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ANOTHER SUGGESTION

In our last issue reference was made to the unprofitable period of quiescence, intervening between the annual meetings of the Canadian Mining Institute. We wish now to touch upon another matter, which, we submit, is of paramount importance.

Under the system now obtaining, the offices of Treasurer and Secretary are distinct. The Treasurer is remunerated at the discretion of the Council. He regulates and records all receipts and disbursements. All cheques for money to be paid are signed and issued by him, and all cheques and other negotiable paper made payable to the Institute are endorsed by him. At the end of the financial year he presents a duly audited statement.

The Secretary resides in Montreal. Upon him devolve the duties of keeping a true and correct record of all the proceedings of the Institute, and a correct list of the members and student members. He conducts the correspondence of the Institute, issues notices of meetings and has the seal of the Institute in his keeping. He, also, is remunerated at the discretion of the Council.

The duties of the Treasurer are light. His remuneration, we understand, amounts to $500 per annum, and only a small fraction of his time is devoted to the service of the Institute. The Secretary, on the other hand, is kept at least fairly busy and receives a regular salary.

With these preliminary explanations we wish to lay before the members of the Institute a few carefully considered proposals.

It is undoubtedly true that the matter of remuneration should not be left to the discretion of the Council. In practice, this tends to render the Secretary's position insecure and in certain matters weakens his hand. The division of the offices of Secretary and Treasurer is unnecessary at present. Were the two functions combined and the salary of the Secretary-Treasurer fixed at a sum equal to the total now received by both officers, the new position would be one of much greater dignity and strength. Indeed, we would go farther. We venture the prediction that, were the Secretary's position thus strengthened and were he assigned a respectable sum of money for travelling expenses, the membership of the Canadian Mining Institute could be doubled within twelve months. And it must be remembered that with a membership of one thousand the matter of the Secretary-Treasurer's salary and travelling expenses would be relatively smaller than at present.

Without doubt, the Institute needs revivifying. Equally without doubt the office of Secretary is not clothed with sufficient authority or discretion. The

logical means of infusing life and energy into the body corporate lies in making it worth while for one man to use all his time and energy in active organization and in keeping the affairs of the Institute constantly moving.

The mining industry of Canada has grown so rapidly of late years, that now, more than ever before, there is need of watchfulness. The promotion of special and class legislation, inimical to the best mining interests, should be promptly and strongly opposed. Branches of the Institute should be aided and encouraged, financially and otherwise. The present provision for the financial aid of branches is vague and the attitude of the Institute is not as favorable as might be desired.

To illustrate the need of unremitting alertness, it is only necessary to cite the following instance: When the Canadian Mining Institute was opposing the passage of the Mines Taxation Act in the Ontario Legislature, last winter, the Government emphasized forcibly the fact that nothing had been heard from the Institute until the bill had been for many months before the House. It was implied that if the mining men had been up to their business, they would have been heard from long before.

As it was, the Ontario Government heard only an ill-digested, conflicting mass of individual opinions.

Perhaps we have said quite enough to demonstrate the need of injecting life into the Canadian Mining Institute. We particularly request expressions of opinions from members of the Institute. The questions outlined above are urgent. They can be discussed entirely without personal animus. But they must be settled before the Canadian Mining Institute rises to its proper standard of practical helpfullness and dignity.

THE PERSEVERANCE OF A PREJUDICE

The belief that mining is essentially a department of the profession of gambling appears to be ineradicably fixed in the minds of the great majority of men. The element of "bull" luck upon which the ordinary prospector is supposed to depend has been largely responsible for this mischievous idea.

As a matter of cold, hard fact, no wage earner works so hard, tolerates such privations and is so scantily remunerated as the prospector. Most assuredly both the prospector, and the mining company that follows him, take chances. But who does not? Is the enterprising dry goods merchant, who starts a business in a new town, sure of his profits? If he is a sane man he will, of course, prospect his field, and estimate as nearly as may be its possibilities. But in all this he consciously accepts the risk of failure. And a not inconsiderable proportion of all new business ventures are doomed to failure.

The prospector, if he knows his business, prospects only the *probable* districts. Like the dry goods man, he must accept the risk of failure. But failure means to the prospector merely the necessity of continuing prospecting.

Thus, before the investor enters the field, the possibilities of loss are limited to the mere expenses of prospecting. With the investor, larger issues are introduced; and it is at this point that ample precautions can be taken to reduce the element of chance to a minimum. In fact a mining investment can be, should be, and often is, as safe as the most conservative industrial venture.

The necessary precautions are embodied in this sentence of advice: "Before investing in a mining property secure the services of a reputable, experienced and competent mining engineer." The business of the mining engineer is to examine mines and mining prospects. He must estimate the probable value of a mineral deposit, considering carefully the conditions of fuel supply, transportation, labor, and a dozen other factors, all of which have a direct bearing upon the cost of development. In many cases this can be done with approximate exactness. In other cases it is only possible to make an intelligent guess at either the value of the deposit or the probable cost of extraction. But in all cases it is possible for the investor to know what he is buying, whether a certainty, a probability or a "gamble." If he buys the last variety he has only himself to blame if he is disappointed ultimately.

GREAT BRITAIN'S FUEL EXPORTS

There has been a noticeable increase in the amount of coal shipped by Great Britain to France, Germany and Italy during the first five months of the current year, as compared with the corresponding months of 1906. The total value of fuel exported during 1907, up to and including the month of May, was $74,165,627, an increase of $13,000,000 over the corresponding period of 1906. Of this total France took 4,507,011 tons, Germany 3,382,734 tons, and Italy 3,371,836 tons. Thus France consumes, by a considerable margin, the largest amount of British coal. Italy and Germany take quantities less than does France, but large enough to be important factors in the grand total.

The next largest consumers are Sweden, Holland, Egypt, Denmark, Spain and the Canaries, and the Argentine Republic. All of these nations have received shipments, during the first five months of 1907, which in each case aggregate about 1,000,000 tons.

The largest increases in shipments are in those to France and Germany, both nations having taken about 500,000 tons more during the period specified in 1907 than in 1906. The United States received only 23,000 tons during 1907, as compared with 40,847 during 1906.

LARDER LAKE

It is probable that the wilful misrepresentation of speculators has damaged the Larder Lake district to such an extent that its future will be seriously affected. The columns of Toronto newspapers and of publications all over the country have been freely used for the purpose of selling that which is not. No account was taken, in these iridescent misstatements, of the extreme costliness of transportation and of installation. If we are correctly informed, there is not yet a stamp mill in operation in the camp. Large quantities of machinery are assembled at points near the railroad. But between the delivery of machinery and its actual installation and successful operation a great gulf is fixed.

In any case, the first operating stamp mills in Larder Lake will be of the light prospecting type. The capacity of these mills is small. Very rich ore will be necessary to give any reasonable return on the money invested. But we have reason to believe that Larder Lake's future will depend, not upon "spotty" and uncertain rich ores, but upon the large bodies of low grade gold ore. The small margin of profit on these latter ores will necessitate large and expensive plants. It is not, then, in our opinion at least, highly probable that Larder Lake will become a steadily producing camp until the present conditions of transportation are vastly improved. But another requisite is the elimination of the "boomster" and the "fakir."

COBALT'S STRIKE

The strike situation, of which full details have been given in the daily press, is still acute. It has been resolved, apparently, into a trial of strength between the managers and the men. As is always the case, both sides have been guilty of tactical errors. So far, however, as the strike itself is concerned, there was not the slightest excuse for its declaration. The miners' complaint boils down to this, not that they were treated badly; but that it was possible that they might be treated better. The representatives of the men, in the face of recent events in the West, disregarded the machinery provided by the Federal Government and declared the strike when and how they saw fit. In this they should be condemned by all law-abiding citizens.

BRITISH COLUMBIA'S MINES IN 1906

The annual report of British Columbia's Provincial Mineralogist, Mr. W. Fleet Robertson, has been issued. It officially confirms the gratifying announcement that the mineral production of that Province for the year 1906 exceeded that of the preceding year by 11.2 per cent. The total value of the production was $24,980,546. On another page fuller statistics are given.

It will be a matter of surprise to many readers that up to and including the past year the value of coal mined in British Columbia is greater than that of any other mineral. Placer gold comes next and lode gold third.

The report is a credit to the Mines Department of the Province. In Mr. Robertson the people of British Columbia have a capable and energetic servant.

CORUNDUM AT CRAIGMONT

By H. E. T. Haultain

The Canada Corundum Company, Limited, at the present time is treating ore only from its Craig mine, situated on Craig Mountain at Craigmont, in the Township of Raglan, in the County of Renfrew, Ontario. Craig Mountain rises to a height of about 400 feet above the valley of the Madawaska River, and on its southern slope conforms to the dip of the foliation of the gneissic rock of which it is formed. Corundum occurs as a constituent of this rock, not uniformly throughout its mass, but scattered through layers interbedded with barren rock. These layers vary in thickness from a few inches to more than 20 feet. The mining operations have been confined entirely to the surface, the deepest workings being open cuts with faces of less than 40 feet. The corundum occurs in crystals irregularly distributed, and of all sizes up to 60 pounds in weight. In general it is of a brown color, varying from almost white to black. Various shades of yellow and pale green are common, red and blue occur rarely. The larger crystals frequently have considerable mica along the parting or separation planes. The chief constituent of the containing rock is sometimes feldspar and sometimes nepheline. This rock has been called syenite, and if we leave its origin in obscurity this will be a good name for it, though it would perhaps be well to modify it to gneissic syenite or syenitic gneiss. Associated with the corundum are found hornblende, mica, garnet, magnetite, iron pyrites, zircon, and other minerals. Small dykes (pegmatitic?) cut irregularly through the gneissic formation, composed chiefly of feldspar, but carrying also quartz and hornblende. There are several small veins, some in contact with the dykes carrying quartz, scapolite, calcite, iron pyrites, molybdenum, apatite and specularite. Outside of these dykes and veins no quartz has been seen in any of the workings.

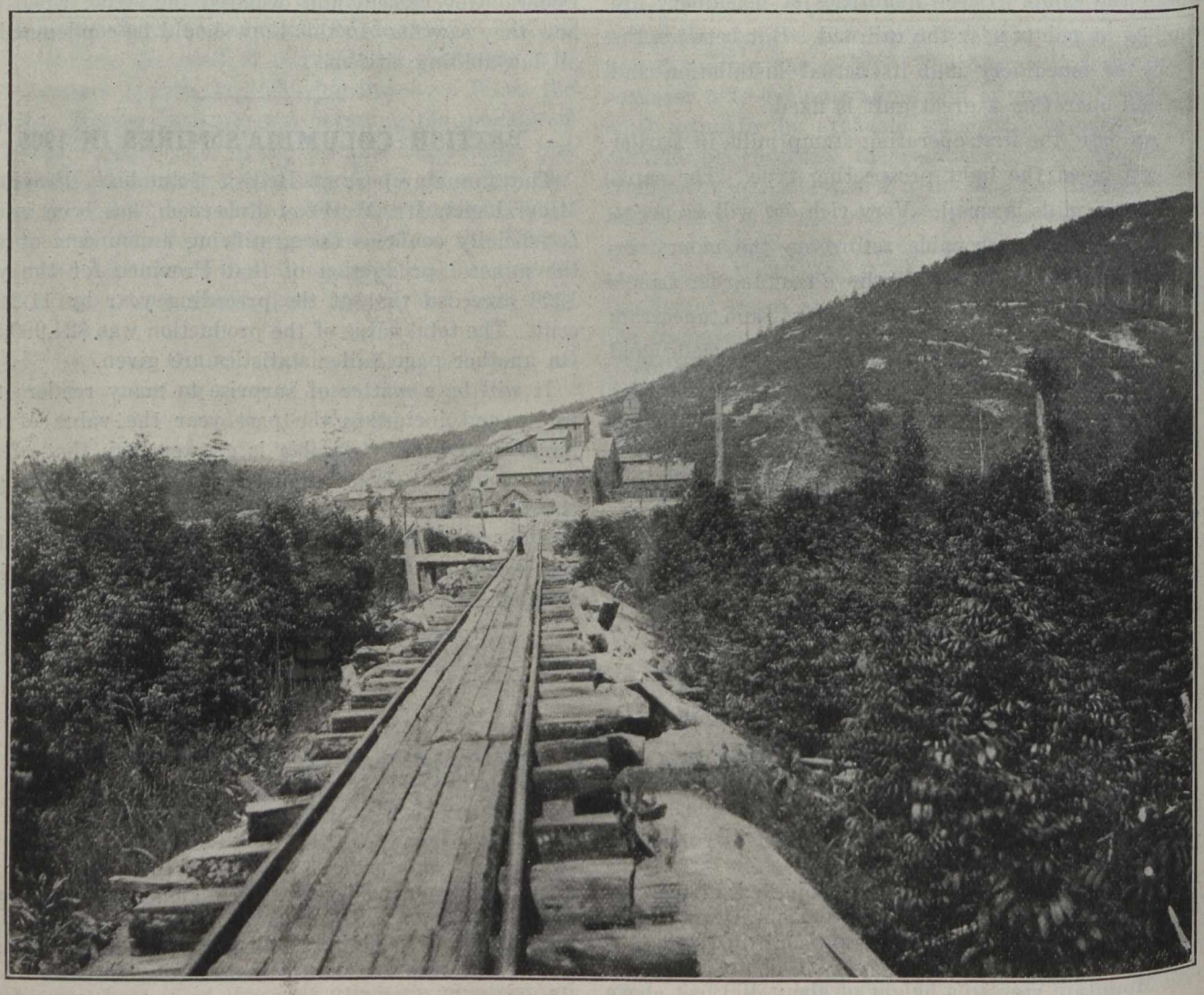
On the higher and more exposed parts of the hill the rough crystals of corundum stand out firmly from the enclosing feldspar, showing their better weathering

qualities, while lower down the hill the surface, protected by sand and gravel, shows both feldspar and corundum ground away by glacial action to an almost equal polish.

Craig Mountain is practically a mile in length, but the mining operations have been confined almost entirely to a portion of the eastern third, which is in the immediate neighborhood of the mill, but throughout the full length of the hill surface outcroppings show corundum with the same general characteristics of formation persistent from east to west.

Of the origin of the corundum in these rocks very little is known. It is work for the ultra specialist in geology and petrography, and calls for laboratory as well as field work. Those who have studied it most deeply have not yet published their conclusions. The only opinions that the writer has ventured to have on the subject are to the effect that the corundum-bearing rocks are not dykes, that they are not eruptive, and that there is no sign of segregation from magma. How, when, or why the corundum was formed is beyond the writer's line of work.

The first discovery of corundum in Ontario was made nearly thirty years ago on this Craig Mountain, then known as Robillard's Hill by Henry Robillard's daughter. As a small child she picked up and carried home a crystal that "looked like a cruet stopper." For years it remained an unnamed curiosity, but at the time of the phosphate excitement it was declared to be phosphate, and Robillard and Fitzgerald located the ground as a phosphate mine. In 1896 Ferrier, of the Geological Survey, described the presence of corundum in the neighboring township. Mining operations were commenced May, 1900, the ore being transported in wagons half a mile to a small mill built on the site of a small water power. In March, 1904, the present large mill commenced crushing. This mill is by far the largest corundum mill ever built, and is the largest concentrating plant in Canada. It has three divisions, the main mill, the grader, and the finishing department, the latter a comparatively recent development. In the main mill the rock is



