, and an author may be forgiven for the expression of some enthusiasm.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Feb. 5, 1907

- DISTRIBUTING-MACHINE FOR CLOSED FILTERS—Hiram W. Blaisdell, Los Angeles, Cal. No. 842,850. Filed Nov. 16, 1904.
- CONVEYER—William H. Morenus, Lake View, Iowa, and Frank R. Jones, Harvey, Ill., assignors to Austin Manufacturing Company, Chicago, Ill. No. 842,900. Filed Nov. 30, 1906.
- ROCK-DRILL—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. No. 842,953. Filed Aug. 11, 1904.
- ROCK-DRILL SADDLE—George S. Power, Passaic, N. J. No. 842,972. Filed Mar. 31, 1906.
- AUTOMATICALLY-MOVABLE DAM-CREST—William R. Davis, Albany, N. Y. No. 843,003. Filed Nov. 16, 1906.
- CONVEYER—James A. Jamieson, Montreal, Quebec, Canada. No. 843,018. Filed Apr. 22, 1905.
- PROCESS OF ENRICHING BLAST-FURNACE GAS—Carleton Ellis, White Plains, N. Y. No. 843,079. Filed Dec. 16, 1905.
- ORE-SEPARATOR—Lucian B. Hunter, Greeley, Colo. No. 843,086. Filed Mar. 17, 1906.

- AERIAL CABLE—Giovanni Strambini, Truckee, Cal. No. 843,116. Filed Sept. 5, 1906.
- LOCK FOR FEED-SCREWS FOR ROCK-DRILLING ENGINES—Frederick E. Glaze, Victor, Colo. No. 843,144. Filed Mar. 16, 1906.
- HOISTER-DRUM WITH HOLLOW SHAFTS—Asher Lambert, Newark, N. J. No. 843,154. Filed Oct. 2, 1906.
- MULTIPLE-HAMMER-PISTON ROCK-DRILLING ENGINE—John G. Leyner, Denver, Colo. No. 843,159. Filed May 9, 1905.
- PROCESS FOR CLEANSING THE SCREENS OF PULP-SCREENING MACHINES—Peter R. Thom, Appleton, Wis., assignor of two-thirds to Kimberly & Clark Company, Neenah, Wis. No. 843,185. Filed Oct. 14, 1905.
- TWIN-CUPOLA PROCESS OF MAKING SEMI-STEEL CASTINGS—James C. Davis, Chicago, Ill., assignor by mesne assignments, to The American Brake Shoe & Foundry Company, New York. No. 843,197. Filed Feb. 27, 1899.
- CONVEYER FOR EXCAVATING—Irving J. Smith, Richmond, Va. No. 843,239. Filed Oct. 16, 1906.
- COKE-DISCHARGING APPARATUS—Lewis Albrecht, Baltimore, Md. No. 843,251. Filed Jan. 31, 1906.
- METHOD OF TREATING LIME—Mone R. Isaacs, Philadelphia, Pa. No. 843,277. Filed Apr. 25, 1906. Renewed Jan. 16, 1907.
- SCREEN FOR CAR-DUMPING APPARATUS—Charles A. Fry, New York, N. Y., assignor, by mesne assignments, to Dodge Coal Storage Company, Saugatuck, Conn. No. 843,334. Filed Oct. 18, 1904.
- MECHANISM FOR HANDLING METAL IN ROLLING-MILLS—Adam J. Hoak, Kewanee, Ill. No. 843,395. Filed Sept. 12, 1905.
- CRUSHING AND PULVERIZING MACHINE—Jacques Anceel, Anières, France, assignor to Charles Brodbeck, Paris, France. No. 843,428. Filed Oct. 4, 1904.
- SAFETY CLOSING DEVICE FOR MINERS' LAMPS—Alexandre L. Tombelaine, Chaptelat, France. No. 843,505. Filed Oct. 9, 1905.
- PROCESS OF REVIVIFYING GAS-PURIFYING MATERIALS—Henry L. Doherty, Madison, Wis. No. 843,524. Filed Nov. 12, 1906.
- BRIQUET-MAKING MACHINE—Edgar D. Milsner, St. Louis, Mo., assignor to William C. Renfrow, Joplin, Mo. No. 843,565. Filed July 27, 1906.
- COKE-DRAWING MACHINE—McClellan F. Stunkard, Fayette county, Pa. No. 843,568. Filed Oct. 29, 1906.
- TREATMENT OF IRON AND STEEL—Harry Luckenbach, San Francisco, Cal., assignor of part interest to William H. Kelly, San Francisco, Cal., George L. Robinson, Frederick E. Fishel, and Joseph J. Robinson, New York, N. Y., and Frederick F. Nolte. No. 843,569. Filed Feb. 10, 1906.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Feb. 2, 1907.

- ROCK CRUSHER—B. Gray, Johannesburg, S. A. In rock breakers of the jaw type, providing toggle arms the length of which can be adjusted according to the amount of wear of the crushing surfaces. No. 347 of 1906.
- SODIUM PERBORATE—Deutsche Gold und Silber Scheide Anstalt, Frankfurt a. M., Germany. Manufacture of sodium perborate by treating a mixture of sodium peroxide and boric acid with carbonic acid. No. 503 of 1906.
- ELECTROLYSIS OF COPPER—L. M. Lafontaine, Paris, France. An electrolytic bath for extracting copper from ores, consisting of a 10 per cent. solution of sulphuric acid, together with barium dioxide and sulphate of copper and a carbon agent such as lamp black. No. 2989 of 1906.
- VAPORIZING WATER IN MINES—W. Collier, Bridgend, Glamorgan. An improved apparatus for producing water vapor in mines by means of fans which beat up water issuing from orifices. No. 8555 of 1906.
- CUTTERS FOR DREDGES—F. Lohritz, Renfrew. Improved cutters for breaking up ground under water, for use in connection with dredging apparatus. No. 15,852 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. C. Douglas, of Houghton, Mich., is a visitor in New York.

F. L. Bosqui has returned from Colorado, and has taken an office in the Studio building, Berkeley, California.

Arthur Dickinson, of the firm of Charleston, Dickinson & Co., has left London for Norway to inspect a silver-lead mine.

Gentry Hillman has resigned his position as general superintendent of furnaces for the Southern Steel Company.

Charles F. Boyers is now mechanical engineer with the United States Coal and Coke Company at Gary, West Virginia.

J. W. Duntley, president of the Chicago Pneumatic Tool Company, has returned from a five weeks' business trip to Europe.

E. T. Buek has resigned his position as vice-president of the Southern Steel Company, but remains a director of the company.

George W. Maynard, mining and metallurgical engineer, of New York, went South this week to examine iron mines in Alabama.

Capt. Thomas Hoatson, of Calumet, Mich., president of the Superior & Pittsburg Mining Company, is in New York on business.

Charles M. Hampson, consulting mechanical engineer, has returned to Denver, Colo., from a trip through the Cripple Creek district.

Samuel W. Osgood, of Chicago, recently made an examination of property near Butte, Mon., owned by the Pittsburg & Montana Copper Company.

Edgar A. Collins has resigned the management of the Combination Mines Company, at Goldfield, Nev., and accepted the management of the Montana-Tonopah Mining Company, at Tonopah.

R. Gilman Brown, consulting engineer, has ceased to represent the firm of Charleton, Dickinson & Co., of London, in San Francisco, as it is his intention to reside in London permanently.

Abbot A. Hanks, chemist and metallurgist, who has been in Oakland, Cal., since the catastrophe in San Francisco, will return to the city March 1, having secured offices at 425 Washington street, San Francisco.

Martin J. Heller, general manager for Capt. J. R. De Lamar, has relinquished the position of consulting engineer to the Nipissing Mines Company, Cobalt, Ont., in connection with late changes in the directorate of that company.

Charles C. Derby, for five years past manager of the Mariposa Commercial and Mining Company at Mt. Bullion, Cal., has resigned and will take up work as

consulting engineer, with office at 1611 Franklin street, San Francisco.

J. A. Lamoureux, of New York, president of the Calumet Graphite Mining and Milling Company, with his engineer, W. T. Downs, of Jersey City, is at the graphite mines in Calumet, P. Q., to start the new 100-ton concentrating mill recently erected.

E. F. Daxman, formerly manager of the Derry Coal and Coke Company, Latrobe, Penn., has been appointed general manager of the coal and coke properties in western Pennsylvania and West Virginia belonging to the Central Iron and Steel Company, Harrisburg, Pennsylvania.

E. Gybbon Spilsbury, mining and metallurgical engineer, of New York, whose serious accident while in Mexico we mentioned some time ago, is still in the hospital at Nogales, Arizona. His recovery has been delayed by a severe attack of pneumonia. His friends will be glad to know that he is now out of danger.

Announcement has been made of the appointment of C. A. Saxton, of Pennsylvania, as general manager of the properties operated under the control of Capt. Henry Stern and associates, of New York. Among the list are the Yampa mines and smelter at Bingham, Utah, the Britannia mine and smelter in British Columbia.

A party from Minnesota visited the mines at Globe, Arizona, last week. In the party were H. B. Howland, L. Roucheleau, John U. Sebenius, and R. B. Whiteside, of Duluth, directors of the Globe Consolidated Copper Company; Dwight E. Woodbridge, mining engineer, of Duluth; G. G. Hartley, a Mesabi mine-owner; and F. B. Mott, superintendent of the Mountain Iron mine on the Mesabi range.

Frank E. Shedd, one of the district superintendents of the Lehigh Valley Coal Company, has been promoted from the Hazleton district to take charge of the new operations at Mt. Carmel. Six years ago when foreman of the William A. Colliery, at Duryea, Mr. Shedd was promoted to superintendent of a small operation and was again promoted at intervals until a short time ago he was placed in charge of the Hazleton district, one of the most important in the Lehigh's extensive properties. He was selected to take charge of the new operations at Mt. Carmel owing to the proficiency he has shown in developing new lands. He is succeeded in Hazleton by William Underwood, division engineer.

Obituary

Thomas F. Griffin, one of the pioneers in the manufacture of car wheels, and of iron suitable for that purpose, died in Chicago, Feb. 11, aged 80 years.

Hugh McMillan, who died in Detroit, Mich., Feb. 10, was largely interested in

iron manufacture, and in iron-mining enterprises in Michigan and Minnesota.

Frank Wayland Higgins, ex-governor of New York, who died in Olean, N. Y., Feb. 12, was largely interested in iron property in Minnesota. He owned a large share in the Higgins and other mines and in lands adjoining the Morrow and McKinley mines. Governor Higgins, however, did not take any active part in the management of those properties.

Herman Unzicker, who died at his home in Chicago, Feb. 7, aged 60 years, was born at Schierstein, on the Rhine, Germany, in 1846. He received his early education from private tutors at the family home. Early in the 60s he entered the works of Emil Roth, at Ilstein, Hesse-Nassau. This firm built pumps and general machinery. He then entered the Baugewerbe Schule of Holzmünden. After leaving this institution he became superintendent of the Ostheimisch Maschinenfabrik at Marburg. Herr Ostheim, the owner of the works, at a later date repeatedly offered him equal partnership if he would return to Germany. He came to the United States in 1872 and settled in Chicago. His first position there was with Fraser & Chalmers, and there he made mining machinery his specialty. It may well be said that he was a most competent and able designer and constructor of that class of machinery. In 1887 Mr. Unzicker, with two partners, started the Chicago Iron Works. The work of that concern met with general approval, but the firm was, financially, not strong enough to withstand the panic of 1893. Later he returned to a position with Fraser & Chalmers, and subsequently with the Allis Chalmers Company. When the new firm of Chalmers & Williams was formed he took a position with them. Herman Unzicker designed and superintended some noted mining plants and reduction works, such as the Granite Mountain, Bi-metallic, Blue Bird, and Drum Lummon Mills; the East Grey Rock, and High Ore hoists, etc. His work is favorably known throughout the West, and in foreign countries. He left a widow, two sons and one daughter. Walter, the oldest son, is a graduate of the Michigan College of Mines, and is at present managing a silver-lead property in Guerrero, Mexico.

Industrial

The H. W. Johns-Manville Company has opened a new branch office at 214 Main street, Buffalo, N. Y., under charge of George A. Schmidt.

At the recent annual meeting of the Detroit Copper and Brass Rolling Mills, the following officers were chosen: Lewis H. Jones, president and general manager; Theodore D. Buhl, first vice-president; Richard P. Joy, second vice-president; William F. Montgomery, secretary and treasurer; Frank H. Hoffman, assistant secretary.

A recent publication of the Ingersoll-Rand Company, New York, describes a line of air compressors, known as "Type H." These compressors are duplex, steam-driven, automatic machines, mounted upon a single base and entirely contained. All possible combinations of steam and air cylinders are provided for, in sizes ranging from below 10 to above 200 h.p. These compressors are designed for practical adaptation to the special and exacting conditions of economical air compression.

The American Iron and Steel Company, Lebanon, Penn., reports that it spent during 1906 for betterments and extensions—mainly for new buildings and new machinery—\$167,901; increased the reserve fund to provide for depreciation by \$65,500; paid the usual dividends on preferred and common stock; and increased considerably the stock of raw materials and finished goods. After all this, the accounts show an increased balance of undivided profits amounting at the close of business, Dec. 31, to \$1,618,220. The business of 1906 far surpassed, in tonnage and value, that of any previous year in the history of the company.

The Chicago Pneumatic Tool Company reports for 1906 net earnings amounting to \$1,001,550. The largely increased sales and profits realized amounted to 11.2 per cent. Of the amount earned during the year, amounting to \$686,468.61, available for dividends, the directors have appropriated 4 per cent. for dividends declared, and the remainder, amounting to \$442,117, has been added to the surplus account. Substantial additions to plants have been made during the year, requiring liberal expenditures. The excess current assets, Dec. 31, were \$1,542,076, an increase of over \$883,000 since the company was organized five years ago. In addition, large expenditures have been made during the year in providing additional plant capacity and substantial amounts have been added to the assets of the foreign organizations.

Societies and Technical Schools,

The Connersville Blower Company, of Connersville, Ind., is making a number of models of its rotary blowers and pumps, which it intends to present to the different engineering and mining schools of this country, which have courses in mining and metallurgy.

University of California—The Mining College has at last taken possession of the new Hearst memorial mining building, soon to be the most commodious, best equipped, and in every essential the finest building devoted to such a purpose in any educational institution in the world. When completed the building will have cost over \$1,000,000. It has been erected and

equipped by Mrs. George Hearst as a memorial to her husband, who made his immense fortune in mining operations.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Western Tube Company, Kewanee, Ill. "Kewanee Union" Pipe Connections. Six-page folder, illustrated, paper, 5x7 in.; 1907.

John A. Traylor Machinery Company, Denver, Colo. Frisbie Friction Clutches and Pulleys. Pp. 4, illustrated, paper, 3½x6½ in.

The Locke Insulator Manufacturing Company, Victor, N. Y. Catalog No. 9. "The Insulator Book." Pp. 59, illustrated, paper, 6x9 in.; 1907.

Standard Sanitary Manufacturing Company, 35-37 West Thirty-first street, New York City. Modern Sanitation. Pp. 32, illustrated, paper, 7x10 in.; January, 1907.

