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The Canadian Mining Journal

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CIRCULATION.

During the year ending with March 1st, 1908, 91,750 copies of "The Canadian Mining Journal" were printed and distributed, an average of 3,822 per issue.

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CONTENTS.

"THE MINING MAGAZINE."

We have looked with considerable eagerness for the first number of Mr. T. A. Rickard's new monthly. The high standard set by our contemporary, *Mining and Scientific Press*, led us to expect even better things from *The Mining Magazine*. And we have not been disappointed.

For the benefit of those of our readers who have not yet seen a copy of *The Mining Magazine*, we may explain that it is a new monthly mining periodical, published in London, England. Its object is to supply mining men, all over the English-speaking world, with a just monthly summary of mining news and technical progress, and a careful digest of current professional literature. Its publishers believe that a monthly publication will be best suited to this end. Specifically its aim is well summed up in the first editorial paragraph of the first number: "The purpose of this periodical is to be useful to those engaged in mining."

It is superfluous to say that *The Mining Magazine* will be honestly and capably conducted. Mr. Rickard's name is ample guarantee of this. But we shall expect more. If the initial number may be taken as a representative sample, and not a specimen, *The Mining Magazine* is assured of success. Its editorials are clear, outspoken and interesting—and of these three virtues the last is the rarest. The arrangement is effective. A general review of mining precedes the editorials. These are followed by special correspondence from the larger mining centres. Then come the markets, discussion, contributed articles, and the regular departments, of which that entitled "Précis of Technology" seems eminently instructive.

With the exception of one anonymous article on "Investments and Speculations," the entire 82 pages of reading matter in the first number of our youngest contemporary are alike readable and useful. This anonymous article includes a tabular classification of mining shares according to their present value as investments. *The Mining Magazine* treads on dangerous ground in giving this class of article. Although published in all good faith, material such as this is extremely open to misuse. We agree heartily with the editorial dictum of *The Mining Magazine* itself, that it is best to leave stock market tipping to the financial periodicals. But in justice to *The Mining Magazine* we must assure our readers that our contemporary's avowed policy emphasizes this point as strongly as does our own.

In welcoming *The Mining Magazine* we are not fulsome when we say that it is bright, clean, thoroughly reliable, and, from a technical point of view, more than

excellent. We commend it strongly to Canadian mining men.

A CUSTOM SAMPLER FOR COBALT.

Some time ago a mild request was put before the Ontario Government. Facts, figures, and opinions were presented shewing, or tending to shew, that beneficent results would accrue to the Cobalt region if a public sampling plant were erected in Cobalt. We believe that the proposal was given not unfavourable consideration. However, although an appropriation was actually made, the scheme withered and died.

Possibly this was well. Nothing beyond a rather indecorous auction sale has come of the Ontario Government's attempt to operate the Provincial mine on the Gillies Limit. The Department of Mines has been, and is, undermanned. One devoted official inspects all the mines of the Province, and, during the life of the late lamented Provincial mine, the same official acted also as mine manager. Hence we have misgivings as to the manner in which a public sampler might have been operated.

It has always appeared to us that a modern sampling plant is a *sine qua non* in any large metal-mining camp. Cobalt needs one, not only because of the variable and complex character of its ores, but also because of the camp's relation to the smelters and to the market generally. Study of the situation compels us to conclude that an independent sampling plant, well-situated to receive and discharge shipments of ore, will surely promote peace between the ore-producer and the ore-buyer, and will, in the long run, influence favourably the prices paid.

It has remained for two enterprising young Canadians to carry out the project of designing and erecting a custom sampler in Cobalt. Messrs. Campbell and Deyell, who have practised for some years in Cobalt as surveyors, assayers, and mining engineers, have elaborated plans and specifications for a suitable sampler, and have also, we understand, succeeded in interesting sufficient Canadian capital to warrant the immediate construction of the plant.

On another page we publish full particulars of the projected sampler. It suffices here to signify our warm approval of the new enterprise.

THE PETERSON LAKE SQUABBLE.

From the Cobalt Peterson Lake—Nova Scotia controversy there is at least one lesson to be learned. An acrimonious dispute arose over the alleged carelessness of the Nova Scotia Silver Cobalt Mining Company in working ground leased from the Peterson Lake Silver Cobalt Mining Company. Into the particulars of the case it is hardly profitable to go. But it is evident that through lack of skilled supervision the Peterson Lake Company has been placed in an awkward position. So also has the offending Nova Scotia Company. If the mining operations of both companies had been under the absolute control, not of absentee directors, but of competent mining engineers, the dispute never would have arisen.

Engineers were engaged by the Peterson Lake Company at the eleventh hour. Mr. Segsworth's report, which we have had the pleasure of reading, is definitive, careful, and businesslike. It stands out in strong relief when compared with many of the slim documents, labelled reports, that have emanated from Cobalt. Associated with Mr. Segsworth was Mr. J. W. Astley, formerly of Le Roi mine. The report reflects credit upon both gentlemen, and, as is always the case when competent engineers are concerned, it deals logically with hard facts, presenting them in such a way as to be thoroughly intelligible to the layman.

There are several mines and many prospects in and about Cobalt that require diagnosis and treatment by a real mining engineer. The *bona fide* mining engineer is always called upon in time of trouble. But it is better business to get him as a preventive rather than as a cure.

THE DUNCAN RIVER COUNTRY, B.C.

A mining region of great progress is the Duncan River country, north of Kaslo, B.C. The lead-silver ores of this district are well worth exploiting. Authentic analyses show that some of the ore bodies carry high percentages of lead and respectable quantities of silver. Assays carrying from 50 to 100 ounces of silver, along with from 50 to 65 per cent. of lead are not uncommon.

The absence of roads has deterred the development of the Duncan River district. It is expected now that the Provincial Government will commence the construction of wagon roads at an early date. Indeed a good road is even now under construction. This leads up Hall Creek and will form one link in the necessary chain.

The Government of British Columbia will be amply repaid in the future for any expenditure of this kind undertaken now.

POLAR POLEMICS.

When the jaded citizen turns to his evening newspaper for refreshment, ten to one his eye falls upon columns of Cook and pages of Peary. Already we are sufficiently familiar with the domestic virtues of both gentlemen. We know how each of them looks in deerskins, and in conventional garb. We know Peary's opinion of Cook, and Cook's opinion of Peary, and we have formed our own opinion of both. And our own opinion will require censoring if this kind of thing is continued.

In Montreal are several clever gentlemen who make a specialty of merging and combining industries that are

in a delicate condition. Would it not be practicable for these same gentlemen to amalgamate Peary, Cook, and our own brawny Bernier? "Amalgamated Polar Publicists" has a goodly sound.

With Mr. Roosevelt making strange noises from out Central Africa, Lieutenant Shackleton orating about the Antarctic, and Cook and Peary at garrulous war, our intellect is in danger of total eclipse.

THE STAMP-MILL.

The development of the heavy stamp is one of the outstanding features of ore-dressing practice during the last twenty years. Two decades ago, the 900-lb. stamp was the heaviest in use in America. It is true that, even at that date, heavier stamps (1250-lb.) were in use at a few mines on the Rand. But these did not set the fashion, and little was known then of their performance.

Exhaustive experimental work on the Rand, work in which Mr. W. A. Caldecott was a leading spirit, demonstrated clearly the higher commercial efficiency of heavy stamps. Roughly, a weight of at least 1750 lbs was indicated as desirable, and, of late, stamps heavier even than this have been installed. Incidentally, experience has shown that the cumbrous cast-iron anvil block is a superfluity. Heavy concrete foundations, with merely a thin layer of insertion between the concrete and the mortar-box have given entire satisfaction, notwithstanding the increased weight of the stamps.

In Mr. Caldecott's paper, "The Development of Heavy Gravitation Stamps," reproduced in this issue, these and other points are elucidated. Mr. Caldecott's papers are the ripe fruit of experience. We commend this paper to our readers.

THE COPPER RESOURCES OF VANCOUVER ISLAND.

What the future has in store for Vancouver Island as a copper producer is foreshadowed in a letter written by Mr. W. H. Trewartha-James, general manager of the Tyee Copper Company, and published in the *Victoria Daily Colonist*.

Mr. Trewartha-James estimates that Vancouver Island has produced, during the past five years, about one-half the copper that has come from the entire Pacific Coast district.

During the twelve months ending August 31st, 1909, the Tyee Copper Company's smelter at Ladysmith turned out 3,500,000 pounds of copper, 52,000 ounces of silver, and 7,000 ounces of gold. This includes about 208,000 pounds of copper produced during six months from a group of mines on Vancouver Island.

But it is evident that Vancouver Island has hardly begun to get its stride. The Island is, to a large extent, *terra incognita*. We believe that the opening up of its mineral deposits will be a vital factor in the industrial progress of British Columbia. Interest can best be aroused by public pronouncements of responsible men like Mr. Trewartha-James.

EXPLANATORY.

Commenting upon an editorial that appeared in our issue of September 15th, the *Evening Citizen*, of Ottawa, while admitting that the *Canadian Mining Journal's* strictures upon certain daily papers are to a considerable extent justified, claims that there is great difficulty in securing reliable mining news, and that daily papers cannot afford to maintain correspondents in mining camps.

The contention of our respected contemporary is, no doubt, quite true. But it hardly covers the point under discussion. We contend that our daily journals should least of all afford to accept and publish the extravagant misstatements of promoters and brokers. How far each paper can go in the direction of getting authentic news is a function of each paper's enterprise.

The *Evening Citizen*, to give further force to its argument, takes exception to our Special Correspondence columns. It charges us with carelessness and inaccuracy. Notices regarding mining properties, states the *Citizen*, in the Elk Lake district or Gow Ganda, or Miller Lake, are published in the *Canadian Mining Journal* under the head of "Cobalt news." This the *Citizen* takes as evidence that we are "getting the four camps mixed up."

As the charge is apparently made without levity, we must hasten to assure our contemporary that we are not ignorant of the geography of Northern Ontario. In fact much of that same geography has been learned to the pestiferous accompaniment of black flies and mosquitoes.

The explanation, if explanation be needed, is simply that most of our correspondence, gathered from many sources, is actually written in Cobalt. Cobalt is still the hub of the northern silver district and the gathering and distributing centre for mining news. Quite seriously, it had never occurred to us that the arrangement of our Cobalt news letters could lead to confusion. We had taken it for granted that the great bulk of our readers had some idea of the relative positions of the old and new mining camps of the north. We hope that the *Citizen* will clear its editorial mind of the horrible suspicion that we don't know Cobalt from Gow Ganda.

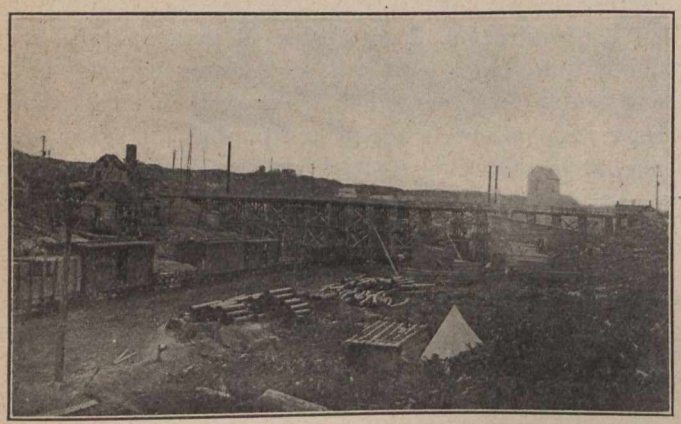
AN OMISSION.

In our issue of September 15th, there appeared a reproduction of the flow-sheet of the Goldfield Consolidated mill. Mention was made of the fact that the Allis-Chalmers Company furnished the machinery for this plant. To this should have been added the statement that the Deister Concentrator Company installed 70 of their No. 3 tables.

THE PROJECTED CUSTOM SAMPLING PLANT—TO BE ERECTED THIS YEAR IN COBALT, ONT.

Written for the Canadian Mining Journal.

The question of a sampling plant in the Cobalt camp has long been mooted, and it is only within the last few days that final arrangements were concluded enabling Messrs. Campbell and Deyell to proceed with their plans and erect the works, the general scheme of which was laid before the mines, smelters, and government some months ago. Negotiations are in progress with the La Rose Company whereby the Sampling Company proposes to lease a site from the former. Should this arrangement be carried through satisfactorily, the first sod will be turned in the next week. The site as shown in the accompanying plate is the strategic position for such a works.



SITE SELECTED FOR C. & D. SAMPLER—LOOKING SOUTH.

The province of the Sampling Company will be to sample and assay all the products from the mines, thereby establishing the percentages of the constituent values, such certified estimation to be the basis of settlement between mines and smelters. The company proposes to take ore from the mines in large or small quantities, weigh, sample, assay, giving their certificate to both mine and buyer. Storage capacity will be provided for ore that is not immediately sold and for purposes of holding ore until the proper material has been added to bring it up to smelter requirements. When shipped, the ore will be placed in non-leakable bags and consigned under seal. The bullion resulting from the melted metallics in the ore will be shipped to smelter or refinery according to understanding between buyer and seller of ore. Certificates will be given in respect to silver, stating weights and amount of silver in friable ore; also weight and number of ounces in bullion, with allowances for slag, dust, loss, moisture, etc. The analyses for cobalt, nickel, arsenic, silica, lime, iron, etc., will be given in percentages.

A few of the functions of such a concern are:—

1. To have a neutral party value the product between buyer and seller.

2. To permit the producer to realize quickly on his raw product, and thus place him in a stronger financial position even should he not find an immediate market.

3. The grading of the various ores to enable the producer to meet the variations of the different markets.

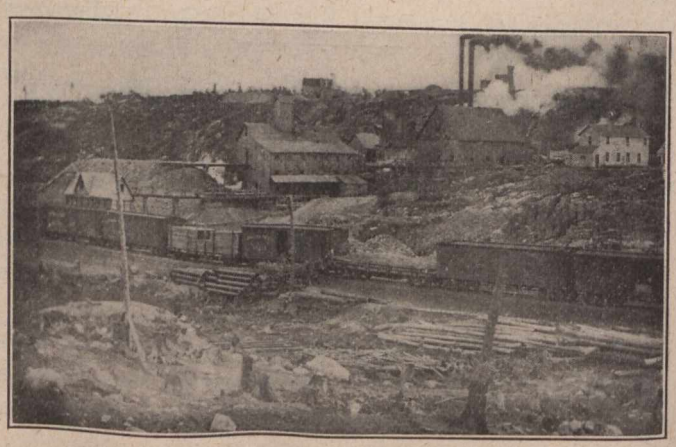
4. To enable the buyer to procure a product most suited to his metallurgical requirements, thus eliminating the chance of getting undesirable products on his hands. The great complexity of the Cobalt ores renders it difficult to more than guess at the percentage of constituents before sampling. The works will thus place the mine and smelter on a sane business footing.

5. Being the only plant in Eastern Canada of its kind, its sphere of influence will be large, and it will tend to centralize the mining industry, which at present has no recognized centre.

6. The direct benefit to the town of Cobalt and to the T. & N. O. Railway derived from the establishing of a valuing point at Cobalt need only be suggested to be appreciated.

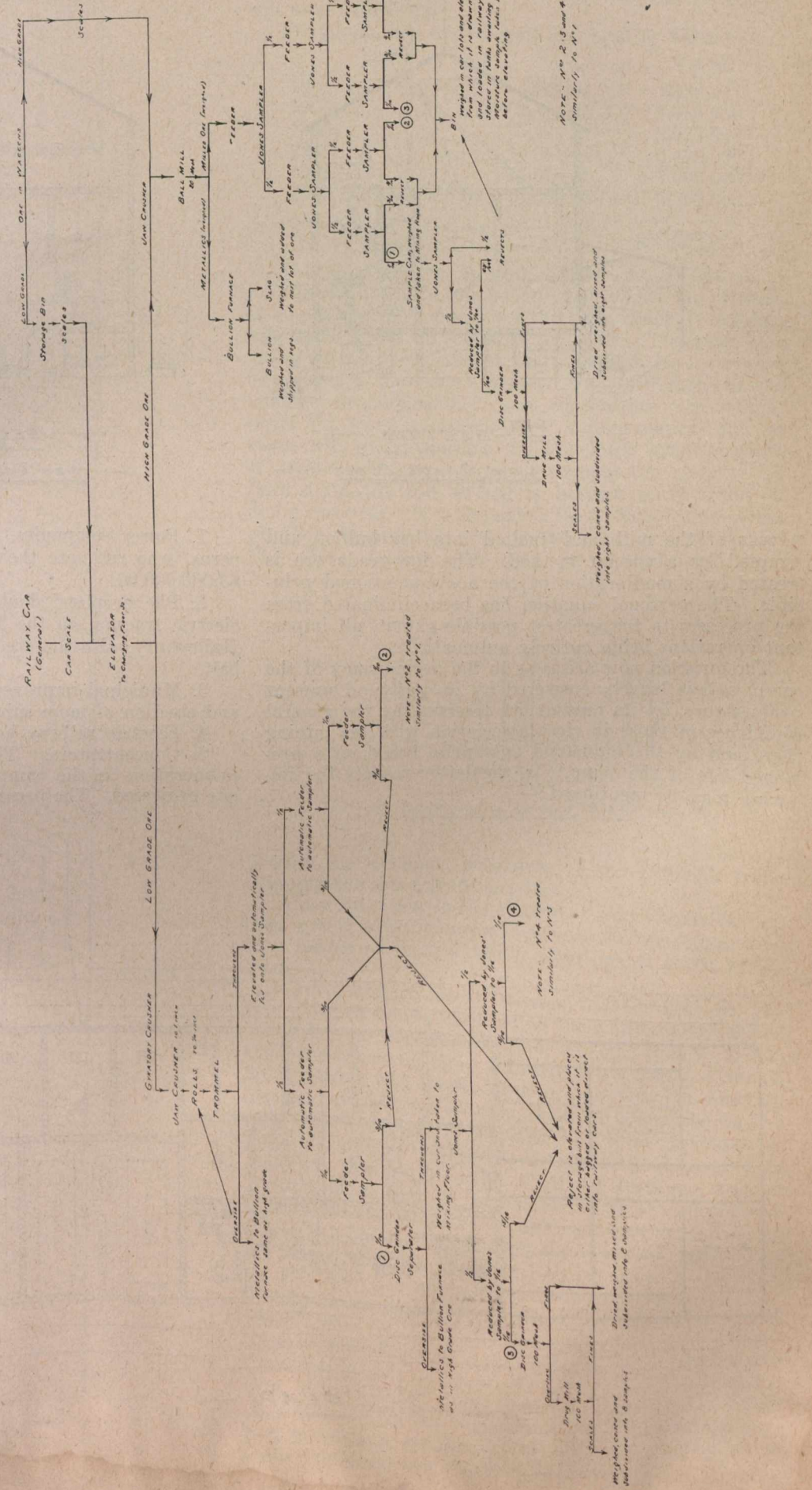
In answer to the objection that such a works should have been erected at the inception of the mining in Cobalt, and that the camp is now at its zenith and in consequence is too late to erect a plant, it may be said that such objection is not valid. The camp is not yet at its zenith, as later we will prove, and also, conditions of market and knowledge of the ore would not have permitted the successful operation of a sampling works, if erected previous to the present year.