MILL AND SOUTHERN SLOPE OF CRAIG MOUNTAIN

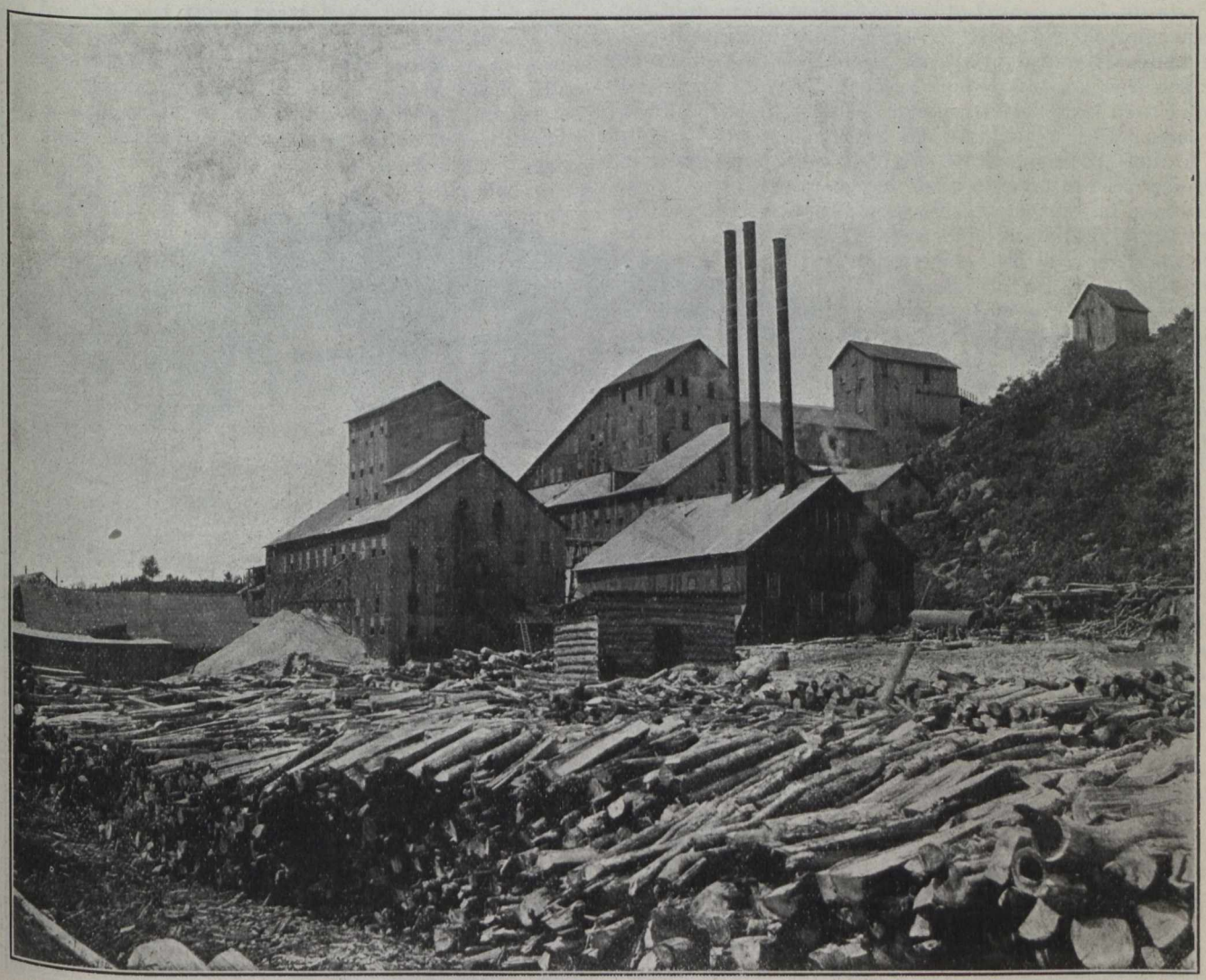
crushed till 90 per cent. of it will pass a 2.5 millimeter round hole, by means of four rock-breakers and five sets of rolls. It is concentrated on 20 Overstrom tables; the concentrates, which contain from 50 to 60 per cent. corundum, passing into bins for drainage. In the grader these concentrates are dried, pass over magnetic separators, sized into 20 sizes from 8 mesh to 200 mesh, and still further subjected to concentration on Wilfley tables and Hooper pneumatic jigs. The resulting product is again dried and again sized and passed into bins, from which it is drawn off into 100 pound bags. Each day's run of bags is sampled by hand, each size by itself, and these samples are carefully assayed, and according to

the assay results the bags are stocked in position in the finishing department. The finishing department performs three functions. It thoroughly mixes the product so as to give a uniform material complying closely with fixed standards. It re-screens each size so as to eliminate the results of carelessness in the grader. It automatically samples every lot of thirty bags. The finishing foreman, knowing the assays of the contents of his bags, mixes thirty hundredweight at a time in a hopper. From this hopper the corundum passes in a thin flat stream past a draft of air, which blows away the mica. It then passes over a set of shaking screens, which screen out both undersize and oversize, and from this it passes to a bin whence it is drawn off past an automatic sampler direct into canvas bags, which are filled to contain 100 pounds of corundum. These bags are then sewn up by machinery and marked for size and lot number. The samples are tested by hand screens for accuracy of sizing, by the eye for pyrites and hornblende contents, by a magnet for magnetite contents, and in the assay office for both corundum and iron content. On the receipt of the assay results, the bags are marked G or G1, G grade being for silicate wheels and the polishing trade, and G1 for the vitrified wheel trade. A sample weighing about half a pound representing each lot of thirty bags is stored for reference. In the winter the bags go by sleighs 21 miles to Barry's Bay on the Ottawa Division of the Grand Trunk Railway, and in summer to the same place by barge and steam tug. From here they are shipped to all parts of Canada and the States, and to stock storehouses in Manchester, Paris, Antwerp and Hamburg for distribution in Europe.

In 1906 the mill produced 2,900 tons of finished grain corundum, and is being constantly improved and added to, to handle both larger tonnage and lower grades of ore. During April and May a little short of 7,000 tons of rock were crushed each month. Rock containing as low as three per cent. corundum is successfully treated.

Corundum is the second hardest mineral, the only other equalling or surpassing it being the diamond. On account of this hardness, and on account of its peculiar form of fracture, it makes an ideal abrasive material and is used as such both for grinding and polishing all over the world in all classes of work. As with nickel, cobalt, mica and asbestos, Ontario holds a unique position in regard to corundum. She has practically unlimited deposits. The Canada Corundum Company has extensive areas in six townships, besides the one on Craig Mountain, and produces from this one deposit considerably more than all the rest of the world.

Before 1900 the hard abrasive field was held almost entirely by emery, which is a natural product, consisting of a mixture of corundum and magnetite and hematite. Carborundum, the trade name for carbide of sili-



THE MILL OF THE CANADA CORUNDOM COMPANY

con, an artificial product manufactured in the electric furnace, was at that time coming strongly into the market and has since then made great strides. It is of about the same hardness as corundum, good crystals of it being somewhat harder and able slightly to scratch the corundum crystal, but it differs very much in the form of fracture and in the shape of the grains and of the cutting edges. Recently there have been put on the market other artificial abrasives, of which perhaps the most important is alundum, an artificial corundum made in the electric furnace from bauxite. Good compact specimens of this are as hard as corundum, but the fracture and form of cutting edge is very different and the product varies in texture.

CRAIG MOUNTAIN AND MILL

These four hard abrasives, emery, corundum, carborundum and alundum, practically hold the market, but corundum does not hold the place that its qualities warrant. Emery holds its position by right of age. For so long a time was it the only hard abrasive that its name began to have a general application, being used instead of the general term abrasive rather than as applied to a specified mineral. Even to-day all classes of manufactured grinding wheels are called emery wheels; even the Corundum Company's own men refer to corundum wheels in the machine shop as emery wheels. Carborundum and alundum have had the advantage of magnificent advertising. Alundum is controlled by what is probably the largest and oldest abrasive wheel concern in the world. They make a specialty of it and practically confine the use of it to their own goods. Carborundum is also treated as a specialty, the company manufacturing it also making it up into all forms of wheels, blocks and papers, and controlling the sale of the articles manufactured from it. The controlling use of a special product and its special name is in itself a splendid trade asset.

Corundum has been handled on a different basis. It has been considered a raw material and has gone into the market as a competitor of the raw material emery, and it has been free to the use of anybody who chose to buy it. It is easy to be wise after the event and it is too late now for criticism, but the writer thinks that if the policy adopted by the owners of carborundum had been followed by the Canada Corundum Company, corundum would have travelled much further, in fact might to-day have been almost alone in its position in the abrasive field, instead of being one of several. The making of an abrasive wheel is a difficult art; it is easy to make a poor wheel out of the very best abrasives. It takes capital, effort, experience and skill to make a good wheel, but it takes much more capital, greater effort, a far wider range of experience and a much more extensive organization to produce the grain corundum. Grain corundum is not a raw material; it has required very

much expensive experimenting, and the combined experience of many men gathered in all parts of the world to produce the high grade uniform product of to-day. But the policy of selling to everybody has been adopted and will in all probability be adhered to. Of late years the Canada Corundum Company has done very little advertising. In its earlier years it advertised fairly extensively; in fact the publicity department was far ahead of the production department, and it was impossible at that time to make good on the promises held out to the public. For more than eighteen months past the cost of advertising has been less than $100, and only for a few weeks did the company have a salesman in the field. There was practically no solicitation of orders by mail. All that was bought sold itself. The sales for the past three years have been as follows:—1904, 855 tons; 1905, 1,545 tons; 1906, 2,700 tons. This is a very remarkable record, for the public is so accustomed to advertising in these days that it thinks there must be something wrong in an article not advertised. The most exclusive monopolies advertise—Standard Oil not only advertises, but makes extensive use of salesmen. The Canada Corundum Company has had a big problem; it has had its full share of difficulties, and it has required time to even realize the existence of these difficulties, and many of them are not only not yet solved but not yet tackled. Probably the greatest drawback was the magnificent enthusiasm and optimism of its early days. This enthusiasm was bad in many ways; it kept the company blind to the difficulties and pitfalls, it prevented forethought, and it was of necessity followed by an almost disastrous reaction of disappointment and depression, through which the company was safely brought only by the tenacity of its larger shareholders. This is probably the common history of all mining enterprises. In these days things have come to such a pass that the public, even our best business men, will not go into a mining venture unless they are promised almost fabulous returns. This has bred a class of promoter over-rich in enthusiasm and optimism. We may take it as part of a normal course, almost an unavoidable course for every mining company to have its period of extreme depression. In the hands of the promoter the pendulum is at one extreme; as the true facts of the case begin to appear they will be accompanied by fears and doubts, and the pendulum will swing to the other extreme. Very often it will swing off the hooks altogether, but if the enterprise has real worth, tenacious shareholders may hold things together till they are reorganized on a normal basis.

But corundum in Ontario had more than the ordinary mine's share of troubles and difficulties, in fact there never was a clearer case of not being able to see the woods on account of the trees. There were so many difficulties in the details obscuring a view that it was next to impossible to see with clearness the general problem. An account of these difficulties and the efforts that were made to overcome them hardly belongs to the sphere of the present article.

Those in control of affairs at the start had to face new and unknown conditions in every part of their work. The nature of the deposit was wholly unknown; the problems of concentration were in many respects entirely new; the district, though in the centre of Ontario, was, from a miner's point of view, as isolated as the Sahara, the tributary labor supplies being entirely ignorant of mining and milling conditions. The demands of the market were unknown and the connection between the true demands of the market and the technical possibilities of milling conditions was wholly conjectural. Many different types of manufacturing concerns needed corundum, but they were not aware of the fact, and this called for missionary work of a distinctly pioneer character. After the missionary work was well started and people began to learn that they needed corundum, they did not know how to use it effectively, and this called for more missionary work of a different type. The directors were not mining men, and though they were prominent and successful business men, they were ignorant of mining conditions; they had never leant how completely local circumstances could alter cases; they had never suffered from the tyranny of local conditions. The problem called for scientific technical work of the highest degree. It called for an organization that would get high grade technical results from a most unsatisfactory untrained class of labor. It called for commercial acumen of a broad and far-seeing type; it called for business energy of the type that would not overlook the smallest detail. It is comparatively easy now to see some of the mistakes of the early days. Five men, as managers or superintendents with experience gained all over the world, have put their efforts into the solution of the problem, and they have left legacies of successful work as well as of mistakes. The mill itself is rather a remarkable legacy; it was designed by one man, the plans were altered by a second; the mill was built by a third, who left shortly before completion of construction, so that its early operation was conducted by a fourth. A fifth was called in to prepare plans for improvements and alterations, which plans were consigned to the care of a sixth to carry out, but they were altered by a seventh. In pioneer work we learn largely by mistakes; they are essential to progress. Probably the successful mining man is the amn who feels his way by his mistakes but is quick to see his mistakes and cut them short.

At the present day most of the difficulties arise out of the unsatisfactory labor supply. Though Craigmont is somewhere midway between Toronto and Ottawa, it is so far from the main avenues of travel that it remains in complete isolation. In the neighborhood of the mine there are several men and women who have never seen a railway train. The writer was driven from Craigmont to Barry's Bay last winter by a bright active boy of twenty, with a good country school education, who saw a locomotive for the first time that day. The local labor supply is small and very irregular, depending upon the season and the harvest, and the supply is kept up by importation, not quite so systematic or so coercive as in the Transvaal, but still containing all the unsatisfactory elements of labor importation. In these days of prosperity, Cobalt excitement, and cheap harvest excursions to the Northwest, the laborer is very independent and very restless. In the twenty months that the writer has had charge of the affairs at Craigmont, there have been on the books of the mill foremen 260 names. This is in the main part of the mill, where the full crews for both shifts consist of twenty-five men. Of these 260 men only two had ever seen a concentrator outside of Craigmont. In one month twenty-eight new men were taken into the mill, and the men in every position, including both foremen, were changed. Very few of the men are dismissed, the majority of them quitting of their own accord, chiefly through restlessness. Concentration is an art depending under ordinary conditions more upon the man behind the machine than upon the machine or the method. In the concentration of corundum not only is the problem rendered more difficult by the small difference

in specified gravity between the corundum and the waste minerals, but the finished product must be cleaner and of a more uniform standard than in any other branch of concentration. The obtaining of these results under the local conditions of Craigmont has called for the development of a method extreme in the direction of fool-proofness and in an organization designed principally to take care of and teach the new unskilled workmen. The hardness of the mineral to be saved and the habit of its fracture more than counterbalance the drawback of its low specific gravity. The absence of any differential surface tension action makes the cleaning of the slimes and finer sizes a difficult and wasteful process, but with all the coarser sizes the high grade of product is maintained without serious difficulty.

The problems of the selling department have also their intricate details; as an example, until very lately the publicity department has included in all its advertising literature the statement that the abrasive efficiency of emeries varies according to the percentage of corundum that they contain, and the inference has been made that because Craig mine corundum contains twice as much corundum as does a high grade emery it must be twice as good. This may be a partial truth, but has been a very serious fallacy, as it has not only emphasized the competition with emery but has largely governed (in the wrong direction) the selling price. In reality, though, both crystal corundum and emery owe their abrasive qualities to the corundum content, the percentage of corundum present has practically nothing to do with the relative efficiency. In the case of emery, most of the corundum is present as a delicate sponge-like skeleton filled in with iron axide. When this iron oxide is dissolved out by acid this skeleton shows to be granular and easily crumbled. In work it is supported by the iron oxide, but its action is a fine scratching rather than a cutting. With crystal corundum the working edge is a firm, hard, sharp edge that cuts cleanly without a sign of rubbing or scratching. Emery and corundum should not be considered as being in the same class of abrasives. This difference in the texture or mechanical character of the individual particle also had much to do with the hindering of the progress of corundum in its early days. The success of an abrasive wheel or an abrasive paper depends as much on the bond as on the abrasive. Emery, on account of its rough, almost porous, surface, is easily held by any bond or glue; corundum, on the other hand, on account of its smooth, dense surface, is much more difficult to hold, and as it takes a much harder bite on the metal it needs much more careful holding. The result was that many of the early products were most unsatisfactory because of the rapidity with which the corundum was pulled away from its bond. The excellent work done by some of the wheel manufacturers of the States have completely overcome this difficulty in the manufactured wheel, but in the polishing trade, where the individual factory or probably the individual workmen attaches the abrasive with ordinary glue to a soft wheel, this particular trouble has often condemned the use of corundum in favor of emery.

The main efforts at Craigmont to-day are directed towards increasing the capacity of the mill, the elimination of horneblende and garnet from the products supplied to the vitrified wheel makers, and the collecting of a nucleus of steady contented workmen trained to the special character of the work. Good progress is being made in each case. Beyond the elimination of the horneblende, no effort is being made to increase the purity of the output. The standards which have been adopted, and which are adhered to very closely, are accepted as being perfectly satisfactory by the most exacting wheel makers on the continent, and the reputation for uniformity of quality and steadiness of supply has been fully established. More than 300 men are now employed on the works.

THE PROFESSIONAL IDEALS OF THE TWENTIETH CENTURY

A Plea for the Higher Conception of the Engineer's Relation to Society.

(Arthur Twining Hadley—Dedication of the United Engineering Societies' Building.

The great element of progress in the nineteenth century has been the recognition on the part of mankind in general, of the value of scientific generalizations in very department of human conduct. Our science has become sounder, our understanding of its applications clearer, and the public has recognized that scientific conduct of a business means the substitution of universal experience, learned with difficulty and applied with toil, for the narrower range of individual experience which was at the disposal of the so-called practical men of fifty or one hundred years ago. Of this change the engineer is the representative and the leader. He it is that makes physical science in its various lines applicable to the complex problems of construction and development. He it is who has paved the way for the recognition of the technologist and the expert in every line of human industry. He it is who has shown how mathematics, instead of being an abstract discipline, remote from everyday human affairs, may become the means of applying truths for a long time remote and undiscovered, to the everyday affairs of the world in which we live. Not the buildings that you have built; not the railroads that you have planned; not the machines that you have invented, represent your greatest achievement. Yours is the proud boast of having in one brief century established science as the arbiter of the material affairs of mankind, and of having enforced her worship upon a world once reluctant but now gloriously admiring.

Well, then, you will ask: is there anything which remains to be done comparable in importance to this? Yes, there is. An equally large part—perhaps in one sense a much larger part—of your professional duty yet remains to be accomplished. It is not enough to have technical training. It is not enough to know the special sciences on which the practice of a profession is based. A man ought to have clear conceptions of the public service which his profession can render, and the public duty which its members owe. Thus, and thus only, can the engineer, the lawyer, the physician, or a member of any other learned profession, rise to the full dignity of his calling.

For there are two quite distinct qualities which must be combined in order to secure the best professional services; two quite distinct tests which work must meet in order to be pronounced first-class. One of these is the technical standard; the other, for want of better word, may be called the ethical standard. The man who wishes to build a good railroad must not only lay it out according to the rules of the surveyor's art, with proper curves and grades, and bridges which will not fall, but he must also have intelligent regard to the needs of the population, the safety of travel, and the many other factors which determine whether a railroad shall be a

work of public use or a source of industrial bickering and financial disaster. This combination of public and private demands is not peculiar to engineering. It can be illustrated in every other profession of importance. It is not enough for the lawyer to give advice which shall be technically sound, and which shall enable his clients to keep out of jail. He must learn to take a large view of the law as a means of public service instead of private gain. It is not enough for the physician to know how to cure specific diseases. He must know how to care for the larger problems of public health, and to use the resources of the community in a way to meet as fully as possible its sanitary needs.

This larger view of professional obligations is not so fully recognized as it should be. We have in the nineteenth century made so much progress in the technical training of doctors and lawyers and engineers that we sometimes forget that there is need of anything more than technical training. We have let the old idea of public leaderships, which was prominent in the minds of the great professional men of past centuries, give place to another and narrower ideal which is fully satisfied when a man has made himself a technical expert. Many a man of real eminence in his calling deliberately rejects the wider conception of professional duty which I have here indicated. Perhaps he recognizes the claims of public service; perhaps he does not, but in any event he believes that these claims rest upon him as a man rather than as an engineer or a lawyer. In his professional capacity he says he is hired not to tell what the law ought to be, but what it is; not to advise how a railroad can do the most public service, but how certain men with certain ideas of their own can best use the differential calculus to get these ideas carried out. This is perhaps the prevalent view of professional ethics today. I believe that it is a wrong view, which must menace not only the influence and standing of the professions themselves, but the general interests of the republic.

