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CIRCULATION.

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CONTENTS.

THE ELECTION.

We are not a nation of prophets. The overwhelming events of September 21st were unexpected by the shrewdest political diagnosticians. Never has a Canadian government been so finally defeated on an issue of grave national importance. Never has the nation spoken with so little regard for political colour. Although, as is usual under our system of party government, the Conservative party reaps the glory and benefits of the election results, a deeper significance than party victory underlies the occasion.

Canada has definitely refused to endorse the reciprocity pact. This is not a hostile demonstration against the United States. It is, on the other hand, a dramatic declaration of Canada's desire and intention not to imperil her place in the British Empire. That the acceptance of the Taft-Fielding pact would have weakened the Imperial connection is not for us to say. We may safely leave that question to political journals. But it is certain that the majority of Canadians did think so on September 21st.

Personal sympathy with Sir Wilfrid Laurier, at once the most picturesque and the most magnetic figure in Canadian public life, will be felt and expressed throughout the length and breadth of the land. Of him any nation might well be proud.

Sympathy, also, will be felt for such of his former ministers as have done their duty honourably, a list that is not as inclusive as it might be.

Upon Mr. Borden, as Premier, and upon the cabinet that he will select, lies a profound obligation. Canada has emerged definitely and cleanly into self-respecting nationhood. Solidarity has been attained. It is known, now, that the interests of the nation must rule supreme. How to give those interests definition, how best to forward them, how to preserve harmony between conflicting commercial elements — these are the problems.

As Canadians we cannot but follow the whole trend of Canada's growth. As mining men we are particularly concerned with the new Government's policy in regard to the mining industry.

The first and, in itself, the one step that will determine the success or failure of the Government's mining policy will be the selection of a competent, enlightened, and vigorous Minister of Mines. Naturally this must be a totally independent cabinet position, and the jurisdiction of the Minister must be complete. It must include the function now anomolously assigned to the Department of the Interior, namely the administration of mining lands in Alberta, Saskatchewan, and Yukon Territory.

Any Minister selected will prove an encumbrance unless he surrounds himself with experienced advisers and keeps constantly in touch with the industry. Therefore it is imperatively necessary that the Minister, unless he is to be a figurehead, be forearmed with a knowledge of what mining means to Canada. In other words, he must have had occasion to study conditions at first hand.

We seize this opportunity of pronouncing our views because experience has convinced us that, of all our industries, that of mining is most in need of careful attention from Ottawa. This assertion needs no laboured proof.

* * * *

Before our new Premier and his Minister of Mines lies a supreme opportunity. Canada can easily improve her position in the mining world. But much will depend upon Ottawa. The revision and codification of our mining laws, a measure already begun, must be completed at an early date. The questions of handling explosives, of rescue work in coal mines, and similar problems can best be met by the Federal Mines Branch. Provincial Departments will follow the lead set by Ottawa.

There is no doubt that the erection of a vigorous Department of Mines at Ottawa, under a competent Minister, will mark the inception of a remarkable development in Canadian mining. We cannot too strongly urge upon the new Government its duty in this respect.

THE ECONOMICS OF TUBE-MILLING.

A remarkably exhaustive thesis, the work of Mr. H. Standish Ball, M.Sc., has just been published in the Bulletin of the Institution of Mining and Metallurgy, of which body Mr. Ball is a student-member. Mr. Ball undertook the work in order to acquire his M.S.C. degree at McGill University, and also to do his duty as the recipient of the Research Scholarship awarded by the Transvaal Chamber of Mines in the year 1909.

Working under the general direction of Dr. J. Bonsall Porter, Mr. Ball made an analysis of the conditions that determine the efficiency of tube-milling. Sketching first the growth of tube-milling practice, he touches upon the factors controlling efficient work, outlines the tests proposed and the tests actually carried out, the general theories of rock crushing, describes the equipment used, and then proceedsd to give a detailed account of each experiment.

The rock used was a hard, compact, nepheline syenite. The tests were divided into four series, in the first of which the feed was varied, the moisture, pebble load, and revolutions per minute remaining constant. In the second series, the moisture was varied; in the third, the pebble load; and in the fourth, the speed.

The preparation of the rock proved to be an unexpectedly arduous task. After reduction to -¼-in. through a "Comet" crusher, 14 tons had to be crushed in a 5-stamp battery through a screen of 18 holes to the linear inch, and de-slimed in a classifier. The sands were then dried, weighed, and stored.

The mill used was formerly an old chlorination barrel, the outside dimensions of which were: length, 4 ft. 8in.; diameter, 3 ft. 5 in. The inside dimensions were: length, 3 ft. 6 in.; diameter, 2 ft. 10 in. The tube shell was built of ⅜-in. steel, bolted to cast iron end pieces, 2 inches thick, which were stiffened by six 2-inch ribs. The lining consisted of 8-inch by 4-inch by 2½-inch Silex bricks, set in patent cement. An iron screen, with ¾-inch holes, was fixed at the discharge end. 18-mesh sand was delivered by means of a pipe from a bucket elevator to the cone, the size of the discharge orifice being regulated by means of carefully calibrated caps with different sized apertures.

The barrel was driven by a chain and sprocket gearing, and revolved on hollow trunnions. The stamp battery consisted of five 600-lb. stamps, the total crushing capacity being 800 lbs. per hour.

The amounts of rock used in each test ranged from 800 lbs. to 2,000 lbs. After careful screening of the sand through ⅛-inch screen, the water was measured and the flow adjusted. The time consumed by each test varied from 45 minutes to one hour. Thorough screen analyses checked every trial.

It is impracticable here to follow the elaborate tests conducted by Mr. Ball. It must suffice to note some of his conclusions. From figures adduced throughout the experiments, it is indicated, provided there be a fair basis of comparison between the large mills in use in South Africa and small mill used by Mr. Ball, that the present general tendency is to overfeed. That is, the "critical feed," is exceeded, power is wasted, and the results obtained are not commensurate with the material and power used.

As regards moisture, the fact is demonstrated that 37.7 per cent. is much more advantageous than any other proportion. This corresponds more or less closely, with the conclusions of other investigators.

The pebble load tests tended to show that the highest efficiency is reached when that load has a volume of 7/16 the volume of the mill.

The conclusion that a peripheral speed of 333 feet per minute, or 37 revolutions per minute, is most efficient is in close accord with results obtained by Richards and others.

Mr. Ball's paper is an excellent student production. It exhibits evidence of care, thoughtfulness, and ability. It is open to certain criticisms, as, for instance, the fact that several of the curves, notably those displaying "moisture efficiency" and "moisture power," are based upon quite insufficient data. Generally, this applies to the whole paper. There is no adequate

reason adduced for instituting close comparisons between the improvised tube mill and the large mills that are used in actual practice. Hence there are gaps in Mr. Ball's demonstration.

Yet the paper is most creditable as the effort of a student working under all the disadvantages of the usual laboratory equipment.

COMPANY PROMOTION.

As chairman of the Western Branch of the Canadian Mining Institute, Mr. Robert Hedley delivered a noteworthy address at the last gathering at New Denver, Slocan Lake, B.C. The leading topic touched on by Mr. Hedley was the subject of company promotion for mining enterprises.

The substance of Mr. Hedley's speech was to the effect that discreditable mining enterprises can be nipped in the bud if proper precautions be taken. In the first place, there must be reasonable grounds for believing that ore exists in commercial quantities in any given prospect. This is one of the considerations glossed over by the promoter and rarely investigated by the casual investor. Secondly, the proposed distribution of capital contributes to kill whatever chance of success there may be. Thirdly, competent management can never be expected in connection with unsound flotations. Fourthly, even if the physical aspects of the proposition be favourable, disproportionately small sums are provided for working capital, and the market for shares is overwhelmed with promotion scrip before that working capital can be raised.

To meet these conditions, Mr. Hedley proposed that it be made a misdemeanour to "promote a company to "operate a mine that has little, if any, reason to hope "for commercial ore; so to distribute the capitalization "that the treasury is inadequately supplied; to place "the management in grossly incompetent hands; to "sell promoters' shares before the property has been "developed beyond the prospect stage."

Mr. Hedley, of course, merely reiterated the opinions of all respectable mining men. His suggestions have been made and discussed many a time and oft. All of them deserve close attention.

Taking these suggestions in order, it may be pointed out that there is so much room for difference of expert opinion as to the merits of a prospect that the first suggested misdemeanour hardly comes within the scope of legislation. All that is really necessary is that the opinion of a competent and disinterested mining engineer be obtained. On the other hand, the matters of organization and distribution of capital shares are readily controllable. This is immediately the duty of each Provincial Government. As to the character of the management, the only way in which efficiency can be guaranteed is by securing legislation that precludes the incompetent man from mine management.

British Columbia laws already guard against the unqualified assayer, and require strict certification of coal mine managers. Why this measure cannot be enlarged so as to embrace the management of metalliferous mines, we cannot see.

We are in hearty accord with the opinion that it should be made a misdemeanour to place promoters' shares upon the market before a mine has been developed. But this restriction will require official definition in each instance. If a time limit be set, evasion of the law will be easy; but the public will have been given a chance of finding out what it is buying. If official sanction be made a condition, abuses will almost certainly be created.

The time limit, one year possibly, appeals to us as the most rational provision. The other essential is the establishment of a constant relation between promotion stock and treasury stock.

Canada's credit in the eyes of the world rests to a larger extent than ever before upon mining flotations. It is high time to do a little housecleaning.

JUSTICE.

On Monday, September 25th, a "high-grader" named Mountell, who had been found with about 150 pounds of silver in his possession, and who was alleged to have operated as a "fence" in the Cobalt region, was tried before Judge Winchester in the Court of Criminal Sessions, Toronto.

No evidence was heard, or, at best, only a tithe of the evidence was taken. The man was allowed to escape with a fine of $200.

It is unimaginable that Judge Winchester did not know that under Section 224 of the Criminal Code it is made a criminal offence for a person who is not the owner of a mine, or the authorized agent of an owner, to buy or sell silver or silver ore. We have reason to believe that the evidence against Mountell was unusually complete. In any event a fine has nothing to do with the case. The accused should have been acquitted or condemned according to law and not according to Judge Winchester's vagaries. Such conduct on the part of our judiciary is both mischievous and pitiful.

EDITORIAL NOTES.

The fourteenth annual session of the American Mining Congress has been postponed from September 26th to 29th, until October 24th, 25th, 26th, 27th, and 28th. The reason of the postponement was the fact that President Taft could not attend on the former dates.

From our British Columbian correspondent's note it will be seen that, as at July 1st of this current calendar year, there was due on lead bounty the sum of $832,979.68. The total appropriation made by the Dominion Government was $2,500,000. The total amount paid before that date was $1,617,020.32. Of this, the sum spent up to June 30th, of this year, is $49,713.32.

Upon Mr. J. M. Clark, K.C., who has been largely instrumental in the recent codification of the mining laws of the Dominion, has been conferred the honour of election to the Honorary Council of the North British Academy. The Academy is a notable scientific society amongst whose officers are such persons as the Right Hon. Viscount Milner, Field Marshall Earl Roberts, and the Right Hon. A. J. Balfour.

CORRESPONDENCE

COMPULSORY CERTIFICATES FOR MINE MANAGERS.

Editor Canadian Mining Journal:—

Sir,—What has played a prominent part in hampering the progress of the mining industry is the fact that the management of a large proportion of the mines has been left in the hands of men who are incompetent to fill such responsible positions. By paying a visit to some of the mining districts and observing the methods employed in carrying on operations it is possible to see where instances of incapable management have been the cause of squandering thousands of dollars. This fact alone demonstrates the need of establishing a strict standard of efficiency for the mine manager.

In order to establish a higher standard for men engaged in this branch of the profession, the urgent necessity for legislation compelling an examination in certain mining essentials is obvious. The passing of an Act of Parliament to this general effect would not only protect the industry but would raise the standard of competent mine managers to a higher plane. Certain reservations could be made in favour of men who have had years of practical experience in underground work. In some cases such men are of equal value to the industry as their technically trained brothers, particularly where mining properties are free from complexity of geological structure and chemical combination. It would be a hardship to the man who has graduated through the underground workings of a mine to exclude him from a higher position for the sole reason that he has not had the opportunity to secure a scholastic training. Cases of this kind could be taken care of in the arrangement of details. It is a matter of vital importance to the mining industry that practical experience be not overlooked. Nevertheless the science of mining makes technical training absolutely necessary for the mine manager. A man who has taken a course in a school of mining, added to years of practical experience, is better fitted for the office than a man who has had no technical training.

For many years the mining fields of Canada and the United States have been the hunting ground for the unqualified man. Men of this character apparently overlook the fact that it is a grave misdemeanour to accept a position as mine manager when they are not qualified to fill the office—no matter under what conditions the position may have been secured. Positions as mine manager are often obtained through the influence of friends for men who have not the slightest knowledge of even the rudiments of mining, and in many cases the final result has been the closing down of prospects before they have had an adequate test.

Some idea of the clamant need for the certificating of the mine manager may be gathered from the fact that before a man is allowed to take charge of a boiler and engine he is compelled to produce a certificate. The lives of men are in his hands. None other but a thoroughly reliable man is allowed to take charge of a hoist, yet the mine manager is the hoist man's superior officer. His responsibilities are more diverse, and he is, to a great extent, responsible for the doings of the hoist man, therefore it is apparent that there should be some law compelling the man in charge of the hoist driver to pass an examination in mining matters before he is considered competent to fill such a responsible position.

The question of certificating mining managers is of sufficient importance to warrant the co-operation of the Minister of Mines with the Canadian Mining Institute in acquiring the desired end.

Yours, etc.,

George R. Rogers,

Toronto, Sept. 21st.

Personal and General

Mr. G. C. Bateman is still in Porcupine.

Mr. J. W. Evans gave another successful demonstration of the Evans-Stansfield furnace at the School of Practical Science, Toronto University, on the evening of Sept. 21st. His audience was largely made up of members of the American Electrochamical Society. Much interest was roused, and it is probable that further demonstrations will be arranged. Practical publicity of this kind is highly desirable.

Mr. W. E. Segsworth, mining engineer, Jarvis Building, Toronto, has returned from a lengthy inspection of mining properties in Eastern Ontario.

Mr. W. A. Parks, associate professor of geology, University of Toronto, returned to Toronto on September 21st, after being absent the whole summer on official business connected with the Federal Mines Branch.

Mr. Kirby Thomas, mining engineer, 20 Broad St., New York, recently examined several claims in the West Shining Tree region.

Mr. George P. Dempster, Porcupine representative of J. S. MacArthur & Co., visited Toronto during the middle of September.

Mr. A. A. Hassan, consulting mining engineer, has established an office in 11 Royal Exchange Building,

Cobalt, Ont. Mr. Hassan has started afresh the development of the Cobalt Station Grounds mine.

Mr. Thomas Kiddie, of Vancouver, B.C., was in California recently.

Mr. C. F. J. Galloway, B.Sc., son of Professor Galloway, of Cardiff, Wales, lately visited the Cariboo district, B.C., to examine mining property.

Mr. Ernest Levy, manager of the mines of the Le Roi No. 2, Ltd., at Rossland, and that of the Van-Roi Mining Co., Ltd., in Four-mile Creek camp, Slocan Lake, has returned to British Columbia after an absence of about three months, which period he spent in England.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, returned to Victoria on September 3rd from an official visit, extending over nearly two months, to mines in the country around Hazelton, Skeena River, Cassiar district.

Mr. O. E. LeRoy, of the Geological Survey of Canada, has been making Nelson his headquarters this season while supervising the geological and topographical work of several survey parties engaged in Kootenay and Boundary districts of British Columbia. Field work has been completed in Franklin camp, Boundary district, but there is still much to do in East Kootenay.

Mr. A. L. Larson, formerly superintendent of the Le Roi mine, but now of Vancouver, B.C., made an examination of the Slocan Star group of mines and the adjoining claims of the Star Mining and Milling Co., in connection with an amalgamation of interests that has been arranged between the several parties concerned.

Mr. Robert R. Hedley, of Vancouver, B.C., accompanied by Messrs. Hugh F. Marriott, of London, and G. G. S. Lindsey, of Toronto, paid a visit to Sheep Creek camp, in Nelson mining division, after their return south from a visit to the Skeena River country. Messrs. Lindsey and Marriott immediately afterwards left British Columbia for New York, whence Mr. Marriott proceeded to London.

OBITUARIES.

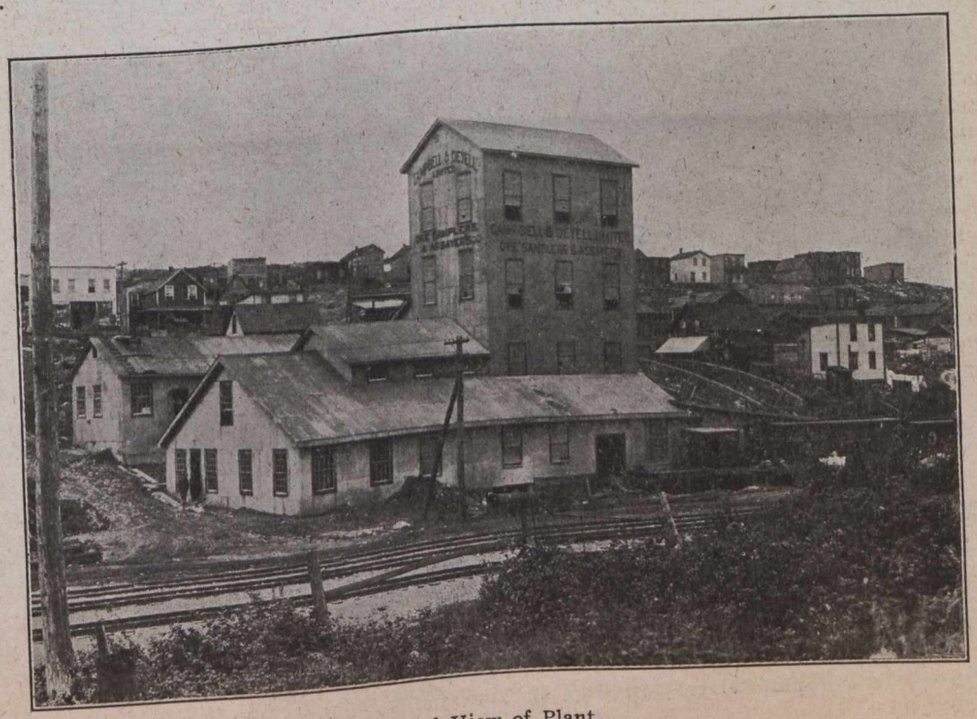
The death occurred at Atlin, B.C., on September 7, of Mr. Th. Obalski, the manager and mining engineer of La Societe Miniere de la Columbie Britannique. Mr. Obalski was about 50 years of age at the time of his death. Heart failure was the immediate cause. Mr. J. Obalski, formerly Superintendent of Mines for the Province of Quebec, and now a member of the mining engineering firm of Obalski and Dulieux, Montreal, is a brother of the deceased.

ORE SHIPMENT SAMPLING IN COBALT.

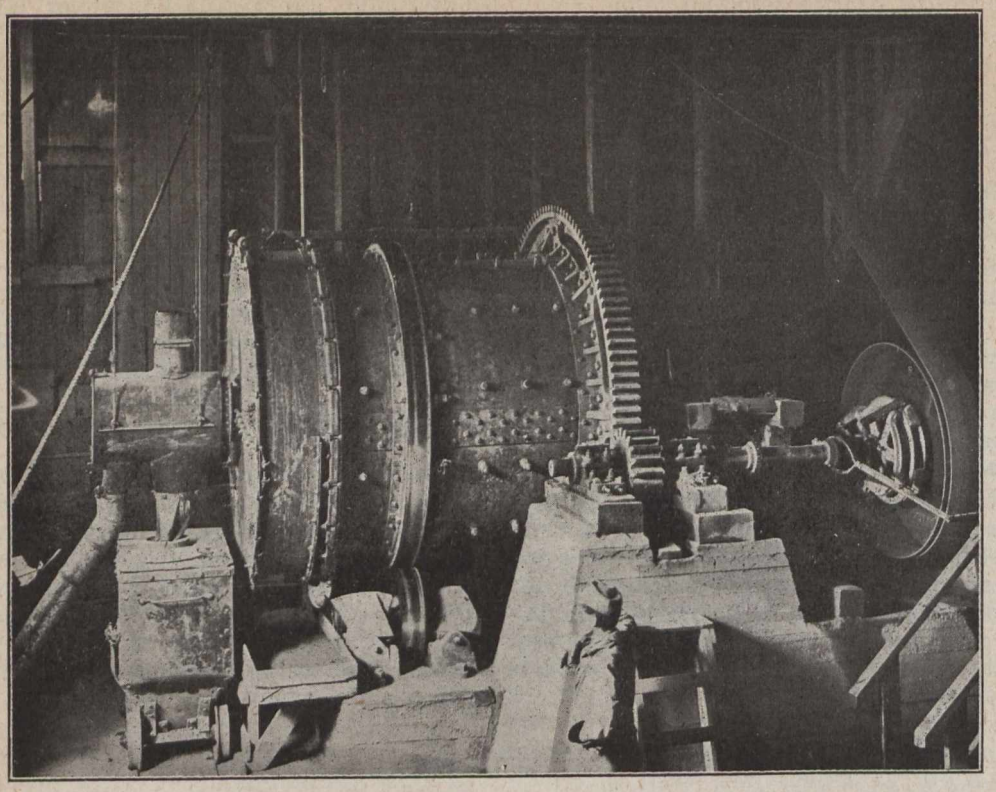
(Written for the CANADIAN MINING JOURNAL.)

