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SOPHISTRY.

The *Toronto Evening Telegram*, in a recent editorial, contends that, so long as newspapers reserve the right of criticism, they can fairly and honestly sell space to legally constituted mining companies.

Preliminarily we may remark that the *Telegram* has kept its columns clean—cleaner considerably from the taint of dishonest mining advertisements than, for instance, has the *Globe* or the *World*. Its argument, therefore, we may respect, even though we fail to agree with it.

Our reasons for differing from the *Telegram* may be brought out by an instance from real life. The *Globe* of October 2nd publishes an advertisement of a mining stock. The character of this advertisement is fully explained in this issue of THE CANADIAN MINING JOURNAL. Briefly, it is dishonest and illegal. It occupies slightly more than one-half page in the *Globe*.

The *Globe* of Monday, October 7th, points an accusing finger at a contemporary for publishing racing tips of a nature calculated to part a callow youth from his money.

Now the *Telegram* will admit that unless care is exercised in the publication of mining advertisements, more harm and more loss can easily result to a greater number of all sorts and conditions of people than could be possible in the case of a race track tip. The latter appeals to a limited class. The former are so coated and glazed that they appeal to the whole reading public.

We fail to see that the *Telegram* can justify by means of logic a contention that its own honesty has not permitted it to put into practice.

Our country has suffered far too much hurt from wildcats. THE CANADIAN MINING JOURNAL believes that they will be exterminated only by a plain statement of the truth. It is too late in the day to indulge in vague moralizing. It is also too late to allow the observance of the pleasant little courtesies and anonymities of journalism to interfere with a clear understanding of the situation.

COAL CUTTING MACHINERY.

Established customs and usages die hard. Great Britain has become, quite unjustly, proverbial for the reluctance with which innovations are accepted. In the United States the pendulum swings to the other extreme. New machinery, for instance, is not infrequently installed in place of old, merely because it is new. Canada is not free from either of these extremes. Mining companies very often make lavish purchases of untried ma-

chinery that finds its way to the scrap pile before it has seen any substantial service. On the other hand, we have an example of groundless prejudice in the case of the Cape Breton coal miners, who are petitioning the Local Government to prohibit the use of disc-and-chain coal cutters in pillar work in Nova Scotian collieries. Our Nova Scotian correspondent describes the condition of affairs accurately in his current letter. "One had thought, however, that this time-worn objection to the mechanical coal cutter had been relegated to oblivion along with the objections made to the spinning mule and the steam locomotive."

It is evident that the miners' society, the Provincial Workmen's Association, has not given the question deep thought. It is an easy matter to create and foster a groundless prejudice against new machinery, more especially when that machinery revolutionizes mining methods. But, ultimately, the effect of such an agitation will be harmful alike to mine and miners. Mechanical coal cutters are not merely time-saving devices. In experienced hands they increase the earning capacity of the miner and the output of the mine. They are an essential of modern practice. The miners of Cape Breton are physically and intellectually the equals if not the superiors of any other stratum of society. They have the means through their organization of studying the record of coal cutting machinery in other countries. It will be a sad blow to the prestige of the P. W. A. if it is directly or indirectly responsible for preventing the use of modern and efficient mining machinery.

CANADA AND THE JAMESTOWN EXPOSITION

The management of the Jamestown Exposition has set aside October 24th as "Nova Scotia Day." On that day it is hoped that the Governor-General of Canada, the Lieutenant-Governor and Premier of Nova Scotia and other distinguished officials will attend the Exposition.

The following day will be celebrated as "Canada Day."

A gratifying consideration is the fact that Nova Scotia's exhibit of gold ores is the most complete to be seen at the Exposition.

NORTH HASTINGS.

Without noise or bluster a revival of mining has taken place in North Hastings. At Deloro, the new plant of the Deloro Mining & Reduction Company is providing a means for the opening up of the rich arsenical pyrites deposits of that section. Near Madoc the old Henderson tale mine is producing granular tale of most exceptional purity. Iron pyrite deposits are being worked in the surrounding district. It is probable also that the old Belmont gold mine will take a new lease of life. Farther north the mines of the Mineral Range Iron Mining Company at Bessemer are producing steadily a high grade

low phosphorus magnetite. In gold, copper, iron, arsenic, tale and fluorspar, not to mention excellent marble and other building stones, North Hastings has the sound basis of a large and varied mineral industry.

A WARNING

As noted elsewhere, Law & Company, the promoters of "Highland Mary" and other Larder Lake companies, have been advised by the Attorney-General's Department to withdraw their advertisement of that affair from the Toronto dailies. This fact should be given wide publicity. We urgently request every reader of THE CANADIAN MINING JOURNAL to aid us in preventing the flotation of such companies. The principal sufferers in all such wild schemes are people with small savings bank accounts, who readily believe the plausible untruths served out to them in the shape of advertisements. We have received full particulars of several instances where farmers and school teachers have been induced to put all their savings into one of these wild cats. These things we intend to search out.

With the intelligent help of our readers we know that it will be possible to prevent the publication of dishonest mining "literature" all over Canada. Just now Law & Company are advertising "Highland Mary" in Quebec and Nova Scotia.

There is no crime meaner, none more sordid, none quite so deserving of contempt, as the deliberate attempt of brokers to misrepresent what they have to sell in such a way that poor and unsophisticated people will give up their savings in the hope of getting rich by a short cut. Advertisements of such things as "Highland Mary" are tossed aside, laughed at, by men who know anything about what mining means.

Editorial Notes.

In our issue of October 1st suitable acknowledgment was omitted of the fact that the paper on "Coal Briquetting" was read at the Toronto meeting of the American Institute of Mining Engineers. We wish to express our regret that this oversight occurred.

The United States postal authorities are making war upon fraudulent mining stock companies. It is being pointed out by the American press that the present force of inspectors is inadequate. Evidence sufficient for the conviction of offenders is so hard to get that often the promoters have amassed a fortune before they can be caught and have escaped to more salubrious climates.

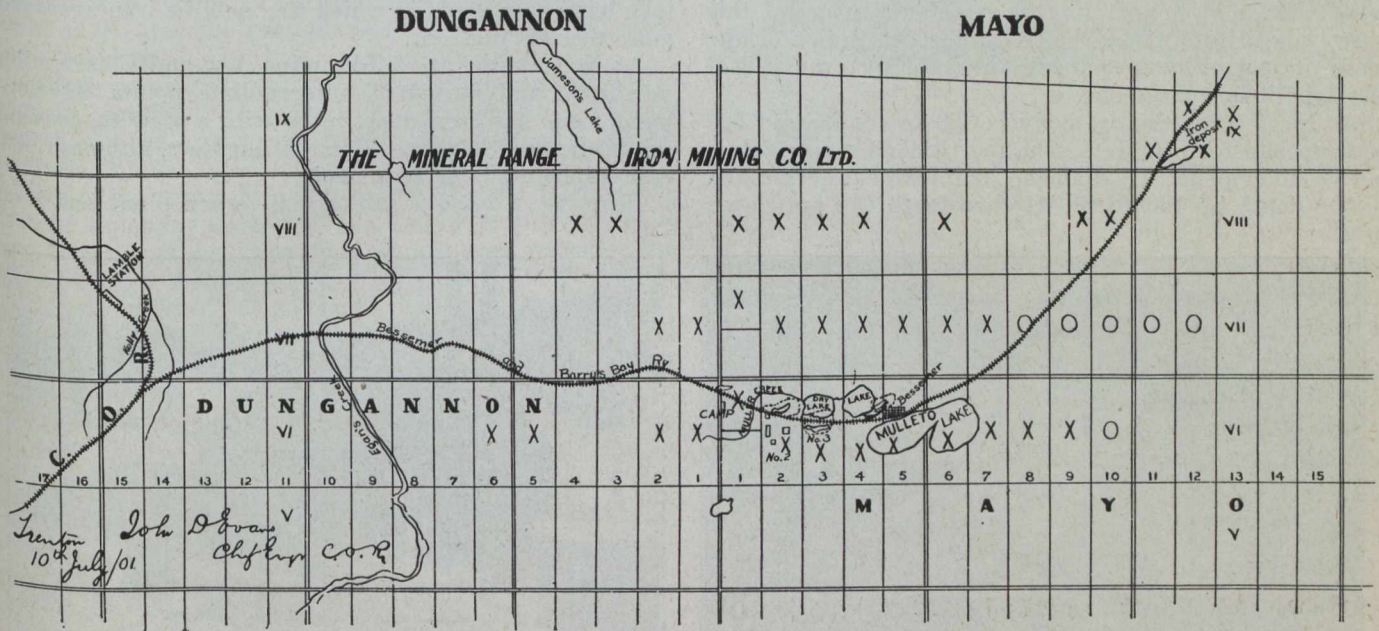
Messrs. Law & Company, the promoters of "Highland Mary" were notified on October 4th that the advertisement appearing over their name was in contravention of the Ontario Companies' Act and that it must be withdrawn from the papers. The Attorney-General's Department acted promptly in this matter. For this the Department deserves warm praise.

The Magnetite Mines of the Mineral Range Iron Mining Company, Limited, at Bessemer, Hastings County, Ontario.

The pluck and clean fighting qualities of one man have been the chief factors in the exploitation and development of what is undoubtedly one of the most promising magnetite deposits in Canada.

Near L'Amable Station on the Central Ontario Railway, the spur line of the Mineral Range Iron Mining Company's provides means of transportation for the ore from the Bessemer mines. To Mr. H. C. Farnum, who is the discoverer of the deposits, the organizer of the company and the general manager of the mines and rail-

not a trace of titanium. A very pure magnetite compact massive and displaying a string vitreous lustre is also found, principally at No. 2 mine. With the ore is associated a fluctuating percentage of calcite. Iron pyrites also occurs, but in such a manner as not to affect the value of the ore. This is explained by the fact that this objectionable mineral is not disseminated through the ore, but is found as the filling matter of small stringers, in distinct and easily separable masses along the contact of the ore and the wall rocks, and sometimes on the con-



MAP OF PROPERTY OF M.R.I.M. CO., LTD.—LOTS MARKED X AND O.

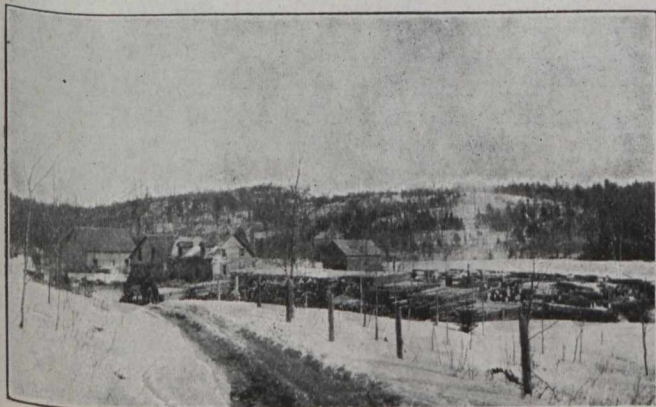
way, belongs the credit of beginning the enterprise and of steering it through many shoals.

The mines are situated about five miles northeast of L'Amable Station. The company controls 700 acres of developed mineral claims from which ore has been shipped and sold, and 3,000 acres of undeveloped claims.

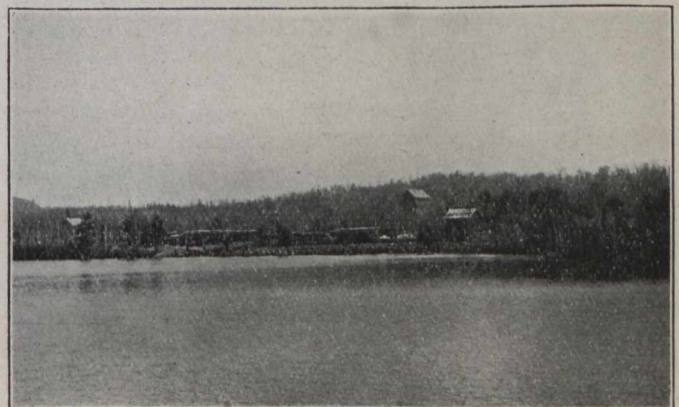
The ore bodies lie mainly in diorite, although at No. 2 mine there is an intrusion of granite. The ore itself is a high grade granular magnetite, containing phosphorus well below the bessemer limit, very little sulphur and

tact faces of the ore and included masses of rock. In mining, crushing and loading the ore sufficient culling is done to bring the sulphur down to a negligible amount.

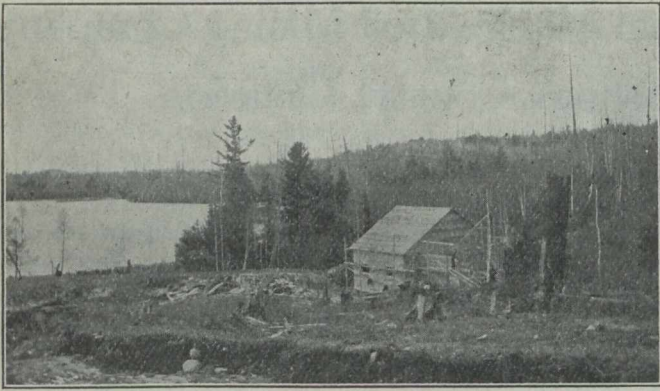
The ore bodies have a dip of 60 degrees south and a general northeast and southwest strike. The extent of these bodies it is impossible to estimate accurately. More than 6,000,000 tons of ore is in sight. But there is strong evidence that the range is continuous over the two and one-half miles intervening between Nos. 3 and 4 mines and Child's mine to the northeast. It is neither safe nor



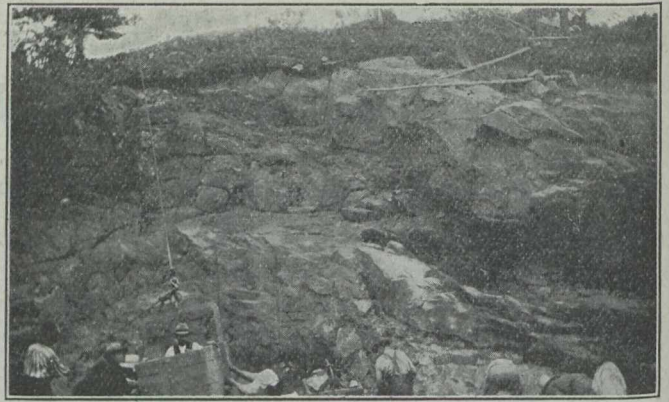
Office and Shop at Bessemer.



View from Lake.



Boiler House at No. 4 Mine in Course of Construction.



Open Cut at Bessemer.

wise to attempt to compute the possible tonnage of this vast body. But even if belief in the continuity of the mass of magnetite is not substantiated by events, still the deposit is a large one.

At No. 3 mine the ore body is 300 feet wide and has been opened for 850 feet. The foot wall at this width is not yet in evidence. A diamond drill core has been taken to the depth of 160 feet. At this depth the ore shows

tons have been made in which the metallic iron averaged more than 63 per cent.

At No. 2 mine, at Child's mine, two and a half miles northeast, and at several intermediate points, development work has been done, more with a view to proving the properties than for shipment purposes, although several shipments have been made.

Near No. 4 mine a substantial power plant has been



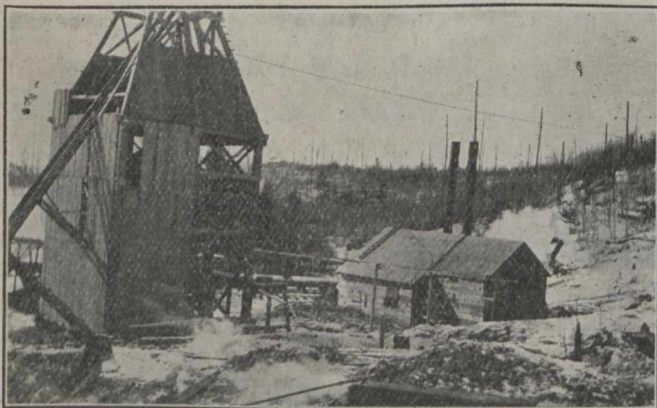
Open Cut at Bessemer.



Boiler House.

no change. The opening in No. 4 is longer and narrower—1,100 feet by 220 feet. From both mines shipments have been made continuously this summer to the Canada Iron Furnace Company at Midland, Ont., to the "Soo" furnaces and to the Deseronto furnace. Usually these shipments average more than 55 per cent. metallic iron, from 0.01 to 0.07 per cent. sulphur, and from a trace to 0.03 per cent. phosphorus. But shipments of over 100

erected. Here also a shaft house and head frame have been built, in which is installed a large gyratory crusher, capable of crushing 1,000 tons of ore per shift. Both No. 4 and No. 3 mines are worked as open pits; but at No. 4 pit a shaft is being sunk to the dip. The ore from the No. 4 pit trams is dumped into a two ton skip. The ore from No. 3 is dumped into bins, and thence into the skip. The skip is hoisted on a trackway at an incline of about



Skip-way, Crusher and Power House



No. 4 Mine.

60 degrees, and is dumped directly into the capacious crusher. At present only one skip is in service, but a double skipway is laid and as soon as the shaft has been sunk to a suitable depth two skips will be run. The shaft will greatly increase the present output of the mines, which is about 300 tons per day.

Work is continued night and day at Bessemer. Light is supplied during the night shift at the shaft house by powerful gasoline gas lamps.

Large quantities of low grade ore are encountered at No. 4 mine and north to Child's mine. The iron content of these bodies varies between 30 per cent. and 50 per cent., the greater portion of it carrying between 45 per cent. and 50 per cent. To render this marketable it is proposed to erect a concentrator. This will also take care of the waste ore culled from high grade shipments. The basic idea of this is not an expensive and elaborate treatment of the ore; but a rough commercial sizing and magnetic cobbing.

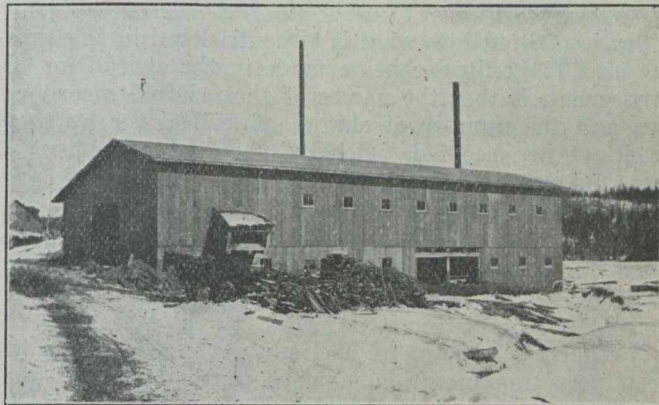
Before passing to another phase of this enterprise it may be mentioned that the writer was shown a curious segregation of apatite crystals on the wall of a fissure near No. 3 mine.

Extending across four lots of the Mineral Range Iron Mining Company's territory is a fine ledge of white, pink and green marble. Negotiations are now pending for the sale of the mining rights of this marble. The writer was shown a beautiful specimen of the polished stone.

In addition to their mining areas, the company owns 10,000 acres of timber lands, a large portion of which is well timbered with cedar, basswood, spruce, tamarack, hemlock, birch, elm, ash and oak. A large saw mill is kept busy with the season's cut.

A small laboratory is now in working order. A shop, offices and many dwellings have been built. The spur line to the Central Ontario Railway is being carefully ballasted and a roadway has been surveyed and partially graded as far as Child's mine.

The Mineral Range Iron Company, Limited, was organized in 1902 by Mr. H. C. Farnum, who is the treas-



Saw Mill at Bessemer.

urer and general manager. Mr. E. V. Voigt, of Detroit, is president, and Mr. H. L. Bingham is secretary. The capital of the company is \$500,000, divided into shares of \$1 each. One hundred and fifty thousand shares are held by the public. The writer wishes to thank the officials of the company for much kindness shown him when he recently visited Bessemer.

WILD CATS AND THE PUBLIC PRESS.

CHAPTER I.

A PROTEST.

The Toronto daily papers, with the notable exception of the *Evening Telegram*, are still publishing the misleading and unlawful advertisements of mining promoters. In our last issue we deal with an advertisement carried by the *Toronto World*. We shall now animadvert upon a similar and even more offensive paid advertisement appearing in the *Toronto Globe* of Wednesday, October 2nd, 1907. On page 2 of that number Law & Company occupy more than half a page with an advertisement of "Highland Mary."

Of the merits of "Highland Mary" as a mining property we shall have more to say in a latter issue. This much may be postulated, however. There is no proved property in Larder Lake. The district may have success, may enjoy prosperity, when the fakirs and leeches are removed from its boundaries. But such things as "Highland Mary," unproved, undeveloped areas, staked for the sole purpose of getting into the pockets of the uninformed masses, are the most effective drawbacks to development.

The points claiming our immediate attention are the advertisement itself and the responsibility of the *Globe* and of Law & Company respectively for the appearance of such an agglomeration of extravagant and flamboyant fiction.

A few excerpts from the advertisements will give the reader an idea of the nature of Law & Company's announcement. A heavily featured proclamation that 250,000 shares were disposed of during the first eight days of sale and that applications are increasing daily is succeeded by some clap-trap advising the public not to gamble. The same public is then enjoined to purchase "Highland Mary" at 10 cents per share. This they can do with the certainty that, on the honor of Law & Company, Limited, they will receive "an income that will each year exceed the total amount of the investment." Among other sad features of this promotion, the above implies that already Law & Company have sold at least 250,000 shares of "Highland Mary" at 10 cents per share, totalling \$25,000. "Highland Mary" is an undeveloped prospect. Law & Company's acquaintance with legitimate mining is at once discounted by their willingness to make such promises as that quoted above. With the assistance of the daily press they are, however, pushing "Highland Mary" upon the market. They are trying to convince the unfortunately credulous public that "Highland Mary" will "make stockholders rich." As usual, they predict a "big advance" in the price of shares. Surely Law & Company, boasting "seventeen years of unflinching business integrity," could afford to dispense with this last hall-mark of unsanitary stock promotion.