Sutton, Steele & Steele, Inc., 194 North Jefferson street, Dallas, Texas. Bulletin T.I. The S. S. & S. Dry Concentrating Table. Pp. 4, illustrated, paper, 6x9½ in.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin 1419. Allis-Chalmers Crushing Rolls for Coal, Rock, Salt, Phosphate Rock, Etc. Pp. 4, illustrated; paper, 8x10½ in.; Sept., 1906.

Construction News

Webbwood, Ontario—The Shakespeare Gold Mining Company has decided to put up a 50-stamp mill at Webbwood at an early date.

Lead, South Dakota—A steam hoist and other machinery will be put in on the Pluma property in the spring. The company's address is at Lead City, South Dakota.

Pineville, Kentucky—The Edgmont Coal Company is preparing to open coal mines, and will need hoisting and other machinery. C. S. Nield, Wilton, Ky., is in charge of operations. An electric plant is also to be installed.

Sherwood, Tennessee—The Cross Creek Coal Company is arranging to open several coal mines; also to build a spur track two miles long, to give railroad connection. Machinery and materials will be needed. Mark Packard, Mutual Life building, Buffalo, N. Y., is largely interested.

Crab Orchard, Tennessee—The Southern Coal and Iron Company is preparing to open two coal mines at Crab Orchard and Cox Valley, and will need machinery. The construction of a blast furnace is also under consideration. John A. Shellito, 80 Wall street, New York City, is president and general manager.

Special Correspondence

San Francisco Feb. 13

A bill has passed the house of representatives which amends the Caminetti law relating to hydraulic mining by providing that where it shall appear to the California Débris Commission that hydraulic mining may be carried on without damage to navigable rivers or lands adjacent thereto, an order may be issued authorizing such mining to be carried on without requiring the construction of any restraining dam, impounding works or settling reservoirs. Under the present law an impounding dam of some sort is required, even if the commission does not consider it necessary. There are hundreds of small properties, especially in Plumas and Sierra counties in this State, at which, were it not for the prohibitory law, hydraulic mining might be carried on successfully without doing the least harm to navigable streams or farming lands. The members of the California Débris Commission know where these claims are, but they are powerless to act under the present conditions. If the amendment above referred to finally becomes a part of the hydraulic-mining law, many of these claims can again be worked profitably.

Announcement has been made by H. B. Underhill, president of the Selby Smelting and Lead Company, that the addition of an acid plant to the new smelting plant at San Bruno point has been authorized. The purpose of this plant is to make acid out of the sulphur fumes coming from the smelter during the season when the winds are variable. The acid department will cost \$300,000. It has been concluded that with this arrangement no one can be harmed by the fumes. In the summer the winds are from the west. The smelter plant is situated 10 miles from San Francisco, between five and six miles from Burlingame, and 12 miles from Alameda. The business advantages to arise from the smelter to this community are great, as 1000 men will be steadily employed and a market will be supplied for the silicious ores of California and Nevada and make it possible to work low-grade deposits of copper in California at a profit. By building an acid plant to take care of the sulphur fumes, the company will do away with any possible annoyance to the community adjacent to the plant, and at the same time produce sulphuric acid at a low price.

The Midway district oil producers of Kern county have come out successfully in their contest with the Standard Oil Company for the sale of the oil of that district, a contract having been entered into with the trust for 3,500,000 barrels of oil at the market price of 30c. per barrel, the highest price for crude paid for five years. According to the agreement the Standard agrees to take 3,500,000 bbl. at 30c.; the pipe-line recently surveyed must

be built and ready to run oil within 60 days; all oil of 14 gravity or above shall be accepted; a minimum of 7000 bbl. a day must be delivered, with refusal to take all. There is no limit in which the producers' end of the contract must be filled. The Midway producers are unwilling to announce as yet the companies which have agreed to enter into this compact.

The Oil City and Twenty-eight oil properties in Coalinga district, Fresno county, have been purchased by parties interested with the Standard Oil Company for \$955,000. This will make \$3,000,000 spent on oil properties in that district recently. The price of light oil, such as Coalinga produces, has recently been raised largely in this market. The properties to be taken in the deal include 320 acres owned by the Oil City Company and 160 acres owned by the Twenty-eight Oil Company and many producing wells in Coalinga. The lands are under a lease to the Hanford Company, which is controlled by the Western Fuel Company, back of which is the Standard Oil. The product from Coalinga will be running to Point Richmond soon, where the great refinery plant of the Standard Oil on this coast is situated.

The supervisors of the county of Sutter, a little farming county lying south of Butte, have passed resolutions directing the district attorney of the county to institute proceedings against the dredgers to enjoin and perpetually restrain them from operating dredge boats on or near the Feather river at Oroville so as to allow tailings from the same to escape into the waters of the Feather.

The Sacramento Valley & Eastern Railroad Company has let the contract for building the first 10 miles of its 14-mile road from Kennett to Delmar. This section is to be completed by next August. Three camps have been established east of Kennett. The railroad is being built primarily to give the smelter at Bully Hill, or Delmar, a railroad connection with the Southern Pacific. The road will pass through Heroult, where an iron smelter is now under construction, and through the old mining town of Copper City.

Utah and Ohio men, among whom is F. H. Clark, of Salt Lake, have secured four miles of Shakespear beach, between Manhattan and Hermosa beaches, about 20 miles from Los Angeles, and propose to mine the sands for gold, iron and platinum.

In opening the manganese deposits between Potter and Redwood valleys, in Medocino county, it is expected to construct an aerial tramway from the top of the mountain down to the Redwood valley. A crew of men has been set at work opening the deposits for more careful examination.

Duncan McVichie, managing director of the Balaklala Company, is authority for the statement that the smelter at Co-

ram, Shasta county, will be ready to go into commission in August, by which time there will be 2,000,000 tons of ore blocked cut in the mine. Of this amount 400,000 tons will run 4 per cent. in copper, he says. The smelter will be increased to 1250 tons daily capacity, in order to treat the ore from the Shasta King and other mines of the Trinity Copper Company.

Seven men of the United States Geological Survey are now stationed at Furnace Creek ranch, Inyo county, working on the first Government topographical map of the region. The map will be struck off for the public by July 15. The demand for a Government map of the Death Valley region has been almost unparalleled and has come from all portions of the United States.

Salt Lake City Feb. 16

The Ohio Copper Company, which recently passed into the control of F. Augustus Heinze, has broken ground for its proposed mill which is to have capacity for the treatment of 2000 tons of ore per day. The plant is to be erected near the mouth of the Mascotte tunnel of the Dalton & Lark mine, which is being driven on to a connection with the ore-bodies of the Ohio mine, as well as to those of the Commercial mine of the Bingham Consolidated. To reach the latter the tunnel will have to be extended about 7000 ft. Contracts are to be let for equipment soon and the plant will probably be ready for commission before the close of the present year. It is not unlikely that the smelting operations of the Bingham Consolidated company will be conducted near the mill-site in the future, notwithstanding the company has secured options on ground elsewhere.

At the annual meeting of the Columbus Consolidated Mining Company, the old board of directors, with one exception, was re-elected. Tony Jacobson, of Salt Lake, will continue president and general manager. In his report, Mr. Jacobson shows that, during the last calendar year the cash receipts of the company from ore sales and other sources amounted to \$403,528, which with the balance of \$28,647 on hand at the beginning of the year, made up a total of \$432,175. The disbursements amounted to \$286,280. During the year there were mined 6590 tons of first-class ore and of this amount 6134 tons were sold at an average of \$43.33 per ton. There was also mined 12,299 tons of milling ore, of a gross value of \$11.15 per ton. New development consisted of 3304 ft. of tunnels, drifts and cross-cuts; 238 ft. of shaft sinking and 582 ft. of upraises, making the total 4124 ft.; the cost of the same averaging \$16.99 per foot. The matter of providing transportation facilities is now receiving consideration by the directors of the Columbus Consolidated Company and it is probable that a standard-gage railroad will be built to a

point within five miles of Alta, this year.

The annual meeting of the Ingot Gold Mining Company resulted in the election of John Dern, president; E. H. Airis, vice-president; George H. Dern, secretary and treasurer. This company owns territory adjoining the Consolidated Mercur mines. An assessment was levied on the stock to raise funds for development.

The Grand Central Mining Company has won another victory in the litigation which has been for several years pending in the courts with the Mammoth Mining Company. After being beaten in every step in the State courts, the Mammoth management endeavored to get the case into the Federal court for a re-hearing, but the application was denied and the judgment of the State supreme court will therefore stand. The only recourse left is the Supreme Court of the United States. The Grand Central sued for \$300,000 damages, the value of ore alleged to have been unlawfully extracted, and for title to certain ground upon which apex rights were claimed.

The stockholders of the Utah Copper Company have been called to meet in special session, Feb. 19, at which time the capital stock of the company will be increased from 600,000 to 660,000 shares. The new issue is to be allotted to present shareholders for subscription on the basis of \$25 a share and the proceeds are to be used to complete the construction of the new concentrating mill and power plant at Garfield. The plant will ultimately treat 6000 tons of ore per day. The initial unit of 3000 tons is nearing completion.

After several months spent in negotiations, the management of the American Smelting and Refining Company has succeeded in inducing the farmers who appeared in the late smelter-smoke cases to ask Judge Marshall for a modification of his late decree in which he set forth that in the future it would not be permissible for existing smelting concerns to treat any ore or combination of ores containing an excess of 6 per cent. sulphur in the charge. The smelting company agrees to compensate those of the farmers who were parties to the late suit to the extent of \$60,000; of this sum, \$20,000 is to be paid when the stipulation for the modification of the decree is properly signed and filed and the balance of \$40,000 is due and payable as soon as the easements are signed by all the plaintiffs to the suit. The smelting company agrees to provide a bag-house system and cooling chambers, through which process it is promised that the dangerous elements contained in the fumes will be so far removed that there will be no danger to growing vegetation.

Globe, Arizona Feb. 14

At the Old Dominion concentrator at Globe, they are experimenting with a buddle or round table, with very satisfactory results. The table in general

plan is somewhat similar to those on Lake Superior, but it has been found that when covered with split vanner belts, rough side up, it gives better separation than from any other surface yet tried. This table takes the tailings from eight vanners and extracts therefrom daily nearly 2000 lb. of 4 to 5 per cent. concentrate, therefore making a saving, at present copper prices, of almost \$20 per machine per day. Power used is not appreciable. It is probable that one or two more similar tables will be installed to treat the waste from additional vanners. Concentration at this mill is clean enough to leave only about 0.75 per cent. copper in tailings, and it is upon this sort of material that the new table works. Old Dominion smelter is now operating four furnaces steadily and is making from 110,000 to 118,000 lb. copper per day, or, say, 3,500,000 lb. per month. Troubles due to lack of fuel seem to have been overcome and the plant is working steadily. At the company's mine copper sulphides—chalcocite—cut on the 12th and 13th levels have now also been opened on the 14th, at the depth of 1100 ft. from surface. The vein, carrying ores grading from 5 per cent. up, has been opened into at points 600 ft. apart from foot-wall drifts, and a few days ago was 23 ft. wide in a crosscut, with the full width not determined. This discovery is of the highest importance to both this mine and the district; to the former because it has always struggled against a deficiency of sulphur in its furnace work, and to the latter because it is an additional proof that the ores of Globe extend deep into the diorite as fissures, secondarily enriched. Proofs of this have been multiplying of late. While a late examination of Old Dominion, under options on the stock at \$52.50 per share, resulted in the forfeiture of the option, there is no doubt that the mine is in far better condition than at any previous period. Possibly if the company had been more anxious to open its orebodies for expert measurement than to preserve its underground workings, this examination might have resulted differently.

The Globe district is now the most active in Arizona in the way of new development. Every day machinery for new operations is sent out from the town. The Gila Valley, Globe & Northern Railway is building north down Pinal creek to reach a number of small mines that now send their product out by team. This should add materially to activity outside the immediate circle of Globe proper. Several large Eastern interests are examining the district with care, preliminary to development. One new property, the Superior & Boston, is sinking two shafts to cut ground that has been opened by the Arizona Commercial Copper Company. The Globe Consolidated Copper Company, easily the most important new development in the district, is down 500 ft. in one shaft, and is developing along the 465-ft.

level of another. It will sink to 1100 ft. at once on the first shaft and is cutting a station and will crosscut on the 500. Arizona Commercial is developing at depth and has completed a standard-gage railway $3\frac{1}{2}$ miles long from the Old Dominion smelter to its mines. A 300-ton matte smelter, largely for custom ores, is under construction some three miles below town on Pinal creek.

Indianapolis Feb. 16

The miners of Indiana during the past week twice stood out for the enforcement of State laws. At the Union mine, in Sullivan county, owned by the Deering Company, the mine boss had not regularly entered the mine for inspection each morning before the men began work and one morning the men refused to go to work. The superintendent threatened to discharge the mine committee, but a settlement was effected by assurances that the law would be complied with.

At mine No. 2, near Terre Haute, 50 miners quit work because the company does not provide an engineer to hoist the shot-firers after they have fixed the shots in the afternoon. These shots cannot be fired until the men have left the mine, and by the time they get through the engineer is off duty. There is a disputed question of law as to the requirement, and the case has been referred to the State mine inspector.

A mine explosion occurred in Castle Garden mine No. 6, south of Booneville, Feb. 15, fatally injuring three and seriously injuring 10 or more miners. The investigation shows that the explosion was probably due to what is known as a windy shot, from a hole drilled into the face of the coal 8 ft. deep and containing too much powder, the shot setting fire to dust, which added force to the explosion.

A report of the legislative committee recommends that the working places of every miner be tested by using a safety lamp every morning before the miners enter the mines; a restriction in the amount of powder to be used in shot firing to not more than 6 lb.; limits the number and the rapidity of the shots; recommends that shot-firers be employed by the miners in all mines of 300 tons daily capacity or more, and that the inspection force be increased from two deputies to four. The committee also recommends that the mixing of dynamite with black powder be forbidden in blasting coal; that dead shots be prohibited except in the block-coal field; that the opening of powder cans with a pick be prohibited under heavy penalty and that the storing of powder and dynamite within a mine be absolutely prohibited.

Scranton Feb. 19

Michael Kelly, an engineer at the Locust Spring colliery at Mt. Carmel, died in the engine house while hoisting the mine

cage, and by the merest accident the cage was stopped in the middle of the shaft. George Fishinger, one of the fire-bosses was in the cage at the time, and after it stopped he signaled the engine room repeatedly. The fireman, hearing the signal, went to investigate and found that Kelly had died as the engine was in action. His right hand clutched the lever, while in his left hand he grasped the reverser. The slightest relaxation of either lever would have resulted in the cage being dashed against the hoisting machinery, or being thrown to the foot of the shaft.

The Pennsylvania Railroad, last week, made some tests of reinforced-concrete poles to take the place of wooden telegraph poles, owing to the increasing scarcity of timber. The concrete pole is about the same size and shape as the ordinary wooden pole, and was subjected to various tests to ascertain the strength as compared with the wooden pole. The officials state that the tests were satisfactory.

A bitter contest is imminent between the employees at the Morea colliery and the owners, Dodson & Co. The mine workers have refused to permit their case to go before the conciliation board, claiming that the company failed to obey the award of the board in a previous dispute. The company announces that it will secure other workers to take the place of the strikers.

Iron ore has been discovered in paying quantities at St. John's, a village between Wilkes-Barre and Hazelton in Luzerne county. M. S. Kemmerer & Co., owners of the Sandy Run colliery, have offered to lease the tract, paying 45c. a ton royalty on the ore mined.