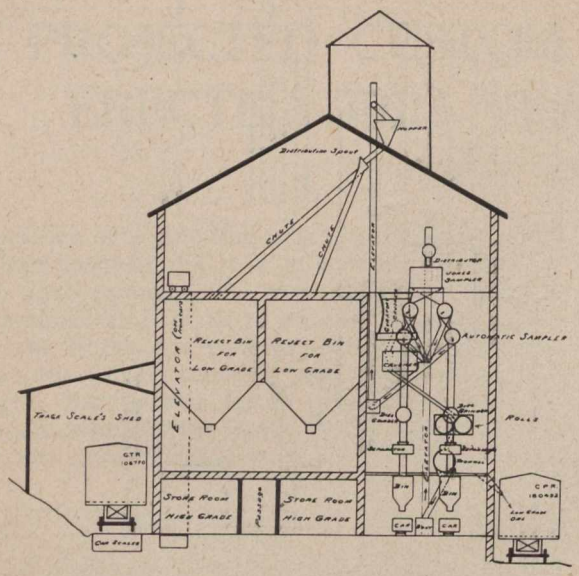
In the early history of the camp the heads of the most prominent sampling concerns across the line came and pronounced a sampling works not feasible. Since then the smelters have evolved mechanical methods, and the ore sampling concerns across the border have instituted a system of quadruple checking by hand sampling. The great difficulty met with is in the presence of the metallics and the non-uniformity in composition of the ore. The method evolved by Messrs. Campbell and Deyell and to be used by the company is that of fine grinding in a Ball mill of all the ore, the pulverized portions being screened off and thoroughly mixed, split into four equal parts by automatic riffle samplers, each of the resultant quarters being separately sampled down to the requisite laboratory sample. All this process is automatic, and permits of four separate samples of each shipment of ore. The metallics are extracted from the



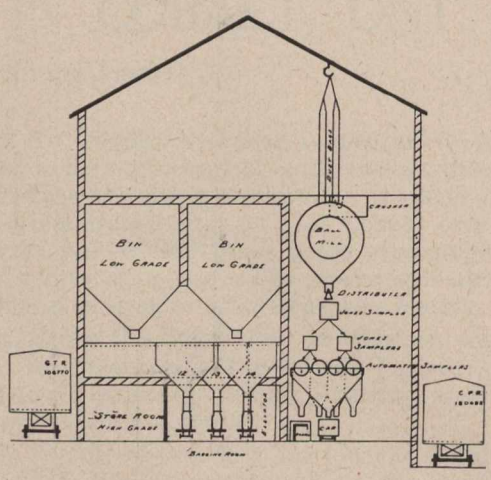
SITE SELECTED FOR C. & D. SAMPLER—LOOKING EAST.
La Rose and O'Brien Mines in background.

FLOW SHEET


RAILWAY CAR (General)
CAR SCALE
ELEVATOR
LOW GRADE ORE
HIGH GRADE ORE
JAW CRUSHER
BALL MILL
BULLION FURNACE
ROLLS
TROMMEL
GYRATORY CRUSHER
AUTOMATIC FEEDER
AUTOMATIC SAMPLER
FEEDER
SAMPLER
DRY CRUSHER
DRY MILL
SCALES
BIN



SECTION THROUGH LOW GRADE PLANT



SECTION THROUGH HIGH GRADE PLANT

screens of the mill and melted into bar bullion and sampled by a special method. The low-grade ore is treated by a modification of the above-mentioned principle. The personal equation has been eliminated from the processes to the greatest possible extent, all important operations being entirely automatic.

The question now arises as to the permanency of the camp, and is largely answered by its past and present performance, by its present ore reserves, by the general confidence of those in close association with the mining there and by the industrial enterprise based on a prolonged life of the camp. In the latter respect the following may be mentioned:—

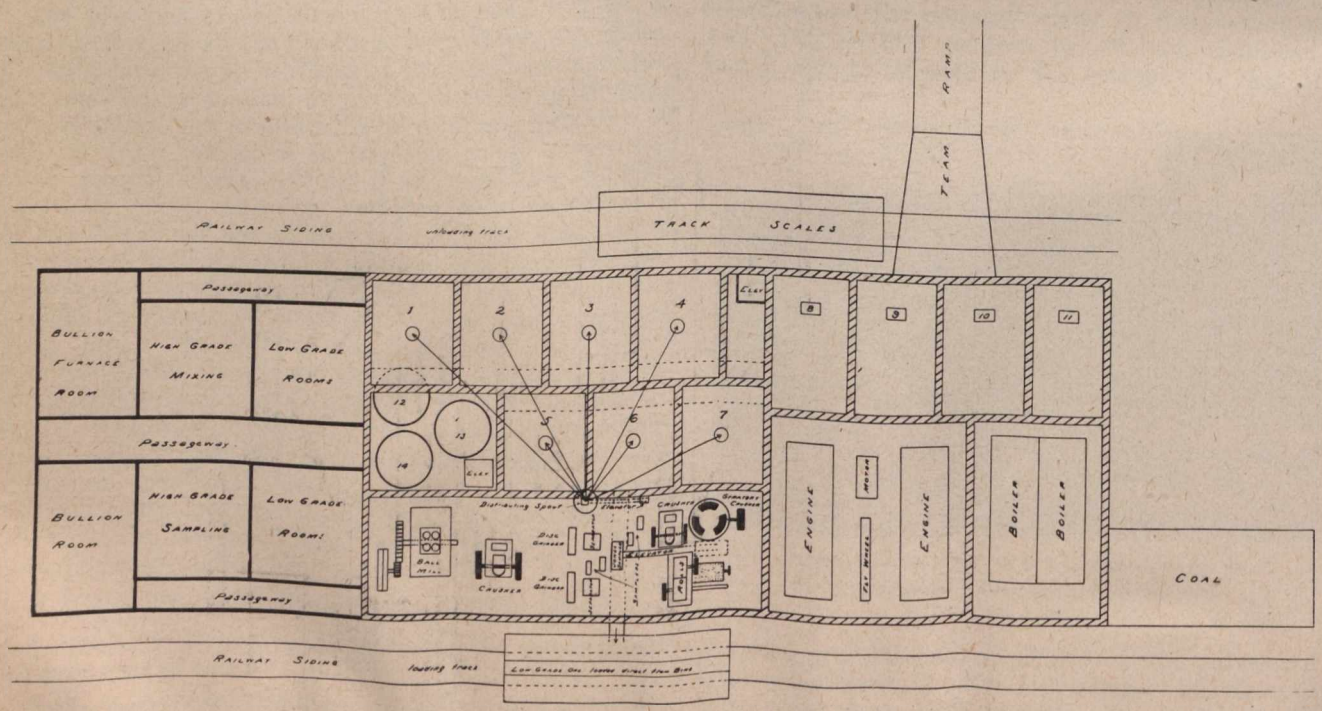
1. Power companies. There are three of these concerns, who estimate their initial expenditure at about $3,000,000.00.

2. The proposed double tracking and installation of electric traction on the T. & N. O. between Cobalt and Haileybury, also the erection of the new station at Cobalt.

3. Municipal improvements; sewage and waterworks, and erection of more substantial buildings in Cobalt.

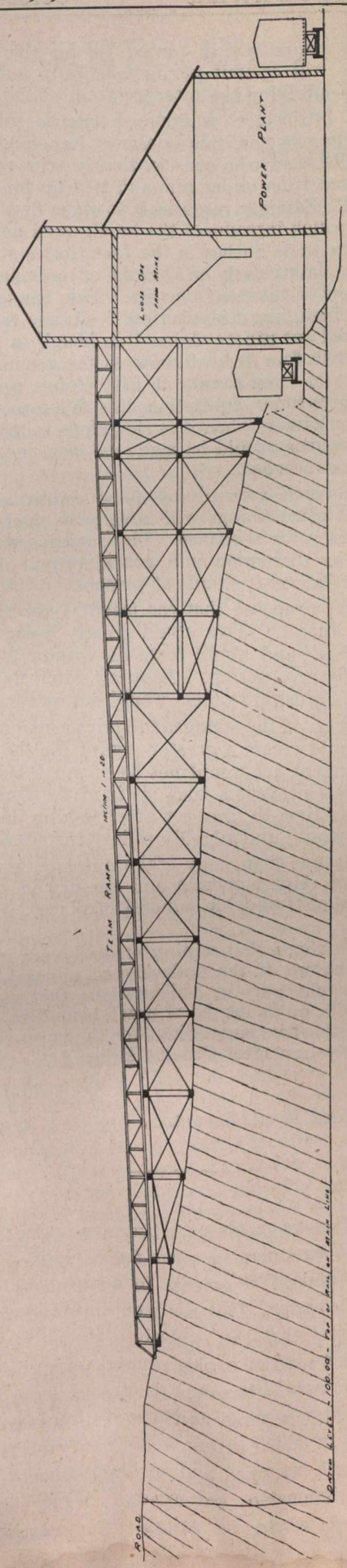
4. Electric railway between Cobalt and Haileybury.

5. Concentrators. There are now eight concentrators in operation in the camp—five under construction and one projected. The present capacity is 635 tons per day.



PLAN

NOTE:- Bins N° 1 to 7 are for Low Grade Ore (Reject) Directly under these are Store Rooms for High Grade Ore in bags. Hoppers N° 12-13-14 are for High Grade Rejects which are to be bagged Bins 8-9-10-11 are for Local Ore hoisted from Mine

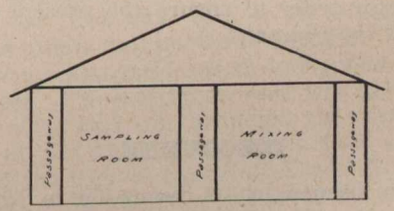


This will be increased to 1,000 tons when the other mills are completed. It is estimated that the aggregate cost will total $1,000,000.

The production of the camp has been as follows:—

	Tons.	Value.
1904	191,55	$136,277
1905	2,336.01	1,485,530
1906	5,836.59	3,573,908
1907	14,851.34	6,476,555
1908	25,510.91	9,000,000
1909, to June 30, '09.	15,000.00 (est.)	5,290,000
		$25,962,270

The shipments to August, 1908, were 14,564 tons; to August, 1909, 20,300 tons; which shows an increase of 40 per cent. in tonnage for this year, which, if it holds, will make about 35,700 tons for 1909. The tendency, owing to the operations of the numerous concentrators, is towards a one-value product. This will decrease the tonnage proportionately and concentrate the values, while the more comprehensive mining policy now in vogue will tend towards a uniform lower grade product of greater tonnage, instead of robbing the reserves for false dividends and having to balance up later on on dump material. It is estimated the average value of the product shipped this year is the same as that of last. The above factors will tend to maintain and even



increase the tonnage, according to development, while shipping the same grade product.

A contradiction to the statement that Cobalt has not been a good investment and has only enriched those who have traded on its spectacular showings, is found as follows:—

Approximately, the O'Brien and Drummond, the privately owned mines, have netted their owners $2,100,000.

Including the non-dividend payers, Nancy Helen, Chambers-Ferland, King Edward, Nova Scotia, Peterson Lake, Foster and Green-Meehan, and also the fourteen dividend payers, we see that these 21 companies have a total issued capital of $49,895,568; total dividends to June 26, 1909, $11,916,510; dividends paid in 1909 to June 26, 1909, $4,016,970. Figuring from the summer of 1905, when most of the companies were incorporated, these mines as a whole have paid 6 per cent. on the money invested. The rate of interest for this year, taken from the above figures is about 16 1-10 per cent.

The figures given do not include royalties.

The total value of ore to June 30, 1909 (est.), $26,000,000.

Total dividends	$14,062,510
Total royalties	934,122
Cost of production	11,000,368

on a basis of 50c an ounce for silver (waiving the copper, nickel and arsenic values), the cost of production including marketing would be 21c per oz.

It should be remembered that silver was produced very cheaply in the first two years of the camp during the gathering stage.

For the year 1908 some costs were as follows:—

Mines.	Gross Value.	Charges.	Cost of Production (include marketing).
La Rose Consol....	$819,823	$281,420	17c oz.
Kerr Lake	789,312	247,359	15 6-10c oz.
Nipissing	933,544	339,078	18 1-2c oz.
Crown Reserve ...	910,350	159,984	9 3-10c oz.

These show that notwithstanding the increased difficulty in extracting the ore, these companies are still able to mine within the average.

With regard to the surrounding camps, little can be said other than that legitimate mining has just commenced, and there is some good positive evidence in favour of some of the ore bodies. They can but enhance the silver output.

The accompanying prints show diagramatically the layout and process of the proposed works. They do not purport to be complete, except in principle.

As a corollary, it may be said that the capitalists interested in this Sampling Company are all residents of Toronto, and are not in any way connected with mines or smelters. Messrs. Campbell and Deyell hold control of the stock in order to ensure the present and future neutrality of the company.

DISCOVERY.

There has been a lot of discussion in Northern Ontario concerning the advisability of requiring an affidavit of discovery of "valuable mineral in place" at the time of recording a claim. The wording is explicit and requires of the prospector a condition that in other provinces is only required or is expected after an opportunity to thoroughly explore the claim.

For instance, in Quebec, under the new Mining Act, any holder of a prospecting certificate may stake out a claim on finding "mineral" or an "interesting indication." Then he has four months to prospect his claim before recording or making any payment whatever. Then the discovery of mineral and a rental per acre is required. If nothing is found the claim may be abandoned.

Again, in British Columbia a "valuable deposit of mineral" is required. This is defined as "mineral in place, in appreciable quantity, having a present or prospective value sufficient to justify exploration." The last phrase allows the prospector an opportunity to open up a favourable indication without leaving himself open to a charge of perjury, which is the only result of the hard and fast Ontario law.

Having in mind the area being prospected for silver in New Ontario, the most conscientious prospector would not hesitate to stake on a showing of cobalt bloom, yet it could hardly be called a "valuable mineral in place;" it is only a favourable indication. The only possible thing is to find native silver or its ores, which is absurd to expect in every case. So the prospector, knowing the impossibility of living up to the exact letter of the law, allows himself a loose interpretation of it that practically nullifies the discovery requirement. For instance, having found a flake of iron pyrites in diabase, he will stake a claim. He argues that iron pyrites is a valuable mineral and is assuredly "in place," so for the chance to prospect he will commit perjury, morally and perhaps legally, depending on the interpretation of the law.

All the prospector wants is a chance to prospect. Due to staking booms, this is almost impossible in New Ontario. The man who conscientiously tries to prospect finds it staked from under him and tied up for an indefinite period. His only recourse is to stake first and prospect after, which introduces the harsh word perjury. A big factor in these rushes is the fact that a staker may stake three claims each on behalf of as many of his acquaintances as take out licenses. This has introduced many evils, including "blanketing." In one case a gang of men staked out ninety claims "en bloc," in the depth of winter, with four feet of snow on the ground. Many other groups of from twenty to fifty claims were staked out at the same time. Operations like this force the prospector out in winter, when it is ridiculous to think that a bona-fide discovery could be made on even one per cent. of the claims recorded.

The discussion aroused by these conditions would indicate that some change will have to be made soon, to give the prospector a chance. The remedy can only be arrived at by discussion and consideration of amendments in the law as it stands at present.

Some have proposed that the locator only be allowed to stake for himself. This would greatly lessen the evils of the "rushes" and would force the locator to be more careful in his prospecting. Company interests may object, but the hardship to them would not be very serious.

A relaxation of the stringent requirements as regards discovery would create a greater regard for the law, but under the present act would not be of much benefit. If coupled with a provision, such as is in the Quebec law, allowing some time to prospect after staking, but before recording it would undoubtedly relieve the situation.

But while one man may stake out any number of claims, rushes, winter staking and perjury in regard to the discovery of "valuable mineral in place" will flourish.

It is to be hoped that mining men who are interested in the opening up of the undeveloped mineral areas of Ontario will take part in a discussion; that can do no harm, and will, no doubt, be of much benefit in bringing before the authorities suggestions for the improvement of the admittedly imperfect Ontario Mines Act.

J. D. CUMMING.

113 Bedford Road, Toronto.

A suggestion was made some time ago in South Africa that coloured wrappers be used for explosives, so that detection of unused fragments in sumps and working faces would be easier. This has been improved upon now by the proposal that the explosives themselves be coloured. If each kind of explosive used were given a different colour, accidents might be traced more readily. This might entail a small sacrifice of strength, but the compensation in added safety would no doubt be ample. Of course, both wrapper and explosive should be coloured. Unsulphonated red azo-dye, being soluble in nitro-glycerine, would be suitable for colouring the explosive.

SOME NOTES ON THE HISTORY AND RECENT DEVELOPMENT OF THE CANADIAN MINING INSTITUTE.

Paper read before the Cobalt Branch of the C.M.I by Secretary H. Mortimer-Lamb.

Although the Canadian Mining Institute is still relatively a young organization, it may be safely assumed that a very considerable proportion of its present membership is uninformed concerning the early history of the society or the causes that led to and resulted in its organization, nor have a number knowledge of its traditions, and the useful services it has rendered the mining industry since its inception. This ignorance, if it may be so termed, is readily understood when it is considered that mining engineering, unlike most other professions, is a sort of will-o'-the-wisp to those who follow it. It is rare for a man belonging to this profession to remain for any length of time in any one place or country. If he succeeds in establishing a reputation in a particular locality, there immediately arises a demand for his services, with the proffer of greater inducements elsewhere. If, on the other hand, his management of a mine in one camp is inefficient, he necessarily drifts on with the stream. Thus, of the original membership of the Institute few now remain on the list, the ranks having been recruited year by year, and especially during the past two years, by new men—men either of a younger generation fresh from the mining schools, or by engineers or mine managers or superintendents representing outside capital, recently attracted to Canada. Nothing, in fact, indicates more forcibly the cosmopolitanism of mining than the character of the membership of the Canadian Mining Institute, which is in itself an essentially Canadian institution, yet includes amongst its members a very large number of men owning other nationality—the United States, Germany, France, Sweden and Italy.

To begin at the beginning, the Canadian Mining Institute as constituted to-day was not of spontaneous generation. Its inception and development followed along evolutionary lines. In the year 1890 a very pernicious and unjust measure was passed by the Quebec Legislature, imposing a royalty of 3 per cent. of the gross value of the product upon mines already alienated from the Crown by actual sale, without any reservation of the right to levy such royalty. The Act also contained other provisions similarly retroactive in effect and unfair in character. It was realized that if this Act were allowed to become operative, it would not only be a heavy blow to established industries, but would also seriously check new enterprises. At this time the only periodical devoted exclusively to Canadian mining interests was the "Review," published at Ottawa, and edited by Mr. B. T. A. Bell, a young Scotsman possessed of extraordinary energy and a forceful personality. At his initiative a meeting of the mine operators of the Province of Quebec was convened and held in the Windsor Hotel, Montreal, on January 23rd, 1891, primarily to combine to oppose this measure, but during the evening a resolution was formally adopted whereby the Quebec General Mining Association came into existence.

Following this example, a year later, March, 1892, the organization of the Mining Society of Nova Scotia was effected as the result of a circular issued by Messrs. J. E. Hardman, R. G. Leckie, Chas. Fergie and others to the mining men of the province, in which their co-operation and interest were invited in the formation of a United Miners' Association, the object of which was to promote generally the welfare of the mining industries. The society immediately justified its existence by its success in inducing the Provincial Government to modify, and in some instances to amend entirely, certain ill-advised clauses in the province's enactments relating to mines and mining leases, which were shown to be inimicable to industrial interests.

Ontario was the last of the three Eastern Canadian mining provinces to organize; but here again, thanks to Mr. Bell's exertions, this was accomplished in April, 1894, when a meeting was held for the purpose at the Rossin House, Toronto. Of those among the first to sign the roll of membership it is interesting to note the names of Prof. W. G. Miller, who for the past two years has so worthily filled the office of president of this Institute; Mr. R. W. Leonard, Mr. T. W. Gibson, Dr. Goodwin, Dr. Nichol, Dr. Coleman, Mr. J. M. Clark, Mr. J. T. Laidlaw, and others well known to us here. The existence of the Ontario organization as an independent body was, however, brief. The society, in fact, was never incorporated, since when this was proposed the question of the federation of the three associations had already been mooted, and the men of Ontario fell readily in with the project. But while the desirability of the step was generally agreed upon at a united meeting of the three societies at Cape Breton in July, 1894, federation was not finally consummated until January 10, 1896.

The birthplace of the federated Canadian Mining Institute was Montreal. Its first president was Major R. G. Leckie. The scheme, which had as its main objects economy in publication, consideration of matters affecting or relating to the mining industries of the Dominion within the jurisdiction of the organization, and the holding of a united meeting annually, aiming in no way to interfere with the autonomy of the respective societies, proved only moderately effective; and when in 1898 some accessions in membership were obtained from British Columbia, it was decided to reorganize on somewhat broader lines by the creation of a society under one central administration, which should be essentially national in its aims, character and scope. Thus, at the close of the annual session of 1898, the Federated Canadian Mining Institute was dissolved, and the Canadian Mining Institute incorporated by Act of Parliament, founded in its stead. The Institute's first president was Mr. John E. Hardman, while Mr. Bell continued to act as secretary until the time of his death in 1904. When originally organized, the membership of the Institute was but sixty-three; but its success was assured from the start, and before the close of the year this number had increased to one hundred and ninety. To-day it is between eight and nine hundred.