It is now in order to look at the "Highland Mary" advertisement of Law & Company in the light of the

Ontario Companies' Act. Section 94 of this Act defines the word "prospectus" as meaning "any prospectus, notice, circular, advertisement or other invitation offering for subscription or purchase any shares, debentures or other securities of a company, or published or issued for the purpose of being used to promote or aid in the subscription or purchase of such shares, debentures or securities, and the word 'company' shall mean any company incorporated or proposed to be incorporated."

Section 99 outlines what is to be disclosed in any prospectus. The only exception made in the case of an advertisement is that the names of the original incorporators and the number of shares subscribed for by them need not be specified. Otherwise an advertisement is regarded as a prospectus and the same penalties are provided to punish irregularities.

We find then that the advertisement of Law & Company in the *Toronto Globe* of Wednesday, October 2nd, 1907, makes no mention of the consideration for purchase. This is distinctly required by the Act.

Neither the amount of preliminary expenses, nor the promoters' remuneration, nor the particulars as to material contracts, nor the names of the company's auditors are to be found. The publication of this advertisement is therefore a reckless breach of the law of the land. But it is more and worse than this.

Like "Big Ben" of fragrant memory, the promoters of "Highland Mary," while they mention that they hold 1,000,000 treasury shares for development purposes (as against 2,000,000 shares obviously not for development) do not specify which variety they are selling. The assumption therefore is that they are not selling treasury stock, and "Highland Mary" may well be described as a sure source of income to Law & Company, Limited, the worthy promoters of that Celtic damsel.

But, to be brief, many things that investors have a right to know and must of necessity know before they can intelligently buy a cent's worth of mining stock are entirely absent from Law & Company's public announcement. Therefore we urge the itching speculator to get a copy of the Ontario Companies' Act. Let him therefrom learn in what respects Law & Company disregard and evade that Act. Then let him respectfully but firmly insist that Law & Company give him all the particulars of every transaction and agreement incidental to the promotion of "Highland Mary"—particulars which in all decency should be fully revealed to the public before a share is sold.

Finally let the possible purchaser remember that a prospect, an undeveloped claim, in Larder Lake is no more than a mere speculative venture in a district of which far too much has been said and of which far too little is known. Law & Company's assurance about the richness of the camp, their quotations of assay results, are so worthless that they need not enter into the discussion.

Referring to the *Globe*, in which this advertisement appeared, we wish to express our unqualified disapproval of the manner in which that newspaper sells its moral support to such wild ventures as that instanced above. Lately the Province of Ontario welcomed a group of British journalists. These men, writers and publicists of a high class, spoke in no uncertain tones of the almost irreparable injury done to Northern Ontario by the unsavory mining schemes which have been and are being floated in the Motherland. They most impressively advised the press and the people of Ontario to discourage such iniquitous phases of frenzied finance.

The *Globe*, admittedly one of the foremost journals of Canada, owes a duty to the public from whom it receives its support. It cannot publish unlawful and misleading advertisements for a money consideration and hope to escape the consequent stigma. In seeming and in truth the paper that continues to publish fraudulent advertising matter makes itself a friend and ally of wild cats. Let us remind the *Globe* that a lofty moral tone and dishonest advertisements, like oil and water, are not miscible. The *Globe* must either adjust the moral plane of its editorials to the level of Law & Company, or exclude all such vicious advertisements from its columns.

CHAPTER II.

AN ILLUSTRATION.

It was in the early spring of this year that Arthur G. Penman, managing director of Penman & Spraug, Limited, Toronto, organized a syndicate to purchase from Rinaldo McConnell, of Ottawa, a mining property situated on the south half of the southeast quarter of the north half of lot No. 5, concession 4, District of Nipissing, Province of Ontario. The members of the syndicate were chosen with a good deal of discrimination. Many of them were men prominent in political and commercial life. After an option had been secured and a company organized mining rights on the property specified above were purchased for about \$50,000.

The name chosen for the company was "The Cobalt Silver Mountain Mining Company."

Mr. Penman appears to have exercised much more sagacity in the selection of his directors and officers than in the choice of his mining location. True, the latter is a very secondary consideration to the average advertising promoter. But we fear that Mr. Penman might well have investigated his property and his title with slightly greater caution.

Mr. Penman, realizing to the full the necessity of having an attractive lot of officers and directors, induced a very prominent politician to act as president of the new company. Fate intervened and carried off this president to another sphere of activity. With no loss of time Mr. Penman then fixed upon E. Guss Porter, Esq., of Belleville, Ont., member of the Dominion Parliament for West Hastings.

Apparently Mr. Penman's imagination and his sense of social discrimination were the only faculties brought into play in these preliminaries. Neither common sense, business acumen nor everyday honesty was evident in the handling and flotation of the company.

The syndicate was formed, the company was organized and shares were sold on the understanding that about nineteen acres of favorably situated mining lands were to be the property of the company. It presently developed, however, that only eleven acres could be patented. Suit was entered by the company against McConnell for the recovery of part of the purchase price. The suit is still dragging on. Money, sorely needed to explore the eleven acres has been, perforce, applied to legal expenses. The position of the company financially is practically hopeless.

Superficially this might appear to call for sympathy. Actually it is an example of a typical mining swindle dying a natural death. A plausible and unscrupulous youth, who certainly knew what he was doing, and whose only aim was to sell the public a doubtful mining claim at an unreasonable figure, induced a number of citizens to help him form a syndicate. The prospectus filed is

fraudulent, and the whole method of flotation was designed to enrich Mr. Penman and his associates. The latter may have been victims of Mr. Penman's wiles; but in effect and in law they are his confederates.

The net results of the promotion of the Cobalt Silver Mountain Mining Company are that the syndicate is out the purchase price of the areas, and that the property has never, and probably never will under the present regime, ship a car load of ore. It has on its hands a costly law suit, eleven acres of mining claims and a reputation that needs disinfecting.

And now we may point our moral. The *Sunday World* early last spring printed a portrait of A. G. Penman, to whom it referred in terms of warm appreciation. Photographs of a trench on the Cobalt Silver Mountain Company's property also appeared and the whole scheme was given a large amount of prominence.

Despite the *World* and Mr. Penman, notwithstanding puffs and prospectuses, the company has failed dismally to do anything more than enrich one or two personal bank accounts at the expense of a number of others.

Thus the reader of the *Toronto World* or of any other newspaper, when he glances over the fat assurances of Messrs. Law & Company regarding "Highland Mary," may well reflect upon the sad fate of the Cobalt Silver Mountain Mining Company, Limited, of which Mr. Arthur G. Penman is managing director and Mr. E. Guss Porter, M.P., president. Cobalt Silver Mountain started life with all the accessories of such schemes—newspaper puffs, dazzling promises and doubtful methods. A bitter legacy of trouble is the principal result of nearly a year of existence. "Highland Mary" begins life with even more glowing promises. The smash, when it comes, will be proportionately greater. Can a respectable newspaper like the *Globe* afford to identify itself with this sort of thing?

We must not close this article until we have referred to an engineer's report, which is incorporated in the prospectus of the Silver Mountain Mining Company. The report is signed by E. C. Kinswell, M.E., and is a most discreditable performance. We hope for Mr. Kingswell's sake that the letters "M.E." are not rightfully his. But if Mr. Kingswell is a graduate of a technical college and can claim the right to his title, he was then deliberately sinning against light and knowledge in concocting such a mass of mischievous nonsense.

THE NOMENCLATURE OF IRON AND STEEL.*

In 1901 the International Association for Testing Materials appointed an influential committee to establish uniform nomenclature for iron and steel. The committee comprised Professor H. M. Howe (New York), chairman; Mr. L. Lévy (Paris), and Professor D. Tschernoff (St. Petersburg), vice-chairman; Professor A. Sauveur (Harvard), secretary, and seventeen members, including Messrs. E. P. Martin, A. Pourcel, H. Wedding, and H. H. Campbell. The report was presented by Professors H. M. Howe and A. Sauveur at the Brussels Congress of the International Association, and it was proposed that the report be submitted to the Iron and Steel Institute for consideration. The Council would, therefore, be pleased to receive written comments for publication in the Journal.

*Paper read before the Iron and Steel Institute.

The report gave the following definitions:—

Alloy Cast Irons.—Those which owe their properties chiefly to the presence of an element (or elements) other than carbon.

Alloy Steels.—Those which owe their properties chiefly to the presence of an element (or elements) other than carbon.

Basic Pig Iron.—In America, pig iron containing so little silicon and sulphur that it is suited for easy conversion into steel by the basic open-hearth process. It is restricted to pig iron containing not more than 1.00 per cent. of silicon.

Bessemer Pig Iron.—That which contains so little phosphorus and sulphur that it can be used by itself for conversion into steel by the original or acid Bessemer process. In America, this term is restricted to pig iron containing not more than 0.10 per cent. of phosphorus.

Bessemer Steel.—Steel made by the Bessemer process, whether its carbon content is high, low, or intermediate.

Blister Steel.—Steel made by carburising wrought iron by heating it in contact carbonaceous matter. It might also be made by so carburising a low-carbon steel.

Cast Iron.—Generically, iron containing so much carbon, or its equivalent, that it is not malleable at any temperature. Specifically, cast iron in the form of castings, other than pigs, or remelted cast iron suitable for casting into such castings, as distinguished from pig iron, *i.e.*, cast iron in pigs, etc. (See Pig Iron.) The committee recommends drawing the line between cast iron and steel at 2.20 per cent. carbon, for the reason that this appears from the results of Carpenter and Keeling to be the critical percentage of carbon corresponding to the point "a" in the diagrams of Roberts-Austen and Roozeboom. As to the significance of this critical point, the committee is not prepared to express an opinion.

Cast Steel.—The same as crucible steel; obsolescent, and to be avoided because confusing, and because it offers a temptation to fraud.

Cemented Steel.—The same as blister steel.

Charcoal Hearth Cast Iron.—Cast iron which has had its silicon and usually its phosphorus removed in the charcoal hearth, but still contains so much carbon as to be distinctly cast iron.

Converted Steel.—The same as blister steel.

Crucible Steel.—Steel made by the crucible process, whether its carbon content is high, low, or intermediate.

Grey Pig Iron and Grey Cast Iron.—Pig iron and cast iron in the fracture of which the iron itself is nearly, or quite, concealed by graphite, so that the fracture has the grey color of graphite.

Haematite Pig Iron.—Originally pig iron made from the haematite ores of England, which happen to be so free from phosphorus and sulphur that the pig iron made from them can be used by itself for the acid-Bessemer process. By association, it has come to mean any pig iron thus relatively free from phosphorus and sulphur. The term is not used in America, and is undesirable.

Hot Metal or Direct Metal.—The molten cast iron from the blast furnace before it has been allowed to solidify.

Ingot Iron.—Steel cast into an initially malleable mass and containing so little carbon or its equivalent that it does not harden greatly on sudden cooling. The word is rarely used in England, "mild steel" or "low-carbon steel" or "soft steel" being generally used in its place. In America, the line between soft steel and half-hard steel is usually drawn at a carbon content of about 0.20 per cent.

Ingot Steel.—Steel cast into an initially malleable mass and containing so much carbon or its equivalent that it hardens greatly on sudden cooling. The word is rarely used in England, but “hard steel,” “high-carbon steel,” or “half-hard steel” are used in its place.

Malleable Castings.—Castings of malleable iron, which see.

Malleable Cast Iron.—Iron which, when first made, is cast in the condition of cast iron, and is made malleable by subsequent treatment without fusion. Although the English name of this variety suggests that it is cast iron, it is not truly a variety of cast iron, but rather forms an independent species of iron, because it lacks the essential property of cast iron, viz., its extreme brittleness. Though the term “malleable castings” is very common, the term “malleable cast iron” is very rarely used. The common but inexcusable term, we regret to say, is “malleable,” pronounced “mallable,” used as a substantive.

Malleable Iron.—The same as wrought iron. Used in Great Britain, but not in the United States, except carelessly, as meaning “malleable cast iron.”

Malleable Pig Iron.—An American trade name for the pig iron suitable for converting into malleable castings through the process of melting, treating when molten, casting in a brittle state, and then making malleable without remelting. The term should be used with care to avoid confusion. This material is so called in trade in America “malleable iron”; but this use should be avoided, because “malleable iron” has the older and (in Great Britain) firmly established meaning of “wrought iron.”

Mottled Pig Iron and Mottled Cast Iron.—Pig iron and cast iron, the structure of which is mottled, with white parts in which no graphite is seen, and grey parts in which graphite is seen.

Open-hearth Steel.—Steel made by the open-hearth process, whether its carbon content is high, low, or intermediate.

Pig Iron.—Cast iron which has been cast into pigs direct from the blast furnace. This name is also applied to molten cast iron which is about to be so cast into pigs, or is in a condition in which it could be readily cast into pigs.

Plate Iron.—A name applied in Great Britain to refined cast iron.

Puddled Iron.—Wrought iron made by the puddling process.

Puddled Steel.—Steel made by the puddling process, and necessarily slag-bearing. (See Weld Steel.)

Refined Cast Iron.—Cast iron which has had most of its silicon removed in the refinery furnace, but still contains so much carbon as to be distinctly cast iron.

Shear Steel.—Steel, usually in the form of bars, made from blister steel by shearing it into short lengths, piling, and welding these by rolling or hammering them at a welding heat. If this process of shearing, piling, &c., is repeated, the product is called “double shear steel.”

Steel.—Iron which is malleable at least in some one range of temperature, and in addition is either (a) cast into an initially malleable mass; or (b) is capable of hardening greatly by sudden cooling; or (c) is both so cast and so capable of hardening. Variety *a* includes also molten iron, which, if cast, would be malleable, as do its two sub-varieties, “ingot-iron” and “ingot-steel.” (Tungsten steel is malleable only when red hot.)

Steel-Cast (adjective).—Consisting of solid Bessemer, open-hearth, crucible, or other slagless steel, and neither forged nor rolled; applied to steel castings. For instance,

a “steel-cast” gun is a gun which is a steel casting, *i.e.* which has been neither forged nor rolled. To call it a “cast-steel” gun would imply that it was made of crucible steel, to which the term “cast-steel” is restricted.

Steel Castings.—Unforged and unrolled castings made of Bessemer, open-hearth, crucible, or any other steel. Ingots and pigs are, in a sense, castings; the term “steel-castings” is used in a more restricted sense, excluding ingots and pigs, and including only specially shaped castings, such as are generally used without forging or rolling. They may, however, later be forged, *e.g.* under the drop press, when they cease to be “castings” and become “drop-forgings,” or, if only part is forged, then they are partly forgings and partly castings.

Washed Metal.—Cast iron from which most of the silicon and phosphorus have been removed by the Bell-Krupp process without removing much of the carbon, so that it still contains enough carbon to be classed as cast iron. The name “washed metal” is extended to cover this product even if its carbon is somewhat below the proper limit for cast iron.

Weld Iron.—The same as wrought iron. Obsolete and needless.

Weld Steel.—Iron containing sufficient carbon to be capable of hardening greatly by sudden cooling, and in addition slag-bearing, because made by welding together pasty particles of metal in a bath of slag, as in puddling, and not later freed from that slag by melting. The term is rarely used.

White Pig Iron and White Cast Iron.—Pig iron and cast iron in the fracture of which little or no graphite is visible, so that their fracture is silvery and white.

Wrought Iron.—Slag-bearing, malleable iron, which does not harden materially when suddenly cooled.

Wrought Steel.—The same as weld steel. Rarely used.

The following are definitions of names designating special sizes or shapes of iron and steel:—

Bar Iron.—Wrought iron in the form of bars, rods, &c.

Muck Bar.—The rough bars, usually 1 inch thick and about 4 inches wide, made by the first rolling of a ball of puddled iron.

Merchant Bar.—Wrought iron in the form of merchantable bars or rods made by shearing muck bar into short lengths, piling it and rolling or forging it at a welding heat.

Bloom.—1. A large bar, drawn from an ingot or similar mass, for further manufacture. 2. A rough bar of wrought iron drawn from a Catalan or bloomery ball for further manufacture.

Billet.—A small bar drawn from a pile, bloom, or ingot for further manufacture. The committee recommends that the line between blooms and billets be drawn at the size of 5 inches square, as representing common custom.

Slab.—A flat piece or plate, with its largest surfaces plane, or sheared from an ingot or like mass for further treatment.

In conclusion, the view is expressed that it would be well to decide on a definite carbon content to serve as a boundary line between ingot iron and ingot steel, between puddled iron and puddled steel, and between any other varieties of wrought iron and weld steel. Two plans have been considered. One is to draw this line at 0.32 per cent. carbon or its equivalent in other elements, for the reason that this carbon content appears to correspond to the critical point O in the diagrams of Roberts-Austen

and Roozeboom. This has the merit of corresponding to a definite physical boundary. The other plan is to draw the boundary at 0.20 per cent. of carbon, because this is a convenient place to separate the important classes "soft steel" and "half-hard steel," so that if this point was adopted "ingot iron" would be synonymous with "soft

steel," and "ingot steel" would be equivalent of the two classes "half-hard steel" and "hard steel."

The report was received and adopted by the Congress, and the committee was requested to continue their labors with a view to securing the foreign equivalents to the terms defined.

THE DEVELOPMENT OF AN ORE SHOOT IN NOVA SCOTIA.¹

By E. PERCY BROWN, B.Sc., Goldboro, N.S.

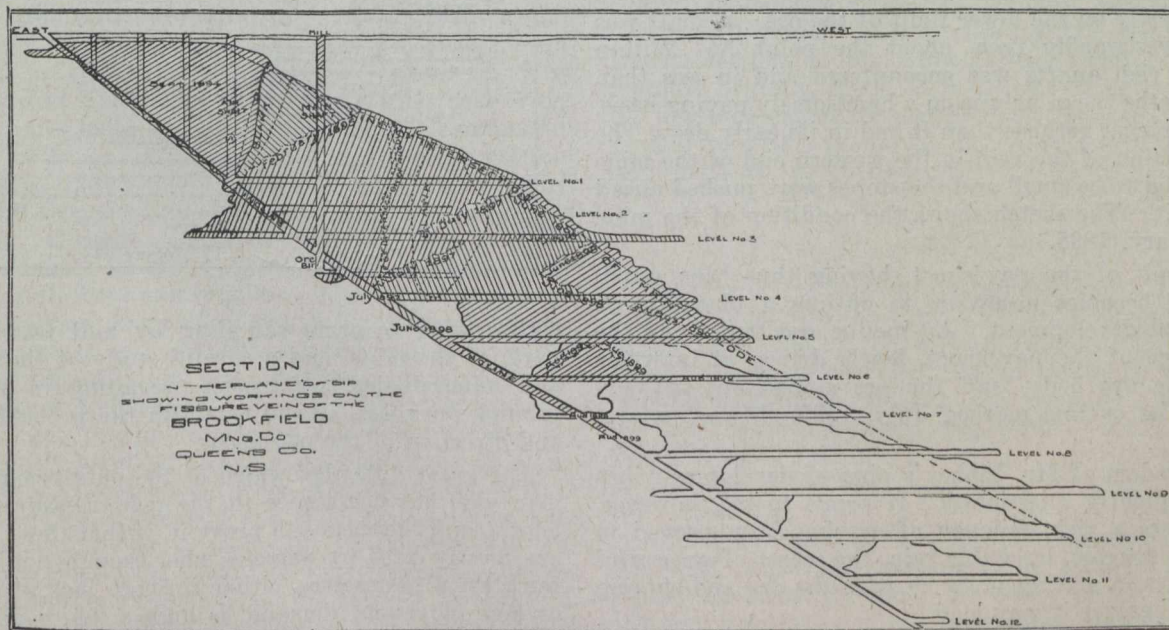
(Read 28th March, 1907.)

Looking over the history of mining in Nova Scotia, one is struck by the large number of properties which, though proved phenomenally rich on the surface, have been abandoned after a rocket-like career of one or two years. The depth usually reached has not been great, two hundred to three hundred feet being the average. In many cases it has been less, in a few cases more, and two reached the depth of one thousand feet.

In almost all instances where any really successful mining has been done in Nova Scotia, a "shoot" or chimney of rich ore has been successfully followed and the poorer portions of the vein neglected. And it is well to note that Nova Scotia is not exceptional in this respect. If the reader will consider, he will find that the

The property of the Brookfield Mining Company² was first opened in 1886. The returns of the mines office for 1887 show that 1,418 ounces of gold were produced from 1,691 tons of quartz. An extreme depth of about 250 feet was reached and the system of mining is shown in the upper left-hand portion of the accompanying sketch. Four shafts were sunk in a distance of about 200 feet and the ore mined out between them by underhand stoping.

This method is recognized by anyone familiar with mining practice in Nova Scotia as the method almost universal in this Province until a few years ago, and it is important to note in this connection how peculiarly well adapted to closing down a mine is such a system.



majority of the richest gold mines in the world have been of this class. The large, uniform, low-grade propositions are the exception rather than the rule.

The objects of this paper are three-fold: (1) To give in brief outline the history of a certain gold mine in Nova Scotia, showing the similarity of the early history of this mine to the total brief history of many of the richest gold deposits of this Province; (2) to show how, by a happy combination of knowledge, pluck and perseverance, the history of this mine was prolonged; and (3) to indicate the probability that many of the other rich outcrops could be opened up and followed in a similar way.