Mere technical achievement is not the thing that endures. Among the peoples of the ancient world, I suppose that there were no engineers equal to those of Egypt. Considering the means at their command, the things they did were very absolutely extraordinary. They did some things which, even with the means at our command, we can hardly duplicate. But they used their abilities in the service of a dominant priestly caste; and therefore, while their work fills us with admiration, it does not appeal to us as does the work of the Roman engineers a few centuries later, who built roads and aqueducts and bridges, and thus took the lead side by side with the Roman lawyers in establishing the basis of modern civilization. The roads and bridges of Rome, simple and straightforward as they are, constitute a more enduring monument to the Roman engineers than all the obelisks and pyramids that were ever erected.

A commonwealth like that of the United States is necessarily governed by public opinion. Courts may formulate this opinion. Legislatures may pass rules to give effect to it. Police may enforce its demands against the recalcitrant. But the governing power rests in the intelligent public opinion itself. When that opinion ceases to be intelligent and powerful, freedom becomes a mere name. Now, a serviceable public opinion of this kind can only be formed when intelligent people, technically trained for different lines of life, seriously try to find out how their work can be made to meet the public needs. They are the only ones who can do this well. If it is done by anyone else it will be done badly. If the lawyers as a class try to keep the law in line with the demands of intelligent public opinion, we can get good law. But if the lawyers are content to see the law perverted to private ends, and judges take refuge in technical construction of precedents, without full regard to the needs of the existing situation, legislatures will step in to create a chaos of conflicting laws which are worse than no law at all. In like manner, if our engineers get their own minds clear, and get the public mind clear, as to the political economy of the properties entrusted to their charge and the ethics of their management, they can forestall these conflicts which now threaten to break out at every moment. But if the members of a profession whose advice is necessary for a clear understanding and wise settlement of these problems retire from the field of action, the matter will be settled by those whose interests are more selfish and less far-sighted. There are three professions to-day which do not regard themselves as servants, but as masters—the financier, the journalist and the politician. If the engineer and the lawyer accept positions as servants, simply putting their technical knowledge at the disposal of merchant, journalist or politician who will pay the highest price for it, it is not simply a confession of inferiority, it is a dereliction of public duty.

GAS POWER

In a series of articles on gas power, contributed to the magazine *Power*, Mr. F. E. Junge has dealt with gas engine practice in Europe and America, and has elaborated the conditions under which it has been retarded in America. Estimating the aggregate power developed in the United States at 14,465,000 h.p., of which 10,664,560 were developed from steam and only about 300,000 from gas, and taking the average price of coal at $2 per tone, Mr. Junge figures that of the 100,000,000 tons consumed for power purposes, at least one-half could have been saved by the adoption of gas generation. On this basis an annual saving of $100,000,000 could be effected.

"There should," writes Mr. Junge, "be more treatises to appeal to the interests of wider industrial and commercial circles, demonstrating the possibilities and clarifying the limitations of the application of gas power in the varied industries." Continuing, he attributes the scarcity of good literature on the subject to the fact that those men who are best qualified to discuss and write upon gas engineering, are prevented by the firms controlling their services from making public such data as would be of practical us to the working engineer. This spirit of commercial secrecy compares but poorly with the liberal attitude obtaining in other contries.

"But here is where this special trouble is wedded to the lamentable plague of commercialized engineering which is threatening us to-day in all progressive countries: Monopoly, the great discourager of effort in trade, manufacture and profusion, will dictate the technical methods to be followed, thereby suppressing individual aspirations; few great corporations will buy up the highest grade of skilled talent, literary, inventive, mechanical, but will keep it latent or at least barren of creative work, by raising almost insuperable barriers to the propagation of the fruits of its labor . . . It is hoped that the vastness and multiplicity of interests involved in the gas power field will effectively prevent centralization of the kind that precludes a stable and healthy industrial growth."

ANNUAL REPORT OF MINISTER OF MINES FOR BRITISH COLUMBIA

The annual report of the Minister of Mines for British Columbia for the year 1906 has been published. It is later than usual, the Bureau of Mines for that Province having previously for several years been able to distribute its annual report a month to two months earlier than this year. The delay has been occasioned by the press of work in the Privincial Government Printing Office, which for some time past has had its work greatly increased by the very considerable enlargement of the official *Gazette*

The report under notice is similar in size and general character to those issued by the Mines Department for a number of years. Its statistics of quantity and value of mineral production show the output of 1906—which was a record year as regards both quantity and total value of the mineral products—and, too, for purposes of comparison, that of all years from the time production was commenced in the Province. These tables have been carefully prepared and arranged in such form as to clearly convey information relative to the steady expansion of the mineral industry of British Columbia from the time it was of comparatively small proportions until now, when its total for the year of approximately $25,000,000 is about 31 per cent. of the mineral production, metalliferous and non-metalliferous, of the whole Dominion in 1906.

The reports of gold commissioners and mining recorders appear to have been reduced to what is of general interest concerning their respective districts. Those of other district officials in like manner have been kept within reasonable limits. The special reports of the Provincial Mineralogist and Provincial Assayer are properly of greater length. That of the Provincial Mineralogist, descriptive of his exploratory trip through the Peace River country, dealing as it does with an extensive region that it may be expected will within two or three years be thrown open for settlement, is of particular value and interest and will doubtless be widely read. The numerous illustrations of places and scenes in that outlying country enhance the value of the report and serve as useful object lessons to those desirous of learning something of the big new district in Northeastern British Columbia that will probably become settled ere many years pass.

A new feature in the report is the list of metalliferous mines shipping in 1906. Arranged according to districts, and showing location, name and address of agent or owner, and the class of ore produced by the numerous shipping mines, this list will be useful to many. It has been prepared following the frequent receipt by the Bureau of Mines of applications for information of this nature.

The half-tone reproductions of photographs merit especial commendation. The excellent work of Mr. Wm. H. Clark, foreman of the Government Printing Office pressroom, has again given very creditable results in this connection. Diagrams, maps, etc., have also been effectively used for purposes of illustration. A comprehensive index completes the report, which, as in former years, has been prepared under the direction of Mr. Wm. Fleet Robertson, Provincial Mineralogist.

Some of the statistical tables, with official comments thereon, follow:—

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS TO 1906, INCLUSIVE.

Gold, placer	$ 68,721,103
Gold, lode	41,015,697
Total gold	$109,736,800
Silver	25,586,008
Lead	17,625,739
Copper	35,546,578
Coal and coke	79,334,798
Building stone, bricks, etc.	5,543,700
Other metals	270,099
Total production, all years.	$273,643,722

This table shows the total gross value of each mineral product that has been mined in the Province up to the end of 1906. From this it will be seen that coal mining has produced more than any other separate class of mining—a total of $79,334,798—followed next in importance by placer gold at $68,721,103, and third by lode gold at $41,015,697. The metal gold, derived from both placer and lode mining, amounts to $109,736,800, the greatest amount derived from any one metal or mineral, the next most important year being copper, of a total gross value of $35,546,578, followed by silver at $25,586,008, and lead at $17,625,739.

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1890 TO 1906 (INCLUSIVE).

1852 to 1890 (inclusive	$ 71,981,634
1890	2,608,803
1891	3,521,102
1892	2,978,530
1893	3,588,413
1894	4,225,717
1895	5,643,042
1896	7,507,950
1897	10,455,268
1898	10,906,861
1890	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
1905	22,461,325
1906	24,980,546
Total production, all years.	$273,643,722

This table shows the values of the total production of the mines of the Province for each year from 1890 to 1906, during which period the output has increased nearly tenfold, having reached a production for the year past valued at $24,980,546, or more than double what it was in 1899.


SKETCH MAP
OF THE PROVINCE OF
BRITISH COLUMBIA
SHOWING MINING DIVISIONS.
DEPARTMENT OF MINES,
VICTORIA, 1907.
MINING RECORD OFFICE.
Sub. Record Office.
Wagon Roads
Trails
YUKON
MACKENZIE
ATLIN
LIARD
ALBERTA
STIKINE
OMINECA
PEACE RIVER
NORTH
PACIFIC
OCEAN
SKEENA
CARIBOO
QUESNEL
BELLA COOLA
CLINTON
KAMLOOPS
YALE
WESTMINSTER
VICTORIA
UNITED STATES
QUEEN CHARLOTTE ISLANDS
DIXON ENTRANCE
FORT SIMPSON
TELEGRAPH CREEK
ATLIN
GREAT SLAVE LAKE
NOTE.—The boundaries of Mining Divisions generally follow the height of land separating watersheds.

TABLE IV.—AMOUNT AND VALUE OF MINERAL PRODUCTS FOR 1904, 1905 & 1906

MINERAL	Custom'ry Measure	1904		1905		1906	
		Quantity	Value	Quantity	Value	Quantity	Value
Gold, placer	Ounces	55,765	$ 1,115,300	48,465	$ 969,300	.....	$ 948,400
Gold, lode.....	"	222,042	5,589,608	238,660	4,933,102	224,027	4,630,639
Total Gold..			$ 5,704,908		$ 5,902,402		$ 5,579,039
Silver	Ounces	3,222,481	$ 1,719,516	3,439,417	$ 1,971,818	2,990,262	$ 1,897,340
Lead.....	Pounds	36,646,244	1,421,874	57,580,703	2,399,022	52,408,227	2,667,578
Copper	"	35,701,128	4,578,037	37,692,251	5,876,222	42,990,488	8,288,565
Zinc	Tons	.....	.....	9,413	139,200	654	17,100
Total metalliferous			$13,424,335		$16,288,664		$18,449,602
Coal	Tons	1,253,628	$ 3,760,884	1,384,312	$ 4,152 936	1,517,303	4,551,900
Coke	2,240 lbs.	238,428	1,192,140	271,785	1,358,925	199,227	996,135
Other materials .	"	.....	600,000	.....	660,800	.....	982,900
Total production		.....	$18,977,359	.....	$22,461.325	.....	$24,980,546

This table gives the amounts, in the customary units of measure, and the values, of the various metals and other minerals which go to make up the grand total of the mineral production of the Province for 1906, and also for purposes of comparison, similar data for the two immediately preceding years.

The table shows that in 1906, as compared with 1905, there was a decrease in the production of placer gold of some $20,900 and of lode gold $302,463, making for this metal a total decrease of $323,363.

The amount of silver produced in 1906 was 2,990,262 ounces, having a gross value of $1,897,320, a decrease from 1905 of $74,498, due chiefly to the decreased production of the Slocan district.

The table also shows an output of lead in 1906 amounting to 52,408,217 pounds, valued at $2,667,578, which, although a decrease from the production of the last preceding year of 4,172,480 pounds, is still greater than that of any other year since 1900, but owing to the greatly increased market value of the metal, and in spite of the materially decreased amount produced, the value of the product for 1906 shows an increase over that of 1905 of $268,556.

TABLE V.—PRODUCTION OF MINERAL BY DISTRICTS AND DIVISIONS.

NAME	DIVISIONS			DISTRICTS		
	1904	1905	1906	1904	1905	1906
CARIBOO DISTRICT	.....	.....	.....	$ 474,600	$ 406,000	$ 405,400
Cariboo mining division	$ 313,000	$ 300,000	$ 355,800			
Quesnel mining division	150,000	96,000	39.000			
Omineca mining division	11,600	10,000	10,000			
CASSIAR DISTRICT	.....	.....	.....	558,573	504,372	556,599
EAST KOOTENAY DISTRICT..	.....	.....	.....	3,210,573	5,339,154	5,171,024
WEST KOOTENAY DISTRICT	.....	.....	.....	5,806,070	5,421 859	4,660,352
Ainsworth mining division.....	168,023	100,273	268,111			
Nelson mining division.....	466,683	532,564	515,709			
Slocan mining division	1,236,858	970,344	532,228			
Trail Creek mining division	3,760,866	3,672,878	3,213,587			
Other parts.....	173,640	145,650	120,717			
LILLOOET DISTRICT.....	.....	.....	.....	34,583	32,584	20,314
VALE DISTRICT.....	.....	.....	.....	4,190,291	6,483,504	8,779,711
Osoyoos, Grand Forks and Greenwood divisions	4.110,366	6,356,410	8,698,470			
Similkameen division.....	2,500	1,533	2,624			
Yale division	77,415	125,461	78,617			
COAST DISTRICTS (Nanaino, Alberni, Clayoquot, Quatsino, Victoria)	.....	.....	.....	4,702,679	4,273,852	5,388,146
				$18,977,359	$22,461,325	$24,980,546

Table V. shows the proportions of the total mineral production made in each of the various districts into which the Province is divided. It will be noted that in 1906 the Boundary (Yale) district again has the honor of first place, followed in order of output by the Coast district and East Kootenay, with West Kootenay, for many years the Province's greatest producer, only fourth on the list. The Coast and East Kootenay districts, however, owe a considerable percentage of their outputs to the coal mines situated within their limits, whereas in the other districts the production is entirely from lode mining.

The official comment on other tables published in the report is as follows:—

Table VI., Yield of Placer Gold to Date, gives the statistical record of the placer mines of the Province from 1858 to 1906, and shows a total production of $68,-721,10. The output for 1906 was $948,400—a decrease of about two per cent. as compared with 1905, due to a dry season with a shortage of water for hydraulic mining.

Table VII., Production of Lode Mines, relates entirely to the lode mines of the Province, and shows the amounts and values of the various metals produced each year since 1887—the beginning of such mining in the Province. The gross value of the product of these mines is $119,774,022. The production in 1906 was $17,484,102, an increase over the last preceding year of $2,303,933, or about 15.2 per cent.

Table VII., Coal and Coke Production per Year to Date, contains the statistics of production of the coal mines of the Province. The total amount of coal mined to the end of 1906 is 24,144,633 tons (2,240 lbs.), valued at $72,815,423. Of this there was produced in 1906 1,517,303 tons, valued at $4,551,909, a larger amount than had been produced in any previous year. In these coal production figures the coal used in making coke is not included, as such coal is accounted for in figures of output of coke.

The amount of coal used in making coke in 1906 was 381,773 tons, from which was produced some 199,227 tons of coke, worth $996,135, a decrease of some 72,558 tons from the total of coke produced in 1905. These figures are to a certain extent misleading, however, as in 1905 some 3,694 tons of coke were put into stock, whereas in 1906 all the coke made was sold, together with 11,670 tons taken from stock, making the total coke sales for the latter year 210,897 tons. The production of coke in 1906 would have been much greater than it was but for the very urgent demand for coal and the general scarcity of labor, which taxed the companies' resources to keep up a sufficient supply of coal. A strike at the Crow's Nest Pass collieries in the autumn also greatly diminished the output.

Table IX., Production of the Metalliferous Mines, gives the details of production of the mines of the Province (excepting coal mines) for the years 1903, 1904, 1905 and 1906, and the districts in which such productions were made, showing the tonnage of ore mined in each district with its metallic contents and market value. The total tonage of ore mined in the Province during 1906 was 1,963,872 tons, having a gross value of $19,432,502.

The following table shows the percentages of such tonnage and values derived from the various districts of the Province:—

	Tonnage, Per cent.	Values, Per cent.
Boundary (Yale) district ...	60.2	44.2
Trail Creek (Rossland) mining division	14.2	16.3
Fort Steel (East Kootenay) mining division	9.2	15.1
Slocan district	0.8	2.7
Coast district	11.1	6.5
Miscellaneous and other districts	4.5	15.2
	100.0	100.0

Table X., Comparative Mineral Production, compares graphically the output of mineral products in British Columbia with that of similar products in all the other Provinces of the Dominion, and shows that in 1906 British Columbia produced of the metals an amount over 757. of that of all the other Canadian Provinces combined.

VEIN FORMATION AT COBALT, ONTARIO

By J. B. Tyrrell, Mining Engineer, Toronto, Ont.

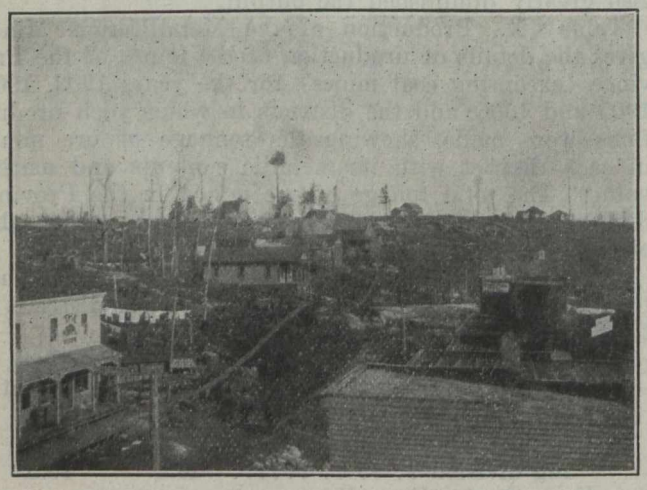
At the meeting of the Canadian Mining Institute, held in Toronto last spring, Dr. C. R. Van Hise, of Madison, Wisconsin, delivered an instructive address on "The Ore Deposits of the Cobalt District," in which he emphasized the facts already pointed out by Messrs. Campbell, Knight, and others, that there is a distinct and regular sequence in the order of segregation of the various ores in the veins, the cobalt and nickel ores being segregated out first, while the silver ores were introduced at a later date.