Exactly two years ago there was published in the CANADIAN MINING JOURNAL a description of a custom sampling plant then about to be built in Cobalt. The men behind the enterprise were Messrs. Campbell and Deyell, of Cobalt.

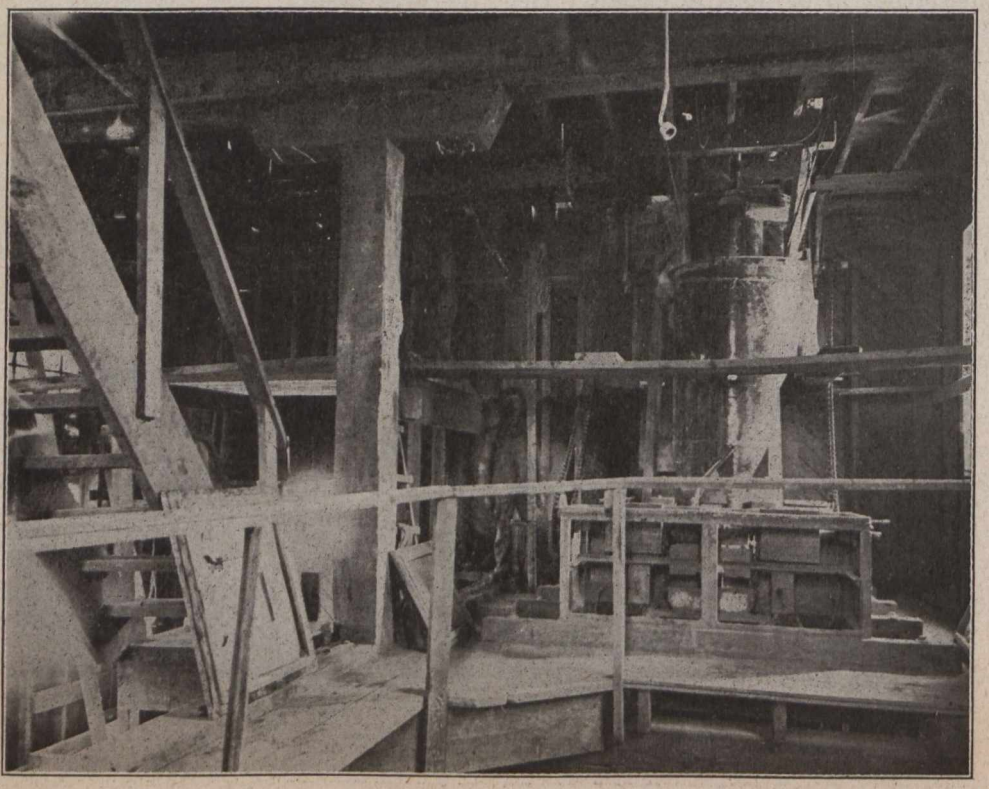
The idea that animated the enterprise was the recognition of the need of some standard system of valuing the ores locally. The discrepancies constantly noticeable between the sampling done by the shippers and that done by the smelters demanded attention. It was



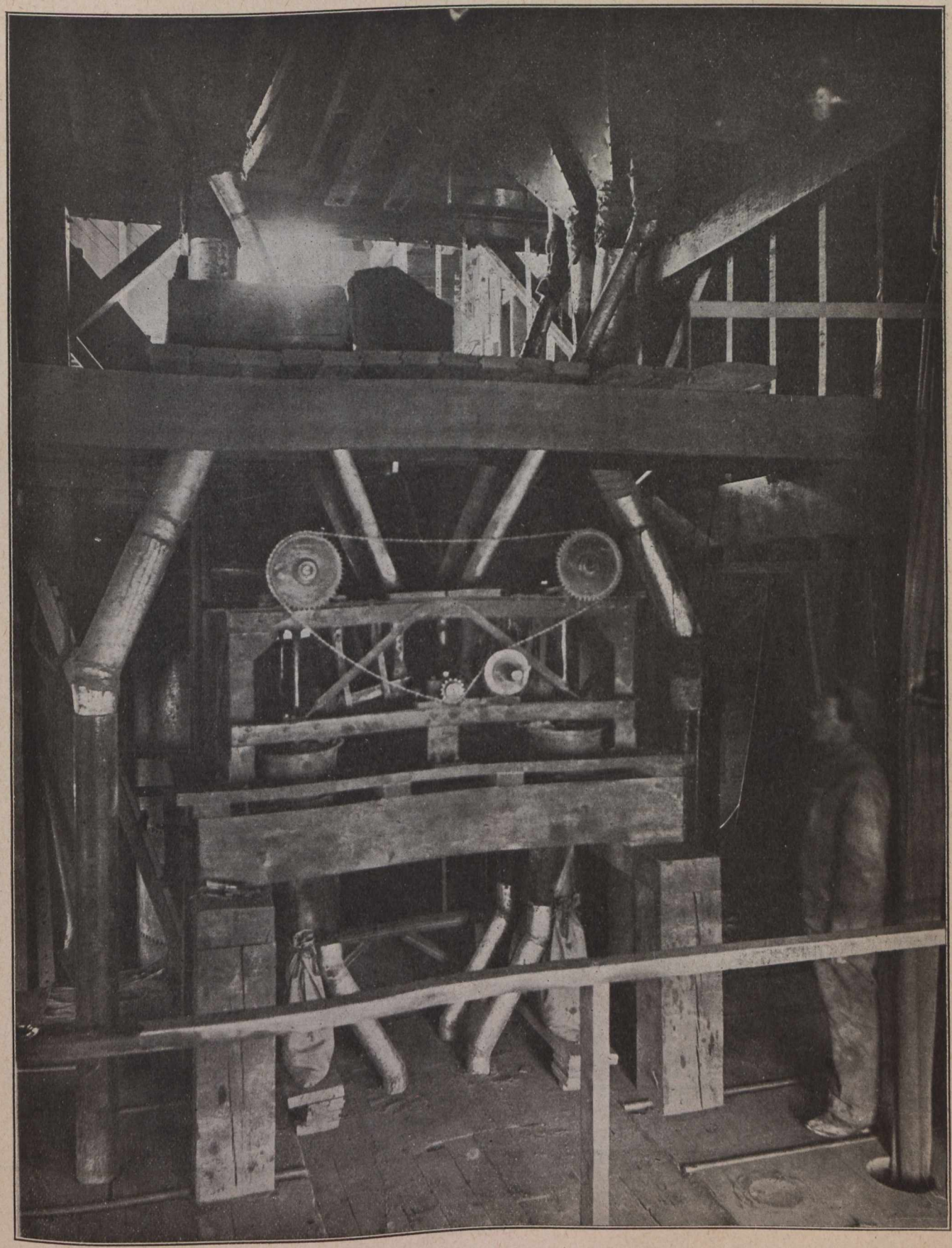
General View of Plant.



Ball Mill.



Spiral Mixer, Quartering Machine, and No. 1 Vezin Sampler.



Quadruplicate Vezin Samplers.

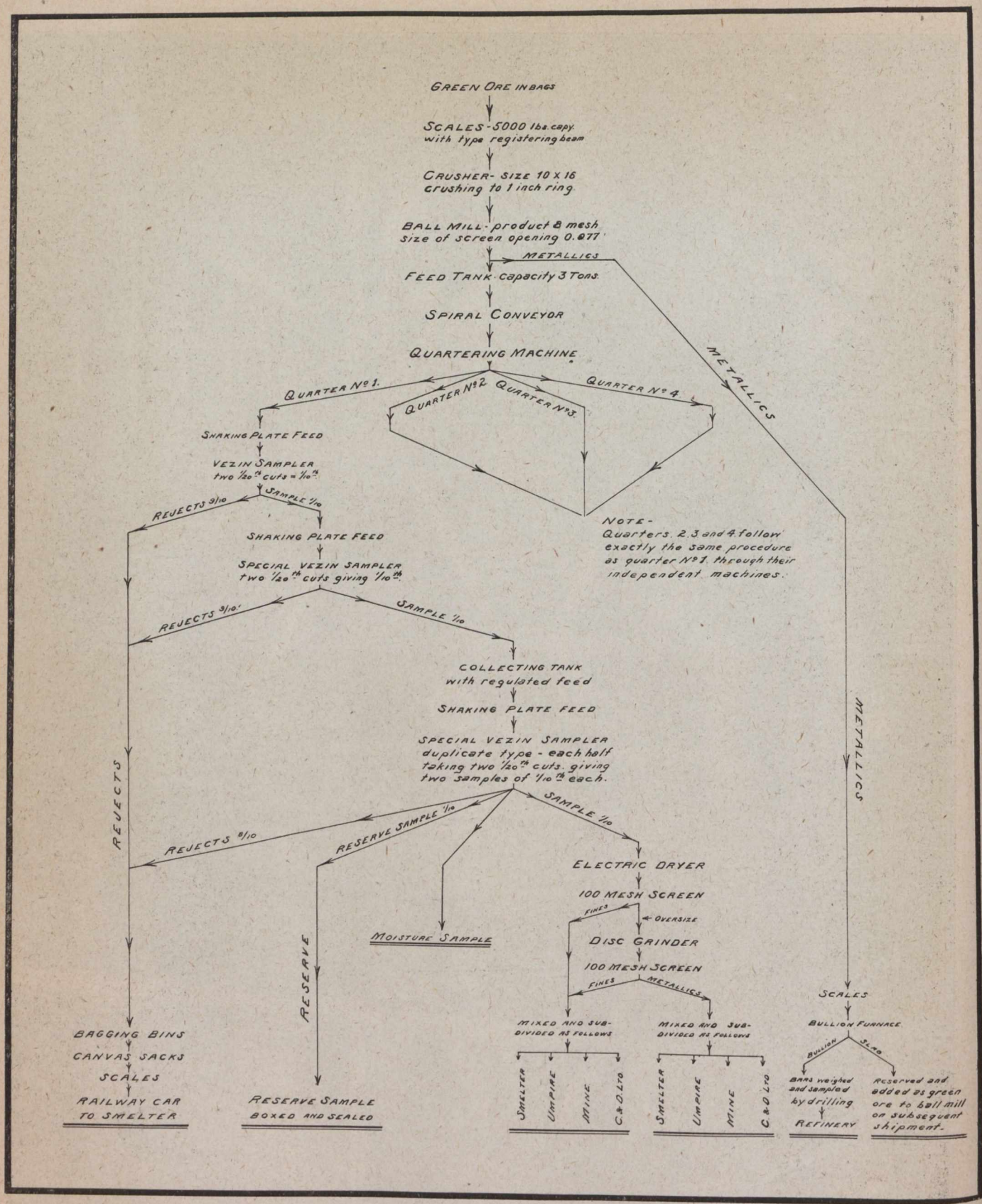
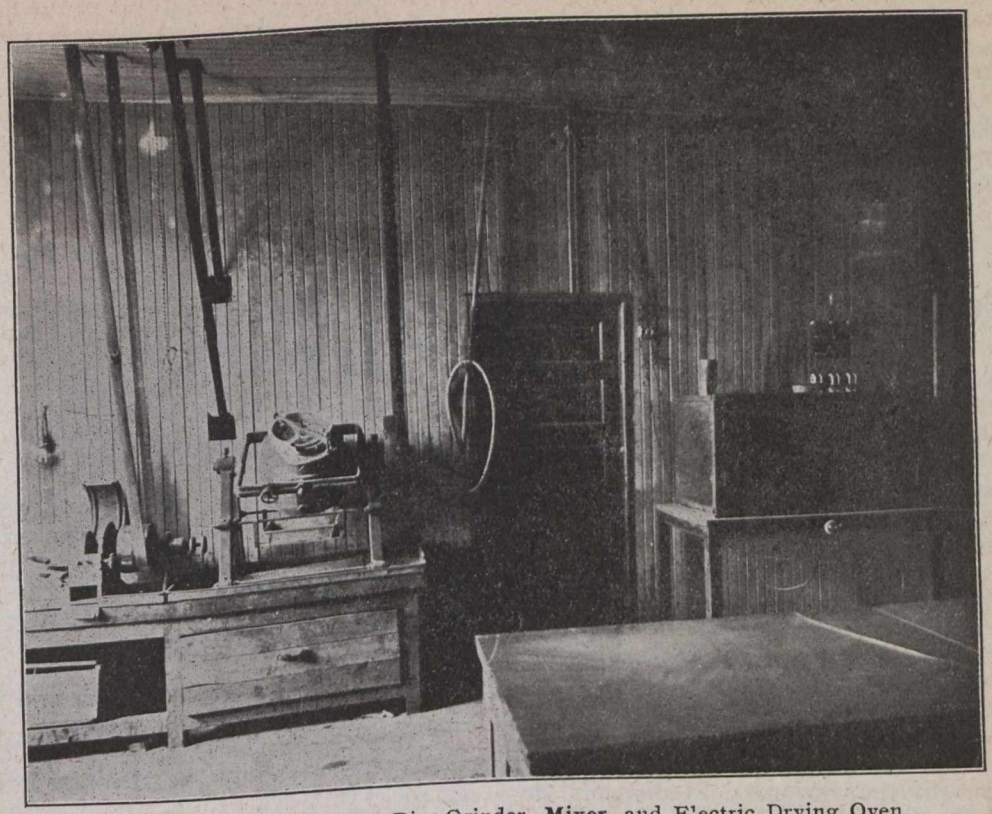


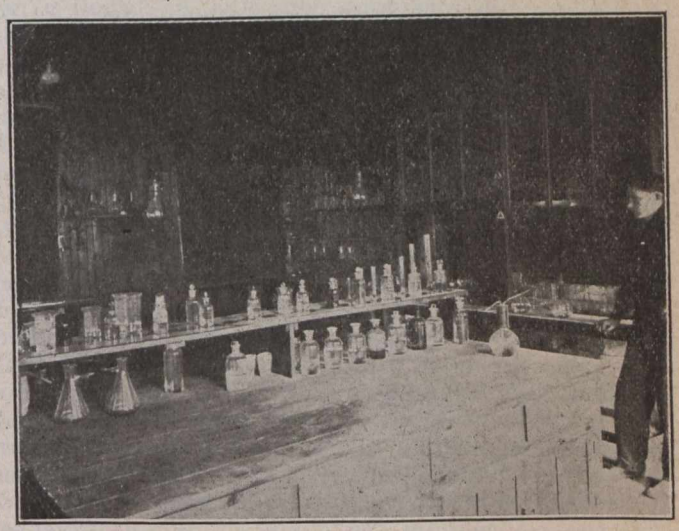
FIG. 1.

Flow Sheet,



Finishing Room, showing Disc-Grinder, Mixer, and Electric Drying Oven.

Bagging the Ore.



Corner of Laboratory.

felt that a local sampler was a necessity. The irregular and very variable ores of the camp presented difficulties that could not be met at each mine. Only a large and well-organized public custom sampler could fill the bill. For more than a year the sampler has been in operation. It has supplied a recognized need and has, moreover, created a larger demand for accurate sampling.

The flow-sheet that accompanies this article is practically self-explanatory. The ore is first crushed to pass a one-inch ring. It then is put through a ball mill giving an 8-mesh product. Here the screened metallics go straight to the bullion furnace, the slag being added to the next shipment of ore. A 3-ton feed tank now takes the ore. Through a spiral conveyor it goes to a quartering machine. Each quarter is treated precisely as quarter No. 1, which is reduced three times in 1/20 cuts.

It will be noted that full provision is made for umpire, control, smelter, and original samples. Moisture samples, also, are obtained on the last cut.

The bulk of the ore, that is, nine-tenths of the original, is transmitted to bagging bins and thence to canvas sacks. It is then weighed and put on board the car for shipment to the smelter.

The contrast between the present flow-sheet and that first proposed (see page 581, Oct. 1st, 1909) is marked. At first it was thought necessary to design two sections, one for low grade ore and one for high grade. As it stands at present, the mill is a unit, capable of sampling any class of Cobalt ore. The system of sampling has been modified, and the whole flow-sheet has been adapted to the changing conditions of the camp. Relatively little of low grade ore is now being shipped from Cobalt. More and more is being concentrated. Thus scrupulous care is needed in handling satisfactorily the high grade ore sent to the sampler.

Every established mining camp that sends its products to outside smelters should possess an independent sampler. Both the shipper and the buyer benefit thereby.

RESEARCH WORK ON CERTAIN NOVA SCOTIAN GOLD ORES.

By Ora Willis Knight, M.Sc., D.Sc., Bangor, Maine, U.S.*

During the summer of 1910 I spent several weeks studying a number of the anticlinal gold districts of Nova Scotia, and since returning to my laboratory at Bangor, Maine, I have been engaged in a continuous series of investigations, both physical and chemical, of quartz, associated minerals, ores, slates, and quartzites, all of which were personally secured by me in Nova Scotia or in two instances were furnished me through the kindness of Mr. Holman.

This original work has been supplemented by a study of the geological literature of Nova Scotia, including a set of the maps of the various gold districts furnished me through the kindness of Mr. E. R. Faribault, and from a study of these maps alone it is possible to arrive at some very valuable conclusions.

My investigations were conducted on behalf of the Caribou Gold Mines, for which I was retained by Mr. C. Vey Holman, president of the Caribou Gold Mines and state geologist of Maine, and Mr. Holman has generously desired to place such of this privately acquired information as may tend to prove of value in aiding the future mining development of the province, at the disposal of its mining fraternity.

Discovery of Platinum.

Five weeks in all were spent in Nova Scotia, much of this time being passed in the Caribou district, but several other districts on anticlinal folds were studied. The names of these other districts cannot at present be mentioned, although it is permitted me to say that on a mine dumy in one of these districts several small crystals of sperrylite, ($PtAs_2$), a native platinum arsenide, were found by me. Though not actually taken from rock in place, there is every reason to believe that the material on the dump actually represented material from an adjoining vein. The gangue mineral containing the sperrylite was quartz, and the chief associated mineral was arsenopyrite, and a magnesia-bearing dike was in proximity. Laboratory tests were applied to this material after returning to Bangor, and the presence of platinum and arsenic in the crystals verified by positive chemical tests. This appears to be the first recorded discovery of platinum in Nova Scotia, but there is no reason why it should not be found elsewhere in the province associated with metallic sulphides such as covellite, tetrahedrite, bournonite, chalcopyrite, arsenopyrite, or other sulphide ores, or as an irregular dissemination in peridotite, pyroxenite, gabbro, syenite, or various basic eruptives, or in serpentine associated with chromite, the presence of which latter may be considered quite a promising indication of platinum. Reference to the discovery of selenium and tellurium in Nova Scotian ores will be found on a subsequent page.

*Abstract of paper read before the Mining Society of Nova Scotia.

Formation of Gold-bearing Rocks and Veins, and Deposition of Ore.

A careful consideration of all the data at hand regarding the origin of the Meguma series of gold-bearing rocks of Nova Scotia, would seem to indicate that it is of pre-Cambrian origin and quite probably Algonkian. (Cf. Van Hise and Leith, Pre-Cambrian Geology of North America, Bulletin No. 360, U. S. Geol. Surv., p. 512). The Meguma series has been divided by Prof. Chapman into a lower or quartzite group, the Goldenville formation, and an upper or slate group, the Halifax formation.

It seems very probable that the quartzites (Goldenville formation) were deposited as sediments in shallow water under the influence of strong waves and currents acting quite constantly for long periods of time, with alternating shorter periods of temporarily deeper waters, and slacker currents. Thus we had deposited coarse sandy material alternating with lesser deposits of very fine clayey sediments. When the metamorphic agencies acted on these later on, thick strata of quartzite with intercalated thin beds of slate were formed.

Following the deposition of these sandy sediments, there occurred a very abrupt change in the conditions, and there was a long time of existing deep waters, very moderate currents, and possibly sedimentary material originating in a more distant land mass was being carried and deposited. This material was deposited as a fine clayey mass quite different in appearance from the coarser sediments beneath. Later this clay sediment became the Halifax series of slates, sharply contrasted in appearance and composition with the Goldenville formation beneath. At far later geologic periods other sediments were formed which we will not consider in this paper.

After deposition of the sediments, a gradual uplifting of them took place. A new land mass was reared above the water, and ultimately crumpled into a series of parallel anticlinal folds by a powerful, uniform, long-continued pressure exerted from the south. More or less coincidently heat was developed and hot water, bearing silica in solution, permeated the sands of the Goldenville sediments, and by the deposition of

silica as a cementing material the quartzites were formed. The interstratified clay sediments were not so readily permeated by the silicifying solutions, so acted on by heat and pressure chiefly they were changed into slates intercalated in thin beds with the quartzites. Similarly heat and pressure changed the Halifax sedimentaries into slates, placed conformably on the quartzites.

These disturbances and metamorphic agencies were directly caused by the intrusion of the granite magma beneath, and took place at a period generally admitted to be later than Devonian. After intrusion of the granite magma which, it must be remembered, was resting under the great pressure exerted by the Meguma series above, a gradual crystallization took place and the various minerals of the granite separated from the magma, until there was left as a final portion excessive quantities of hot water under great pressure and charged chiefly with silica in solution. Finally great convulsions opened fissures extending towards the surface into which these waters poured, and on their upward way were forced laterally through openings formed by the tearing apart of the various thin slatey strata met on the upward course. Silica was deposited in these openings, both the vertical and the horizontal ones, resulting in the one instance in the formation of the fissure veins of quartz, with direct lateral branches forming the so-called bedded leads. There can be no question that practically all of the bedded veins are of a common origin and source and are direct branches of certain of the more prominent fissures, for they clearly branch from the fissures and neither cut nor are cut by them.