No development work, such as levels and shafts, was carried ahead, and if a blank or poor portion of the ore-body occurred, particularly if it occurred as in the case under consideration, all the stopes would likely be in it at the same time, seeming to justify the belief of the superficial observer that the vein had absolutely "petered out."

The four shafts were sunk while they were in pay ore and the line of stopes carried ahead until they had reached the position shown in the sketch. Another shaft was sunk about 120 feet further west, but not reaching

¹Paper read before the Nova Scotia Mining Society.

²At Brookfield, Queen's County, N.S.

ore at a depth of about 60 feet, it too was discontinued. Thus no ore was visible in any of the shafts or on the stopes, and the mine was abandoned.

The plan of the Brookfield mine at this time might stand almost unaltered for the underground plans of dozens of abandoned mines in Nova Scotia to-day. Many of these have given high returns for a year or two; many shafts have been sun, the rich ore and handsome specimens being dug out between them; managers, assistant managers, superintendents, etc., have enjoyed good salaries; many miners have made small fortunes by stealing rich nuggets; until the day has come, as in the above case, when all the shafts were bottomed in barren ground, the stopes were black and the mine was closed down, leaving an indignant body of stockholders to mourn their loss and blame the gold measures of Nova Scotia.

In September, 1894, this mine was pumped out by Mr. W. L. Libbey, who had for underground foreman Mr. C. N. Crowe. Mr. Crowe had had experience outside of Nova Scotia and appreciated the fact that an ore body as rich as this had proved was not likely to be an isolated bunch. He had seen pay shoots found and followed in other countries, and "hulk seams," even when no thicker than a knife blade, chased through blanks to rich bodies of ore. Such a hulk seam existed here, and certain corrugations on the vein walls, together with the dip of angulars, etc., indicated the direction to take.

A main or interstratified vein, intersecting the Libbey "fissure" in strike and dip, appeared to cut off the latter vein and to form the upper limit of the pay shoot. The stopes in the eastern end of the mine were found to be practically on the lower limit of the ore. A drift was started westwardly from about the point A. Within a month rich quartz was encountered and in less than three months the mine was on a handsomely paying basis, yielding larger returns than it had in its early days. The blank portion of the vein in the western end of the mine was proved to be small and the stopes were pushed ahead through it. The sketch shows the condition of the mine in February, 1895.

The limit of the pay shoot, having thus been established, it became necessary to outline a plan for its economical development. An incline was run along the lower edge of the pay shoot, levels driven at intervals across the ore body, and the ore stoped out between them. The outline marked July, 1895, shows this system.

The wisdom of Mr. Libbey's plan of development has been frequently questioned. It seems to me, however, that, where a rich chimney of ore has been proved to exist in a narrow, irregular vein, the secret of successful mining lies in getting in touch with the ore and staying with it wherever it may lead.

There are many examples in Nova Scotia where the other plan, viz., sinking vertical shafts, has been tried and proved a failure. Certainly Mr. Libbey's system was well tested during the year 1897, when a blank portion of the vein was again encountered, and though this blank was much larger than the former one, pluck and perseverance won the day and the mine kept pushing ahead.

During the next year, as may be seen from the sketch (marked June, 1898) the system of the stoping was gradually changed from underhand to overhand. The results of the adoption of this system may be seen by the outlines marked August, 1899, when development

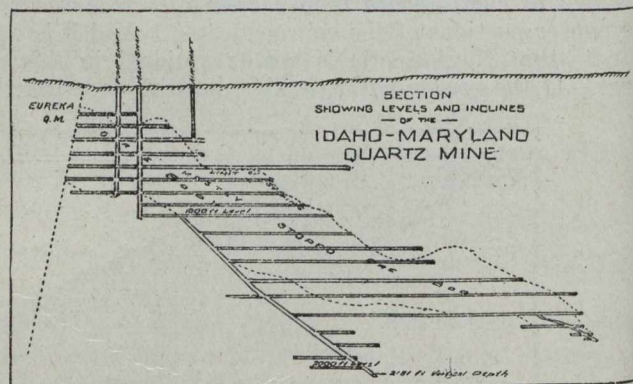
work had been pushed ahead and ore reserves had been blocked out.

The further workings explain themselves and are shown up to February, 1903.

Such is a brief outline of a portion of the history of the development of an ore chimney in Nova Scotia. To show that similar ore bodies occur elsewhere, the reader is referred to the accompanying sketch on a small scale of the Idaho Maryland quartz mine. This shows the development of an ore chimney to a vertical depth of over 2,000 feet, and it is interesting to note the poor system of development: a vertical shaft for 1,000 feet, and levels and inclines form there to the bottom.

Is there any reason to suppose that many of the other deposits of the ore referred to in the first portion of this paper, and proved so rich on the surface, could not be successfully followed in the same manner as has been done by the Brookfield Mining Company? I hold that there is every reason to suppose that many, if not all of them, could be so opened up.

Mr. E. R. Faribault, of the Dominion Geological Survey, has performed a great deal of very valuable work in most of the gold mining districts of the Province, and such work properly applied would be of the greatest assistance in opening up these abandoned mines. A careful survey and mapping of the old workings, to-



gether with accurate sampling by mill tests from all parts of the mine, and a careful study of the geological and mineralogical conditions prevailing in the underground workings, should establish the probable location and direction of the pay shoot.

The great difficulty which at the outset confronts the man who has confidence in the gold measures of Nova Scotia, and the means to prove it, is that these properties are mostly held by persons who, though not willing to work them themselves, either through lack of confidence or lack of means, demand as high a figure for the property as though it were on a dividend-paying basis. They cannot be made to sell, and easily afford to pay the small sum of fifty cents per annum for each area they wish to hold. Thus are most of the mining properties in Nova Scotia tied up. The result is stagnation in the mining industry. The Government of Nova Scotia has shown its willingness to co-operate with the mining fraternity to overcome this stagnation; but with so large a proportion of the desirable properties tied up as they are at present, it is difficult to effect much lasting good. It would seem that the remedy must lie with the mining laws. The measures necessary may seem harsh, but the present crisis would seem to call for prompt and decisive action.

NOTES FROM A TRAVELLING CORRESPONDENT.

Next to the labor question there is no topic at the moment more universally discussed in the West than the "fuel situation" and the alleged coke shortage. Every man you meet in the Kootenays has something to say on the matter and that say is usually more or less emphatic and forcible. Generally speaking the Crow's Nest Pass Coal Company gets the major proportion of the damning, and the coloring may be fairly accurately determined by the Associated Press despatches of recent date. Unfortunately, however, the suspicion that these despatches are not entirely uninspired somewhat weakens their effect locally, and your Eastern readers may very comfortably accept all the telegraphic news bearing on the subject with tongue in cheek. It is true, of course, that there has been a coke shortage, and that in consequence output in Rossland and Boundary has been, during the past three months, restricted thereby. But it is not true that the Crow's Nest Pass Coal Company is responsible for that shortage, or has, as is alleged, unfairly discriminated against local reduction works in favor of other customers in the United States. The fact is the situation has arisen from a variety of circumstances, not the least contributory of which was the quite unnecessary and impolitic action of one of the large undertakings in the Boundary in increasing wages at mine and smelter early this summer. Just at that time labor was by no means plentiful. The rise of wages at one centre upset the equilibrium elsewhere. The price at which coke is sold to local consumers—\$4.50 a ton—does not admit of any considerable addition to the cost of production, such as an all-round increase in wages would, and so men left the colliery in numbers to secure employment in the more remunerative camps of West Kootenay and Yale. The work of drawing coke ovens is at all times hard; during the hot days of summer it can only be borne by the strongest. Men were brought in to replace those who had left, but only to stay a shift or two and then depart. Here was one very real reason for output shortage. Another, none the less tangible, was the absolute inability of the Canadian Pacific Railway to supply cars and engines. The company did not treat the colliery less prejudicially in this respect than it did the mines and smelters, for the complaint on the score of transportation inadequacies is general in the metal mining districts to this day. The fact remains, however, that the operations of the colliery company were seriously handicapped this summer by car shortage, and scarcely a week passed when it was possible to work either the mines or ovens to full capacity. No allowance for these limitations is made by those critics of the Crow's Nest Pass Coal Company's management, who are now claiming that the shortage of fuel in British Columbia is due to a large exportation this season of coal and coke to Montana and other United States smelters. The truth or otherwise of this contention will doubtless be shown from the evidence which may be demanded by the Arbitration Board appointed by the Provincial Government to investigate the question; but I am in a position to state that only during the month of July, when some of the British Columbia smelters reduced their orders and all were "stocked up," did the colliery's American customers receive, and that only in one instance, a percentage of coke or coal on their orders in proportion to the tonnage required by and supplied to Canadian consumers. In August shipments to the United States were considerably curtailed, and in Sep-

tember practically ceased altogether. Of course there is no use denying that the position of the company is not altogether a happy one. It stands between the Charybdis of the C. P. R. and the Scylla of the Northern Pacific. It is a case of pull baker, pull devil, and somebody necessarily has to get the worst of it. Meanwhile the effort that has been made by one side to close the Northport smelter by inducing the Provincial Government to use its alleged prerogative to prevent the export of coke for use at these works has, I am glad to learn, proved ineffectual, the authorities recognizing that any such action would necessarily be regarded by all fair-minded people as arbitrary in the extreme and calculated to injure a British company operating at heavy expense in the Province, employing a large number of men and therefore entitled to every consideration. I am not saying that it would be a bad thing for the Le Roi Company if the Northport smelter were compelled to close down; on the contrary it would, I believe, be the very best thing that could happen from every point of view; but the shareholders should at least have another chance to find that out for themselves, and perhaps in a subsequent letter I may present a few facts for their consideration in this regard. Meanwhile the crisis as far as concerning immediate fuel requirements appears to have passed. Both cars and labor are now plentiful, and the colliery is now, therefore, in a better position to cope with the situation. It has promised to supply the British Columbia Copper Company's requirements in full, while the Granby, to make sure of a preference, has stepped in and by the investment of from half to three-quarters of a million dollars in Crow's Nest Pass shares claims to have secured the balance of power between the two big interests. At any rate Granby interests will be well looked after by Mr. Groves, whose recent election on the Crow's Nest directorate is portentous. Finally, the C. P. R. is proceeding rapidly with the development of its coal areas at Hosmer, which in a year or so's time should be placed on a productive footing. At least, so it is hoped.

H. M.-L.

The Geological Survey's determination of the highest and lowest land in the United States is a fresh reminder of the smallness of the vertical range of the habitable globe. These points are both in Southern California, only 75 miles apart, Mt. Whitney reaching a foot or two over 14,500 feet above sea level, while Death Valley sinks 276 feet below that level.

A new electric furnace, for determining the fusion points of refractory substances, has been constructed at Hanau by W. C. Heraeus. Its essential part is a tube of iridium four-fifths of an inch thick and an inch and three-fifths in diameter, and in this temperatures between 1500 and 2000 degrees C. can be maintained for any desired length of time.

The *Iron and Coal Trades Review*, September 20th, attributes the fall in metal prices to the readjustment of supply and demand. Readjustment has been made more difficult by "unrest, depression and lack of confidence in the business and financial world," particularly in the case of copper and tin. Decreased consumption without any corresponding decline of output explains the price movements of lead and spelter.

THE ERZBERG OF EISENERZ.*

BY H. BAUERMAN (London).

The Erzberg or Ore Mountain of Eisenerz is the largest of a series of mineral deposits associated with the Palæozoic rocks of the Eastern Alps on their northern slope, which extends from the Tyrol on the west to the margin of the Vienna basin in the east, a distance of nearly two hundred miles. These deposits, although following the same general direction, are irregularly distributed and vary very considerably both in size and in their contained minerals of value, some of them, to mention only those of the immediate vicinity, having been worked as copper mines in the district west of Eisenerz, at Kallwang, Radmer, and Johnsbach, from the year 1546 to the middle of the nineteenth century, one of them having produced about 150 tons of copper annually for a century. At present, however, only the iron ore and magnesite deposits are of importance, and among the former the Erzberg takes an exclusively prominent position.

The geological structure of the Eisenerz region is shown in a general way in the sketch map, Plate I., in the preparation of which the author has been kindly assisted by Professor von Ehrenwerth and Professor Dr. Redlich of Leoben. The southern part of the area is made up of granular and schistose rocks (grauwacke) and heavy masses of limestone with a general east and west strike, and dipping at high angles to north and northeast, which are overlain unconformably by the great masses of the Triassic formations constituting the northern limestone Alps, commencing with the Ferfen series of the lower Trias, red sandstone schists and gypsum beds, and followed by the limestones and dolomites of the Muschelkalk (Wetterstein Dachstein, etc.), forming the mountain masses of the Hochschwab, and extending to the Semmering, Raxalp, and Schneeberg districts to the eastward. The change in the formation is marked by a strong contrast in the shape of the ground, the older rocks giving mountains of more rounded outline and well wooded, while the Triassic summits rise in great wall-like cliffs, a striking example being the Pfaffenstein, which dominates the town and valley of Eisenerz and towers above the Erzberg, as shown in Plate II.

Topographically, the Erzberg is a nearly isolated conical mountain overlooking the watershed of the Enns and Mur¹ rivers, the former receiving the northern drainage of the Erzbach at Hieflau, about ten miles to the northwest, and the latter those of the Vordenberg brook, immediately above Loeben, the height of the dividing line at the Prebichel summit being 4,026 feet. From its summit, 5,043 feet above the sea level, the Erzberg slopes sharply to the Krumpenthal on the west and Trofeng on the east, a depth of about 3,000 feet in either direction, but to the south the inclination is somewhat less to the Platten ridge, connecting it with the great limestone mass of the Reichenstein, which is about two miles to the south, and 7,108 feet total height.

The iron ore workings are confined to the western side of the mountain, covering about three-quarters of the

height, with a horizontal extension of about 1,400 yards. From the Krumpenthal, about 600 feet up the slope, the oldest member of the series, the so-called footwall or base of the ore appears. This is the "Grauwacke," a well-stratified, greenish-grey rock made up of grains of quartz and felspar crystals in a more compact base of potash, mica scales, and some quartz. This is an important rock formation as generally marking the limit between the central crystalline region of the Alps and the limestone mountains of the north. Intimately connected with the grauwacke below the ore bed is a dark grey or black siliceous slate, with inclusions of pyrites and some fossils that are referred to Upper Silurian species.

Following the grauwacke in ascending order is a heavy formation several hundred feet thick, made up of alterations of spathic iron ore, ankerite (rohwand), and a light-colored or variegated yellow and red limestone known as the Sachberg limestone, or the ore-bearing limestone by the older authorities. This contains fossil crinoids of Lower Devonian age.

The ore bed forming the highest member of the series shows a basin-like structure with an included belt of schists, containing sericite, which gives it a soapy feeling to the touch. This, while closely confirming the outline of the ore below it, is so sharply separated from it in character that it is considered by Vacek² to mark a division between the ore beds of dissimilar ages, the lower one being assigned to the Devonian and the latter to the Permian period. This view, however, has not been generally accepted, on the ground that no difference in mineral composition can be established between the upper and lower beds, and that the schist may represent an original barren clay parting.

At the summit of the Erzberg, above the iron ore workings on the eastern slope, the grauwacke beds with their associated limestones appear in a vertical position, or in some places with a partially reverse dip, while below, on the Krumpenthal side, the same beds dip into the hill at a lower angle. The ore bed therefore seems to be included in a plain synclinal fold, but the numerous slip faults and other disturbances exposed in the bed by the quarrying operations indicate a more complicated structure resulting from disturbances renewed at several different periods. In all probability, however, it originally formed part of the Silurian and Devonian limestone series, with which it is so intimately associated, and was subsequently transferred into spathic ore at the close of the Palæozoic but before the commencement of the Mesozoic period.

Evidence for the latter is afforded by the overlying red sandstones of the Werfen series occurring on the eastern side of the mountain, which contain in places at their base, breccias, with fragments of the ore-bearing limestones, marking the commencement of the Triassic formations of the northern limestone Alps. The western side being entirely free from newer overlying strata, the ore bed is exposed for about three-quarters of the whole length of the slope, on that side giving facilities for working the deposit such as can scarcely be paralleled in other localities.

Another view of the age of the grauwacke is also taken by Vacek, who on petrographical grounds considers it to be the equivalent of the Archæan gneiss of Blas-

*Paper read before the Iron and Steel Institute.

¹Both rivers join the Danube but a considerable distance apart. The mouth of the Enns is a few miles below Linz, and that of the Drau, of which the Mur is a tributary, about 400 miles further down, at the lower end of the north and south reach of the Danube, through the plain of Hungary.

²Jahrbuch der k. k. geolog. Reichsanstalt, 1900.

seneck, and that it has been extensively eroded before the deposition of the Devonian limestone formation which therefore covers it unconformably. This, however, is generally contested by other observers.³

Spathic ores occur under similar conditions to those of the Erzberg at the Donnersalpe, about three miles west, and on the Polster, two miles east of the main deposit. At the former locality the ores, with associated limestone and ankerite beds, are from 100 to 120 feet thick, and cover an area of about 700 acres.⁴ These, from their position and relation to the overlying Triassic strata, are considered to be the remains of a series of deposits formerly continuous, which have become separated by the erosion of the Erzbach and Gerichtsgraben valleys in post-Triassic times.

The Erzberg ore, when freshly broken, is a fine-grained crystalline spathic ore, which weathers to a rusty brown limonite. The hard uncharged ore is known as Flinz, and in the early days was thrown aside as waste, only the soft brown ore being suitable for reduction in the bloomary furnaces. This was known as Blauerz (blowing-house ore). Another characteristic variety is the so-called Kernflinz, where the spathic ore is altered to limonite externally to a depth of an inch or two, the line of separation between the two minerals being very sharply defined. Manganese and iron are present in about the proportion of 1 to 16 or 18, or considerably less than in the spathic ores of the Devonian rocks of Siegerland and Somersetshires, where the ratio is 1 to 4 or 5. Unlike the latter, however, the Erzberg ores are remarkably free from the sulphides of other metals, particularly those of copper, which are so very characteristic of spathic ores from other places. Cinnabar (sulphide of mercury) is found as a rarity, together with some iron pyrites, quartz and hematite. The most abundant foreign admixtures with the ores are the isomorphous carbonates of lime and magnesia, principally in the form of ankerite or rohwand, which makes up most of the waste material. This is a somewhat indefinite mixture of the different carbonates. As a rule, carbonate of lime predominates, making up about one-half, the remainder being ferrous carbonate with that of magnesia in subordinate quantity. This distinguishes it from Breunnerite, Brownspar, Mesitine, and Pistomacite, which are essentially ferrous and magnesian carbonates without lime. The following analysis of the Erzberg ankerite is due to Reibenschüh⁵ :—

	Per Cent.
Ferric oxide	2.29
Ferrous oxide	23.40=FeCO ₃ 37.75
Manganous oxide	1.69=MnCO ₃ 2.74
Magnesite	6.08=MgCO ₃ 12.77
Lime	24.41=CaCO ₃ 43.58
Carbon dioxide	42.08
Total iron	19.8

Carbonate of lime occurs both as calcite and aragonite. The latter, in the coral-like forms known as *eisenblüthe* or *fios ferri*, is about the best known of the Erzberg minerals. Another form, made of alternating layers of aragonite and calcite, has received the name of Erzbergite. The composition of the ore, as may be imagined, is subject to considerable variation. According to older analyses of K. von Hauer and Paterer⁶ in 1872, the spathic

ores ranged between 37 and 42 per cent. iron when raw, and 50 and 59 per cent. when calcined. The brown ores showed a greater range (between 41 and 52 per cent.), owing to the increase of siliceous waste, and for the same reason the increased yield by calcination was not as marked as with the spathic ores.

According to a statement kindly furnished by the Oesterreichische Alpine Montan Gesellschaft, the average composition taken over the whole output at the present time is :—

	Raw Ore. Per cent.	Calcined Ore. Per cent.
Ferric oxide	19.50=Fe 13.65	71.18=Fe 49.83
Ferrous oxide	32.25=Fe 29.08	1.23=Fe 0.85
	38.73	50.68
Manganic oxide	3.50=Mn 2.45	4.29=Mn 3.00
Lime	5.92	6.19
Magnesia	4.06	4.14
Carbon dioxide	27.62	2.64
Water	0.84	0.14
	4.08	8.19
Silica	1.26	1.61
Alumina	0.034=P 0.015	0.059=P 0.025
P ₂ O ₅	0.202=S 0.079	0.432=S 0.169
SO ³		

From this it appears that about one-fifth of the ore is weakened to the ferric condition, the remainder being made up of carbonates in the following proportions :—

	Per Cent.
FeCO ₃	51.96
CaCO ₃	10.61
MgCO ₃	8.52

The large proportional increase in silica and phosphorus in the calcined ore, both nearly doubled, is probably due to additions supplied by the ash of the small coke used as fuel in the kilns.