The recently completed shaft of the Scranton Coal Company in Scranton, where considerable engineering difficulties were encountered, owing to the presence of a bed of quicksand, has been named Bryden shaft in honor of General Manager John R. Bryden.

Three miners employed in the Diamond mine of the Lackawanna railroad, in Scranton, were severely burned in a peculiar manner this week. They were preparing to drive a crosscut into an abandoned chamber when, while using the drill, they broke into an accumulation of gas. One of the men took off his coat and had partly succeeded in changing the course, when, the air-current was suddenly changed and the volume of gas was blown toward his fellow workmen, who were carrying naked lights. The three men escaped by lying down as soon as they saw that an explosion was imminent. Their injuries were very severe.

Toronto, Ont. Feb. 18

Numerous changes in the tariff bill now before the Canadian Parliament were announced this week by Finance Minister Fielding. Among new provisions affecting the mining and metallurgical industries

are the following: Blowers of steel of a kind not made in Canada for smelting and refining metals; rotary kilns, revolving roasters and furnaces of a kind not made in Canada for roasting ore, etc.; blast furnaces, slag trucks and slag pots of a kind not made in Canada; well-drilling machinery and apparatus of a kind not made in Canada for drilling for water, natural gas and oil, and prospecting for minerals; all these are placed on the free list.

A drawback of 99 per cent. of the duty is allowed on imports of lap-welded tubing of iron or steel, not less than $2\frac{1}{2}$ in. diameter, testing 1000 lb. pressure to the square inch, when used in oil or natural-gas wells and for transmission of natural gas; also on bituminous coal, when imported by proprietors of smelting works and converted into coke for the smelting of metals.

The Ontario Government bill providing for the taxation of mines was introduced into the provincial legislature, Feb. 13, by Hon. Frank Cochrane. It provides for an acreage tax on mining lands in unorganized territories, and also for a tax on the profits of working mines whether in organized or unorganized territories in cases where the profits exceed \$10,000 per year. In neither case is the amount of the tax specified in the draft bill, the fixing of the rate being postponed to a later stage. A companion bill provides that a portion of the proceeds of the tax will be devoted to the encouragement of the refining of metals within the province. Bonuses for the term of five years will be given as follows: On refined nickel or the nickel contained in nickel oxide, 6c. per pound, the aggregate bounty not to exceed \$60,000 in any year; on refined cobalt, or cobalt contents of oxide of cobalt, 6c. per pound, aggregate bounty per year not to exceed \$30,000; on refined copper, or on copper contents of sulphate of copper, $1\frac{1}{2}$ c. per pound, or on any copper product carrying at least 95 per cent. copper, $\frac{1}{2}$ c. per pound, the aggregate bounty not to exceed \$60,000 per year; on white arsenic produced from mispickel ores, but not from other ores, $\frac{1}{2}$ c. per pound, the aggregate bounty not to exceed \$15,000 per year. In case the bounty in any year is insufficient to meet all claims it is to be divided *pro rata*.

The completion of a power plant at Michipicoten falls, in the Michipicoten mining district, which is being constructed at a cost of \$150,000, and will be ready to deliver electric power by next July, is regarded as likely to revive the gold-mining industry in that neighborhood. Economic working of the mines has been difficult, owing to the cost of operating machinery. The supply of power from the falls at a cost of \$40 per horse-power per year, 24 hours per day, will, it is anticipated, render gold-mining profitable. Several of the companies are arranging for a supply. The Manxman, Grace and Reid will between them take 6000 h.p.

Alex. Scott, usually known as "Lucky" Scott, and John McKane, of Tonopah celebrity, have invested largely in copper properties which they intend to develop. They have taken over the Hamilton property in the Sudbury district where they have a diamond drill at work, and also secured the Campbell-Duke property in the Bruce mines region.

A 100-ton sampling plant is to be erected at Argentite, in the neighborhood of Cobalt, by S. L. Silverman, of Montana, to be conducted on an independent basis. It will be subsequently increased to a daily capacity of 250 tons.

Cobalt, Ont. Feb. 16

The official report of the Timiskaming & Northern Ontario Railway for the week ending Feb. 9 shows shipments of Cobalt ore as follows: La Rose, 117,578 lb.; Nipissing, 105,300; Kerr Lake, or Jacobs, 75,000; O'Brien, 67,000; Coniagas, 44,800; Cobalt Central, 32,307; total, 441,994 lb., or 221 short tons.

The contracts for the construction of a branch line of the Timiskaming & Northern Ontario Railway from Cobalt to Kerr lake, a distance of about five miles, has been let. This line will give transportation facilities to some of the principal mines.

American capitalists have secured a charter for the building of a line along the Montreal river through the Edison property. It may run as far north as Evelyn lake.

In the Larder Lake district, important finds have been made on Victoria creek, a branch of the Blanche river, including native silver, native gold, copper, galena and bismuth. There is also a black quartz said to be rich in gold, though its value has not yet been definitely ascertained.

London Feb. 9

A few weeks ago I referred to the case of the Copiapo Company, which owns the well known copper mines of that name in Chile, and mentioned that the new directorate appointed last year had come to the conclusion that the method of mining and disposing of the ores required thorough overhauling. The new scheme is now practically settled. The main shaft is to be sunk deeper and other levels are to be driven for prospecting purposes; also a smelter is to be erected, so as to smelt on the spot. For these purposes £50,000 of new capital is required, and the money is to be raised by the issue of debentures to this amount, exchangeable at any future time into shares of equal par value.

The British Aluminum Company, having got rid of the various troubles that clogged its operations in earlier years, is now extending its scope of action in many ways. The works at Foyers, in Scotland, have long been unequal to meet the demand for the metal, and the power to be supplied by the new works at Loch Leven will also

fall short of the requirements. The latter works are not yet ready, and the directors are making special efforts to complete a part of them. It is hoped that 3000 h.p. from this source will be ready in spring. The directors have also acquired a partially developed water power in Stangford, Norway, and have purchased a similar concession at Orsieres, Switzerland. When all these schemes have fully fructified, the company will have available a total of something like 70,000 h.p. For the purpose of carrying out these additional schemes the capital is to be increased by the issue of £600,000 in 40,000 6 per cent. preference shares of £5 each, and 40,000 special shares of £10 each. The total cost will probably come to £200,000 more, which will subsequently be raised by the issue of debentures.

Some interesting information is now available in connection with the richer shoots of ores found at the Mexico mines of El Oro. These mines are under the control of the Exploration Company, and are an offshoot of El Oro Mining and Railway Company. The neighboring Esperanza mine developed some very rich shoots, and the possibility of such developments at El Oro, and the Mexico mines has always acted as a piquant sauce for the shareholders. Some of the richer ore at the Mexico is found on the third level on a small branch vein, which has so far been opened up for a length of 60 ft. Across a width of 2 ft. the values run \$80 in gold and 700 oz. of silver per ton. Another similar body has been located on No. 4 level of greater width, but slightly less value, running \$55 in gold, and from 4 to 5 ft. wide. The policy of the company is to pick out this ore and ship it to the smelter, in order to provide additional capital for completing the erection of the 40-stamp mill. During the month of January the amount shipped in this way was 279 tons, and the net proceeds were \$33,000 in gold, the ore assaying \$89 in gold and 70 oz. of silver. During the next four months similar amounts will be shipped, and the proceeds used for capital purposes.

Perth, Western Australia Jan. 10

An important and promising silver-lead mine, only about 25 miles from Perth, is being opened up by a syndicate of local men. A shaft has been sunk 85 ft. where the lode, which was 7 ft. wide near surface, has widened out to 15 ft. and carries rich values. Assays so far made, have returned from 70 to 80 per cent. lead, and from 2 to 16 oz. silver per ton. Prospectors are testing the adjoining country and have picked up continuations of the lode.

The production of tin is steadily increasing, the principal districts being Greenbushes in the southwest, and on the Pilbarra goldfields in the northwest. At Moolyella some 400 men are working on alluvial tin deposits, and several lodes have been also located.

General Mining News

Petroleum Exports—The exports of mineral oils from the United States during the month of January were, in gallons:

	1906.	1907.
Crude oil.....	62,626,354	67,029,728
Naphthas.....	17,721,929	8,178,831
Illuminating.....	508,836,313	493,359,402
Lubricating.....	79,861,691	76,348,229
Residuum.....	43,725,192	37,021,179
Total.....	712,771,479	681,937,369

Paraffin is included in illuminating oils. The totals show a decrease of 30,834,110 gal., or 4.8 per cent., over the preceding year.

ALABAMA

Official figures given out by State Mine Inspector J. M. Gray show a reduction in coal output for 1906 in Alabama as compared to the output in 1905. The total production for 1906, with but one small county unheard from—and that will not materially affect the report—was 11,446,161 tons. In 1905 the output went to 11,900,153 tons. The production in 1906 by counties is given out as follows: Bibb, 1,220,534 tons; Blount, 159,963; Cullman, 115,607; DeKalb, 32,834; Etowah, 130,660; Jefferson, 5,826,892; Marion, 60,895; Shelby, 157,524; St. Clair, 159,478; Tuscaloosa, 694,193; Walker, 2,877,217; Winston, 10,363. In comparison with the previous year, reductions in output were noted in Bibb, DeKalb, Etowah, Marion, St. Clair, Tuscaloosa and Winston counties. Jefferson county, the largest coal-producing county in the State, produced only 10,728 tons more coal in 1906 than in 1905. The decrease last year was 453,992 tons.

Southern Steel Company—This company has filed a petition in the Circuit Court at Birmingham, Ala., asking for an injunction against the numerous plaintiffs in suits brought against the Alabama Steel and Wire Company as a result of the explosion nearly two years ago in the Virginia mines, in Jefferson county. The object is to determine the liability of the Southern Steel Company, which acquired the properties of the Alabama Steel and Wire Company, in the pending cases. The explosion, which was said to have been one of dust in the mines, caused the death of 112 men. More than 118 suits for damages were filed against the company for sums ranging from \$20,000 to \$50,000 each. Four of these cases were tried, two of them being decided in favor of the defendant company; one was a mistrial and in the other case a verdict for \$6000 was awarded the plaintiff, from which decision an appeal was taken. The injunction desired is to determine whether the Southern Steel Company is liable and to what extent. In the petition, which is very lengthy, it is set forth that there are more than 114 cases yet pending and that each case so far tried took up from two to three weeks time, costing the State

something like \$500 each. Should the court decide that the Southern Steel Company is not liable, all the causes would be dismissed. The suit is a novel one and will be watched closely.

ARIZONA

There has been introduced in the legislative assembly of Arizona a bill making it a felony for any person or persons to make or publish any false or fraudulent statement regarding any mines in this territory for the purpose of procuring persons to invest in such mines. It is thought that the bill will become a law, and that several other restrictions will be added to it before its final passage.

COCHISE COUNTY

Trouble is reported at Bisbee, owing to the organization of the miners by agents of the Western Federation of Miners. A despatch dated Feb. 17 reports that 1100 men had been laid off by several of the larger companies; and that it was expected that most of the mines would be temporarily closed. Bisbee and the whole Warren district have always been non-union, and the mines have been worked on the "open shop" plan.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the production of its works at Clifton, in January, at 1124 short tons of copper.

YAVAPAI COUNTY

Dividend Consolidated Gold Mining Company—It is reported that this company will soon resume operations. Its property is near McCabe, and has been idle for some time.

Octave—This mine has passed from the Octave Gold Mining Company into the hands of Chicago capitalists, who will organize a new corporation and work the same. It has been given out by the management that operations on a large scale will be commenced in a short time. The Octave has been one of the large gold mines of the county, but has not been operated to any extent for the past two years.

Consolidated Arizona Smelting Company—In January this company smelted 12,000 tons of ore, producing 403 tons of blister copper. It is expected that the works will be soon operating at their full capacity.

Hassayampa Copper Company—This company, recently organized in Boston, has closed a deal for a group of copper claims in the Hassayampa district, 12 miles southeast of Prescott.

CALIFORNIA

BUTTE COUNTY

Nugget Ranch—This company has been organized at Oroville by Los Angeles men, to purchase lands and build a gold dredge on the Nugget ranch in Butte creek cañon.

Butte Creek Gold Dredging Company—The machinery for this company is nearly completed and will be soon installed in Butte creek.

Gold Bar Company—The machinery for the dredge of this company in the Ferguson lands, Butte creek, will be installed as soon as the weather permits.

East Magalia Mining Company—This company, W. H. Parry superintendent, is developing the old Parry mine three miles from Magalia. Two large pumps have been provided to handle the water.

EL DORADO COUNTY

Bachi-Collins—This quartz mine, a mile from Garden Valley, has been sold to Nevada men. The mine is a new one.

INYO COUNTY

Darwin—At this camp, 20 miles south of Keeler, the Rio Tinto mine owned by J. L. Girner is being rapidly developed. The Defiance, opened to the 400 level, is beginning to show copper ore. The Lucky Jim, operated by Boston, Mass., men, shows good silver-lead ore. Senator T. L. Oddie, of Nevada, has recently bought a group of nine claims.

Resting Springs District—The Tecopa group of 20 claims in this district is reported sold. The Tonopah & Tidewater Railroad will run within three miles of the mines, which were opened over 30 years ago.

MADERA COUNTY

Golden State—This mine, six miles from Raymond, has a small force of men at work and a mill is to be put up as soon as the roads are in condition for hauling.

NEVADA COUNTY

Copper—Men have started work on copper deposits in the Brown & Tissue ranch, west of Grass Valley.

Morning Star—In this property, on the Mother Mitchel ranch west of Grass Valley, specimen ore has been discovered by H. & W. James, who have a bond upon it.

Union Blue Gravel—In this drift mine at North Bloomfield good gravel is being found and milled. J. H. O'Connor is superintendent and A. D. Gassaway, manager.

Murchie—In this mine, at Nevada City, a rich ledge has been met on the northeast side of the shaft at the 850 level. It is 8 ft. wide, all of milling ore.

Mountaineer—At this mine, Nevada City, J. C. Campbell superintendent, a large body of ore has been found. It is 2006 ft. from the mouth of the tunnel and 1200 ft. beyond where the shaft starts down from the tunnel.

Blue Tent—At this mine, on the Yuba river, a force of men has been set at work reopening the property under Superintendent Oscar Jones. This was at one time a very prominent hydraulic mine, and was

later worked by drifting. A new tunnel is being run to open a channel which cannot be reached through the old workings.

PLACER COUNTY

Bellevue—This quartz mine, near Ophir, has been sold to W. F. Brice and associates, of Los Angeles. The 300-ft. shaft is being enlarged and strengthened.

Peckham Hill Tunnel—This tunnel, on the Forest Hill divide, is expected to open up seven gravel channels, and will cross about 100 old tunnels. The tunnel, now in 2000 ft., will drain a number of drift mines.

SAN BERNARDINO COUNTY

Providence Gold and Copper Company—The tunnel is in over 800 ft. on this property, near Kelso station. The vein is not expected to be reached sooner than six to nine months.

SAN DIEGO COUNTY

Picacho Basin—This property will shortly be producing again. The railroad from mill to river is being put in order and so is the milling plant. The mines have been unwatered, and 30 miners have been set at work.

SHASTA COUNTY

Rattlesnake—This mine, near Redding, now under bond to the Mammoth Copper Company, will soon begin shipping ore to the smelter.