Speaking of the silver ores, and of the probability that they again might have been introduced at two separate and distinct periods of time, he said: "To what extent are the rich deposits the result of one segregation under comparatively deep-seated conditions, and to what extent of two segregations, one under deep-seated and the other under shallow conditions? Did the shattering which resulted in the entrance of the silver solutions occur under deep-seated conditions, so that the silver of the rich shoots was deposited as a closing episode of practically one continuous period of concentration? Or, after the first concentration was complete, did the shattering then occur, and the later enrichment take place under comparatively shallow conditions, the two periods of concentration being separated by a long interval? Whatever is the final answer to the above question, it appears certain that the extremely rich superficial deposits of a few feet in thickness, connected directly with the zone of weathering, are due to secondary concentration under surface conditions. I refer to the nugget horizon, which is so rich in silver, and in which the smaltite and cobaltite have been largely altered into secondary minerals, or have been leached out altogether. It is practically certain that this extraordinarily rich upper film in the Cobalt district has been produced by two concentrations, one under deep-seated

conditions, when atmospheric waters were not present, and the other under surface conditions, when atmospheric waters were present."

Again, "I believe that the extremely rich upper silver belt, so characteristic of the district, is unquestionably the result of two concentrations, the latter of which is accomplished through the agency of atmospheric waters."

Thus two distinct periods of time are here clearly



designated for the deposition of the silver ores, namely, an earlier one under deep-seated conditions away from the presence of atmospheric influences, and a later one under surface conditions, though both of these segregrations are secondary as compared to the prior segregration of the cobalt and nickel ores.

Dr. Van Hise also agrees with Professor Miller and others that the post-Huronian diabase which is known to underlie large areas within the district is the original source of the ore, and also that this diabase has the form of a horizontal sill or laccolith, rather than of a series of huge dikes or batholitic masses which spread out and increase in size as they descend, and that it rose through fissures or vents in the older rocks of Keewatin, Laurentian or Huronian age, until it reached and was stopped by some more resistant layer, through which it was unable to penetrate, and so was forced to spread out horizontally beneath it.

Professor Miller has also shown, in a paper published in the first number of this JOURNAL, that the mineral-bearing veins "appear to have been formed when the cooling of the diabase was taking place. On cooling, the diabase would contract, producing fissures, not only in its own mass, but also in the rocks with which it was in contact, or which lay adjacent to it."

It will be interesting to consider some of the effects on the form and richness of the mineral-bearing veins of the Cobalt district which would seem to follow as natural and logical results from the conditions outlined above. If the conclusions here reached do not harmonize with the conditions that may be found to occur in the mines by the managers and superintendents who are operating them, any corrections and emendations will be gladly welcomed.

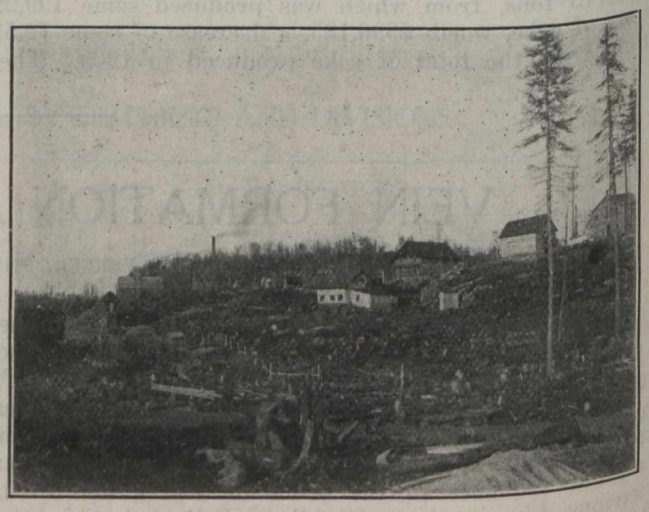
At the time when the laccolith was being formed the molten diabase, after rising for a certain distance through the older and already consolidated rocks, would seem to have met a more resistant layer which obliged it to spread out horizontally along planes of weakness in these rocks and form extensive flat-lying sheets. By the injection of this fluid sheet or lens the superincumbent rock was raised to a certain extent.

The liquid diabase was, of course, very hot, and the heat from it was communicated to the rocks above and below it, and these in their turn would expand with the increase in temperature, but on account of difference in texture and composition the heat would be absorbed differently by different bands, and the expansion would consequently be unequal, so that joints, fissures and shearing planes would be formed.

After the intrusion of the diabase had ceased, it would gradually begin to cool and harden. As it cooled it would contract, and fissures would form in the parts that had consolidated, but while there was any portion of the mass still fluid these fissures would probably be filled from the fluid interior. The fissures occupied by the present veins were therefore formed subsequent to the solidification of the whole mass.

After the mass had solidified, as it and the adjoining rocks gradually cooled they would necessarily contract, the contraction amounting to about 9 inches in 1,000 linear feet for every decrease of 100 degrees centigrade in temperature. This contraction would cause the formation of many irregular fissures normal to the plane of heating and cooling, or in this instance approximately vertical. The fissure would be widest and most extensive either in the diabase itself, or in the surrounding rock wherever this was in immediate contact with the diabase, where the heat had been most intense, and where the subsequent cooling and consequent shrinkage was also greatest.

The rock above the laccolith, extending from it to the surface of the earth, would lose its heat and cool comparatively quickly, and on this account it is hardly probable that it became very hot to any great distance from the diabase. Therefore the cracks and fissures wards more or less at right angles to it, would all be short and very shallow. They would, of course, be that were formed by contraction on cooling in the thin heated layer near the diabase, and that extended out-



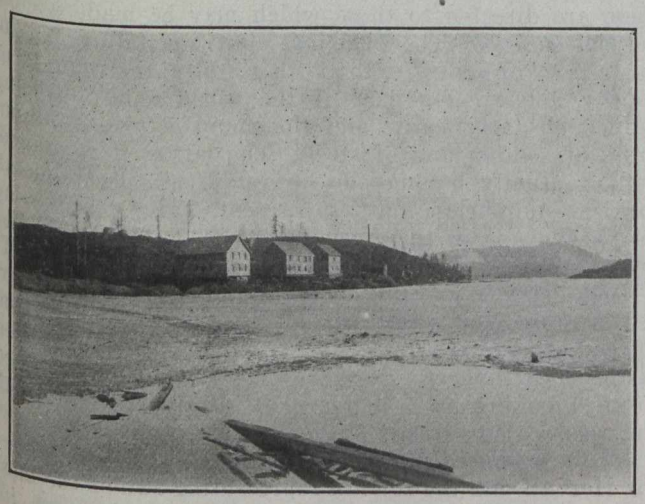
widest close to the diabase where the heat and subsequent decrease in temperature had been greatest, and would quickly contract and disappear altogether at a short distance from it. If mineral-bearing solutions in ascending from the heated interior of the earth reached this zone, the fissures were probably filled by such minerals as are known to have been deposited first throughout the district, such as calcite, smaltite, cobaltite, niccolite, etc., but the silver ores, which are

here the products of a later segregation, would probably be absent.

The rocks that underlay the diabase, whether Keewatin greenstone, Laurentian granite or Huronian conglomerate, would be heated by it like the rocks above it, but as the cooling took place largely by radiation of heat from the surface of the earth, and as the laccolith now lay between these underlying rocks and the surface, the cooling would progress exceedingly slowly, in fact it would not begin at all until the laccolith itself had cooled to the temperature of the rock below it. Then this lower rock would begin to cool and shrink, and as the shrinking continued numerous fissures would be formed, which in the aggregate would certainly be widest and most extensive close to the contact with the overlying diabase, and would pinch out and disappear as they descended, or as they went farther and farther from the diabase.

To what depth the rock was affected by the heat from the diabase and by its subsequent cooling is not known, but it will be a matter of great interest to determine, as the fissures occupied by the veins may be expected to extend to that depth.

As clearly shown by Dr. Van Hise, the fissures so



formed in this zone of shrinkage were first filled by calcite and ores of cobalt and nickel by precipitation or deposition from solutions that had risen from deep-seated sources during the later stages of the diabase eruption, and had circulated outwards through cracks and crevices as far as the influence of the diabase intrusion had reached. These minerals now make up very much the largest part of the contents of the veins, so that the veins were formed almost to their present size, and the walls were almost as far apart as they are now, and consequently the adjoining rock had cooled almost to its present temperature, while this early stage of ore deposition was in progress.

As an accompaniment to the very last stages of the diabase instrusion, silver-bearing solutions rose from deep-seated sources along the igneous vents and spread through and under the mushroom-shaped laccolith along the fissures and veins as these widened slightly with the final cooling and shrinking of the rock, the process being continued until all the channels for the passage of the rising waters were choked.

The veins thus fill V-shaped fissures which extend downwards unknown distances below the bottom of the laccolith, or the former position of the laccolith, and in the aggregate become narrower as they go down.

In applying this rule, however, it should be observed that any individual fissure may be only a part of a complex imbricated series, so that while one may contract, another to one side or the other of it may widen to an almost corresponding degree. The rapid pinching out of one vein in depth should not, therefore, lead to the belief that the bottom of the zone of shrinkage had been reached, but should rather lead to exploration for other so-called "blind veins" in the vicinity.

After the veins had thus been formed by segregation from waters of magmatic, or at all events of deep-seated origin, there was a very long period of time during which the earth's surface was here subjected to the influence of atmospheric agencies, and was gradually eroded away. Much of the rock which originally covered the diabase laccolith was thus removed, and doubtless large blocks of the diabase itself were also worn away, uncovering the rocks which underlay it over areas of unknown extent. At the same time many veins holding ores of cobalt and silver were cut into, and exposed to meteoric influences, so that the oxygenated surface waters percolated downwards into them, and leached the silver from their decomposed uppermost portions, redepositing it a little lower down near the zone of groundwater. This process went on continuously as the surface was gradually removed, and the level of groundwater was lowered, and in this way an abnormally rich zone was constantly present in the veins a short distance below the surface. This is the later "secondary enrichment" spoken of by Dr. Van Hise.

As the long period of denudation was drawing to a close, during which erosion, solution and concentration had been almost constantly at work, the Glacial period set in. A vast sheet of snow and ice then moved southward across the country, and cleaned off and swept away the decomposed rock that for long previous ages had everywhere formed the uppermost layer of the surface of the land, and left the greatly enriched parts of some of the veins either exposed to view, or merely covered by a thin layer of boulder clay.

In summing up the evidence, more especially in regard to the veins in the conglomerate and other rocks beneath the diabase, it would thus appear:—

That these cobalt and silver veins were formed in V-shaped fissures which taper from above downwards;

That though they were formed by mineral-bearing waters which rose from deep-seated sources, and were associated with the latest stages of the eruption of diabase, having probably risen through the same vents with it, these waters spread out laterally through cracks and openings in the mushroom-shaped top of the laccolith of diabase, and descended into the fissures in the rocks beneath it;

That thus the veins were originally formed by deposition from waters which locally descended from above, rather than ascended from below, as in most normal veins;

And finally that the veins were superficially enriched at a later period by atmospheric waters descending through portions of the veins which have since been eroded away.

TORONTO MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS

The proceedings of the Institute were formally opened on Tuesday afternoon, July 23rd, in the banquet hall of the King Edward Hotel. The delegates were met at the station by a reception committee consisting of Dr. W. G. Miller, Mr. J. B. Tyrrell, Mr. O. N. Scott and Mr. J. C. Murray.

At the afternoon session Mr. John Hays Hammond, the president, occupied the chair. In the absence of His Worship, Mayor Coatsworth, Alderman J. J. Graham read a brief address of welcome.

The secretary of the Institute, Dr. R. W. Raymond, was presented with a portrait of himself. This mark of appreciation was contributed to by members of the Institute from all quarters of the globe. Dr. James Douglas made the presentation. His speech was singularly happy. Dr. Raymond replied in a brief but most characteristically felicitous speech.

It was then announced by the secretary that Dr. Charles D. Wolcott, late Director of the United States Geological Survey, and now secretary of the Smithsonian Institute, had been unanimously elected an honorary member of the American Institute of Mining Engineers.

Papers were read by Professor W. P. Blake, on "The Destruction of the Salt Industry at Salton Lake, California," and by Dr. James Douglas, on "Some Reflections on Secrecy in the Arts."

In the evening a reception was held at the Parliament Buildings. The Hon. Mr. Cochrane occupied the chair, and Chief Justice Moss, Acting Lieutenant-Governor, welcomed the visitors on behalf of the Province of Ontario. The Hon. Mr. Foy, Acting Premier, also spoke briefly. Mr. John Hays Hammond, in an incisive and brilliant reply to the welcome, spoke appreciatively of Canadian mining engineers. Dr. R. W. Raymond and Dr. James also spoke. Refreshments were then served in the west wing of the building.

Wednesday's proceedings consisted in the reading of several papers. The ladies of the Institute were taken for a tour of inspection by the civic authorities. In the evening the whole party left for Cobalt.

As these meetings are being held just as THE CANADIAN MINING JOURNAL is going to press, it is impossible to give a full account of the proceedings. In our issue of August 15th we shall, however, publish a full and accurate account of all the meetings, both in Toronto and elsewhere.

It is noteworthy that never before has Toronto been visited by such a body of distinguished mining men. The Provincial authorities and the City Council, fully realizing the importance of the occasion, have spared no effort to make the visit of the American Institute of Mining Engineers a memorable one. The tone of all the meetings has been high, as is to be expected from a society whose officers are men of such lofty attainments and ideals. The series of meetings, entirely apart from the commercial aspect of their advertising value, will do much to educate the mining men of this Province.

ELECTRO METALLURGY

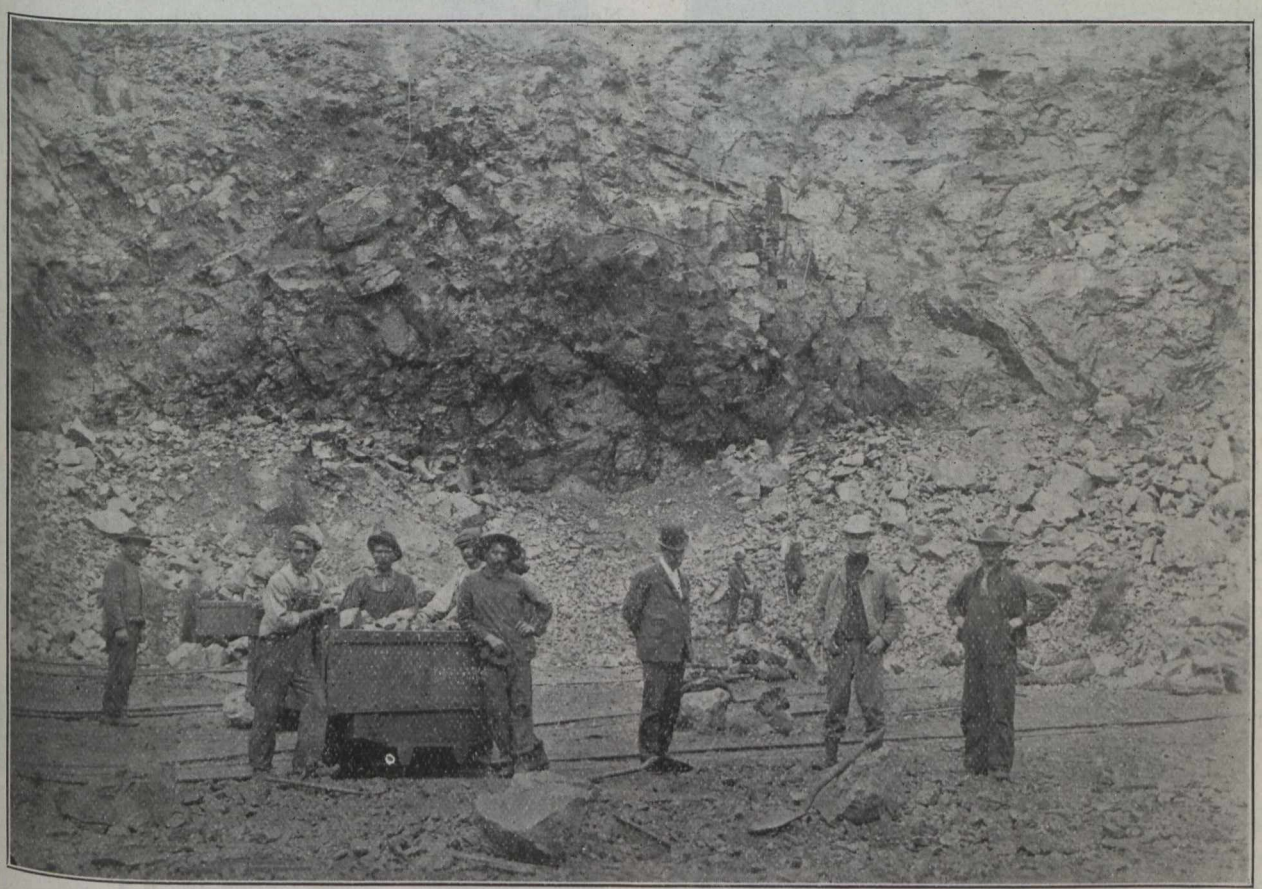
At the recent meeting of the Engineering Conference of the Institution of Civil Engineers, in Great Britain, the subject of the progress of electro-metallurgy was very ably discussed in a paper presented by Mr. Bertram Blount, A.I.C.E. After referring to the recent improvement in methods, it is pointed out that the subject of electro-metallurgy was not so long ago so special that few were able to judge whether a process was likely to be successful or not. Now, however, it is being studied like any other branch of chemical engineering, its principles are well understood, and the result is that processes which may be of considerable laboratory interest, but are plainly unworkable commercially, are disregarded, and the energy and money formerly wasted on these are directed to those which may be made a commercial success. The principal electro-metallurgical industries at present are, the author states, the refining of copper, the greater part of the world's output being refined electrolytically, and the manufacture of aluminum, of sodium and of steel. The latter, it is opined, will eventually become the largest of all electro-metallurgical industries; but, at present, only a beginning has been made in the development of suitable methods. We quote the following paragraph from the paper itself: "Much delay in arriving at the present status has occurred because for years inventors tried to smelt iron instead of manufacturing steel from iron already smelted in the blast furnace. Now, however, attention is turned to steel-making as a more easily attainable end, with the results that already steels of high grade can be successfully prepared in electric furnaces of various type—the Heroult and the Kjellin representing two of the most distinctive and promising. Probably, in the first instance, the electrical method will have its greatest measure of success in preparing steels of such high grade that any extra cost will be quite outweighed by the certainty that the metal will absorb no impurity in the course of manufacture. But as methods are cheapened it may well be that every grade of steel now prepared in open hearth furnaces will be prepared in corresponding furnaces electrically heated. The power necessary should be obtainable from blast furnace gases, for after a liberal allowance for heating the blast and for the blowing engines, hoists and subsidiary gear, there is certainly an ample surplus, provided modern power plant is installed."