The mining of iron ore on the Erzberg has been carried on from very early times. Traditionally the workings date back to the eighth century, but there are no authentic records older than A.D. 931. Under feudal organization the mountain, being considered as the property of the sovereign, grants were made to individual territorial proprietors, known as Radmeister, or wheelmaster, who were not merely owners of the water power, but were required to have sufficient resources in land, forests, and tenants to supply the necessary fuel and labor for effective working without outside assistance. Another condition required the proprietor to be resident. Only by special license from the sovereign was non-residence permitted, and when an approved agent had been provided. The mining rights were defined in the thirteenth century by dividing the mountain into two parts by a horizontal plane nearly at the level of the Prebichel summit, the part above that plane (the Ebenhöhe), 3,891 feet above the sea level, being assigned to Vordernberg proprietors, and the lower part to those of Eisenerz, an arrangement which is still in force. The diversity of interests between the large number of owners—fourteen in Vordernberg and nineteen in Eisenerz—was attended with great confusion and waste in working the ores, and in 1625 the interests in the lower part were consolidated by the formation of the Inneberger Haupt Gewerkschaft, which, after passing through several changes, was incorporated as a joint stock company under the same name in 1868, subsequently becoming merged, with other principal ironworks in Styria and Carinthia, in the Oesterreichische Alpine Montan Gesellschaft in 1881.

³J. Taffanel, *Annales des Mines*, 1903, vol. iv. p. 24.

⁴Aigner, *Die Mineralschätze der Steiermark*, p. 46.

⁵Aigner, *op. cit.* p. 169.

⁶*Ibid.*, p. 166.

The Vordernberg proprietors maintained their individuality for a much longer period. Consolidation of thirteen of the works into the Radmeister Communität took place in 1825, the fourteenth having only joined in 1871. Since 1890, the working of all the mines has been taken over by the Alpine Montan Gesellschaft, who hold 54.84ths of the Vordernberg proprietary rights.

At the time of the former visit of the Institute in 1882, underground mining was still carried out to a considerable extent in the higher part of the mountain in winter, working in the open being confined to the summer, while in the lower ground, open working alone was practised. At that date there were twenty-six quarry faces or terraces on the Eisenerz side, with room for five more up to the Vordernberg boundary; but since 1890 underground mining has been completely abandoned, and the entire face of the deposit has been laid out in a series of steps or terraces, fifty-eight in all, varying in height from 33 to 43 feet, giving a total depth of working faces of about 2,000 feet.⁷ The ore, broken by hand-boring and blasting with dynamite and other high explosives, is picked by hand from the waste and carried in trucks by levels driven in from the face to the different distributing shafts and levels in the interior of the mountain. Originally the Vordernberg ores were conveyed by a horse-railway of 3-foot gauge, made in 1835 and converted to steam traction in 1878, on a falling gradient of 1 in 125 to Prebichel, whence the further drop of 1,176 feet to Vordernberg town (the terminal point of the branch railway from Leoben), was covered by a combination of inclined planes and railways; while those of the Innerberg workings were passed out by a deep adit and inclined planes to the Eisenerz terminus of the State line branch from Hiefiau. Since the completion of the connecting railway on the Abt centre rack rail system, joining these points across the Prebichel pass, the arrangements have been remodelled upon the principle of collecting the output at three different levels, each one being connected with its own station on the railway. The highest of these, the Wismath main level, 4,164 feet, utilizes the old railway as far as Prebichel station, but the lower part, with the inclined planes to Vordernberg, has been abandoned. The middle section is served by the Drei König stage (3,539 feet), which is connected with Erzberg station (3,511 feet) by an electric railway about 1,200 yards long; and the lowest by the Liedemann adit at the bottom of the workings (2,962 feet), which emerges on the slope about 650 feet above the kiln plant on the Krumpenthal, which is covered by a series of inclined planes, as shown in Plate III. The ores from levels above the collecting planes are lowered by self-acting inclines or cage-drops in shafts, while those from lower levels are hoisted by water-balance lifts. Latterly, electric winding gear has been fitted in the deepest of the drop-shafts, that between the Drei König and Liedemann levels, which enables a portion of the Eisenerz output to be diverted to the Erzberg station when required. From the kilns an electric railway connects with the Eisenerz station and the blast furnace at the north end of the town.

With the improvement of the transport arrangements, the Erzberg output has increased largely. In 1882 it amounted to about half a million tons, 212,000 for the Vordernberg and 250,000 to 300,000 tons from the Eisenerz side. In 1906 it was 1,300,000 tons, about 300,000

⁷A model showing the present state of the workings has been prepared for the Imperial Mining Academy at Leoben.

tons from Vordernberg and the remainder from Eisenerz workings.

Until past the first half of the nineteenth century, the Erzberg ore was smelted exclusively with charcoal at numerous small furnaces at Hiefiau, Eisenerz, Vordernberg and Trofojach, in the vicinity of the mines; but the growing scarcity of charcoal has led to the almost complete abandonment, and out of forty-five furnaces existing in 1882, only four are at work intermittently at the present time—three at Vordernberg, with an output of from 18 to 60 tons each, and one at Trofojach making from 30 to 40 tons per day. The furnace charge is made up of 75 to 80 per cent. of calcined and 20 to 25 per cent. of small raw spathic ore, and 4 to 5 per cent. of siliceous clay flux. The fuel consumption is from 15 to 16 cwt. of charcoal per ton of metal, or, in the most favorable cases, as low as 14 cwt. The product, a low silicon white iron, resembling the plate metal of the West Yorkshire refinery, containing:—

Carbon	Silicon	Manganese	Sulphur	Phosphorus
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
3.57	0.25	1.37	0.04	0.04

goes usually for crucible steel making.

Smelting the Erzberg ore with coke on the large scale was commenced with a pair of furnaces at Klein Schwechat, near Vienna, the fuel being brought by rail from Moravia; but these are not now at work, the main smelting operations being conducted at Donawitz, near Leoben, and Eisenerz. At the former place the number of furnaces has been increased to four, the two earlier ones having cage lifts and hand-filling, while the newer pair have inclined lifts and self-tipping charging skips. The materials smelted are calcined spathic ores, heating furnace slags, and mill scale and limestone. The coke used is mostly Westphalian, with some from Ostrau in Moravia, the consumption being about 18 cwts. per ton. The daily make is about 300 tons; the slag produced, 16.8 cwt. per ton, is granulated and thrown into the brook to be washed away during floods. The Eisenerz furnace is larger and makes over 400 tons daily. The range in composition of the metal is:—

Carbon	Manganese	Silicon	Sulphur	Phosphorus
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
3.0-3.8	2.2-2.8	0.5-0.7	0.04-0.08	0.05-0.10

Formerly Donawitz was a puddling forge, the furnaces being fired with the miocene lignite from the mines in the hills above Leoben, but at the present time the same fuel is used in gas producers for heating a range of ten 30-ton Siemens furnaces working the basic process on magnesite bottoms, in which the bulk of the produce is converted into steel. Full details of the construction of these furnaces will be found in Professor Pavloff's atlas of the open-hearth furnace, published in 1904.⁸ The puddling furnace, however, still survives in the district, a principal use being in the production of steel for crucible steel melting stock. The production of steel blooms in the open charcoal fire (Rohstahlfeuer) is still carried on in some small mountain forges, but on an extremely restricted scale, for extremely special steel-making purposes.

⁸Much interesting information on the Styrian works will be found in Braune's report in Vogel's *Jahrbuch* for 1900, pp. 206, 274.

Cobalt can be separated from manganese by means of potassium nitrite in the same manner as from nickel, provided a nitrate or a chloride solution is used. A sulphate solution gives unsatisfactory results.

THE EMMA MINE.

By FREDERIC KEFFER, Greenwood, B.C.
(Toronto Meeting, 1907.)

Among the low grade mines of the Boundary District the Emma is in a way unique, in that the magnetite, which constitutes the main portion of the ore body, has persisted from the grass roots to at least the 250 level in a practically continuous vein or deposit; and also in that the vein stands vertically so far as explored.

In the other low grade mines of the district magnetite is a frequent constituent of the ores, but its occurrence is most erratic, the deposits being irregular, varying in size from a few ounces to masses of thousands of tons, and frequently dipping (so far as any dip is observable) entirely at variance with the general dip of the ores with which they are associated.

A characteristic case was that of a body of magnetite of exceptionally good value found on the 300 foot level of the Mother Lode mine, which lay perfectly flat, being about 20 by 100 feet in area, but only 7 to 8 feet thick, and which was encased in barren eruptive rocks.

In the Emma (save in Quarry No. 1, where a slip has thrown the ore about 25 feet to the southeast) the magnetite continues unbroken to a point some 200 feet below the surface, where diamond drilling has found what is seemingly another slip, throwing the ore again a short distance to the southeast. Diamond drilling on the 250 foot level has recently located the ore near the shaft.

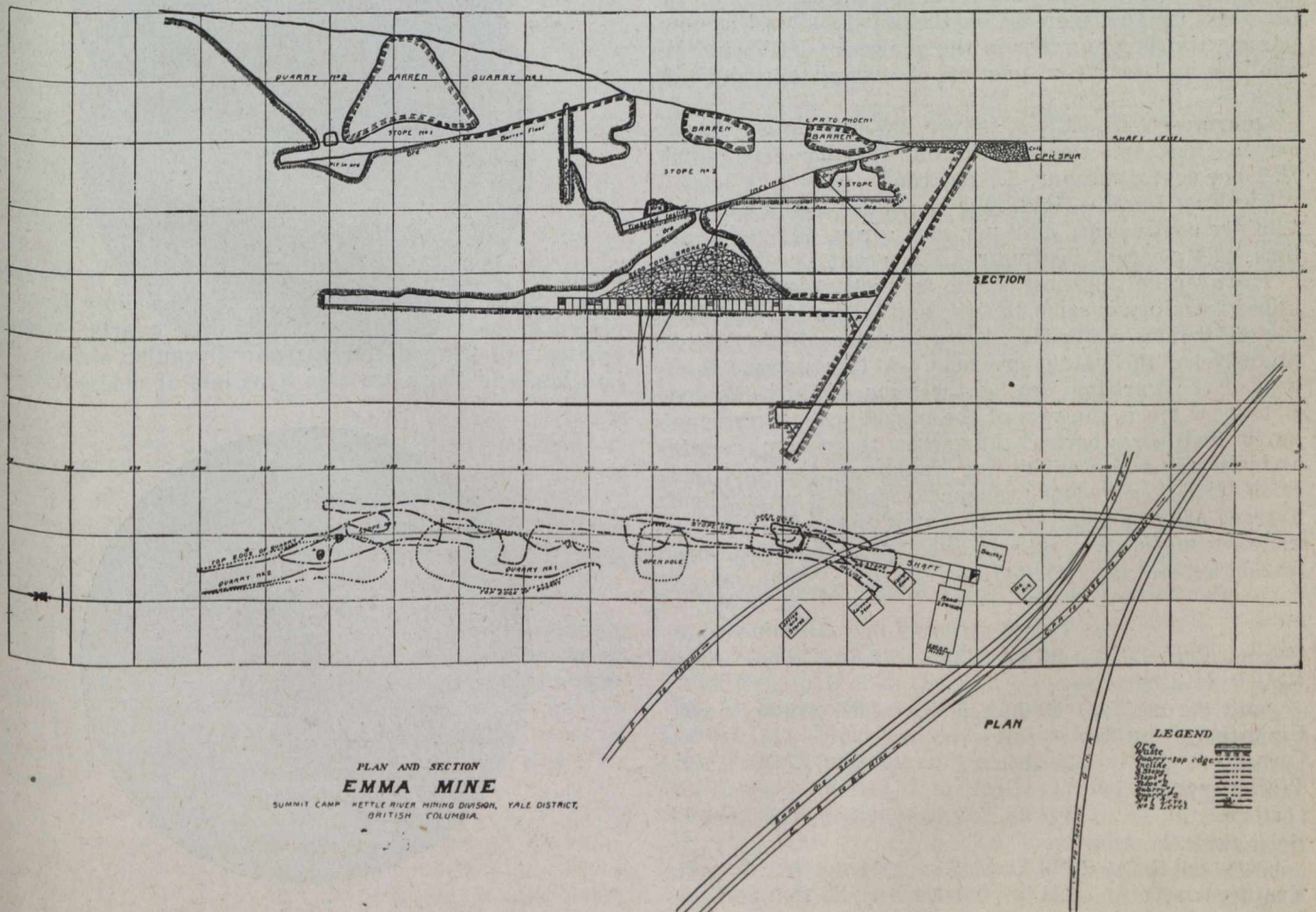
The Emma ores are found along the contact of extensive "island" surrounded by eruptive flows. These

latter rocks are of the general types characteristic of the Boundary district, analysis of which usually lie between the limits of:—

	Per cent.
Silica	30 to 40
Iron	15 to 25
Lime	10 to 20
Magnesia	0 to 5
Alumina	5 to 15
Alkalies	0.5 to 2

To the east of this "island" of limestone are several pyrrhotite deposits, the most prominent of which is that occurring on the "Mountain Rose" mineral claim. This pyrrhotite is extensively mined for use as sulphur flux, it being sometimes essential in order to reduce the grade of copper matte, thereby avoiding unnecessary slag losses, which accompany matte running over 50 per cent. copper. This sulphur ore consists of pyrrhotite, together with varying proportions of lime, alumina and silica, but with little or often no magnetite, in striking contrast with the Emma ores, which contain little or no pyrrhotite.

On the Emma, to the south of the limestone "island," occurs a body of magnetite, which where mined was some 20 to 100 feet in area. This ore was followed to a depth of about 25 feet, where it was cut off by a slip, beyond



which no further work has been done. But little pyrrhote was found in this place.

To the west of the limestone island occurs the main ore body of the Emma mine, which ore has been developed by quarries and drifts for some 575 feet, shown in plan and section on the accompanying map.

Most of the ore next the east wall of the deposit (which here runs about 5 degrees east of north) is magnetite, but minor bands of garnetite also occur. Along the northwest wall, however, the magnetite for the most part is next a garnet zone, which (where crosscut by diamond drilling on the 150 foot level) passes into a bluish and very silicious rock beyond which the drill was not pushed.

In other places the magnetite stands directly against snowy white crystalline limestone, which latter rock, when near the ore, frequently carries masses of magnetite and chalcopyrite embedded within it, this mineralization extending sometimes several feet into the limestone in diminishing ratio. In other cases, however, the line between this limestone and the ores is clear cut. The garnet zone is about 20 to 25 feet thick and in places carries sufficient copper to pay for mining.

More or less epidote also occurs along both walls of the ore. The magnetite frequently includes masses of crystalline lime spar, which are almost always accompanied by enrichments of copper. The garnet zone includes considerable magnetite scattered through the rock in crystals and little patches.

On the surface to the north of the workings the magnetite gives place to garnet ore well mineralized with copper pyrites. Still further north (about 1,000 feet) the garnet again crops for several hundred feet carrying good values in copper, but now dipping to the west about 70 degrees. The copper and gold contents of the ore show decided increase on the 150 foot level as compared with the ore miner in the quarries. Following are analyses and assays on two lots of several thousand tons each:—

Quarry.—Gold, 0.07 oz.; silver, .06 oz.; copper, .52 per cent.; silica, 16.5 per cent.; iron, 43.6 per cent.; lime, 12.1 per cent.; sulphur, 1.1 per cent.

150 Foot Level.—Gold, .031 oz.; silver, .06 oz.; copper, 1.28 per cent.; silica, 14.9 per cent.; iron, 40.7 per cent.; lime, 14.4 per cent.; sulphur, 1.7 per cent.

The average thickness of the magnetite deposit in the upper workings is some 18 feet, but on the 150 foot level the ore widens materially, being in places 40 feet across exclusive of the garnet ore zone. A fair average thickness of the workable ores of the mine would be 25 feet. Below are given analyses of the garnet zone, the silicious bluish drill cores beyond the garnet, the general country and also the white crystalline limestones, the rock lying immediately east of the magnetite and an approximate average of the general eruptive rock of the district. Alkalies, magnesia and other constituents present in small quantities are not included:—

	Silica	Iron	Lime	Alumina	Sulphur
Garnet zone	26.8	23.5	32.6	12.0	1.5
Bluish drill core beyond garnet	63.6	5.3	4.5	16.9	.52
Limestone country rocks	18.3	2.3	43.9	5.6	.00
White crystal limestone	7.6	.8	56.0	.3	.12
Rock next the magnetite on the east	38.5	6.5	27.6	19.3	.47
Eruptives	35.0	20.0	18.0	15.0	

It is evident from these analyses that the limestone and eruptives contain in sufficient measure all the constituents necessary for the formation of the garnet and magnetite zones. That these latter rocks were produced by the hot water gases and water carrying dissolved mineral derived from the eruptives, reaching upon the adjacent limestones through replacement and recombination, can hardly be doubted.

It is seen from the analyses of the ore that the sulphur present is very small, barely more than sufficient to form the copper pyrites present.

Iron sulphides are of rare occurrence, and it seems certain that the magnetite was deposited as such, and did not result from the alteration of sulphides. This view is borne out by the fact that as a rule magnetite crystals and not iron sulphides are found in the garnet zone, however far removed from the main body of magnetite. The crystalline limestone found next the magnetite in the mine is considerably purer than the main portion of the limestone formation.

The accompanying photographs of rock sections from the Emma throw an interesting light on the formation of the deposit. Fig. 1 is a specimen of garnet ore, and

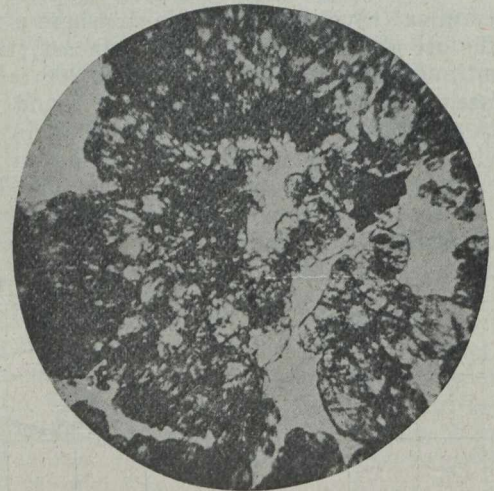


Fig. 1.

shows a limestone in the course of alteration to a garnet rock. Some calcite remains, but it has mainly been replaced by garnet, together with a little quartz. Copper pyrites run through the mass in irregular strings and bunches, and there are also some bits of magnetite.



Fig. 2.

Fig. 2 represents a rock from the 150 foot level, in which all the original mineral has been replaced by plagioclase, feldspar and actinolite, together with some copper sulphides. This rock is probably an altered eruptive rather than a limestone replacement.

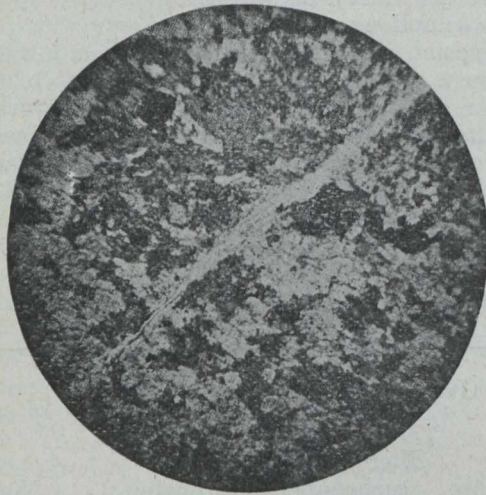


Fig. 2.

Fig. 3 is a section of the rock which cuts off the Emma deposit on the south. It is chistose through great pressure, and is mainly composed of feldspar and hornblende. A few crystals of iron sulphide are also present.

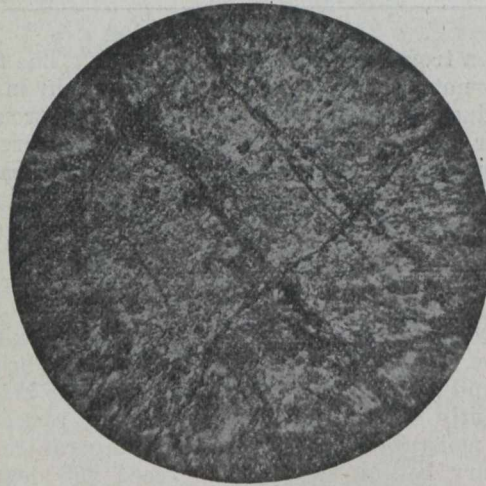


Fig. 3.

Fig. 4 is from near the ore on the 250 foot level, 40 feet north of the Emma shaft, and, like Fig. 1, shows limestone in the course of conversion to garnet.

Some pyroxene is present in small grains, and all the calcite which remains is in minute lines running through the rock.

The sections are magnified 25 diameters.

Mining.—Owing to the vertical position of the deposit, mining here is a much simpler problem than in most of the Boundary mines. The shaft is a two compartment incline, angle 60 degrees. Across the drifts are placed heavy stulls supported by posts, the stulls and posts in the widest portions of the drift being often 30 inches in diameter.

The stulls are placed 5 feet apart, and are covered with 8 to 12 inch pole lagging. Chutes are provided at convenient intervals, they being at the opening 3 1-2 to 4 feet wide by 2 to 2 1-2 feet deep, so as to allow large rocks to pass. The ore is broken down on the timbers

to the level above, only the swell being drawn from the chutes, which swell amounts to about 40 per cent. After the level above is reached the stopes can be drawn at will, and, commencing at the point furthest from the shaft, the timbers can be removed if in condition to be used elsewhere. In commencing a stope it is of course necessary to first raise to the level above to secure ventilation. In portions of the work where bodies of crystalline limestone or poor garnet ore are found these are left as pillars to reduce the cost of timbering. The ore is so heavy, averaging from 8 to 8 1-2 cubic feet to the ton when in place, that timbering must be of the heaviest description to bear the weight above, which weight, owing to the vertical walls, rests almost entirely on the timbers. Power is supplied from the Bonnington Falls electric plant, some 85 miles distant, the machinery at the mine consisting of a 12 drill cross-compound Rand compressor, driven by a 200 h.p. motor, together with a hoist, now driven by compressed air, but which will shortly be replaced by an electric hoist. There is also a steam driven X Ingersoll straight line class A compressor, capacity about 8 drills, which machine is held as a reserve.