The popularity of the Institute and its growth during the past eleven years may, perhaps, be attributed to two principal causes: the fortunate selection of public-spirited and able men to direct its affairs as members

of the governing body or Council; the tangible results achieved by the society in the interests of the mining industry. The first of these causes is naturally paramount in importance, for the Institute could not have influenced public opinion, secured recognition from governments, or otherwise played as it has a momentous part in the amelioration of conditions, had the men who administered its affairs and policies been anything else but zealous, able and disinterested. It is, meanwhile, a matter of record that one of the Institute's presidents, at the time resident in a distant part of the country, never once failed in his attendance at a Council meeting during his two years' term of office, although to perform this duty he was obliged on each occasion to undertake a special journey of over a thousand miles. To attend an annual meeting the president elected in 1907 travelled over six thousand miles, while last year the president of the Institute devoted no less than seven weeks of his time to duties, at times prodigiously strenuous, which fell to his lot as the Institute's chief executive officer and leader of the ocean-to-ocean excursion, representing over ten thousand miles of continuous travelling. These are merely instances. It may be added that there are very few men who have served on the Council to whom almost equally high tribute might not be justly paid; and to their devotedness, interest, loyalty and singleness of purpose the society is very deeply indebted.

As to the actual accomplishments of the Institute during the period under review, there have been, of course, advantages common to all successful societies of a like nature; such advantages, for example—social and educational—as are expected to be derived from professional intercourse, the interchange of views and ideas between men following the same calling, and by the publication and dissemination of valuable information and records. But probably no mining society in the world has exerted its ascendency to an equal degree or to better purpose in safeguarding the interests of its members, or rather of the industries they represent, against the passage of oppressive or ill-advised legislation, or has done more to influence the introduction of remedial measures where these were necessitous. Merely to indicate the scope of the Institute's activities in these directions, allusion need but be made to one or two instances of its successful opposition to the passage or operation of ill-considered legislation, such, for example, as the Order-in-Council of the Ontario Government in 1899, recommending the imposition of an export duty on copper-nickel ores and mattes—the effect of which, had it been put in practice, would undoubtedly have been to paralyze the nickel industry in Canada; and the proposed "Act to amend the Mines Act" of Ontario, 1900, which, as originally framed, passing a first reading, imposed absolutely ruinous and prohibitive taxes on the mining industry of the province. Again, in more recent times the advice of the Institute has been repeatedly sought by both the Federal and Provincial Governments in respect of proposed mining legislation, while if the society had done nothing else, its claims to consideration would have been more than upheld by the successful result of its endeavours whereby a Federal Department of Mines has been established under the direct administration of a responsible Minister. The recent repeal of the Quebec Mining Law, and the enactment of a new set of regulations decidely more conducive to the encouragement of legitimate prospecting and industry, is also directly traceable to the Institute's representations.

Other testimony might readily be adduced in evidence of the Institute's activity and services in the past, but doubtless sufficient has now been mentioned to fully serve the present purpose.

It may now, meanwhile, be permissable to refer more specifically to the objects of the Institute, to the ideas of the promoters who formulated them, and to compare conditions existing when these ideas were adopted with conditions to-day, in the hope thereby of provoking discussion on some of the questions involved. Briefly, then, these objects as set out in the Institute's charter, comprise the promotion of the arts and sciences connected with the economical production of valuable minerals and metals; the distribution of information; the establishment of a central reference library and headquarters; concerted action upon matters affecting the mining and metallurgical industries of Canada, and lastly, the encouragement and promotion of these industries by all lawful and honourable means. These objects, it will be noted, cover a very wide field, and are very much more comprehensive, than the sole object, for example, of the Institution of Mining and Metallurgy, which, as a strictly technical society, confines its aims to the general advancement of mining and metallurgical science. The charter of the Canadian Mining Institute, moreover, differs from the constitution of the Institution of Mining and Metallurgy in that the former contains no clause relative to the qualifications required of persons seeking enrollment as members, the matter being regulated merely by by-law, which is subject to amendment at any annual meeting; whereas in the case of the latter these requirements are very explicitly defined, and are not amenable to change. The records of the Institute, however, show that its founders very carefully considered the issue of the desirability, or otherwise, of organization on strict lines of technical or professional qualifications; and the conclusions then arrived at that the time was not opportune to attempt to found a society composed exclusively of professional men, and that, furthermore, if all conditions were favourable to the promotion of such a project, greater ends might be served by organizing on broader lines, and thus launching an organization which would embrace within its scope of activities not only the promotion of the arts and sciences of mining, but that of the industry of mining also. Hence, this was the idea that found expression in the charter, and the by-law regulating the matter of the eligibility of candidates for enrolment gave the Council practically without limitation or restriction discretionary powers as to whom they might admit to membership. Every system, however, is liable to abuse, and there can be no doubt that during the first few years of the Institute's existence, in the natural desire to increase its membership, less care than might have been was exercised in scrutinizing the status of certain candidates, with the result that several were admitted whose admission reflected no credit on the organization. No change in this general policy was made until some three years ago, when, at the annual meeting in Toronto, a new by-law was adopted establishing a second class of membership, those elected to which being termed "associates." This new by-law, while not limiting the Council's discretionary powers, was at least a suggestion to that body to thereafter discriminate between technically and non-technically qualified persons applying for enrollment, by classifying the latter as associate members. As to the advantage of this change opinion is still somewhat divided, although generally it is believed favourable. At the same time, it is fair to add that at least one member of the Council has registered a protest against the present practice, on the grounds that in his opinion it is not in the interests of the Canadian

Mining Institute, nor of the mining industry, nor of the profession of mining engineering, to attempt to establish a class distinction in the Canadian Mining Institute under existing conditions. In other words, the opinion of this gentleman appears to be that since the Institute represents an industry and not a profession, membership classification or discrimination, such as may be practised by essentially technical societies, is not one of its legitimate or logical functions. On the other hand, it may be well argued that while this may not be in accord with established precedents, these in a new country may be ignored without fear of dangerous consequences; and that, therefore, the Institute need not be deterred from adopting a policy of its own that would differentiate it from any other society of similar aims, for the reason merely that it would appear to be a departure. Admitting this, it but remains to discuss the question of the policy of classification on its merits. The most important point of all is how it has affected and how it is likely to affect the general development and usefulness of the society. So far as the by-law's recent operation is concerned, it is difficult to prove that it has exerted any injurious effect. This by-law has now been in force for nearly three years. In that time the membership has very nearly doubled. In 1907 there were elected 161 members and 34 associate members; in 1908, 87 members and 62 associate members, and in 1909 to date, 49 members and 52 associate members. During these three years only three candidates for membership have objected to their classification as associates, and in but one case has a candidate withdrawn his application in consequence of a ruling. This gentleman was a director of mining companies, his actual knowledge of mining was merely perfunctory, and in no sense professional or even practical. The Council, acting in accordance with the implication of the by-law, could not, therefore, have well come to any other decision than they did in adjudicating on this application.

It will be noted that the distinction between a member and an associate member is little more than nominal, the associate having all the privileges of membership, with the exception only that he is debarred from holding office. The attempt to classify the membership may be said, then, to have a sentimental basis rather than anything else, although its ultimate aim may be eminently practical. Thus, even full membership in the Canadian Mining Institute does not at the present time imply professional proficiency or even professional experience. A graduate fresh from college is as eligible for full membership as is a mining engineer old of international repute. The Institute merely draws a line, and a not particularly distinctive line, between those professionally engaged and those commercially engaged in the mining industry. Nevertheless, even this somewhat meaningless discrimination has, in the writer's belief, served to popularize the Institute with the class of men whose interest and support is of most value to the society. Although, as has been stated, the Institute represents an industry and not a profession, it can scarcely be disputed that the esteem in which the organization is held and the influence it exerts, is mainly attributable to the fact that its membership is preponderantly professional in character. Again, the technically trained engineer or practical mining man is necessarily in a position to render greater service to a society, one of whose chief objects is the publication of technical information, than another whose qualifications to express himself authoritatively on this subject are entirely limited. To complete the argument in favour of membership classifications, it may be further urged that no person desiring to join the Institute for legitimate reasons, such as to secure its publications, attend its meetings, or participate in its work, could or would offer reasonable objection to being classified as a non-technical man if he had no claim to the title of mining engineer. On the other hand, it is conceivable that one proposing to make improper use of his membership by, as has been done in the past, advertising it as proof of expert qualification, would strongly disapprove of a discrimination which might easily interfere with his schemes in this regard.

Against the system of discrimination the strongest argument, perhaps, is that it is not sufficiently thorough, and is, therefore, non-effective, if not actually injurious. Non-effective in the sense that the qualifications required for admission to membership are so broad as to be in a large degree meaningless; and injurious in that this absence of real significance is not realized by the general public, who would, naturally, be disposed to conclude the direct contrary from the fact that some sort of discrimination is now known to be exercised. Consequently the danger that Institute membership may be made to serve personal and improper ends is greater than before. The Council has, however, recognized and endeavoured to provide against, or at least minimize this possibility, by issuing at periodical intervals a list of the names of applicants, together with a statement of their alleged qualifications, to the membership at large, inviting members to scrutinize this list and to submit any criticisms they are in a position to afford concerning the status of candidates and which would affect their right to election. By this means the members as a whole are made to share with the Council any responsibility attaching to the admission of new members; but although these lists have now been issued for upwards of a year, as yet they have failed to elicit a single reply. Which, of course, presumes that all recent elections have been beyond reproach.

These, then, are in part the arguments for and against the present practice of membership classification. No doubt others could be adduced in support of contentions on either side. The question is worthy of consideration in view of the proposed revision of the by-laws this year, and it is to be hoped that members will take advantage of the present opportunity to present their views on the subject.

In conclusion, a word may be said on the Institute's recent policy of establishing branches throughout the country. The idea is not a novel one, even in the Institute, having been first suggested and partly carried into effect by Mr. Bell in 1902. It was also warmly advocated by Mr. Coste during his term of office in 1903 and 1904. The successful operation of the branch system, however, is of comparatively late date, and takes into account the organization of the Toronto, Cobalt, Montreal and Western branches. Of these, the Cobalt and Western branches are naturally the most important, and have served the most useful purpose; in fact, a large increase in membership during the past two years is chiefly due to the activities of these two branches, and of their executive officers, to whom the Institute is under considerable obligation. Until quite lately there has been much opposition in certain quarters to the establishment of branches, and even now some very able gentlemen hold the view that the expedient is a mistaken and dangerous one. Their ground for this belief is that branches foster and encourage localisms and sectional feeling; that they threaten to become a drain on the finances of the Institute, and, in brief, are likely to be a source of weakness rather than of strength. These ob-

jections contain, no doubt, at least a germ of truth, and it is well that they should be raised in order that any possible contingencies may be combatted before they actually arise. The Institute's chief claim to recognition, its power for good, is on the score of nationalism. As a national organization it is in a position to accomplish what would be otherwise impossible. This should be, and of course is recognized by every member, whether he belongs or not to a branch organization. The principle is precisely the same as that which governs the world by maintaining the individuality of nations. The branch, as such, is a small organization within a larger one, and its main function is comparable to that of a colony in its relation to an empire of which it is an integral part. Branches were originally established to meet conditions peculiar to this country. The centres of mining activity in Canada are widely scattered, and spread across a continent. It was realized that a great majority of members could not, by reason of these great distances, attend meetings; that it was difficult to keep in touch with them from headquarters, and that consequently they were apt to become indifferent to the Institute, or lose interest in it altogether. The only feasible way to overcome these difficulties was to create enthusiasm by local organizations, and by providing machinery whereby men residing in the same locality might meet as members of the Institute in common cause. It was in no wise intended that these local branches should become more than this. So far, the plan has proved most effective; but nowhere as at Cobalt, thanks in part to the naturally favourable conditions and environment, but more especially to the enthusiasm, notably that of the secretary, Mr. Cole, of the men who have taken a prominent part in the organization and administration of the branch.

THE DEVELOPMENT OF HEAVY GRAVITATION STAMPS.

*By W. A. Caldecott, Member.

The history of ore crushing by means of gravitation stamps shows a progressive increase in their weight and in corresponding efficiency. This holds good in the development from the square wooden non-rotating stamps in use in Germany in the Middle Ages[1] to iron-shod wooden stamps in Cornwall, and then to rotary iron stamps in South Africa. The latter have greatly improved during the last few years, and probably represent the highest existing stage of development. About 1835, the first stamp mill in the United States was started at Tellurium, Virginia.[2] The stamps weighed 50 lb., and were made of square wooden stems with iron shoes and dies, the cams operating in slots in the stems.

Ten years later the Vauclause Mine installed 380-lb. stamps, of which the head weighed 125 lb. When the first batteries were erected on the Rand over 20 years ago, Californian practice probably represented the highest state of the art, and was introduced upon these fields by J. S. Curtis, J. H. Hammond and other well-known Californian mining engineers.

To illustrate the type of battery in operation on the Rand in 1889, in which year the writer's experience of stamp-milling began, the following details may be given of the Du Prez Gold Mining Co.'s mill, premising that this was before the introduction of the cyanide process, and that concentrators, other than blanket-strakes and buddles, were not in common use.

The mill was erected in that year, and was of Sandycroft make, designed in accordance with the best Californian practice to date. It consisted of 20 stamps weighing 900 lb. each when new, and was run at the rate of 90 7-in. drops per minute. The stamp duty was about 3 tons per 24 hours, using a screen of 900 meshes per sq. in.

By 1899 some progress had been made and 1,250-lb. stamps were in use at the Robinson Gold Mining Co. and elsewhere, though in Australia and the United States 900 lb. per stamp remained the almost universal maximum limit, and this remains true of the celebrated Homestake mills at the present time. At the Mount Morgan Gold Mining Co. (Westralia), in December, 1902, 30 stamps weighing 1,500 lb. each were erected. These were eclipsed, however, by the neighbouring Millionaire Gold Mining Co.'s battery of five stamps weighing 1,750 lb. each.[3] The advance made on these small companies was not generally realized, and in 1907 few stamps dropping on the Witwatersrand weighed above 1,250 lb., with the exception of certain batteries of Consolidated Goldfields companies, as will be noted later.

In 1904, the author was authorized by Mr. R. M. Catlin, Acting Consulting Engineer of the Consolidated Goldfields, to carry out a series of milling tests at the Knights Deep battery, which was equipped with stamps weighing 1,350 lb. when new. The object of the trials was to discover some means whereby stamp-milling efficiency could be increased.

The initial experiments were made to test the effect of fine breaking before stamp-milling, and also whether the increased discharge area afforded by a double discharge mortar-box increased the stamp duty. A pair of rolls was installed to effect the preliminary fine breaking, and also a double discharge mortar-box. A

* Paper read before the Institution of Mining and Metallurgy.

1 See Remarks by Bennett H. Brough, Proc. Inst. of Civil Eng., vol. cviii. (1892), during discussion upon paper by A. H. Curtis on "Gold Quartz Reduction."

2 See Crane's "Gold and Silver," p. 473 et. seq.

3 See Special Edition of Australian Mining Standard, December 8th, 1904; also Jl. of Chem. Met. & Min. Soc. of S. A., vol. vii, September, 1905, p. 92.

staff of men was specially employed to carry out the trials, and most complete and detailed records were kept.

The tests extended over more than a year, and a considerable amount of money was expended in testing many variations of conditions, such as varied angles of screen frames, heights of discharge and of drop, and different methods of water introduction into the upper portion of the mortar-box.

The following statement illustrates some of the many experimental runs:—

	(A) Single Discharge Mortar. Ordinary Mill Feed.	(B) Single Discharge Mortar. Ore from Rolls set 0·5 in. apart.	(C) Double Discharge Mortar. Ordinary Mill Feed.
Running Weight of Stamp	1343 lb.	1342 lb.	1356 lb.
Set Height of Drop	7½ in.	7½ in.	7½ in.
Drops per minute	98	98	98
Duty per Stamp per 24 working hours	5·85 tons	5·68 tons	5·81 tons
Height of Discharge	2¾ in.	Level	3¾ in.
Screen used and Aperture	700 (·024 in.)	700 (·024 in.)	700 (·024 in.)
Ratio of Water to Ore by Weight	7·67 to 1	8·35 to 1	10·70 to 1
Percentage of + 60 (0·01 in.) grade in screen pulp	29·00 %	27·50 %	26·00 %
Ore Feed + 1⅜ in..	54·8	1·1	49·9
− 1⅜ + ¾ in.	14·3	19·3	16·3
− ¾ in.	30·9	79·6	33 8

The results of the above typical trials with a double discharge mortar-box and with fine breaking before stamp-milling are almost identical within the limits of experimental error.

The above conclusions were confirmed by the fact that the average stamp duty on ordinary mill-feed for six pairs of parallel trials was 5.82 tons with a double discharge mortar, and 5.82 tons with a single discharge mortar.

The average stamp duty for four pairs of parallel trials on the product of rolls set ½ in. apart was 5.64 tons with double discharge mortar, and 5.78 with a single discharge mortar. There was no increased duty to compensate for the extra cost of preliminary fine breaking,[4] and the only difference with the double discharge mortar-box was a considerable increase in the amount of water used.

This last conclusion is in accordance with the fact that the ordinary single battery screen has about 40 per cent. of its area available for discharge, or, say, 1½ sq. ft. of discharge area for the small stream of pulp yielded by five stamps.[5] It will be observed that in trial (B) many flat pieces of ore which had passed the rolls set ½ in. apart yet remained on a coarser screen used in the grading analysis.

Finally it became obvious that to crush more rock it was necessary to strike a heavier blow. This was sought by affixing helical springs round the stem above the tappet so as to be compressed by the upper guide during the stamp's rise, and so that when released the stamp would fall more rapidly, rendering a higher drop practicable, and would likewise strike harder. Whilst this object was in some measure fulfilled, the noise in the mill was much increased and the life of the springs did not promise to be long. Hence, finally, the conclusion was reached that a simple increase of stamp weight was the best course.

A series of runs were then made, whereby direct comparisons could be obtained of the actual tonnage milled by alteration in the weight of stamps. The table on p. 5 exemplifies the increased tonnage obtained by increased weight of stamp on ordinary mill feed, both under ordinary milling conditions and with a high discharge and back water feed to obtain a very fine product.

Another run with 1,337-lb. stamps having a height of discharge of 2 in. and a 64-mesh screen gave a duty of 10.23 tons per 24 working hours, of which 52.8 per cent. remained on a 60 screen. The water-feed adopted in this test consisted of inlets at an angle of 45 degrees at the back of the mortar-box, as suggested by the late Mr. H. T. Pitt.[6]

Encouraged by the results of these and many other tests, including a duty of approximately 6½ tons through 1,500-mesh screening with stamps weighted up to 1,622 lb., the writer felt justified in recommending that the next 360 stamps erected by Consolidated Goldfields Companies, namely, at the Simmer East, Robinson Deep and Luipaards Vlei, should have a weight of 1,550 lb. each when new.[7]

Such a departure excited much adverse comment among experienced millmen generally, on the ground that no foundations could stand the shocks, but the reasoning that if foundations could be built to endure the blow of the colossal steam stamps, it would be possible for them to be built to withstand gravitation stamps, proved correct. All the above mills are satisfactorily at work to-day after periods of service ranging up to three years, and the foundations promise to last as long as did their lighter predecessors.

In accordance with the present changed state of professional opinion, all Rand batteries lately erected or designed have stamps of a weight not long ago deemed extravagant, and aided by the installation of tube-mills, stamp duties of 8 tons are as common as of 4 tons but a few years previously.[8]

Whilst in the United States and in Mexico the relatively light stamp is still generally upheld, there is at least one notable exception in the recently built mill of the Boston Consolidated Copper Co., which is equipped with 312 single Nissen stamps of 1,500 lb. weight each and with a 9-ton duty.[9]

The accompanying diagram, Fig. 1, illustrates a modern heavy gravitation stamp with its mortar-box, as used in the Simmer Deep Jupiter joint mill.