At some subsequent period other fissures were opened, cutting directly through the bedded veins as well as the older fissures, and were filled with solutions bearing silica, gold and other minerals. These later disturbances caused faulting, shearing, and fracturing, and many of the bedded veins and earlier fissures were faulted. It seems very probable that in connection with these later disturbances many of the richer oreshoots were formed. The statement of practical miners has appeared in print and several have told me verbally that in their experience in mining in Nova Scotia, while working in zones of faulting, they have generally found the richest ore under the faults, and that a vein which was rich up to a fault was very often barren when located again above and beyond the fault.

In connection with the anticlines of Nova Scotia we find at several localities that the rocks have been forced up into the form of domes, and in the Caribou district we find existing perhaps the most perfect of these domes. It is evident that some powerful force exerted from below forced the rock formations into the shape which gives them their name, nor is it difficult to fully explain what force formed them. At various localities in granite formations there exist very perfect domes or bosses of granite from which all formerly existing rock which covered them has been eroded. It is also not infrequently the case that granite domes have other rock formations covering their sides more or less completely, and still other domes of which only the very tops have been exposed by erosion of the rock formerly covering them, and so on by an almost complete series of intergradations existing in various parts of the world. It seems very certain that the domes of Nova Scotia, existing on the anticlinal folds, owe their shape to the existence of granite domes beneath which were forced up but never subsequently exposed by erosion.

At various places throughout the Meguma series of Nova Scotia, granite outcrops, having been exposed by erosion, and granite dikes also are not uncommon. It is also very certain that granite exists, at no great depth everywhere beneath the rocks of the Meguma series. While partial erosion has exposed the granite in many places, there seems to be no locality in the province where the slates and quartzites both have been eroded sufficiently to expose the granite on one of the domes.

It is quite generally agreed by the authorities that all gold was primarily of magmatic origin, and it is likewise quite certain that the gold of Nova Scotia originated in the granite magma beneath, and, carried up by ascending waters, was finally deposited in the sedimentary formations above. Even as this paper is being written there has come into my hands an article which records the finding of gold in the granite formations southwest of Halifax about the head of Terence Bay and at Pennant. While particulars of the find are lacking, I am inclined to predict that any pay-ore which has been or may be found in these granite formations will be in quartz veins or quartz segregations derived from the granite magma.

The natural solvents of gold are more numerous than commonly supposed, and the several naturally occurring solvents which have the power of dissolving gold at ordinary temperature and pressure have their solvent power increased proportionately by increased temperature and pressure. If such salts as ferric chloride, ferric sulphate, cupric chloride, cupric sulphate or any of the alkaline sulphides are dissolved in water then the resulting solutions are capable of dissolving gold, especially when heated with gold under pressure. Sodium carbonate solution containing dissolved carbon dioxide, and sodium silicate solution containing sodium sulphide or sulphydrate or other alkaline sulphides also dissolve gold. The presence of any compound capable of liberating oxygen, such, for instance, as manganese dioxide in acid solution, increases the solvent power of certain of the beforementioned solutions for gold, while heat and pressure likewise increase their solvent power.

In the Meguma formations of Nova Scotia we find an abundance of pyrite, pyrrhotite, arsenopyrite and other sulphides which, when bronght in contact with descending waters containing oxygen from the air dissolved therein, become oxidized, and soluble salts are formed capable of dissolving gold. Manganese dioxide is also common in the rocks of the Meguma formation, being more or less generally and finely disseminated, especially in the slates. The sulphur of the metallic sulphides named is first attacked and oxidized, and the finally resulting sulphuric acid attacks the iron, copper and other metallic elements of the sulphides, forming at first, in the case of iron, ferrous sulphate and finally by oxidation ferric sulphate, a gold solvent. The descending waters also contain some sodium chloride which, acted on by the sulphuric acid formed, sets free hydrochloric acid, and in the presence of manganese dioxide, chlorine, a solvent of gold. Ferric chloride is also formed and other solvents of gold as well by the complex series of chemical reactions resulting between the descending waters and the metallic sulphides they encounter.

These surface waters descend through various cracks, seams, joint planes, lateral fissures and through the pores of the rocks, becoming charged with solvents

of gold and other minerals, and becoming heated as well as under pressure with depth. These waters of meteoric origin and bearing "ic" salts in solution are very capable of dissolving gold and do dissolve it when brought in contact with it along their course. Finally at great depths and under great pressure these waters are forced into more or less vertical fissures extending towards the surface, and, charged with various salts dissolved from the rocks through which they have passed, they become ascending waters passing through trunk channels to the surface.

The waters entering the trunk channels at various places contain salts of a more or less diverse nature in solution, the nature of these salts varying with the nature of the local constituents of the rocks through which each set of waters has passed. Waters from the magmatic mass beneath also enter the trunk channels, and these are generally reducing waters, containing "ous" salts in solution and likewise containing agents capable of reducing "ic" salts to "ous" salts. Some branches of the trunk channels pour into them waters charged with alkaline silicates, alkaline sulphides, or alkaline carbonates, while other waters are charged with "ous" or "ic" salts. Under these conditions there would mingle in the trunk channels a series of solutions often of more or less neutralizing power, one to another.

It is a fixed law governing chemical reactions that if two or more solutions bearing different salts in solution are mixed together, and by reaction of these different salts on one another any insoluble compounds can be formed, then such insoluble compounds will be formed. In conformity with this law insoluble compounds are formed and precipitated along the course of the trunk channels. Reduction of both temperature and pressure as the waters near the surface result in the decrease of their solvent powers for certain salts which are precipitated. Locally also the walls of the trunk channels contain minerals capable of acting as precipitating agencies. While these conditions exist to-day and a certain amount of waters are still circulating in the rocks of Nova Scotia and doing the work described, such circulation is a mere nothing as compared with the vast volume which went through the same cycle in the period immediately following the granite intrusion of the past.

Among the common precipitants of gold positively known to exist either as minerals in Nova Scotia rocks, or to have been carried in solution by ascending waters, are ferrous sulphate, ferrous chloride, iron pyrite, pyrrhotite, arsenopyrite, native arsenic, the organic matter including the graphite and carbonaceous matter of the upper rock formations, and even pure slate, which latter has the power of throwing down gold from certain solutions.

Experiments and Analyses.

For the most part these statements regarding the solvent and precipitating power of various substances have been confirmed by conducting a series of experiments and analyses on material personally taken by me in the Province of Nova Scotia, and including gold, gold ores, slates, quartzites, gangue minerals, mine water, and similar material. In other words, I have been able to prove that the conditions in Nova Scotia were formerly very favourable for the solution and ultimate precipitation of gold, silica, and other minerals and metals, and that even to-day in a vastly lessened degree these same processes are being carried on. During my investigations I made many analyses and assays of material from bedded veins, fissure veins, slates, and whin (quartzite), to determine their gold content as well as the other minerals therein, but space forbids my giving more than a few of the most interesting analytical results.

A sample of mine water was taken where it poured from a crevice of the roof on the 100-foot level, east drift, Holman mine, near the intersection of the Ross vein with a little fissure vein of less than half an inch in width, at which place a large quantity of coarse, nuggety gold was taken in December, 1909. The analysis of this water is as follows:

Analysis of Mine Water.

Results in parts per million.

Total solid matter in solution	272.
Solids volatile on ignition	47.5
Solids not volatile on ignition	224.5
Free ammonia	.05
Albumenoid ammonia	none
Nitrogen as nitrites	none
Nitrogen as nitrates	none
Chlorine	1.354
Bromine	trace
Sulphuric acid radicle (SO_3)	60.01
Hardness by Clark's test	110.
Lead	none
Manganese	trace
Cupric oxide	.12
Ferric oxide	8.
Aluminum oxide	1.
Silica	21.5
Calcium oxide	73.
Strontium	trace
Magnesium oxide	24.1
Sodium plus potassium oxides	35.3
Gold	trace

The gold was detected by evaporating several liters of the filtered water and submitting the residue to fire assay, and at the same time carrying on a check test on the reagents used which proved them to be free from gold. A confirmatory test for the gold consisted in dissolving the metallic particle obtained by fire assay in a drop of chlorine water, adding a drop of stannous chloride solution and obtaining a precipitate of purple of Cassius. Here we have a mine water actually carrying gold in solution. The iron in solution in the water reacted for ferric iron but not for ferrous iron. Where the water flowed from the wall it deposited a sludgy mass of red, hydrated iron oxide.

At a point on the wast plunge, 40-foot level, Holman mine, a sample of the same hydrated oxide of iron was taken beneath the B vein where it had been deposited in considerable quantity by a stream of water. Every possible care was taken to obtain this material free from rock or other extraneous matter, and after being carefully dried it was taken to Bangor and assayed. The assay showed in the dry material that gold was present at the rate of 67 cents per ton. The water content of the original was not determined dbut is estimated at about 75 per cent.

To prove the precipitating power that certain metallic sulphides, occurring in almost every bedded vein, have when brought in contact with gold-containing solutions, three different experiments are quoted here, all being on material from the Holman mine. The details of these experiments follow:—

(a) A sample of V vein ore was taken from the east superstope on the dome, and from this sample a piece

was selected which measured 32 x 25 x 6 millimeters and weighed 27 grammes. This piece was chiefly a mass of yellow and silver coloured metallic minerals containing several particles of visible quartz. It was placed in a beaker and over it was poured 25 cubic centimeters of a solution containing 55.5 milligrammes of gold in solution as the chloride. After 3 hours the solution was decolourized, showing that reduction of gold had taken place. The solution was filtered and found free from gold by the purple-of-Cassius test. Examination of the ore under the microscope showed it had become coated with minute crystals of gold and with a brownish mass of amorphous gold, the crystals being distributed equally over the surface of the quartz, the yellow, and the silver coloured metallic minerals. The quartz, in addition to being coated with crystals of gold, was coated in places with a yellow film of metallic lustre such as I have frequently observed on bits of Nova Scotian vein quartz. Examination of the sample previous to immersion in the gold solution was made, and no such yellow films of crystals were then present. This C vein ore is a peculiarly distinct ore, different from anything else I have observed in Nova Scotia. As exposed in the various workings of the Holman mine, it is found to be a mass of yellow and silver coloured minerals with metallic lustre, appearing as a solid metallic vein until on closer examination small particles of quartz are found scattered through it, but the quartz content is probably never over 35 per cent. In width the vein varies from an inch to five or six inches. Everywhere it is found to carry better than $4 in gold value to the ton, but this gold cannot be extracted by direct amalgamation, requiring instead some modification of the cyanide process. While the C vein appears to be a bedded vein wherever it has been exposed, it is so absolutely different in appearance from the many other bedded veins below and above it that I am not prepared at present to discuss its origin. An analysis of the C vein ore made for Mr. Holman by the Pennsylvania Salt Manufacturing Co., is as follows:

Iron	19.00 per cent.
Arsenic	20.22 per cent.
Sulphur	20.75 per cent.
Insoluble	31.60 per cent.
Total	99.57 per cent.

The material they classify as insoluble is probably mostly quartz. In this vein iron pyrite and native arsenic make up the major portion of samples I have examined.

(b) For the next experiment I selected a partly crystalline pyrite of a silvery colour with striated faces. This was taken from a vein immediately beneath the Ross vein in the face of the east drift, 100-foot level, Holman mine, the sample being from the face, as it was in July, 1910. After pulverizing and mixing the sample a portion was taken for analysis, and another portion, weighing one gramme, was placed in a beaker and over it was poured 25 cubic centimeters of a solution containing dissolved therein 55.5 milligrammes of gold as gold chloride. The solution was stirred at five minute intervals, and at the end of 15 minutes it had become decolourized, while after filtering and testing the filtered solution no gold was found remaining therein. A copious precipitation of both crystalline and amorphous gold had taken place on the particles of powdered ore, as was shown by examination under the microscope. My analysis of the ore is as follows:—

Specific gravity, 6.17.	
Insoluble (mostly quartz)	1.45 per cent.
Sulphur	20.67 per cent.
Iron	35.18 per cent.
Arsenic	42.68 per cent.
Selenium	traces
Total	99.98 per cent.

Eliminating the insoluble matter shown by this analysis, the metallic minerals of the ore would appear to exist in about the proportion of 46 parts arsenopyrite to 4 parts pyrrhotite to 1 part pyrite.

(c) From a mass of nuggety gold, quartz and metallic sulphides submitted to me by Mr. Holman, and by him stated to have been a part of the rich ore taken from the Ross vein in December, 1909, I selected particles of the metallic sulphides as free as possible from both quartz and gold. This gold was taken from the intersection of a little fissure with the Ross vein, 100-foot level, Holman mine. The silvery coloured sulphides were powdered and mixed, a sample taken for analysis, and a gramme weighed out into a beaker. On this gramme of material was poured 25 cubic centimeters of a solution of 55.5 milligrammes of gold as gold chloride. The solution was stirred as described in the previous experiment and at the end of fifteen minutes was filtered and no gold found remaining in the filtered solution. The powdered particles of pyrites were covered by a precipitate of both crystalline and amorphous gold.

My analysis of this pyrite is as follows:

Specific gravity, 6.72.	
Insoluble (mostly quartz)	2.40 per cent.
Iron	35.35 per cent.
Arsenic	41.76 per cent.
Sulphur	20.22 per cent.
Selenium	trace
Tellurium	trace
Total	99.73 per cent.

We have here the first recorded instances of the occurrence of selenium and tellurium in Nova Scotian ores. The presence of both was confirmed by applying the usually recognized decisive tests.

The metallic material from the Ross vein, whose composition is shown by the above analysis, may be assumed to exist in the proportion of 23 parts arsenopyrite to 3 parts pyrrhotite, as calculated from the analysis and eliminating the insoluble matter. The presence of pyrrhotite is easily demonstrated by passing a magnet over the powder which is attracted in a small amount.

Other tests, not quantitative, have been conducted where dilute solutions of gold chloride in water were poured into beakers containing Nova Scotian slates of the Halifax formation, some of these slates containing metallic sulphides imbedded therein, and others free from sulphides but containing graphitic or carbonaceous matter, and still other nearly pure slate. In all these cases the gold was entirely precipitated from solution, fairly quickly in the case of the materials first named and requiring several days in the case of the pure slate, but ultimately in each case the precipitation of the gold was complete.

Formation of Ore-shoots.

While it is, of course, possible that some of the bedded veins were direct trunk channels and derived their quartz and ore direct therefrom, it seems to me certain that a vast majority of the bedded veins are merely lateral branches which were filled by vein material diverted from the trunk channels into lateral openings, made in the thin strata of intercalated slate, into which the solutions from the vertical fissures were forced and in which were deposited silica, pyrite, arsenopyrite, and other minerals. Examination of the intersection of fissures and the bedded veins branching from them seems in many cases to show that they are contemporaneous in origin, while in other instances stances the fissures are clearly of later origin.

(To be continued).

MINERAL PRODUCTION OF THE PROVINCE OF QUEBEC DURING 1910.

Asbestos.

The returns received from asbestos producers show a total production of 80,605 tons of the various grades of asbestos, valued at $2,667,829 at the points of shipment. This is a substantial increase as compared with the shipments made in 1909, which totalled 63,965 tons, valued at $2,296,584.

These figures represent the actual shipments made, and they are this year considerably less than the output, as a great deal of asbestos of all grades was reported as stock on hand on December 31st. As may be seen by the table given below, this stock on hand amounted to 41,159 tons, which, valued on the same basis as the shipments, amounted to $1,921,923.

The activity of asbestos mining was very notable duriing the first seven months of the year. The mines were working night shifts as well as day shifts, and most of the mills were producing to their full capacity. Unfortunately the demand did not keep pace with the increased output, and as a result the market became congested, prices dropped and the stocks on hand increased. Towards the end of the year several of the mines discontinued mining operations and a period of stagnation ensued. That this state of affairs is only temporary is shown by the past records of the asbestos industry. Periods of over-production and consequent depression have been noted before, and these have always been followed by periods of healthy growth.

	Shipments		Stocks on hand Dec. 31.	
	Tons	Value	Tons	Value
Crude No. 1	1,817	$ 471,649	1,703	$ 447,227
Crude No. 2	1,612	196,382	3,181	440,884
Mill Stock No. 1	10,313	627,635	4,938	313,053
Mill Stock No. 3	44,793	1,141,374	24,417	621,065
Mill Stock No. 3	22,070	230,789	6,920	99,694
	80,605	$2,667,829	41,159	$1,921,923
Asbestic	24,711	17,612		

The value of the asbestos shipments made during the year 1910 is the highest recorded to date. The previous banner year was 1908, when it reached $2,551,596.

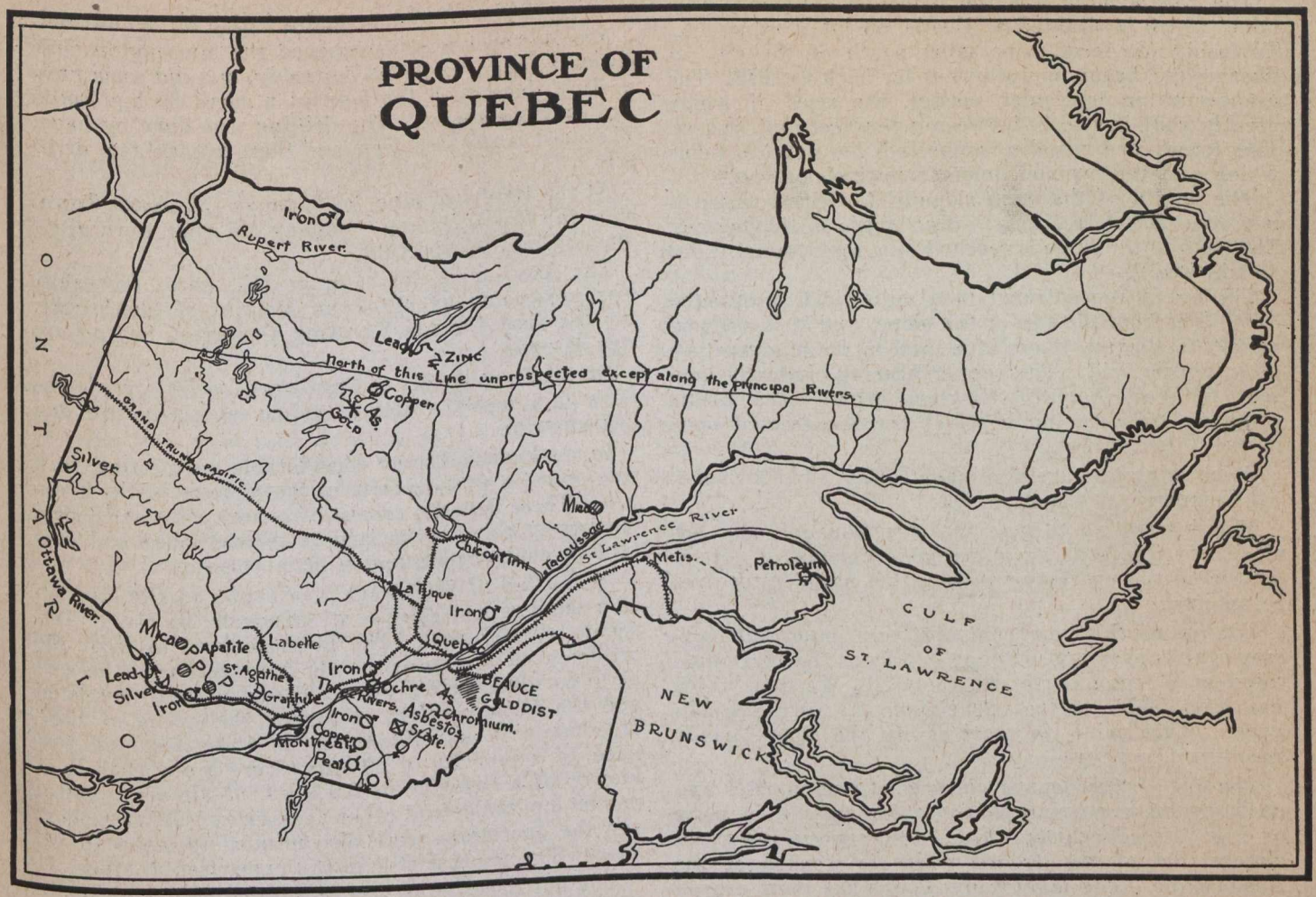
The following table illustrates the growth of the asbestos industry during the past decade:

Year	Tons.	Value
1900	21,408	$ 719,416
1901	33,466	1,274,315
1902	30,634	1,161,970
1903	29,261	916,970
1904	35,479	1,186,970
1905	48,960	1,476,450
1906	61,675	2,143,653
1907	61,985	2,455,919
1908	65,157	2,551,596
1909	63,965	2,296,584
1910	80,605	2,667,829

The returns which we received from the producers show that a quantity of 2,035,705 tons or asbestos bearing rock was quarried during 1910. Of this rock about 25 per cent. is waste, which goes to the dumps without treatment as being too lean in asbestos for milling. Shipments of asbestos during 1910 and stocks on hand at the end of the year totalled 121,755 tons, valued at $4,589,756 at the prices prevailing during the year. To arrive at the output, we may substract the stocks on hand at the end of the previous year 1909, which, according to the Federal Mines Branch, amounted to 20,921 tons. These figures leave a total extraction during 1910 of 100,837 tons of asbestos from 2,035,705 tons of rock mined or from about 1,500,000 tons of rock milled.

It must be understood that these figures are averages of totals. In the case of individual mines the figures of extraction, may diverge considerably from these averages.