There have been shipped from this mine to date some 93,500 tons of ore.

NOTE.—Rock sections were furnished through the courtesy of Dr. Frank D. Adams of McGill University, who also made a petrographic examination of them.

BOOK REVIEWS

TABLES OF MINERALS — INCLUDING THE USES OF MINERALS AND STATISTICS OF THE DOMESTIC PRODUCTION, BY SAMUEL LEWIS PENFIELD, M.A., LL.D. 8VO., VI X. 88 PAGES. CLOTH, \$1.00. NEW YORK, JOHN WILEY & SONS, 1907.

Part I. of this new book consists of a list of minerals arranged according to the six systems of crystallization. Part II. gives an arrangement of the minerals according to the elements, with their uses. Statistics of production are also included. In Part III. a number of useful minerals are described, such as corundum, mica and talc. Part IV. gives lists of minerals according to geological occurrence and association. The general classification is Igneous, Sedimentary, Metamorphic and Accessory Minerals. Veins and vein minerals and minerals resulting from contact metamorphism are touched upon.

For the mining engineer whose geological knowledge is in need of repairs this little book will prove most useful. The several methods of classification are suggestive. While by no means a text-book, the volume will be found a convenient and ready source of reference.

The *Mining World*, October 5th, presents an article on "The Sudbury Nickel-Copper Field, Ontario," by Ralph Stokes. Mr. Stokes recommends the encouragement of a new nickel producing plant in the Sudbury region. Competition, he thinks, would lower the price of nickel and lead to a great expansion of trade. In this we cannot agree with Mr. Stokes. A knowledge of Sudbury's rise and development and familiarity with the present conditions of the nickel market and industry will lead to a modification of this view.

GYPSUM AND GYPSUM PRODUCTS IN 1906.

(Condensed from a Bulletin of the United States Geological Survey.)

Pure gypsum is a hydrous lime sulphate having a chemical formula $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Reduced to percentages of the weight it may be represented as follows:—

Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	{	Lime Sulphur (CaSO_4)	{	Lime (CaO).....32.6	}79.1
		Sulphur Trioxide (SO_3)		46.5	
		Water H_2O			20.9

Few deposits of rock gypsum are ever approximately as pure as this. Clay, limestone, magnesian limestone, iron oxide and silica are usual impurities.

Where gypsum occurs in an earthy, granular condition, it is known as gypsite and may carry 10 to 20 per cent. of impurities.

Dehydration to this extent can be accomplished at any temperature between 212 degrees F. and 400 degrees F. It is found most economical of fuel and time to carry the process at the highest allowable temperature.

A general plan of calcining plaster—the size and weight of machinery depending upon the capacity desired—is as follows:

The gypsum rock is crushed first in a jaw crusher; second, in a pot crusher; and then it goes to a rotary kiln drier. This drier is erected in brickwork like a boiler, and is equipped with an automatic feeder. If soft coal or wood is used as fuel, care must be taken that the products of combustion do not come in contact with the materials being dried, on account of the danger of discoloration. Fuel of any kind—oil, gas, coke, wood, or coal—is suitable. This drying process, eliminates 10 per cent. of the moisture. Next, the crushed rock is

ANALYSES OF GYPSUM AND GYPSITE.

	Silica (SiO_2)	Alumina (Al_2O_3) and iron oxide (Fe_2O_3)	Lime carbonate (CaCO_3)	Magnesium carbonate (Mg CO_3)	Lime sulphate (CaSO_4)	Water (H_2O)
1. Gypsum from Blue Rapids, Kan..	0.40	0.19	0.35	0.35	78.10	20.36
2. Gypsum from Alabastu, Mich....	0.05	0.08	....	0.11	78.51	20.96
3. Gypsum from Hillsboro', N.B....	0.10	0.10	....	....	78.55	20.94
4. Gypsum from Baddeck Bay, N.B.	0.11	1.07	....	....	78.42	20.43
5. Gypsum from Salina, Kan.....	9.73	0.78	4.32	Trace	68.29	16.88

Distribution of Gypsum.—Gypsum occurs in sedimentary rocks of practically all ages, either in the crystalline form or as rock gypsum, and it is widely distributed over the world. It is commonly found near beds of rock salt. In the United States workable deposits are confined to beds of rock gypsum, which occur east of Missouri River in Paleozoic rocks, while those of the West are mostly of Mesozoic and Tertiary age. Gypsum is produced in seventeen States and Territories, besides Alaska. Mills for grinding and burning it are operated at nearly all the places of production.

Uses.—Most of the gypsum produced is manufactured into the various plasters, such as plaster of Paris, stucco, cement plaster, flooring plaster, hard-finish plaster, etc. A steadily increasing quantity is being used as a retarder in Portland cement. Refined grades of plaster are used in dental work, also as cement for plate glass during grinding. Considerable quantities are ground without burning and are then used as a low grade fertilizer, while smaller quantities are used in the manufacture of paint and paper, imitation meerschaum and ivory, and as an adulterant. The pure white massive form, known as alabaster, is much used by sculptors for interior ornamentation. The reputed excellence of British beers is attributed to the presence of calcium sulphate in the natural water used in their preparation.

Chemistry and Practice of Gypsum Burning.—In addition to the combined water, the rock may contain as much as 25 per cent. of absorbed moisture. If pure gypsum is heated to a temperature of more than 212 degrees F. and less than 400 degrees F., all the moisture and a certain definite portion of the combined water will be driven off, and the gypsum thus partially dehydrated will be plaster of Paris. The composition of plaster of Paris may be represented thus:

$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	{	Lime Sulphate (CaSO_4).....	93.8
		Water (H_2O).....	6.2

sieved in a trommel, generally to 24 mesh. The material that does not pass the sieve is ground in buhr mills, and this product, with the screenings from the trommel, is ready for boiling. The boiling is done in a large kettle with wrought steel sides and cast iron or very heavy steel convex bottom. Flues pass through the kettle near the bottom and distribute the heat, which is applied below the kettle and passes around the lower part of the sides, through the flues, and then around the upper part of the sides and out at the stack. Inside the kettle is a shaft, which propels stirrers below the flues and mixing paddles above. The kettles are heavy and rest on brickwork. The ground gypsum is fed from bins into the kettle, and is constantly stirred and boiled until the remainder of the free moisture is expelled. The temperature of this preliminary boiling should not exceed 265 degrees F., for at a higher temperature the water of crystallization, or combined water, begins to separate, and then the separation must be completed or the calcination will be a failure. To remove the necessary three-fourths of the combined water the material is then heated steadily to a temperature of 390 degrees to 395 degrees F. Care must be taken not to allow the temperature of this second boiling to exceed 400 degrees, or all the combined water will be expelled and the plaster will lose its setting properties. When properly boiled the gypsum settles and may then be discharged through a gate on the side near the bottom of the kettle. After boiling, the plaster should be screened again through 40 mesh wire cloth, and the oversize should be reduced in a finishing buhr mill.

To manufacture 100 tons of plaster a day the following machinery is required:

1. A crusher; estimated cost, \$1,000.
2. One direct heat drier, 48 inches in diameter and 27 feet long, together with one dust room; estimated cost, \$2,500.
3. One pot or bowl crusher for fine grinding the material

after drying; estimated cost, \$300. 4. Four French buhrstones for grinding; cost, about \$300 each. 5. Two calcining kettles, \$200 each. In addition to the above mentioned machinery the necessary elevators, conveyors, shafting, belting, and bins are required. On account of the nature of the process and material, the bins, elevators and conveyors should be made of steel, and the entire plant should be as nearly fireproof as practicable.

Trade Conditions.—Active demand for gypsum products continued throughout the year 1906. New deposits were discovered in Riverside County, California, and other localities. Alaska became a producer of gypsum. Increasing trade is very generally noted. At Mabou, Nova Scotia, a new mine has been opened, the output of which will be shipped by water to New York points.

Production and Disposition.—The gypsum mined in the United States in 1906 amounted to 1,540,585 short tons, valued at \$1,147,129. This production represents an increase in quantity of more than 47 per cent., and in value of nearly 40 per cent., as compared with that of 1905. The total number of producers at the close of 1906 amounted to 74, as against 46 in 1905. The State of Michigan holds first place, New York second, with Iowa a close third. The average price per ton for crude gypsum was 74 cents. The maximum reported was \$1.47 in California, Nevada and Oregon. The minimum, reported from Wyoming, was 24 cents.

One hundred and eighty-six thousand nine hundred and ninety-nine tons of the gypsum produced was sold crude; 62,671 tons sold as land plaster; 899,581 tons sold as calcined plaster.

Imports.—Gypsum imported into the United States comes almost wholly from Nova Scotia and New Brunswick, with the exception of a few hundred tons annually from France and the United Kingdom. It enters the ports of the New England and Northern Atlantic States, over one-half entering the port of New York. The gypsum imported is nearly all calcined and converted into wall plaster. For the year 1906, a total quantity of 3,587 tons, valued at \$22,821, of ground or calcined plaster was imported; and 436,999 tons of unground, valued at \$464,725.

Canada.—Gypsum occurs in New Brunswick, near Hillsboro', Albert County, and near St. John Harbor; in Nova Scotia, in many localities, such as Windsor, South Maitland and the intervening district, and at Baddeck, Cape Breton. In Grant and Haldimand Counties in Ontario, and on Manitoba Lake, Manitoba, there are also large deposits. The deposits of the Maritime Provinces are of most interest to the American producers. Most of this Canadian gypsum is calcined in plants near seaboard cities; but a considerable quantity is shipped as far inland as Syracuse, N.Y.

COAL BRIQUETTING IN THE UNITED STATES

Paper read at Toronto Meeting of A.I.M.E.

(Continued from last issue.)

CALIFORNIA.

The manufacture of briquettes has shown more actual progress in California than any any other State of the Union. This has been brought about through the efforts to improve the fuel quality of the rather low grade character of the California lignites, and has been encouraged by the high prices of the better grades of bituminous coal or anthracite brought into the State from Washington, the Rocky Mountains, and Eastern States, or imported from British Columbia, England, Australia, and Japan. It has also been encouraged by the cheap asphaltic pitch obtained from California petroleum, which not only serves excellently as a binder but adds to the calorific value of the briquetted fuel.

The first plant to be put into successful operation in California was one built at Stockton by the San Francisco & San Joaquin Coal Company. The plant was completed in 1901, and when running at full capacity could produce 125 tons of briquettes per day. The fuel used was lignite from the Tesla mines, in Alameda County. The plant was, unfortunately, entirely destroyed by fire in 1905 and has not been rebuilt. It is stated that the plans of the company were to rebuild the plant at San Francisco, but these were upset by the earthquake and fire which destroyed a large part of that city in April, 1906. A complete description of the Stockton plant by the designer of the presses, Mr. Robert Schorr, of San Francisco, has been published.⁷ The briquettes produced

at this plant were round, convex lenses or "boulets," which weighed from 6 to 8 ounces.

The Western Fuel Company, of Oakland, completed early in 1905 a briquetting plant, also designed by Mr. Schorr.⁸ In mechanical construction this plant differs materially from the one destroyed by fire at Stockton. The shape of the briquettes is cubical instead of "boulet." The advantage claimed for the cubical shape is that the briquettes ignite more readily, though it is admitted that in handling the same mechanically there is more waste.

The capacity of this plant is 480 briquettes per minute, or 8.5 tons per hour. The fuel used is coal yard screenings from lignites, anthracite, and sub-bituminous coals, with about 7.5 per cent. of asphaltic pitch. This pitch is obtained by the distillation of California crude petroleum. The temperature of the still, for the production of the proper grade of pitch, is about 600 degrees F. Some difficulty has been experienced in securing the right quality of pitch on account of the tendency of the refineries to "rush the stills," their aim being the securing of refined oils rather than pitch. An excellent grade of asphaltic pitch is obtained by keeping the stills at a temperature of 500 degrees F., using a vacuum to force the distillation. Grade "D," the quality best adapted for the purpose, is fairly hard up to 60 degrees F., but begins to soften above that point. It becomes liquid at 250 degrees F., and has a specific gravity of from 1.05 to 1.1.

Before the earthquake, the Western Fuel Company paid \$10.50 per ton for the ordinary pitch "D" delivered at its plant, while a properly and carefully prepared pitch was worth from \$12 to \$13.

⁷The *Engineering and Mining Journal*, vol. lxxviii, p. 262 (1904).

⁸The *Engineering and Mining Journal*, vol. lxxx, p. 389 (1905).

Owing to the enormous building activity in San Francisco since the earthquake, the demand for asphaltum for roofing materials has increased in leaps and bounds. Consequently, there is a great scarcity, and the price per ton now ranges from \$14 to \$20. This scarcity necessitated many shut-downs of the plant at Oakland, and for that reason the company is negotiating for the importation of coal tar pitch from the East and from Europe. As three new refineries are contemplated, conditions may gradually return to their normal stage.

All of the coal purchased and mined by the Western Fuel Company is brought in ships and is unloaded by electric hoists into receiving bins. When drawn from the storage bins it is screened, all material passing through the perforations dropping into auxiliary bins from which it is fed into a Williams crusher. The disintegrated coal from the Williams crusher is elevated into the iron hopper of an automatic feeder which feeds into the coal heater. The heated coal enters the mixer and meets there the binder. The mixer as well as the binder distribution and the tempering of the mixture embody some novel features.

The prepared material is conveyed into the feed hopper of a Schorr press, style "A," which is belted for 6 revolutions per minute. At that speed 480 briquettes of 9.5 ounce weight are discharged in one minute, or more than 17,000 pounds per hour. The briquettes are of a rectangular shape, 2.75 by 2.5 by 1 7-8 inches thick, with rounded corners and branded with a "W." They are uniform in size, and have a specific gravity of about 1.22.

All wearing parts of the press are lined with phosphorus bronze, and they are thoroughly lubricated under an air pressure of 40 pounds per square inch. Oil is also atomized and sprayed into the moulds and upon the plungers.

The briquettes drop upon a short conveyor delivering the same to another one located outside the building. At this point provision is made to sack the briquettes for the local market, or to take them up to the top of the storage bunkers, where arrangements are made to discharge the briquettes into cars or to distribute them into the bunker compartments. The average output is 64 long tons per shift of 8 hours, four men being employed, one of them getting \$4, one \$2, one \$3, and one \$2.75 per day, which makes about \$0.20 per ton of briquettes. By running 24 hours more than 200 tons could be made, which would reduce the labor item to about 14.5 cents per ton. This can be further cut down by speeding up the press to 7 revolutions per minute, which would produce 560 per minute, or 20,000 pounds of 9.5 ounce briquettes per hour. With a forced feed attachment a further increase in speed may be possible.

Since the foregoing was written, wages have been increased considerably, most of the men getting \$3.50 per shift, working through the lunch hour.

The present pressure arrangement was tested up to 48,000 pounds, exerted upon two 2.5 by 2.75 inch surfaces, making more than 3,700 (?) pounds per square inch. The adjustment is placed to give about 2,900 pounds, which is ample, and makes a better-burning briquette than when a greater pressure is used. The press is designed for a maximum pressure of 6,000 pounds.

The briquetting press has been described by Mr. Schorr substantially as follows:⁹

"In this press two sole plates with heavy bearings are arranged to carry a stationary steel shaft, upon which a large spur wheel is revolving, driven by means of gearing, countershaft and friction clutch pulley. The spur wheel rim is made integral with a mould ring which has a series of holes and sliding plungers (pistons) therein. The pistons are under continuous control of cams which are supported by heavy shields. The pistons are released from the camway only when the final pressure is applied, and this is done by a large wheel with steel tire, pivoted in two levers.

"This wheel is pressed against the piston heads by means of an adjustable spring, which permits a perfect regulation of pressure up to 4,000 pounds per square inch. After leaving the pressure wheel, *i.e.*, after the briquette is made, the plungers are gradually forced forward to eject the briquettes, which drop upon a vibrating discharge chute.

"The pistons are then gradually withdrawn, and in passing the feed box the cavities become filled with the mixture of coal and pitch. At the end of this feed box all surplus material is scraped off by a steel plate. After passing the scraper plate the pistons are gradually forced in, pressing the material against the resistance block, which is supported by the main shaft. This pressure is effected by a cast iron stand with phosphor-bronze liner.

"When the pistons are about 0.5 inches from their terminal, they strike against the rocking pressing wheel and are forced home. In this way the briquettes are made, and the play repeats itself with every revolution.

"The machine is entirely self-contained, and it is claimed that there is no possibility of its getting wrecked by overfeed or obstruction. It is also claimed that as the pressure is applied slowly and gradually, this type of press permits briquetting mixtures containing from 13 to 14 per cent. of moisture, and that it is an advantage not possessed by intermittently-acting presses. Up to the present time two press designs have been made, the one with two rows of 2 inch cylindrical moulds, and the other with two rows of 2.5 by 2.75 inch rectangular shapes with rounded corners. There is no difficulty in making other shapes and heavier briquettes. A simple arrangement permits working with half the capacity whenever desired. No complications are presented if it is desired to have more than two rows of moulds, and the type of press can be built for a much larger capacity. On the other hand, should the market for briquettes be limited for some months in the year, the capacity can be cut down without requiring any change in speed or other alterations.

"From 80 to 120 briquettes are made for each revolution, the number depending on the size and shape of the briquettes, which govern also the capacity. The same varies from 6 to 24.5 tons per hour. The briquettes are uniform in size and plainly branded with 'W.'"

Mr. Schorr says that all wearing parts of the machine can be quickly and cheaply replaced. The lubricating is done by an air compressor and oil atomizer.

The press is especially adapted for the manufacture of small briquettes, and the use of such in preference to large blocks is obvious. Small briquettes can be readily shoveled into furnaces, while the large ones have first to be broken up, thus causing labor, waste, and dust.

A briquetting plant of an entirely different type, designed by Mr. Chas. R. Allen, was built and put in operation by him during 1905 at Pittsburg, at the junction of the San Joaquin and the Sacramento Rivers, about 50 miles from San Francisco. This plant, as originally projected, was intended to utilize the lignite produced by

⁹*Engineering and Mining Journal*, vol. lxxx., p. 627 (1905).

the Pittsburg Coal Mining Company at Somersville, but the enormous increase in the production of oil in California has had such a demoralizing effect upon the coal trade generally that there has been little or no market for lignite during the last two years, and these mines have been shut down. The material used has, therefore, been screenings obtained from the coal yards of San Francisco, the binder (here as at other plants in the State) being asphaltic lignite, and as long as the supply of this material is available at such prices it will continue to be used.

The methods of preparing the briquetting mixture differ somewhat from those used at other plants in that the binder is passed, together with the fuel, through the retorts under a high degree of heat. This, it is claimed, insures an intimate and thorough mixture, each particle of fuel being impregnated with the binder. This treatment, it is asserted, prevents the binder from being consumed before the coal is ignited, which is apt to be the case, particularly with lignites, if the mixing is merely superficial.

Mr. Allen claims that in his process the nature of the fuel is changed so that the lignite partakes of the character of bituminous coal, the briquettes remaining firm and hard until entirely consumed. He claims also that the process possesses as much of novelty and value as the press.

briquetting mixture is fed into a hopper one-fourth of a revolution of the smaller ring from the point of compression, and the amount of pressure is regulated by the distance of the feed from the point of compression; that is to say, the hopper may be placed further away if a

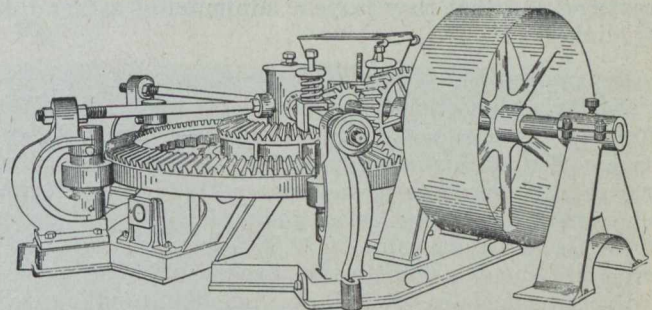


FIG. 12.—ALLEN BRIQUETTING-PRESS. (Prospective View.)

Fig. 12.—Allen Briquetting-Press. (Prospective View.)

greater pressure is desired, or nearer, if the pressure is to be reduced. Relief from an excess of pressure is provided for by two heavy spiral springs on the outer bearings, and two over the upper pressure plate, the lower pressure plate being fixed. The relief springs are shown in Fig. 11. The machine has been operated without using any of the springs, with the result that when there was a surplus of feed the operating belt was thrown off through the choking of the machine.