The tabular statement illustrates the results obtained on a large scale under regular working conditions by the use of heavy stamps, and further shows in

[4] See also Journal of C. M. & M. Society of S. A., vol. vi, Jan., 1906, p. 215.

[5] See Lock's "Gold Milling," p. 79.

[6] See Trans. Inst M. & M., 1904, vol. xiv, p. 164; also Journal Chem. Met. & Min. Soc. of S. A., 1908, vol. viii, p. 374.

[7] See Annual Report of Con. Goldfields of So. A. for 1905, p. 32; also Report for 1906, p. 27, and Report for 1907, p. 28.

[8] See the S. A. Mining Journal, p. 802, Sept. 19th, 1908; p. 1016, Nov. 14th, 1908; p. 1100, Dec. 5th, 1908; and p. 1348, Feb. 6th, 1909; 1860-lb. stamps with a 12-ton estimated stamp duty are to be erected on the West Rand Consolidated property (South African Mining Review, p. 232, Nov., 1908).

[9] See Eng & Min. Jour., 14th Sept., 1907, p. 433.

the case of the Simmer East that whilst stamps alone can be used with a high discharge to produce a fine product, yet the later use of tube-mills as well yielded at the same total cost a product with fewer coarse

stamp batteries side by side in the Simmer East mill, the one with a concrete block only, and the other with a cast-iron anvil block as well, shown in the accompanying Figs. 2 and 3.

Apertures per sq. in. in screen used.	Running weight of Stamps in lb	Set Height of Drop.	Height of Discharge.	Tons of Water used per ton of Ore	Tons of Ore crushed per stamp per 24 working hours.	% of + 60 (·01 in.) grade in screen pulp.
981 (0·021 in.)	1196	8 in.	3 in.	5·8	5·88	22·63
,, ,, ...	1279	,,	,,	5·8	6·58	22·23
,, ,, ...	1531	,,	,,	5·7	6·74	20·86
1512 (0·016 in.)	1216	8 in.	11 in.	5·40	4·26	5·16
,, ,, ...	1288	,,	,,	5·30	4·29	4·91
,, ,, ...	1293	,,	,,	5·43	4·55	9·49
,, ,, ...	1337	,,	,,	6·27	4·96	6·66
,, ,, ...	1562	,,	,,	5·05	5·17	—
,, ,, ...	1605	,,	,,	6·30	6·02	11·66

(+.01 in.) particles, and hence a still more perfect exposure of the gold.

Somewhat later than the series of battery tests already described, the matter of battery foundations was also investigated. It was recognized that timber foundations were unsuitable for heavy stamps, their liability to decay rendering them less durable than the then recently introduced cast-iron anvil blocks. However, it had never been practically proved since the introduction of these anvil blocks that they were superior to concrete foundations in themselves, and that this point might be elucidated the author in 1906 had a series of 23 comparative trials carried out on two five-

The results of the parallel trials were on the average practically identical. These extended from the use of 100-mesh screening to 1,400-mesh, and the cast-iron anvil block battery showed an average stamp duty of 6.84 tons as against 6.78 tons for the concrete block, the average screen grading analysis of the latter showing, however, only 25.00 per cent. of + 60 (0.01 in.) grade as against 26.76 per cent. for the cast-iron anvil block.

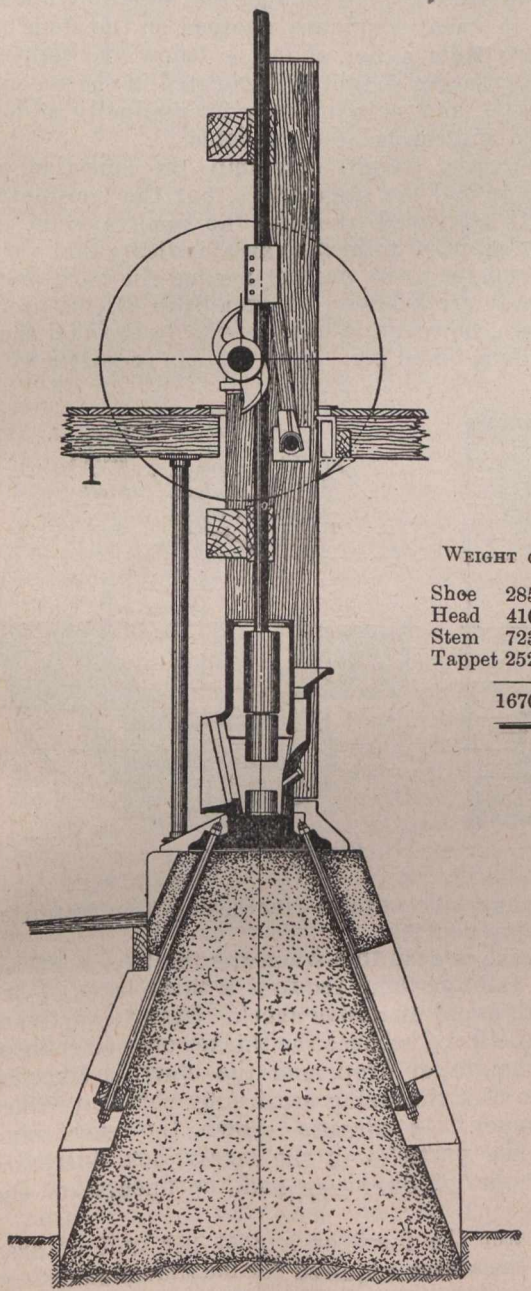
The question of the life of the concrete block without

	Luipaards Vlei.	Simmer and Jack East.	
	(August, 1908.)	(May, 1907.)	(January, 1909.)
Tonnage milled during month	18,807 tons	35,500 tons	29,600 tons.
Number of Stamps	60	250	130
New Weight of Stamps	1629 lb. (with 18½ ft. stem)	200 at 1550 lb. 50 at 1350 lb.	1550 lb.
Running Weight of Stamps	1520 lb.	200 at 1450 lb. 50 at 1250 lb.	80 at 1450 lb. 50 at 1550 lb. (with compensating weights)
Average Drops per minute and Set Height of Drop	98·6 at 8½ in.	96 at 8 in.	96 at 8 in.
Duty per Stamp per 24 working hours	9·667 tons	5·006 tons	8·333 tons.
Height of Discharge	4 in.	9 in. (average)	3½ in.
Screen used and Aperture	200 (·056 in.) and 250 (·046 in.)	1600 (·016 in.) and 1200 (·017 in.)	200 (·057 in.) and 400 (·035 in.)
Ratio of Water to Ore by Weight	8 to 1	8 to 1	6·46 to 1
Percentage of + 60 (0·01 in.) grade in screen pulp	43·7 %	10·92 %	1·61 % (final pulp).
Cost of Crushing per ton of ore—			
(*a*) Stamps	1*s.* 3·879*d.*	1*s.* 10·424*d.*	1*s.* 3·672*d.*
(*b*) Tube Mills	6.215*d.*	—	7·070*d.*
(*c*) Total	1*s.* 10·094*d.*	1*s.* 10·424*d.*	1*s.* 10·742*d.*

out timber or a cast-iron anvil block has received attention also, and one mortar-box, erected on Mr. H. C. Behr's recommendation at the Simmer East Mill, upon a concrete block with only a thin layer of insertion

between, has been in use now for three years with no visible sign of cracking or deterioration. This has been so encouraging that at the Simmer Deep and Jupiter mills all the batteries have been erected with the mortar-box resting on the concrete blocks.

Crushing is usually performed either by impact or abrasion, and whilst hard ores are best dealt with by the former method, the latter is applicable to softer material. The relative efficiency of the two methods for hard material is well illustrated by the case of the diamond,



WEIGHT OF STAMP (NEW).

Shoe	285 lb. =	17·066 %
Head	410 ,, =	24·551 %
Stem	723 ,, =	43·293 %
Tappet	252 ,, =	15·090 %
	1670 ,, =	100·000 %

FIG. 1.

which is hardly capable of abrasion at all except by its own dust, whereas, if placed on an anvil, it will be shattered into a thousand fragments by one blow of a hammer.

As has been pointed out by C. de Kalb, the crushing of the larger pieces of ore in stamp milling is done as the result of reaction from the resilient die, the waves of compression transmitted through the ore from the shoe being reflected from the die, until the strains set up from the oncoming and reflected waves exceed the elastic limit of the ore, and rupture results.[10] The stamp is essentially an impact machine, and hence readily pulverizes hard tough ore.

Such ore, if handled in any of the legion of rubbing or shearing appliances, would only be reduced at the expense of serious wear by abrasion of costly steel parts which may have to be discarded when but a fraction of their weight has been worn away. With soft material the case is different, and machines of the latter class may be employed with advantage and without undue abrasion of wearing faces.

It is much to be regretted that no satisfactory machine for testing the capacity of material to resist abrasion, or conversely of testing the abrasive capacity of materials requiring abrasion, yet exists, as this property is of prime importance in all crushing operations.

When gravity stamps are used for very fine crushing they pass beyond the economic range, and operate by abrasion rather than by impact, with consequent reduction of efficiency, as may be seen from the following considerations. Impact is essentially dependent on the pressure exerted by the blow, and depends upon the

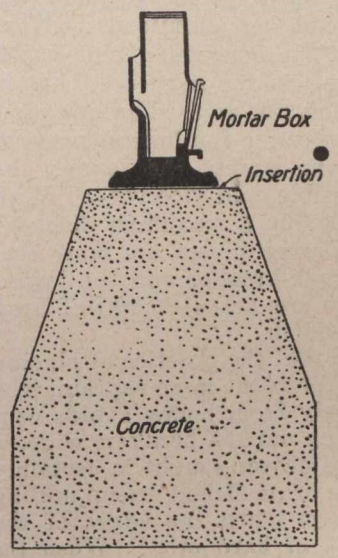


FIG. 2.

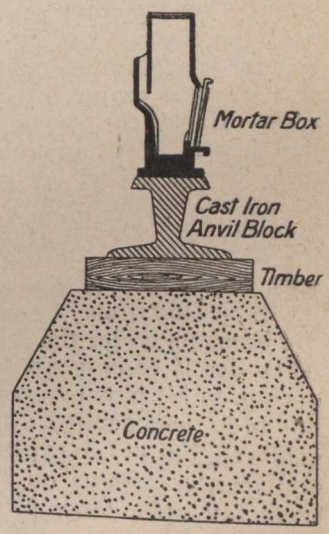


FIG. 3.

weight of the stamp and the height of the drop. Assume that a 1,750-lb. stamp having a 9.5 in. diameter shoe and with a set height of drop of 8 in. strikes a layer of ore 2 in. thick on the die, and comes to rest 0.5 in. from the die. Then having fallen 7.5 in. and having done work for 1.5 in., it has exerted on the ore a mean total pressure of 8,750 lb.[11] The shoe having an area of 71 sq. in., the average unit pressure exerted over the whole of its area is only 123 lb. per sq. in., or less than that exerted by a man of average weight supported upon an area of 1 sq. in.

The crushing effect of such a pressure on hard quartz grains is trivial, and a certain amount of reciprocal abrasion of grains of sand re-arranging themselves under pressure is probably the main effect produced. The case, however, is quite different in the first impact of the stamp on the ore in the box. Assume that only a 2in. cube resting on the die is first struck; having an

[10] See Mines and Minerals, p. 135, Oct., 1906; O. H. Howarth in Mines and Minerals, p. 441, May, 1906; and Journal Chem. Met. and Min. Soc. of S. A., vol. vi. June, 1906, p. 385.

[11] Cf. Hiscox, "Compressed Air," p. 437.

area of 4 sq. in., the average unit pressure here is 2,190 lb. per sq. in., or eighteen times as much as under former conditions.

The finer the crushing is carried in the battery the longer sand particles remain before sufficiently reduced to escape, and the higher the ratio of fine to coarse material in the mortar-box. Hence, under these conditions the liability is for the falling stamp to have its force of impact distributed over so large an area as to produce little effect but abrasion on a bed of shifting compressible sand. These considerations serve also to explain why fine breaking before milling with heavy stamps does little good. A large number of pieces of ore of approximately equal size afford a large area to receive the blow of relatively small pressure upon each. And further, the abrasive action, above referred to, explains why stamp milling with a fine screen and a high discharge, or both combined, is inefficient through the waste of energy in converting fine sand into slime by abrasion of the particles re-arranging themselves under the stamp.[12]

As regards the desirable size to which ore should be broken before entering the mortar-box, the disadvantage of too fine crushing yielding a uniform bed has already been pointed out. The maximum limit varies with the class of ore, being less for hard ores, but in general it should be such that not more than one blow of a stamp is required to pulverize the largest piece of rock. Hence the heavier the stamp, the coarser the preliminary breaking admissible, and vice versa. With unweathered banket ore probably a maximum diameter of 1¾ in. is permissible. Larger pieces are more economically reduced by the rock-breaker and the lowering of stamp duty, owing to less actual height of drop with such a feed, is thus avoided.

In passing it may be said that the practice of placing the breakers under the control of the mine captain, who when ore is coming up freely from below avoids congestion in his bins by opening out the breakers wide, is not to be commended. The object sought is certainly achieved, but at the expense of inefficient stamp milling and greater strains on stems when the edges of the shoes fall upon large pieces of hard ore.[13] When the pieces of ore are too large to enter the feed opening of the mortar-box, and feeding consequently ceases, the results are of course even worse.

Taking the average running weight of a stamp as with a half-worn shoe and with a stem of less than its original length owing to breakage, it will be found that this weight is some 10 per cent. less than the weight of the stamp when new, and that its duty is correspondingly reduced. The obvious remedy is the use, as the shoe wears down, of compensating weights in some form or other, which have been frequently suggested and occasionally used.[14]

Since, however, greater attention has been directed to the weight of stamps through the trials on the Knights Deep referred to, the use of compensating weights has become common on the Rand, and their importance in maintaining a high efficiency and stamp duty is so considerable as to be well worth the small additional trouble and expense involved by their use. Probably the earliest form of this device was placing an old head at the top of the stem or an extra tappet above the one in use.

These devices were, however, crude, and the writer has tried various other methods, including a false head intermediate between the true head and the shoe, on the ground that additional weight is better added near the bottom than near the top of the stem. Probably the most convenient compensating weights, however, are split cast-iron discs about 4 in. high and weighing about 50 lb. or 60 lb. each, which are clamped on the stem by means of two bolts either above or below the tappet. Such a compensating weight is illustrated in the accompanying Fig. 4, and as many may be gradually added as are needed and can be accommodated.

With increased weight of stamp, the question of increased shoe and die area arises, but the considerations already advanced, showing the small amount of pressure per sq. in. of total shoe area, indicate that very large shoe and die areas are not needed for hard ores, whilst for soft ore a lower, quicker drop can be used. Some increase, however, is usual owing to the fact that the larger diameter of stems and tappets required with heavier stamps necessitates increasing the distances between stamp centres.

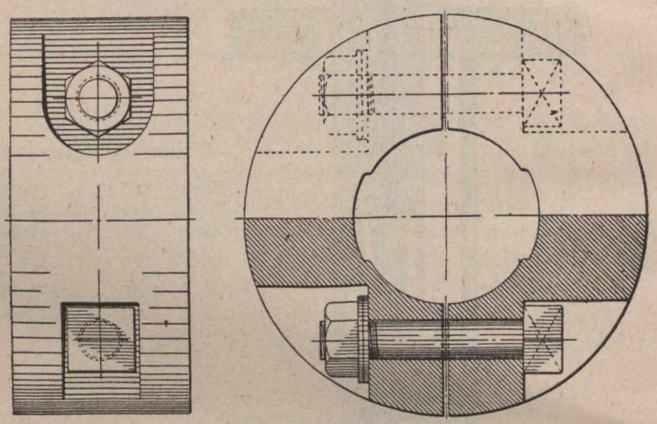


FIG. 4.

An increase is desirable when the total force of impact of the falling stamp requires a thick layer of ore on the die to avoid excessive shock. Such heavy feeding lessens the duty, because the thicker ore bed reduces the actual height of drop, and the blow is likewise cushioned so that the stamp crushes by abrasion rather than by impact. As already shown, the cushioning caused by fine particles in the mortar-box increases with the height of discharge and the fineness of the screen.

The greater the force of impact per unit of area the coarser the screen required for maximum efficiency, as otherwise a thick layer of fine ore particles would be needed to avoid pounding. Since even a heavy stamp crushes but a very thin layer over the surface of the die, it is obvious that the least thickness of ore layer necessary to take the impact of the stamp without pounding is sufficient to supply ample material for pulverization.

The prevention of irregular wear of dies is as yet an unsolved problem. At first sight it would appear that a slight cavity in the die surface due to soft metal would, when formed, be protected against further excavation by the surrounding portions of the die standing

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12 See E. A. Hersam's paper on "Economy of Power in Crushing Ore," published in the Mining & Scientific Press, of 16th Nov., 1907, p. 624; also C. de Kalb n Mines & Minerals, p. 136, Oct., 1906.

13 See T. A. Rickard's "Stamp Milling of Gold Ores," p. 151.

14 See Lock's "Gold Milling," p. 109; also Journal of Chem. Met. & Min. Soc. of S. A., vol. ii, April, 1898, p. 299.

above it, but in practice no such protection seems to be afforded. The cavity grows steadily deeper with use, and even turning the dies regularly is not a cure.

In the writer's opinion the trouble is due to the larger pieces of ore, or pieces of steel such as drill ends, gravitating in the swirl of pulp in the mortar-box to the lowest point, that is into any slight depression originally due to softness of the metal, and thus the impact of the falling stamp is transmitted to gouge out the bottom of the cavity. Such irregular wear is especially liable to start at the back of the centre dies where the ore feed first lodges and is thus struck whilst at its largest size.[15]

Consequent upon the introduction of tube-mills, coarse battery screening has generally replaced the finer mesh, and thanks to the work of this Institution, and of the Chemical, Metallurgical and Mining Society of South Africa, more accurate descriptions are now applied to screening,[16] with the result that the millman can with some certainty obtain a duplication of a previous order.

In accordance with the demands of the modern millman armed with a micrometer gauge, manufacturers' catalogues, in place of giving vague trade terms, now detail diameters of aperture, wire and so forth, with a most laudable desire for extreme accuracy.

Since this development, however, the general introduction of secondary grinding by means of tube-mills has lessened the importance of the battery screen as a criterion of the degree of reduction of an ore, and, in fact, the grading analysis of the final pulp leaving the crushing plant as an overflow of the hydraulic classifiers is now the guide to the metallurgist.

As pointed out previously before this Institution, this change makes the degree to which a particle is reduced dependent on both its diameter and its specific gravity, instead of on the former only, with the result that the pyritic material undergoes that finer comminution and more perfect exposure of gold contents which its greater value renders desirable.[17]

Breakages of cam-shafts as well as stems and other battery parts are still commonly described as being due to "crystallization" set up by vibrations incidental to the operation of crushing. At the present day, however, such an explanation cannot be accepted, it having been proved that repeated shocks in time develop, in such essentially crystalline aggregates as iron or steel, minute microscopic crevices which gradually extend until a fracture results.[18]

Among the few who have initiated improvements in stamp mill design of recent years is that experienced millman, M. P. Boss, whose design of a stamp with long head, thus giving strength at what would otherwise be a weak point in the stem, is worthy of serious investigation.[19] It is somewhat remarkable that whilst the number of crushing machines invented to supersede stamps is endless, and much space in metallurgical publications is devoted to the description of crushing plants, yet the actual operation of the gravitation stamp and the discussion of its most appropriate design has been but little dealt with either by the skilled engineer or by the mathematician.

In order to employ heavy gravitation stamps to full advantage, it is absolutely necessary that a uniform speed should be maintained by proper governing of the engine. Only under these conditions can the maximum speed and height of drop be safely used without fear of camming; and the damage done in a few moments by sudden increased speed above the normal may prove a costly matter both in loss of time and material. Further, with heavy stamps the use of five-stamp cam-shafts is very desirable, in that as compared with ten or fifteen-stamp cam-shafts both the power to be transmitted and the number of shocks due to lifting stamps are reduced by one-half or two-thirds for each shaft.