In last year's report, attention was drawn to some of the advantages which were likely to ensue from the amalgamation of individual asbestos properties into large corporations. One of these advantages was that it would be easier to establish a standard classification of the various grades of asbestos. The importance of this point can hardly be exaggerated, for it is quite likely that one of the reasons which militates against a more rapid extension of the uses of asbestos and contributes to the dulness of the market, comes from the fact that at present there is a lack of uniformity in the grading and classification of the various products of the asbestos mills. Each individual producer has its own grades and marks which can only be sold to manufacturers and consumers by submitting samples. In the classification which we have adopted in the short table given above, we have followed the Federal Mines Branch, based on value per ton of the product. Crude No. 1 represents asbestos quoted $200 a ton and over. Crude No. 2 under $200. Mill stock No. 1, is the product of the mills of a value of $45 per ton and over, No. 2 between $44 and $20 inclusively, and No. 3 under $20, but individual items of these groups vary widely between the limits assigned and the classification is arbitrary in the extreme. For instance, under mill stock No. 1, we



have grouped asbestos representing not less than 17 grades according to prices, which are designated by the following marks: "No. 1," "No. 1 A," "No. 2 A," "No. 2 B," "A," "C," "D," "M," "X," "XXX," "Long," "Special Spin."

Similarly in Mill Stock No. 2 there are ten different prices and the products are classified as: "A," "3 B," "B," "C," "E," "No. 2," "No. 3," "X," "XX," "OO," "OK."

Whereas in Mill Stock No. 3 we get: "C," "CC," "F," "N," "D," "E," "Short F," "No. 3," "No. 4," "No. 5," "X," "XXX," "XX paper."

As may be imagined, these various designations which have no connection between themselves, must to a great extent puzzle and bewilder the buyers, and selling by samples must necessarily be resorted to.

This subject of classification is very important, and it is thought that great benefits to the industry would be derived from a better standardization of the various grades. But, of course, such a result can only be achieved through a concerted action on the part of the producers.

Returns of shipments of asbestos were received from 13 companies, as follows:

Amalgamated Asbestos Corporation,	Thetford Mines.
Asbestos and Asbestic Co., Ltd.,	Danville.
B. & A. Asbestos Co.,	Robertson.
Bell Asbestos Mines,	Thetford.
Belmina Consolidated Asbestos Co.,	Chrysotile.
Berlin Asbestos Co,	Robertson.
Black Lake Consolidated Asbestos Co.,	Black Lake.
Broughton Asbestos Fiber Co.,	East Broughton.
Frontenac Asbestos Co.,	East Broughton.
Jacobs Asbestos Mining Co.,	Thetford.
Johnson's Company,	Thetford.
Ling Asbestos Co.,	East Broughton.
Robertson Asbestos Mining Co.,	Thetford North.

Copper.

The copper bearing ores now produced in the Province of Quebec come from the cupriferous pyrite deposits of the Eastern Townships. This ore is primarily used in the manufacture of sulphuric acid and the cinder is sent to the copper smelters for the extraction of the copper.

The production of ore in 1910 was the lowest recorded since 1904, being 24,040 short tone, a decrease of 11,060 tons as compared with the previous year.

Year	Tons	Year	Tons
1893.....	64,960	1902.....	31,938
1894.....	47,132	1903.....	26,481
1895.....	42,470	1904.....	23,729
1896.....	47,730	1905.....	28,644
1897.....	41,233	1906.....	32,527
1898.....	39,968	1907.....	29,574
1899.....	43,599	1908.....	26,598
1900.....	37,791	1909.....	35,100
1901.....	22,732	1910.....	24,040

The Eustis mine was the principal shipper. This mine, which is situated at Eustis, on lot 2, range IX., Township of Ascot, nine miles south of the city of Sherbrooke, began operations as far back as 1879. The ore occurs in lenticular masses, the sizes of which greatly vary in width, between a few feet and 75 feet. The lenses are usually connected by narrow veins which sometimes pinch down to an inch or less.

The length of the main slope of the Eustic mine is now over 3,000 feet long, on an angle of 40 degrees. The head of the slope is reached by a rock tunnel, 1,000 feet in length.

The ore is concentrated in a mill which is situated 3,000 feet from the top of the slope, and it is shipped mainly to Boston, where it is used in the manufacture of sulphuric acid. The copper bearing cinder is then sent to West Norfolk, Virginia, where the Eustis company has a smelter in which are also treated some of the Virginia ores.

Some shipments are also made to the Nichols Chemical Company, at Capelton, Que.

It is interesting to note that the manager, Mr. Adsit, saved this year an appreciable amount of copper by the simple process of passing the mine water over scrap iron.

We record this year comparatively important shipments of copper and sulphur ore from the McDonald mine, at Weedon, on lot 22, range II., Weedon, which has been under active development work for two years. This mine is worked by the East Canada Smelting Company.

The ore of this deposit consists of iron pyrites and chalcopyrite, occurring as lenticular masses, in more or less altered schists. The occurrence resembles closely that of the deposit which is worked at the Eustis mine. The main body of ore has been proved to be over 500 feet long, and to have a maximum width of 50 feet. It is likely that further development work will reveal other lenses.

The lens which has been developed has the same strike as the county rock, N. 40 deg. E., and dips to the S.E. at an agle of 45 deg.

The deposit has been developed to a depth of 110 feet by means of two shafts, 100 and 110 feet deep respectively. The latter is now being sunk to the 200 feet level. More than 700 feet of levels and crosscuts have been driven.

Shaft No. 1 is equipped with a 15 h.p. hoist, which can handle 70 tons per shift from a depth of 400 feet. The boiler equipment consists of two horizontal boilers and one vertical boiler, aggregating 200 h.p. The compressor plant comprises two Rand straight line compressors capable of running 8 drills.

Substantial shipments were maed to the Capelton Chemical Works of ore said to average 44 per cent. sulphur and 5½ per cent. copper.

The Albert mines in the same district, which shut down some two years ago, have not been reopened. The workings are now full of water. Some prospecting work was done on several of the old mines, but nothing of note has resulted.

A. O. Norton continued his prospecting and development work at the Suffield mine, but no ore was shipped. The deposit worked here is a low-grade silicious ore, which consists of a mixture of chalcopyrite, pyrite, and a little bornite. The shaft is 400 feet deep, and there are 700 feet of drifts at various levels. The surface plant consists of a steam boiler of 100 h.p., a hoisting engine of 50 h.p., and a 4 drill air compressor.

Mr. Norton has also reopened the Marrington mine on lot 6, range V., Ascot Township, and did some prospecting there with the help of a small 20 h.p. boiler and hoisting engine. The drilling was done by hand. The shaft is 265 feet deep, and there are 500 feet drifting.

At the Hepburn mine, lot 7, range IX., Ascot Township, the Eustis Mining Company did some work of reopening and prospecting.

The Ascot mine, lot 8, range IX., Ascot Township, was prospected by Mr. John McCaw, of Sherbrooke, for the East Canada Smelting Company, but no ore was shipped.

On lot 24, range V., of Cranbourne, a little work was done on a deposit which is said to contain bornite and chalcopyrite.

In the Beauce district considerable prospecting work was done on two deposits in the vicinity of St. Francois. These deposits consist of quartz veins and lenses cutting eruptive rocks largely serpentinized and containing chalcopyrite and a little bornite.

In the fall of 1909 work was begun on the erection of a small copper smelter at Actonvale, by Mr. P. Tetreault, of Montreal. The intention was to treat the ore from the dumps of the old Actonvale mine, as well as to do some custom work. The plant was completed and the furnace blown in during the spring of 1910. It consists of an Allis-Chalmers water-jacketed furnace, of a capacity of 80 tons of ore a day; one Root blower of a capacity of 6,600 c.f. of air per minute; one 80 h.p. boiler and other accessories. After a short run the operations were discontinued to make alterations. The plant is still in the experimental stage.

The old Ascot mine was unwatered and some sampling was done.

On the whole, the copper industry of the Eastern Townships was not very active during 1910, owing in a measure to the low price of the metal which prevailed during the year. But other reasons also militate against an active resumption of work. One of the main causes, as remarked by Dr. Wilson, who studied the question for the Federal Mines Branch in 1909, is the attitude assumed by the majority of owners of undeveloped and unexplored prospects, who usually have high pretentions and disproportionate ideas as to the value of such prospects. The owners will not, as a rule, assume the risks of development, and yet ask prohibitive prices for their properties, and often are not even willing to give facilities to have them tested. Instances have come to our notice in which thousands of dollars are asked for mere copper-bearing outcrops, on which no work beyond a few days' stripping have been done.

Mr. Samuel Owen Greening, for 34 years the head of the well-known B. Greening Wire Company, Limited, died on the morning of August 31st, at his residence in Hamilton. The late Mr. Greening was born 64 years ago in Manchester, England. He came to Hamilton in 1856, in which year his father founded the company. Under the son's management the business grew to its present large dimensions.

Mr. Greening was one of the very best types of citizen and business man. He weilded a large, though quiet, influence for good.

FLUORSPAR

By Ernest F. Burchard.*

Fluorspar.

Commercial Value.—Fluorspar is a mineral of relatively low value as compared with metallic ores mined under similar conditions. Under the most favourable conditions, therefore, the margin of profit can never be expected to be large, and it requires exceptionally good management to conduct any spar mining operations profitably, especially in the western states. In 1910 there were 69,427 short tons of domestic fluorspar, including gravel, lump, and ground varieties marketed in the United States at an average value of about $6.20 per short ton. Of this total, 61,136 short tons were sold as gravel and lump spar, at an average value of $5.58 per ton at the mines, and 8,291 short tons were sold ground, at an average value of $10.72 per ton, f.o.b. cars.

Uses and Requirements of fluorspar—Fluorspar is used in the manufacture of glass and of enamelled and sanitary ware, in the electrolytic refining of antimony and lead, the production of aluminum, the manufacture of hydrofluoric acid, and in the iron and steel industries, in which it is used as a flux in blast furnaces and in basic open hearth steel furnaces. It is estimated that about 80 per cent. of the American fluorspar output, mainly in the form of gravel spar, is consumed in the manufacture of basic open hearth steel. The use of fluorspar is increasing in practically all of these industries. The western market for fluorspar is more limited than that of the central and eastern states, but it is nevertheless increasing. Recently the iron and dsteel works at Irondale, Washington, and in Shasta County, California, have been enlarged.

Supplies of spar mined in the west have heretofore not been sufficient to supply the western market for more than a few months at a time. This has been due to several conditions, the most important of which is that most of the western spar thus far produced has not been of as high a grade as that produced in the Illinois-Kentucky district. Fluorspar for iron and steel making should carry at least 85 per cent. calcium fluoride and preferably it should be purer. For most other chemical uses it should contain from 95 per cent. to 98 per cent. calcium fluoride.

Production.

The total quantity of domestic fluorspar reported to the Survey as marketed in the United States in 1910 was 69,427 short tons, valued at $430,196, as compared with 50,742 short tons, valued dat $291,747, in 1909, an increase in quantity of 18,685 short tons, and in value of $138,449. This increase represented nearly 37 per cent. of the quantity and 47 per cent. of the value of the production of 1909. The production in 1910 was the largest ever recorded. The average value per ton for the whole country, considering all grades of fluorspar, was about $6.20 in 1910 as compared with $5.75 in 1909. This value represents the selling price on board cars at railroad or water shipping points, and with reference to the product from Colorado, New Mexico, and Kentucky the price reported for much of the spar includes the cost of a long wagon haul—$1.50 to $3 a ton. In Illinois the principal producing mines are near river transportation, and the cost of long wagon hauls has not entered into the reported value of the fluorspar.

Fluorspar was produced in 1910 in Illinois, Kentucky, New Mexico, and Colorado in the order named, each state, except Colorado, reporting an increased production. The product of Colorado and New Mexico has been classed as gravel spar, although much of the New Mexico product was equal to the grade of lump spar. Both Illinois and Kentucky produced gravel, lump, and ground spar.

In 1910 Illinois produced a total of 47,302 short tons of spar, valued at $277,764, or $5.87 per short ton on board cars. The gravel spar amounted to 35,477 short tons, valued at $178,880, or $5.04 per ton. The sales of lump spar in Illinois were 6,151 short tons, valued at $38,415, or $6.25 per ton. The ground spar sold in this state amounted to 5,674 short tons, valued at $60,469, or $10.66 per ton. Kentucky reported total sales of 17,003 short tons of spar, valued at $124,574, or an average price of $7.33 per ton, distributed as follows: Eleven thousand four hundred and fourteen short tons of gravel spar, valued at $75,823, or $6.64 per ton; 2,972 short tons of lump spar, valued at $20,359, or $6.85 per ton; and 2,617 short tons of ground spar, valued at $28,392, or $10.85 per ton. Colorado and New Mexico together produced 5,122 tons of gravel spar, valued at $27,858, or $5.44 per ton. The total stocks of fluorspar reported on hand in all the states December 31, 1910, were less than 2,000 tons.

Trade Conditions.

The demand for American fluorspar at Pittsburg, Birmingham, and other cities during 1910 was apparently greater than the capacity of the mills operating in the Illinois-Kentucky district. Prices advanced a little, but not enough to pay many of the smaller companies for operating, and consequently many of them were idle in both states. As a consequence of the increased demand, large stocks left over from previous years were practically cleaned up in localities within reach of transportation lines. Many steel plants purchased reserve stocks in anticipation of possible future scarcity of fluorspar. The steel plant at Pueblo, Colo., took the whole output of the Colorado and New Mexico producers in 1910, besides some spar from Illinois, but did not consume the total quantity purchased. Although, as noted on another page, the imports were exceedingly high, notwithstanding the import duty of $3 per ton imposed in 1909, the market for domestic spar does not appear to have been seriously affected by the quantities of fluorspar imported.

The conditions in the open hearth steel industry have a most direct bearing on the production of fluorspar, since the greater part of the gravel spar produced is used in the manufacture of basic open hearth steel. The increase in the quantity of basic open hearth steel in 1910, as compared with 1909, amounted to 1,874,857 long tons, or nearly 14 per cent. The following table* shows the production of open hearth steel during the last three years

*Abstracted from advance chapter Mineral Resources of the United States.

*Ann. Statis. Report Am. Iron and Steel Association, Philadelphia, Pa., July 25, 1911.

Production of open hearth steel in 1909-1910, in long tons.

	Basic.	Acid.	Total.
1908	7,140,425	696,304	7,836,729
1909	13,417,472	1,076,464	14,493,936
1910	15,292,329	1,212,180	16,504,509

Imports.

Before August, 1909, fluorspar was imported into the United States duty free, and the full statistics of importation were not given before that date. Large quantities of gravel spar produced at a low cost from the tailings of lead mines and from the gob in abandoned mines in England have been shipped to this country as ballast at a very low freight rate. The material thus produced is high in silica and is almost entirely consumed by open hearth steel makers. Before 1909 spar from England competed with American fluorspar as far west as Pittsburg and practically fixed the market price at that point. In the Lehigh and Susquehanna valleys of Pennsylvania and other localities near the Atlantic seaboard English fluorspar can yet be advantageously purchased under present conditions, and large quantities are consumed annually in the open hearth steel furnaces. The imports of fluorspar entered for consumption into the United States in 1910 were 42,488 short tons, valued at $135,-152, as compared with 6,971 short tons, valued at $26,377, in 1909. The value assigned to the material in 1910 was $3.18 per ton, as compared with $3.78 in 1909.

Mining and Milling Developments.

Illinois.

The principal developments during 1910 were confined to the properties of the Fairview Fluorspar & Leadd Company at Fairview Landing, and the Rosiclare Lead and Fluorspar mines, at Rosiclare. At other properties there was some prospecting by drill and a little mining, but the greater part of the output came from the two companies named.

At the Fairview mine four shafts produced ore, including one mining the "blue" vein. The deepest shaft (or steep incline) was reported 503 feet deep in the spring of 1911 and the deepest working level was 475 feet below the surface. At this level considerable calcite is encountered, either mixed with spar or else constituting nearly the whole vein. The vein is irregular in width, ranging from pinches 18 inches wide to swellings 25 feet wide. The spar bodies exhibit irregular outlines within the vein, and range from a few feet to 22 feet in width. One of the largest bodies was encountered at the 400-foot level. A new shaft has recently been sung to a depth of about 320 feet, with levels at 100 feet, 235 feet, and 295 feet from the surface. The "blue" vein shaft was at that time reported to be down 120 feet and to show 4½ feet of ore at the bottom. An important production was stoped from this vein in 1910. The main workings of the Fairview and the Rosiclare companies are approaching one another and are believed to be on the same vein. The mill at Fairview has recently been improved and enlarged, particularly with reference to the facilities for the preliminary picking and the final jigging of the spar. The jigs are reported to consist of a 5-cell rougher, a 6-cell cleaner, and a 5-cell finisher. The capacity of the mill is reported at 200 to 250 tons of cleaned spar per 10-hour shift and the storage capacity at about 3,000 tons. Spar is loaded directly at the mill into standard-gauge cars, which are moved over a short line to the landing on Ohio River and towed on barges to the Illinois Central Railroad at Golconda.

At Rosiclare the mining method has been changed from underhand to overhead stoping. Only one shaft is operated here, and the lowest level was 235 feet below the surface in April, 1911. In July it was reported that the shaft had been sunk to 275 feet and was planned to be sunk to a depth of about 335 feet, where a new level will be established. Local pinching and swelling is characteristic of the vein, the width ranging from a few inches to 22 feet. In places the vein is found to carry almost entirely calcite, but there are large quantities of good ore still available above the lowest level, in both directions from the shaft. A new steel and concrete mill, entirely fireproof, has been built at Rosiclare, designed to reduce 500 tons of crude ore per day. The shaft has been reconstructed and consists of three compartments, two of which, for hoisting, are 5 feet 5 inches by 4 feet 4 inches, and one is a pump compartment, 5 feet 5 inches by 3 feet 8 inches. The mill consists of three large buildings. The sizing and sorting building, with the shaft at the south end, stands in the middle, with the power house and grinding building to the west and the concentrating building, or jig house, to the east. All the buildings are approximately 90 feet long. The middle building is 20 feet wide at the base, and the head frame stands 84 feet high. The two other buildings are 36 feet wide and stand 30 feet to the eaves. The alleys between the middle building and the two other buildings are 14 feet 6 inches wide.

From the mine the spar is hoisted to the top of the mill in steel cars having a capacity of one ton each. The spar is dumped on steel grizzlies having 2½-inch spaces. The grizzlies are inclined toward two 24-inch steel apron conveyers. From the oversize No. 1 lump spar is picked and thrown on the conveyers. The common spar not passing the grizzly is shoveled into a No. 5 gyratory crusher. The total capacity of the grizzlies is about 100 tons of material. The material passing the grizzly and the crusher feeds down into two 150-ton steel bins on the floor below. These bins feed into two shaking screens on the floor next below. These screens have steel frames 17 feet by 2 feet 9 inches, with bottoms of heavy wire with meshes about ½-inch by 1⅛ inches. The lump spar is delivered by the apron conveyer to a rotary drier 25 feet long by 36 inches in diameter, which is supplied with hot air from the top of the boilers. The ore falls from the drier on a "butterfly," which diverts the material as desired, either into a bin for No. 2 lump spar or through a drying tower into a No. 3 crusher. The No. 2 lump spar may be drawn directly from the bin, barreled, and shipped. The No. 1 spar passes through the No. 3 crusher, which feeds by gravity into a grinding mill. This mill discharges through a 30-mesh, 30-wire screen into a screw conveyer, which moves the ground spar to four storage bins. Each bin feeds into a barrel which stands on a packer. The barrels of ground spar weigh 550 to 610 pounds when filled. The capacity of this packing room is about 10 barrels per hour, or 30 tons a day.

From the shaking screens the undersize is carried by water through a 9-inch pipe to the jig house, and the oversize of the screens falls on a picking belt, on which 9 to 15 men may work. On this belt separation is made by hand of the larger fragments of lead and zinc ore, calcite, waste, and fluorspar. Lump spar can thus be picked, if desired, in order to increase the

quantity secured by picking on the grizzly above. The waste and calcite are thrown directly to chutes leading to their respective bins, while the lead and zinc ores pass through short chutes to separate troughs just below the picking belt, and are moved by a double shaking conveyer to separate 13-inch disk crushers. The overrun of fluorspar from the picking belt passes in the opposite direction to a 24-inch disk crusher. The lead and zinc ores discharged from their respective disk crushers are carried through pipes across to pulsator jigs in the jig house. From the 24-inch disk crusher the spar and the fine lead and zinc ores are fed into a bin. This bin feeds into the same service pipe which receives the undersize from the shaking screens. This service pipe crosses to the jig house and feeds into a 5-celled rougher jig. The ore from the rougher jigs goes to a cleaner jig having six cells. Provision is made for catching the lead from the righer jig and for taking care of the tailings. Between the rougher jig and the cleaner jig are sand crushers and several pumps, and the system is very flexible. The lead and zinc ores coming from the 13-inch disk crushers are treated by two 4-celled pulsator jigs, having a set of laboratory rolls. Of the ore at present considered normal about 90 per cent. consists of concentrates of fluorspar, galena, and sphalerite (zinc blende). The galena recovered constitutes about 1 per cent. of the concentrates, and the sphalerite still less. It is planned to treat a large quantity of tailings from the oil mill, of greater richness than those now produced, as soon as the new mill is working perfectly. The milling of fluorspar offers rather difficult problems, for unlike most ores, the bulk of the product must be saved, and the waste which must be eliminated constitutes relatively a small percentage. In addition, the separation of the lead and the zinc from the fluorspar is difficult, particularly where such small percentages of the former minerals are present, yet it is essential that they be almost completely removed, since the presence of sulphide ores renders the fluorspar of little value as a flux in steel making. Moreover, if the separation can be completely and economically effected, the lead and zinc ores recovered materially assist in paying the expense of cleaning the ore.