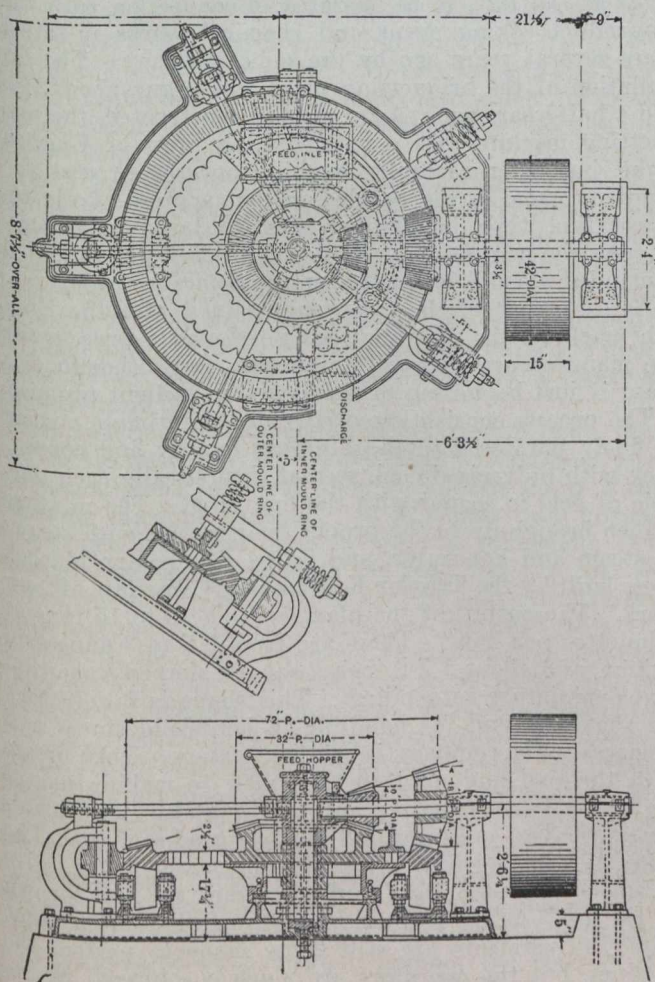
Mr. Allen's invention is patented.¹⁰ The briquettes, as now made, are approximately cylindrical in shape, with flat ends. They weigh from 8 to 10 ounces each, and have a specific gravity of 1.14. It is Mr. Allen's intention to reduce the size of the briquette and change its shape by having the smaller ring of the press made without corrugations. This will be done in order to meet the demand for a briquette adapted for domestic use.

The plant is at present turning out about 5 tons of briquettes per hour, at a moderate running speed. With a smaller briquette the production per hour would be decreased, with the same speed, while with an increased speed the same production could be maintained, even with the smaller briquette.

The Standard Coal Briquetting Company, of Oakland, constructed in 1905 a plant designed by a Mr. Crawford. An accident to the press shortly after being put in operation practically wrecked it, and the enterprise was unsuccessful.

Another plant beginning operations in 1905 was a small plunger type of press designed by Mr. A. Demetrak, and built by the American Briquetting Company (afterwards reorganized as the Ajax Briquetting Company), of San Francisco. It was destroyed by the earthquake and fire of April, 1906, and has not been rebuilt. The plant had a capacity of about 15 tons a day, using Coos Bay, Ore., lignite, sometimes mixed with coal yard screenings, and asphaltic pitch.

The United States Briquette Company, of Stege, Contra Costa County, has undertaken the manufacture of briquettes from a mixture of peat and California crude petroleum. This plant had not been completed at the time of writing this report, but some briquettes made of the mixture in an experimental way are interesting productions. They give promise of a method of using California oil as a domestic fuel, the peat, on account of its spongy character, acting as a carrying vehicle for the oil, and at the same time performing duty as fuel. The briquettes are cubical in shape and of attractive appear-



(Fig. 11.—Allen Briquetting-Machine. (Plan and Elevation.)

As shown in Figs. 11 and 12, the compressing machine consists of two non-concentric rings horizontally placed, one within the other, the periphery of the smaller one being corrugated, or scalloped, and engaging with similar corrugations in the inside of the larger ring. The

¹⁰U. S. Patent No. 851,007, April 23, 1907.

ance. They weigh about 10 ounces each and have a specific gravity of 1.3.

It is claimed that they are as well adapted for steam-raising as for domestic purposes, giving an intense heat under forced draft, and burning freely under ordinary draft; that they can be handled without waste from breakage, and that they leave a minimum of ash and do not clinker.

ARIZONA.

The Arizona Copper Company, of Clifton, installed, during 1905, a briquetting plant purchased from Messrs. Yeadon, Son & Company, of Leeds, England. The plant was put in operation in September, 1905, and, during the first six months of 1906, produced 690 short tons of briquettes of a total value of \$4,830, or an average of \$7 per ton. About 300 tons were produced in the experimental runs made in 1905. It was installed for the three-fold purpose of utilizing coke breeze, which is without value and non-usable as such; for securing better efficiency out of the slack coal (Gallup) which is used as fuel; and for obtaining a fuel that could be stored without material deterioration, and without danger of spontaneous ignition. Mr. James Colquhoun, president of the company, affirms that what economic advantages are secured are from the first and third operations. In the briquetting of the coke fines or breeze a profit of about \$4 per ton is made in the conversion of a formerly-wasted material into a usable fuel. In using the Gallup, N. M., slack, which is of sub-bituminous, or black lignite, quality of coal, the expense of briquetting brings the total cost up to approximately \$6.80 per ton, or about the same as that of the lump coal obtained from the same source, although the price for the slack at the mines is very low when compared with that of lump coal. The briquettes have been found to burn freely and satisfactorily under locomotive and stationary boilers, and appear to be equal to the best of Gallup lump coal, but no laboratory tests of calorific power have been made.

The real profit in the briquetting of this coal is in the superiority of the briquettes over lump coal for stocking purposes. They stand weathering perfectly, while the lump coal disintegrates upon exposure, loses a portion of its combustible gases, and becomes in time a very inferior fuel. It is also liable to spontaneous combustion, which the briquettes are not.

In the making of the briquettes 92 per cent. of the coal is mixed with 8 per cent. of California asphaltic pitch. The capacity of the plant is 2.5 tons of briquettes per hour.

The following description of the process at Clifton has been furnished by the company. In design the press is similar to the one used by the United States Geological Survey coal testing plant at St. Louis. This was designated as the "English" machine, and has been described in the reports of those tests.¹¹

The process of making briquettes of coal or coke fines is that of Yeadon, Son & Company, of Leeds, England. The fines are fed from the bins into the boot of a bucket elevator, which discharges them into the hopper at one end of a mixer, where they are mixed with pitch that has previously been broken in a pitch breaker into pieces of 0.5 in. maximum size. The quantity of pitch found to give the best results is about 8 per cent.

From the mixer the material is sent into a disintegrator, which thoroughly pulverizes the coal and pitch into grains of 2-mm. size and under. It is then elevated

and passed into a heater, where it is subjected to the action of live steam, which gives the pitch sufficient fluidity to bind the other ingredients.

From the heater the material drops into a pug mill, which, while stirring the mass, sweeps it into a false bottom. This false bottom is behind the disc of the briquetting machine, and, at each revolution of the main shaft, the material is rammed into a pair of compartments in the disc. The disc contains eight pairs of such compartments, and at the same time that a pair of briquettes is being rammed into the disk on one side, another pair is being compressed on the opposite side, while a third pair is being pushed out from the top of the disc into an endless belt conveyor, which delivers the briquettes to the side of a railroad car in front of the building. The briquette disc is made to revolve intermittently in eight periods to each complete revolution. During the pause in each period, the three operations referred to take place simultaneously.

The capacity of the plant is 25 tons per 10 hours. It is arranged to mix three ingredients into material for briquettes, but at present only the fines from coal or coke and pitch are used. The briquettes are rectangular in shape and weigh approximately 4 pounds each.

MICHIGAN.

The Semet-Solvay Company, of Syracuse, N.Y., has recently completed the construction of a briquetting plant at Del Ray, to be operated in connection with the by-product coking ovens and chemical works installed there several years ago by the same company. The installation of the briquetting plant was begun about two and a half years ago. As originally constructed, the briquetting machine was a reciprocating press of English make, but after carefully working out the process the company came to the conclusion that a press of the reciprocating type is adapted only to large briquettes, whereas the markets for which this product was intended demanded a small briquette for the domestic trade.

As the result of the experience gained with the English machine, the company has developed a process for the manufacture of small briquettes, and although this plant is just beginning to run it gives excellent promise.

The process consists essentially of the intimate mixing of finely powdered pitch of proper quality and consistency with pulverized coal, so that theoretically each particle of coal is coated with the fine pitch. The mixture is then brought up to the proper temperature with steam, or steam and hot water, and is fed to a rotary Mashek press built by the Traylor Engineering Company, of New York. The output of the plant is from 10 to 15 tons of briquettes per hour. These are from 2.5 to 3 ounces in weight, and about 1 7-8 inches square, shaped somewhat like a miniature sofa pillow. This shape is satisfactory for shoveling and for handling in household stoves and furnaces. The company is using a portion of coke breeze with the coal and pitch, with a view to making use of the breeze from its coke plant, and it is also experimenting on the best mixtures and the best grades of coal. The briquettes made so far are said to burn well and to give no smoke, except a slight puff when they are first thrown on the fire. As the plant is not yet in full running, some minor adjustments are still being made to perfect the product, but the operators are much encouraged by results so far obtained, and expect within a short time to be making a thoroughly satisfactory and commercial product.

MISSOURI.

Renfrow Briquette Machine Company.—During the summer of 1903, Governor W. C. Renfrow, of Oklahoma,

¹¹United States Geological Survey Bulletin No. 261, and Professional Paper No. 48.

became financially interested in a briquetting company in St. Louis. In the fall of the same year Mr. E. D. Mizner, of Hamilton, Ont., visited St. Louis to make a report for some Canadian interests relative to the purchase of the Canadian rights for the patents of this company. The results of these investigations, and the efforts of Governor Renfrow to force the briquette company to deliver a machine, ended in the bankruptcy of the company. In October, 1903, an agreement between Governor Renfrow and Mr. Mizner was made by which Mr. Mizner was to build a briquette machine which would overcome the difficulties encountered by the former press. No company was organized at that time, but contracts were drawn satisfactory to the people interested.

The following spring, Mr. Mizner built the first Renfrow press, which made briquettes 2 inches in diameter, weighing about 4 ounces. This press had some of the essential features of the present Renfrow press, but made briquettes only at one end of the stroke; that is, 12 briquettes per revolution. After this machine was built it was discovered that the briquettes were too small and that the construction of the machine was too light. Mr. Mizner also developed the idea of making briquettes at both ends of the stroke, thus doubling the capacity of the machine. It was decided to build a much heavier machine, and one making a briquette 3 inches in diameter. Changes were also made in the method of mixing and heating the material. The cast iron vertical heaters of the original press were supplanted with horizontal acketed heaters, using ordinary spiral conveyor flights for mixing and handling the fuel. To this was added a short vertical heater acting as a reservoir, into which live steam was admitted just before the mixture was delivered to the moulds.

The briquetting portion of the Geological Survey coal testing plant at St. Louis during the Exposition has already been described.¹² After the close of the Exposition the "American" machine, installed by the National Compressed Fuel Company, of Chicago, was removed, and early in 1906 the remaining portion of the briquetting plant was destroyed by fire. In rebuilding the plant provision was made for the installation of a Renfrow briquette machine.

This machine was completed in the fall of 1905. Mr. C. T. Malcolmson, of the United States Geological Survey testing plant, inspected this press at the shops of the Ramming Machine Company, at St. Louis, and burned some of the briquettes under a boiler at that plant. Difficulties were developed from the fact that the fuel remained too long in the vertical heaters, and some trouble was also experienced in getting the material from the die-filler to the die proper. Occasionally briquettes would stick in the dies, resulting in a double charge, which finally crippled the machine. Provisions were then made to overcome these difficulties and the machine was rebuilt. The new machine was first tested in March, 1906. The heating capacity was increased so that the charge remained in the conveyors about 15 minutes before reaching the dies, thus allowing the material to become thoroughly heated and the melted pitch to mix with the coal. Brushes were added to insure the charge being carried to its proper position in front of the die, and an ejector, operated by a magnet, insured the delivery of the briquettes from the ends of the plungers. Many of the parts of the machine were strengthened, and steel and bronze substituted for cast iron in the wearing parts.

The results of the tests on this machine, made under the supervision of Mr. Malcolmson for Mr. J. A. Holmes, expert in charge of the St. Louis fuel testing plant, at the testing plant of the company, resulted in a contract for the rental of this machine by the Government. In May, 1906, the first successfully-operating Renfrow machine was installed at the fuel testing plant. It is shown in Fig. 13.

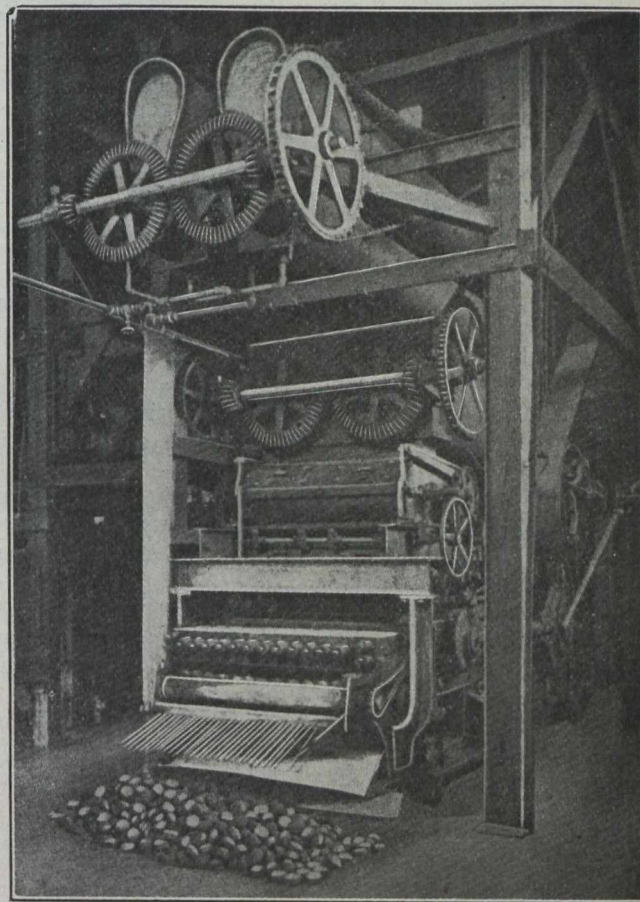


Fig. 13—Renfrow Briquetting Press.

The result of the tests which have been made on the Renfrow machine from May, 1906, to March, 1907, indicated that the design of this press was, in the main, satisfactory, and that the difficulties experienced were due almost entirely to bad or weak construction of the machine. This machine was the result of many changes, while in many cases it was impossible to strengthen the weak parts owing to the limited space, or the fact that the size of the part was fixed by the original design.

The difficulties encountered in operating this machine at the coal testing plant soon indicated its weaknesses, and as a result the Renfrow Co. designed and built two new presses, one of which was installed and is now being operated by the Western Coalette Fuel Company at Kansas City. The other is now ready for delivery to the fuel-testing plant at the Jamestown Exposition. The new press makes a briquette 3.25 inches in diameter, weighing about a pound. The machine which was operated at the St. Louis fuel-testing plant could not be depended upon to deliver more than 1,000-lb. pressure per square inch on the briquettes without seriously straining the frame of the press. The new machine will deliver a maximum pressure of about 2,500 lb. per square inch without straining the machine. All of the wearing parts not under pressure are made of bronze so as never to become corroded, while the dies are made of

¹²U. S. Geological Survey Bulletins Nos. 261 and 290, and Professional Paper No. 48.

case-hardened steel, which, owing to the abrasive action of fuel, are kept clean and bright. The cams and rollers, originally made of chilled cast iron, are made of case-hardened stool steel in the new machine, and the design of the housing has been so changed that any of the parts can be removed without dismantling the machine. Provision has also been made in the new machine so to feed the heaters that they will always run clean and at the same time keep a full load in the chamber above the die filler. This chamber, while closed in the old machine, is open in the new, which allows the operator to regulate the supply of fuel to the press at all times.

(To be continued.)

PERSONAL AND GENERAL

Mr. J. J. Fingland, of Glasgow, Scotland, has opened assay offices at Sandon, B.C.

Mr. A. J. Goodell, superintendent of the Le Roi Company's Northport smelter has tendered his resignation to the directors.

THE MINING JOURNAL congratulates Mr. J. La Barthe, superintendent of the Trail smelter, on his recent marriage. Mr. and Mrs. La Barthe are now enjoying their honeymoon.

The Hon. Jean Prevost, Minister of Colonization, Mines and Fisheries in the Quebec Government, resigned his portfolio at a meeting of the Provincial Cabinet on September 30th.

Dr. Frank D. Adams is expected to arrive in Montreal from England this week. During his stay in London Dr. Adams was in attendance at the meetings of the Royal and Geological Societies.

Mr. T. Hayes-Sheen and Mr. H. J. Carnegie-Williams left Bruce Mines late in September. Both these gentlemen are visiting England in connection with the acquisition of an Elmore vacuum installation at Bruce Mines.

Mr. J. D. Kendall, the distinguished mining engineer of London, England, arrived in Canada on the 6th of October on a visit to his son, Mr. Cosmo Kendall, who is operating the Bell mine, a graphite property near Buckingham, Que.

Mr. R. R. Hedley expects to complete the work of collecting information on the mining and metallurgical industries of British Columbia for the Dominion Government by the end of the year, when he will go to Ottawa to prepare his report.

Mr. H. H. Claudet, of Rossland, representing the Elmira Company, is absent in California, where he is spending his honeymoon. Mr. Claudet has contracted to supply three plants to treat ore by the new Elmore vacuum-oil process in British Columbia.

In consequence of the increased activity in the Omineca district of British Columbia, the authorities have decided to re-open the Government offices at Hazelton, which will be placed under the direction of Mr. F. W. Valteau, who has been appointed gold commissioner.

Advices from Ottawa state that the Deputy Minister of Mines, Mr. A. P. Low, is rapidly recovering from the effect of the slight relapse which he suffered while in the West, as a result of over-taxing his strength there. He is, however, recommended by his medical adviser to take a complete rest and it will, therefore, be some little time before he will return to his duties.

The following gentlemen were elected to membership in the Canadian Mining Institute at a Council meeting held on Saturday, October 5th:—

Corresponding Members:—Mr. M. Walton Brown, secretary of the North of England Institute of Mining En-

gineers; Mr. Bennett F. Brough, secretary of the Iron and Steel Institute; Dr. Wm. Campbell, Columbia University, New York; Dr. J. F. Kemp, Columbia University, New York; Dr. A. C. Lane, State Geologist, Lansing, Mich.; Dr. C. K. Leith, Madison, Wis.; Mr. C. McDermid, Secretary Institution of Mining and Metallurgy; Dr. R. W. Raymond, Secretary, American Institute of Mining Engineers; and Dr. C. R. Van Hise, President Wisconsin University, Madison, Wis.

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Student:—John N. Morrison, Glace Bay, N.S.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.—Things are going along very nicely around the collieries just now. The labor situation is distinctly easier, more from the fact that the men as a whole are working better than from any influx of labor. The output of the Dominion Coal Company's mines for September will be about 300,000 tons. October will in all probability have the heaviest tonnage of the year. Somehow October is always a banner month in the matter of outputs. Perhaps it is that the miner begins to realize that the harvest is past and the summer ended, or in other words that picnic time is over and that he will want a little saved for the winter. It is a strange thing that the same men that will resist bitterly the reduction of a single mill in their price list will yet lose weeks of valuable time summer after summer, to their own sure detriment and loss did they but realize it. The fable of the grasshopper and the ant has still its application in Cape Breton collieries.

The Dominion Coal Company are now actively engaged in preparing a site for their new colliery on the areas that lie between Low Point on Sydney Harbor and the anticline that is supposed to run concurrently with Bridgport Basin. The new mine will be known as "Dominion No. 12," and will be a slope mine on the Victoria Seam. This seam has a great reputation locally, and was in much demand when the old Victoria Mine was working. A branch line will be constructed of about seven miles in length to connect the new mine with the Sydney & Louisburg Railway at a point near Grand Lake. In all probability the branch will be completed for the shipping season of 1908. The officials' houses and a number of workmen's dwellings will be erected before the winter sets in. Two slopes are now commenced, and the work of driving will be actively prosecuted throughout the winter, for which purpose a temporary plant is now being installed.

In what are generally known as the Lingan-Victoria areas the Coal Company have a property the value of which is not generally realized. The coal exposure is one of the finest in existence, showing as it does the crop of five workable seams, three of them over seven feet thick, for a length of seven miles or more. The crops are admirably adapted for slope mining under the most favorable circumstances. As yet the most valuable portion of the Coal Company's properties is practically untouched.

The steamer "Cabot" is the latest addition to the Black Diamond fleet. She arrived here on the 20th after a stormy voyage across from her builders, the Grangemouth & Greenock Dockyard Company of Scotland. The "Cabot" is not a very large boat, being about 150 feet over all, and drawing only 12 feet of water. She is intended for small ports trade. She is happily named, the matter of nomenclature being one in which the boats of the Black Diamond line excel, as witness the "Bonavista," the "Catalone" and the "Louisburg," all of which have an old time smack that is good to hear. It is amusing to hear a Cape Bretonian from "way back" or a newcomer from the "Bruce" trying to get his tongue around words like "Borgestad," "Drottning Sophia" or "Fimreite."

The Dominion Government recently passed an Order-in-Council remitting to the Dominion Coal Company the sum of \$1,380, being the duty and German surtax paid on the recently imported Draeger life-saving apparatus. One of these apparatus is at present on exhibit at the Provincial Exhibition at Halifax.

Glance Bay and the collieries are still chuckling over the remarks of the Hon. Rubert Drummond in the "Mining Record" on Judge Longley's decision in "Steel vs. Coal." His remarks on laminations and layers are particularly illuminating. The "Hon. Bobby," as Mr. Drummond is usually called, cannot see how No. 6 coal could be "commercial coal, well picked," and at the same time "not reasonably free from stone and shale." So far Mr. Drummond is the only writer who has dared to record a protest

against the findings of the learned judge, and to the Glance Bay people at least his dissertations are distinctly refreshing.