Another author of a paper read at the meeting refers to the electro-metallurgical experiments carried out in Canada under Government auspices, and states that three important points have been decided thereby: (1) that charcoal, even of inferior quality, can be satisfactorily used in the electric furnace without briquetting; (2) that ores containing a considerable percentage of sulphur and practically no manganese can be used to produce low sulphur pig iron; and (3) that magnetite offers no special difficulties for treatment by this method.

THE MINING AND SMELTING EQUIPMENT OF THE CANADIAN COPPER COMPANY.

By David H. Browne.

The last three years have been, for the Canadian Copper Company, a period of transition. In 1902, when this company was absorbed by the International Nickel Company, the smelting plant at Copper Cliff consisted of two furnace buildings, which had grown by accretions and additions, covering a number of small Hereshoff furnaces, all of which were fed by hand, and each was independent of the others. These furnaces produced a matte containing from 30 to 40 per cent. of copper-nickel, which was shipped a mile away to an auxiliary company, known as the Ontario Smelting Works. Here the matte was ground in a ball mill, roasted in long calcining furnaces, briquetted and smelted in brick cupolas to a matte containing from five to eight per cent. of iron.



Creighton Mine—Open Pit.

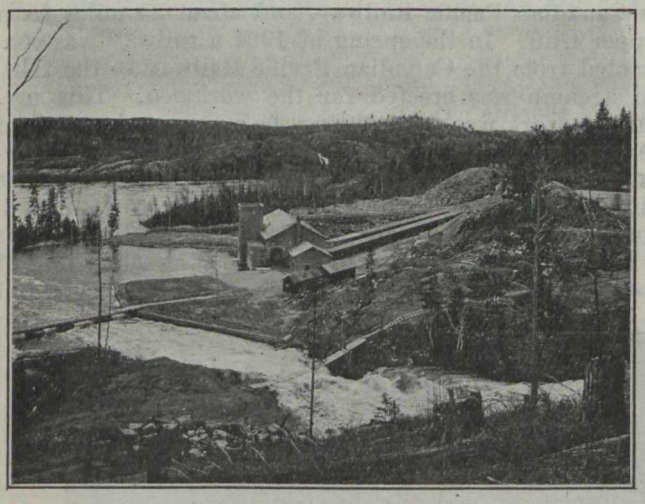
This procedure, as might be expected, was inefficient, and it was decided to consolidate the furnace work and the refining in one plant and to go back to the Bessemer process, which had been formerly used. Consequently, in 1903, a new furnace building was erected, and two modern furnaces 50 x 204 inches were installed. The matte from these furnaces was blown up to 80 per cent. copper-nickel in the same building in three converter stands. All this equipment was steam driven. In 1904 it was decided to make use of the water power on the Spanish River, owned by the Huronian Company, and in that year Messrs. Ross & Holgate, of Montreal, took charge of the construction of the dams and the installation of the machinery to generate the power required and to transmit it to the smelter at Copper Cliff.

The High Falls of the Spanish River is about four miles north of the town of Nairn, on the Soo branch of the Canadian Pacific Railway, and about 25 miles from Copper Cliff. In the spring of 1904 a railway was constructed from the Canadian Pacific Railway to the falls, and a camp was erected for the workmen. This preliminary work was done during the summer of 1904, and the construction of the dams and power house was begun in the fall of that year. The Spanish River at this point flows in two channels around a high, rocky island, about 2,000 feet long by 900 feet wide, falling about 65 feet in its passage. As this island rises some 75 feet above the upper level of the river, the engineers found it advisable to make use of this island as part of their system of dams, cutting out a large forebay at one side of the island and so gaining a total head of about 85 feet between the upper and lower water levels. This construction was also advisable in order to drown out a series of rapids which obstructed the river above the falls. The raising of the water twenty feet by this construction forms a storage basin about six miles long, and avoids the danger of "frazil" or mushy ice, which forms in the neighborhood of rapids.

Work on the dams was carried on throughout the winter of 1904-5, in weather sometimes as low as 30 below zero. Some very interesting problems were met by

Messrs. Ross & Holgate, and their solutions of these is told in a paper read at the meeting of the Canadian Institute of Civil Engineers, in April, 1907, from which the following passage is quoted:—

"Though a large part of the concrete work in dams and also in the power house foundations was done in winter, no difficulty was found in securing good concrete work, the only precaution taken being to heat the mixing water by turning a three-quarter inch steam pipe into the barrel supplying the mixer, and during the process of mixing to use a jet of live steam in the mixer,



High Falls Power House

keeping the cylinder closed by wooden coverings during the process of mixing. No attempt was made to heat sand, or stone, nor was such at all necessary. In all the winter work care was taken to use only cement which would attain its initial set in not more than sixty-five minutes, and the results obtained have been absolutely satisfactory."

The power house at High Falls is a concrete and brick building 106 feet long and 55 feet wide in the main, with an extension along one side 24 feet wide containing the transformers and a wing 35 feet square at one end containing a storehouse and heating plant. In this building provision is made for four penstocks 9 feet in diameter, through which water enters to the turbines at a maximum speed of 7.2 feet per second. Two turbines are at present in operation, and a third will be installed during the summer of 1907. These turbines, made by the I. P. Morris Company, of Philadelphia, are designed for a maximum of 3,350 horse-power each. Direct connected with each turbine is a 2,000 kilowatt generator, made by the Crocker-Wheeler Company.

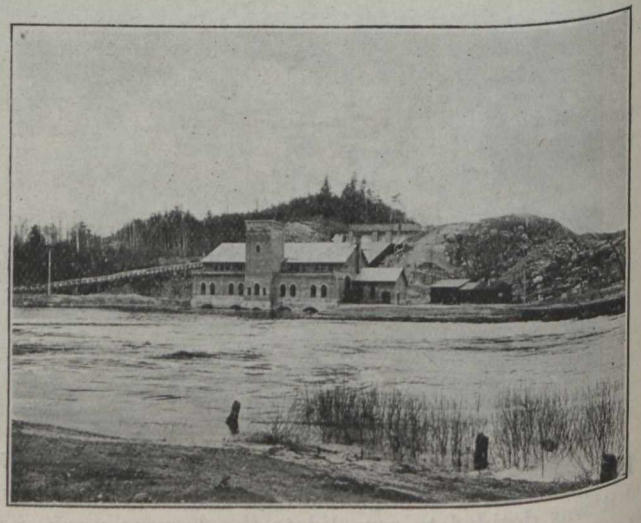
The effective head of water is 85 feet, and the speed of the turbines and generators is 375 revolutions per minute. These generators produce 2,000 kw. current at 2,400 volts, 3-phase, and 25 cycles. Space is provided in the power house for four such units, two of which were put in operation in February, 1906, and the third is at present under construction, leaving the fourth for future installation. When these generators were completed one was tested against the other by reversing the direction of rotation of the second and using it for a time as a turbine pump operating against the full head of water. In this way each machine was tested under varying brake loads.

The switchboard, installed by the Westinghouse Company, occupies a sloping marble table in front of the operator, on a platform about ten feet above the floor. In front of this table are pillars carrying the necessary volt and ammeters, and other recording instruments, so that the whole output of the machine is recorded in front of the operator.

Two groups of three transformers are at present installed in the transformer chamber behind the switchboard. These raise the pressure to 35,000 volts, at which tension it passes through the tower to the transmission line.

This line follows the Soo branch of the C. P. R., on a private right of way, and owing to the necessary curves, is about 29 miles in length. It consists of two three-phase circuits of No. 1 wire, supported on a cross-arm on and between two poles. But one line is in operation at a time, provision being made for throwing the load from one to the other line in case of accident or repair. The insulators were tested at the start at 70,000 volts, and the transmission has given no trouble except in two or three cases where the insulators have been accidentally or maliciously broken.

At Copper Cliff this transmission line enters the sub-station, a concrete building 203 feet by 100 feet, and is there stepped down to a proper voltage for the various electric motors. In this sub-station are installed three Nordberg radial valve blowing engines, while a fourth similar engine is being constructed at present. These engines are rope driven by Allis-Chalmers-Bullock induction motors of 600 horse-power working at 2,200 volts. These motors are arranged to work at three speeds, so that the volume of air delivered to the furnace is under control. The engines are duplex, 42 inch stroke, 70 inch piston diameter, and deliver 320 cubic feet of free air per revolution. The blast for the Bessemer converters is furnished by a Nordberg blowing engine, rope driven by an Allis-Chalmers-Bullock 500 horse-power induction mo- for running at a constant speed of 375 revolutions per minute. This blower is 36 inch stroke, 40 inch diameter, duplex, and runs at 100 revolutions per minute, delivering 12,600 cubic feet of free air per minute at a pressure of 12 pounds.



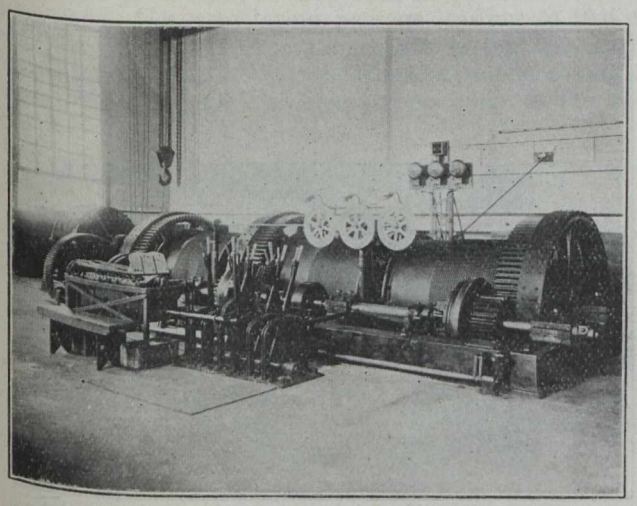
Power House at Crean Hill.

For air hoist on furnace doors, for running drills, and for similar mechanical work, a 100 lb. air compressor, made by the Laidlaw-Dunn-Gordon Company, is provided. This is 25 inch stroke, 15 inch diameter on the high pressure cylinder, and 24 inch diameter on the low pressure side, and is direct connected to an Allis-Chalmers-Bullock induction motor of 300 horse-power, running 125 revolutions per minute at 2,200 volts. The motive power for the electric locomotives which take the trains of ore from the ore bins to the furnaces is furnished by

one 40 kw. motor generator set which takes 550 volts, 40 amperes, alternating current, and delivers 250 volts, 100 amperes, direct current.

The alternating current arc lighting system used for street lamps is supplied by a 75 kw. frequency changer set, in which the 25 cycle current from the transformers is changed to 60 cycles, as required by the arc lamps.

The blast from the three Nordberg air compressors is carried through 36 inch pipes on an overhead system of supports to the furnace building, which adjoins the sub-station. The furnace building is 357 feet long and 85



Interior Crean Hill Engine House—Hoisting Plant.

feet wide. It covers at present three cupola furnaces, four converter stands, and the relining platform, but these converter stands and their lining machinery are in this building merely as a temporary expedient during the erection of the main converter building. The furnace building is designed to cover five cupolas, of which two have been in operation since July, 1904, and the third has been in blast since April, 1906, and two more are under construction. These cupolas stand in a row down the centre of the building, having on one side two standard gauge tracks for the disposal of furnace slag, and on the other side a 32 foot crane span, on which two 50 ton cranes attend to the handling of furnace matte to the converters and of Bessemer matte from the converters to the casting moulds.

The platform on which stand the settlers is 10 feet above the floor of the smelter building. On this rise the concrete bases of the furnaces, so that the hearth plates of the furnaces are 6 feet 6 inches above the tapping platform. The furnaces are 50 inches by 204 inches at the tuyeres, and consist of two tiers of water jackets, the lower or tuyere jackets being 8 feet 6 inches and the upper or top jackets being 6 feet in height. The total height from the lower floor of the furnace building to the charging floor is 35 feet, and the total jacket height of the furnaces is 14 feet 6 inches.

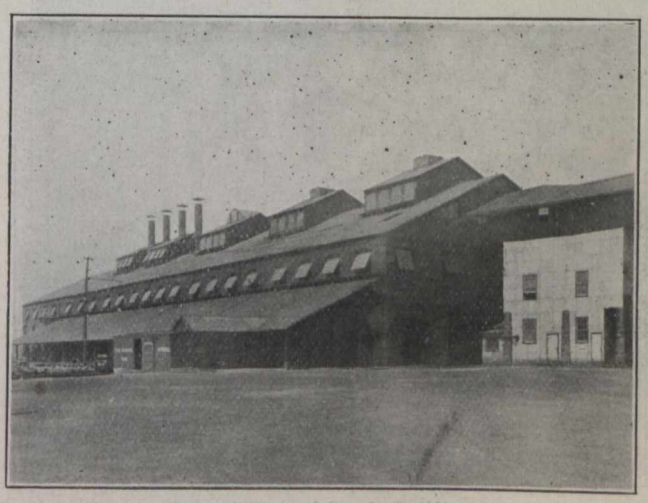
Each of the tuyere jackets contains four six inch tuyeres, which are bushed down to four inches. The side tap is notched out of one of the middle tuyere jackets on the crane side, and is filled with a water cooled cast iron side tap jacket 10 inches x 24 inches.

The furnace slag flows off at the back of the settler into cast iron slag pots, each holding 22 tons. These slag pots are made in sections, with four side pieces and a separate bottom piece. The train of three slag pots is handled by a yard locomotive, and poured over the slag dump.

Matte from the settlers is tapped as required into cast steel ladles 5 feet high and 5 feet in diameter. This is picked up by the electric crane and poured into the converters.

Four converter stands are provided, and three are in use all the time. The shells are 7 feet by 10 feet 6 inches inside, and revolve in tread rings 7 feet 8 inches in diameter. The lining is the ordinary mixture of white quartz and local clay, as there is no quartz in the neighborhood containing copper or precious metals. The blow in the Bessemer converter is carried on in exactly the same manner as in blowing for blister copper, except that the operation is stopped as soon as the iron is eliminated. It is a curious point that copper-nickel behaves as one metal in the converter, and that the ratio of elimination of sulphur and iron in these mattes has exactly the same relation to the amount of copper-nickel present as the elimination of these elements in ordinary copper work has to the amount of copper present. The point of elimination of iron is readily known by the color of the flame, and when this shows that nickel has begun to slag, the converter is turned down and the matte cast into a ladle which is poured by the crane into iron moulds. This matte contains about 80 per cent. copper-nickel.

The charges are brought to the furnaces by three trains of seven or eight cars each. These are accurately weighed before leaving the ore bins, and the amount of flux adjusted to the ore under treatment. Some ores, such as Creighton, require silica; others, as Crean Hill, sometimes require lime; in each case the endeavor is to produce a fluid slag which shall carry as little copper-nickel as possible. Slag from the converters, as well as all scrap and cleanings from the cupolas, are returned to the ore bins. These ore bins are parallel with the furnace building, and 200 feet behind it. The roast ore from the roast yard, green ore from the mines, slag and scrap from the furnaces, coal and coke, quartz, clay and limestone are all delivered on the upper tracks of the ore bins, 35 feet above the charging floor. The ore bins are 700 feet long and 35 feet wide. This makes a row of bins



General View of Cupola Building.

about 30 feet wide inside, and sub-divided into pockets the length of which differ according to the contents and amount of each substance handled. Ore from the roast yard is handled from the roast beds by a steam shovel into Ingoldsby drop bottom cars, which can be dumped readily into the bins.

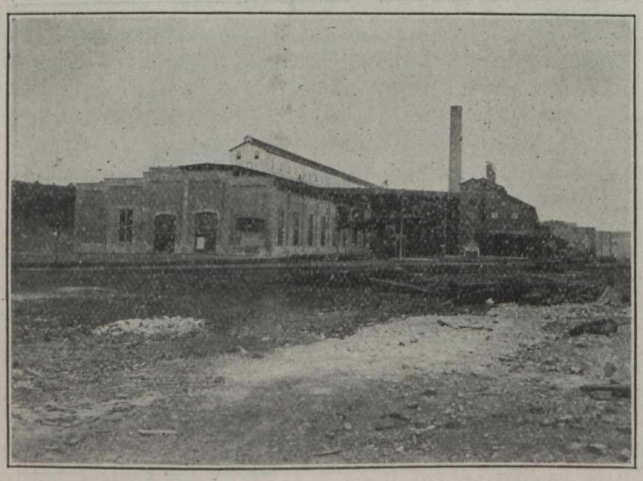
The ore and other furnace supplies are drawn from the bottom of these bins by means of curved bin gates actuated by a sectional gear wheel and crank. These are spaced at intervals of six feet above two tracks, on which run the charging trains. These tracks form an

oval one-third of a mile in circumference, and pass on each side of the furnaces, allowing the cars to be dumped directly into the cupolas. At a tangent from the curve at one end of the charge track, a line branches off to the sample house. The same cars used in charging the furnaces are used to carry the samples of ores, slags, etc., to the sample house bins, twenty-four in number. On the floor below these sample bins, small end dump cars are used to bring samples to two crushers, from which the ore is automatically sampled and passed through the various fine-grinding machines. The revert or discard from the samplers is collected in a bin, from which it is dumped into charge cars and taken back to the furnaces.