Under normal conditions about 57 men are employed overhead, including office force and superintendents, and about 48 men underground. When visited in April, 1911, this mill had not been entirely completed, and its capacity had not been demonstrated. It was expected, however, that its capacity would far exceed any other mill built to treat fluorspar and associated ores. The product of this mill is carried to Ohio River over an electric tramway 3,300 feet long, and is then loaded on barges and towed to Shawneetown, Ill., Evansville, Ind., or Golgonda, Ill. The river is generally closed by ice for a short period in winter, and in very dry summers the water may become too low for transportation. For this reason an endeavour is made to maintain sufficient stocks of spar from the Rosiclare mines at the railroad in Shawneetown to provide for shortages caused by interrupted shipments.

New Mexico.

Only recently has fluorspar been found in New Mexico in sufficieit quantities for exploitation. The American Fireman's Mining Company, of Kansas City, Mo., in prospecting for metallic ores on property situated 10 miles northeast of Deming, Luna County, N. Mex., has opened a number of veins of fluorspar which give promise of containing nearly if not quite sufficient spar to supply the western market for several years.

Location.—The fluorite occurs on the flanks of a small ridge called "Fluorite Ridge," one of the foothills of Cooks Range, 10 miles northeast of Deming. The most promising prospects have been made in two localities separated by a distance of about 1¼ miles. One of the localities is at the extreme southeastern base of the ridge on a gentle rise about 400 feet above the plain; the other well up the south slope of the ridge about 900 feet above the plain. Deming lies in a nearly flat valley covered by desert deposits, with Cooks Range 10 to 15 miles northeast and the Florida Mountains 10 miles or more southeast. The fluorspar deposits are most easily reached by a 10-mile drive from Deming, but the product is shipped from a siding, on the Atchison, Topeka & Santa Fe Railway, called Mirage, 5½ miles southeast of the prospects.

Geologic Relations.—Fluorite Ridge consists of a central mass of monzonite pohphyry which has intruded strata of Paleozoic and Mesozoic age, chiefly Ordovician limestone and Carboniferous and Cretaceous sandstone, quartzite, and conglomerate. The dips of the sedimentary strata on the south and west sides where the fluorspar is found are very steep, or vertical, and masses of the strata have not only been tilted up by the intrusive action, but folded into the intrusive rock. The base of the ridge is surrounded by an agglomerate consisting of angular masses of ondesite embedded in tuff. Some thin dikes of balast cut the agglomerate, and unconsolidated "desert fill" overlies it at a short distance from the base of the ridge.

Occurrence and Character of the Fluorspar. — The fluorspar occurs in veins, cutting and altered monzonite porphyry. Certain of the veins fill fractures in the rock along which there has been movement in both a vertical and a horizontal direction, but between the walls of some fissures there has not been noticeable displacement. The rock at the southeast base of the ridge is cut by two or more groups of approximately parallel veins. As shown by the openings that have been made, there appear to be at least five or six distinct veins in each group. One group of veins strikes N. 17 deg. E. to N. 27 deg. E., and the other strikes N. 6 deg. E. to N. 18 deg. W., and still other veins were observed to strike at various angles between these limits. The veins are nearly vertical or dip steeply in a southeast or northeast direction. The vein material is mainly fluorite mixed with a little quartz. Where the veins are partly siliceous they resist weathering slightly better than the surrounding porphyry, and therefore leave broken traces on the surface. At the surface the fluorspar in places is altered to calcium carbonate. The thickness of the veins as shown by surface cuts and by prospect pits and shafts ranges from a few inches up to 12 feet or more, but it is generally from 2 to 5 feet. The structure of the veins is in places distinctly banded; in other places the vein appears to consist mainly of a mass of crystalline spar, showing no banding, but carrying pockets of quartz. Brecciation of the vein by which large fragments of the wall rock have been included is not uncommon. The walls of the veins where open to any considerable depth are found to be smooth in places, but they are rarely smooth or regular for many feet, and the wall rock is generally much decomposed.

At the locality on the south slope of the ridge only

one set of veins, striking in a northwesterly direction, was observed. They stand nearly vertical or dip steeply toward the northeast. These veins had been opened in only two or three places in 1910, and the maximum width observed was only about 4 feet, not all of which was filled by spar. The veins cut monzonite porphyry, as at the first locality, and were observed to outcrop at intervals in the direction of strike for a distance of one-quarter mile.

Developments—At locality No. 1 the American Fireman's Mining Company opened in 1909 a number of veins by means of shallow cuts, and sank several test pits to depths of 6 to 12 feet and two shafts to depths of about 80 feet. In all, about 20 openings had been made up to August, 1910. A triangular area about one-fourth mile wide at base from northwest to southeast, and about one-third mile from northeast to southwest, has been shown to carry productive veins of fluorspar. The surface of the area slopes gently to the southeast. At the main opening the vein strikes N. 17½ deg. E. to N. 22½ deg. E. and dips 65 deg. to 70 deg. toward the southeast. The vein had been opened to a depth of 75 or 80 feet in August, 1910, and had been worked for a distance of about 100 feet on the strike. The thickness between the walls of the vein measures 4 feet to 12½ feet, the irregularities being due to pinching together of the walls in places. The strike of the vein is apparently slightly sinuous, according to the irregularities in the walls, but there are no evidences of movement between the walls. The rock inclosing the vein is altered to a reddish colour so far as observed, and although the vein walls are smooth and clean in places, in other places there is interpenetration of vein and wall material.

The fluorspar is principally of a light-green shade, but there is some purple spar present, especially near the margins of the vein, and some quartz is present in pockets and thin stringers scattered throughout the mass of spar. The spar is mined from several levels and milled down through chutes to the lowest level, from which it is hoisted in buckets up the shaft to the surface. A steam hoist was being installed in August, 1910. On the strike of the opening, less than 100 yards north of the shaft, an open cut and shallow burrow showed a promising vein of spar with a fork extending in a northwest direction. These veins and one other a few yards to the west are the nearest to the limestone mass, which lies 35 yards or more to the west. So far as could be ascertained, none of the veins extend into the limestone. The greater part of the spar that has been produced in this region has been taken from the shaft just mentioned.

Grades of Western Fluorspar.—None of the spar that has been mined in Colorado and New Mexico has been cleaned in any way except by hand. Mechanical concentration would improve the grade of the Colorado spar greatly, but none of the fluorspar prospects in Colorado have proved of sufficient richness to warrant the installation of washing plants. In certain places water is available, but in others the problem of finding water would be difficult. The Colorado product has never averaged quite high enough in grade fully to satisfy purchasers or to command a price satisfactory to producers. With regard to the deposits near Deming, N. Mex., there is little necessity for washing, but such a process would not be at all feasible on account of thescarcity of water. Supplies of water for men, teams, and hoisting engine have to be hauled from a well more than 4 miles distant on the road to Deming. There is little probability that a well could be obtained by drilling anywhere near the fluorspar deposits on account of the nature and structure of the underlying rocks.

Analyses.—The following table gives analyses of gravel fluorspar from Mirage, N. Mex., generally in carload lots used in basic open hearth steel furnaces, and analyses of spar from Colorado, Illinois, and Kentucky, made on a similar basis, are given for comparison.

Analysis of Fluorspar from New Mexico, Colorado, Kentucky, and Illinois.

Locality	CaF_2.	SiO_2.	Al_2O_3+ Fe_2O_3.	$CaCO_3$.	$MgCO_3$.	Authority.
Mirage, N. Mex.	93.68	4.68	0.74	0.76	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	93.55	4.97	.80	.62	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	91.98	6.60	1.00	.67	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	88.80	9.83	1.10	.48	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	88.30	9.85	1.06	.98	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	89.52	8.62	.92	.79	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	91.32	6.60	.74	.74	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	90.13	7.86	.70	.74	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	92.19	6.05	.68	.83	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	90.90	6.96	.86	.86	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	90.22	7.60	1.04	.68	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	88.59	9.66	.96	.83	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	93.99	3.84	1.12	1.12	Trace	Colorado Fuel & Iron Company.
Mirage, N. Mex.	89.70	8.60	.92	.80	Trace	Colorado Fuel & Iron Company.
Rosita, Colo.	81.55	13.3	5.1	....	.....	Colorado Fuel & Iron Company.
Rosita, Colo.	86.75	9.3	4.2	....	.....	Colorado Fuel & Iron Company.
Rosita, Colo.	82.25	12.6	5.0	....	.....	Colorado Fuel & Iron Company.
Rosita, Colo.	84.3	11.6	n.d.	....	.....	Colorado Fuel & Iron Company.
Rosita, Colo.	60.9	27.0	n.d.	....	.....	Colorado Fuel & Iron Company.
Jamestown, Colo.	76.05	19.8	4.2	....	.....	Colorado Fuel & Iron Company.
Jamestown, Colo.	83.76	12.2	4.0	....	.....	Colorado Fuel & Iron Company.
Jamestown, Colo.	85.9	10.5	3.75	....	.....	Colorado Fuel & Iron Company.
Jamestown, Colo.	79.06	15.24	5.26	....	.....	Colorado Fuel & Iron Company.
Jamestown, Colo.	86.75	8.60	4.46	....	.....	Colorado Fuel & Iron Company.
Marion, Ky.	84.25	2.98	1.28	10.28	.....	Colorado Fuel & Iron Company.
Marion, Ky.	87.8	3.10	2.06	....	.....	Colorado Fuel & Iron Company.

Marion, Ky.	90.02	4.72	1.5	....	.....	Colorado Fuel & Iron Company.
Marion, Ky.	92.7	2.5	.64	....	.....	Colorado Fuel & Iron Company.
Marion, Ky.	96.01	1.9	1.88	....	.....	Colorado Fuel & Iron Company.
Marion, Ky.	94.72	1.22	.98	1.82	0.68	Lackawanna Steel Company.
Marion, Ky.	95.63	1.32	.93	.38	1.22	Lackawanna Steel Company.
Fairview, Ill.	88.85	3.4	1.45	....	.....	Carnegie Steel Company.
Fairview, Ill.	87.07	3.12	....	8.96	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	86.31	4.30	....	7.57	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	86.60	2.38	....	10.94	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	85.35	8.17	....	4.50	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	83.49	4.0	....	7.67	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	84.80	3.51	....	8.29	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	84.50	3.85	....	8.27	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	85.63	3.82	....	9.21	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	88.67	5.13	....	4.49	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	85.61	6.05	....	4.22	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	85.57	6.76	....	2.26	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	86.10	7.39	....	2.14	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	86.87	7.39	....	4.44	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	98.27	.58	....	.27	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	96.62	1.67	....	.79	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	98.30	.46	....	.46	.....	Fairview Fluorspar & Lead Company.
Fairview, Ill.	95.38	.47	....	3.55	.....	Fairview Fluorspar & Lead Company.

From these analyses it will be seen that the spar shipped from Mirage, N. Mex., is of an exceptionally high grade, considering the fact that it has not been washed and cleaned as has the Illinois-Kentucky product.

Cost of Production.—The mining of the fluorspar near Deming is done almost wholly by contract. Mexican labour is employed, and miners earn about $1.50 per day. Mining the spar costs per ton $1.75, plus 25 cents for incidentaly expenses, and haulage to the railroad costs $1.50, making a total cost of $3.50 per ton dumped into cars. The spar in 1910 was selling at $5.25 per ton on the cars, based on at least 90 per cent. calcium fluoride, and the freight from Mirage to Pueblo, paid by the purchasers, was $2 per ton. According to contract a penalty of 20 cents per ton is deducted for each per cent. that the spar falls below 90 per cent. calcium fluoride, but no premium is paid unless it carries more than 95 per cent. calcium fluoride, when each unit brings 20 cents more per ton. The equipment for mining the spar is simple, the largest items of expense being the small steam hoist stationed at the deepest working, and the several teams necessary to haul the output. Small store buildings and machine shops have been built at both places where the spar was being developed. The labourers live in tents, and work can be carried on the year round. From the opening of these deposits in the summer of 1909 to the close of 1910 nearly 5,000 tons of fluorspar had been shipped, averaging 92 per cent. calcium fluoride.

Conclusions.—The exploration for and development of fluorspar deposits under present conditions in the western states can not be said to offer attractive profits; nevertheless the market for fluorspar is growing, and where deposits are found so situated that the freight rates do not hold down the price to a profitless level and the cost of haulage does not further wipe out all chances of gain, the development of such deposits should be encouraged.

THE PREVENTION OF ACCIDENTS IN MINES.

In Queensland and New South Wales the Acts for the prevention of accidents in mines provide that in mines employing more than ten men below ground the mining inspector shall be the holder of a first-class mine-manager's certificate, and be over thirty years of age. The Queensland Act states: "Wherever any mining inspector shall have inspected any mine or machinery he shall enter in a book, to be kept on the mine or works for the purpose, his opinion derived from such inspection of the actual condition of the mine and machinery at the time of such inspection, and he shall also record what alterations or requirements he thinks necessary." This is doubly useful, as it keeps the inspector up to the scratch and allows the manager to know at once the position, while should an accident occur it shows that the mine was in a safe condition at the time of the inspection. This record is also useful for reference purposes on any subsequent visit of an inspector. There is another useful regulation in the Queensland Act, namely, that the manager of every mine has once a week to sign a statement in a book kept for the purpose, that during the week he has at least once visited every working face in the mine, and he has to state whether conditions were safe or otherwise. In big mines this regulation will keep the manager up to his work and prevent too much dependence being placed on the foreman.

As to the storage of explosives, the Queensland Act states that: "Detonators for blasting shall be kept on the surface of the ground, in a covered box placed in a separate magazine. No more than 100 detonators shall be kept underground in any level at one time, and these shall be kept in a covered box in a separate drive or chamber and only taken out in such quantities as required for immediate use. Detonators shall not on any pretence whatsoever be placed near any travelling road, pass or working face." The Australian Acts require the mine manager to supply the Mines Department with a copy of the working plans of the mine, and are very particular about the tensile strength of hoisting ropes, etc. In the case of fatal accidents no work other than that required to save life shall be done, nor the conditions altered in any way until the inspector has had an opportunity of examining the position.

Preliminary Programme of the National Mine Safety Demonstration

Pittsburg, Pa.

October 30 and 31, 1911.

Board of Managers.

H. M. Wilson, representng United States Bureau of Mines; Dr. M. J. Shields, representing American National Red Cross Society; S. A. Taylor, representing coal operators of the United States; Francis Feehan, representing United Mine Workers of America; John Laing, representing the State Mine Inspectors; Thos. B. Dilts, representing Industrial Department of International T. M. C. A.

General Committee.

Chairman, H. M. Wilson; Mine Rescue and First Aid, J. W. Paul; Arsenal Demonstration, Clarence Hall: Experimental Mine, L. M. Jones; Programme, Lauson Stone; Reception, J. C. Roberts; Ushering, J. K. Clement; Secretary, C. S. Stevenson.

United States Bureau of Mines.

Arsenal Grounds, 40th and Butler Streets, Pittsburg.

October 30, 1911.

Address of welcome, 9 a.m., Director J. A. Holmes, Bureau of Mines.

Event No. 1—(Continuous from 9.15 a.m. to 12M., with interruptions for Events 2 to 6.)

Building No. 10—Electrical laboratory, showing the effect of breaking lighted incandescent lamps which are surrounded by an explosive mixture of gas and air.

Building No. 13.—The foundry cupola in operation and method of securing gas samples and taking temperature measurements from different zones in the coke bed for the purpose of studying the fundamentals of the process and possible improvements therein.

The operation of a gas producer when burning coke at high temperature, at high capacity and eliminating ash and clinker by slagging.

The smokeless combustion of low-grade fuel in boilers when using mechanical stokers.

Operation of the long combustion chamber, designed to make a comprehensive investigation of the processes of combustion in boiler furnaces and the conditions requisite for complete combustion with coals of varying volatile matter, with various rates of firing and heating of coal with variations in the amount of air supply and in the rate of mixing of air with the volatile combustible.

Building No. 17.—Demonstration of the relative safety of single gauze and double gauze bonnetted safety lamps when subjected to a current of gas and air containing eight per cent. of methane and ethane at a known velocity.

The training in a noxious atmosphere of men wearinfi different types of rescue apparatus.

Exhibition of apparatus for the physical testing of explosives, including ballistic pendulum, pressure gauge, calorimeter, flame test apparatus, rate of detonation apparatus, large and small impact machines, cone and pendulum friction devices, and Trauzl and small lead blocks.

Building No. 32.—Demonstration of lignite and coal briquetting plant, making briquets from California lignite.

Gas and Dust Gallery No. 2.—Test of an electric mine motor surrounded by an explosive mixture of gas and air, and provided with explosive proof protection device.

Event II.—9.30 a.m.

Gas and Dust Gallery No. 1.—To determine the effect of a charge of a permissible explosive, equivalent in disruptive force to one-half pound of forty per cent. nitroglycerine dynamite, tamped with one pound of dry fire clay, when fired into a mixture of gas and air containing seven per cent. of methane and ethane.

Note.—At Forbes Field, October 31, at 10.30 a.m., Events II. and III. will be repeated in the presence of coal dust instead of mine gas.

Event III.—10 a.m.

Gas and Dust Gallery No. 1.—To determine the effect of a charge of FFF black blasting powder, equivalent in disruptive force to one-half pound of 40 per cent. nitroglycerine dynamite, tamped with two pounds of dry fire clay, when fired into a mixture of gas and air containing seven per cent. of methane and ethane.

Event IV—10.30 a.m.

Near Gas and Dust Gallery No. 1.—Illustrating the ignition of coal dust by means of the laboratory coal-dust ignition apparatus devised and used by the Bureau of Mines.

Event V.—11 a.m.

Gas and Dust Gallery No. 2.—Illustrating the effect of removing the explosion proof protective devices from an electric mine motor operating in an explosive mixture of gas and air.

Event VI.—11.10 to 12 m.

Building No. 21.—Chemical and physical laboratories: Inspection of fuel, oil, explosives, gas, and other laboratories.

United States Bureau of Mines Explosion at Experimental Mine.

Near Bruceton, Pa., Oct. 30.

2 p.m. Leave Pittsburg on special train over the Wheeling Branch of the Baltimore & Ohio Railroad.
2.30 p.m. Arrive at Experimental Mine.
2.30 to 3.30 p.m. Inspection of Exeerimental Mine.
3.45 p.m. Explosion in Experimental Mine.
4 to 4.45 p.m. Inspection after explosion.
5 p.m. Return to Pittsburg by special train.

Programme of National Mine Safety Demonstration.

Tuesday, October 31, 1911.

Forbes Field, Pittsburg, Pa.

Field Officers.—Manager of Field Events, J. W. Paul; Field Marshal, Francis Feehan; Chief Usher, J. K. Clement.

Event I.—9 to 10.30 a.m.

Demonstration of first aid to the injured by teams of men representing mining companies from all sections of the United States of America.

Problems I, II, III, IV, V. (These problems to be published October 1).

Companies represented in demonstration of first aid to the injured and personnel of teams. (This to be filled in after entries have closed on September 30).

Rules.

1. The officers shall be as follows: A manager of events, a secretary, and assistants, a field marshall and assistants, and a chief usher and assistants.

2. Each team may be identified by the number worn by the captain, the same corresponding to the number on the printed list of teams on the final programme.

3. Each team shall perform according to the numbers assigned; all holding odd numbers performing together; subsequently, those holding even numbers, together.

4. All patients must be placed on stretcher after each treatment. All artificial respiration must be given for one minute.

5. No practicing shall be permitted on the day of demonstrations, nor shall the patient assist in any treatment.

6. As soon as an event has been completed, the team shall stand at position and the captain shall raise his hand.

7. The number of each event will be displayed, as performed upon the bulletin board.

8. The beginning and closing of each event will be designated by the sounding of a gong. Two signals will be given for removal of bandages.

EVENT II.—10.30 to 11.30 a.m.

Part I.—A permissible explosive, equal in disruptive force to one-half pound of 40 per cent. nitroglycerine dynamite, tamped with one pound of dry fire clay, will be fired into the gallery.

No explosion of the coal dust is expected.

The Forbes Field Dust Gallery.

This gallery is cylindrical, 133 feet long, and an internal diameter of six feet four inches, and represents an underground tunnel or part of a coal mine. The explosive is fired into the end of the gallery. Within the gallery are 133 pounds of fine coal dust from the Pittsburg seam, distributed uniformly throughout, and 20 pounds on a wooden bench 20 feet long near the mouth of the cannon, making a total of 153 pounds of coal dust.

Part II.—Demonstration of the use of birds in exploring mines after explosions or mine fires, at which carbon monoxide causes a large percentage of the fatalities. A few birds, which are much more sensitive to the effect of poisonous gas than men, can be taken into a mine with a rescue party, and as soon as they show signs of distress, the party can retreat to safety. In the demonstrations a man will enter a glass box, the atmosphere of which contains 0.25 of 1 per cent. of carbon monoxide gas, and remain there for some time after the birds have collapsed.

Part III.—A charge of FFF black blasting powder, equal in disruptive force to one-half pound of 40 per cent. nitroglycerine, tamped with dry fire clay, will be fired into the gallery containing 153 pounds bituminous coal dust, being the same dust as that used in Event II, Part I.

An explosion of coal dust is anticipated.

Part IV.—Foremen miners of the Bureau of Mines, equipped with various types of artificial breathing apparatus, will enter the gallery immediately after the coal dust explosion and recover supposed victims of mine explosion. First aid miners of the Bureau of Mines will resuscitate those overcome by noxious gases, using artificial respiration and oxygen respirating apparatus. They will administer first aid to the injured, using in this demonstration only the pocket first aid packet and those things which might be near after an explosion in a mine.

EVENT III.—11.30 to 12 Noon.

Introduction of President Taft by Joseph A. Holmes, Director, United States Bureau of Mines.

Presentation of medals, by William H. Taft, President of the United States.