Many attempts have been made to supersede the use of gravitation stamps as the standard machine for the crushing of gold-bearing ore, but without success. That, in spite of certain obvious disadvantages, they still hold their own, is probably due to the fact that pneumatic and steam stamps as hitherto designed have proved wasteful of power and liable to derangement under the vibrations and shocks inevitable during crushing, whilst the gravitation stamp has little to go wrong, and power can be cheaply developed by a complex and economical steam-engine removed from unfavourable conditions and tended by a skilled operator without other duties. A serious effort is, however, now being made to utilize a new type of Holman pneumatic stamp at the New Kleinfontein mill, and there is no doubt that the energy and experience of those concerned in this test will, if it is possible, overcome such difficulties as have been encountered in the past with similar crushing appliances.

From the foregoing discussion it will be evident that the day of the stamp as a unit of crushing capacity has passed away. The unit of the present basis is the tonnage crushed per month or per day, and this is dependent on many factors—the relative proportion of stamps to tube-mills, the actual running weight of the stamps, the ratio of water fed, the height of discharge, the height and number of drops per minute, the screening used, and the maintenance of "concert pitch" in the mill engine.

The future limit of stamp weight is difficult to foretell, but it will probably be determined more by the mechanical considerations involved, as in the cam system of lifting, than by any decreased relative efficiency as a device for pulverizing ore.

The advantages of heavy stamps, as compared with lighter ones, may be briefly stated as follows:—

1. Reduction of the initial capital expenditure in erecting, say, 200 stamps at 1,750 lb. with accessories, in place of 280 stamps at 1,250 lb. each.
2. Reduction in size of mill building, almost proportionate to the less number of stamps.
3. 30 per cent. less shafting, belts and other moving parts to maintain.
4. 30 per cent. less labour required for dressing plates, lubricating moving parts, changing screens, and other work incidental to milling operations.

In concluding this somewhat lengthy, yet incomplete discussion of some of the factors affecting present day stamp-milling, it is my pleasant duty to acknowledge my indebtedness to the Consolidated Goldfields of South Africa, whose foresight provided means whereby a departure was rendered possible which, besides bene-

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15 See Jl. C. M. & M. Soc. of S. A., vol. vii, 1907, pp. 216 & 293; also paper by M. P. Boss on "Crushing Ore" published in The Mining & Scientific Press of March 14th, 1901, p. 356.

16 See Jl. C. M. & M. Soc. of S. A., June, 1906, vol. vi, p. 393; also October, 1907, vol. viii, p. 130.

17 See Trans. Inst. M. & M., vol. xiv, 1904, p. 55.

18 See Rosenhain on "The Crystallization of Iron and Steel" in The Times Eng. Supplement, p. 1, 6th Nov., 1907.

19 See Mines and Minerals, p. 209, Dec., 1908.

fitting the gold mining industry in general, has enabled them to claim "the heaviest stamps and the highest average stamp duties of any gold mining corporation in the world;"[20] and to Messrs. R. M. Catlin, H. H. Webb, and H. C. Behr and their staffs for greatly appreciated encouragement and suggestions during the progress of the experimental work detailed.

A MODERN MINING PLANT ON THE RAND.

The following extract from the South African Mining Journal, describing the plant on the Simmer Deep-Jupiter, is most interesting. The reader will notice that many new features are incorporated in the equipment:—

"This plant has the distinctive feature of being entirely driven by electricity from the stamps right down to the last pumps in the extractor house. The 300 stamps, each of which weighs 1,670 lbs. when new, are driven in lots of 10 by separate three-phase motors of about 50 h.p. The drop is about 8½ ins. The pulp, after passing over the amalgam tables, is pumped to 12 classifiers. The underflow from these goes to four tube mills, 22 ins. by 5 ft. 6 ins., driven by separate 125 h.p. three-phase motors. The overflow from the classifiers gravitates to 12 conical sands separators. Here a complete separation of the slimes from the sands takes place. These sands separators are 6 ft. in diameter by 6 ft. 6 ins. They are provided with a movable diaphragm about 2 ft. from the nozzle to regulate their action. The underflow from these separators is pumped to a set of eight conical de-watering cones, 8 ft. 6 ins. by 9 ft. deep. The overflow from these cones passes to two others, the underflow from which gravitates back to the mill tailings launder, and the overflow goes to the slimes plant. It is being found that four of these cones are sufficient when run in conjunction with the two cones last referred to. This part of the plant was in the nature of an experiment, the outcome of which was more or less assured.

"The underflow from the de-watering cones, containing about 33-35 per cent. of moisture, is delivered on to the two continuous vacuum filters that are the feature of the plant, and were from the design of Mr. W. A. Caldecott, the consulting metallurgist to the Consolidated Gold Fields Group of Mines. These filters are in the form of circular tables, 29 ft. in diameter, the filter bed being 2 ft. 6 ins. wide, giving an area of 137 square feet, and make one revolution in about three minutes. Thus, a 1½ in. layer of sand is run on to the bed. A pump, giving a vacuum of about 7½ ins. of mercury, by withdrawing the air and water from below the bed, reduces the moisture in the sand to 16-17 per cent. A plough arrangement removes the dried sand from the bed. There are two of these filters at work, and they treat from 1,200 to 1,400 tons of sand per day. The filter bed is made by placing coir matting on slats about 4½ ins. apart. Unbleached calico is placed on top of the matting. The filter has to be renewed once in 24 hours, the time taken being about 45 minutes. The dried sands are mixed with a .025 to .030 per cent. KCN solution, and pumped to one of 8 sands tanks, 8 ft. 3 ins. by 50 ft., where they are distributed by the 'Butter and Mein' apparatus. These tanks are capable of holding 750 tons of dry sand. The overflow from these tanks goes back to be mixed with more dried sand. The sand is given from two to three days' treatment, this being facilitated by applying a vacuum pump, the solution being finally delivered to two storage tanks of the same size as the sands tanks prior to going to the extractor house. When these tanks have been drained the sand is removed through holes on to shuttle belts 32 ins. wide, which in turn deliver to the two main belt conveyors 28 in. wide. There are six of these shuttle belts, but only three are used per tank at a time. The belt conveyors take the sand to ten sands leaching tanks (Blaisdell distributors being used), the first solution applied being about .12 per cent. KCN and the final about .025 per cent. KCN. From here the sands are taken by 20 cubic ft. trucks to the dumps. The circuit of the sand from the mill to the dump is only about 6½ days. From the time the sands are delivered from the mill to the time the sands are charged into the sands tanks is only about two hours. The advantage of this system is therefore obvious. The ordinary time taken is almost ten days for sands treatment.

"There are 16 tanks at the slimes plant, these being 70 ft. by 12 ft. to 17½ ft. deep at the centre, and are about the largest at present in use. Their capacity is about 400 tons of dry slime. A 12-in. centrifugal pump with 16 ins. suction and delivery can transfer 400 tons of dry slime with 43 per cent. of moisture in about 50 minutes. There are two of these pumps. A notable feature of this slimes plant is that the whole of the operations can be overlooked from a small building in the centre of the plant. All the solution from the slimes plant is passed through filter presses, of which there are three of 48 frames, 32 ins. by 32 ins., to remove any calcium carbonate and other matter that would interfere with or foul the precipitation. There are eight zinc boxes for the slimes solutions, and these treat about 2,500 tons of solution per 24 hours. There are 12 zinc boxes on the sands side of the extractor house, but only a portion of them are in use. About 66 per cent. of the dissolvable gold goes into the .025 per cent. KCN solution first mixed with the sand. This solution usually runs from 1.8 to 1.9 dwt. per ton, and only assays .01 dwt. on leaving the boxes. Separate boxes are kept specially for this solution. The sands themselves usually run about 3-3½ dwts. per ton. Other boxes are, of course, kept separate for the strong and the weak solutions. Three more tube mills will be installed shortly, as well as three new slimes settling tanks, two of which are in course of erection. This extension of the slimes plant has been found necessary from the increased length of time required to settle the slime in winter, and especially that from the dump rock now being partially milled. Next winter, when it is expected only fresh rock will be milled, the plant as extended will be capable of treating the 66,000 tons per month—its nominal capacity."

ELECTRICAL POWER FOR RAND MINES.

The project for producing electrical power at the pitheads of the local coal mines in the neighbourhood of Johannesburg is one which promises commercial success in consequence of the contracts entered into with the Eckstein, Consolidated Gold Fields of South Africa, General Mining and Finance, Messrs. Goerz & Co., and other groups for a period of 20 years. The

[20] See Annual Report of the Consolidated Gold Fields of South Africa, Ltd., 1908, p. 30.

contracts entered into are estimated to amount to 400,000,000 units a year, with an ultimate requirement of 500,000,000 units, making this the largest electrical installation in the world. The Kalgoorlie Electric Company supplies many of the Kalgoorlie mines with power, also the Tramway Company and the Townships of Boulder and Kalgoorlie, and only requires 10,000,000 units annually. In comparison the magnitude of the Rand's requirements is fifty times as great. The price at which the contracts have been taken allows a substantial profit to the Power Company, even on the basis of the smaller supply now being generated, but with the enormous increase to be provided by the end of 1910, the reduction of costs should allow a larger margin of profit, and still effect a considerable reduction in power costs to the mines. Seeing that many of the contracts involve the scrapping of large steam plants now at work on the largest mines, it is certain that such would not have been done if a considerable advantage were not assured through the change, but it will mean much more to such mines as the City Deep and all new mines, as it will save them the large expenditure for motive power in all their operations. New mines will, therefore, require to provide much less working capital than when they had to provide huge steam engines.

EXCHANGES.

The South African Mining Journal, August 21, 1909.—The S. A. Mining Journal pleads for concerted effort on the part of syndicates in prospecting for petroleum. It urges also upon the Geological Survey Commission the propriety of bestirring themselves in the same cause. In the same article our contemporary expatiates upon the origin of oil, referring to the distillation of petroleum from coal as the result of the intrusion of basaltic dykes as an established fact. We commend to the writer of the article Mr. Coste's paper on the origin of coal and petroleum.

The Colliery Guardian, September 10, 1909.—Referring to the renewed crisis in the collieries of South Wales, the Guardian reminds its readers that it, the Guardian, stood alone in taking a less sanguine view of the Cardiff settlement, June 30th, which was heralded as a triumph of conciliation. Mention is made of the circular letter, recently issued by the Coal Owners' Association. Continuing, the Guardian wisely points out that "there can be no useful purpose served by attempting to discount the gravity of the situation. The fact is that the [Eight Hours] Act is practically unworkable in South Wales, and the position of the collieries has been rendered quite unworkable by the unreasonable and fractious obstruction of the workmen and their representatives. Everybody connected with the trade . . . is becoming unnerved by the uncertainty and insecurity of the market."

The Mining Magazine, Volume 1, No. 1, September, 1909, (London, England.)—Many features of interest call for attention in this first number. The Review of Mining occupies the first eight pages. Here are discussed the current mining affairs of South Africa, West Africa, Australia, Mexico, and other countries. Fourteen editorial pages follow. It may be noted that the last editorial, "The Price of Copper," indicates that The Mining Magazine believes that "production appears fully to keep pace with any anticipated consumption; therefore, there is no reason to expect an increase in the price of copper, although there is no immediate fear of a further decline." Next comes the section assigned to "Special Correspondence." The letters from Johannesburg, Mexico, San Francisco, Denver, New York, and Redruth are good stuff. They are not merely a record of work done; they give one a bird's-eye view of general commercial, technical, and political conditions. "Metal Markets" and "Discussion" are followed by 28 pages of technical and general articles. Then, after five pages of summarized company reports, we find the same amount of space devoted to a "Précis of Technology," in which are numerous digests of current monographs, and bulletins. Three minor departments, "Current Literature," "Books Reviewed," and "New Publications," complete the magazine.

The Engineering and Mining Journal, September 18, 1909.—The relation of mine explosions to earthquakes is a topic that generated a certain degree of heat between the Engineering and Mining Journal and that most respectable monthly, Mines and Minerals. Their exchange of editorial grape-shot was noted in these columns. The E. and M. J. held that the hypothesis that there is connection between the two phenomena is not unreasonable, and is supported by substantial arguments. Mines and Minerals laughed the laugh of scorn. Seemingly that laugh was premature. In the current number of the E. and M. J., Mr. W. A. Spalding develops a strong case for the existence of a connection between mine explosions and seismic disturbances.

A mine explosion, says Mr. Spalding, is not a natural phenomenon. It arises from a natural condition plus an artificial condition plus an accident. Now, although earthquakes are localized by the region of least resistance or of greatest pressure, seismographs inform us that minor tremors pass entirely round the earth, and are recorded thousands of miles away from the centre. . . . "A mine is an artificial pocket in the earth. At a time when gases are driven forward by compression—

when the earth's crust is flexed, buckled, broken by seismic action—what assumption is more natural than that they should find exit through seams and fissures to this place of least resistance? . . . There are times when, without any apparent local cause, underground chambers become filled with gas. Whether such gases are explosive or not, whether it requires the admixture of air or coal dust to render them explosive; whether they are actually exploded or not, is entirely foreign to the argument. We are simply tracing natural causes which supply the conditions favourable to accidents of this sort. . . . That the mine in which an explosion occurs is far removed from the locality of a proximate or concurrent seismic disturbance does not discredit the theory of relationship, in view of the wide range of stresses and strains previously discussed."

Mr. Spalding concludes his paper by quoting a series of Associated Press dispatches concerning the roaring well near Beloit, Wisconsin. The well was active for two weeks before the San Francisco earthquake and ceased on the day of the catastrophe. It appeared also to synchronize with the earthquake in Mexico. Similar phenomena have been noted in France.

BOOK REVIEWS.

Ore Dressing. By Robert H. Richards, S.B., LL.D. Volumes III. and IV. Price, $5 per Volume. The Set, 4 Volumes, $20 (£4 4s.) net, postpaid. McGraw-Hill Book Company, 239 West 39th Street, New York.

To very few of our readers are any words of introduction necessary when mention is made of Richards' "Ore Dressing." The first two volumes appeared in 1903, and were regarded as practically a complete presentation of the subject. Changes, improvements, and investigations, however, have multiplied so rapidly in the art of concentrating ores that Dr. Richards determined to add a small supplement to the two volumes. Work on this was commenced in October, 1906.

So much material was collected that it soon became apparent that a new work, ranking in size with the previous volumes, would be necessary to cover the ground. The new work has therefore taken the form of Volumes III. and IV., in which the subject matter of Volumes I. and II. is added to, chapter by chapter.

Beginning with chapters entitled "General Principles" and "Preliminary Crushing," Volume III. treats successively of rolls, stamps, pulverizers, laws of crushing, preliminary washing, sizing screens, classifiers, hand-picking, jigs, fine sand and slime concentrators, amalgamation, miscellaneous processes of separation, and accessory apparatus. Short chapters on the laws controlling screening, classifying, and jigging appear also.

Volume IV. consists of two long chapters—Chapter XLI., "Summary of Principles and Outlines of Mills," and Chapter XLII., "General Ideas on Milling." In the former chapter 94 mills, representing milling practice in the principal mining centres of the world, are described. The latter chapter gives much practical information as to costs, power tests, process tests, etc., etc. Volume IV. concludes with an appendix of useful tables and an exhaustive bibliography. Bibliographies are also appended to every chapter.

Nearly every type of ore-dressing machine is noted by Dr. Richards. The numerous diagrams and half-tones that illustrate the text are exceedingly useful. In whatever minor details the work may be open to criticism, it is, beyond question, one of the most complete and the most satisfactory of text-books.

There is always danger of the mine manager becoming enamored of one particular type of machine. Not seldom the agent's personal charms are the deciding factors in the manager's choice of equipment. This is particularly apt to be the case in isolated camps.

There is no doubt that the manager can best fortify himself to withstand the blandishments of the machinery agent, and can most readily qualify himself to make a wise choice of equipment by arming himself with a copy of Richards' "Ore Dressing." He will then have at his disposal an array of facts and figures far greater than he can have accumulated in his own personal experience.

This, possibly, defines the function of the volumes before us. They are guides to the engineer and millman. They give, in concentrated form, all available data concerning the principles and practice of ore crushing and ore concentration. While it is humanly impossible to make any such treatises absolutely comprehensive and exact, these volumes come well within both categories.

CANADIAN PATENTS.

The following is a list of patents issued by the Canadian Patent Office on Sept. 7, relating to mining and metallurging, and furnished by Fetherstonhaugh & Co., 5 Elgin St., Ottawa. Russel S. Smart, Resident:—

120338. A Meyer, J. W. Allison, St. Louis, Mo., apparatus for rolling wire glass and the like.

120339. Ditto.

120354. A. R. Frank, H. A. Halansee, Max Voight, Friedenau, Germany, apparatus for manufacturing nitrogen compounds, Societa Generale.

120356. J. F. Monnott, New York City, compound metal bodies and processes of producing same, Duplex Metal Co.

120371. A. A. McIsaac, P. McKinnon, Broad Cave Chapel, N.S., safety devices for mine riding rakes.

120391. J. Hartness, Springfield, Va., methods of turning metals.

120392. Ditto for means of turning metals.

120393. W. J. Hough, Toledo, Ohio, processes of recovering precious resinous matter.

120414. W. C. Sharpe, Jr. and Sr., Eastfield, Louth, England, apparatus for the production of air gas.

PERSONAL AND GENERAL.

Mr. Allan Greenwell, editor of the Colliery Guardian, London, left Toronto en route for England on Sept. 22nd.

Mr. Reginald E. Hore, of the Michigan College of Mines, has returned from Cobalt district. Mr. Hore leaves for Houghton in a few days.

Mr. H. G. Carmichael, McGill '08, who is in charge of the operations of the Night Hawk Mining Company, on Night Hawk Lake, passed through Toronto on Sept. 20th.

Mr. C. L. Constant, Jr., of C. L. Constant & Co., the newly organized firm of mining engineers and metallurgical chemists, 42 Broadway, New York, passed through

Toronto on his way to Cobalt. The object of the organization has been to gather together a number of recognized mining specialists qualified to deal with all the details of exploiting and operating mining properties and smelting propositions. The directors are the following: C. L. Constant, president and treasurer; Dr. Walter Harvey Weed, vice-president; C. L. Constant, Jr., secretary, and R. B. Lamb and Frank H. Probert.

ARCTIC AMENITIES.

Where boreal breezes blow,
Where lies eternal snow,
There Peary, don't you know,
Vows Cook did never go!

Where flares the Northern light
To illume the Polar night,
There Cook, with all his might,
Swears that he got all right!

Cook claims an errant cake
Of ice him safe did take
Just where the Pole all nake-
-D stands without a quake.

And Cook asserts that hog—
That Peary—pinched his prog
From out a cache of log—
The most unseemly dog!

And now there's not a soul
Cares aught about the Pole—
That source of direful dole!
That vaguest, vainest goal!

Our object, one and sole,
Is not to find the Pole,
But just to let the whole,
Damned business drop!

Industrial Notes.

Nine Deister tables and slimers are being placed in the new addition to the Coniagas mill, Cobalt, Ont; eight in the enlarged McKinley-Darragh mill, and two in the Temiscamingue new mill.

THE SULLIVAN MACHINERY COMPANY.

The Sullivan Machinery Company announces that the Northern Canada Supply Co., Ltd., of Cobalt, Ontario, has been appointed agent for the Sullivan Machinery Company, covering Cobalt and other northern Ontario mining territory. Mr. Robt. T. Walker has associated himself with the Northern Canada Supply Co., and will give his attention to the sales of the Sullivan Rock Drills, Hammer Drills, Air Compressors, Diamond Core Drills, etc. A liberal stock of these machines and their parts will be maintained at Cobalt, with improved facilities for serving customers.