SIERRA COUNTY

Alleghany—This company, near Alleghany, operating the McNulty diggings, has started piping with one monitor. This is the first hydraulic property worked in that section for about 25 years.

Tightner—In this mine, near Alleghany, famous for its rich pockets, a new shoot of ore has been found in the south drift 100 ft. from the shaft.

SISKIYOU COUNTY

Helena—In this property at Callahans, James McKean, superintendent, the ledge has been struck in tunnel No. 5, and a good average value of ore found.

TRINITY COUNTY

Fairview—At this property, Minersville, Charles Dobler, superintendent, a body of ore has been found just above the lower level.

Brown Bear—An important strike has been made in this mine at Deadwood by Grigsby & Motherwell, leasers. They have found an 8-in. streak of high-grade work, and a 2-ft. ledge of \$30 ore.

COLORADO

LAKE COUNTY—LEADVILLE

Big Evans Gulch—A great deal of interest is being taken in the resumption of work at the Mammoth. At present the new company is installing a 10-in. water column, electric hoists and pumps, and when this is completed, unwatering the shaft will be commenced.

To the west and south of the Mammoth

is located the Fitzhugh and from several levels a high grade of ore is being hoisted and sent to the smelter; the average is 30 tons daily. The lower north drift has penetrated the fault, and is now heading toward the end lines of the Mammoth; it is in flint and an upraise has been started into the porphyry.

New Monarch—Considering the hardness of the ground fair progress is being made in sinking the Cleveland shaft; so far only 25 gal. of water are being raised every minute. The shaft is being sunk in a body of quartz; a strange feature has occurred in the north end of the shaft a few feet out of the perpendicular course, which cannot be used in sinking. A perfect wall comes in, alongside of which is a good vein of ore running well in gold, silver, and lead; as the shaft gains depth it is expected that this wall will come into the shaft, when the breaking of the ground will be more rapid. The body of quartz that the shaft is going through runs \$6 per ton.

Sunday—This property, Ball Mountain, has been leased to M. A. Nicholson and associates, and the main shaft will be sunk another lift of 300 ft.; the present depth is 375 ft. The shaft is a perpendicular one and when sinking is completed a cage will be installed, and drifting to the vein will be started from the bottom. A deal is on foot by the present lessees to secure the right of way for a tunnel to be driven from the base of the mountain into the Sunday vein, and if successful it is probable that the Garibaldi tunnel, now in about 700 ft., will be used and driven ahead.

Rock Hill—The Ben Burb, Oro City and O'Sullivan claims are under lease to several well known practical miners of the camp and in a few months they have accomplished a great deal of work. All of the properties in early days produced heavily from the upper workings, and at present the chances of catching one of the Rock hill ore channels are very encouraging. All of the work is carried on from the Ben Burb shaft, which was re-timbered and put into good working order; while this work was being carried out several good bunches of ore were found and shipped, which aided materially in cutting down the expenses. A drift has been run from the Ben Burb to the O'Sullivan, and prospecting from this drift is being carried on in different directions. The Reindeer, Murphy shaft, Rock, Crecentia, Dome and others are shipping daily the regular quota of ore with development in each case being kept well ahead.

Yak Tunnel—A large amount of development work is being carried on from the different laterals in the great bore, and the main tunnel is being driven ahead to the Ollie Reed property, in South Evans gulch. When the necessary arrangements are completed with other companies

in this section the tunnel will reach out to them. At the Louisville lateral 50 tons daily of sulphides and zinc ore are being hoisted from the lower workings.

SUMMIT COUNTY

Dunkin—A shipment of a carload of rich lead carbonate ore has just been completed from this property in a lease held by Knorr, Kistler & Co.

New York—This group of claims on Gibson Hill is now being worked by a company and a trial shipment of a complex lead-zinc-iron-sulphide ore has been sent to the sampler to ascertain how the product can best be treated.

Wellington—As long as the Colorado & Southern Railway can supply empty cars, the Wellington Company can keep filling them at the rate of 75 or 80 tons per day. This ore is high-grade zinc and goes to the Colorado Zinc Company's works in Denver. Shortage of cars is the only drawback at present.

Senator—This mine has a force of 20 miners taking out ore and filling the bins ready to make regular shipments when the roads are opened up in spring.

Washington Joliet—H. T. Keltie, president of this company, is now at the mine in company with W. R. Everett, of Chicago, who is considering the purchase of the property. F. H. Summeril, of Denver, is making the examination for the Chicago people.

Sundown Placer—This property is now being put into shape for vigorous work this year. It is situated in Illinois gulch and is owned by Wm. Squires and associates.

Reliance Dredging Company—Dredgmaster D. A. McDonald has returned to Breckenridge and has commenced the work of repairing and reconstruction on the dredge-boat on the French Creek property.

Gibson Hill—This is the title of a new incorporation of a group of properties on Gibson hill. The incorporators are B. W. Newcomb, O. W. Pitcher, Geo. Kellogg, and W. F. Forman. The authorized capital is \$300,000.

Kimberly Consolidated—This company at Kokomo is employing 80 men on the construction of its new mill for treatment of lead-zinc ores.

Rothschild—This mine, at Rathbone, made a shipment of high-grade silver ore recently. Ruby silver is prominent in some of the ore. This ore was obtained from the main tunnel workings in Cooper Mountain. Thos. Webb is superintendent.

Hibbs—This company is operating the Victoria mine on Mount Royal at Frisco, and is employing three shifts of men in sinking the main shaft. J. Percy Hart is in charge of the work.

TELLER COUNTY—CRIPPLE CREEK

Drainage Tunnel—Talk about the drainage tunnel is being indulged in, but no

definite arrangements have yet been made for the commencement of the big bore. It is understood that final action is being delayed until the railroads can be heard from with regard to subscribing toward the construction of the tunnel. At present it is not known just what action will be taken by the roads on the matter.

Forest Queen—The new hoisting plant on this property has been installed, and the work of sinking will be commenced at once. Considerable ore has been shipped from this property, which is being operated under lease by Chicago people. The shaft is at present 600 ft. deep.

Iron Clad Mill—A successful run has been made on this mill and a clean-up better than expected was the result. This mill is being operated by the Ironclad Milling Company under lease from the receiver of the Homestake Company, and has been running for some time. The ore treated is of low grade. It is reported on good authority that the large mill will soon be started again.

Portland—At the annual meeting of this company at Cheyenne, Wyo., the old board of trustees were re-elected for the ensuing year. The result was a decided victory for the Howbert party, as against the Burns faction. The former voted 1,861,017 shares against 604,497 shares by the latter. The principal contention of the Burns faction was that the stock of the Shannon and Stratton estates should not be voted. This amounted to over 1,200,000 shares, and was finally voted for the Howbert faction. The report of President Howbert showed the affairs of the company to be in good condition. The gross output of the mine for the past year amounted to 92,265 tons of ore of the value of \$19.69 per ton and 11,318 tons of low-grade oxidized ore of the value of \$10.18 per ton, making in all 103,583 tons of ore of the average value of \$18.64 per ton, giving a gross output of \$1,932,083. The cash on hand Dec. 31, after paying all expenses, amounted to \$371,844. The total profit for the year, from both mine and mill, was \$512,106. A large amount of development work was done during the year and several new orebodies opened up. The most important of these were those discovered in the winzes below the eleventh level of the Burns shaft. The ore during the past year was of considerably lower grade than that of the previous one. Dividends paid during the year were \$690,000 in all.

GEORGIA

WHITE COUNTY

Canadian-American Loud Gold Mines, Ltd.—This company has been incorporated at Athens to work the old Loud gold mine, which has not been operated for some time. Rufus K. Reaves and others are incorporators.

IDAHO

The annual report of Robert N. Bell,

State inspector of mines, gives the number of fatal accidents for the year at 17, which compares with 20 in 1905; 10 in 1904, and 20 in 1903. There were approximately 7000 men employed in mining during the year, the exact number being difficult to ascertain, owing to irregular working of some mines. The causes of accident were as follows:

Explosions of blasting compounds.....	6
Falling ground	4
Falling down chutes, etc.	5
Tramway accident	1
Handling timber	1
<hr/>	
Total number	17
Average per 1000 employees.....	2.43

This shows a low average of deaths, as compared with some other mining States.

INDIAN TERRITORY

CHOCTAW NATION

Ozark Coal and Railway Company—This company has a lease on 1000 acres near Panama, together with mines and mining equipment producing 600 tons per day, and a connection with the Kansas City Southern Railroad. The company is at present cleaning out its mines and making some necessary improvements with a view to beginning operations March 1. Officers of the company are J. H. Durkee, Kansas City, Mo., president; H. F. Durkee, treasurer, and C. A. Braley, attorney and secretary.

KENTUCKY

BELL COUNTY

Edgmont Coal Company—This company has been organized with a paid-up capital stock of \$150,000, and will develop coal lands near Pineville, in Bell county, Kentucky. The company owns about 5000 acres of coal lands, containing the Straight creek seam, and producing, it is stated, an excellent quality of steam and gas coal. A modern electrical mining plant will be installed for a production of 1000 tons daily. C. S. Nield, of Wilton, Ky., will be in charge of active operations.

MICHIGAN

HOUGHTON COUNTY—COPPER

Franklin—It has been decided to cross-cut at the 22d and 23d levels from No. 1 shaft in the conglomerate to the Pewabic lode. This will facilitate prospecting at depth. In the spring the old Pewabic property will probably be pumped and efforts will be made to make a mine of the property.

KEWEENAW COUNTY—COPPER

Allouez—It is reported that with the transfer of 25,000 shares of Allouez stock the Calumet & Hecla Company has acquired control of this company. The rumor, which has been current for some time, is now practically confirmed by the announcement of this transfer of Allouez stock. The Calumet & Hecla mine now owns 35,000 shares in its own name, and the balance of control is held by interests

favorable to that company. No. 2 shaft is now in country rock and is almost completely lined with concrete, which will eliminate water trouble. The compressors for this shaft have been shipped and will be installed as soon as they arrive.

Centennial—With the passing of the control of the Allouez, 60,000 of the shares of this company have been acquired by the Calumet & Hecla Company. Conditions at the property remain unchanged, except that work is progressing steadily and No. 2 shaft is being sunk to the 28th level. Work has suffered considerably on account of the heavy storms of the past few weeks.

Keweenaw Copper Company—Since its organization 1½ years ago this company has built an operating line of railroad from Lac La Belle to Calumet. A cross-section of the entire property has been taken with diamond drills and one shaft, the Medora, has been opened to a depth of 670 ft., while a second is down about 200 ft. It is stated that the amygdaloid lode shows very good values. It is expected that next summer's development will be most satisfactory and will throw new light on the extent of mineralization in Keweenaw county.

MONTANA

BUTTE DISTRICT

Amalgamated—All of the mines of this company, with the exception of the Neversweat, are again yielding their customary quantity of ore, the weather having moderated sufficiently to permit of resumption. The Neversweat is yielding only in part, but will be running full blast soon. Boston & Montana is shipping its usual quantity of ore, but is still a little short on coke at the smelter. It has passed the 1700-ft. mark in the West Colusa shaft, having sunk 100 ft. since it resumed work in the bottom, 45 ft. of which was put down in January. It is going to the 2000, and expects to make about 60 ft. a month hereafter. Parrot is preparing to sink the Little Mina shaft from the 800 to the 1000. It tapped the bottom of the opening with a diamond drill from a crosscut south of the 1000-ft. station of the Mountain Con, and drained the water. The Little Mina has not been worked for several years, but was a fairly good producer when in operation. The company expects to open greater orebodies between the 800 and 1000.

Butte Coalition—This company has opened an immense body of high-grade copper ore in the Minnie Healey. The point of discovery is 250 ft. west of the main shaft, where a winze was sunk from the 1200 to the 1300. The vein will be crosscut from the 1400 when the shaft reaches this depth. The Rarus is yielding about 700 tons of ore a day. During the car-shortage period no particular attempt was made to operate the Corra or Minnie Healey on an extensive scale, because there were not enough cars to transport

the output, and the company desired to concentrate its efforts on the Rarus. Most of the output of Rarus is coming from vein 40, which was lost in the upper levels by United Copper, and found lower by Coalition. Veins 14, 17, and 19 are not very productive at present, but may become better with depth. The shaft is sinking, and has reached the 2000. It is going to the 2500, and the remaining 500 will be sunk under contract.

North Butte—The crosscut heading for the Berlin from the 1600-ft. level of the Jessie has entered Snowball ground adjoining the Berlin on the south, and is said to have cut a 22-ft. vein of high-grade copper ore in the property. The company is now making its customary shipments, having recovered from the recent congested condition that affected all large operators.

Davis-Daly—The crosscut south of the 500-ft. station of the Smokehouse has encountered a 10-ft. vein, but the vein filling is not commercial ore. Drifting is in progress east and west, a distance of 23 ft. having been attained in either direction. The shaft on the Colorado, another company property, is 680 ft. deep, and is bound for the 1000. The shaft on the Mount Moriah is 520 ft., and is also going to the 1000 on an incline. The vein has pitched south of the opening and sinking is in the foot wall. The face of the crosscut from the 1800-ft. station of the Original is more than 1300 ft. south and advancing rapidly. It is supposed to be close to the vein of the Thomas claim.

Butte-Milwaukee—This company, of which Butte-New York is the holding corporation, has finished equipping its property with machinery, and is sinking a three-compartment shaft, now about 100 ft. deep. It is installing an air compressor to facilitate the work.

Butte Copper Exploration—A crosscut has been driven north of the 1000-ft. station and another started south. No commercial ore has been struck in the property, but indications are said to be favorable.

PARK COUNTY

Montana Coal and Coke Company—It is reported that this company has closed a yearly contract to deliver its coke output to the Anaconda and Washoe works at Butte.

NEVADA

LYON COUNTY

Yerington—A deal was closed in Salt Lake City recently for the purchase of the Copper King and Copper Deposit groups of claims at Yerington, and these will form the basis for the organization of the Yerington Consolidated Copper Company. The area is 225 acres, situated between the Mason Valley and Bluestone mines. The purchasers, with the exception of Col. E. A. Wall and John Dern, are heavily interested in the Nevada-Douglas mine in the same district.

LINCOLN COUNTY

Groom—These lead mines, in the Groom district, have been sold to a syndicate of Goldfield mining men.

NYE COUNTY—BULLFROG

Shoshone—A shipment of 2000 sacks of the richest ore has been made to Salt Lake. The work of connecting the mine with the railroad by a short spur is nearly completed, and this will greatly facilitate mining. Development operations are being carried out in the mine, and large ore reserves have been opened.

Tramp Consolidated—A shipment of rich ore amounting to about three railroad carloads has been sacked and is awaiting cars. The mine workings continue to look well.

Venture Nevada—The main tunnel has been extended a distance of 520 ft., and it is estimated that it will have to be driven a further 100 ft. before cutting the main ledge, which outcrops at the surface.

Skookum—This mine is situated on Bare mountain, 10 miles from Rhyolite, and has not long been operated. The shaft is 125 ft. in depth, and is being sunk on a medium-sized vein. A recent trial shipment of the ore amounting to 20 tons gave an average return at the Salt Lake smelters of \$166 per ton.