The following appeared recently in one of the Halifax dailies, and is good enough to quote: "If twenty years ago I had the moral courage to fling away the joys of office, I might have made the world happier and better," said Judge Longley at General Booth's meeting. It is not too late yet for Mr. Justice Longley to go into the Army. The Dominion Coal Company would probably be willing to advance sufficient to buy him a bonnet and tambourine. We daresay they would.

The P. W. A. at their recent meeting in Halifax decided to petition the Government against the use of disc and chain coal cutters in pillar work, urging that they are dangerous in use and make no noise as to drown the "talking" of the roof. A good many pillars have been drawn in Cape Breton recently which have been undercut by these machines, and we have not yet heard of an accident due to their use. We do not think the objection of the P. W. A. is well taken. It is an objection that has been urged time and time again in the mines of the British Isles, but an objection which is now pretty well exploded. The miner who depends entirely upon the "talking" of the roof for his danger signal is running things too closely, and we fail to see why undercutting by machine should be any more dangerous than undercutting by hand. Pillar work in the Cape Breton mines is exceedingly well paid, and there is considerable competition among the miners for places in the pillars with the "little pick." One had thought, however, that this time-worn objection to the mechanical coal cutter had been relegated to oblivion along with the objections made to the spinning mule and the steam locomotive, but such notions die hard.

Labor unions throughout Canada appear to be disturbed over the problem of Asiatic labor, and the P. W. A. also drafted a resolution against the importation of labor of this character. At Winnipeg recently the Trades Congress protested against the importation of skilled European labor. We wonder whether the trades unions of Canada think the commerce of this Dominion can be carried along by the present working population of Canada, and whether this great and growing Dominion can be a close corporation. Laboring men are needed in Canada. They are needed to-day in large numbers, but to-day's needs will be eclipsed and forgotten in to-morrow's greater needs. For the working classes of Europe Canada is now "God's Country," a title to which our southern neighbors are fast losing their right. Any attempt on the part of any body of men to restrict the present rate of emigration to Canada can only hinder the progress of our commercial prosperity, and for this reason will almost necessarily be an abortive attempt. As we see it "it is up to" the Canadian workman to see that he becomes the patrician in the ranks of labor in the Dominion, that from out of the influx of foreign labor he wrests promotion and advancement for himself. His are the rights of patrimony and primogeniture, and if he plays his part well, no one can take them away from him.

We suggest to some of the labor unions of this Province that instead of fighting the chimera of Asiatic immigration they enquire why it is that when a capable superintendent is required for the Steel Works he has to be imported from Alabama, U.S.A., or from across the water, and why so many lucrative positions in both mines and steel works are being filled by men who have the necessary technical and theoretical training gathered in other parts of the world. The Nova Scotian Government are patting themselves on the back because they contemplate the expenditure of \$100,000 on technical education, and truly this is a beginning. Only a beginning, however. Over \$400,000 per annum is spent in Cape Breton for "rum." The Sydney Town Council offered to give \$400 to technical education as represented by the Cape Breton Technical School last winter. They collected a lot more than

this in Scott Act fines. Charity begins at home, they say. Asiatic labor in Cape Breton is a pipe dream, a bogie to scare children with, but there are real evils to be fought right here. One is "rum," the other in plain English is ignorance. This may be strong language, but unless the native miner wishes to become the helot of the newcomer he must be afforded and take advantage of the opportunities for self-advancement and technical study that are so freely offered both in Europe and in the United States. Almost all the theoretical and technical knowledge among the lower officials in this Island was despatched from Scranton, U.S.A. That is to say, the portion of it which was assimilated. All of it was paid for, and it would be an interesting thing to know just how much money had gone across the border for correspondence lessons that could very well have been expended this side of the line.

The Commission to enquire into Relief Societies at the collieries and the matter of Old Age Pensions finished its labors in Glace Bay last week. A considerable amount of evidence was taken, which will doubtless form the subject of a Government publication. Old age pensions appear to be in the air just now, for much is being said and written on them both here and over in England. We do not think, however, that old age pensions exactly appeal to the more deserving classes of the British Empire, particularly those who reside in Canada. Over here we appear to have absorbed something of the aggressive individualism of the United States, where they are said not to need such pensions, because at sixty a man has either made his "pile" or is dead. However this may be, we cannot see why miners as a class are any more deserving of old age pensions than other classes in the community. We grant that as a rule they live longer, but why they should be entitled to special consideration in this matter is not quite apparent. There are trades fully as hazardous as the miner's and not half so well paid, as for instance, the deep sea fisherman, the alkali and cement worker, the steel worker, and the railroad man. If, however, old age pensions ever become an accomplished fact in Nova Scotia, there should be no large Governmental grant, and no suspicion of charity about it. Compulsory payment by a prospective beneficiary from a certain age, say 20 to say 50 years of age, or in other words the purchase of a guaranteed annuity by compulsory instalments is the only equitable and workable basis on which old age pensions can be obtained. We do not imagine that the average Canadian is much exercised on the subject of old age pensions. Life is too short.

The Dominion Coal Company have made somewhat of a departure in their management organization under a circular issued this week. Mr. Peter Christianson, who has for a long time been the assistant superintendent of mines, is now appointed mines superintendent of district No. 1, which comprises collieries Nos. 1, 8, 5 and 10, and Mr. Norman McKenzie, for some time past the manager of Nos. 2 and 9 collieries, is appointed mines superintendent of district No. 2, comprising collieries Nos. 2, 9 and 7. Each of the collieries named will have its own manager. In creating this new office of district superintendent the Coal Company have opened up a new avenue of promotion for their managers, and we think the appointment will give general satisfaction.

ONTARIO.

COBALT.—The Coniagas concentrating mill is in full operation and is proving a decided success. It consists of Blake crushers, three jigs, a Huntington mill, one Wilfley table and two Frue Vaners, the total capacity of the mill being 100 tons a day. Mr. Fraser Reid, formerly of the Canada Corundum Company, Craigmound, is in charge of operations.

The Buffalo mines are constructing a similar mill and expect it to be in full operation in a few weeks.

The Nova Scotia have installed a new compressor. Some very rich ore is being mined here, their new discovering having proved to be regular bonanzas.

The strike, to all outward appearances, is a thing of the past. All the mines are operating in full force and men seem plentiful. Organizer Roadhouse's appearances on the Square are growing scarcer since his following has diminished to a few men, who seem to enjoy his peculiar style.

A widely signed petition is being circulated among the citizens of Cobalt to prevent the reckless blasting by the mining companies and railroad contractors. It is to be hoped that some means will be taken to prevent this unnecessary danger, whoever is to blame, the miners or the railroad workers.

The Kerr Lake mine is constructing a large number of buildings, including one of the finest sleeping camps in the district. A commodious engine room has just been completed, and a new compressor installed. There has been remarkable progress made on this property during the past few months.

A remarkably rich vein of calcite, smaltite and native silver was discovered on the Silver Leaf property last week. It is fully 18 inches to 2 feet in width in some places. The discovery was made while trenching.

The City of Cobalt uncovered a couple of rich veins last week. This property is showing up well under systematic development work.

Mr. Wm. Nicol, Professor of Mineralogy at Queen's University, has returns to Kingston after a visit of some weeks in the camp, where he has been gathering specimens for the Department of Geology and Mineralogy at the University. Prof. Nicol spent the early part of the summer in Germany.

Mr. Barnett, M.E., of London, England, is at present in the camp, representing British capital.

Thos. Burkett, M.P., of Ottawa, director of Cobalt Lake Mining Company, also the City of Cobalt, was in town last week.

J. M. Clark, K.C., Toronto, spent a few days in camp last week.

A remarkably large vein of cobalt and silver has been struck on the Temiskaming & Hudson Bay property. This property adjoins the Trethewey, and during the summer development work has shown it to be a bonanza property.

The concentrator at the McKinley-Darragh is now in full working order. The crushing is done by a stamp mill land concentrated by vanners. It has proven so successful that the company intend to put in another twenty stamps. This property, under the management of Capt. Harris, has been making remarkable progress.

The O'Brien mine is installing a new power plant. The boilers are already in place and they expect to have their twenty drill compressor at work very soon. They are also installing a new electric plant.

ALBERTA.

CANMORE.—The H. W. McNeill Company, of Canmore, Alberta, are opening up a new vein of coal on the eastern side of their property. This vein, known as the Sedlock vein, was prospected several years ago and found to be a good steam coal. Owing to the present great demand for steam coal, the company has thought it advisable to develop this new vein and increase their present output. About 200 men are at work on the spur line, which runs from the main C. P. R. track to the tippel at the Sedlock mine. This spur line is a little over one mile in length and of a good grade throughout, although the cutting in hard limestone rock is at some points very heavy. It is expected that the steel will be laid in a few weeks, by which time the large staff of men employed building the mine tippel will have completed their work. It will be some time, however, before a large output can be expected, as the mine workings have all to be opened out, nothing having been done inside the mine except the driving of a few trial drifts.

HILLCREST.—The Industrial Disputes Investigation Act has been brought into force at Hillcrest, Alberta, where there is a dispute between the Hillcrest Coal Company and the United Mine Workers of America regarding the wages to be paid miners. President

F. H. Sherman of the U. M. W. A. is representing the men, and Mr. John R. Macdonald is representing the Hillcrest Coal Company on the Arbitration Board. The board having failed to agree on a chairman, the Minister of Labor has appointed C. W. Fisher, Speaker of the Alberta Legislative Assembly, to act as chairman.

MORINVILLE.—The following resolution, passed by Morinville Miners' Union, has been forwarded to Sir Wilfred Laurier:

Whereas the time has arrived in the history of Canada when the Government must choose between an Asiatic or a Canadian British Columbia;

And whereas the present influx of Asiatics into the Province of British Columbia must inevitably lead to constant clashes between the two races, resulting in rioting, destruction of property and murder;

And whereas this state of affairs threatens the solidarity of the Dominion, and must result ultimately in the secession of British Columbia or war with Japan;

And whereas it is the working man who is called upon in the time of war to bear the brunt of the fighting, and it is labor that backs every fund for the repayment of expenses incurred by war;

And whereas war is hell;

And whereas it is the belief of the working men of Western Canada that these unassimilable alien races are being allowed to enter Canada to suit the convenience of railway corporations, lumber operators, and other trust concerns;

And whereas now it is a matter of choice with the Dominion Government whether they should decide with Canadian working men and peace or with the corporations for an Asiatic British Columbia and ultimate war;

Therefore be it resolved:

That the Morinville Miner's Union, No. 2378, of the U. M. W. of A., regard as a national menace the delay of the Dominion Government in the face of such a crisis, and as citizens of Western Canada we call on you, Sir Wilfred Laurier, your Cabinet and the Dominion Government to take immediate action to avert a national calamity by passing an Absolute Asiatic Exclusion Act which will for all time preserve Western Canada to the white race, and this resolution is passed with the full knowledge that the ever-ready argument of "Imperial" reasons might be brought forth to answer this, as it has served to answer other and similar resolutions, but with this fetich we have little patience and less faith.

The Morinville mines are situated about 20 miles north of Edmonton and employ about 60 men underground. The output is 400 tons per day. This camp has been "organized" by the U. M. W. of A., and has now been a "union" camp for about four months.

EDMONTON.—The men employed by the City Coal Company, Edmonton, have been organized by Organizers Patterson and Galvin of the U. M. W. of A. Twenty men are employed in the City Coal Company mine, and all have joined the union.

BRITISH COLUMBIA.

FERNIE.—Senator Cox, of Toronto, president of the Crow's Nest Pass Coal Company, Limited, interviewed at Vancouver, B.C., emphatically denies the report that G. G. S. Lindsay, K.C., general manager of the Crow's Nest Pass Coal Company, is about to retire from his position with the company.

Rev. Hugh. R. Grant, late of Fernie, B.C., now of Pincher Creek, Alta., has been appointed chairman of the Joint Committee of the Western Mine Operators' Association, and the United Mine Workers of America. The reverend gentleman was very popular amongst the miners while stationed in Fernie, and his appointment as chairman of the Joint Committee meets with general approval from all interested in mining matters.

HOSMER.—The Hosmer Miners' Union has applied for a Board of Investigation under the Industrial Disputes Investigation Act,

and their application having been favorably received the Board has been formed. President F. H. Sherman, of the U. M. W. of A. will act on behalf of the men, while Frank F. Smith, mining engineer, of Edmonton, will act on behalf of the Hosmer Mining Company. The chairman of the Board is Judge Wilson, of Cranbrook, B.C.

THE KOOTENAYS.—Conditions in this district during the past couple of weeks have been very satisfactory. Things are really a little quiet at present, and those who speak for the various industries lay the cause to the coke and fuel shortage, scarcity of money, the fall in the price of copper, etc. Many of the mining shares have taken a marked slump, some of the mines have reduced their working forces, and the demand for lumber and telephone poles has fallen off to a considerable extent.

Trouble between the miners at Lethbridge and the coal mine operators has come to the surface again. It is the same old story. The men want their time to begin when they take up their tools and start for the face, while the operators claim that the day's work begins when the men arrive at the face of the workings. The miners also complain that the machinery is started about ten minutes ahead of time and left running until ten or fifteen minutes after quitting time, and it is imperative that they remain at their posts until the machinery stops to avoid breakages and accidents. The men are working ahead and the affair will be arbitrated if both parties can agree on a board, which they are haggling over at present.

There is quite a scarcity of coal miners along the Crow's Nest. The Crow's Nest Pass Coal Company and the Canadian-American Coal & Coke Company have had to look into outside districts for men. About forty miners recently came from England to work for the first mentioned company, and Manager Moore of the latter corporation has been to Montana in search of help, but finds that men are more scarce there than in the Crow's Nest district.

The Great Northern has a force of men engaged in making a permanent location of the Great Northern line up the Elk River from near Michel. This railway, from Fernie, B.C., to Calgary, Alta., will traverse rich coal fields all along its line. The grade is less than one per cent. The surveyors will try and carry their work as far as the summit between the headwaters of the Elk and Kanakaskis Rivers, an elevation of about 6,500 feet, before the weather conditions make it impossible for them to go farther. About 800 men are now at work on the grading and bridge work for part of the road from Fernie to Michel.

The St. Eugene mine, of the Consolidated Company, has entered into a contract with European buyers for part of their output of concentrates.

The Hewitt mines, near Silverton, which is owned by New York interests, now has 35 men on the pay roll and about 60,000 tons of ore blocked out. On a car of ore recently sent to Trail smelter good returns were realized.

Matters are looking a little brighter in the Sloean. It is rumored that an important strike was recently made at the Westmount mine on Sloean Lake. They are diamond drilling at the Arlington and they are working again at the Ottawa.

The Rossland mines are shipping every day and while things are quiet the industry is in a healthy condition. Mr. F. W. Warren, of White Bear fame, was in the city recently, and reports that affairs with the White Bear mine are looking better.

In the Boundary, the Dominion Copper Company is thinking of enlarging its smelting capacity. They can at present treat about 1,200 tons of ore per day. For the week ended September 28th the Granby shipped 23,000 tons of ore. This is the greatest quantity they have ever shipped in a week. One day they shipped over 4,000 tons. The total shipments from Phoenix for that week were 41,000 tons, which made a new record. So it will be seen that the mines of this district are still shipping a rather bulky tonnage, despite the fact that many of the copper producers in

the United States have cut down their production almost as much as fifty per cent. in some cases.

This is an age of arbitration. Now the Crow's Nest Pass Coal Company and a Government nominee, J. A. Mara, are going to select a third arbitrator between them, and the three will thresh out the coke shortage proposition. It is to be hoped that their efforts will result in more fuel.

It is understood that an agent for the Orientals on the coast has been making overtures to the Boundary mining men and the coal operators of the Crow's Nest district towards furnishing them with cheap labor to operate their mines. Feeling is still running high throughout this country against Asiatic immigration in unlimited numbers, and it is hoped and trusted that the Government will find some means of checking this yellow stream.

Granby shareholders will soon be receiving cheques for the eighth dividend of that company, amounting to \$3 per share, or a total of \$405,000 for the 135,000 shares issued. During the fiscal year ended June 30th last the Granby Company produced about 20,000,000 pounds of copper and realized somewhere about 22 cents per pound for it.

KOOTENAY.—Although there is a tightness of money for investment, and mining stocks in common with others have undergone a severe reaction, there was probably no time in recent years when more capital is seeking bona fide investment in the mines of Kootenay than the present. In the Big Bend country, to the north of Revelstoke, three hydraulic properties have employed a considerable number of men this season. The Revelstoke and McCullough Creek Company have taken out a quantity of gold. The French Creek hydraulic property is being operated by Mr. Vance on behalf of Mr. Hoover, a mining investor of Indiana. Pittsburg people are putting in a hydraulic plant on Smith Creek, the work being done under the supervision of Mr. Guffy.

Spokane parties had an option on the Downie Creek copper properties, but after spending a good deal in opening up the trail to the ground they have thrown up the option without having done any development work on the property.

The Standard mine, in the Big Bend, is a copper property which has been developed to a depth of 550 feet, but is at present shut down for want of funds.

Development work is being pushed on the Lightning Peak properties at the head of Fire Valley, and the first shipments of ore from this camp will be made this winter.

Spokane parties have been up examining the Big Ledge, a large low grade zinc property on Pingston Creek, and tributary to upper Arrow Lake.

At Rossland the mines never looked better. The Le Roi, Le Roi No. 2, War Eagle, Centre Star, and White Bear are working steadily and shipping. The Le Roi Company have now completed their five compartment shaft to the 1,650 foot level, and have cross-cut the ore body there for 30 feet, besides drifting on it 150 feet each way. There is a fine showing of ore on this new level—the lowest in the mine. As the ore body is not yet cross-cut from wall to wall its width is unknown.

The north vein on Le Roi is now developed to the 300 foot level, and contains the richest ore yet found in the mine.

The new company organized to operate the California and Giant art pushing development work on both properties with every prospect of success. The ore bodies in Le Roi No. 2 have now been developed to the boundary of the California, and as the ore continues strong and of good values in the face, the new company, which is composed mainly of the original founders of the Granby, begins its operations under most promising auspices.

Scotch capital has become interested in a copper-gold property in South Kootenay, where there is a large quantity of ore in sight, and should future development warrant it the intention is to add a smelting plant.

The Trail smelter has had two copper furnaces shut down owing to want of coke, but the situation is improving. This smelter continues to make big improvements to meet the increased mineral production of South Kootenay, and is adding a number of Heberlein roasters to those already in use. The lead refinery is being extended, and the lead pipe manufacturing branch of the business turns out a large quantity of piping of first-class quality. This industry is a great credit to Canadian enterprise.

Things are looking up in the Slocan. New capital is coming in. The profits made by leasers have had the effect of throwing new life into this well-known camp. Old properties are being re-opened and new ones are being developed.

The Blue Bell mine, being operated by the Canadian Metal Company on Kootenay Lake, is showing an immense body of ore. A new mill is being completed, and the mine put in shape for a large output. The mine will start shipping next month.

Poplar Creek, which a few years ago created a sensation by the immensely rich gold specimens produced in the camp, is again attracting attention. New York parties are developing the Calumet and Hecla on Rapid Creek with great success. John Keen, of Kaslo, is developing a property on the hill behind the town. Boston people, under the management of E. Mobbs, have taken up the Smith and Rogers property at Poplar Creek and intend putting in a stamp mill.

In the Lardeau, the Silver Cup, which has been a shipper of high grade silver ores for ten years, is looking better than ever. The mine is now developed to a depth of 800 feet. The ore averages an ounce in gold to the ton and nets \$150 after payment of mining, transportation and smelting charges. A hoist was recently installed to sink a shaft with a view to testing the ground at depth before running another long tunnel, and a 30 drill compressor is now being installed.

The Ohio Development Company, which has been operating the Broadview mine at Trout Lake, has sold that property and is now erecting bunk houses and buildings with a view to starting operations on the St. Elmo, Blue Bell and True Fissure, which the company has recently acquired. This is a remarkable property, having 4 1-2 acres of low grade ore exposed on the hanging wall of the main vein with cross veins carrying high values. Considerable development work has been done on the Blue Bell claim of this property. It is intended to mine the higher grade of ore this winter and make some shipments to a smelter.

A deal is on for the Eva and Oyster-Criterion, two well-known free gold properties at Camborne. The idea is to consolidate them and equip them with a large mill. There is plenty of ore, but it is low grade, and successful operation is a matter of reduction of cost of mining and milling. There is no question as to the quantity of ore, Lexington Mountain, where these mines are located, being traversed in all directions by gold-bearing veins having an average value of \$5 per ton. The Eva mine is now doing remarkably well in the matter of costs, ore being mined by glory-hole methods and delivered to the mill for 45 cents a ton, and the milling is done at similar cost. A compressor plant has been recently installed in the Eva. Mr. Racey, M.E., is entitled to great credit for his management of this property.

W. J. Butler, owner of the Lucky Jack mine, one Lexington Mountain, has arranged to put in a two stamp mill to assist in the development of the property.

The Silver Dollar mill has started running, but it was intended for gold ores, whereas development is proving the mine to carry silver-lead rather than gold values.

The Edward Baillie Syndicate, owners of the Mammoth, a high grade gold-silver property on Fish Creek, intend to put in an aerial tramway.

GENERAL MINING NEWS

NOVA SCOTIA.

ANNAPOLIS.—At the Torbrook iron mines the Springhill strike is being felt indirectly. The mines are suffering badly from shortage of coal. No doubt this will be remedied very rapidly. It is the intention of the Annapolis Iron Mining Company to develop power at Nietaux Falls, about a mile from their mines. The power will be transmitted to the mines electrically. The cost of power installation at the Falls is estimated roughly at \$50,000.