The steam power house, which at present is idle and kept mainly as a reserve in case of any break-down in the electrical equipment, lies to the north of the furnace building and 150 feet distant from it. It consists of a brick building, 156 feet by 101 feet, containing the boilers and blowing machinery, which were used to operate two blast furnaces before the electrical equipment was installed. The water supply from two small lakes a mile and a half northeast of the smelter is slightly acid, containing about 10 to 25 parts of sulphuric acid, or acid salts per million. This is due to sulphur gases from the roast heaps. The water is therefore treated with alkali in a purifying system before passing to the boilers.

There are four Altman-Taylor boilers, each of 400 horse-power. The coal bins are below the charging tracks, and the same train which supplies the furnaces carries coal from the main coal storage bins and drops it into small pockets above and behind the boiler room. The coal is thus delivered by chutes within a few feet of the boiler grates.

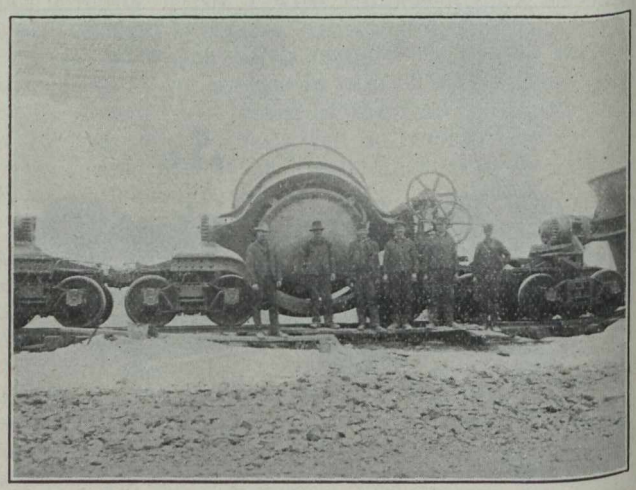
In this boiler room is a Blake underwriter pump, delivering 1,000 gallons per minute to the fire lines, and three Snow boiler pumps for supplying the boilers. As a reserve there is in this room a Rand air compressor,



Smelter Building and Sub Station at Copper Cliff.

which can supply air at 100 lbs. pressure, in case of accident to the electric driven air compressor in the sub-station. The exhaust steam from the steam blowing engines is condensed by an Alberger barometric compressor 24 inches diameter with 34 foot head, and dry vacuum pump 8 inches by 16 inches by 16 inches running at 120 revolutions per minute.

The steam Bessemer blowing engine, made by Nordberg, of Milwaukee, is 15 inches by 42 inches on the high pressure steam cylinder, and 30 inches by 42 inches on the low side. The air cylinders are both 40 inches by 42 inches. This blower delivers 10,000 cubic feet of free air per minute at 12 pounds pressure or 120 cubic feet per revolution. For supplying air to No. 1 and No. 2 furnaces there are two Nordberg cross-compound blowers. These are 13 inches by 42 inches on the high steam cylinder, and 26 inches by 42 inches on the low steam cylinders, both air cylinders being 57 inches by 52 inches. These deliver each 20,000 cubic feet per minute at 45 ounce pressure. The capacity is 236 cubic feet per revolution. Electric power is generated by two tandem Robb-Armstrong engines 13 inches by 20 inches and 26



Slag Pots—Copper Cliff.

inches by 20 inches, which are direct connected to two Canadian General Electric alternating current generators. Each of these is 200 kw., 600 volts, 192 amperes at 200 revolutions per minute.

The motor generator set which provides direct current for electric charging locomotives, takes alternating current at 550 volts, 40 amperes, and delivers direct current at 250 volts, 90 amperes, with a speed of 1,200 revolutions.

In this building is also an electric lighting plant. All this machinery is steam driven and is at present idle, but is kept in reserve in case of accident to electric machinery in the sub-station.

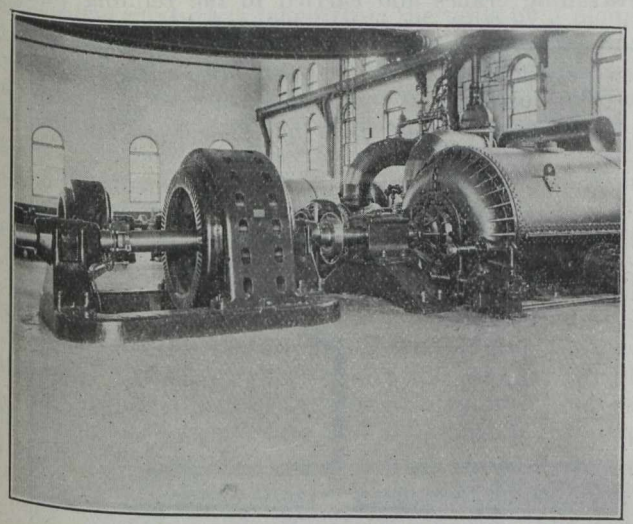
A large Connersville blower is at present under construction for use in this building. This blower has a capacity of 300 cubic feet air per revolution at 60 ounces. This is to be rope driven by two induction motors of 225 horse-power each. It is intended ultimately to replace all the steam driven machinery by electric.

The steam plant has been a valuable reserve at the start, but the new construction involves so much electric machinery that the total power generated by the steam plant would be of little service in case of a break-down of the transmission lines.

The chemical laboratory, to the south of the furnace building and sub-station, was completed during the winter of 1906. The building is of concrete and brick, all the partitions, stairs, floors and ceilings being of concrete and expanded metal. The building is 35 feet by 80 feet. The basement contains a large storage room for acids and a small room for special research work, a glassware store room, a toilet room, and a large dark room with two sinks and eight lockers for photographic work. In the main storage room a Sturtevant fan heating system draws cold air through a steam coil and distributes the warm air throughout the building. A suction fan, of ample capacity, draws the gases downwards through two concrete ducts from the hood in the working room overhead, and discharges them into the

base of a chimney. A system of compressed air pipes runs along one side of this room over the benches on which the acid carboys are stored, and is used instead of the usual syphons for drawing acid and ammonia from stock.

The second floor of the laboratory contains two halls at either end, opening into the main working room, and at either end of these halls are, at one end, an assay room and a sulphuretted hydrogen room; at the other end, a balance room and an office. The main room is 41 feet 3 inches by 21 feet 6 inches, and is open clear to the tile roof. Above each hall, at either end of this main room, is a ventilating passage leading to two circular fans with electric motors, which in this way gather all the gases which rise in the peak of the roof and discharge them through two circular openings in the outer gables.



Interior of High Falls Power Plant.

The hood is 16 feet by 5 feet in size and 9 feet high. It is covered on top and the sides with heavy wire meshed glass, and is divided by concrete walls, which rise about a foot above the hearth, into three compartments. The suction fan in the basement maintains a very powerful down-draft through ducts in these concrete walls. The hearths are well lighted by a number of incandescent lamps inside the hood, and above the hearth. As the gases are very rapidly withdrawn at a point about a foot above the hearth, there is no corrosion of the lamp sockets or wiring. This hood, being all of glass. with cast iron columns, in no way interferes with the proper lighting of the work benches.

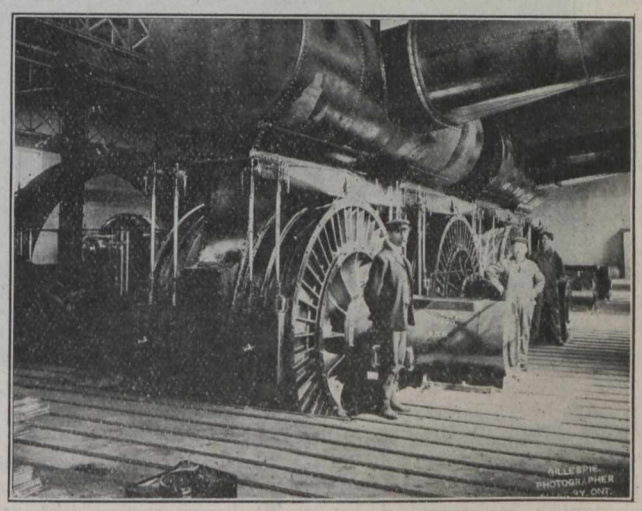
All heat for evaporation and similar work in the hood is supplied by electric hot plates. These are each 12 inches by 18 inches in size and are arranged in groups of eight to cover the hearth of two compartments of the hood. Each plate is connected to a service cable, and is provided with a switch giving three separate temperatures. The lowest heat used is just below the boiling point of water, and is used for slow evaporation. The next heat will boil ordinary solutions, and the highest heat is used for driving off the last trace of sulphuric acid and for baking residues, silicas, and other substances which demand a high temperature. The power used is 110 volts, alternating current, the low heat requiring about 5 amperes, and the highest 15 amperes per plate. The third compartment of the hood contains a concrete hearth with a number of acetylene gas burners, blast lamps, gasoline gas lamps and other apparatus for combustions. Work benches run all around the room on three sides, and two smaller benches lie in the middle of the room at right angles to the hood. The plating bench occupies part of the fourth side, and is supplied with direct current from storage batteries in the sub-station. The plating of nickel, cobalt and copper is done on series plating frames, the current, density and voltage being regulated by a switchboard in the balance room.

The balance room is 12 feet by 19 feet and contains a heavy bench on concrete piers running down to bed rock with room for five balances. This room is well lighted from the north.

The precipitation of copper, arsenic etc, by sulphuretted hydrogen is all done in a room 12 feet by 15 feet which communicates by a window in the partition with the main work-room. The hoods in this precipitation room are provided with electric hot plates, and are ventilated by one of the fans in the gable. Owing to the care taken in ventilation, it is practically impossible to smell sulphuretted hydrogen, or for that matter any noxious gases in the laboratory.

As previously stated, the furnace building at present in use is intended to cover five cupolas, three of which are at present in operation and two to be erected this year. This will take all the available space in the present building. One of these new furnaces will be blown by a new Nordberg machine similar to those now installed in the sub-station. The fifth furnace will be connected with a large Connersville blower to be erected in the old power house.

To provide for the Bessemer converters, a new building is now under construction. This will be parallel with the present furnace building and sixty feet distant from it. This new Bessemer plant will contain ten converter stands, and will use the new type of Allis-Chalmers converters as described in *The Electro-Chemical and Metallurgical Industry* for June, 1907. This building is of steel and corrugated iron. The crane runway is 35 feet high, the walls 48 feet and the total height to the peak of the monitor is sixty-seven feet.



Interior of Sub-Station at Copper Cliff -showing Blowing Engines.

The main building is 60 feet wide, with a shed 35 feet wide which extends the entire length on the south side and for 112 feet on the north side of the building. The converter department is 280 feet by 60 feet in the main, or by 95 feet including the shed which is used for sculling and matte casting. The relining department is a continuation of the converter department, using the same crane-run. It is 112 feet long, 60 feet wide with a shed 35 feet on each side, making the entire width 130 feet.

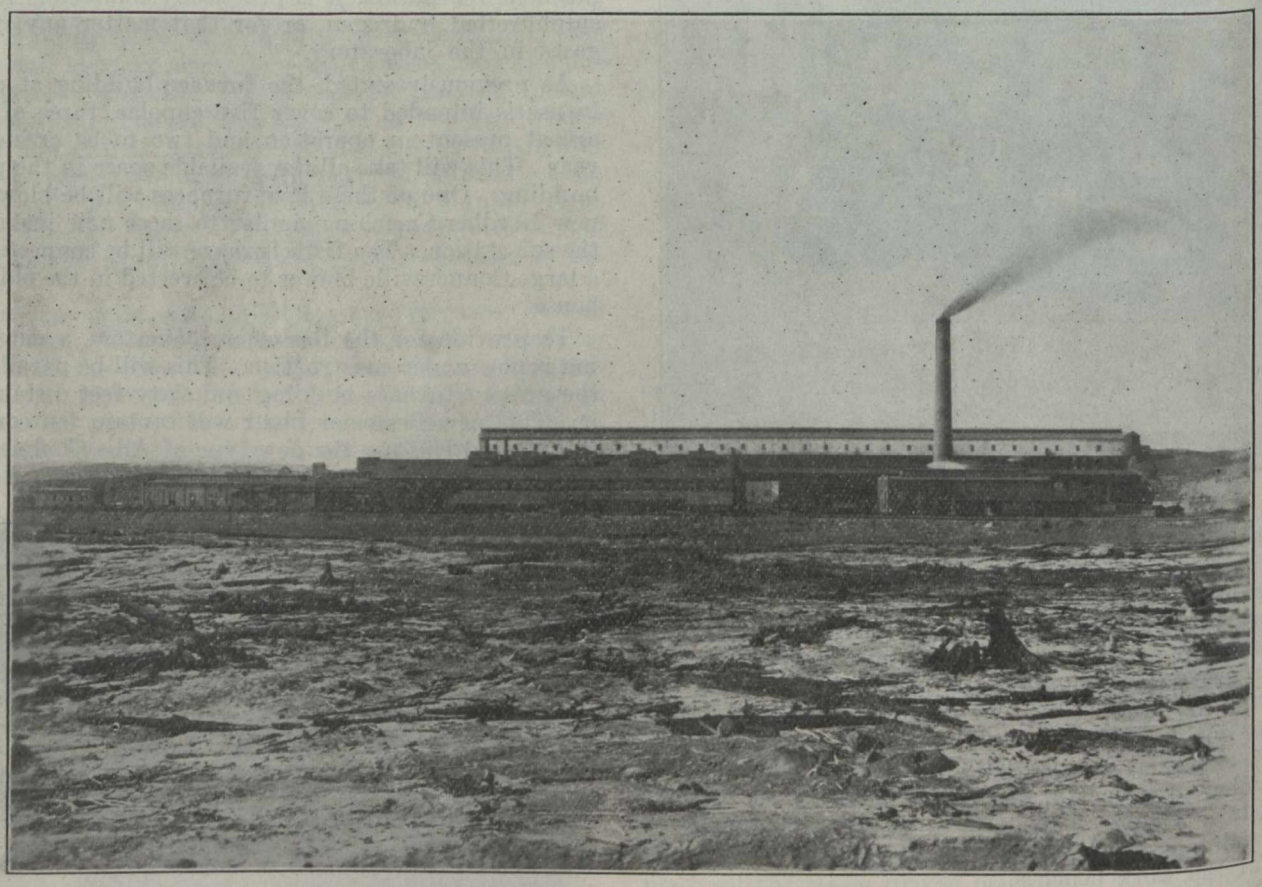
Back of this are the storage bins for quartz, clay and old linings, with a floor space 60 feet by 60 feet, and behind this again the machinery for crushing and drying quartz and clay and elevating them to the storage bins. This occupies a floor space of 70 feet long by 60 feet wide. The total length of the building is therefore 522 feet. It is a steel construction, with corrugated iron sides and roof.

Two Morgan electric cranes, 55 feet 8 inches span, with 50 ton main and 20 ton auxiliary hoist, will be used to handle the shells in the lining and blowing rooms.

Furnace matte from the cupola building will be taken across on three tracks to the Bessemer department by means of motors. The matte pots will be lifted and poured by the electric cranes. Owing to the nature of the ground it is not possible to arrange the converter building on a lower level so that the matte can be poured direct from matte cars into the converters. These ten concrete stands are controlled by two pulpits, each handling five stands. The control is entirely electric. Each converter is operated by a 30 horse-power induction motor, with solenoid brake. This is direct connected to a bronze worm which, by two gearings, transmits the power to the drive trunnions of the converter

The slag from the converters is to be poured into steel pots, which are lifted by the crane and set on a slag car, on which it is taken out of the building and poured into a slag casting machine. This casting machine is a circular steel framework 58 feet in diameter, resting on a circular track. On this framework rest cast iron moulds forming a continuous flat ring Each mould is 12 inches by30 inches by 4 inches, and holds about 150 pounds of slag. This ring is slowly rotated under the stream of slag poured down from the slag car. The slow rotation allows time for the slag to cool before the moulds reach a hand controlled tripper, which reverses the mould and drops the material into a hopper. Below this hopper a mine skip takes the slag, carries it up on an incline track and drops it into a steel bin of 500 ton capacity above the charging tracks.

The converter matte will be handled in clay lined ladles by the cranes and poured into moulds under the shed roof. As soon as the lining of a shell is burned out the shell is lifted by the travelling crane and placed on one of the sculling cars which run on standard gauge tracks from the main building, out under the shed roof on the south side. The space between columns in the main buildingis filled with sheet steel doors of the roller blind type, which can be raised and lowered to allow the sculling cars to pass out. After the shells are sculled, the cars are pushed back, and the shells lifted by the travelling cranes and carried to the relining platform.



Smelting Plant from South. Ore Bins in Distance.

Here, they are dropped on cars at each side of a sixty foot platform, twenty-five feet wide and ten feet high. This platform is in the centre of the relining department, with space on each side for five relining cars. Down the centre of this relining platform run two narrow gauge tracks, which bring the mixture of quartz and clay from the Carlin mills.

The lining is done by ramming machines which are handled by jib cranes, three on each side of the platform. The tops are to be lined by ramming around a mould instead of by hand, as at present

As fast as the shells are lined, and the tops are replaced, the lining cars are pushed out under the shed roof, which lies at each side of the relining room. This brings the shells under a row of hoods and along side of a wood storage platform, from which the cord-wood is handled for drying the lining.