Gibraltar—The vein system has been developed by tunnels to a depth of 500 ft., and a large amount of ore of milling grade has been blocked out. A shaft is also being sunk to prospect for the Tramp Consolidated veins, which are believed to run into the southern portions of the Gibraltar leases. This shaft has now reached 330 ft. depth.

China-Nevada—Prospecting work is being vigorously pursued on this property, which is situated in the vicinity of the Mayflower mine. A promising quartz vein outcrops on the surface, and a shaft is being sunk to prospect it at the 150-ft. level.

PENNSYLVANIA

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company has completed the installation of electric lighting in the Sterling colliery, near Shamokin, where the workings are as well illuminated as the buildings on the surface. Arc lights are installed in the gangways while incandescent lights are used in the chambers. The North Franklin and the Enterprise collieries are also equipped with electric lights.

BITUMINOUS COAL

Ellsworth Collieries Company—This company has taken over the property of the Ellsworth Coal Company, consisting of 15,000 acres of land in Washington county, and opened mines which produced last year 1,321,000 tons of coal. The new company has issued \$1,000,000 capital stock, all of which is held by the Lackawanna Steel

Company; and \$6,000,000 purchase-money bonds.

SOUTH DAKOTA

LAWRENCE COUNTY

Homestake Extension—The differences between the Douglas Lacey people and the local management have been adjusted, and the headquarters will be transferred from New York to Deadwood. Both this property and the New England Homestake, under the same management and located directly across the gulch, will resume operation at once.

New England Homestake—A settlement of the difficulties between the Douglas Lacey Company and the local management of this company has been reached, and at a meeting held in New York the following officers were elected: Charles E. McHugh, Deadwood, president; R. L. Spenser, New York, vice-president; N. E. Frankling, Deadwood, treasurer; John R. Russell, Deadwood, secretary; E. Baldwin Hammitt, of Hartford, Conn., W. H. Bonham, Deadwood, and John Treber, Deadwood, directors. Work will be resumed on the property at once.

Lucky Strike—The construction of a 40-stamp mill on this property will be begun early in the spring. Sufficient lumber has now been cut at the saw-mill on the ground for the entire mill, and the grading is also completed. The necessary machinery is all on the ground and has been housed in until the mill is ready to receive it.

PENNINGTON COUNTY

Caliboga—A deal is now pending for the purchase of ground about and including this property in the antimony belt near Silver City. This property was located 12 years ago, and considerable development work has been done upon it. A shaft, now 125 ft. deep, was sunk on a vein of lead-silver ore, and at the 80-ft. level a ledge 12 ft. wide and carrying lead was encountered. The company has a steam hoist and pump.

Mercedes—This property will be sold for debt at Rapid City, Feb. 23. The property was worked successfully for six months, and then owing to internal dissensions a receiver was appointed. The shaft is 140 ft. deep and in good ore.

UTAH

BEAVER COUNTY

Newhouse Mines and Smelters—The mill of this company is now being operated with equipment to handle 1200 tons of ore per day.

Indian Queen—A good body of lead-silver ore containing shipping values has been recently developed in this property, which is situated near the Cactus copper property of the Newhouse Mines and Smelters.

Talisman—The heavy mine equipment ordered for this property some time ago is being installed.

Newhouse Mines and Smelters—The management of this company has contracted for electrical energy, to the amount of 1000 h.p. from the Telluride Electric Power and Transportation Company, delivery to begin not later than Nov. 1, 1907. One object of this move is to guard against future trouble on account of a fuel shortage.

IRON COUNTY

Jennie Gold—The management of this property has announced that the mill under construction has been inclosed, and that it will be ready for commission about May 1. C. A. Short, of Gold Springs, is manager.

JUAB COUNTY

Utah Mine—The management of this Fish Springs property has received \$5600 in adjustment of the late loss of the company's hoisting plant by fire. Notwithstanding the loss the company has been marketing about the usual amount of ore, by utilizing an old shaft.

May Day Mill—Lessees are operating quite successfully with a dry-process concentrator.

Lower Mammoth—While blasting out a place for the new hoisting machinery on the 1200-ft. level, copper ore of a commercial grade was encountered.

Tintic Smelting—This company has completed the surveys of the site selected for its lead smelter and the breaking of ground for the plant will begin by March 1. The Eureka Railway Company, a subsidiary corporation, has been formed, and will build a standard-gage railroad to connect several of the principal mines of the Tintic district with the smelter.

Tintic Ore Shipments—Last week shipments amounted to 148 carloads, the contributing mines being: Ajax, 3; Beck Tunnel, 12; Bullion Beck, 9; Carisa, 4; Centennial Eureka, 49; Eagle & Blue Bell, 7; Eureka Hill, 2; Gemini, 5; Godiva, 1; Grand Central, 10; Mammoth, 11; May Day, 5; Ridge & Valley, 3; Scranton, 6; Swansea, 3; Tintic Iron, 8; Uncle Sam, 3; Victoria, 4; Yankee Consolidated, 3 cars.

PIUTE COUNTY

Seiver Consolidated—The mill on the property of this company is in operation and is said to be effecting a good saving.

Annie Laurie—This property is being operated under the direction of the receiver appointed some time ago.

SALT LAKE COUNTY

Utah Apex—This company has given notice of an issue of 26,000 shares of new stock. This is offered to present stockholders at \$6 per share, each to have the right to take one share of new stock for each 20 shares of old stock held.

TOOELE COUNTY

Cliff—This company, operating the Buckhorn mine, at Ophir, has its new aerial tramway almost completed, and ex-

pects to have it in commission in March. Regular ore shipments will then begin.

WASHINGTON

FERRY COUNTY

Dominion Copper Company—This company has begun shipping ore from the Lone Star and Washington claims, situated near Danville.

Byrne Group—A vein 6 ft. wide has been discovered in a crosscut from the tunnel. It appears to strike parallel with the tunnel, at a distance of 25 ft. The material of the vein is mainly iron sulphide, with some chalcopyrite. On the west wall is a streak of galena 12 in. wide.

Bridge Creek Mining Company—A contact vein, between quartzite and lime, is traceable through five claims. A tunnel has been driven 246 ft., 174 ft. of it running on the vein. The face is nearly 100 ft. below the surface. The ore consists of lead carbonate, galena and iron sulphide.

Gavin Group—Six claims are under bond to Seattle people, who have done 675 ft. of work, to determine their value, and claim enough ore in sight to pay for the property. A shaft was sunk 170 ft., and the vein drifted on shows an average width of about 5 ft., the widest part being 16 ft. in driving a little over 100 ft. Considerable good ore has been found in raises and winzes. The ore carries gold, silver, and copper.

Meteor—This camp, on the south half of the Colville Indian reservation, in Ferry county, has lately become unusually active. The veins in that section are usually wide, with the bulk of ore low grade and small rich streaks. The Meteor company is preparing to ship silver-lead ore as soon as the snow is off. The Black Thorn Mining Company has driven a tunnel about 300 ft. The Stray Dog Mining Company has commenced hauling ore to the railway, for shipment to the smelters. The Imperial Company, adjoining the Stray Dog, has erected new buildings for the miners, and is starting on active development. A tunnel has been driven 250 ft. on a 5-ft. vein of inferior ore in the Keystone mine, but in the face a body of ore, 3 ft. wide, is giving good assays in gold and silver. The Golden Treasure Company is driving a tunnel, to intersect a vein at a distance of 500 ft. It is now in over 300 ft. The Queen mine has a shaft down over 100 ft. on a vein of high-grade ore. Ladd & Tilton, of Portland, Oregon, have purchased the H. & E. group of four claims, and have started driving a tunnel to cut the lead at 500 ft. in. M. D. Rankin is superintendent. The Syndicate Mining Company, owning 11 claims, has driven a tunnel 250 ft., and let a contract for 50 ft. more. J. W. Bartlett is superintendent. D. S. Presscott, Hyde block, Spokane, Wash., is secretary and general manager.

Foreign Mining News

CANADA

BRITISH COLUMBIA

British Columbia Copper Company—Colgate Hoyt, of New York, was elected president, to succeed F. L. Underwood, at a meeting held in New York, Feb. 14. Newman Erb was elected chairman of the executive committee, and B. B. Lawrence was made second vice-president. Mr. Underwood remains a director.

ONTARIO—COBALT DISTRICT

Argentite—This company owns the Argentite townsite, two miles north of Cobalt, and several hundred acres of land. Walter Hovey Hill has been engaged as engineer, and is erecting buildings on the properties. This company announces that it will erect a hotel, electric-light plant, and other conveniences on its townsite, and will do active development and work on its mining territory during the winter.

Cobalt Lake Mining Company, Ltd.—Cobalt lake, which was purchased from the Ontario Government for \$1,087,000, covers an area of between 40 and 50 acres. The company which acquired this property is now actively operating. The grant includes the right to mine under the lake, and on the borders for a horizontal distance of 33 ft. from high-water mark. Two steam drills are in operation, and 30 or 40 men are employed. Three veins have been exposed, but value is as yet indefinite, although some native silver has been encountered. The company expects to prospect the lake bed during the winter by installing a diamond-drill plant on the ice. E. L. Fraleck is engineer in charge of the work.

Coniagas—New buildings have been erected for compressor and power plant. The machinery has been ordered some time since, and is now in transit. At present, this company is obtaining power from the Trethewey mine adjoining.

Green-Meehan—This property, in Buckle township, has the most extensive and richest surface showing of any discovery which has been made during the past year. The company is erecting a power plant consisting of 200-h.p. boilers and six-drill compressor. Two 2-compartment shafts are being sunk on two of the richest veins exposed. Seventy-five tons of ore have been shipped from the surface during the past two months.

Kerr Lake—This new company, better known as the Jacobs mine, has ordered machinery consisting of 200-h.p. boilers and 14-drill duplex compressor, and intends sinking two shafts on vein No. 3, which is in the diabase, and which has produced a large proportion of the ore extracted, and on vein No. 7, commonly called the dyscrasite vein. A drift on this vein shows 170 ft. of practically continuous ore. The average value of ore extracted from this mine from its begin-

uing is between 2000 and 3000 oz. silver per ton. No second-class ore has been shipped. On the 130-ft. level on vein No. 3 in the diabase, the drift has exposed ore for a distance of 35 ft. with ore continuing in the face. This is important, because of its depth from surface, which is about 170 ft.; from the fact that the vein is in the diabase which was originally thought to be the least desirable formation; and because the vein is a well defined fault fissure.

La Rose—John MacMartin, president of this company, announces that his company is about to sink the main shaft to the 400-ft. level, successful results having been obtained from diamond drill at depth of 383 ft. Should this work show ore value, it would be the most important development in the district, tending as it would to demonstrate the strength of ore bodies to considerable depth.

Violet—This property, recently purchased by New York parties, has resumed active operation. At present a force of 20 men is employed. Drifting and crosscutting at the 70-ft. level will be done in the main shaft, and sinking will be done at three other points on the property.

Kerr Lake Crown Reserve Company—Plans have been decided upon for early development work. S. D. Madden, a well known diamond-drill expert, will have charge of operations.

ONTARIO—MANITOU LAKE DISTRICT

Paymaster—At this gold mine, Manitou lake, the shaft is being put down to the 400-ft. level and a crosscut is being run at the 200-ft. level with good results. The latter work has been temporarily interrupted by a flow of water. Acting Superintendent Manby is in charge.

Nipissing—At a meeting of the board of directors of the Nipissing Mining Company, Ltd., held in New York, Jan. 16, a reorganization of the officers was effected. Samuel Newhouse assumes the duties of president, and the following other officers, were elected: W. B. Thompson, vice-president; F. W. Holmes, treasurer, and David Fasken, secretary. The new directors are Lyman B. Kendall and W. B. Thompson. President Newhouse is at present in Salt Lake City, but will assume active charge of the company in the near future.

ONTARIO—VERMILLION LAKE

Northern Pyrites Company—This company, near Dinorwic, of which E. R. Michie is general manager, has undertaken the development of a valuable sulphide property on Vermillion lake, in Northwestern Ontario. Four carloads of machinery, including two boilers of 65 h.p. each and a 12-drill duplex compressor are being forwarded from New York to the mine. A spur line of five miles will be built for the shipment of the output to connect with the Grand Trunk Pacific now under construction.

MEXICO

BAJA CALIFORNIA

Boleo Copper Company—During the year 1906 this company's smelters at Santa Rosalia treated 302,499 tons of ore from the mines. The total value of the product was \$4,780,600, chiefly in copper.

SONORA

Greene Consolidated Copper—At a meeting held in New York, Feb. 15, the board of directors was reorganized, in accordance with the recent deal by which the control is transferred to the new Greene-Cananea Company. The new directors are C. D. Fraser, J. W. Allen, W. D. Thornton, Clyde A. Mullen, F. E. Searle, Geo. N. White, Walter S. Reed, C. A. Wright, Jr., J. C. Lalor, Charles E. Scheide, E. A. Brennan, Edgar Davis, W. J. Sullivan, and Arthur G. Caldwell. The board was organized by the election of W. D. Thornton to succeed President Greene, C. D. Fraser as treasurer in place of Alfred Romer, and J. W. Allen, secretary, to succeed George S. Robbins. One of the preliminaries of the consolidation was carried out Feb. 15 in the transfer of the company's treasury of \$4,000,000 in payment for the 200,000 shares of Cananea Central stock, which was the Greene company's return for its transfer of a large tract of mineral lands to the Cananea Central Company at the time of the latter company's organization.

ASIA

INDIA—MYSORE

Kolar Goldfield—Gold production in January is reported at 46,010 oz. bullion, which compares with 52,014 oz., in January, 1906; a decrease of 6004 oz. The bullion reported this year was equal to 41,409 oz. fine gold, or \$855,924 in value.

AUSTRALIA

QUEENSLAND

Gold production in January is reported at 31,500 oz. fine gold, or \$651,105 in value.

WESTERN AUSTRALIA

Gold production reported for this State in the month of January was 154,365 oz. in 1906, and 162,238 oz. in 1907; an increase of 7873 oz. this year.

NEW CALEDONIA

Mineral exports in November and the 11 months ending Nov. 30 are reported by the *Bulletin du Commerce*, of Noumea, as below, in metric tons:

	November.	Eleven Mo.s
Nickel ore.....	6,368	112,047
Cobalt ore.....	.....	2,352
Chrome ore.....	8,494	47,479

The November exports included one cargo, 3556 tons chrome ore, for New York.

SOUTH AMERICA

BRITISH GUIANA

Exports of gold from the colony for the year were 91,736 oz. bullion in 1905, and

92,037 oz. in 1906; an increase of 301 oz.; or 0.3 per cent. The bullion reported in 1906 was equal to 79,682 oz. fine gold, or \$1,647,031 in value.

The diamonds entered for the year were 5315 carats in 1905, and 4330 carats in 1906; a decrease of 985 carats. The exports in 1906 were 3892 carats.

Coal Trade Review

NEW YORK, Feb. 20

The weather and car shortage are the chief factors in the coal trade of the West, as they have been for some time past. Actually, there is no material change from last week, except that the severe cold and storms have been followed by higher temperatures. More coal is moving, but not enough to quiet the many complaints. There is room for much improvement in transportation conditions.

In the East a brief spell of very cold weather has stirred up the domestic trade. The demand for steam coal is steady and strong, as it has been for some time past. The cold and stormy weather has interfered with the coastwise trade to a considerable extent.