Address, John K. Tener, Governor of the Commonwealth of Pennsylvania.

Address, Walter L. Fisher, Secretary of the Interior.

Address, Miss Mabel Boardman, American National Red Cross Society.

EVENT IV.

Parade of 19,927 miners, each of whom in his person represents one of the 19,927 men killed in the coal mines of the United States in the last twenty years.

Miners to march in review before the President's stand, and then to special cars on Forbes Street, which will carry them to the river front, where they will witness the marine parade commemorative of the Centenary of the Opening of Steam Navigation on the Ohio River.

NATIONAL MINE SAFETY DEMONSTRATION.

Entrance Rules.

The following rules, with suggestions, are sent mine operators who expect to enter first aid teams in the National Mine Safety Demonstration.

Rule 1.—The National Mine Safety Demonstration will be a non-competitive exhibition of skill in first aid to the injured in mines.

Rule 2.—Not more than one team of five men to represent any one coal mine, or the U. S. Bureau of Mines, or state mine departments, except that coal mining companies operating more than one mine may enter additional teams representative of groups of miners, helpers, trapper boys, or other mine workers.

Rule 3.—All persons entering to submit certificates showing that they are, or have been, bona fide mine workers.

[Suggestion—Submit a brief statement by one of the state mine inspectors to the effect that Messrs. Jone Doe, Richard Roe, etc., have worked in and around coal mines (give minimum length of time). (Signed and dated:— Inspector).]

Rule 4.—All entries to close one month prior to date finally selected for the meet (viz., Sept. 30, midnight).

[Suggestion.—The entries, like the certificates, need not follow any particular form, being merely a letter stating that you enter the following men, giving the full name of all entrants with the company name and official in charge.

Positively no entries will be accepted after October 1, since names are to appear on souvenir programme, which will go to press that day.]

Rule 5.—Coal companies entering teams to be invited to present, not later than one month in advance of the meet, viz., Sept. 30th, a list of five events as their choice, these to be submitted to the managers, who will select five for adoption from the various events suggested, each entering team to exhibit in these events suggested by them and such others of the five as they may elect.

[Suggestion.—The five events you prefer will, with others, be submitted to the committee to the committee of managers, who will select for the public exhibit frrom all those sugestions, the five which have the majority of recommendations. No suggestions will be received after October 1, on which date the five events selected will go to press. You will be notified prompt-

ly of the events decided upon so that your team may practice them. It is essential that you do this in order to assure that your team can perform within the time limit fixed for each event. The programme must President Taft is limited.]
be run off with snap and speed, since the time of

Rule 10.—Souvenir badges of the American Red Cross, souvenir buttons of the U. S. Bureau of Mines, and souvenir programmes will be presented to individual entrants; a souvenir first air box to each team entering; a souvenir pennant with the name of the company sending entrant, and to be used on the field as a marker, to be presented to the company represented.

Rule 13.—Each team will select its own subject in addition to the five operating members thereof, or will have a miner present, selected for them.

Rule 14.—In this exhibition, the correct use of the roller bandage of the triangular bandage will be given the same credit. In dressing wounds, the first aid packet only will be used. There will be no restrictions as to the make of the first and packet. Teams are to bring their own material, consisting of splints, cotton, bandages, first aid packets, picric acid gauze torniquots, stretchers, and at least two woolen blankets.

THE BENONI CONSOLIDATED PLANT.

A Modern Gold Mill.

Our Porcupine readers will be much interested in the following description, culled from the South African Mining Journal, of a large new plant that is soon to be put in commission. It represents the last word in mill equipment:

At the present time the mine is only being developed by the east and central shafts, and the ore hoisted through these two shafts will be carried by bottom discharge hopper trucks, and dumped direct into the main ore bin at the reduction works, which has a capacity of 1,000 tons. From this bin the ore will be fed on to conveyer belts and carried direct to the crusher station. The crusher station, which is of steel construction, is laid out for double sorting. The crushers are of the jaw type, 30 in. by 28 in. in size, and are four in number, three serving the intermediate sorting belts and one the coarse sorting belt. They are belt driven from a countershaft operated by a 150 h.p. motor. The fines from the Nos. 1 and 2 fines bins are carried by a belt, which, after passing over a weighing machine, feeds them on to a shuttle belt conveyer erected above the mill bins. This conveyer distributes the fines to the mill bins, which have a capacity of 2,000 tons. Both the mill bins and building are of steel construction.

The battery consists of 55 stamps of 2,000 pounds weight, operating in open-fronted mortar boxes, which stand on anvil blocks bolted to heavy concrete pile blocks. The king posts, which are of cast steel of special design, are secured to heavy wooden timbers bolted to the concrete pile blocks, whilst the guide beams are also of cast steel and are fitted with cast iron guides for the stamps. The stamps are arranged in batteries of five each, each battery being electrically driven. The tube mill plant consists of four 22 ft. by 5ft. 6 in. tube mills, each operated by a belt drive from an A. E. G. motor. The shaking tables are of the usual type, and are 28 in number—seven for each tube mill. The pulp, after passing over the amalgamating tables, is lifted by two 8 inch pumps to a second series of four Stadler classifiers, the overflow from which passes to the cyanide works, whilst the underflow is returned to the tube mill circuit.

The overflow from the Stadler classifiers, just mentioned, passes to primary and secondary Stadler classifiers, the final underflow from which goes to a 21 ft. diameter Caldecott filter table, whilst the final overflow runs to three 21 ft. diameter Arbuckle dewatering cones. The dewatered products from these two sets of apparatus pass together to the first set of four mixing agitators, 8 ft. diameter by 22 ft. high, where they are mixed with the required quantity of strong cyanide solution, and then pass to a series of Way-Arbuckle air agitators, in which the gold dissolving process is carried out. These agitators are so arranged that they can be used in series or in parallel as desired, it being possible to short-circuit any one tank or section of tanks as required. The combined sand and slime, together with the gold in solution, is then lifted by two 5 in. pumps to a Stadler classifier, the overflow from which goes to the first set of three 21 ft. diameter Arbuckle desolutionizing cones, the underflow from which cones joins the underflow from the Stadler classifier and passes to the second set of four mixing agitators 8 ft. in diameter by 22 ft. high, where they are mixed with a weak wash cyanide solution. The sludge from these agitators passes to a second series of primary and secondary Stadler classifiers, the final underflow from which is treated on a second 21 ft. diameter Caldecott filter table.

The extractor house is fitted with eight 12-compartment steel extractor boxes and with the necessary motor-driven solution pumps. The solution, after passing through the boxes, gravitates to the strong solution tanks, from which it is lifted by two 5 in. pumps to the first set of mixing agitators. The clean-up room is fitted with the usual appliances, and is under the same roof as are the shaking amalgamating tables in order to simplify supervision. The whole plant has been laid out with a view to simplify joint administration with the plant to be ultimately erected by the Apex Mines (gold section), and at the same time in such a way as to permit any unit of either plant to be enlarged to any extent that future developments may render necessary.

CANADIAN MINING INSTITUTE — WESTERN BRANCH.

Eleventh General Meeting.

The eleventh general meeting of the Western Branch of the Canadian Mining Institute was opened at New Denver, Slocan Lake, B.C., on Wednesday evening, September 13, Mr. Robert Hedley, of Vancouver, B.C., chairman of the Branch, presided, and among those present were the following: Wm. Fleet Robertson, provincial mineralogist, and E. Jacobs, branch secretary, Victoria; S. S. Fowler and A. H. Gracey, Nelson; Thos. Kiddie, Vancouver; M. E. Purcell, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star group of mine, Rossland; A. J. Becker, Lucky Jim mine, Slocan; John Vallance, superintendent Standard mine, Slocan, and the following visiting members: C. E. LeRoy, of the Geological Survey, and Dr. A. W. G. Wilson, Cosmo T. Cartwright, and L. Heber Cole, all of the Mines Branch, Canada Department of Mines, Ottawa. Other visitors included M. S. Davys and H. M. Ridge, London, England; W. Anderson, C.E., Vancouver; H, Nation, Bureau of Mines, Victoria; A. H. Tuttle, Wilcox mine, Ymir;

C. V. White, superintendent Slocan Star mine; Sandon; W. A. Cameron, Richmond-Eureka mine, Sandon; Thomas Avison, Alamo mine; J. C. Moen, Black Prince mine; S. A. Griffith, Eastmont mine; Ed. Shannon, Enterprise mine; T. J. Lloyd, Van Roi mine; Alex. Smith, Surprise mine; Julius Wolff, Mollie Hughes mine; Geo. H. Ayland, general manager Standard Silver-Lead Mining Co., Silverton; Capt. Harry Johns, Wellington group mines, Boundary; J. V. Richards, and O. Jeldness, Spokane, Wash.; John Wagener, Butte; Mont. A. Lakes, Jr., Denver, Colorado; Wm. Hunter, M.P.P., Silverton; Wm. Thomlinson, G. B. Webster, A. E. Ritchie, Colin J. Campbell, W. P. White, formerly superintendent of the St. Eugene mine, East Kootenay, and about 30 others.

On behalf of the New Denver Town Improvement Society, Mr. J. C. Harris read an address of welcome to the visitors, and he was followed by Mr. W. Hunter, M.P.P., who also heartily welcomed the visitors. The chairman replied briefly in acknowledgement, and then delivered an address.

Chairman's Address.

The chairman, Mr. Hedley, after having thanked the Town Improvement Society and Messrs. Harris and Hunter on behalf of the residents of New Denver and district for their cordial welcome, first mentioned the natural beauty of the district, which had always attracted him since his first visit to it in 1898; and then referred to two items of general interest to the public which had been published the previous day in the Nelson Daily News. One of these was an account of a new find of an apparently large body of carbonate of lead on Deen Creek, Nelson mining division, which had been sufficiently opened by its owners to draw to it the attention of the Consolidated Mining and Smelting Co., of Canada, Ltd. The other was the information made public to the effect that A. Gordon French had succeeded at his small plant in Nelson in handling the complex zinc ores of the country. Mr. French first roasts the ore, then dissolves the zinc by aid of a chemical reagent, recovers the zinc in metallic form by electrolysis, and smelts the residue for lead and silver. He (the speaker) wished Mr. French God-speed, and hoped he would make a commercial success of his zinc reduction process, which would be of inestimable benefit to the country.

He next said: "The Canadian Mining Institute enjoys a high standing among the technical societies of the world, and our Transactions are recognized as embodying material that is the result of the experience of men of brains and capacity for doing things. Among our members are men of attainment in all branches of the mining and metallurgical industries and research, and they do not hesitate to give their best efforts toward the advancement of the Institute. Our facilities in Canada are second to none. In addition to the well equipped and constantly improving testing plants of the Dominion Government, and of McGill and Kingston, we have metallurgical plants at Sudbury, Ontario; at Trail, and Boundary, B.C., and elsewhere, which stand in the front rank for efficiency. I was much impressed the other day to hear Mr. Hugh F. Marriott, consulting engineer of the Central Mining and Investment Company of London, say that he had arranged with McGill University, Montreal, to complete certain research work in its metallurgical department.

"At the last meeting of this branch we were asked to approach the Provincial Department of Mines, asking that it take further steps toward assisting in opening our vast unknown fields, by sending capable engineers to observe the geological structure to the end that the Government might advise prospectors of favourable conditions. This did not seem to arouse much interest, and was disposed of without discussion. It seems to me there is a much better field in which the Institute might endeavour to improve the conditions of the mining industry of the province, and that is the field of company promoting for mining enterprises. In this we could well ask the co-operation of the Provincial Government.

"Why is it that the general public — the cautious public — shies at a mining proposition? Why has mining enterprise fallen into disrepute? You and I know it is not for lack of opportunity to select judiciously and operate a mining property that will make good.

"About 18 months ago, Mr. Thomas Kiddie told the Vancouver Canadian Club, when addressing a large meeting of that organization, what a very small proportion of the money subscribed for mining was used for actual mining operations. The long-suffering public has been asked lately to subscribe to many schemes that from their inception were impossible of success, and impossible from either crass ignorance or deliberate and premeditated dishonesty. Often both these combine to fleece our investing public. Now, can you in some measure protect the public. They must, of course, take some chances.

"Mining enterprises that start as prospects cannot be sure of success, but they can be protected against that class of investment that is from the start absolutely sure of failure. Most of us can recall one instance, perhaps many instances, of company promotion that was predestined to failure from one or more of the following reasons: (1) The prospect gave but little reason to hope that it ever could yield commercial ore. (2) The proposed distribution of the capital was such that there was no chance for the sufficient development of the property. (3) The management of the company's affairs was placed in grossly incompetent hands. (4) Often it has been the case with a property of some merit, that large blocks of promoters' shares were issued and a small block sold to raise working capital. This might have been sold at 25 cents a share with the expectation that when needed further capital could be raised by selling another block at a higher figure. Before that became necessary, however, the promoters' shares might have been offered for what they would bring, and the market consequently so demoralized that treasury sales became unsaleable.

"It should, I think, be made a misdemeanour to (1) promote a company to operate a mine that has little if any reason to hope for commercial ore; (2) to so distribute the capitalization that the treasury is inadequately supplied; (3) to place the management in grossly incompetent hands; (4) to sell promoters' shares before the property has been developed beyond the prospect stage.

"Surely this Institute can approach the Provincial Government with a view to persuading it to so legislate so that it shall be required that all prospectuses shall be submitted to an advisory committee to detect faults, if any, that will surely lead to failure of the enterprise. It may not be necessary to ask for a staff of Government engineers who will investigate and pass on the merits of the proposition, if it be required that the opinion of a reliable mining engineer be obtained before proceeding to promotion. The ideal way, of

course, is to develop prospects to a certain point where there is a fair chance of making good, by a syndicate or a development company. Mr. Marriott, when commenting on the fact that there are so few mining properties sufficiently developed to attract his company, said: 'What you need here is a few good development companies.' ''

After a few further observations by Mr. Hedley, a discussion ensued, in which Mr. H. M. Ridge (who gave the meeting information relative to some of the disadvantages that had followed the passing in Great Britain of laws intended for the protection of the public from abuses in connection with company promotion), and Messrs. Kiddie, W. F. Robertson, E. Jacobs, and others.

Reading of Papers.

Papers were read, as under:

1. ''Early Slocan Days,'' by Prof. J. C. Gwillim, School of Mining, Kingston, Ontario.
2. ''Notes on Minerals Found in Slocan District,'' by Wm. Thomlinson, New Denver, B.C.
3. ''Notes on Geology and Ore Deposits of the Slocan,'' by O. E. LeRoy, of the Geological Survey of Canada.
4. ''Costs and Cost Conditions at the Blue Bell Mine, Kootenay Lake,'' by S. S. Fowler, Riondel, B.C.
5. ''The Lucky Jim Zinc Mine, Slocan, B.C.,'' by A. J. Becker, superintendent.

There was also some discussion on the present position of the zinc ore reduction question in British Columbia, in connection with which reference was made to W. R. Ingalls' paper on ''The Problem of Mixed Sulphide Ores.''

ROTARY CONVERTERS FOR MINING SERVICE.

Rotary converters are being used in many coal and metal mines. Direct current is necessary for the operation of mining locomotives because alternating current motors cannot satisfy the speed and space requirements. Alternating current is used for the transmission of the energy from the steam or hydro-electric generating stations to the mines, and the rotary converter is the logical machine for efficiently converting the alternating to direct current at the point where the energy is to be used.

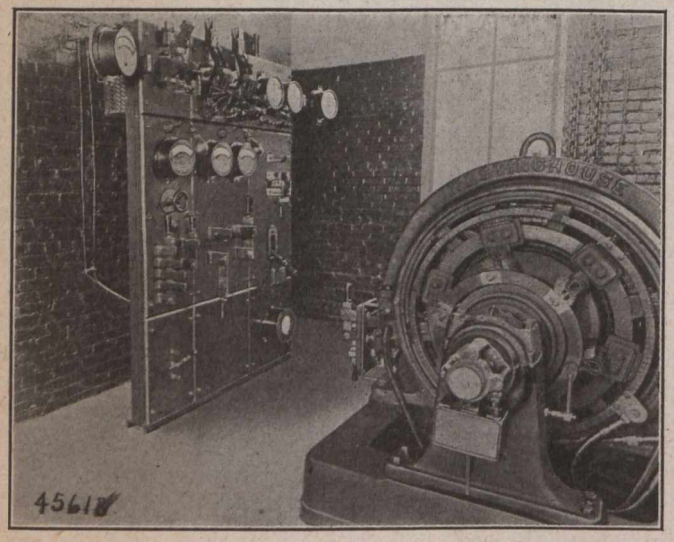


Fig. 1

Several public service companies in both Pennsylvania and in Colorado are making a specialty of supplying mines with alternating current energy and are developing excellent mining loads. The larger mining companies find it economical to establish steam or hydraulic generating stations at points where energy can be generated cheaply and to transmit it as high tension alternating current to the mine or group of mines where it is utilized. Whether alternating energy is generated by a public service company or by the mining company, experience shows the rotary converter to be an efficient, reliable machine for converting the alternating to direct current. A nominal voltage of either 275 or 600 is adopted for the direct current distribution systems within the mines.

A good example of a mining plant rotary converter installation is shown in fig. 1, which is a view of the substation at Mine No. 22 of the Consolidated Coal Company of Pennsylvania. This station received energy as alternating current at 2,300 volts, three-phase, 60 cycles. The pressure is stepped to 158 volts for the alternating side of the Westinghouse 150 k.w. rotary, and is delivered therefrom as direct current at 275 volts. A standard Westinghouse black marine finished switchboard, carrying the usual switch gear and instruments, controls the incoming alternating current line, the rotary converter, and the outgoing direct current feeders, which radiate to different parts of the property.

In large mines it is sometimes expedient to locate rotary converter substations underground near the centre of the area that they serve. Such an underground substation of the Consolidated Coal Company is shown in fig. 2. The room forming the station is lined with brick, which is waterproofed on the outside, and the roof is arched so that it will drain and that dripping water cannot damage the apparatus. The incoming lines to this station are alternating current, 2,300 volts, three-phase, 60 cycles, and the 150 k.w. rotary converter delivers direct current at 275 volts. The transformers stepping down from the alternating transmission voltage of 2,300 to the alternating rotary voltage of 158 are located in the substation. (See fig. 2). A pipe frame work arranged over the high tension transformers supports the high tension bus-bars. A two-panel black marine finished switchboard carries the equipment for metering and controlling the incoming and outgoing lines, the transformers, and the rotaries.

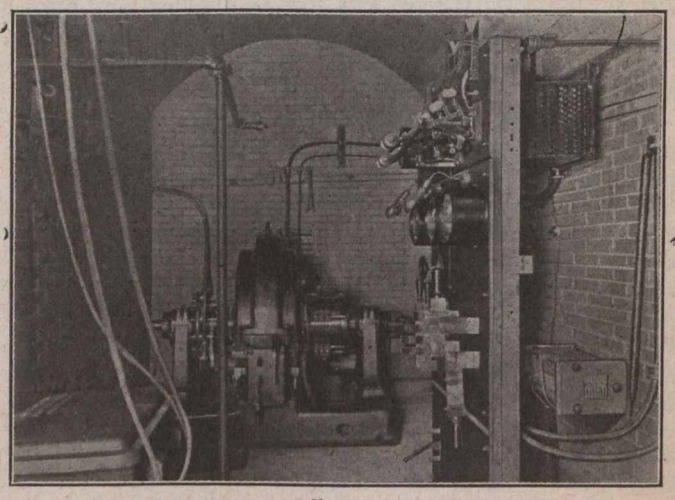
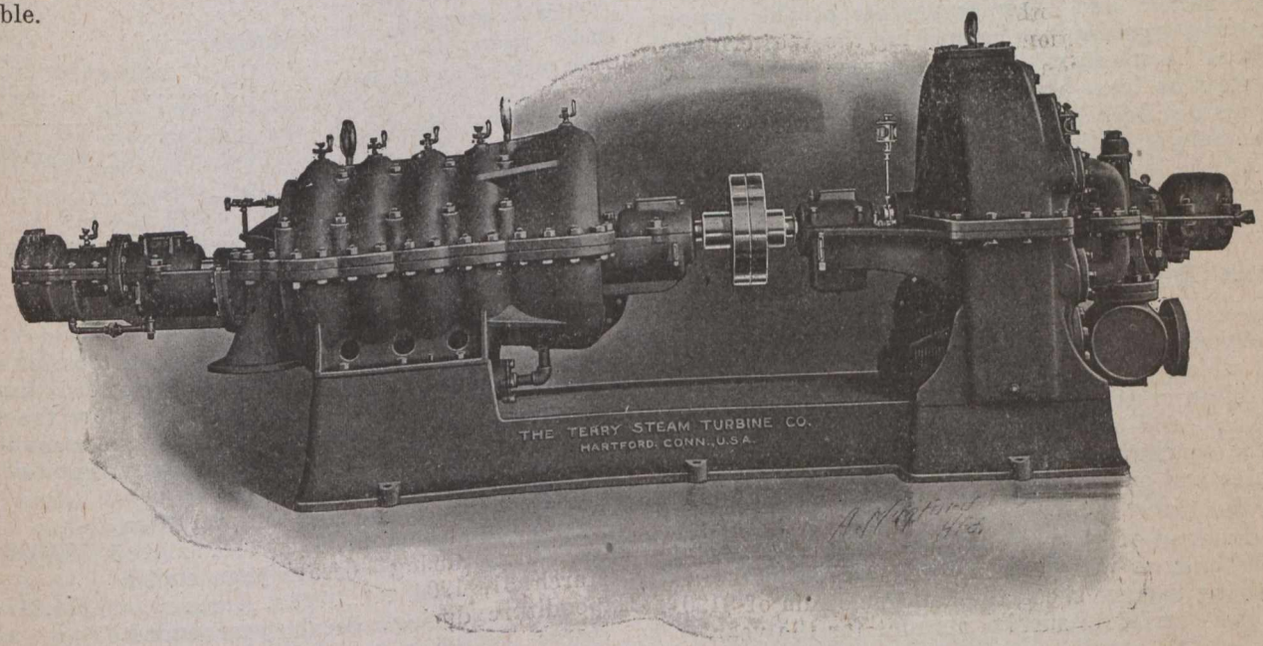


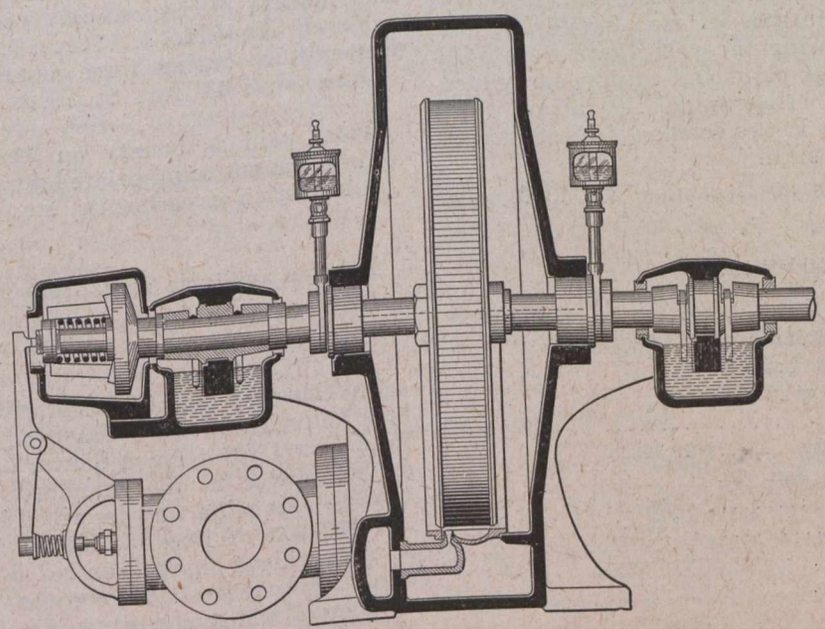
Fig. 2

Armored lead-covered cables are generally used to convey the high voltage energy to an underground substation in a mine. The cable is usually carried down a bore-hole rather than through the workings, so that the chance of injury from falling rock and from interference will be minimized.