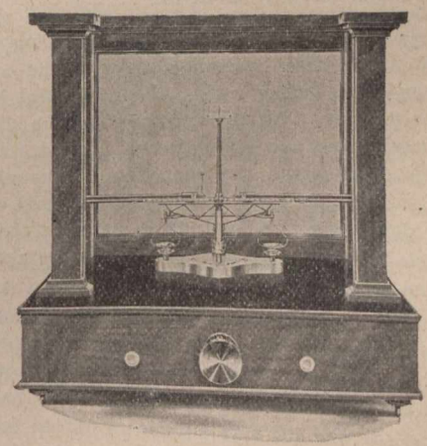
A NEW INVERTED TYPE ASSAY BALANCE.

Recently in America there has been a revival of the inverted type balance, one of the earliest designs of European makers of precision balances, although now given an inferior position in their line, due largely to the more energetic development of the familiar type with dependent pointer or indicator.

The accompanying illustration shows a new model just put out by a leading maker and having numerous improvements over existing types.

The beam is of truss design, and made of hard rolled magnalium, an alloy equal in strength and of about one-third the weight of the brass or bronze commonly used, effecting thereby a reduction in the inertia of the moving parts, with a consequent increase in speed and sensibility.

The rider carriers have no metal-to-metal surfaces in sliding contact, hence are smooth in operation under adverse working conditions. The graduations are in



hundredths on a celluloid index, each division representing 1-100 of the weight of the rider used.

The end bearings are of one solid piece of agate, supported by agate contact points when at rest, and the releasing mechanism is of improved design, thereby eliminating the disadvantages of earlier balances of this type, operating absolutely without "kick."

The unit base carries the entire mechanism above the glass base, and maintains its perfect alignment under all conditions, and having less than one-half the parts of other balances of this type, its simplicity and the ease with which all parts may be removed for cleaning and replaced without disturbing their adjustment will appeal to the user at a great distance from the factory.

This balance is made by Wm. Ainsworth & Sons, makers of balances and engineering instruments of precision, Denver, Colorado, U.S.A., and is fully described in Bulletin A-16.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt.—The results of the sale of 349 acres of mining lands in the Gillies Limit have been announced. Twenty parcels of land were offered, and of these fifteen were sold. Tenders received for the other five lots were not considered high enough, and were therefore not accepted. The fifteen lots sold brought in a total of $109,943.50. In addition to these fifteen lots the Provincial mine was sold to F. M. Connell, of Haileybury, the purchase price being $113,111, making the total proceeds of the sale $225,054.50. In addition to the sale price a royalty of 10 per cent. of the gross proceeds of the sale of ore will be levied. The successful tenderers were as follows:—

Lot A,	5—Geo. F. Webb, Hamilton, Ont.	$7,709.00
" A,	8—Ben Sommer, Montreal	7,447.50
" A,	15—A. Pierce, Montreal	7,600.00
" A,	20—T. C. Simpson, Westmount	12,250.00
" A,	26—Geo. E. Martell, Renfrew	15,300.00
" A,	7—A. R. Flynn, Pittsburg	4,506.00
" A,	16—W. H. Legge, Toronto	3,502.00
" A,	19—A. R. Flynn, Pittsburg	6,511.00
" A,	33—A. R. Flynn, Pittsburg	2,706.00
" A,	34—A. R. Flynn, Pittsburg	2,706.00
" A,	31—Frank E. McDonald, Toronto	2,250.00
" A,	44—A. H. Jackson, Montreal	2,655.00
" A,	26—A. Pierce, Montreal	20,600.00
" A,	39—A. Pierce, Montreal	9,200.00
" A,	38—Bannell Sawyer, Montreal	5,011.00

The Buffalo mine has been working for a long time on its cyanide plant, to be used in connection with the concentrator, and at last has it in running order. The new plant has a capacity of 50 tons per day. For the treatment of the slimes a combination of mechanical and air agitation is used. The millmen of this district will watch the operation of the plant with a great deal of interest, as many of them have carried on extensive experiments along this line, and have come to the conclusion that a commercial success cannot be made of the cyaniding process as applied to cobalt ores.

It was stated a short time ago that development on the Waldman vein in the Gillies Limit had not been productive of very encouraging results. When the shaft was down about 15 feet the vein changed to calcite with a streak of barren cobalt, but when the work was down an additional fifteen feet the high-grade ore came in again, carrying practically as good values as were found on the surface. Sinking will be continued to the 100-foot level before any drifting is done, and in addition to this two diamond drills will be operated on the property in an effort to locate new veins. This company is at present leasing air from the Provincial mine, but as this property has now been sold, it is altogether likely that new arrangements will have to be made. It will not, however, be necessary for them to install their own plant, as the main pipe line of the Cobalt Hydraulic Power Co. passes within 100 feet of the property.

The 10-stamp concentrator at the Colonial mine has been completed, and the company is only awaiting the arrival of the air and electricity, when work will be started. Last spring mining operations were suspended, and since that time no work has been done.

It is generally understood that Montreal capitalists who are identified with the Crown Reserve mine have obtained control of the Silver Leaf, and the recent appointment of Colonel Carson, President of the Crown Reserve, and Mr. Cohen, who is manager of the same company, to the positions of president and consulting engineer respectively of the Silver Leaf, would seem to point to the truth of these rumours. It was believed that the shares of the Silver Leaf were very widely scattered, but it now appears that the controlling interest was held by some New York people, and that they have sold the same at a price low enough to induce the buyers to consider the property. The Silver Leaf is capitalized at five million dollars, and up to date only about $300,000 worth of ore has been mined. The main vein of the Crown Reserve continues into the Silver Leaf, but shortly after crossing the boundary the values pinched out.

Progress is being made with the addition to the Coniagas concentrator, which will double the capacity of the plant. A large part of the machinery is already on the ground, and the management is confident of having it in operation by the end of the year, provided the power companies have their electricity ready for distribution by that time. The addition has been designed to use electric energy, and the steam power equipment is only sufficient to operate the existing plant.

Part of the machinery for the extension to the Northern Customs Concentrators has been installed, and the results obtained were very satisfactory. Two Nissen stamps were running for a short time to get an idea of their capacity. These were installed by the inventor under a guarantee to crush a certain amount of ore a day, and in the test that was given them they exceeded the guarantee.

The Townsite mine only commenced operations a short time ago, and up to date the results obtained have been very encouraging to the management. A new vein about 3 inches in width was discovered at the 110-foot level on the No. 7 shaft. It consists of cobalt carrying high values in silver. In a short time a cross-cut will be run to the west to catch a continuation of one of the main veins of the Buffalo. At the present time the main part of the work is being carried on from the Silver Queen shaft, where the company is stoping out a vein that cuts across the corner of the Townsite property, and already a considerable amount of high-grade ore has been taken out.

It is reported that one of the best veins on the Mann property in Gowganda was discovered Sept. 3rd. The new vein, which has been traced for some distance, varies in width up to 4 inches, and consists of high-grade ore.

Another drilling contest was held in Cobalt on Labour Day, Sept. 6th, and the first prize was awarded to the Nova Scotia team, who drilled 38½ inches. In a similar contest held a couple of weeks previously this same team was only able to drill 25⅜ inches. All the other competing teams made a similar advance above their previous records, and this is largely due to the great strides made since the former test, when they were so hopelessly outclassed by Page and Pickens, the world's champions.

A short time ago a deputation representing several of the Cobalt mines called upon the officials of the department and petitioned that the heavy royalties which these have to pay should be reduced. Although no announcement has as yet been made, there are indications that such a reduction will be made. Should such be the case, the following mining companies would be benefitted: Chambers-Ferland, 16 per cent. royalty; Crown Reserve, 10 per cent.; O'Brien, 25 per cent.; Temiskaming & Hudson Bay, 15 per cent. Besides these companies paying a royalty to the Ontario Government, the following companies have to pay a similar royalty to the T. & N. O. Railway commission. These are: Right of Way, Townsite, Nancy Helen, City of Cobalt, Station Grounds, Jackpot, Wright and Railway Reserve, all of which pay 25 per cent.

Since the installation of the new 6-drill compressor at the John Black Mining Co. the work is progressing much more

rapidly. At the present time drifting is being carried on at the 100-foot level, and some good ore is being taken out. The shaft is being sunk to the 200-feet level, and from that point a cross-cut will be run about 300 feet, where it is expected to cut the Ophir vein. Several new camp buildings are being erected.

It is understood that the Cobalt Lake will ship a car of high-grade ore in a short time.

The Silver Mines Exploration Co. has declared its regular dividend of 1½ per cent., and an extra bonus of 3½ per cent., payable Sept. 16th.

The Crown Reserve Mining Co. has declared its regular quarterly dividend of 6 per cent., and also an extra bonus of 9 per cent. On August 30th the cash on hand and ore in transit amounted to $912,000. After paying the quarterly dividend the surplus will be $647,000.

The Buffalo Mines has declared its regular quarterly dividend of 5 per cent., payable Oct. 10th, and an extra dividend of 3 per cent., payable Nov. 5th. Up to date this company has paid 59 per cent. of the capitalization.

The Temiskaming & Hudson Bay Mining Co. has declared a dividend of 300 per cent.

A 5-drill compressor has been installed at the Last Chance mine, which is located near the town of Latchford. This company has lately found good values at depth, and the force of men has been doubled and the work is being pushed as rapidly as possible.

At the present time there is a force of nearly one thousand men engaged in the construction of the plant of the Mines Power, Limited, and good progress is being made in the different branches of the work. The poles for the transmission line have been erected, and the work on the sub-stations for the distribution of the air and electricity at Cobalt and Kerr Lake is making good headway. The Cobalt sub-station is being built on the Nipissing property on the south side of Cobalt Lake, and the one which is to serve the Kerr Lake district is being built at Brady Lake. Large compressors will be installed in both these sub-stations, and air will also be connected by a 10-inch main, so that in case of breakdown at either place, there will be no interruption of the supply of air.

At the eleventh hour the Provincial Government has realized the gravity of the fever situation in Cobalt, and has sent several special inspectors to look after the work of cleaning up the town. A great many nurses have been sent in from outside points, and a number of tents have been erected to serve as hospital camps. It is hoped that the methods now being employed, together with the colder weather, will be successful in checking the disease.

Active development work is being carried on at the Temiskaming & Hudson Bay, and it is understood that several very promising discoveries have been made within the past few weeks. In a short time the management expect to sink a winze below the 200-ft. level, and from the bottom of this drifts and cross-cuts will be run to catch several veins. A few days ago the Coleman Township properties of this company were transferred to the Hudson Bay Mines, Limited, which has a capital of $3,500,000.

At the Nipissing Mine, vein No. 122, which was discovered on the surface some time ago, has been traced for 820 feet. This vein has been cut underground at two points, 520 feet apart and 80 feet below the surface and in both places shows high grade ore.

Some excellent samples of niccolite ore were recently brought into Cochrane. These were stated to have been broken from an outcrop a few miles from the town. It was in this section that the International Nickel Co. were working diamond drills on a large nickel deposit on which they had an option. Some time ago the machines were taken off, but no announcement has been made as to the results obtained.

Mr. W. P. O'Brien, on behalf of the Imperial Crown and Silver Leaf, denies the report that these companies will amalgamate. A special general meeting of the Silver Leaf Co. will be held in Toronto on Sept. 27th to confirm by-laws passed by the directors.

Recent development at the Silver Cliff mine has much improved the outlook at that property. Drifting is now being carried on on Nos. 1, 2 and 3 veins, and some very good ore chutes have been encountered. At present operations are confined to the main tunnel, which is now in 400 feet. A winze has been sunk to a depth of 80 feet below the tunnel, and from the bottom a cross-cut is being run to catch the No. 1 vein. The foundations for the new concentrator have been started, and the work will be pushed as rapidly as possible.

During the past month a large number of prospectors have been going into the new gold fields in Whitney Township, which is 65 miles by canoe from Driftwood City. A large number of claims have been staked, and some very fine specimens of gold quartz brought out. The veins in this section are very similar to those in Munro Township, and are narrow, but rich.

The addition to the concentrator at the King Edward mine is now complete, and the company only await the delivery of power in order to re-commence operations. There is a large quantity of milling ore on hand but as the enlargements to the concentrator were made with a view to using electric power, operations will be delayed for some time.

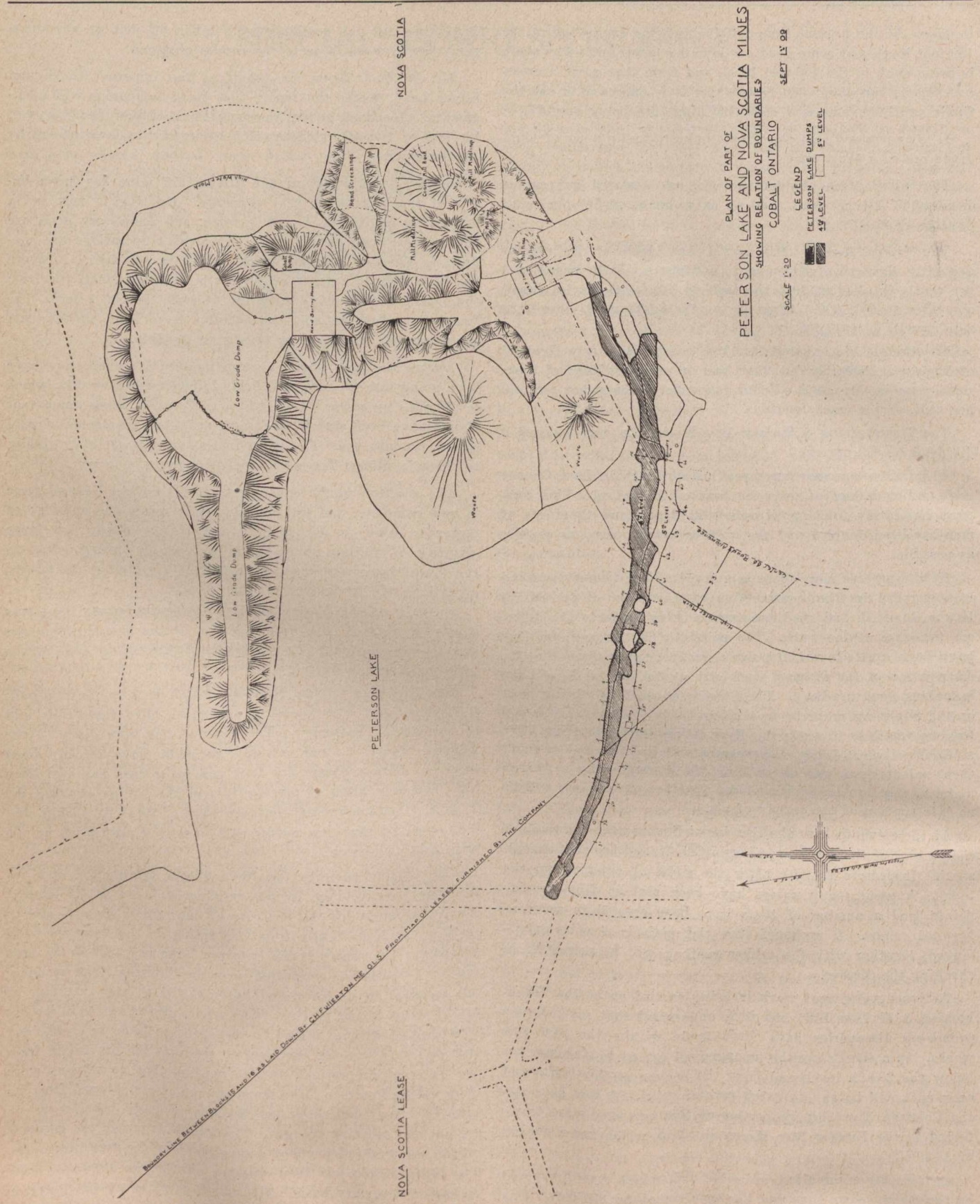
On Sept. 15th the assay building at the Trethewey mine was destroyed by fire. The prompt action of the brigade from the Coniagas was undoubtedly the means of preventing some of the other buildings being burnt.

The Nipissing Central Railway, which is to connect Cobalt, Haileybury and New Liskeard, expect to have their rails laid by the last of November. The contract has been given to the Algoma Steel Co., and several carloads have already been received. The contract for four passenger cars has also been let. The only hitch at present is over the bridge crossing the T. & N. O. tracks on the southern edge of Buck Township, and it is expected that this matter will be settled next week by the Railway Commission.

The trouble between the Nova Scotia Mining Co. and the Peterson Lake Mining Co. has culminated in an action against the Nova Scotia for the recovery of one million dollars, and to restrain the Nova Scotia from trespassing on the Peterson Lake property. The report of the Peterson Lake engineer shows that the Nova Scotia has trespassed upon the Peterson Lake property not included in its lease, and has removed a large quantity of ore to which it had no title. The report also shows that the ore was handled without regard to the Peterson Lake interests, and that due care was not exercised to separate the ore taken from the different properties. It also appears that no returns were made to the Peterson Lake from one car of ore shipped from its property, and that improper deductions have been made in freight and smelting charges. The trouble is partly the outcome of the want of independent management of the two properties. The Nova Scotia has been working one of the Peterson Lake claims on a royalty basis. The annual meeting of the Peterson Lake Co. will take place on October 6th.

About twenty-six miles of the wagon road between Elk Lake and Gowganda has already been completed. The road is in first-class shape, with very easy grades, and it is reported that next summer an automobile line will be in operation between the two places.

In the Gowganda district a large vein carrying some silver values has lately been discovered on the property of the Gow-



ganda Four, and a 1-inch vein of high-grade ore has been discovered on the Sweet claims at Hangingstone Lake.

An automobile stage, running five trips a day, has been started between Cobalt and the Kerr Lake district. This will be a great advantage to the residents of both places.

Recent development below the 200-foot level of the City of Cobalt has shown that the ore which pinched out came in again. An intermediate level has been run, and from 4 to 6 inches of high-grade ore was found. Development in the banded slates below the 137-foot level has been very encouraging. Some of the richest ore in the mine has been taken from this formation.

The Cobalt Hydraulic Co. has connected the two portions of their 1,000-foot tunnel. The connection was made at a point 375 feet from the intake end. It now remains to cut out the two benches and to complete the second intake shaft. Work will also be started on the chamber near the outlet shaft from

which the air will be drawn off. The main pipe lines are rapidly being joined up, and when these are completed the different lines to the mains will be laid.

Mr. J. W. Shaw has been appointed manager of the Cochrane mine in place of Mr. Floyd Harman, who resigned a short time ago to take care of the Harman Mining & Development properties.

A special meeting of the Cobalt Development Co. has been called for Sept. 20th. in Toronto. The purpose of the meeting is to dispose of the remainder of the treasury stock at 25 cents per share. There is also a by-law to be brought before the meeting for the reduction of the number of directors from nine to five.

The shaft on the Gould Consolidated Mines at Cart Lake has now a depth of 125 feet, and will be continued to the 150-foot level. From this point cross-cuts will be driven east and west with the object of cutting the Nipissing vein and other leads under Cart Lake.

Progress is being made in sinking the shaft of the Union Pacific mine at Peterson Lake. When the 150-foot level is reached a cross-cut will be driven to cut the big vein which dipped from the shaft 60 feet below the surface. This company also owns claims adjoining the North Cobalt mine, and on one of these a shaft will be sunk in an effort to locate the big vein recently found by the Jacobs Exploration Co. A considerable sum of money has been voted by the directors for the purpose of developing some of their other properties.

WESTERN ONTARIO.

Kenora Mining Division.—The Prospectors and Mine Owners' Association held their monthly meeting on Tuesday, Sept. 7th. The entire meeting was given over to a discussion amongst the members of section 78, sub-section 1, of the Mining Act, some of the members being inclined to think that the working conditions enforced were of too stringent a nature. They finally instructed their secretary to write to similar

Vein 7 to 8 feet, 120 feet stripped, on claim located by G. Lariviere, Kenora.

associations in other districts asking an expression of opinion on this subject.

The Laurentian gold mine is now working double shifts, and the company is getting a good showing for its work.

The Paymaster mine at Gold Rock is erecting a new stamp mill, which will be in operation at the end of January, 1910.

The Detola mine is re-commencing operations, and has started in doing development work.