COAL-Traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburgh for the year to Feb. 9 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	583,209	566,356	D. 16,853
Bituminous.....	4,118,541	4,126,179	I. 7,638
Coke.....	1,429,178	1,488,540	I. 59,362
Total.....	6,130,928	6,181,075	I. 50,147

The coal tonnage of the Southern Railway for the 11 months ending Nov. 30 was, in short tons: Tennessee district, 1,407,553 tons; Alabama district, 1,699,410; total, 3,106,963 tons.

Receipts of coal at Boston in January are reported by the Chamber of Commerce as below:

	1906.	1907.	Changes.
Anthracite.....	120,761	172,843	I. 52,082
Bituminous.....	232,980	208,885	D. 24,095
Total domestic....	353,741	381,728	I. 27,987
Foreign coal.....	72,572	44,100	D. 28,472
Total.....	426,313	425,828	D. 485

The receipts of foreign coal are chiefly from Nova Scotia.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Feb. 16 were 143,566 tons.

Coal receipts at St. Louis for the full year were 6,146,363 short tons in 1905, and 7,582,209 tons in 1906; an increase of 1,435,846 tons.

Coastwise shipments of coal from the chief Atlantic ports are reported by the Bureau of Statistics as below, for the full year:

	Anthracite.	Bituminous.	Total.
New York.....	14,150,811	10,572,464	24,723,275
Philadelphia...	1,794,773	3,977,909	5,772,682
Baltimore.....	238,162	3,176,710	3,414,872
Newport News..	.....	2,791,404	2,791,404
Norfolk.....	.....	2,080,087	2,080,087
Total.....	16,183,746	22,598,574	38,782,320
Total, 1905....	17,221,155	21,061,545	38,282,700

The increase in 1906 was 499,620 tons, or 1.3 per cent.

The tonnage of the roads in the Ohio Coal Traffic Association for the full year was as follows, in short tons:

	1905.	1906.
Hocking Valley.....	3,817,618	3,861,212
Toledo & Ohio Central.....	1,576,962	1,831,666
Baltimore & Ohio.....	1,936,093	1,951,865
Wheeling & Lake Erie.....	2,765,871	2,430,614
Cleveland, Lorain & Wheeling	2,099,670	2,145,936
Zanesville & Western.....	1,057,737	1,187,728
Toledo Division, Penna. Co.....	1,873,613	2,307,921
Lake Erie, Alliance & Wh'ling.	813,212	843,237
Marietta, Col. & Cleve.....	.....	15,675
Total, net tons.....	15,940,836	16,575,984

The total increase last year was 635,148 tons, or 4 per cent., notwithstanding the strike in April.

New York Feb. 19

ANTHRACITE

There is a scarcity of hard coal in the market, due to the brisk demand, and to the car shortage which has been very noticeable during the past few weeks. The congestion at various points along the railroads still remains a factor in the car supply. Business among the local retail dealers has been very active; in some cases consumers have had considerable difficulty in having their orders filled promptly.

The Lehigh Valley Coal Company has started to ship coal from its new Sayre breaker in the Shamokin district.

Small steam sizes still remain practically out of the market. There is a little No. 2 buckwheat to be had, but smaller sizes are extremely scarce. The reason for the scarcity of small steam sizes is the curtailed production at the mines on account of the inadequate shipping facilities, which prevent the mines from producing their usual quota of small coal.

Consumers are not taking on any more coal than they can use. Prices remain unchanged at \$4.75 for broken, \$5 for egg, stove and chestnut. Small steam sizes are quoted nominally at \$3 for pea, \$2.25@2.50 for buckwheat, \$1.50 for rice, \$1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade is quiet at the present time; the cold weather of the last two weeks froze the coal in the cars so badly that a general embargo was declared by the Pennsylvania Railroad on shipments to South Amboy on account of the delays in unloading. This stopped shipments for the best part of a week. The question of contracts for the season is still held up on account of the railroad's not having yet fixed their through rate. Car supply in West Virginia continues very poor. Trade in the far East is quiet and there does not seem to be much demand at this time. Trade along the Sound is taking a fair amount of coal quietly.

New York harbor trade shows a condition out of the ordinary in that the small steam sizes in the anthracite market are

held at an advance of even 50c. per ton, while soft coal has shown no advances up to this time for any particular size. Good steam coal is quoted at \$2.60@2.75 per ton f.o.b. New York harbor shipping ports. Transportation from mine to tide has improved although not up to the requirements. Car supply is generally poor.

In the coastwise market vessels are in sufficient supply for all demands. We quote freight rates from Philadelphia to Boston, Salem and Portland at from \$1 to \$1.10, and discharge for large vessels, the loading and discharging clause included.

Birmingham Feb. 18

Coal operators in Alabama have to hustle to get cars. The production is improving slightly. There is still a strong demand for coal and fuel agents of large consumers, especially railroads, are in the district watching movements.

Operators and miners alike have been interested during the past few days in probable action to be taken by the legislature of the State on mining laws. A law prepared by Capt. Frank S. White, attorney for the United Mine Workers in Alabama, is bitterly opposed by the operators on the ground that sections of it are oppressive. It is asserted that the proposed law has a mechanics' lien clause that is dangerous to the operator. Several officials of coal companies in this district spent several days recently in Montgomery in the interest of proposed legislation. The union miners were also at the capital looking after their interests.

Chicago Feb. 18

Western coals in general are weak, as the result of the long run of mild weather, and doubtless they will continue weak for the rest of the season, there being little hope now among dealers of enough cold weather to affect the trade substantially. But for conditions of transportation unfavorable to the receipt of large quantities, Eastern coals, particularly smokeless run-of-mine, would be in the same condition. Anthracite also is falling off, the reason being the approach of spring and the April discount. Individual orders for anthracite are already small in quantity, though their number shows that most retailers are carrying little coal.

Illinois and Indiana prepared sizes are especially weak. Lump and egg bring \$1.75@2.65, run-of-mine \$1.75@2.25, and screenings \$1.25@1.50. The car supply is reported short from many Illinois and Indiana mines, though this affects out-of-town business rather than Chicago.

Smokeless probably leads eastern coals in demand, though lump and egg are weak in comparison with the demand for run-of-mine, which brings \$3.40@3.65. The standard price of \$4.30 for smokeless lump and egg is cut 25c. on many sales. Youghieny is fairly plentiful and brings \$3.20

for ¾ in. Pittsburg No. 8 suffers from the weather conditions and brings \$2.90 @3 for ¾ in. Cannel coal is active, the supply being limited and the demand large; it sells for \$5.40 per ton.

Cleveland Feb. 19

Some of the bigger shippers by lake are beginning to inquire for lake tonnage for the ensuing season of navigation. It is likely they will close their contracts before long. At first it was supposed they would wait until the matter of railroad freight rates to the Lake Erie ports had been settled. This cannot now have an influence on the lake rates, since season charges have been fixed at last year's figures by the placing of some boats with the smaller shippers. All indications are for a big movement, in view of the fact that 1906 shipments increased 3,000,000 tons over those of 1905 and the indications are for clean docks at the opening of navigation.

The big merger of the mines in No. 8 district is moving along, and it is now known that 80,000 acres of land have already been optioned to the promoters, with other additions likely. This will probably take over some of the mines in No. 7 district, as well as the lake coal docks and boats.

The steam market in this territory is strong and steady. The market rules about firm, with Ohio mine-run selling at \$1.20@1.25 at mines; Pennsylvania at \$1.10@1.15; Ohio slack, \$1.15@1.20; Pennsylvania slack, \$1.

The coke market is strong with a good demand for spot shipment. The market holds firm at \$4 at the oven for spot-shipment 72-hour foundry coke and \$3.60@3.75 for spot-shipment furnace coke. Contract prices would likely shade these figures a little.

Hartshorne, Ind. Ter. Feb. 11

The Interstate Commerce Commission spent Feb. 7 and 8 at South McAlester, investigating the coal situation in the Indian Territory. The car shortage and prevailing high prices of coal were the special subjects of inquiry. The results are not yet reported.

Indianapolis Feb. 16

The recent brief cold snap stimulated the coal business slightly and strengthened the market for a few days, but mild weather followed during the past week. The tonnage of steam coal has been kept up by an unusual demand from the manufacturing industries; but local dealers are ordering in limited quantities, having given up hope of any zero weather this winter.

Operators say that prices have fallen since Nov. 1, instead of going higher, as is usual during the winter months. December and January of the present scale year have the unusual record of actual dullness

at many mines, with an over-supply instead of a shortage of cars.

Consideration of the Shippers' bill last week brought a large number of coal operators and dealers to the legislative halls, and a stubborn fight is on between the shippers and railroad men concerning this measure. The bill provides that the railroads shall furnish sufficient number of suitable cars to shippers under penalty; that loaded cars must be moved at least 50 miles every 24 hours, under penalty; that demurrage charges shall be mutual; that there shall be no discrimination in the furnishing of cars, and that the railroad commission be empowered to make rules for hauling coal and to equalize rates, raise blockades, and enforce the provisions of the law. The representatives of the railroads say the bill is sufficiently drastic to put them out of business; that certain provisions make requirements beyond the physical power of the companies. The indications are that the bill will pass in an amended form.

Pittsburg Feb. 19

Coal—The demand has increased and prices are firmer and higher this week. One or two small contracts for deliveries extending through the year have been made on a basis of \$1.20 a ton for mine-run coal at mine. The absolute minimum on large tonnages is \$1.10, and many sales are being made on a basis of \$1.15. The railroad mines are running almost full and there is a good supply of cars. All the river mines have been in steady operation and a large tonnage has been accumulated. The rivers are rising and are expected to be navigable before the end of the week, when some large shipments will be made to the lower ports.

Connellsville Coke—There has been but little change in the coke market. Prices remain strong on the basis of \$3.50@3.60 for spot furnace coke, \$3.25 for second quarter and \$3.10@3.25 for deliveries extending through the year. Foundry coke is quoted at \$3.90@4.10 for first quarter and \$3.75 for all year. The *Courier* gives the production for the week in the Connellsville region at 283,840 tons and in the Lower Connellsville region at 125,836 tons. The shipments for the week aggregated 13,972 cars distributed as follows: To Pittsburg, 4749 cars; to points west of Connellsville, 8210 cars; to points east of Connellsville, 1013 cars.

The H. C. Frick Coke Company on Feb. 18 ordered an advance in wages for its 18,500 employees, effective March 1, ranging from 8 to 12½ per cent. This increase will add \$125,000 to the pay roll monthly, or \$1,500,000 a year. All the independent interests are expected to grant a similar advance. The new rate of wages is the highest in the history of the industry in the Connellsville region except in two items where the new rate is the same as was in force in the boom year

1903. They are "mining and loading room and rib coal, per 100 bush.," which is advanced 15 cents to \$1.35, the rate prevailing in 1903, and "drawing coke, per 100 bush. charged," advance 7 cents to 77 cents, the rate paid in 1903.

Foreign Coal Trade

Feb. 20

Imports of coal into Germany for the full year were as follows, in metric tons:

	1905.	1906.	Changes.
Coal.....	9,399,698	9,221,538	D. 178,155
Brown coal.....	7,945,261	8,432,188	I. 486,927
Total.....	17,344,954	17,653,726	I. 308,772

Imports of coke for the 10 months, March to December, were 448,656 tons; of briquets, 128,863 tons.

Exports of coal from Germany for the year were, in metric tons:

	1905.	1906.	Changes.
Coal.....	18,156,998	19,554,343	I. 1,397,345
Brown coal.....	20,118	18,735	D. 1,383
Total.....	18,177,116	19,573,078	I. 1,395,962

Exports of coke for the 10 months, March to December, were 2,849,005 tons; of briquets, 899,758 tons. Included in the coke exports are 16,729 tons to the United States.

The quantity of coal bunkered, or sold to steamships engaged in foreign trade, at all United States ports is given by the Bureau of Statistics at 413,016 tons, in December, and 5,125,103 tons for the year 1906. Adding this to the exports previously reported, makes a total of 15,046,922 tons consumed beyond the limits of the United States.

Exports of fuel from Great Britain in the month of January, with coal shipped for the use of steamers engaged in foreign trade, were as follows, in long tons:

	1906.	1907.	Changes.
Coal.....	4,080,460	4,624,741	I. 594,281
Coke.....	66,391	84,341	I. 17,950
Briquets.....	121,540	125,560	I. 4,020
Total exports..	4,218,391	4,834,642	I. 616,251
Steamer coal.....	1,533,505	1,486,302	D. 47,203
Total.....	5,751,896	6,320,944	I. 569,048

This shows a total increase of 9.9 per cent. in the coal consumed beyond the limits of the United Kingdom.

Dusseldorf, Germany Feb. 8

The coal production of the German empire for the year ended Dec. 31 is reported as below, in metric tons:

	1905.	1906.	Changes.
Coal.....	121,298,607	136,479,885	I. 15,181,278
Brown coal.....	52,512,062	56,235,189	I. 3,723,127
Total mined..	173,810,669	192,715,074	I. 18,904,405
Coke made.....	16,491,427	20,260,572	I. 3,769,145
Briquets made,	13,074,682	14,500,851	I. 1,426,169

The increase in coal was 12.5 per cent.; in brown coal, or lignite, 7.9 per cent.; the total gain in coal mined being 10.9 per cent. Deducting the excess of exports over imports for the year 1906, the approximate consumption of coal for the year, in all forms, was 190,795,722 tons. The activity of the iron trade and of most manufacturing industries explains the large gain made last year.

Iron Trade Review

NEW YORK, Feb. 20.

Business has been quiet so far as new trade is concerned. This is especially the case with pig iron, in which not much business has been done, and that at perceptibly lower prices. The high figures reached in the rush of last month have not held. This has little effect on the furnaces, which have enough of their capacity engaged well into the current year to make them independent.

Many people think that the rest and the shading of prices are good things for the trade. Prices of raw iron had reached dangerously near the point where they might check consumption. Moreover there is increasing difficulty in financing new construction projects, and this will have an effect on trade later. A pause in the rush can do no harm.

Pig Iron Production—Reports from the blast furnaces show that on Feb. 1 there were 317 coke and anthracite stacks active, having a total weekly capacity of 492,400 tons; a decrease of two stacks and 14,900 tons capacity, as compared with Jan. 1. The decrease is not due to any falling off in demand, but to the necessity of blowing out several furnaces for repairs. Taking the *Iron Age's* estimate for the coke and anthracite stacks, and making allowance for the charcoal furnaces, the total production of pig iron in January was 2,241,600 tons, approximately.

Baltimore Feb. 19

Imports of spiegeleisen for the week were 1526 tons; of ferro-manganese 1862 tons. There were also 73 casks of ferro-silicon from Germany. One cargo, 4950 tons, of manganese ore was received from Brazil. Arrivals of iron ore were 6000 tons from Cuba.

Birmingham Feb. 18

While pig-iron sales in southern territory were not so brisk the past week, no word of complaint is uttered by the manufacturers save as to the transportation facilities. The car shortage and the lack of locomotive power still exist. The delivery this month will be no better than it was during January. The manufacturers had expected to move out a large amount of iron. The railroad officials assert that they have done everything possible to move the iron. Consumers are clamoring now for their iron.

As to quotations, all reports agree that No. 2 foundry is bringing \$18.50@19 per ton, delivery during the last half of the year. Second-quarter iron was quoted at \$22 per ton the past week, with but little obtainable. None of the furnace companies in this district appears to be able to accept business for March delivery. A report that some of the smaller iron companies were selling their product at from

\$1 to \$2 under the quotations given by the larger producers could not be verified.