Turbine Driven Centrifugal Mining Pumps.

For keeping mines free from water and for creating hydraulic power for placer mining, the turbine-driven centifugal pump in its present development is peculiarly applicable. The very small dimensions of such sets would commend their use where space conditions are important without very deep inquiry into their other virtues. Turbine pumps can be started up at any time from a cold condition and once started operate for an indefinite time until stopped by the simple closing of the throttle valve. To those unfamiliar with the modern turbine and centrifugal pump the power and speed of these machines is almost incredible.





For example, the larger illustration shows a Jeanesville 5-stage centrifugal pump driven direct-connected by a single-stage Terry steam turbine. These units are about 48 inches in height and not over 10 ft. in length, yet have a capacity of 1,000 gallons of water per minute against an average discharge pressure of 270 lbs. The small size and simple construction is in striking contrast to the great weight of a reciprocating pump for the same service.

As a means of propulsion for centrifugals no machine has yet been devised which fills the bill as satisfactorily as the small steam turbine. Because of its superior range of speed it is possible to get a unit of much smaller diameter than would be necessary in a larger pump driven by a reciprocating engine. The accompanying cuts show its extreme simplicity; there is but a single row of buckets on the rotor. This single-stage feature reduces complications, but in order that the speed shall be normal the steam in the course of its expansion is made to traverse the buckets several times, each time being redirected into the wheel through return passages in the casing. The wheel thus receives energy in successive stages and therefore the periphiral speeds are much lower than would be the case if the steam impinged on the wheel but once.

INTERNATIONAL COAL AND COKE CO., LTD.

The colliery of the International Coal and Coke Co., Limited, is situated at Coleman, southwestern Alberta. The head office of the company is in Spokane, Washington, U.S.A.

The annual meeting of the company is held on the fourth Thursday in March in each year. The printed "Seventh Annual Report of the Directors" to the shareholders in the company, however, was not circulated until the latter half of August, ultimo. It should be noted, therefore, that the period covered by the appended report and balance sheet was the calendar year 1910, so that the information given below relates to an earlier time than that during which the strike of coal miners and other employees of the various coal-mining organizations comprising the Western Coal Operators' Association was in progress, which strike took effect as from March 31, 1911, since which date there has not been any production of coal or coke at the company's colliery at Coleman, though the payment of the quarterly dividend has been continued, the same having been made out of accumulated funds.

The report and balance sheet follow:

Directors' Report—

"The net profits for the year, after paying all operating expenses at head office and mine, amount to $300,097.02, which sum has been derived from the various departments of the company's business, including the sale of coal and coke, receipts on account of lots sold from the company's townsite, and returns from rentals, water and electric light.

"On the 1st of February, May, August, and November, a dividend of 1½ per cent. was paid, aggregating $180,000, and, as will be seen by reference to the accompanying balance sheet, the handsome sum of $120,097.02 was carried to surplus account for the year.

"The total amount of the payroll for 1910 was $567,974.99; average number of men employed, 524; days worked, 280. During the year there were additions made to coal lands, plant and equipment (expenditure under this head being $71,958.10) all of which were deemed necessary in the company's best interest and approved by the board."

The balance sheet as at December 31, 1910, is as under:

Liabilities.

Capital — authorized and issued		$3,000,000.00
Dominion Government — Balance of royalty on coal mined between 1903 and 1909, payable at $3,000 per month		58,019.97
Accounts payable — Sundry	$ 19,362.96	
December payroll, payable Jan. 14, 1911	49,347.81	
Unclaimed dividends	882.36	
		69,593.13
Reserve for Contingencies		39,448.16
Surplus—		
As shown December 31, 1909	$634,595.93	
Less items chargeable against 1908	5,018.19	
		$629,577.74
Net profits earned during 1910	$300,097.02	
Less dividends paid during 1910	180,000.00	
	120,097.02	
		749,674.76
		$3,916,736.02

Assets.

Coal lands	$3,103,214.31
Plant, dwellings, horses, etc.	606,295.41
Warehouse stock	45,098.08
Accounts receivable	119,447.53
Stocks of coal and coke	3,572.32
Unexpired insurance	3,679.53
Timber rights	4,304.82
Cash on hand and in bank	31,124.02
	$3,916,736.02

WESTERN BRANCH C. M. I. MEETINGO

The Lead Bounty Situation.

The following figures obtained by E. Jacobs for submission to the recent meeting of the Western Branch of the C. M. I., at New Denver, B.C., show the balance unexpended as at July 1, 1911, of the amount of $2,500,000 originally voted for the payment of a bounty on lead mined in Canada:

Total expenditure (under old Act) for period ended June 30, 1908	$ 700,390.04
Expenditure during fiscal year ended March 31, 1909	274,447.50
Expenditure during fiscal year ended March 31, 1910	343,099.08
Expenditure during fiscal year ended March 31, 1911	249,370.38
Expenditure during three months ended June 30, 1911	49,713.32
Total paid as bounty on lead	$1,617,020.32
Add amount appropriated for zinc ore reduction experiments, etc.	50,000.00
	$1,667,020.32
Balance available as at July 1, 1911..	832,979.68
Total amount voted	$2,500,000.00

On Thursday morning, September 14, about 20 members and visitors were conveyed in gasoline launches from New Denver down Slocan Lake to Silverton, and driven thence to the Standard silver-lead-zinc mine (Note—This mine was described in the Canadian Mining Journal of Dec. 15, 1910). The very large body of clean galena exposed on No. 5 level of the mine excited much interest among the visitors, the greater number of whom also went into the intermediate and No. 4 levels, and afterwards into No. 6. The last is in about 2,000 feet from the portal and is just entering the downward extension of the big oreshoot opened in No. 5, below which it is 190 feet, vertical depth.

After having been hospitably entertained at luncheon by Mr. Geo. H. Aylard, general manager of the Standard Silver-lead Mining Company, the visitors

next went to the Wakefield concentrating mill, operated by the Silverton Mines, Ltd., owning the Hewitt-Lorna Doone mines, distant about a mile up the mountain. Then the new concentrating mill of the Van-Roi Mining Company, Ltd., was inspected, the company's resident superintendent, Mr. Douglas Lay, showing the visitors through the works. Here refreshments were liberally served, and then the return trip was made.

In the evening, after dinner, a smoking concert, given by the citizens of New Denver in honour of the visitors, was held, and this was numerously attended and a very enjoyable evening spent.

Next day the visitors dispersed in various directions, and the New Denver meeting, which had proved one of the most enjoyable and successful the Western Branch has held, was a thing of the past.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt and Gowganda.

Probably the best strike yet made on the Nova Scotia was that reported a few days ago, when No. 14 vein was encountered 50 feet below the first level. The vein shows three inches of calcite, smaltite, and silver that runs 5,000 ounces to the ton. At the 100-foot level on this vein high values were obtained, the ore assaying 13,000 ounces.

The report of the returns to the Ontario Department of Mines, recently issued, shows that the silver production of the Province, of which 95 per cent. comes from Cobalt, was 15,231,969 ounces in the first six months of 1911. This amount is valued at $7,644,200. The increase in value over the silver produced in the first half of 1910 is over $1,300,000. The shipments consisted of 7,733 tons of ore and 4,380 tons of concentrates, while in addition, 1,302,699 ounces of bullion were shipped. Although shipments this year have been much below those of 1910 in tonnage, the higher value of the ore shipped, and the increased amount of concentrates, has brought the total values up to a sum exceeding that of last year's shipments. In the six months Gowganda shipped 110 tons of ore and 2 tons of concentrates, while South Lorrain shipped 216 tons of ore, the whole containing 430,540 ounces of silver.

The quarterly report of the Beaver Consolidated Mines, Limited, shows that there is cash on hand of $59,960.45. During the three months ending August 31, drifting, cross-cutting, sinking, and raising to the extent of 1,102 feet was accomplished. Eight cars of ore were shipped by the company, two of them of high grade.

There is a possibility that the Alexandra mine will resume operations. Mr. E. W. Beidler, of Buffalo, is at present in the camp looking over the property, where the main shaft was sunk to 200 feet before work ceased.

Shipments of ore for the week ending September 8th were noteworthy because of the falling off from the average which had been maintained for several weeks previous, only 10 cars being despatched from the camp by eight mines, totalling 618,120 pounds. Several bullion shipments were made in that week. Two consignments of bars were made by the Nipissing, one of 47 bars, worth $26,366, and one of 43 bars, valued dat $23,615. The O'Brien shipped 18 bars worth $8,773, the Drummond 2 bars worth $681, the Wettlaufer 1 bar of 22 pounds, valued at $160, and the Nova Scotia shipped 22 bars, valued at $17,500.

For the week ending September 15th the ore shipments were the second highest of any week this year, over 600 tons leaving the camp. There were 663.67 tons in the 20 cars shipped, McKinley-Darragh leading with 4 cars of high grade. Following are the figures for the week:—

	Tons.
McKinley-Darragh, 4h	134.66
La Rose, 21	74.14
Coniagas, 2h	61.57
Drummond, 21	60.00
City of Cobalt, 1h	53.00
Trethewey, 2h	50.40
Cobalt Townsite, 1h	50.26
O'Brien, 1h	32.00
Chambers-Ferland, 1h	32.00
Temiskaming, 1h	31.11
Cobalt Lake, 1L	31.00
Kerr Lake, 1h	30.31
Buffalo, 1h	23.20

Bullion shipments were made during the week by the Nipissing, which sent out 36 bars, valued at $20,550; and by the Buffalo, which sent out 8 bars, worth $4,844.27.

Shipments for the month of August were the heaviest of any month this year, exceeding those of any other month by over 500 tons and those of July by almost 1,000 tons. Eighteen mines shipped a total of 86 cars during the month, 55 of these being of high grade, the shipments amounting to 5,426,934 pounds.

West Shining Tree, about 40 miles northwest of Gowganda, is the centre of the latest rush of gold seekers. It is reached either by rail and canoe from Sudbury, or by trail from Elk Lake and Gowganda. The Gosselin claims, whose rich deposits started the stampede, are located in Churchill township. They were sold a few days ago for $300,000, it is reported. In addition to Churchill, the townships of McMurchy, Asquith, and Fawcette are practically all staked up, and many prospectors are going in daily. It is said that representatives of the big Dome interests are in the district looking for promising claims. Inside of a week or so the C. N. R. will have its extension within about 15 miles of the district.

On the Moosehorn property, in James township, a rich mineral deposit has been uncovered in the course of trenching operations. Samples taken of the vein have been sent away to be assayed, and as yet the actual value of the find is not known, but it is considered rich by the official of the company.

Porcupine and Swastika.

Cody Township is coming to the fore with the reported discovery of free gold on a property being worked under the direction of A. J. Bouzan, son of the manager of the La Palme property. The belt of schist in which the quartz is found is 20 feet wide. Assays ran from $4 to $30.40 per ton.

While stripping and trenching at the Rea property, what is thought to be a continuation of the main vein was struck a few days since. The vein is 60 feet in width and pans gold freely. Underground work is progressing rapidly.

Although little is heard of the district near Matheson, yet considerable development work is being carried on in Munro Township. Several companies have shafts down 100 feet or more, and on the Porcupine Townsite Mining Company's pro-

perty a 4-foot quartz vein has been uncovered, from which samples assayed $20 to the ton.

The end of the present month will see the new plant at the Swastika mine in running order. The five-stamp mill now in operation will be used as a test mill, but no plans have yet been formulated for the erection of a large mil. Last week connections were made with the raise from the 100-foot level to the surface. This new opening will constitute the main shafe, as the shaft that has been in use for some months past has proven too small. Mr. M. W. Summerhayes, manager of this property for the past three months, has resigned, and Mr. R. B. Lamb, consulting engineer of the mine, is in charge at present.

The new plant for the West Dome is almost completely installed and every effort is being expended in getting camp buildings completed. The boilers for the Dome Extension, two locomotive type portables of 80 horsepower each, have reached the property and are being erected. The new compressor is already in position. At the Dome the greatest activity prevails, hundreds of men being engaged in the construction of the various buildings on the property. Two diamond drills are working and large gangs are engaged in surface work.

Three hundred thousand dollars was the sum paid the Sutherland Brothers, of Toronto, for their two claims in Bristol Township, staked during the early days of the rush in June. Development work on the Thompson, Yates, and Jowsey-Woods claims in that township continues with excellent results.

What is considered by many a most important development in the Porcupine field is the fact that at a depth of between 650 and 700 feet free gold was found by a core drill at the Pearl Lake property. The free gold was found in both the quartz and schist stringers. The vein encountered at this depth is thought to be an extension of the Dixon-McIntyre vein. Two shafts are being worked on the property just now, both being over 100 feet down. A 12-drill compressor and large motor are being installed and as soon as in running order, more drills will be set at work below.

Eight drills are at present working underground on the McIntyre, and this number will be increased as soon as more machines can be secured. Developments underground are quite extensive and good ore is being mined in several of the shafts, which have reached the 100-foot level.

A general assay of $20.10 has been obtained from the sampling of No. 3 vein at the Vipond. Cross-cutting showed 16 feet of ore from which the samples were taken, but the south wall of the vein had not been reached. This vein was first reached by cross-cutting the day before the big fire, and at the 100-foot level it is much wider than when first encountered.

GENERAL MINING NEWS.

NOVA SCOTIA.

(Special to the Canadian Mining Journal.)

Halifax, Sept. 20.—Representations are to be made to the Provincial Government by local mining men with a view to organizing a Royal Commission to report upon the gold mines of the province. Although the Government has not yet been approached it is believed that the proposal will not be looked upon unfavourably. It is recognized by all that some steps must be taken in this direction if only to set matters right in the eyes of the public. The strong investor is needed very badly, and he will not come until he knows more about the mines. The Report of a Royal Commission would arouse interest at once. It could be made absolutely clear and authoritative. There is really nothing to be hid.

Just so long as the present policy of inertia prevails, just so long will the gild mines stand idle.

Three Toronto investors have recently been looking round the Province, but no news has been made public.

ONTARIO.

Cobalt.—Two drills have been started to sink the main shaft of the Temiskaming mine to a further depth from the 575-foot level and at the present time the shaft is now down between 590 and 600 feet. It will be continued to a depth of 650 feet, where the eighth mine level will be cut and all the veins drifted upon at this depth, which will be the deepest by over 75 feet ever atempted by a mine in the Cobalt camp.

Porcupine, Sept. 19.—A new mark for depth in the camp was set Saturday, when the drill penetrated 800 feet at the Pearl Lake Gold Mines, cutting through 60 feet, carrying gold in vein matter of schist and quartz. The drill ran down on an angle, and it is believed the Dixon vein, on the McIntyre, to the south, is encountered.

The drill on the "A" vein reached 350 feet yesterday, bringing up free gold in 25 feet of quartz. Consulting Engineer Lamb reports the new mark as showing mineral all the way down. Hretofore the Dome at 700 feet of drilling held the record for depth.

ALBERTA.

Calgary, Alta., Sept. 17.—The Trades and Labour Congress of Canada concluded its business and adjourned till next year, when the meeting will be held in Guelph. The time of the session was occupied with a consideration of the various reports of committees, and there was an acrimonious discussion on several topics, chief of which was the future relations of the Congress with the Social and Moral Reform League. After a heated discussion in which the western members bitterly opposed the grant of $50 to the League, the motion to make the grant, and also the give the support of the Congress to the Moral and Sociay Reform League, was carried after an amendment to discontinue affiliation with the League had been defeated.

Resolution 64 was considered next. This was a motion by Delegate Hooper of, Winnipeg, to incorporate in the platform of the labour movement the principle of the abolition of the wage system. In a rather long speech, for which he was granted extra time, Delegate Hooper advocated his resolution from the standpoint of the Socialist party of Canada. "They were all opposed," he said, "to capital," which he dedfined as the "right to exploit labour."

Another resolution advocating the incorporation ini their platform of the principles of collective ownership and the democratic control of land and capital, was spoken to by several members, but the committee's report recommending non-concurrence was also endorsed by the assembly.

Section 13 of the officers' report, which was held over for discussion, was proceeded with. This section had reference to the condition of the miners in the present strike in the Crow's Nest Pass and at the invitation of the convention the

Fernie delegate detailed the history of the strike and explained why the miners had refused to accept the Gordon report. The main reason for their rejection of it lay in the fact fact that it recommended an increase to the day wage worker which had to be paid by the miner who was paid on piece work, and who had to pay the day wage man who was his helper. He said that when they refused to consider or recognize the operation of the Lemieux Act, the Minister of Labour had wired them a royal commission would be sent down to investigate and make a report. The miners did not want a royal commission because the appointments to such a body were made politically, and their grievance was not a political one, but was one of wages, and they did not wish to be concerned with politicians.

President Powell, of District 18 of the United Mine Workers, made a short speech in which he thanked the Congress for the kindness they had shown the mining delegates and for the grant of $300.

BRITISH COLUMBIA.

Hope, B.C., Sept. 19.—During the past week M. C. Williams, M.E., of Hope, B.C., has just concluded a deal which involves a transaction of $100,000. It includes the sale of three groups of claims owned by Andrew Larson & Co., of Vancouver, and Frank Fritz & Co., of Grand Rapids, Mich.

Williams' property has been sold by Mr. Williams to Charles F. Solderling, of Spokane, who will call the new mining camp, 23-Mile camp. It is located within easy reach of Hope.

Coalmont, Sept. 18.—A. S. Williamson, of Williamson & Turner, agents for Coalmont Townsite, arrived in town from Vancouver. He is sepnding a few days making an inspection of the Columbia Coal & Coke Company's properties here and is more than surprised at the great amount of work which has been done by the company in so short a time.

George L. Fraser, general manager for the coal company, has been absent in Chicago and eastern cities for the past 30 days, where he has been completing the final arrangements for the installation of the company's plant with Messrs. Roberts & Schaffer, of Chicago. While in the east Mr. Fraser has also visited some of the largest coal mines in Pennsylvania.

COMPANY NOTES

CANADA IRON CORPORATION.

The Canada Iron Corporation, of which Mr. T. J. Drummond is president, has just issued its annual report for the year ending May 31st.

Although some of the plants are undergoing construction and are not up to full working capacity, earnings were good.

The profits for the year were $401,885, and the bond interest $175,200, leaving $226,685.

There were minor charges of $16,305, and the year's surplus added to the balance last year of $149,427 made $359,807 of undivided profits carried forward. The showing is thus very satisfactory.

Since the close of the fiscal year the position of the corporation has been further very materially improved through the acquisition of valuable assets which will not show in their statements until the close of the present year.

LE ROI No. 2 AUGUST OUTPUT.

Following is cable sent by the management of Le Roi No. 2 to London head office:—

Le Roi No. 2—"Josie mine report for August—Shipped 2,240 tons of ore and 142 tons of concentrates. The receipts from smelter are $43,579 (£8,985), being payment for 2,314 tons shipped, and $6,364 (£1,312), being payment for 135 tons concentrates shipped. In all $49,943 (£10,297). Estimated costs for corresponding period:—Development, $9,000; ore production, 09,000; milling, $1,250—$19,250 (£3,969). Poorman drift west, 500 ft. level—Advance 20 feet, which averaged 1 oz. 4 dwts. gold and 5 per cent. copper over 9 ins. Rodney drift west from crosscut, 1,200 ft. level—Advance 20 feet, which averaged 11½ dwts. gold and 4¾ per cent. copper over 4 feet. Rodney drift, east from crosscut, 1,200 foot level—Advance 50 feet, which averaged 1 oz. gold and 3¾ per cent. copper over 2½ feet. Rodney raise, 1,200 foot level—Advance 27 feet, of which 27 feet averaged 7 dwts. gold and 5¾ per cent. copper over 2 feet 9 inches."