A good deal of attention is being paid to the West Hawk and High Lakes district, some thirty miles west of Kenora. Several prospecting parties from Winnipeg have been operating this summer in that district, but no important strikes are as yet reported.

Negotiations are now under way concerning the reopening of the Regina mine, owned by English capitalists. The pumping out of the mine and resumption of operations there at a not far distant date is confidently expected by those having a knowledge of the affairs of that company.

From the Sturgeon Lake district comes the report of a valuable find made by G. Lariviere, of Kenora. The vein is 7 to 8 feet, and has been stripped for a distance of 500 feet, and is showing splendid values.

In connection with these Sturgeon Lake properties it may be of interest to quote from an engineer's report made on behalf of a private company:—

"The formation of the country is Laurentian, Keewatin and Post-Keewatin. The great body of country rock is gneissic granite with intrusions of schists and slates. Porphyritic granite, quartz porphyry, mica syenite, etc., are common. The schists are chlorite, olivine, sericite, serpentine and mica, the first-named being the most common. Diabase, gabbro and dionite are important rocks of the district."

I might say that the reason so little prospecting has been done in previous years has been on account of the excessive cost of transportation, 100 miles from Ignace Station, until now, when we have the G. T. P. branch from Westfort, which takes us to the south end of the lake, on which there are several boats and good facilities for getting around. The greater number of the reported rich strikes of this year are upon prospects staked last year, and have shown up good values when sinking was started, and these values in nearly every instance increased with depth, and show free gold in remarkable quantities. Other properties have shown nuggets of native silver along with the gold. Copper occurs, and zinc blende is quite noticeable.

The district is in its infancy; the small lakes adjoining Sturgeon Lake have not been looked into at all. Nothing has been done back from the water, and scarcely any systematic work done.

QUEBEC.

Sherbrooke.—Mr. G. R. E. Kennedy has sent up from the Eastern Townships the best exhibit of the mineral wealth of that section of Quebec that has ever been shown at Ottawa. It is well known that that section of the Eastern Townships is the greatest shipper of asbestos in the world. In addition to asbestos, the Kennedys exhibit some beautiful samples of gold in quartz and nuggets, some from Nova Scotia and some from Southeastern Quebec, from which region the late Hon. J. H. Pope is credited with taking more gold than the public ever heard of. The exhibit also comprises chrome, mica, phosphate, marble, slate, talc, coal, copper, silver, etc.

John McDonald has transferred his copper property in Weedon to the people to whom it has been under option, the price being $100,000, and the first payment was made Sept. 11.

On Tuesday, the 21st of September, Messrs. C. J. McCuaig, F. W. Bailie and S. W. Ewing, of Montreal, visited the properties of the Black Lake Consolidated Asbestos Co., and those of the Amalgamated.

The issue of $1,000,000 of 8 per cent. gold bonds, with a bonus of 25 per cent. of preferred and 50 per cent. of common stock is announced by the Black Lake Consolidated. It is intended to erect immediately two large mills for the Union and the Bell mines, and later a third for the development of other portions of the company's large acreage.

Work on the 750-ton mill for the Union is begun, the concrete foundation for the rock bin and crusher house are nearly completed, and foundation for the drier house started.

Survey has been made for the tramway from the Southwark pits, about 4,000 feet is completed, rails purchased and delivered, and by the time the mill is ready it will be supplied with its full 750 tons per day.

A company has been organized by Messrs. E. A. Dyer, Dr. McDonald, John Harris, C. P. Willey, D. L. Smith, Wm. W. Smith, and C N. R. Tarte, N.P., to open and operate a copper property two and one-half miles from the village of Sutton. Mr. Harris will have the management of the work.

H. D. Reihle, M.E., now retained by the Black Lake Consolidated Asbestos Co., has visited nearly all the known asbestos fields of the world. In 1897 he was in Dutch East Africa, Cape Colony, etc. In 1898-1900 he spent two years in Nordland, Norway. In 1902 he went to Asiatic Russia, Siberia, Altai and Northern Mongolia. Later he went to the Aosti Valley, Italy; then he examined some deposits in Georgia, U.S.A., returning to Canada, where he has erected an efficient and up-to-date plant in the East Broughton District.

Mr. C. E. Kennedy, of Beebe Junction, is opening an asbestos property in Northern Vermont that promises to make a mine. In spite of the man on the street, boundary lines of towns, counties, provinces or countries do not cut off mineral belts, as may be shown in Pontiac County, when the blanket licenses expire.

BRITISH COLUMBIA.

Rossland.—At the Le Roi mine, which is the centre of attention in this district just now, the working force has been steadily increased to a crew of about eighty men, and in addition to the three diamond drills a few machine drills have been put to work stoping ore from a new lode that has been recently opened up. In addition to the work going on in the lower levels the 600 and 700 ft. levels are also scenes of activity. It is expected that work will be energetically extended as opportunity and development permit from this time on, and all those interested here seem to be quite sanguine of good results ensuing.

At the Centre Star group and at the Le Roi 2, Limited, the regular weekly shipments were made, running the total shipments for the week ending Sept. 4th up to 4,370 tons, which is somewhat lower than the weekly shipments have been from this district lately.

Among the smaller properties about the camp things are not as lively as they were. At the Blue Bird there has been a cessation of work owing to the company having bought out the recent lessees and having now under consideration a plan of operation. The Evening Star is now not under lease, the last lessee having got into legal difficulties. But little work is going on at the Hattie Brown, although the management states that a plan of diamond drilling is being prepared. In the case of several meritorious small mines hereabouts, however, it is not lack of applications for leases that is causing the mines to lie idle, for there are a number of men who are willing to take hold, but the mining companies feel that it will take men with plenty of money to work the mines properly and systematically, and they are waiting until such time as men with money come along, when we may expect to see these mines on the working list once more. Taking the district throughout, things are looking well. There are some very good prospects in the hills about this camp that in the next four or five years will come into their own.

The Boundary.—There is so much going on in B. C. Copper and New Dominion affairs these times that one wonders where and how it is going to end. Last week the district received a visit from J. Lewisohn, a director of the B. C. Copper Co. and heavy owner in the New Dominion. J. Parke Channing, consulting engineer of the New Dominion Copper Co., accompanied Mr. Lewisohn. Together with J. E. McAllister, manager of the B. C. Copper Co., they visited the Brooklyn and Rawhide (New Dominion) mines, the Mother Lode (B. C. Copper) at Greenwood, and the Sunset and Idaho (New Dominion). J. Seward, manager of the Dominion properties, was also of the party. It is quite natural, of course, that Mr. Lewisohn and Mr. Channing should look over the New Dominion properties at a time when dawn is just breaking over another (and we trust successful) period of operations for the Dominion mines. It is also businesslike of Mr. Lewisohn to look over the property of the B. C. Copper, in which he has invested a large sum of money and of which he is an important director. This more especially when the copper producers of the Boundary are about to enter an epoch-making period of activity.

The B. C. Copper Co. is making regular shipments of about 8,000 tons of ore per week to the Greenwood smelter, and the activity of the company is felt throughout this district. The company has a crew of men doing development work on the Sappho group, near Midway, which it has recently bonded. It has applied for a water right in the Similkameen water district, this water to be used on its claims in Wellington camp. A couple of Kamloops mining men have been here during the past week working on a proposition to bond one of the Kamloops groups of claims, on which there is a splendid showing of iron ore, to the B. C. Copper Co. The officials of the B. C. Copper Co. have announced that the concern will be in a position to pay a dividend when the surplus amounts to $200,000 or over. The big "glory hole" workings of the Copper Co. are to be worked on a larger scale than ever from now on, so much so that the company is moving the homes of several miners that were near, fearing they might be damaged by the heavy blasting. This surface mining is really what counts in low mining costs in the Boundary, and is a big aid in the production of 8½c blister copper.

Work is soon to be started on the Canadian Pacific Railway spur into the Phoenix Amalgamated mine of the Con. M. & S. Co. of Canada. As soon as this spur is completed this concern intends to begin shipments to Trail smelter from this point, augmenting the shipments now being made from the Snowshoe. The Consolidated Company will also ship from the No. 7 mine in Central camp as soon as the new railway spur is built into that camp. It is suggested that it may be found necessary to build a concentrator to treat the ore from the No. 7 mine.

The general manager of the Granby Con. M. S. & P. Co., Mr. A. B. W. Hodges, is on a visit to the Queen Charlotte Islands and the Portland Canal mining districts. It is Mr. Hodges' opinion that if half of what he has heard of the copper deposits of the Queen Charlotte Islands is true, then another very valuable copper field is being opened up. Mr. Hodges was accompanied by R. P. Williams, of Rossland, who, with Mr. Hodges, is one of a syndicate that controls the Contact group of copper claims at Tasso Harbour.

The Granby Company will have finished enlarging its eighth and last furnace next month, and will then be in an excellent position to take advantage of the expected rise in the price of copper. The recent improvements at Grand Forks smelter of the Granby Co. have cost over $250,000, the converter and blowing plant having been enlarged and several wooden buildings replaced with steel structures. It is considered that under the new working conditions the Granby will be enabled to place blister copper in New York at an average figure of 8½c per lb. It is now eight months since the Granby Company paid a dividend, and it is thought that there must be one about due. This concern has paid five million in dividends on an issued capitalization of thirteen million. Among the large shareholders who have benefitted some by these substantial dividends are

J. J. Hill, the First National Bank of New York, American Metal, Nichols Copper, H. I. Higginson, of New York, etc. The Granby smelter is now the largest smelter in the British Empire and the third largest on this continent, and consequently is in a position to rank as one of the lowest cost producers but for one or two things, one of which is the long haul to eastern refineries and markets.

Nelson.—The famous Big Ledge zinc property on the Arrow Lakes has been taken on option by W. J. Greenstreet, of the Guggenheim syndicate. The Big Ledge is a prodigious showing of "blackjack" bursting from the hills above the lakes, much of which averages 40 per cent. zinc. But little development has been necessary on the property aside from that done by Dame Nature in throwing up the huge mass of zinc ore. It is said the option price was in the neighborhood of $400,000.

The Lucky Jim mine continues to make occasional shipments of zinc blende, carrying approximately 50 per cent. zinc. To date about 1,200 tons have been shipped by the new management. There is a large quantity of concentrating ore in the mine, and it is planned to put up a mill to treat this product. Capitalists from the middle United States have bought the Sunset-Trade Dollar-Apex group near the Lucky Jim.

The buildings recently burned at the Silver King mine, Nelson, are to be rebuilt.

Good strikes of milling ore were made during the past week at the Mother Lode and Queen mines, Sheep Creek district.

A 20-oz. nugget, valued at $359, was picked up on Granite Creek, near Barkerville, recently.

A group of Minneapolis capitalists has acquired 800 acres of coal land in the Nicola Valley, near Merritt. This land lies just north of the property of the Nicola Valley Coal & Coke Co., and west of that of the Diamond Vale Coal Co. The tract will be mined by a close corporation. Work along modern lines is to begin in the near future.

GENERAL MINING NEWS.

NOVA SCOTIA.

Glace Bay.—President McDougall, of the U. M. W., was arrested and taken by special car to Montreal on a charge of criminal libel. Particulars are not known in Glace Bay.

ONTARIO.

Ottawa, Sept. 22.—Dr. Eugene Haanel, Director of Mines, states that arrangements are being made for the establishment of the first electric smelting plant in Canada in connection with the Sault Ste. Marie iron and steel industries.

The Lake Superior Co. is arranging for the construction of a number of furnaces similar to those now in successful operation in Sweden.

A second electric smelting enterprise, involving the investment of several millions is also contemplated for the treatment of iron ores on the Ottawa River at Chat's Falls, where a splendid power site has been secured by a company headed by Mr. Louis Simpson, of Ottawa.

Toronto.—The particulars of the sale by tender of portions of the Gillies Limit were made public on September 15th. The total proceeds of the sale amounted to $223,054.50. This includes $113,111 for the Provincial Mine, which was purchased by Mr. F. M. Connell, of Haileybury. In addition to the mine, twenty parcels were offered for sale by tender. Only fifteen were sold. The area sold comprises 349 acres. The Provincial Mine property takes up 30 acres of this limit.

Including former sales, this brings up the total receipts of the Government to $329,436.40; $94,092.68 represents the total expenditure by the Government in mining and prospecting. The net proceeds are therefore $234,543.72.

The successful tenders are as follows:—

A5—Geo. F. Webb, Hamilton, $7.709.
A8—Ben Sommer, Montreal, $7,447.30.
A15—A. Pierce, Montreal, $7,600.
A20—T. C. Simpson, Westmount, $12,250.
A6—George E. Martel, Renfrew, $15,300.
A7—A. Rex Flinn, Pittsburg, Pa., $4,506.
A16—William Henry Legge, Toronto, $3,502.
A19—A. Rex Flinn, Pittsburg, Pa., $6,511.
A33—A. Rex Flinn, Pittsburg, Pa., $2,706.
A43—A. Rex Flinn, Pittsburg, Pa., $2,706.
A31—Frank E. Macdonald, Toronto, $2,250.
A44—A. H. Jackson, Montreal, $2,655.
A26—A. Pierce, Montreal, $20,600.
A38—Bannell Sawyer, Montreal, $5,011.
A39—A. Pierce, Montreal, $9,200.

In addition to the purchase price the Government receives a 10 per cent. royalty on the gross proceeds of all sales of ore.

Port Arthur.—Two carloads of silver ore were shipped September 20th from Port Arthur on the steamer Easton. The ore came from the West End Silver Mountain mine, and is ticketed to Butte, Mont.

ALBERTA.

Taki.—On September 13th, a Slav named Mike Nichylochuk was killed by a fall of rock at the Canada West Mine.

BRITISH COLUMBIA.

Nelson.—On September 8th, Mr. Byron N. White, principal owner of the famous Slocan Star mine at Sandon, announced here that work would be resumed on a large scale at the property as soon as some details are closed in winding up the celebrated extra-lateral rights case with J. M. Harris, known as Star vs. White. It is expected that another month will see active work on this property resumed.

Princeton.—Wolframite has been discovered on the Marion group of claims near here.

Kootenay.—The B. C. Copper Company has secured options on seven of the best known groups of claims in the Kamloops camp. The groups bonded are the Bonanza group, consisting of the Comstock, Commoner, Ashton Fraction, Comet, and Cisco, all of which are held by Mr. H. Beckman on option from the original locators.

The Giantess group, two claims, Giant Copper and Giant Fraction, of which W. H. Fowler and Mr. Beckman are owners.

Rising Sun group, consisting of Rising Sun, 1, 2, 3, 4, 5 and Rising Sun and Daylight Fractions, owned by E. B. Drummond and W. H. Fowler.

Kimberley group of eight claims, which includes the Stemwinder, Morning Star, Windsor Fraction, Keystone Fraction, Charlotte, Occidental, and Last Chance, all of which are owned by Mr. Beckman, who has recently spent a large sum in developing the property and has succeeded in showing an enormous mass of low grade ore.

Laura group of four claims owned by Drummond and Fowler, and which may also include the Grass Roots, of which Dr. Wade is the owner, and for which negotiations have been pending in associaton with the other members of the Laura group.

The deal also embraces the Maxim and Esperanza groups.

By the terms of the bond work will be commenced at an early date, and shipment of ore will follow as speedily as possible, and if the B.C. company is satisfied with the result

of their operations here, a smelter will assuredly follow, under the management of that corporation.

Revelstoke.—The Big Bend mica property is being developed with difficulty. The trails are in bad shape and will have to be improved before substantial work can be done.

Victoria.—The Pacific Metals Company has just been incorporated in Victoria with a capital of $250,000. The object of the new mining company is to take over mining prospects and undevelped mines and work them in order to bring them to a shipping or selling basis.

W. M. Brewer, who since 1902 has been ore-buyer for the Tyee Copper Company of this city, which position he resigned president, and J. L. Parker, who was for some time manager of the Brown-Alaska Company's mines at Hadley, Alaska, and who was in charge of the North Star and Brooklyn and Stemwinder mines in the Kootenay district, is manager for the new concern.

W. M. Brewer has been engaged in mining and ore buying for the last quarter of a century, and before coming to British Columbia in 1893 spent years in the mining districts in the Black Hills of South Dakota, Arizona, Colorado and other mining centres. For the past six years he has been engaged as ore-buyer for the Tyee Copper Cmpany.

It is expected the incorporation of the Pacific Metals Company will give an impetus to the development of mining in British Columbia, for prospectors and others who have promising propects will find the company ready to take over the development. Mr. Brewer left on the steamer Princess May on behalf of the new company to look up some properties in the north.

YUKON.

Dawson City.—The Yukon Gold Company, in which the Guggenheims are interested, employs 1,200 men on its various works, chiefly on Bonanza and Hunker, and have seven dredges and three electric lifts engaged in saving gold as well as hydraulic apparatus. It is expected that the company will pay a big dividend this fall, when operations will cease for the winter. By then the company will have dug 78 miles of ditches, obtaining the water from the head of the Twelve Mile.

The Northern Light and Power Company, which is developing coal deposits near Forty Mile, employs 200 men. This is the company formerly controlled by Dr. Grant and A. N. Fuller, and was taken over by an English company. Mr. Thurston is the manager.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

The owners of the Uranium and Radium mine at Grampound Road, near St. Austell, Cornwall, announce that their pitchblende lode has been reached at a depth of forty fathoms. The lode has forced its way through an extremely hard elvan course, every inch of which had to be blasted—the elvan course being a mixture of porphyry and granite. Some men of science doubted the existence of the pitchblende below the thirty fathom level; it is now proved to be present in good strength at a further depth of 72 feet. The British Metalliferous Mines, Ltd., believe that they will be able to supply larger orders for radium than that of 7½ grammes, value £30,000, they are now engaged upon for the Radium Institute. The company is erecting a concentrating plant, so that the pitchblende will go for radium treatment in a highly condensed form.

Preparations are being made for the erection of two steel furnaces at the works of W. Gilbertson & Co.

A lockout is threatened in the iron industry in Scotland. The Employers' and .the Operatives' Executive Committee recently agreed to a reduction in wages of a farthing per hour, or a shilling per week on time rates and 2½ per cent. on piece rates, to take effect on the 9th instant. The day men have acquiesced, but the piece workers have struck. The employers have issued an ultimatum to the effect that if piece workers do not return to work on Monday there will be a general lockout of associated moulders throughout Scotland on Wednesday, the 15th September.

EUROPE.

Spain.

A telegram from Huelva states that as the result of the strike of the workmen of the Mora mine, a British concern, the directors have declared a lockout which affects one thousand miners.

Russia.

So far as concerns production, the position of the Russian oil industry is a little more favourable than was the case a short time ago, and it is probable that an expansion will be shown in the output for the current year as the result of the increasing number of wells which are steadily coming into operation. An analysis of the ouput of each individual source of supply shows, however, that the production per well is not improving. As regards prices, the current quotation at Baku is a little under 23 copecks per pood, which while higher than the corresponding quotation in 1907-8, is not so good as the figure ruling some six months ago. There does not seem to be much prospect of a recovery in prices just at present, though it is equally true that the market seems firm at the present level. Expenses have undoubtedly gone up very substantially of late, partly as a result of increased wages, while the much greater depths to which the wells have been sunk adds to the cost of raising the mineral. It is also a fact that a great deal of unproductive work has been carried out, a considerable number of the borings recently instituted having given no tangible results. As it costs at least £10,000 to sink a well, it is obviously a serious matter when such a heavy expenditure proves abortive.

Italy.

Salt is being experimented with by the Italian Department of Agreiulture as a preventive of ankylostomiasis The Formignano colliery was chosen as the place for the experiments. Here salt was strewn about the workings. Results so far are negative.

Roumania.

Eighteen petroleum testing holes at Moreni, the richest spot in the Prahova petroleum district, have been burnt out. The loss is estimated at about £40,000, of which half represents American capital. No loss of life is reported.

Austria.

The year 1908 was an eventful one in the Galician oil industry, being marked by greatly increased production and such unprecedentedly low prices that many of the producers were threatened with ruin. The Austrian Government finally came to the rescue with active assistance, which has helped towards putting the industry on a sound basis. By the end of 1907 the price of crude oil had fallen to 1s 3d per 100 kilogs. During the first three months of 1908 there was a slight rise in prices, but in April and May a number of new wells were struck, and the enormous overproduction which followed caused the greatest embarrassment to the industry, while the existing storage and railway transport arrangements proved totally inadequate.