Steel, cast-iron pipe and finished iron and steel are active. Extraordinary conditions prevail in cast-iron pipe, demand being good and prices firm. Some healthy shipments of pipe were made from this district recently.

Chicago Feb. 18.

Sales of pig iron on contracts are slow, with indications of continued quietness. Reports on quick-delivery sales are conflicting, but it is doubtless true that this end of the business has not gained in the last two or three weeks, and the impression prevails that the consumer is going to hold off for a while. The Southern market seems especially to be weakening, despite assurances from the sellers that prices will be held up firmly.

In the last week contract iron has sold at \$23.50@24.50 for Northern, and \$18@18.50 Birmingham (\$22.10@22.60 Chicago) for deliveries in the last half. On deliveries prior to July the price runs up to \$2 more. The demand for quick delivery is especially active on small lots to be had before March 1, when the advance of the freight rate to \$4.10 is expected on Southern iron.

General trade conditions in iron and steel products continue good, but there is apparent a spirit of caution that is based on the possibility of over-production. With this spirit removed there probably would be little trouble with the market for pig iron, for it is apparently influencing the melters considerably. If it continues, the bear movement will grow from both with and without the pig-iron trade.

Coke is active, with little available for quick deliveries and \$6.25@6.65 paid for the best Connellsville.

Cleveland Feb. 19

Iron Ore—The market is exceptionally dull. There are a few small sales off stock piles, but they do not amount to much. Prices have not changed. No further season chartering of lake vessels has been done. It is probable that going rates at the opening of the season will be the same as the contract rates, namely 75c. from the head of the lakes; 70c. from Marquette and 60c. from Escanaba.

Pig Iron—Inquiries are in this market for nearly 10,000 tons of No. 2 foundry for second-quarter delivery. It is known that other big consumers are partially uncovered and it is a question whence the supply is coming. In two inquiries obtained yesterday there was a demand for 5000 tons for second-quarter delivery. The demands of these consumers could not be met by imports of foreign irons. It is now an open question whether some of the consumers will not run short before July 1, especially as some of the purchasers are showing a disposition to anticipate contract requirements, leaving only a small amount open for the furnaces to sell.

The prices are stiffening. Spot iron is selling at \$25.50@26 in the Valleys; second quarter at \$25 in the Valleys, with \$22 quoted for second half. Southern prices have not changed, being based upon \$18.50@19 Birmingham for No. 2.

Finished Material—The various lines of finished material are active and strong. Bars are still on a strong basis, due to the shortage of scrap. Bar steel is in demand, especially open-hearth. Sheets are steady at unchanged prices. One new ship, for the passenger trade, will be ordered soon. Spring building is about ready to open.

Pittsburg Feb. 19

There has been no large buying of finished material, but the iron and steel markets continue strong. It is expected that the agricultural-implement makers will come into the market during the next two months for their requirements of steel bars for the year beginning July 1. Heretofore producers have granted concessions on this business, but it is said they intend this year to insist on the full price of 1.60c. It is doubtful if the implement interests will place their contracts unless allowed the usual concession, and there will be likely some delay before these annual contracts are closed. There is a good demand for steel bars, and the established price is being readily paid. In some instances where prompt delivery is desired consumers willingly pay a premium. Iron bars also are in demand, and the minimum price remains at about \$4 a ton above steel bars, or 1.80c. Orders for standard steel rails and light rails continue to be placed, the leading interest booking about 25,000 tons of standard and 1000 tons of light rails during the week. There has been a slight decline in the demand for plates for car-building concerns, but this has been more than made up by the increased demand from shipbuilding and other interests. Merchant pipe mills are crowded to capacity. The National Tube Company is putting its Youngstown works in shape for operation after an idleness of over a year, and it is expected a start will be made on Monday. These works, when in full operation, have a capacity for 5000 tons monthly. New business is being offered daily, and some large contracts are under negotiation. The National company has closed a contract with the Southern Pacific Railroad for 400 miles of 8-in. line pipe for an oil line in California.

Pig Iron—Large consumers of pig iron still refuse to enter the market for second-half requirements at the prices named by the leading producers. While the furnaces want \$21.50, Valley, for bessemer pig iron for the last half, steel interests say they will not pay within \$1 a ton of that price, and it is said the United States Steel Corporation, if it buys any outside iron, will not pay more than \$19. A large tonnage of bessemer iron is sold for deliveries through the year at the average

monthly price, but a maximum price is fixed which when reached releases the buyer. It is understood that this point has been reached in some contracts, and the buyers have refused to take the iron. The furnaces affected, however, have had no difficulty in selling the iron thus released, but in some instances the price has been shaded. This week one interest sold 6300 tons of bessemer for deliveries running from February to October at the average monthly price. One lot of 1500 tons of bessemer was sold today for delivery in the first half at \$23.35, Pittsburg. Other late sales included 500 tons of malleable bessemer for third quarter at \$21.30, Valley furnaces, and 800 tons of basic for delivery in the first quarter at \$23, second quarter at \$22.50, and third quarter at \$21.50. The tonnage being small these prices do not represent the market. It developed this week that the Jones & Laughlin Steel Company, which was crippled by the blowing out of three of the five blast furnaces in the Eliza group, secured some outside bessemer pig iron by an exchange deal, giving ore for iron. Two of the idle furnaces were put in blast last week, the repairs having been completed in record time. No. 5 furnace will be ready to blow in shortly. Foundry iron continues in demand but prices have declined to about \$24.85@25.35, Pittsburg, for prompt delivery. Gray forge for spot shipment is quoted at \$22.85, Pittsburg.

Steel—Bessemer billets are quoted nominally at \$29.50, and open-hearth at \$32, and there is a scarcity this week. Billets are easier in the West and, according to reports, prices are lower than in the Pittsburg district. Plates are strong at 1.70c. and merchant steel bars at 1.60c.

Sheets—There is no change in the sheet market. The demand continues heavy and prices are firm, black sheets being quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—The market continues dull, but is a trifle stronger than 1 week ago. Prompt ferro is still quoted at \$73@74, but for the second half \$70 is quoted as the minimum price.

London Feb. 11

Iron and Steel Exports—Exports of iron and steel, and of machinery, from Great Britain for January, are valued by the Board of Trade returns as below:

	1906.	1907.	Changes.
Iron and Steel..	£ 3,036,922	£ 2,935,204	D. £ 101,718
Machinery	2,140,958	2,473,236	I. 332,278
New Ships.....	198,238	628,880	I. 430,642
Total.....	£ 5,376,118	£ 6,037,320	I. £ 661,202

The increase in the total this year was 12.3 per cent. The larger items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	90,700	175,820	I. 85,120
Wrought iron.....	14,915	18,069	I. 3,152
Rails.....	35,346	30,225	D. 5,121
Plates.....	18,610	33,900	I. 15,290
Sheets.....	46,261	41,761	D. 4,500
Steel shapes, etc....	5,528	6,664	I. 1,136
Tin-plates.....	29,063	36,872	I. 7,809
All other kinds.....	96,989	110,039	I. 13,555

The total increase in quantities was 116,418 tons, or 34.5 per cent. Exports of pig iron to the United States were 59,539 tons, an increase of 39,886 tons; of tin-plates, 5900 tons, a nincrease of 2708 tons.

Iron and Steel Imports—Imports of iron and steel into Great Britain for January are valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£ 944,901	£ 605,255 D.	£ 339,246
Machinery.....	377,087	358,036 D.	19,051
Total.....	£1,321,988	£ 963,291 D.	£ 358,697

The total decrease was 27.1 per cent. The chief items of the iron and steel imports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	9,827	13,815 I.	3,988
Wrought iron.....	13,637	7,965 D.	5,672
Steel billets, etc.....	66,328	21,492 D.	44,836
Bars and shapes.....	6,822	1,160 D.	5,662
Structural steel.....	16,636	7,536 D.	9,100
All other kinds.....	47,129	27,924 D.	19,205

The total decrease in quantities was 70,487 tons, or 47 per cent.

Iron Ore Imports—Imports of iron ore into Great Britain for January were, in long tons:

	1906.	1907.	Changes.
Manganiferous ores.	40,302	31,850 D.	8,452
Iron ores.....	719,912	777,988 I.	58,076
Total.....	760,214	809,838 I.	49,624

Of the imports this year 26,800 tons of manganiferous ores and 614,187 tons of iron ore came from Spain.

Dusseldorf, Germany Feb. 10

Imports of iron and steel into Germany for the full year were, in metric tons:

	1905.	1906.	Changes.
Iron and steel.....	323,024	690,081 I.	367,057
Machinery.....	75,985	79,734 I.	3,749
Total.....	399,009	769,815 I.	370,806

The large increase was mainly in raw and half-finished material. Exports for the year were as follows:

	1905.	1906.	Changes.
Iron and steel.....	3,349,917	3,619,796 I.	269,879
Machinery.....	301,442	296,094 D.	5,348
Total.....	3,651,359	3,915,890 I.	264,531

This shows the moderate increase of 7.2 per cent, in the total export trade.

Metal Market

NEW YORK, Feb. 20

Gold and Silver Exports and Imports.

At all United States Ports in January and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1907...	\$2,443,441	\$ 3,204,457	Imp. \$ 761,016
" 1906 ..	5,741,665	2,605,709	Exp. 3,135,956
Year 1907 ..	2,443,441	3,204,457	Imp. 761,016
" 1906 ..	5,741,665	2,605,709	Exp. 3,135,956
Silver:			
Jan. 1907...	4,766,874	3,620,888	Exp. 1,145,986
" 1906 ..	7,516,668	4,686,711	" 2,829,957
" 1907 ..	4,766,874	3,620,888	" 1,145,986
" 1906 ..	7,516,668	4,686,711	" 2,829,957

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Feb. 16 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 5,970	\$ 593,773	\$685,000	\$ 20,684
1907.....	1,395,065	1,092,050	3,233,540	351,988
1906.....	3,008,375	254,269	12,254,482	297,924
1906.....	28,511,165	492,938	4,642,234	124,931

Exports of gold for the week were to the West Indies; of silver to London. Imports of gold for the week were from London, Paris and South America; of silver, from Mexico.

The foreign trade of the United States for the month of January is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.
Exports.....	\$170,603,053	\$189,260,250
Imports.....	106,521,525	126,576,965
Excess, exports....	\$64,081,528	\$62,683,285
Add excess of exports, silver.....		1,145,986
Total.....	\$63,829,271	\$63,829,271
Deduct excess of imports, gold.....		761,016
Net export balance.....	\$63,068,255	

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending Feb. 16 shows loans, \$1,092,061,000, a decrease of \$7,295,400; deposits, \$1,057,546,200, a decrease of \$8,016,300, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	\$188,509,500	\$192,167,500
Legal tenders.....	79,438,300	76,650,100
Total.....	\$267,947,800	\$268,817,600
Surplus.....	\$5,789,925	\$4,431,050

The surplus over legal requirements shows an increase of \$1,085,575, as compared with the previous week.

Specie holdings of the leading banks of the world on Feb. 16 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....	.....	.....	\$192,167,500
England.....	\$176,912,755	.....	176,912,755
France.....	536,244,000	\$196,846,000	733,090,000
Germany.....	159,626,250	53,208,750	212,835,000
Spain.....	77,015,000	121,490,000	198,505,000
Netherlands.....	27,712,000	28,685,000	56,407,000
Belgium.....	16,610,000	8,805,000	24,915,000
Italy.....	161,210,000	23,686,500	184,896,500
Russia.....	590,255,000	23,675,000	613,930,000
Aust-Hungary.....	232,190,000	60,360,000	292,550,000
Sweden.....	20,540,000	.....	20,540,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Feb. 7:

	1905.	1906.	Changes.
India.....	£ 2,614,500	£ 838,110 D.	£ 1,776,390
China.....	.....	.....	.....
Straits.....	.....	76,300 I.	76,300
Total.....	£ 2,614,500	£ 914,410 D.	£ 1,700,090

Receipts for the week were £251,000 from New York, £5000 from the West Indies, and £41,000 from China; £297,000

in all. Exports were £291,000 in bars and £40,000 in Mexican dollars; a total of £331,000, all to India.

Indian exchange continues strong, and all the Council bills offered in London were taken at an average of 16.09d. per rupee. The gold reserve in India is reported lower.

The gold and silver movement in Great Britain for the month of January was as follows:

	1906.	1907.
Imports.....	£ 2,391,777	£4,579,082
Exports.....	3,305,024	3,731,236
Excess.....	Exp. £913,247	Im. £847,846
Silver:		
Imports.....	£ 2,089,268	£2,745,435
Exports.....	1,809,214	1,138,421
Excess, imports.....	£ 280,054	£1,607,014

Of the silver imported this year £1,298,286, or 47.3 per cent. of the total, was from the United States.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.531	\$0.55
Peruvian soles and Chilean.....	0.484	0.49
Victoria sovereigns.....	4.854	4.87
Twenty francs.....	3.86	3.89
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

February.	Sterling Exchange.	Silver.		February.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
14	4.84½	68¾	31¾	18	4.84½	68¾	31¾
15	4.84½	69	31½	19	4.84½	68¾	31½
16	4.84½	69½	32	20	4.84½	68¾	31½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

February.	Copper.		Tin.	Lead.	Spelter.		
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.			New York, Cts. per lb.	St. Louis, Cts. per lb.	
14	25 @25½	24¾ @25	107¾	42¼	6.00	6.30 @6.90	6.65 @6.75
15	25 @25½	24¾ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
16	25 @25½	24¾ @25	.....	42	6.00	6.80 @6.90	6.65 @6.75
18	25 @25½	24¾ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
19	25 @25½	24¾ @25	107½	41¾	6.00	6.80 @6.90	6.65 @6.75
20	25 @25½	24¾ @25	106½	41¾	6.00	6.80 @6.90	6.65 @6.75

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—After the large sales a little more than a week ago the market relapsed into dullness, and during the past week has been extremely quiet. Consumers are fairly well covered for delivery until June, and are not very anxious to contract for their supplies beyond this period, although some small sales extending into July have been made. Quotations at the close are unchanged at 25@25½ for Lake, and 24¾@25 for electrolytic in ingots, cakes or wirebars. Business in casting copper has been done between 24¼@24¾.

The London standard market has softened somewhat but remains rather steady on the decline. The close is cabled at £106 10s. for spot, and £108 for three months'.

Refined and manufactured sorts w: quote: English tough, £110@111; best selected, £114@115; strong sheets, £124@125.

The American Smelting and Refining Company has purchased the copper refinery of the Baltimore Copper Smelting and Rolling Company, at Baltimore, Md.

Exports of copper from New York for the week were 1419 tons. Our special correspondent reports the exports from Baltimore for the week at 25 long tons.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—Although the London market toward the end of last and the beginning of this week has shown signs of strength, higher quotations could not be maintained for very long, and the close is cabled as weak at £190 15s. for spot, and £189 10s. for three months'.

The domestic market was not affected at all by the fluctuations in London, but through the arrival of a large consignment of tin the premiums which heretofore have been exacted for spot material have disappeared. Business was done by home consumers in a retail way only, and the market closes weak at 41¾.