SPRINGHILL.—Owing to the refusal of the miners to accept the award of the Board of Arbitration and to the consequent continuance of the strike, it is possible that the Nova Scotia Government will be asked to operate the mines of the Cumberland Coal & Railway Company, pending the settlement of the strike. The Town of Springhill is suffering badly from the present inactivity.

Deputy Minister of Labor MacKenzie King visited Springhill on October 3rd and 4th. After discussing the situation with the workmen, Mr. King wrote to General Manager Cowans requesting him to give some assurance about the resumption of work and the filling of contracts for coal with the Intercolonial Railway. Mr. Cowans replied that the men had refused to abide by the decision of a legally appointed Board of Arbitration, and that the company could not, in the face of this, take any further action or make any assurances in regard to the contracts. Thus, unless the strike is settled, the I. C. R. will be forced to place a 60,000 ton contract in the United States.

ONTARIO.

WABIGOON.—The Paymaster Shaft has attained a depth of 300 feet. The plant is being added to, buildings are under construction and, below, the ore chute looks well.

SUBBURY.—Mine No. 1 of the Moose Mountain Iron Mining Company is putting out a large quantity of iron ore daily. The ore is stacked for shipment in the future. On mine No. 4 a diamond drill is being used for prospecting purposes. Under Superintendent Leach the settlement composed of the workmen's residences has assumed a neat and attractive appearance. Foundations are being laid for the installation of power plants and crushing machinery.

COBALT.—During the present month the directors of the Foster Cobalt Mining Company will issue a statement to shareholders showing the exact financial condition—proceeds from shipments and detailed information regarding the workings of the property. Shipments of ore have been maintained regularly, and it is expected that they will continue. Sinking on vein No. 5 has now reached a level of 140 feet, and drifting will be proceeded with in three directions, following the course of veins 5, 1 and 2. The property is thoroughly prepared for economical and satisfactory work throughout the winter, permitting development work and ore extraction to proceed concurrently. Shaft No. 6 has been closed, and all ore will be handled from shaft No. 5. Sinking on No. 1 has extended to forty feet. The assay office is just completed, and will be in operation within a week. A complete summary with plans above and below ground is nearing completion. Blue prints, kept up to date monthly, may be examined at the head office of the company after November 1st.

A four foot vein with mineral deposit in the vein eight inches and heavily shot with silver, is reported to have been struck in the Silver Leaf property. The find was made while laborers were prospecting about 450 feet from the main shaft.

Manager Lang of the City of Cobalt, reports the new vein to show about eight inches of ore averaging a considerable amount of silver to the ton.

A three inch vein of calcite, rich in native silver, was found last week close to the main shaft of the Solar Cobalt. The shaft is now down about 50 feet.

Rapid progress is reported in the erection of plant for the Cobalt Concentrators and also the Muggley concentrator.

Only two mining companies secured Ontario charters last week. One is capitalized at \$2,000,000 and the other \$600,000.

The T. & N. O. Railway will in future refuse to permit the loading and unloading of dynamite at Cobalt. A spur line is under construction by which all shipments of explosives will be sidetracked to a suitable storing place. No small quantities of high explosives will be handled by the railway.

The weekly bulletin of the Cobalt Lake Mining Company reports the north shaft down to 26 feet. The south shaft is now down 65 feet. Cross-cutting and drifting are being extensively begun.

The Cobalt Concentrators, Limited, are installing machinery in their new plant. Foundations are completed.

KINGSTON.—The Kingston & Pembroke Railway has just moved the first shipment of iron ore from the Wilzurn mines to Renfrew, whence it was shipped to Sault Ste. Marie. This is the first shipment of a hundred thousand ton contract. A new electric plant is being installed at the mine, so that men can work night and day. The Kingston & Pembroke will on November 1st have a special train and crew to do nothing but handle the ore, taking it from the mines to Renfrew. At present they are moving 250 tons a day, and when all the machinery is installed they will be able to load a train in one hour.

ALBERTA.

FRANK.—The Leitch Collieries, which owns the townsite, has at present a small office building up and Townsite Agent Radcliffe has his office built. Aside from a small residence for the mine engineer, there are no other buildings as yet, but four cars of lumber passed through Frank yesterday for Hamilton, and without doubt there will be much building activity almost at once. The C. P. R. is now engaged in putting in a side track for unloading supplies, the grading for the yards of the local coal company is in progress, and the company has its underground work in shape to begin shipping coal as soon as the yards are ready.

BRITISH COLUMBIA.

PHOENIX.—It is estimated that the Consolidated Mining & Smelting Company employs 1,500 men and pays in wages annually \$1,750,000. The operation of its mining properties costs \$3,500,000 annually, and its tax bill is \$50,000.

VANCOUVER.—The Ikeda mine recently shipped 80 tons of ore to Ladysmith. One hundred and ten men are employed in the Ikeda and three tunnels are being driven. A tram line six thousand feet long connects the new wharf with the mines. The Ikeda copper ore carries about \$5 in gold per ton in addition to its copper contents.

Mr. W. G. Trethewey, lately of Cobalt, has bonded a copper property near Collinson Bay, Moresby Island.

The Southern Cross Mining & Smelting Company has been organized for the purpose of putting up a smelter near Alberni. English capital has been interested.

BOUNDARY.—The ore output of the Granby Consolidated for the week ending September 28th was the largest on record. Twenty-three thousand tons of ore were shipped for the week, and in one day 4,000 tons were shipped.

EAST KOOTENAY.—At the meeting of the stockholders of the Sullivan Mining Company, in the last week of September, Manager Dedolph of the smelter advised that the company expend between \$65,000 and \$75,000 to increase the capacity of the smelter. He stated that the smelter should be increased from 100 to 200 tons. This would require three new roasters and 10 concentrators.

According to the annual statement of the affairs of the Sullivan Group Mining Company, given at the annual meeting, the operating profit of the company for the year ending August 31st, 1907, was \$77,091.94. The bullion account due the company is \$472,091.42, the bonds for which the company is liable amount to \$400,000, the interest for which the company is liable to September 1st amounts to \$6,225.67, and the net gain to the company as a result of the year's work, after the payment of all interest, is \$45,441.56. The receipts from the sale of bullion for the year were \$374,286.74. The company has purchased the Big Dipper and Euphemia Fraction mineral claims, and has taken an option on the Commonwealth. The proposition to expend the above mentioned amount on the smelter was opposed by Manager Finlay of the Sullivan mine, who claimed it was unwise to expend much money in increasing the capacity of the smelter when the ore reserves were not known. He said the company did not yet know what it had below the 100 foot level, and he believed the company should sink a shaft another 100 feet in depth, so as to find if the ore continued at depth, before any such increase should be attempted. He said there was enough ore in sight to keep the smelter going at its present capacity for ten months or a year.

ROSSLAND.—The coke supply is becoming much more regular. Five of the seven Trail furnaces are in blast. Le Roi mine shipped 1,575 tons of ore to the Northport smelter during the week ending September 21st, and Le Roi No. 2 shipped 560 tons to the Trail smelter.

COAL CREEK.—Another disaster occurred at Coal Creek mines by which one man met his death and another was seriously injured. A premature explosion in No. 9 mine is supposed to be the cause, but as usual in cases of this sort the affair is veiled in mystery. The name of the dead man is Peter Johnson. The wounded man's name is John B. Deballiste.

MICHEL.—A party of fifty miners arrived here from England last night to work in the mines.

The management of the mines expect to soon be working full handed.

They are, however, confronted by a serious situation, being unable to find boarding room for men already here. It was expected that the new boarding house just being completed would relieve the situation. However, accommodations are still inadequate. Every house in camp is filled. One cause is that very many of the miners have sent for their families during the past few months. As many as thirty families are now waiting for houses.

The only relief will be for the men to build houses themselves. In the new town many lots have been sold, but no houses are yet being built.

NANAIMO.—The dispute between the management and the drivers at the Nanaimo coal mines has been amicably settled. The men have gone back to work after four days' idleness. An agreement covering two years has been effected, making a 10 per cent. bonus a fixture.

NELSON.—The Kootenay Engineering Works has contracted to build a 1,000 ton ore bunker for the Hewitt Mining Company. It will be placed at the lower terminal of the tramway. A 300 ton bunker is being built at the upper terminal, near No. 6 tunnel.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

The centenary celebration of the Geological Society of London opened at the House of the Institution of Civil Engineers, Westminster, on the 26th of September. The president, Sir Archibald Geikie, delivered an address on "The State of Geology at the time of the foundation of the Geological Society. In the evening of the same day the official dinner was held at the Metropole Hotel, while on the following evening the Geological Society Club entertained the foreign and colonial delegates at dinner at the Criterion Restaurant, followed by a conversation at the British

Museum of Natural History, South Kensington. The third and subsequent days were devoted to excursions to various centres of geological interest. Canada was represented at the convention by Dr. Frank D. Adams, of McGill University.

GERMANY.

The electrical production of steel is making much headway in Germany, where experiments with various types of furnaces are now being conducted. Recently the plant of the Rochling Iron & Steel Company, at Volklingen, was inspected by representatives of the iron and steel trade. Here a new type of furnace, founded upon a combination of the original Kjellin furnace, is in use. The furnace has a charge of three tons, and purifies a liquid charge from the basic convertor down to mere traces of sulphur and phosphorus.

FRANCE.

At the congress of miners of the centre of France, held recently at Commentry, one of the questions discussed was what attitude should miners assume in the event of war being declared. Finally a resolution to the following effect was passed: "The National Federation of the Miners of France ought to respond to a declaration of war by a general strike." This in no wise discounts some of the unpatriotic utterances of certain anarchistic delegates, to a labor convention at Winnipeg.

AFGANISTAN.

According to a report of a commercial agent of the United States Government, Afganistan is an extraordinarily rich mineral country. It is known to have mines of rubies, topaz, lapis lazuli, mable, iron, lead, copper, antimony, and other metallic ores, as well as sulphur and several of the earthly alkaline and metallic salts. Coal is also found. The lead, iron and precious stone mines are partially worked by the Government with modern machinery, but the mining of the country is mostly carried on by the crudest of methods and the bulk of the mineral wealth is not yet touched. The Amir continues to gradually purchase mining machinery as he has funds; but both Government and people are opposed to granting any concessions to foreigners.

SOUTH AFRICA.

The Legislative Council of the Cape has passed a bill imposing a profit tax of 10 per cent. on diamond and copper mining companies earning over £50,000 per annum, and providing that a defined dividend on preference shares in mining companies shall be taxed at the rate of two shillings on the pound.

The gold output of the Transvaal in fine ounces for the eight months ending August 31st is given as 4,226,470, valued at £17,952,905. This compares very favorably with the returns for 1906, which were 5,786,617 ounces, valued at £24,579,987. The production during August was a record achievement, the yield being 555,027 ounces.

It is stated that the replacement of Chinese in the mines by raw native recruits was adversely affecting working costs. Many of the Chinese are being repatriated against their will, and had even offered large sums of money to be allowed to remain in the country.

AUSTRALASIA.

The new Australian tariff places a rather serious tax on the mining industry in that the duty on mining machinery has been materially increased. Thus the old duty of 12 1-2 per cent. on mining engines and machinery has been increased to 35 per cent., with a preferential duty of 25 per cent. on articles of British origin. In nearly all materials used in mining a considerable increase in duty impost is also to be noted.

The gold output of the Commonwealth for the eight months ending August 31st was 2,083,863 ounces, or a decrease of 222,669

ounces compared with production for the corresponding period of last year.

Several new alluvial gold discoveries are reported to have been made recently in Victoria, and a nugget of 114 ounces has been found in the Poseidon field, which has resulted in reviving interest in the district.

NEW ZEALAND.

The Government of New Zealand is now offering a bonus on the production of marketable copper from ores mined and smelted in the country; and a bonus of four pence a pound on the production of the first one hundred thousand pounds of quicksilver, free from impurities, from any New Zealand mine. In respect to copper, the conditions are that if 1,000 tons are produced on or before June 30th, 1909, the bonus payable will be £1,000; after that date, £500 will be paid on respectively the second and third thousand tons produced.

UNITED STATES.

During the past two years and a half the productive capacity of iron furnaces in the United States has been increased to the extent of four million tons per annum, so that on July 1st of this year the actual productive capacity of the plants is about 27,700,000 gross tons per annum. Since that date still other furnaces have been blown in. For the first six months of this year the production was 13,478,044 tons.

The report compiled by the Minnesota Tax Commission, after exhaustive investigation, has developed the fact that the iron ore resources of the Lake Superior region are greater than a previous estimate. Thus in the Gopher State alone no less than 30,591 acres of iron lands, estimated to contain 1,135,000,000 (roughly) tons of ore, have been proved, the greater proportion being credited to the Mesabi range.

Several of the copper districts, in which the Amalgamated Copper Company have no interest, expect to benefit by the shut down of the Butte mines. This is especially the case in the Black Hills region, where recently some important strikes have been made. Meanwhile, already about fifty per cent. of the miners have been laid off in the Butte district, while the large copper concerns in Arizona have curtailed production very considerably.

The small electric smelter at Heroult, Shasto County, California, to which reference was previously made in this column, is now producing ferro-silicon at the rate of two tons daily. Directly the plant for making electrodes is completed the production of pig iron by electric smelting will be resumed.

The discovery of deposits of asbestos in the Province of Ilocos Norte, in the Philippines is announced. The mineral is found as a stockwork in the serpentine formation of the district. Two varieties of the mineral occur, namely, the true crysolite asbestos and tremolitic or amphibole asbestos.

Clarence Mackay has regained control of the Yellow Jacket mine, in Nevada, once owned by his father, John W. Mackay, who lost it to Robert Morrow many years ago. Morrow held on to it, and seemingly it was his for years to come. The Mackay interest in it was an unknown quantity and was not heard of until it suddenly asserted itself.

Commercial Note

The catalogue of Belliss & Morecom, Limited, has been received from their Canadian agents, Laurie & Lamb, 212 Board of Trade Building, Montreal. The catalogue is admirably illustrated with diagrams and engravings. The B. and M. patent self-lubricating, quick-revolution engines, direct, belt or rope driven. Their engines for electric lighting, power, traction and mill driving are the subjects of this catalogue.

Company Notes

A statement issued late in September by the Dominion Iron & Steel Company shows that its claim against the Coal Company amounts to \$1,796,000. This is made up of \$289,000 paid to the Coal Company in excess of \$1.28 a ton, while the balance the company claims is damages.

STATISTICS AND RETURNS

Dominion Coal Company's output for September:—

No.	1907 approx.	1906 actual.
1...	41,130	41,186
2...	55,450	52,636
3...	26,800	31,971
4...	39,720	50,741
5...	58,360	57,981
6...	18,540	14,468
7...	.....	12,028
8...	19,700	23,271
9...	28,800	34,420
10...	8,500	5,031
	297,000	323,733
Shipments.	287,150	333,779

Following are the ore shipments and smelter receipts in South-eastern British Columbia for week ending September 21st and year to date:—

	Week.	Year.
Boundary	41,493	882,078
Rossland	7,112	194,280
East of Columbia River	2,782	100,283
Total	51,387	1,176,641

	Week ending Sept. 28	Since Jan. 1.
	Ore in pounds	Ore in pounds
Buffalo.	60,000	1,858,830
Foster	128,000	447,300
Nipissing	178,210	4,090,291

	Oct. 5.	Since Jan. 1.
	Ore in pounds	Ore in pounds
Buffalo	80,000	1,838,830
Coniagas	65,000	4,622,820
Cobalt Central .....	.....	101,360
Colonial .....	.....	74,250
Drummond .....	.....	44,090
Foster .....	.....	447,306
Green-Meehan .....	.....	196,780
Hudson Bay .....	.....	45,170
Imperial Cobalt .....	.....	37,530
Kerr Lake (Jacobs) .....	.....	373,780
La Rose .....	.....	1,229,852
McKinley	172,260	360,260
Nipissing .....	.....	4,090,291
Nova Scotia .....	.....	156,000
O'Brien .....	.....	2,281,014
Red Rock .....	.....	40,000
Right of Way .....	.....	134,530
Silver Leaf .....	.....	43,518
Silver Queen	65,000	837,157
Trethewey	118,990	1,530,008
Townsite .....	.....	150,078
Temiskaming .....	.....	229,011
University .....	.....	61,388

The total shipments for the week were 501,250 pounds, or 250 tons.

The total shipments since January 1, 1907, are now 18,955,820 pounds, or 9,477 tons. In 1904 the camp produced 158 tons, valued at \$136,217; in 1905, 2,144 tons, valued at \$1,473,196; in 1906, 5,129 tons, valued at \$3,900,000.

The output of the Crow's Nest Pass Coal Company's collieries for the week ending September 27th was 19,439 tons, a daily average of 3,240 tons.

Following are ore shipments and smelter receipts in south-eastern British Columbia districts for the week ending September 28th, and for the year to date, in tons:—

	Week.	Year.
Boundary	32,098	964,176
Rossland	5,521	199,801
East of Columbia River	2,899	103,182
Total	40,518	1,217,159

The Cobalt shipments for the month of September were:—

Name.	Cars.	Tons.
La Rose	6	150
Coniagas	3	95
Buffalo	5	150
O'Brien	2	61
Nova Scotia	1	30
Foster	3	95
Silver Queen	3	90
Nipissing	5	167
A. A. Cole (sample)	1	9
Total	29	847

The output of the four collieries of the Nova Scotia Steel & Coal Company for the month of September amounted to 49,053 tons, as compared with 54,928 tons in August. The amount of shipping, however, from the company's piers has by no means diminished, as every pound of coal banked was used to supply the increasing demand. The figures for the different mines last month were as follows:—

Mine.	Tons.
No. 1	21,950
No. 3	20,600
No. 4	400
No. 5	6,103

The output from the new No. 4 colliery is not yet being shipped, as the railway connecting the mine has not been ballasted. When trains begin running to the new mine modern mining machinery will be installed.

The output of the Crow's Nest Pass Coal Company's collieries for the week ending October 4th was 20,692 tons, a daily average of 3,448 tons.

The United States will produce in the current calendar year approximately 27,000,000 tons of all classes of pig iron, which will compare with 16,497,000 tons produced in the year 1904, and 18,000,000 tons produced in 1903. The production this year will represent an increase of nearly 65 per cent., as compared with 1904, the largest increase reported in any similar period in the history of the iron and steel industry.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
 Antimony—10 1-4 to 12 cents per lb.
 Arsenic, white—6 7-8 to 7 1-4 cents per lb.
 Barytes, crude—\$18 to \$20 per short ton.
 Bismuth, metal—\$1.75 per lb.
 Cadmium, metal—\$1.50 per lb.
 Carbons for drills—\$70 to \$80 per carat.
 Carborundum, powdered—8 cents per lb.
 Chromium, metal pure—80 cents per lb.
 Cobalt, f.o.b. Cobalt, Ont., unrefined—25 to 40 cents per lb.
 Corundum—7 to 10 cents per lb.
 Feldspar, ground—\$14 per short ton.
 Flourspar, lump—\$8 to \$14 per long ton.
 Graphite, domestic—\$50 to \$150 per ton.
 Gypsum, lump—\$7 per short ton.
 Infusorial earth, ground—\$20 to \$45 per long ton.
 Lead—4.75 cents per lb.
 Manganese, pure metal—75 cents per lb.
 Mica, ground—\$50 to \$80 per short ton.
 Mica, scrap—\$10 to \$15 per short ton.
 Molybdenum, pure—\$1.70 per lb.
 Molybdenite ore, 90 per cent. pure—\$4.50 to \$5 per unit.
 Nickel, metal—45 to 65 cents per lb.
 Platinum, ordinary metal—\$27.50 per ounce.
 Platinum, scrap—\$23 to \$24 per ounce.
 Pyrite—10 to 11 1-2 cents per unit for 38 to 45 per sulphur lump ore or fines.
 Quicksilver—\$40.50 per 75 lb. flask.
 Sulphur—\$19 to \$23 per long ton.
 Tale—\$15 to \$35 per short ton.
 Tungsten, pure metal—\$1.30 per lb.
 Tungsten, ore, 60 per cent. pure—\$9 per unit.
 Tin—34 1-2 cents per lb.

MARKET NOTES.

Spelter.—Market has improved and displays strength. New York, 5.40 cents per lb.; London, £21.

Lead.—Production has been restricted and lead holds its own at 4.75 cents per lb. New York; London, £19 5s for Spanish.

Tin.—Tin has declined markedly, and the market is weak. New York, 34 1-2 cents per lb.; London, £156 10s for spot.

Copper.—Copper is quiet. Consumers are still withholding orders. New York, lake 14 1-2 to 15 cents per lb.; electrolytic, 14 1-2; London, £61 15s for spot.

Silver.—Sept. 19th, 67 3-4; Sept. 20th, 67 5-8; Sept. 21st, 67 1-2; Sept. 23rd, 67 1-4; Sept. 24th, 67 1-4; Sept. 25th, 67 1-4; Sept. 26th, 67 3-8; Sept. 27th, 67 1-2; Sept. 28th, 67 3-8; Sept. 30th, 67 1-2; Oct. 1st, 66 7-8; Oct. 2nd, 66 3-4.

Mexican dollars, 51 7-8 cents; sterling exchange, \$4.8575.

Pig Iron.—Pittsburg, Bessemer pig, \$22.90; No. 2, foundry, \$22.

Iron Ore.—Bessemer, old range, \$5; Bessemer Mesabi, \$4.75; non-Bessemer, old range, \$4.30; silicious non-Bessemer, \$2.50.

The output of gold in Rhodesia, South Africa, in August amounted to 54,749 fine ounces, against 50,127 last year.