A EUROPEAN VIEW OF ZINC MARKET.

An interesting review of the position of the zinc market, in which both England and Germany are about equally interested, appeared last month in the "Frankfurter Zeitung" apropos of the recent advances in the price of the metal. During August, according to this account, the price of crude zinc has been raised no less than four times, aggregating a total advance of M3½ per 100 kilos for the month. The rise was grmly based on the strong and well-sustained demand for zinc by consumers and the reduction of stocks which took place. Production did not keep pace with the extensive consumption. It was free to the zinc foundries this year to increase their output as much as they pleased; but though the statistics show that an increase of output took place, it was not in proportion with the advance in consumption, and the stocks at the foundries went back to a minimum. They could not supply the quantities for which orders were received in July and August, and the Zinc Foundries Union has recently been repeatedly in the position of only having small quantities to dispose of at the enhanced prices. Reviewing the course of operations under the Zinc Convention, which was agreed to in 1908, and prolonged by the Zinc Foundries Union to 1916, and by the International Zinc Syndicate to 1914, it will be found that, starting from the low level of £18 to which the price had fallen in 1908, an upward movement has taken place continuously ever since, uninterrupted by any important break. The London price is now at the £27 10s level, while at the beginning of the year it was still £24, as compared with a yearly average of £23 in 1910, £22 6s 8d in 1909, and £20 3s 5½d in 1908. During the years in which all metal prices moved convulsively upwards, namely 1905 and 1906, zinc averaged £25 6s 8d in 1909, and £20 7s 7d in the former year and £27 1s5d in the latter. The advance of late years has been attributed partly to the regulating influence of the syndicate on prices. Germany's consumption, calculated on the reductions of stocks at the foundries, has increased from 188,100 tons in 1909 to 191,500 tons in 1910, while the export of zinc in zinc and brass goods increased by 100,000 tons to 479,000 tons. In England the consumption for 1910 was 177,800 tons, as com-

pared with 155,500 tons in 1909, and the export of galvanized sheets increased by 100,000 tons to 595,000 tons. The consumption of the United States, which is one-third of that of the entire world, increased by 8,100 tons in 1910 to 245,000 tons. In consequence of the Zinc Foundries Union putting up the price at the beginning of the year 1910 to M47.25 per 100 kilos for ordinary brands, whereas it now demands M54.50, the prices for zinc goods also rose, and, above all, for galvanized sheets. These cost at the beginning of the present year M57.35 to M59.36 per 100 kilos. In consequence of the action of the German Zinc Rolling Mills Union the price now stands (end of August) at M62.35 to M64.35 at foundry station, according to quantity of goods ordered. As in spite of the high prices the inquiry for zinc finished goods is said to be active, the consumers of the raw metal ought to give expression to a strong demand in the near future. The Zinc Foundries Union will in any case do its best not to give an impetus to the price movement, but will pursue a policy suited to the conditions of the market, in order to hinder to the best of its ability any slump on the eventuality of consumption falling off.

STATISTICS AND RETURNS

DOMINION COAL OUTPUT FOR AUGUST.

The Dominion Coal Company's August record of 415,000 tons was 22,000 tons better than any former year.

In previous years June and July were the months when big shipments were made, as the following best month's shipments in the years specified will show:

September, 1902	313,000
July, 1903	273,000
June, 1904	346,000
July, 1905	342,000
June, 1906	362,000
June, 1907	386,000
July, 1908	391,000
June, 1909	393,000
September, 1910	369,000
August, 1911	415,000

The reduction in the coal duty under reciprocity would prove a serious handicap to the company, and if the duty is lowered last month's record will stand unbeaten.

NOVA SCOTIA COAL OUTPUTS.

Nova Scotia Steel & Coal Co., Ltd.

Shipments, August, 1911	79,010
Shipments, August, 1910	100,364
Decrease, August, 1911	21,354
Shipments, 8 months, 1911	419,461
Shipments, 8 months, 1910	514,415
Decrease, 8 months, 1911	94,954

Acadia Coal Company.

Shipments, August, 1911	32,902
Shipments, August, 1910	25,360
Increase, August, 1911	7,542
Shipments, 8 months, 1911	253,519
Shipments, 8 months, 1910	168,545
Increase, 8 months, 1911	84,974

Intercolonial Coal Company.

Shipments, August, 1911	20,102
Shipments, August, 1910	21,380
Decrease, August, 1911	1,278
Shipments, 8 months, 1911	166,188
Shipments, 8 months, 1910	164,038
Increase, 8 months, 1911	2,150

Inverness Railway & Coal Co.

Shipments, August, 1911	23,145
Shipments, August, 1910	25,597
Decrease, August, 1911	2,452
Shipments, 8 months, 1911	175,267
Shipments, 8 months, 1910	171,502
Increase, 8 months, 1911	3,765

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending Sept. 15, and those from Jan. 1, 1911, to date:

	Sept. 15. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger	.....	55,200
Bailey	.....	40,000
Barber	.....	6,000
Beaver	.....	1,340,673
Buffalo	46,410	1,907,414
Chambers-Ferland	64,060	1,023,000
City of Cobalt	106,000	663,980
Cobalt Lake	62,000	2,879,506
Cobalt Townsite	100,520	819,800
Colonial	.....	135,410
Coniagas	123,150	2,995,293
Crown Reserve	.....	1,791,680
Drummond	120,000	410,000
Green-Meehan	.....	60,000
Hargraves	.....	161,100
Hudson Bay	.....	1,066,340
Kerr Lake	60,620	1,927,709
King Edward	.....	40,000
La Rose	148,780	5,164,208
McKinley-Darragh	270,330	4,602,509
Nipissing	.....	4,406,338
O'Brien	64,010	1,072,898
O'Brien, M. J.	.....	47,000
Peterson Lake, Little Nip.	.....	58,420
Provincial	.....	151,950
Right of Way	.....	950,915
Silver Cliff	.....	106,680
Standard	.....	102,813

Temiskaming	62,220	1,244,112
Trethewey	100,800	935,220
Wettlaufer		117,232

The shipments for the week were 1,328,840 lbs., or 664 tons. The shipments from Jan. 1 to Sept. 15 were 36,283,419 lbs., or 18,141 tons.

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending September 22, and those from January 1, 1911, to date:

	Sept. 22. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger		55,200
Bailey		40,000
Barber		6,000
Beaver		1,340,673
Buffalo	60,860	1,968,274
Chambers-Ferland		1,023,000
City of Cobalt		663,980
Cobalt Lake	60,640	2,940,146
Cobalt Townsite	100,520	920,320
Colonial		135,410
Coniagas	123,150	3,118,443
Crown Reserve	50,800	1,842,489
Drummond	130,000	540,000
Green-Meehan		60,000
Hargraves		161,100
Hudson Bay		1,066,340
Kerr Lake	60,870	1,988,579
King Edward		40,000
La Rose	238,480	5,402,688
McKinley Dar.	64,250	4,666,759
Nipissing	151,070	4,557,408
O'Brien		1,072,898
O'Brien, M. J.		47,000
Peterson Lake, Little Nip.		58,430
Provincial		151,950
Right of Way	56,980	1,007,895

GOWGANDA ORE SHIPMENT.

The Canadian Mining Journal has been notified that the Miller-Lake Gowganda mine has just completed a shipment of 51,000 lbs. of high grade ore by way of Charlton. Owing to the very bad condition of the Gowganda road it took three weeks to get the ore out to the railroad.

B. C. ORE SHIPMENTS.

The ore shipments and ore milled in the Slocan-Kootenay, Boundary, and Rossland districts for the week ended Sept. 9th totalled 17,255 tons, while the smelter receipts were 14,780 tons. The shipments for the year to date total 1,196,508 tons, and the smelter receipts total 1,096,008 tons. The figures in detail are:

Rossland Shipments.

Centre Star	3,476	139,458
Le Roi	36	10,274
I. X. L.	9	79
Le Roi No. 2	616	19,557
Le Roi No. 2, milled	300	10,800
Other mines		19,319
Total	4,445	199,487

Boundary Shipments.

Mother Lode	5,120	213,055
Rawhide	3,555	21,085
Athelstan	277	5,415
Unnamed	509	3,052
Other mines		650,313
Total	9,459	892,920

Slocan-Kootenay Shipments.

St. Eugene, milled	420	19,776
Knob Hill	236	3,277
Emerald	35	1,396
Sullivan	744	13,150
Arlington	36	65
Granite-Poorman, milledd	250	9,010
Nugget, milled	110	3,960
Van Roi, milled	800	26,649
Queen, milled	420	14,910
Molly Gibson, milled	300	2,400
Other mines		9,508
Total	3,351	104,101

B. C. Copper Company's Receipts.

Greenwood, B. C.

Mother Lode	5,120	213,055
Rawhide	3,555	21,085
Athelstan	277	5,415
Unnamed	509	3,052
Other mines		30,133
Total	9,461	272,740

Consolidated Company's Receipts.

Trail, B.C.

Centre Star	3,476	139,458
Le Roi	36	10,274
Queen	38	349
Granite-Poorman	30	303
Le Roi No. 2	616	19,557
Knob Hill	236	3,277
I. X. L.	9	79
Emerald	35	1,396
Sullivan	744	13,150
St. Eugene	63	4,368
Arlington	36	65
Other mines		40,579
Total	5,319	232,855

B. C. ORE SHIPMENTS.

For the first time for some years the Emma mine in the Boundary, once a heavy shipper to the Hall Mines smelter, last week appeared on the list of shipping mines, 302 tons being received from the property at the B. C. Copper Company's smelter at Greenwood. The shipments during the week ending September 2nd, totalled 17,808 tons, and the smelter receipts were 15,772 tons. The totals for the year to date were respectively 1,159,891 tons, and 1,080,629 tons.

Slocan-Kootenay Shipments.

Richmond-Eureka	31	1,633
Sullivan	218	12,406
St. Eugene, milled	420	19,356
Rambler-Cariboo	32	1,115
Hewitt	31	246
Queen	420	14,490
Granite-Poorman, milled	250	8,760
Nugget, milled	110	3,850
Emerald	43	1,361

Society Girl	52	433
Idaho	34	47
Knob Hill	228	3,041
Sweetgrass	6	38
Molly Gibson	90	726
Van Roi, milled	800	25,489
Arlington	13	29
Other mines	.....	8,676
Total	2,737	100,423

Rossland Shipments.

Centre Star	3,904	135,982
Le Roi No. 2	391	18,941
Le Roi No. 2, milled	300	15,500
Le Roi	467	10,238
Other mines	.....	448
Total	5,062	176,109

Boundary Shipments.

Mother Lode	5,240	207,935
Rawhide	3,341	17,530
Jack Pot	266	19,521
Athelston	295	5,138
Napoleon	155	6,825
Unnamed	410	2,543
Emma	302	302
Other mines	.....	623,565
Total	10,009	883,359

Consolidated Company's Receipts.

Trail, B.C.

Centre Star	3,904	135,982
Sullivan	218	12,406
Le Roi No. 2	391	18,941
Le Roi	467	10,238
Richmond-Eureka	31	1,633
St. Eugene	31	1,633
Rambler-Cariboo	32	1,115
Hewitt	31	246
Emerald	43	1,361
Society Girl	52	433
Idaho	34	47
Queen	420	14,490
Knob Hill	228	3,041
Sweetgrass	6	38
Molly Gibson	90	726
Van Roi	95	930
Arlington	13	29
Other mines	.....	35,155
Total	5,763	226,937

B. C. Copper Company's Receipts.

Greenwood, B. C.

Mother Lode	5,240	207,935
Rawhide	3,341	17,530
Jack Pot	266	19,521
Athelston	295	5,138
Napoleon	155	6,825
Unnamed	410	2,543
Emma	302	302
Other mines	.....	3,485
Total	10,009	263,279

B. C. ORE SHIPMENTS.

Another Slocan property was added to this year's list of producing mines last week when the Panama shipped 40 tons of ore to the Trail smelter. The ore shipments for the week ending September 16th totalled 18,243 tons, and for the year to date 1,194,076 tons. The smelter receipts for the week and year respectively were 13,901 tons and 1,111,262 tons.

Boundary Shipments.

Mother Lode	6,930	219,985
Rawhide	1,796	22,881
Jack Pot	365	19,886
Athelstan	335	5,750
Unnamed	486	3,538
Other mines	.....	630,691
Total	9,912	902,731

Rossland Shipments.

Centre Star	3,400	142,858
Le Roi No. 2	506	19,447
Le Roi No. 2, milled	300	11,100
Le Roi	560	10,842
Other mines	.....	457
Total	4,774	184,704

Slocan-Kootenay Shipments.

Molly Gibson	103	829
Van Roi, milled	800	27,449
Molly Gibson, milled	300	2,700
Panama	40	40
Sullivan	646	13,796
St. Eugene, milled	420	20,196
Richmond-Eureka	122	1,724
Ruth	35	420
Rambler-Cariboo	92	1,207
Queen, milled	420	15,330
Granite-Poorman, milled	250	9,260
Nugget, milled	110	4,070
Emerald	88	1,484
Society Girl	24	457
Second Relief	46	83
Knob Hill	61	3,338
Other mines	.....	5,252
Total	3,557	106,641

B. C. Copper Company's Receipts.

Greenwood, B.C.

Mother Lode	6,930	219,985
Rawhide	1,796	22,881
Silver Cliff	.....	106,680
Standard	.....	102,813

Temiskaming	40,320	1,284,432
Trethewey	64,960	1,000,180
Wettlaufer		117,232

The shipments for the week were 1,202,900 pounds, or 601 tons, against 664 tons the previous week.

The shipments from Jan. 1 to Sept. 22 were 37,486,319 lbs., or 18,743 tons.

Jack Pot	365	19,886
Athelstan	335	5,750
Unnamed	486	3,538
Other mines		10,612
Total	9,912	282,652

Consolidated Company's Receipts.

Trail, B.C.

Knob Hill	61	3,338
Molly Gibson	103	829
Van Roi	96	1,026
Panama	40	40
Centre Star	3,400	142,858
Sullivan	646	13,796
Le Roi No. 2	506	19,447
Le Roi	560	10,842
Richmond-Eureka	122	1,724
St. Eugene	127	4,495
Ruth	35	420
Rambler-Cariboo	92	1,207
Emerald	88	1,484
Society Girl	24	457
Second Relief	46	83
Queen	35	384
Other mines		35,767
Total	3,989	238,197

MINERAL PRODUCTION OF GREAT BRITAIN.

The production of minerals in the United Kingdom in the calendar year 1910 has been made public by the British Government.

Coal—The production of coal in 1910 amounted to 264,433,028 gross tons, against 263,774,312 tons in 1909. The maximum production of coal was reached in 1907, when 267,830,962 tons were mined. The year of next largest production was 1910.

Iron Ore.—The output of iron ore in the United Kingdom in 1910 amounted to 15,226,015 gross tons, as compared with 14,804,382 tons in 1909. The maximum production was reached in 1882, when the output was 18,031,957 tons.

Limestone.—In 1910 there were produced in Great Britain 12,512,736 gross tons of limestone, against 11,811,122 tons in 1909. In 1906 the maximum output of 12,758,,588 tons was reached.

Manganese Ore.—While Great Britain is a fairly large manufacturer of ferro-manganese it is a small producer of manganese ore, its output in 1910 amounting to only 5,467 tons. In 1909 it was 2,768 tons. The maximum production was reached in 1906, when 22,762 tons were mined.

Tine Ore.—The production of tin ore in Great Britain is declining. In 1884 the output was 16,117 gross tons of dressed ore, but in 1910 the output was only 7,562 tons. In the ten years from 1873 to 1882 the average production was 14,114 tons; 1883 to 1892, 14,429 tons; 1893 to 1902, 8,741 tons; and from 1903 to 1910 it was about 7,500 tons.

Zinc Ore.—The production of zinc ore is also declining. In 1910 the output was 11,238 tons, against 9,902 tons in 1909. In early years the average was about 25,000 tons—1873-82, 25,519 tons; 1883-92, 21,931 tons; 1893,1902, 22,182 tons; and 1903-10, about 19,500 tons.

INDIAN GOLD OUTPUT.

The gold production of the mines of the Kolar Goldfield (Mysore) and two outside mines (the Hutti Nizam's and the North Anantapur) for August was 47,730 ozs., an increase of 139 ounces compared with the return of the previous month.

NEW YORK METAL MARKETS.

September 26th—

Tin, Straits, 27.87½ cents.
Copper, Prime Lake, 12.50 cents.
Electrolytic Copper, 12.30 cents.
Copper wire, 13.75 cents.
Lead, 4.50 cents.
Spelter, 6.00 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 8.15 to 8.25 cents.
Aluminium, 19.25 to 19.75 cents.
Nickel, 40 to 45 cents.
Platinum, $44 per ounce.
Bismuth, $1.80 to $2 per pound.
Quicksilver, $46.50 per 75-lb. flask.

MINERAL MARKETS.

Acids—
Muriatic, tank cars, $1.15 to $1.55 per 100 lbs.
Nitric, $0.04 to $0.05 per lb.
Sulphuric, $0.01 to $0.01¾ per lb.
Chrome ore, 50 per cent., ton of 2,240 lbs., $15.
Fire clay, $2.50 to $5 per short ton.
Fluorspar, lump, $9 per long ton.
Fluorspar, ground, $12 to $15 per long ton.
Graphite, lump, 4 cents to 10 cents per lb.
Gypsum, short ton ground, $4 to $7.50 per ton.
Magnesite, crude, 95 per cent., $7 to $8.50 per long ton.
Molybdenite, commercially pure, 25 to 30 cents per lb.
Pyrite, lump, arsenic free, 10 to 12½ cents per unit.
Pyrite, fines, arsenic free, 8 to 11 cents per unit.
Tungsten ore, 50 per cent., $7.70 per unit.

SILVER PRICES.

	New York cents	London pence
Sept. 7	52¼	24⅛
" 8	52¼	24⅛
" 9	52⅜	24 3/16
" 11	51¼	24⅛
" 12	52¼	24⅛
" 13	52¼	24⅛
" 14	52⅜	24 3/16
" 15	52½	24¼
" 16	52½	24¼
" 18	52⅜	24 3/16
" 19	52⅜	24 3/16
" 20	52½	24¼
" 21	52½	24¼
" 22	52½	24¼
" 23	52½	24¼
" 25	52½	24¼
" 26	52½	24¼

SHARE MARKET.

(Courtesy of Warren, Gzowski & Co.)

COBALT STOCKS.

Amalgamated	...	...
Bailey	.02½	.02⅝
Beaver Consolidated	.45½	.46
Buffalo	...	...
Chambers-Ferland	.10	.11
City of Cobalt	.09 bid	
Cobalt Central	... offered	.01
Cobalt Lake	.25	.25¼
Coniagas	5.95	6.15
Crown Reserve	2.70	2.85
Foster	.02	.04
Gifford	.01 bid	...
Great Northern	.11½	.11⅝
Green Meehan	.01¼	.01½
Hargraves	.04¾	.05
Hudson Bay	...	...
John Black	...	...
Kerr Lake	3.65	3.90
La Rose	4.00	4.12½
Little Nipissing	.03	.03⅛
McKinley	1.56	1.57
Nancy Helen	...	...
Nipissing	7.90	8.00
Nova Scotia	...	...
Ophir	...	...
Otisse	.01	.02
Peterson Lake	.06½	.06¾
Right of Way	.05	.06
Rochester	.02¾	.03
Silver Leaf	...	...
Silver Bar	...	...
Silver Queen	...	...
Temiskaming	.39½	.40
Trethewey	.65	.75
Watts	...	...
Wettlaufer	.85	.90

PORCUPINE STOCKS.

American Gold	...	...
Apex	.12½	.15
Coronation	.03¼	.04
Nor. Exploration	...	...
Dobie	1.35	1.40
Dome Ex.	.68¼	.69
Foley-O'Brien	... offered	1.00
Rea	3.30	3.35
Hollinger	12.30	12.35
Monita	.12	.15
Pearl Lake	.42 bid	...
Central	2.87½	3.00
Imperial	.10½	.11½
Northern	.83	.84
Tisdale	.05¼	.06
Preston East Dome	.24	.24½
Standard	... offered	.04
Swastika	.35½	.36
United	.02	.03
Porcupine Gold	.41	.43½
West Dome	.95	1.00
Crown Chartered	.30	.32
Eldorado	.10½	.11
Gold Reef	.16	.18
Porcupine Canada	.85	.95

NEW YORK CURB.

Braden Cop.	4½	4¾
B. C. Copper	3¾	4
Butte Coalition	15	15⅜
Ely Central	.02	.04
Ely Cons.	⅜	½
First National Cop.	1	1⅛
Giroux	3⅞	4
Greene-Canadian	6	6¼
Nevada Hills	2⅞	3
Ohio Copper	1⅜	1½
Ray Central	1¼	1⅜
Union Mines	⅛	⅜
Yukon Gold	3¾	3⅞
Goldfields	5⅜	5¾
Nevada Cons.	16½	16¾
Miami	18	18½
Granby	30	31
Cons. Mining & Smelting	40	45
Davis-Daly	⅞	1
Cons. Arizona	1 1/16	¾
Rawhide Coal	.04	.06
Ray Cons.	18½	18¾
Chino	18½	19
New Baltic	..	..
Inspiration	6¼	6⅝