Shipments of tin from the Straits for the full year are reported as follows, in long tons:

	1905.	1906.	Changes.
United States.....	16,632	14,911	D. 1,721
Great Britain.....	31,779	34,719	I. 2,940
European continent.....	8,434	7,509	D. 925
China and India.....	1,484	1,292	D. 192
Total.....	58,329	58,431	I. 102

This shows practically no change. The shipments reported to Great Britain include a large quantity in transit to the United States.

Lead—The quotation remains unchanged at 6c. New York.

The London market shows no change from previous advices and the quotations remain steady at £19 10s. for Spanish lead and £19 12s. 6d. for English lead.

The movement of foreign lead in the United States for the year 1906 is reported by the Bureau of Statistics as below, in short tons:

In bond, Jan. 1.....	8,148
Imports for the year.....	84,134
Total supplies.....	92,282
Re-exports for the year.....	47,247
In bond, Dec. 31.....	5,691
Total deductions.....	52,938
Balance.....	39,344

This balance has, presumably, entered into consumption in this country.

St. Louis Lead Market—The John Wahl Commission Company telegraphs on Feb. 20 as follows: Lead is firm, but quiet. Missouri lead is selling at 6.07½@6.15c., according to brand and delivery.

Spelter—Notwithstanding that transactions have somewhat diminished the market remains firm and closes at 6.80@6.90 New York and 6.65@6.75 St. Louis. Near-by metal is still scarce and commands a premium.

The London market has again become weak and quotations have declined at the close to £25 15s. for good ordinaries and £26 for specials.

Zinc Sheets—The base price was advanced 10c. on Feb. 15, and is now \$8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The better tone which was noticeable has not been maintained, in consequence of which prices have declined somewhat. Quotations are nominal at 23¼c. for ordinary brands and 23½@24c. for Hallett's; 24½@25c. for Cookson's.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at \$38 per oz. for ordinary and \$41 per oz. for hard. For good scrap \$31.50@32 is paid.

Quicksilver—Current prices in New York are \$41 per flask of 75 lb. for large quantities, and \$42 for smaller orders. San Francisco prices are \$38@39 per flask, according to quantities, for domestic orders, and \$37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Metal Imports and Exports, Great Britain

Copper Imports and Exports—Imports of copper and copper material into Great Britain, with exports of copper, were as follows in January; the total imports given being the copper contents of all material, in long tons:

	1906.	1907.	Changes.
Copper ore.....	8,392	8,267	D. 125
Matte and precipitate...	6,380	5,626	D. 754
Fine copper.....	4,722	6,712	I. 1,990
Total imp., copper.....	8,751	10,352	I. 1,601
Re-exports.....	1,639	1,627	D. 12
Exports.....	4,075	4,543	I. 468
Total exports.....	5,714	6,170	I. 456
Balance, imp.....	3,037	4,182	I. 1,145

Of the imports this year the United States furnished 39 tons of matte, a decrease of 413 tons; and 3082 tons of copper, an increase of 1165 tons. Imports of precipitate from Spain were 1602 tons, a decrease of 63 tons.

Tin Imports and Exports—Imports and exports of tin in Great Britain in January were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	3,970	3,110	D. 860
Australia.....	436	568	I. 132
Other countries.....	81	196	I. 115
Total imports.....	4,487	3,874	D. 613
Re-exports.....	2,275	3,957	I. 1,682
Exports.....	423	538	I. 115
Total exports.....	2,698	4,495	I. 1,797
Balance..... Imp. 1,789 Exp. 621			

The re-exports are largely of Straits tin to the United States.

Lead Imports and Exports—Imports and exports of lead in Great Britain for the month of January were, in long tons:

	1906.	1907.	Changes.
United States.....	1,277	1,400	I. 123
Spain.....	8,388	10,585	I. 2,197
Australia.....	4,952	5,339	I. 387
Germany.....	2,004	1,314	D. 690
Other countries.....	180	230	I. 50
Total imports.....	16,801	18,868	I. 2,067
Exports.....	3,565	4,524	I. 959
Balance, imports.....	13,236	14,344	I. 1,108

The lead credited to the United States is chiefly Mexican lead, refined in this country.

Spelter Imports and Exports—Imports and exports of spelter in Great Britain for the month of January were, in long tons:

	1906.	1907.	Changes.
Spelter.....	10,272	8,265	D. 2,007
Zinc sheets, etc.....	1,395	2,013	I. 618
Total imports.....	11,667	10,278	D. 1,389
Exports.....	529	309	D. 220
Balance, imports.....	11,138	9,969	D. 1,169

Imports of zinc ores are not reported separately.

Quicksilver Imports and Exports—Imports of quicksilver into Great Britain for the month of January were 7630 lb. in 1906, and 28,148 lb. in 1907; an increase of 20,518 lb. Re-exports of imported metal were 311,456 lb. in 1906, and 264,525 lb. in 1907; a decrease of 46,921 lb. this year.

Missouri Ore Market

JOPLIN, Feb. 16

The highest settling price of the week for zinc is placed at \$53 per ton, with \$53.50 bid for delivery Monday. The assay basis price ranges from \$47 to \$50 per ton of 60 per cent. zinc, and the average price, all grades, is \$47.44 per ton.

The highest price paid for lead is reported at \$88.25 per ton, with 80 per cent. grades selling around \$86. The average price, all grades, is \$84.96.

The zinc shipment of the week was 1,161,310 lb. greater than the preceding week and 4,359,260 lb. greater than the corresponding week of 1906. For seven weeks the increase aggregates 13,562,970 lb. of zinc. Lead shipments were correspondingly increased, and the value for the seven weeks is \$437,679 greater than last year. This, too, with a large portion of this year's output still in the bins, which it has been impossible to move on account of the deplorable car situation.

Following are the shipments of zinc and lead for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	3,684,930	1,062,560	\$132,396
Joplin.....	2,922,240	301,680	84,412
Galena, Kansas.....	1,261,060	169,370	37,463
Duenweg.....	1,187,910	127,690	33,215
Badger.....	1,082,900	5,330	27,301
Alba-Neck City.....	811,270	.....	20,281
Aurora.....	561,640	.....	11,580
Spurgeon.....	418,230	64,490	11,449
Prosperity.....	364,370	.....	8,744
Granby.....	365,000	60,000	7,395
Oronogo.....	181,120	10,300	4,884
Sherwood.....	52,790	46,360	3,191
Baxter Springs, Kan..	126,150	.....	2,996
Carthage.....	108,200	2,530	2,806
Stott City.....	116,920	.....	2,806
Totals.....	13,164,820	1,850,210	\$390,919

Seven weeks.....81,457,100 11,103,270 \$2,353,154
 Zinc value, the week, \$312,311; 7 weeks, \$1,885,106
 Lead value, the week, 78,608; 7 weeks, 468,048

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January...	47.38	45.84	January...	75.20	83.58
February...	47.37	.....	February...	72.83	.....
March.....	42.68	.....	March.....	73.73	.....
April.....	44.63	.....	April.....	75.13	.....
May.....	40.51	.....	May.....	78.40	.....
June.....	43.83	.....	June.....	80.96	.....
July.....	43.25	.....	July.....	74.31	.....
August.....	43.56	.....	August.....	75.36	.....
September.	42.58	.....	September.	79.64	.....
October....	41.55	.....	October....	79.84	.....
November..	44.13	.....	November..	81.98	.....
December..	43.68	.....	December..	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

Wisconsin Ore Market

PLATTEVILLE, Feb. 16

The past six weeks have been full of rapid developments, advantage being taken of the mild weather that has prevailed. The feeling among producers and buyers remains about the same. Sellers are expecting higher prices and buyers are will-

ing to accede to all reasonable demands. One of the principal producers has been receiving a low price for the ore sold, owing to the presence of barytes, which brought the grade of ore down. It has been proposed to sort the ore before milling. The price of 60 per cent. zinc held at \$49.50. Lead was strong at \$85@90, depending on manner cleaned. Dry-bone and sulphur same as last week.

The camps of the district loaded ore for the week ending Feb. 16 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville.....	307,750	83,690	.....
Linden.....	249,550	47,490	.....
Benton.....	246,680	.....	.....
Cuba City.....	127,400	.....	.....
Mineral Point.....	96,000	.....	.....
Galena.....	86,000	.....	.....
Rewey.....	54,600	.....	.....
Total for week.....	1,167,980	131,180	.....
Year to Feb. 16.....	10,042,015	544,070	96,480

The car shortage during the week was worse than ever before, which reduced the quantity of ore loaded.

Chemicals

NEW YORK, Feb. 20

Copper Sulphate—The market remains steady, with continued demand and prices unchanged at \$7.25 per 100 lb. for carloads or over; \$7.50 for smaller parcels.

Phosphates—Messrs. J. M. Lang & Co. report the exports of phosphate rock from the port of Savannah in the month of January at 8744 long tons, all to Germany.

Nitrate of Soda—There is no material change in the market. Supplies are moderate and the demand is steady for the season.

British Chemical Trade—Exports of chemicals from Great Britain for January were as follows, in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder....	92,143	102,254	I. 10,111
Muriate of ammonia,	10,730	16,610	I. 5,880
Soda ash.....	111,001	193,937	I. 82,936
Bicarbonate of soda.	17,973	34,617	I. 16,644
Caustic soda.....	128,773	158,012	I. 29,239
Soda crystals.....	12,060	8,653	D. 3,407
Soda sulphate.....	65,838	81,064	I. 15,226
Sulphuric acid.....	9,904	4,839	D. 5,065

Exports of copper sulphate were 2081 tons in 1906, and 2921 tons in 1907; an increase of 840 tons.

Imports of chemicals and raw materials into Great Britain for January were, in long tons:

	1906.	1907.	Changes.
Nitrate of potash....	898	1,089	I. 141
Nitrate of soda.....	4,281	9,813	I. 5,532
Phosphates.....	33,465	52,916	I. 19,451
Sulphur.....	2,416	1,860	D. 556
Pyrites.....	67,938	76,893	D. 45

Estimating sulphur contents of pyrites at the usual figure, the total imports of sulphur were 29,591 tons in 1906, and 29,017 tons in 1907; a decrease of 574 tons this year.

Mining Stocks

NEW YORK, Feb. 20

The main features of the general market have been quiet, varied only by moder-

ate fluctuations. An increasing difficulty in financing new projects and placing new securities is apparent, which would indicate that the capacity of the country for investment has been strained already, and that a halt is imminent.

Mining stocks in New York have been rather quiet. An attempt to boom Nipissing again did not meet with much success. In Boston there has been some excitement, chiefly over the reported aggressive policy of Calumet & Hecla, whose managers seem to have decided to forestall the lake combination which was supposed to be in course of formation.

Boston Feb. 19

The market has been one of specialties the past week, with the high-priced mining stocks in the foreground. Calumet & Hecla made a new record, selling at an even \$1000 per share for five shares, Friday last. This company is now the biggest factor in the Lake mining region and there is little doubt that plans which started some two years ago for expansion are now being carried out by this company for the taking over of leading properties. There is no doubt that control of Centennial is held by these people. Now their hand is shown in the fact that 25,000 shares of Allouez have been transferred to Calumet & Hecla interests, although they have not gained control of it. The action of Osceola, Tamarack and Quincy in this market the past week also indicates that they already do, or soon will, bear the Calumet & Hecla tag. Osceola made a new record price of \$180 today, which is \$13 above a week ago. Tamarack took a \$10 jump today, touching \$160, and Quincy is up \$5.50 to \$147.50.

Trinity has acted weak and peevish. From \$38 a week back it has gone steadily down until today it touched \$27.75, but rallied sharply to above \$31. The action at the close was better than seen for some time. La Salle has acted queerly since it was put on the list. It broke \$2.75 to \$25.25, closing at \$26.50 tonight. Isle Royale spurted \$2 to \$31. Allouez is up \$5.50 to \$72, and Centennial touched \$47, closing at \$46.50. Amalgamated, after touching \$115.25, fell to \$112.62½, closing above \$113. Arcadian spurted to \$14, but reacted to \$12.62½ tonight. Butte Coalition is off \$2 to \$36.50, and North Butte is off \$3.50 to \$112. Old Dominion spurted almost \$6 to \$63 on rich strikes at the 14th level, but is back to \$58.50 tonight. Parrot fell \$4.75 to \$30 on disappointment that no increase was made in the quarterly dividend of 25c. Shannon closes the same as a week back, at \$22.75. The directors declared quarterly dividend No. 2 to day of 50c. per share, payable March 30.

Boston & Corbin touched \$9.87½ on the curb and Balaklala is up almost \$2 in the week to \$12.75, notwithstanding an issue of 100,000 shares.

Osceola is the first mining company to issue its annual report for 1906. Gross

Earnings were \$3,646,811, against \$2,961,371 for 1905, and the surplus above expenses, construction and dividends was \$469,389, against \$369,846 last year.

Colorado Springs Feb. 16

There has been a fair amount of trading on the local exchange during the past week. Prices have not declined, and in some instances there has been a slight advance. Elkton, El Paso and Portland have each gained a few points. On the whole, the market has been dull and featureless. Work has not as yet begun on the much talked of drainage tunnel. The price of shares on the local exchange will probably not advance much until work on this tunnel begins in earnest.

STOCK QUOTATIONS

Table with columns for NEW YORK Feb. 19 and BOSTON Feb. 19. Lists various companies like Alaska Mine, Am. Nev. M. & P. Co., Amalgamated, Anaconda, Balaklala, etc., with their respective share prices and dividends.

N. Y. INDUSTRIAL

Table listing industrial companies such as Am. Agri. Chem., Am. Smelt. & Ref., Bethlehem Steel, Colo. Fuel & Iron, Federal M. & S. pf., etc., with their share prices.

ST. LOUIS Feb. 16

Table listing companies like Adams, Am. Nettle, Center Crk, Cent. C. & C., C. C. & C. pd., etc., with their share prices.

S. FRANCISCO Feb. 13

Table listing companies like COMSTOCK STOCKS (Belcher, Best & Belcher, Caledonia, etc.), GOLDFI'D STOCKS (Blue Bull, Columbia Mt., Comb. Frac., etc.), and BULLFROG STOCKS (Amethyst, Bonnie Claire, etc.).

NEVADA Feb. 20

Table listing companies like TONOPAH STOCKS (Tono'h Mine of N., Tonopah Exten., Caledonia, etc.), GOLDFI'D STOCKS (Sandstorm, Kendall, Red Top, etc.), and MANHAT'N STOCKS (Manhattan Con., Manhat'n Dexter, etc.).

New Dividends

Table listing companies and their dividend payments, including American Coal, Md., Am. Smelters Securities, A., Am. Smelters Securities, B., etc.

Assessments

Table listing companies and their delinquent and sale assessments, including Belmont, Idaho, Black Diamond, U., Bullion, Nev., etc.

Monthly Average Prices of Metals

Table showing Average Price of Silver by month from January to December, with columns for New York and London prices in 1906 and 1907.

AVERAGE PRICES OF COPPER

Table showing Average Prices of Copper by month from January to December, with columns for New York (Electrolytic and Lake) and London prices in 1906 and 1907.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Table showing Average Price of Tin at New York by month from January to June, with columns for 1906 and 1907 prices.

AVERAGE PRICE OF LEAD

Table showing Average Price of Lead by month from January to December, with columns for New York and London prices in 1906 and 1907.

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Table showing Average Price of Spelter by month from January to December, with columns for New York, St. Louis, and London prices in 1906 and 1907.

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