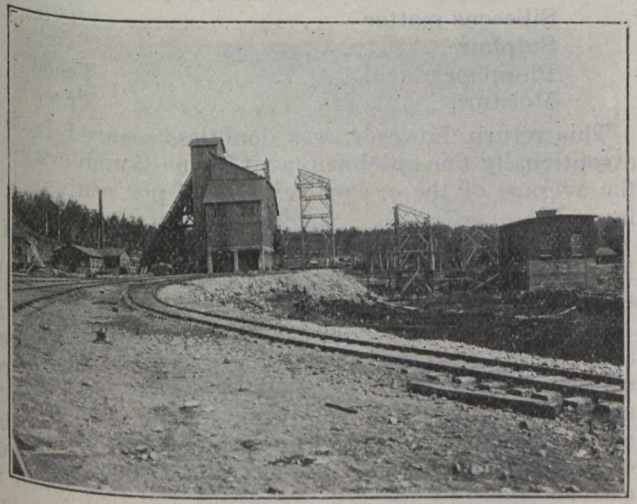
When this has been completed, the cars are again

pushed back to the lining platform, the shells lifted off and placed on the blowing stands by the travelling crane, and the cars are ready to receive a fresh shell for lining. The motion of the drying cars back and forth from the lining platform to the drying hoods is effected by ratchet gears on the cars.

The quartz and clay mixture for lining is made up in the crushing department, above which are the storage bins. These bins are of sheet steel and hang from the side and central columns in a catenary curve. There are six bins, one set of three on each side containing, respectively, crushed quartz, dry clay and old converter linings from the sculling shed. On each side below each bin-row are narrow gauge tracks on which run side dump cars which gather the mixture of clay and quartz from the bins and dump it into the mills. These tracks are on platforms five feet above the relining platform level. The crushed mixture is taken from the mills by a plough attached to the side of each pan, which scrapes the mixture off the pan and delivers it into cars which run down the centre of the mill floor and out along the relining platform. In this way the usual wheel barrow work is avoided. Space is provided for six mills, three on a side, each mill being below the level of the tracks which bring the supply of quartz and clay, and above the level of the tracks which take away the crushed and mixed product to the lining platform.

At the rear of the bins and mills are the quartz crushers and clay driers. These occupy a floor space 60 by 70 feet. On either side of this end of the building are standard gauge tracks, on which quartz and clay are brought in. The clay is all passed through a Ruggles-Coles dryer, which removes the moisture and rolls it into the shape of pellets. This is necessary in winter, in order to avoid freezing in the bins. During part of the summer drying is not required.

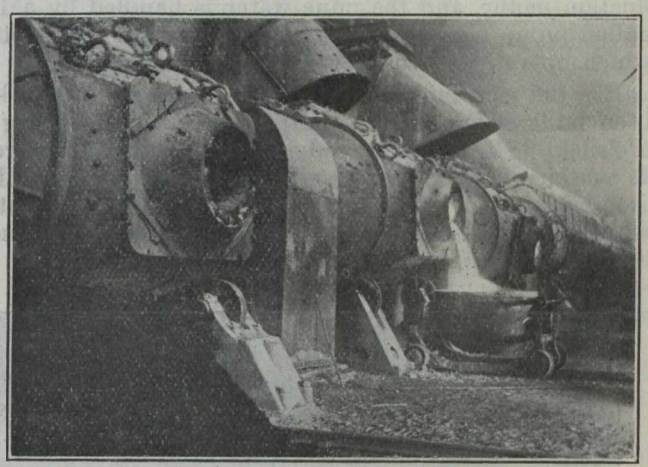
Quartz comes from the quarry in two forms, lumps and screenings. In summer the screenings can be passed



Crean Hill Shaft House and Engine House

direct to the bins. In winter the screenings are wet and frozen, so that they require drying. A small rotating dryer is provided for handling these frozen quartz screenings. The coarse quartz passes from the cars on to a platform, from which it is fed directly into a Blake crusher, elevated by belt to a roll, passed through a dryer, if necessary, and, if not, then elevated to the bins by bucket elevators. The spreading and carrying of material to the proper bins is done by travellings belts.

The ore supply comes at present from the Creighton and Crean Hill mines. The Creighton Mine is well known as the largest body of pyrrhotite carrying nickel and copper that has been opened in the Sudbury district. It lies on the border line between the Townships of Creighton and Snider; the present operations being all in the Township of Snider. The mine is worked as an open pit of oval form about 225 feet from foot to hanging wall. The pit is at this time about 160 feet deep. In the bottom of this pit thirteen tracks converge like the ribs of a fan to an entry on the footwall leading to the inclined shaft. The ore is broken from the side of the open pit in steps, and thrown down to the tracks, where it is block-holed, or broken up and trammed to the shaft.



Converters—Copper Cliff

About 330 feet west of the old shaft, a new shaft has been sunk during the last year, and a raise has been made connecting the bottom of the new shaft with the surface to the west of the present open pit. This will more than double the producing capacity of the mine. During the last year also the entire surface equipment of steam-driven machinery has been removed and replaced by electrical machinery. The sub-station at the Creighton mine contains three transformers of 275 kw. capacity each. These bring the voltage down from 35,000 to 550 volts. There are two hoisting engines, each carrying three drums, which are so arranged that any two can be run in counter-balance, or all three run independently. These hoisting engines are operated by 150 horse-power 3-phase variable speed induction motors. The rope speed is 500 feet per minute, and the capacity is three tons to each skip. The two hoisting engines are set at right angles to each other, the new shaft being operated by a hoist which is parallel with the new rock house. The old rock house and shaft, 500 feet to the east, is operated by the second hoisting engine, the ropes making a turn through sheives behind the old rock house.

The mine drills are supplied by a compound, direct driven compressor, running at 120 revolutions per minute and giving 1,635 cubic feet free air per minute. This is driven by a constant speed 550 volt induction motor of 300 horse-power. The air regulation is obtained by automatic Corliss step valves.

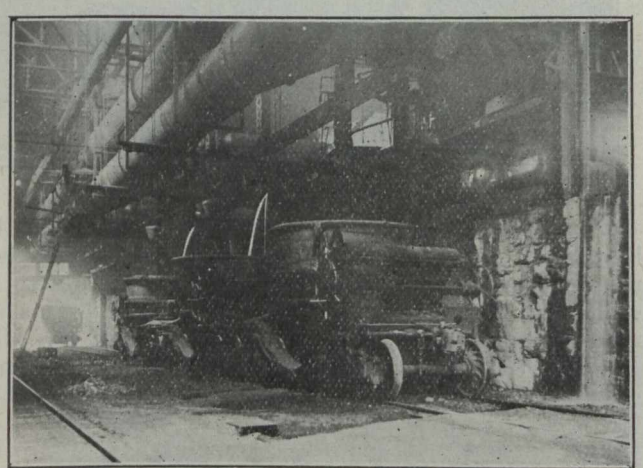
The fire protection equipment consists of a 1,000 gallon 6 inch 4 stage pump, direct connected with a 150 horse-power 3 phase 550 volt induction motor. To supply this a steel tank holding 60,000 gallons is erected just outside the power plant.

The rock house at the old shaft is a wooden structure 42 feet by 46 feet, and 72 feet high. The new rock house at the Creighton is built of reinforced concrete up to the bin floor. Above this the walls are three inch plank, ten inches wide, spiked together. There are three

skip tracks entering this building and delivering the ore over the grizzlies, through which the smaller fragments fall direct into the bins. The coarse ore is fed into two crushers 30 inches by 18 inches. From these the crushed ore passes through revolving screens on to rubber belts 3 feet wide and 50 feet long. Here the rock is picked out and thrown into a rock pocket, while the ore passes over the belt into the ore bins. Two railway tracks beneath the rock house admit the trains on which the ore is taken to the roast yards at Copper Cliff.

The crushers and belts, which are in two sets, are each operated by a 50 horse-power 3 phase 550 volt induction motor, and the mine water is handled by a 100 gallon pump geared to a 15 horse-power 550 volt motor, which operates at 750 revolutions per minute.

For the convenience of the men, a large "Dry" has been built adjoining the shaft house. This building is of brick, 36 feet by 80, and is well lighted and heated. It contains 205 lockers for clothes, three long enamelled iron basins, each fitted with taps for hot and cold water, and in an adjoining room shower baths and water closets are provided.



Back of Furnace—showing Slag Pots

The Crean Hill mine, which has been opened up within the past year, lies in lot 5, concession 5, in the Township of Denison, about a mile and a half northeast of the Vermillion mine. The hill rises sharply from a swamp and shows a number of outcroppings, which are strung out in an east and west line. Extensive diamond drilling operations were conducted before the location of the shaft house was determined. The ore at this mine seems to lie in veins from 50 to 80 feet in width. Whether these veins continue, or whether they overlap, will be brought out by the development of the mine.

The ore contains a larger proportion of pentlandite than the normal ores, and as the rock involved is a mixture of soapstone and greenstones, it requires entirely different treatment from the massive ores found at Stobie and Creighton. A branch line three and one-half miles long has been constructed from the C. P. R. at Victoria Station to the mine. The rock house, Dry, engine houses, etc., at Crean Hill are an exact duplicate of those at Creighton, except that in this case one hoisting engine with three drums is used, as but one rock house has to be considered.

The foregoing description covers the plants at present in operation, or under construction at the Cliff, and the mines, for the treatment of copper-nickel ores.

Plans have been drawn and work will this year be commenced on the new shops at Copper Cliff. These will adjoin the smelter to the south of the present buildings, and will replace the present inadequate buildings which surround the old Copper Cliff mine. The new equipment will consist of machine, blacksmith and foundry shops under one roof, a warehouse and gantry crane storage yard, a large carpenter and pattern shop, and a round-house for seven locomotives. It is expected that this construction will be completed before another year, at which time the plant of the Canadian Copper Company will challenge comparison with any smelting plant in the United States or Canada.

IRON MINING IN BRITISH COLUMBIA

It is reported that mining operations are to be resumed at the Texada Island iron mines, the ore from which will be treated at Irondale, near Port Townsend, where a new plant is at present being installed. These mines have been worked intermittently for several years past, the product, which was smelted with a mixture of 1-9 to 3-10 of bog ore, having been marketed in San Francisco, and used in the construction of United States battleships. The property is situated on the southwest of Texada Island and includes some 2,700 acres. The ore mass, which varies in width on the surface from 20 to 25 feet, is an irregular contact deposit between limestone and granite, and may be traced northward along a ridge following the coast line for a distance of nearly four miles. When operations were in progress some years ago it was estimated by experts that the development at that time had exposed an ore body representing five million tons of commercially valued ore in sight. The ore has been analyzed on several occasions in the laboratory of the Canadian Geological Survey, and the following result was obtained from one sample submitted:—

Iron	69.85
Manganese	Trace.
Siliceous matter	2.75
Sulphur	.06
Phosphoric acid	Trace.
Moisture	Trace.

This return, however, was doubtless secured from an exceptionally fine specimen, as it is questionable whether the average of the ore will exceed 50 per cent. metallic iron.

So long ago as 1872-3, the deposit was reported on by Mr. Richardson, of the Geological Survey, who thus describes the geological features of the locality:—

"Three miles northwesterly from Gillies Bay, and about seventy paces from the shore, a small exposure of magnetic iron ore was met with, associated with a cross-grained epidotic rock and grey diorite. Immediately north of this exposure, the ground rises steeply to about 450 feet above the sea. Here on the eastern and south-eastern slopes of the hill, for about 150 feet down and extending from 200 to 250 feet in length, is an exposure of rich magnetic iron ore. On the outcrops, facing to the northwest, the ore bed is seen to be from 20 to 25 feet thick, and to rest on grey crystalline limestone, with which, for about two feet down, are interstratified bands of ore, of from half an inch to one inch in thickness. The hill still rises to the north and northeast, but along the flank, and at about the same elevation in a northwesterly direction for nearly a mile the ore is occasionally seen, and in one place there is a continuous exposure of 250 feet. . . In the concealed intervals the course of the bed appears to be indicated by a coarsely crystalline epidotic rock, carrying ore in places, but with the grey

limestones apparently overlying it to the northeast, and the grey and green dioritic rocks beneath it to the southwest . . . In a northeasterly direction from the first noticed exposure, for a quarter of a mile, no ore is seen, after which it is again found, at first in irregular patches mixed with epidotic rocks, and then, its course becoming more noticeable, for more than half a mile the bed presents an irregular surface exposure of from 600 to 900 feet of nearly pure ore."

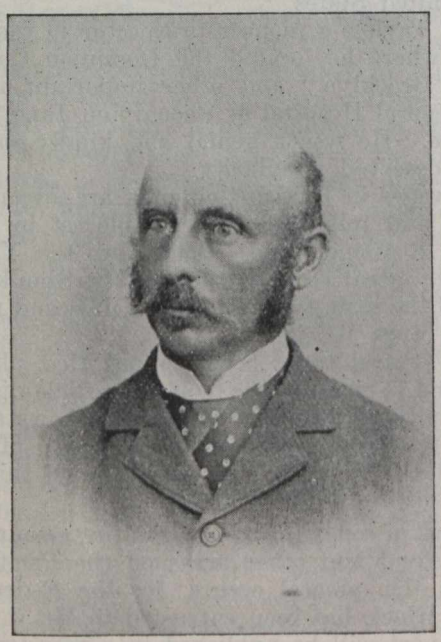
Dr. Dawson, commenting on Mr. Richardson's report, differs from the latter in respect to the nature of the ore deposit, which he describes as neither a bed nor a true vein, but a contact deposit which has been produced at or near the junction of the granitic mass with the stratified rocks, and more particularly with the limestone.

On the second exposure referred to by Mr. Richardson, development work was concentrated for some time, a shaft being sunk and a cross-cut run into the hill at a depth of 150 feet. Here, after passing through dioritic rock, a very fine body of ore was encountered, over a hundred feet in thickness, and affording a remarkably high return of metallic iron.

In addition to the occurrence noted, another deposit of magnetite occurs on the northeast side of Texada Island, while important deposits are being developed on the west coast of Vancouver Island, and there is every reason to believe that here and in other localities the available resources are sufficiently great to promise an abundant supply of raw material for the up-building of a flourishing and important iron industry on the British Columbia coast, when the conditions are ripe for its establishment, and those conditions are now within measurable distance of fruition.

DR. EDWIN GILPIN

Dr. Edwin Gilpin, Deputy Commissioner of Mines for Nova Scotia, died on July 10th after a few days' illness.



The late Dr. Edwin Gilpin.

Dr. Gilpin was born in Halifax, N.S., in 1850. His father, the late Rev. Dean Gilpin, was for years a successful teacher, and throughout his long and useful life a distinguished and ardent worker in the Church of England. Dr. Gilpin's grandfather was the Hon. T. C. Haliburton, known to the world of letters as "Sam Slick." On his father's side, Dr. Gilphin could claim descent from Richard de Guylpyn, who flourished in 1206 in Westmoreland, England.

Edwin Gilpin, Jr., graduated from King's College, Windsor, N.S., in 1871. From the same University he received the degree of A.M. in 1873, his course being a special one in mining, geology and chemistry. During his college course he began the practical study of mining engineering. At the Albion collieries of the General Mining Association, in Pictou County, he gained his first mining experience. Later he visited extensively the leading mining districts of Great Britain.

In 1874 he was elected a Fellow of the Geological Society of London, England. His membership of the Nova Scotia Institute of Natural History dates from 1873. To this institution he has always been a source of help and support.

In 1879 and 1881 he was successively appointed Inspector of Mines and member and secretary of the Board of Examiners of Colliery Officials for the Province of Nova Scotia. In 1885 he was elected a member of the American Institute of Mining Engineers, and in 1886 he received the appointment of Deputy Commissioner of Works and Mines. This position he held until the time of his death.

Dr. Gilpin, during his active life, contributed scientific papers, many of them unique sources of information, to the transactions of the leading societies in Great Britain and America. The annual reports of the Mines Department to the Government of Nova Scotia were issued under his direction.

BOOK REVIEWS

"Electric Blasting Apparatus and Explosives: With Special Reference to Colliery Practice," by Mr. Maurice, Mining and Electrical Engineer, London. "The Electrician" Printing and Publishing Company, Limited. Salisbury Court, Fleet street; pp. 166; price, 8s. 6d. net.

This much-needed book was written in the hope that it would prove to be a useful work of reference for mine managers, engineers and others. Particular attention is paid to the problem of safe shot firing in coal mines.

Chapter I. takes up electric fuses and detonators, exploders, wire and cables, and test; Chapter II., explosives and explosive risks; Chapter III., a most invaluable chapter, deals with practical applications, and Chapter IV. with the laws and regulations relating to the storage and use of explosives. An appendix gives a list of permitted explosives. The illustrations are numerous and well chosen.

EXCHANGES

In *The Mining World* of July 13th Ralph Stokes writes of "Mount Bischoff Tin Mine, Tasmania." The "Mount Bischoff's" monthly average production of block tin has fallen from 229 tons in 1885 to 60 tons in December, 1906.

The Colliery Guardian, July 5th, reprints a paper on the "Polmaise Collieries," recently read before the Mining Institute of Scotland. The safety lamps used in these collieries are magnetically locked and electrically ignited.

The Mining World, July 6th, celebrates the beginning of its twenty-seventh volume by reducing its size to the

standard 9 inch x 12 inch page. There is, however, no reduction in the amount of reading matter. In this number Mr. R. S. Moss writes of the "Manufacture of Coke from Western Coal." He describes an improved coke oven. "Examining a Placer Property" is also very well worth reading.

The Chemical Engineer, June, contains a paper by Alfred Sang on "Protecting Iron and Stetel from Corrosion." Of metal coatings the writer says: "If the metallic coating is considered merely as a garment which protects the iron article from atmospheric influences, the points which must receive special consideration are the closeness of the fit and the impenetrable qualities of the coating."

The Iron and Coal Trades Review, July 5th, has a description of Eskbank Ironworks at Lithgow, New South Wales. A new blast furnace was recently erected there under the superintendence of Mr. Pennymore. It has a capacity of 500 tons per week. It is somewhat surprising to notice from the protograph of this furnace that in general lines, and in equipment, such as vertical elevator, stores, etc., modern designs have not been closely followed. In fact, from its appearance, the furnace might have been designed ten or fifteen years ago.