In view of the critical condition of the industry, the Austrian Railway Minister visited the oil district and promised to introduce the use of oil instead of coal on the state railways in Galicia; he also arranged for improved transport facilities. A provincial association of oil producers, representing 80 per cent. of the total production, was formed, and this body made a contract with the state railways for the delivery of 220,000 metric tons of oil per annum. The railway authorities, however, found that it was not safe to use the oil in its crude state in railway locomotives, but that the benzine would have to be extracted first. The Producers' Association had not the capital to build the necessary works for this process or the new reservoirs required. Accordingly the Government undertook to build a factory extracting the benzine at Drohobycz, and to lease it to a cartel of the Austrian refineries which is being formed, and which will undertake to purify the oil for the use of the state railways. The state will pay the Producers' Association direct for the raw oil required at a price considerably higher than the present market price, and which has been fixed with reference to the cost of the coal that would have been required for the locomotives. The state will further build the reservoirs and lease them to the oil miners at a rate just sufficient to cover the interest and amortisation of the capital.

The Government has introduced a bill in the Reichsrath by which a concession will in future be necessary for carrying on the business of storing, handling, and refining raw oil in Austria, and the provincial authorities will be empowered to refuse this concession at their discretion.

In 1908 the amount of crude oil produced in Galicia was 1,734,235 metric tons, as compared with 1,175,974 tons in 1907 and 760,443 tons in 1906. 15,906 metric tons of mineral oils were imported into Austria-Hungary in 1908, as compared with 18,816 tons in 1907 and 27,399 tons in 1906; and 370,600 tons were exported in 1908, as compared with 217,258 and 195,885 tons respectively in 1907 and 1906. The export of mineral oils from the monarchy, chiefly in the shape of refined petroleum or benzine, has risen enormously during the last few years, having increased proportionately more rapidly than the total production, of which it now forms about the fifth part. Nearly two-thirds of the export are sent to Germany; then follow Fronce, Switzerland, Turkey, Italy and the United Kingdom, the last-named country only taking 4,500 tons.

NEW ZEALAND.

The Consolidated Goldfields of New Zealand in 1908 distributed dividends to the amount of £12,119, as against £18,178 in 1907. Progress Mine paid no dividend; but the Wealth of Nations Mine gave a higher yield than usual, the working profit being £14,500, or 21s 5d per ton.

UNITED STATES.

The improvement in the spelter market is being reflected in the zinc-producing districts of Colorado. This is especially noticeable at Leadville.

The U. S. Assay Office, Butte, Montana, reported receipts of $240,982 of gold during August. These receipts are unusually large.

The Goldfield Consolidated mill will probably be enlarged to a capacity of 1,000 tons per day. Its present capacity is 600 tons. Treatment costs are now less than $2 per ton of ore.

The railroads are granting reduced rates to delegates to the American Mining Congress to be held at Goldfield.

It is estimated that the output of the Goldfield Consolidated, Goldfield, Nevada, for August stands at $602,000. The ore tonnage was 22,160 tons. The estimated total cost of production was $155,000, leaving a net profit of $447,000.

The asbestos deposits near Casper, Wyoming, are being actively exploited. Two mills are to be erected in the near future.

MEXICO.

A number of mining companies have suffered directly and indirectly from the flood in the Monterey district. Although most of the mines are on high ground, their loss has been great through the destruction of transportation lines.

The tonnage of ore treated at the El Oro plant in August was 24,183 tons. Total yield was $215,120, and net profits $78,300.

SOUTH AFRICA.

Johannesburg.—A modified form of gelatine for blasting purposes has been produced at the Moddersfontein Explosives factory, and will, it is stated, enable two additional holes per shift to be drilled, requiring less labour for equivalent results, or enabling quicker and more economical development.

Mine Inspector Swinburne has recently made a highly valuable and instructive report upon the northern tin fields. The developments on the properties being worked by the Transvaal Consolidated, Lands, Rooiberg Development Company, and others practically assure a permanent industry.

The aggregate profits of the Witwatersrand mines for July amounted to £1,027,374. The month's development work gives a measurement equivalent to 15½ miles and marks another record.

The entire control of the Bantjes Consolidated is passing into the hands of Messrs. Eckstein & Co., their representative having been appointed chairman and the offices of the company transferred.

The new scheme for the amalgamation of the Nigel Deep with the Sub-Nigel is favourably criticised.

The Apex Mine and Benoni Consolidated have come to an agreement for the erection of a joint mill, capable of crushing 60,000 tons of ore per month, to be located on the former company's property. The developments on the Benoni property will ensure the supply of 20,000 tons per month to the first section of the mill as soon as erected.

The boring operations upon the Roberts-Randfontein property have resulted in striking a banket series at a depth of 1,950 feet.

In the Transvaal Government stope drill competition the Siskol drill has established a new record by accomplishing 132 feet in one shift.

Johannesburg.—At the annual meeting of the New Moddersfontein Gold Mining Company, Mr. Samuel Evans, the acting chairman, stated that they anticipated that with the enlarged plant now working the costs for the current year would be substantially reduced. He forecasted a vigourous development policy, and stated that when the ore reserves had been sufficiently increased there would be such an enlargement of plant as would enable the present generation of shareholders to derive the maximum benefit from their extensive claim area. The recent development in their own property and in the Brakpan mine had proved the value of their deep-level ground. For the moment the rate of progress depended upon the supply of unskilled labour. It was impossible to forecast the condition of the South African labour market from month to month, but past experience justified them in concluding that in time they would get all the labour they wanted. Mr. Evans added that they were in the midst of an industrial revolution, the far-reaching effect of which on shareholders' dividends and on South African prosperity would only be fully appreciated in a few years' time. He pointed out that the largest companies crushed monthly per white employee an average of 95 tons, as against 85 for the smallest companies. Similarly the coloured labour of the large companies crushed 14 tons, as against 8 tons of the smallest companies. The number of coloured employees to one white employee was in the large companies 6.1 and in the small companies 10, thereby showing that the growth of the large concerns increased the proportion of Europeans employed, as compared with coloured labour, and improved the productivity of both classes of labour.

COMPANY NOTES.

Following is the report of the Le Roi No. Two, Limited, for the Josie mine for the month of July, as issued by F. A. Labouchere, from the London office of the company.

Output.—Approximately 2,000 tons were shipped during July.

Development Work.—Development work was carried on in the Josie shaft, 400-foot level, 500-foot level, and intermediate level, between 500 and 700 (703 drift).

Josie Shaft.—The Josie shaft was sunk a distance of 97.5 feet during the month. Favourable ground was met with, which drilled and broke readily. We shall not make such good speed during August on account of the station cutting, which will be necessary at the 1,000-foot level. (The following cable has since been received: "Josie shaft, 1,000-foot level station, nearly completed.")

400-foot Level, 401 Drift.—This was driven eastward a distance of 41.1 feet until it met with the Josie dyke. As there is still ore in the hanging wall, this was slabbed off for about the same distance. The average assay from drift and slab work was .71 ozs. gold and 4.0 per cent. copper, but the ore, though very good, is too scattered to be given a definite width as yet. Twenty samples were taken.

402 Drift.—This was driven westward a distance of 34.9 feet, and met with a little scattered ore, which assayed .68 ozs. gold and 1.2 per cent. copper. Eight samples were taken.

500-foot Level, 501 Drift.—This drift was advanced a total distance of 3.75 feet during the month. Some stoping was also done. Nineteen samples of the scattered ore taken in drift and stope averaged .56 ozs. gold and 3.8 per cent. copper. Both here and in 401 stope the width of the ore body should show up more definitely during August.

703 Intermediate Drift.—This was advanced a distance of 79.5 feet and towards the end got poorer. The average assay was .87 ozs. gold and 1.2 per cent. copper over a width of 17 inches. Eighteen samples were taken.

Poorman Stope.—The ore from here is practically all second-class.

303 Stope, 300.—We shall probably discontinue drawing ore from here temporarily during August, since the ore now showing in the back of 32 stope is not so good. A pillar of ground will be left in for the present so that track will not be disturbed.

301 Stope.—More ore will be drawn from here during August than during July.

401 Stope.—This stope is showing up very well, and during the next five months should become an important ore producer.

423 Stope.—Three samples across the full width of the stope were taken here, and the average assay was .66 ozs. gold and 2.32 per cent. copper, over an average width of 2 feet. Lately the ore has begun to extend eastward, and in all this month's work has added about 53 feet to the stope.

32 Stope.—The ore in this stope is now getting a little poorer in the back the average of 40 samples taken during the month showing .68 ozs. gold and 2.1 per cent. copper over a width of 15 inches.

501 Stope.—This stope is referred to under the head of 501 drift. The ore here is gradually beginning to assume more definite shape.

702 Stope.—Good ore is being broken here, the average for the month being 1.86 ozs. gold and 5.3 per cent. copper over an average width of 1 foot 11 inches. Twenty samples were taken.

703 Stope.—The drift is being taken down here and stoping operations started. When this is timbered up, the drift will be pushed westward as long as it is in pay ore.

Announcement is made that the annual general meeeting of the City of Cobalt Mining Company will be held on Friday, October 8th, at 3 p.m., in Cobalt. The report of the directors will be received and other business transacted.

The Buffalo Mines declared its regular quarterly dividend of 5 per cent., payable October 10th, to stockholders of record September 20th, and an extra dividend of 3 per cent., payable to stockholders of record November 5th.

WORK ON THE LE ROI.

A despatch from British Columbia states that the managing director of the Le Roi, having returned to the mine, says that the directors having made the necessary financial arrangements, will enable him to undertake immediately the large and comprehensive scheme of exploration work approved during his stay in London. It is intended to sink the main shaft a few hundred feet further and to do a large amount of diamond drilling, so that the mine can be thoroughly prospected to a depth of about 1,000 feet below the present 1,650-foot level.

The directors of La Rose Mining Company on Sept. 20th. declared the regular quarterly dividend of 3 per cent., with 1 per cent. bonus.

The Herald has it on good authority that the next quarterly dividend will be on a higher basis.

While the Lawson property and other mines in the La Rose combination have been making wonderful showings, the development of the new properties has required the expenditure of a good deal of money, all of which has come out of the La Rose treasury. The La Rose, however, can at any time now increase its output materially.

At the meeting of Nipissing directors held on Sept. 20th. it was decided to raise the dividend from 20 per cent. to 30 per cent. per annum. The regular quarterly dividend was raised to 5 per cent, and, in addition, the bonus was made 2½ per cent.

By the time the Nipissing dividend is payable on October 20th next, the company claims that it will have a surplus of approximately $1,300,000, of which $800,000 will be in cash and the balance in ore in transit or at the smelter.

STATISTICS AND RETURNS.

COBALT ORE SHIPMENTS.

There were only six shippers among the Cobalt mines last week, with the bulk of the tonnage from the Nipissing and La Rose. Shipments for the week aggregated 871,750 lbs. of ore, or 435.87 tons.

Shipments of ore in pounds for week and year to date were:—

	Week ending Sept. 11.	Year.
Chambers-Ferland	.....	961,010
City of Cobalt	.....	1,042,522
Cobalt Central	41,360	600,204
Cobalt Lake	.....	79,960
Coniagas	.....	1,216,895
Crown Reserve	189,630	4,433,079
Drummond	.....	920,000
Kerr Lake	.....	1,482,156
King Edward	.....	180,740
La Rose	273,700	9,038,433
McKinley	42,810	1,431,106
Nipissing	259,800	9,560,043
Nancy Helen	.....	83,400
Nova Scotia	.....	480,810
O'Brien	64,500	1,895,502
Peterson Lake	.....	324,040
Right of Way	.....	2,134,891
Silver Queen	.....	598,395
Silver Cliff	.....	123,820
Temiskaming	.....	2,046,060
Trethewey	.....	1,362,698
T. & H. B.	.....	1,106,260
Muggley Cons.	.....	72,900

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending Sept. 18, and those from Jan. 1, 1909, to date:—

	Sept. 18. Ore in lbs.	Since Jan. 1. Ore in lbs.
Buffalo	.....	832,668
Carnegie	.....	63,410
Chambers-Ferland	.....	961,010
City of Cobalt	.....	1,042,522
Cobalt Central	.....	600,144
Cobalt Lake	.....	79,960
Coniagas	.....	1,153,485
Crown Reserve	63,000	4,496,079
Drummond	72,100	992,100
Kerr Lake	160,050	1,642,206
King Edward	.....	183,740
La Rose	130,000	9,168,433
McKinley-Darragh	.....	1,426,108
Nipissing	252,310	9,803,353
Nova Scotia	.....	480,810
Nancy Helen	.....	83,400
Peterson Lake	.....	324,040
O'Brien	63,960	1,959,512
Right of Way	.....	2,154,891
Silver Queen	.....	598,395
Silver Cliff	.....	123,820
Temiskaming	60,000	1,566,060
Trethewey	123,000	1,485,698
T. & H. B.	.....	1,106,260
Muggley Cons.	.....	72,900

Ore shipments to Sept. 18 from Jan. 1 are 42,401,022 pounds, or 21,200 tons.

Total shipments for week ending Sept. 18 are 924,420 pounds, or 462 tons.

The total shipments for 1908 were 25,463 tons, valued at $10,000,000.

During the first seven months of 1909 the exports of anthracite coal from the United States amounted to 1,709,401 long tons, and of bituminous coal 4,915,914 long tons. Of these amounts Canada took 1,685,395 tons of anthracite, and 3,424,795 tons of bituminous. This amounts roughly to 77 per cent. of the total U. S. exports. In the same period Canada sent 543,198 tons of coal to the United States, and about 70,000 tons of coke, chiefly from the West.

KASLO SILVER, LEAD AND ZINC ORES.

The ore shipments through Kaslo over the K. & S. for the month of August were the largest known for any single month for some years past. The output was 100 cars, compiling a total of 2,222 tons. Of this amount zinc ore formed the bulk with 1,710 tons and 482 tons of silver-lead. The latter was consigned to Trail, and the former to four zinc smelters in various parts of the United States. The largest shipper was the Whitewater with a total combined output of 1,010 of both classes of ores, zinc predominating, and the Lucky Jim a close second with 990 tons of zinc only. Although mining as a whole appears quiet, the output so far for 1909 is the largest for a number of years past, the total for the district to date being 13,597 tons of all kinds of ores, and from this is omitted the past month's output from the Bluebell, which would swell the August output at least 500 tons more. At the present rate of shipments the output for the year will easily touch or go over the 25,000 mark, which will establish a latter day record.

The following is the list of mines and their tonnage for August:—

Silver-Lead.

Mine.	Tons.
Rambler	120
Cork	82
Whitewater	60
Whitewater Deep	200
Wellington	20
	482

Zinc.

Lucky Jim	990
Whitewater Deep	750
	1,740

Total output to date of silver-lead and zinc ores, 12,597 tons.

Nelson, Sept. 11.—Some 80 men are now at work in the Le Roi mine at Rossland, and it is expected that shipments will be recommenced shortly. The output of the district for the past week has been about the average for the year so far. Appended are the details:—

ORE SHIPMENTS.

Boundary—	Week.	Year.
Granby	19,027	681,900
Snowshoe	4,313	95,929
Mother Lode	6,336	176,684
Other mines	.....	2,112
Total	29,676	956,625
Rossland—	Week.	Year.
Centre Star	3,377	122,044
Le Roi No. 2	629	22,022
Le Roi No. 2, milled	260	9,200
Other mines	.....	9,561
Total	4,266	162,827
Slocan-Kootenay—	Week.	Year.
Queen, milled	420	14,910
Granite-Poorman, milled	250	8,850
Whitewater Deep, milled	700	25,000
Kootenay Belle, milled	70	2,490
Second Relief, milled	145	5,150
Nugget, milled	110	3,910
Bluebell, milled	900	32,000
St. Eugene	314	14,949
Enterprise	8	8
Ferguson	33	131
Belcher	23	58
North Star	44	1,379
Ottawa	63	168
Rambler-Cariboo	59	680
Cork	21	277
Emerald	77	1,022
Bluebell	133	3,584
Yankee Girl	105	1,694
Whitewater	87	907
Queen	29	468
Other mines	.....	14,636
Total	3,591	132,271

SMELTER RECEIPTS.

Granby	19,027	682,350
Consolidated	9,315	277,748
B. C. Copper Co.	6,336	178,167
Le Roi	.....	12,761
Total	34,678	1,151,026

The London circular of Pixley & Abell, dated Sept. 2, gives the total exports of silver from London to the far east from Jan. 1 to Sept. 1 as follows:—

	1909.	1908.	Dec.
To India	£4,305,700	£6,448,433	£2,142,733
To China	1,555,200	516,400	*1,038,800
To Straits	82,800	90,510	7,710
Total	£5,943,700	£7,055,343	£1,111,643

*Increase.

TORONTO MARKETS.

Metals.

Sept. 24.—(Quotations from Canada Metal Co., Toronto.)
Spelter, 5¾ to 6 cents per lb.
Lead, 3.50 to 3.60 cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 32 cents per lb.
Copper, casting, 13¾ cents per lb.
Electrolytic, 13.75 cents per lb.
Ingot brass, 9 to 12 cents per lb.

Sept. 24.—Pig iron.—(Quotations from Drummond, McCall Co.)
Summerlee, No. 1, $22.50 (f.o.b. Toronto).
Summerlee, No. 2, $22.00 (f.o.b. Toronto).
Midland, No. 1, $21.00 (f.o.b. Toronto).
Coal—Anthracite, $5.50 to $6.75.
Bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Connellsville coke (f.o.b. ovens):—
Furnace coke, prompt, $2.50 to $2.75 per ton.
Foundry coke, prompt, $2.75 per ton.
Tin (Straits), 30.35 cents.
Copper, prime Lake, 13.00 cents.
Electrolytic copper, 12.85 to 12.95 cents.
Copper wire, 14.50 cents.
Lead, 4.37½ to 4.40 cents.
Spelter, 5.75 to 5.80 cents.
Sheet zinc, 8.00 cents.
Antimony, Cookson's, 8.50 cents.
Aluminium, 23.00 to 24.00 cents.
Nickel, 40.00 to 47.00 cents.
Platinum, $25.50 to $29.25 per oz.
Bismuth, $1.75 per lb.
Quicksilver, $43.50 to $44.00 per 75-lb. flask.

SILVER PRICES.

	New York. Cents.	London. Pence.
September 4	51⅝	23 13-16
" 6	—	23 13-16
" 7	51½	23¾
" 8	51⅜	23 11-16
" 9	51½	23¾
" 10	51⅝	23 13-16
" 11	51½	23¾
" 13	51⅜	23 11-16
" 14	51½	23¾
" 15	51⅝	23 13-16
" 16	51½	23¾
" 17	51½	23¾
" 18	51½	23¾
" 20	51½	23¾
" 21	51½	23¾
" 22	51¼	23 11-16

MARKET NOTES.

Ferromanganese is a desired commodity. Deliveries for next year are going up in price. Pittsburg prices stand at about $43.45 per ton f.o.b. Pittsburg, for prompt, and $45.45 for future delivery. During the fiscal year 1907, 94,543 tons of ferromanganese were imported into the United States. The corresponding figure for 1908 was 58,101 tons, and for 1909, 64,107 tons.

Silver.—Messrs. Pixley and Abell report on September 10th a moderate inquiry for silver from the Indian bazaars on September 9th. The market closed steady. Fluctuations of the market in the near future will likely be small.

The amount of silver consigned to Bombay by this week's (Sept. 10th) steamer is about £150,000. A shipment of £22,500 was made from San Francisco to the Far East.

M. Cochery, the French Minister of Finance, has appointed a committee to study the advisability of introducing aluminium fractional coinage to take the place of copper and nickel coins. The movement was brought about by the fact that in the last 55 years copper coins to the nominal value of £900,000 have been lost out of a total coinage of £2,900,000. Aluminium has many advantages. It is light, does not tarnish, and cannot cause poisoning.