The Engineering Magazine for July presents some articles of particular value. The concluding number of a series of papers on "Hydro-Electric Power Versus Steam for Industrial Plants, by H. Von Schon, closes with this paragraph: "Generally speaking, an investment of from $160 to $180 per horse-power delivered will show a net earning capacity of 6 to 8 per cent. These are rather high cost figures. The large majority of hydro-lectric developments range between $125 and $150 per horse-power and are therefore capable of a commensurate increase in net returns. The value of these investments is, however, more likely to increase than otherwise, since every indication points to a rise in the price of power service in all branches of industry."

The Engineering and Mining Journal, July 13th, editorially discusses the action of the Indiana Legisalture in prohibiting coal miners from using drills exceeding 2 1-2 inches in diameter, when drilling a hole in coal for blasting purposes. It is claimed that the law limiting the quantity of powder used to six pounds is a sufficient safeguard against blown-out shots. *The Engineering and Mining Journal* points out that, when State Legislatures begin to investigate the quality of powder used, instead of so carefully regulating the quantity, the number of fatalities resulting from blown-out shots will be reduced. It recomends the preparation of a table of permitted explosives.

A correspondent in *The South African Mines, Commerce and Industries* for June 15th writes thus of overcapitalization: "It is obvious that in mining finance, more than in any other branch of finance, the difficulties of 'proper capitalization' are considerable, since it is dependent on the exact estimation of profits which by the very nature of underground operations is difficult to attain. If those who are prone to explain so much by 'over-capitalization' looked with any sense of fairness at the present prices of Rand securities, they would see that, despite the depression, there are more instances of shares standing at over par than below."

The Mining Journal, June 29th, concludes an editorial on "The Rand Strike and the Outlook" with these words: "The nearer future of the Rand, it seems to us, must depend very much on what the Government is able to do for the industry, and therefore their mutual cooperation is greatly to be hoped for, since the present policy of constant hostility by the mining interest can only result in making the Government incline more and more towards the Socialistic labor party, which is arising in South Africa, as it has already done in all our other colonies."

PERSONAL AND GENERAL

Mr. J. B. Tyrrell is examining properties in the Montreal River district.

Mr. Cyril Knight, of the Ontario Geological Survey, is in Tilbury, Ont.

Dr. Eugene Haanel, Director of Mines for the Dominion, is absent from his office on a vacation.

Mr. Anthony McGill has been appointed Chief Analyst for the Dominion, in succession to the late Dr. Thomas Macfarlane.

We regret to record the death which occurred recently in Toronto of the father of Mr. J. E. McAllister, the manager of the British Columbia Copper Company.

Dr. K. Leith, of the University of Wisconsin, was in Toronto on the 14th July. Dr. Leith is exploring the newly discovered extension of the Misabi River range.

Mr. N. Angrignon, a well-known miner, has been appointed foreman of the British Columbia Copper Company's "B.C." mine, in Summit camp, Boundary district.

Mr. Frederic Keffer, engineer of the British Columbia Copper Company, and president of the Canadian Mining Institute, is spending a vacation in Vancouver and Victoria.

Messrs. George Caverhill, of Montreal, and Mr. W. G. Ross, managing director of the Montreal Street Railway Company, have been appointed directors of the Dominion Iron & Steel Company, to fill vacancies on the board.

Mr. H. E. T. Haultain, general manager of the Canada Corundum Company, Craigmont, Ont., passed through Toronto on his way from New York. Mr. Haultain has been looking into the manufacture of abrasives in the United States.

"Joe" Taylor, a pioneer prospector in the Boundary district, where he located the Dominion Copper Company's "Brooklyn" and other important mines, died at the General Hospital at Phoenix on June 31st, at the age of 66. He was a genial and kindly soul and enjoyed a deserved popularity.

Mine wages in British Columbia are advancing in all districts, and following the example set by mine managers in Rossland and Boundary, the Yale Mining Company, operating at Hedley, in the Similkameen, has increased the scale from $3 to $4 a day, and reduced the hours of work to eight.

It has several times been claimed that platinum has been found in place in the Tulameen, Yale district, B.C., but it is only recently that capital has shown any disposition to investigate these claims, a group of properties on Champion Creek having been bonded this month to Colorado investors for $80,000.

The task of reporting on the iron ore resources of Vancouver Island and other areas on the Pacific seaboard in which the mineral occurs, for the Federal Department of Mines, has been entrusted to Mr. J. Lindeman, whose report will be published in a monograph on the subject of the Dominion's iron resources to be issued by the Department.

ordinary bituminous coal to lignites. From the Pacific coast to Behring Sea and the Arctic Slope, through the valleys of Copper and Yukon Rivers and their tributaries, coal beds are widely distributed. The work of

the present season will include studies of the coal-bearing rocks of the southeastern part of the territory and of the Yukon coal fields so far as they are accessible from the Yukon River.

Mr. C. D. Rand, a well-known broker, has been elected president, and Mr. J. Kendall, F.C.A., secretary of the Vancouver Stock Exchange, to which the British Columbian Legislature granted a charter at its last session.

Mr. Fritz Cirkel visited Toronto on July 17th. Mr. Cirkel, with two assistant engineers, is gathering information concerning all the producing mines, metallurgical establishments and the mineral industries in general of all Ontario. The hand-book, in which all these facts will appear, in conjunction with similar information from every Province of the Dominion, will be published by the Federal Mines Department early in 1908.

Mr. Herbert Carmichael, Provincial Assayer of British Columbia, has been delegated by the authorities to make a reconnaissance survey and make a complete report on the resources of the country tributary to Alberni, on the east coast of Vancouver Island. At one period this district boasted more than one producing mine and the surface prospects appeared quite promising. The present work will include the surveying of Great Central Lake, and it is proposed to establish stations from which triangulations will be made.

Bulletin No. 314, published by the United States Geological Survey, is of special interest to Canadians, in that it treats of the coal areas of Alaska, and consequently has considerable application to the Yukon. This report states that of the 600,000 square miles forming the territory of Alaska, it is estimated that 12,644 square miles are underlain by rocks that probably contain coal seams, and that 1,238 square miles contain workable coal, ranging in age from Carboniferous to Tertiary, and in composition from anthracite of good quality through high grade semi-bituminous steam and coking coals and

An exceedingly interesting report has been issued by the British Home Office under the title of "Colonial and Foreign Mineral Statistics." This report shows that in 1900 the number of persons engaged in mining and quarrying in the world exceeded five millions, of which approximately one-third were employed in the British Empire. As however these statistics do not include the labor employed in the metal mines and quarries of the United States and some other lesser important countries, they are not conclusive. More than half of the labor mentioned was employed in coal mining, Great Britain employing over 843,000 persons alone, the United States 626,000, Germany 548,000, and France 175,000. The coal produced during this period amounted to 941,000,000 tons, the value of which is estimated at over $1,500,000,000. In point of relative importance, it is interesting to note that Canada takes second place, following closely on India, among the coal-producing possessions of the Empire, though our output of, in round figures 8,000,000 tons, appears small in comparison with the enormous production of the Mother Country of 239,918,239 metric tons. Of the world's gold output the Empire contributed 59 per cent.; Australia contributing 19 1-2 per cent., the Transvaal 26 1-3 per cent., and Canada 3 3-4 per cent. The total value of the world's output of minerals is roughly estimated as representing about $3,500,000,000. The death rate from accidents in coal mines in this year was 2.72 per 1,000 in British Columbia and 1.86 in Nova Scotia, as compared with 1.35 in the United Kingdom and 3.45 in the United States.

Mr. W. H. Cowell, formerly associated with the Algoma Steel Company, Sault Ste. Marie, has been appointed secretary-treasurer of the Wellman-Seaver-Morgan Company, of Cleveland, Ohio.

Mr. John MacDonald, who until recently has been on the engineering staff of the Trethewey mine at Cobalt, has been appointed manager of the Foster in this camp.

Mr. J. Argall, manager of the Iron Mask mine at Kamloops, B.C., now being successfully operated by an English company, has returned to British Columbia from a visit to the Motherland.

It is to be noted that another important discovery of mica is reported to have been made some forty miles north of Buckingham, Que., and development operations have been already commenced.

Mr. Alexander Henderson, of Vancouver, a former County Court Judge for the Province of British Columbia, has been appointed Governor of the Yukon Territory, in succession to the Hon. W. W. B. McInnes.

The Council of the Society of Arts (London) are offering a gold medal or a prize of £20 for the best portable apparatus or appliance for enabling men to undertake rescue work in mines or other places where the air is noxious.

The United States Consul at Victoria, in an official report to his Government, states that the British Columbia output of copper has increased 800 per cent. in ten years, while that of the rest of Canada has increased 50 per cent. in this period. To the successful mining of copper is attributable largely the improved showing of the Western Province in respect to profit-earning distributions, the dividends paid last year by the mines aggregating in amount, it is said, between three and four million dollars.

In a leading article *The Iron and Coal Trades Review* refers at length to the extraordinary expansion of the steel industry in the United States, as indicated by the largely increased output and more presently by the number of new blast furnaces which have already been built this year or are being completed. Thus since January last no less than nine furnaces have been blown in having a rated annual capacity of 1,260,000 gross tons, while twenty-seven others are in course of construction, the rated capacity of which is roughly four million tons annually.

Mr. D. D. Rosewarne, F.G.S., London, M.I.M.M., M. Am. Inst. of M.E., has arrived from England to spend a few months in the examination of the Cobalt and adjacent districts on behalf of London financiers. Mr. Rosewarne was one of the early pioneers of the Broken Hill district of New South Wales, and, having spent his boyhood days in the Comstock, Nevada, U.S.A., should have an intimate knowledge of silver ore. For some years he was Chief Inspector of Mines for the South Australian Government. He intends making his headquarters at Haileybury.

Mr. L. Pratt, the manager of the Last Chance mine at Sandon, B.C., in an interview published in a Nelson paper, speaks very favorably of the conditions now existing in the silver-lead sections of West Kootenay, due of course in a measure to the present high prices of the metals. Another erstwhile important mine, the Good-enough, has been reopened, and there is a general activity throughout the district. It is to be noted that under the terms of the Bounty Act, producers of lead ore are no longer entitled to the subsidy, since the price of lead in London is now quoted at over £20.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay, July 15th, 1907.

A regrettable accident occurred at the new No. 4 winning of the Nova Scotia Steel & Coal Company on the 6th of July, by which three men were fatally injured. Two tubs, one filled with coal and the other with water, ran back down from the bankhead and collided with these men at the face of the deep. The evidence given at the inquest appears to prove that the accident was due to the neglect of the chain runner to turn a switch after the rope was knocked off at the brow of the slope. There was laxity, but not such laxity as would warrant the headlines and the attitude of *The Halifax Herald* in its issue of the succeeding day. Under the usual red headlines the *Herald* writer makes some very naive comments on "the mine running without 'Sampsons' " and other matters, and we rather suspect the writer had a very vague idea of what a "Sampson" is. To quote: "Attorney-General Pipes will not be held guiltless if he allows anyone to escape, whether it be officials in the management of the mine, or chain runner, or whoever else may be responsible. It will be no use for Hon. Mr. Pipes to say that he is leaving the enforcement of the law to the Cape Breton police. He should act, and act at once, and order the arrest of whoever is responsible, or of all who are responsible."

We do not think such language is called for by the circumstances of the case, sad as they are. The officials of the Nova Scotia Steel & Coal Company are not going to abscond, nor do the mining community of Cape Breton need the assistance of *The Halifax Herold* in what is distinctly their own business.

Since the date of the above remarks it has been plainly brought out in the coroner's inquest that the accident was the direct result of disobedience of orders, and there is no doubt that proper cognizance will be taken of this. But no thanks will be due to *The Halifax Herald,* whose irritating proclivity to offer advice on matters with which it is imperfectly acquainted is becoming so proverbial that any efficacy its remarks once possessed has now disappeared.

Glace Bay, C.B., July 12th, 1907.

After a great many delays the petition for a plebiscite on the question of the retention or the non-retention of the so-called "Scott Act" has been allowed by the powers at Ottawa, and it is understood that the plebiscite will now be taken. There is, therefore, a possibility that the Scott Act may be repealed in Cape Breton County, and that the Provincial Licensing Law may take its place.

The liquor problem has a very decided bearing on the mining industry of this Island, and almost anything would be better than the present farcical state of affairs now prevailing here. Reference has been made on a previous occasion in these columns to the loss of output occasioned fortnightly by the "pay-day drunk," and it is a moot question whether the Scott Act, or rather the way in which this Act has been maladministered, is not to blame for most of this lost time and disorganization of all colliery business.

The Scott Act makes the sale of drink illegal, and provides all sorts of penalties for the offender. Somehow, notwithstanding, the drink is sold, and in large quantities, but as the traffic is theoretically illegal no supervision of the quality of the liquor dispensed is possible. Consequently our miners get their "pizen" of a peculiarly deadly and ghastly blend, stuff that maddens and paralyzes at very short notice.

Further, the various abortive and spasmodic attempts that are made to enforce the law make it necessary to maintain the semblance of secrecy. Secrecy always makes a bad thing worse, and it does not need a labored argument to prove that slinking round a corner in a surreptitious manner to get a drink is not calculated to increase the self-respect of any man. Once he gets into a bar he finds it is advisable to take a bottle of "square face" home with him because of the difficulty of getting another drink. The consequences are inevitable, and are also very apparent when Monday's colliery outputs come to be reckoned up. Everybody in Cape Breton knows how thickly the country roads, parks, and every cemetery and back lot is strewn with whiskey flasks in various stages of brokenness. These things are everywhere, and they tell their own unmistakeable tale. The motormen on the electric railways know the effects of a "pay-day jag," and many a poor fellow has met his death under the cars when laid across the rails, which in this country seem to exercise a peculiar fascination for the man who is drunk on Scott Act "firewater."

The experience of the Colorado Fuel & Iron Company in this matter of the "pay-day drunk" is well presented in a thoughtful article by Lawrence Lewis that appeared in *The Engineering and Mining Journal* for the 29th June last. Of course, social conditions in the mining camps of Colorado and in the coal fields of Cape Breton are not by any means the same, but nevertheless the social problems of mining districts are the same the world over, and only vary in their intensity. In the experience of the company referred to prohibition proved an utter and total failure, and culminated in a glorious orgy on the 4th of July, 1901, which laid their mines off for five days. Prohibition has always proved a failure, and will always prove abortive in any community where even a small minority of public opinon countenances the use of liquors. The Colorado Company instituted a "restricted club" with bar room, billiard room and pool rooms, card and game rooms, where limited stakes were allowed, and a well-provided reading room. This restricted club is said to have changed the Town of Coal Basin from a "prohibition to a temperance town." Into this sentence is packed a wealth of ironical and practical wisdom.

There is no disguising the deadly monotony of life among the miners in the average coal mining colony, more particularly among the newcomers and foreigners. Take the position of German, Belgium and English miners who come to Cape Breton from the mining towns of the Old World. They have from childhood been in the habit of imbibing light wines and beers, and have all their lives had places of amusement to visit. The German has his "bierhalle" and "theatre," the Frenchman his "cafe chantant," and the Englishman his "pub" and colliery reading room. Everyone of them in all likelihood has had his little garden allotment also. Then they find themselves in Cape Breton, where to drink is a legal crime, and where a man must cover his tracks if he wants a pint of beer, as if he were some nocturnal marauder. When he gets his drink he is oftentimes ignorant of its vicious nature, and he is in the hands of the policeman or has unknowingly committed some assult before he really knows what he has done.

The farce of Scott Act administration is, further, a moral canker that is steadily undermining the respect for law that should be inherent in the breast of every subject of the King. It opens a door for every kind of "graft" and political jugglery. In a word, the present condition of the liquor traffic in Cape Breton is a standing menace to the industrial prosperity of our coal fields. A most significant factor in the present agitation is that the liquor dealers themselves wish to see the Scott Act retained. The rum-seller is not usually a philanthropist either.

There can be no doubt in the opinion of a great many thinking people in Cape Breton that a properly framed licensing act, with restricted hours, Sunday closing, and honest police supervision, will more efficiently control a traffic which, while not the most beneficial in the world, yet exists in response to a public demand, and it will further put the publican on the same footing as the grocer who sands his sugar or sells margarine for butter. The

man who wants his glass of beer should be able to get one in an open manner, and not have to skulk in holes and corners for fusel oil and dilute brimstone.

While the present Scott Act remains in "force" the hands of the coal operators are tied, and they could not if they wished attempt a sociological campaign for the amelioration of the present unsatisfactory conditions, and any attempt to run reading rooms or clubs on strictly temperance lines or "Sunday School" methods is foredoomed to failure.

ONTARIO.

Cobalt.—Your correspondent has been so much occupied with strikes and rumors of strikes that the gathering of news has been neglected. The Western Federation has succeeded, with the help of the managers, in bringing about a deadlock. The policy of the Federation leaders was simply and solely to prove to the men that they, the men, could get anything they asked for. The managers foolishly (as events have proved) gave out their ultimatum at the precise moment when it best served the purposes of the imported professional agitators. The managers could have silenced the men by concessions at an earlier date; or they could have preserved silence—probably the wiser course of the two. If the initiative had been left to the men they could not have manufactured a case. If the leaders of the Federation had not openly boasted of their power to get any terms, a settlement would have been easily reached. As it is, foreign interference has brought about a cessation of work, has injured the reputation of the camp and has embittered the relations of the managers and men. The point is that if the men had been left to themselves they would have got peaceably whatever reasonable concessions justice demanded, without injury to themselves or to the camp. The demagogues of the Federation have rendered calm deliberation impossible, have belittled the Government's represntatives, and have encouraged the spirit of opposition. This is not arm-chair criticism.

GENERAL MINING NEWS

NOVA SCOTIA.

Sydney, July 12.—It is understood that the transfer of the Gowrie and Blockhouse Collieries and other areas at Port Mouton and vicinity to the Atlantic Coal Company, Limited, has been practically completed, and that operations on a large scale will shortly commence. Nicholas Richardson, of Newcastle-on-Tyne, who represents the interests of the British investors, will, it is stated, undertake the management at the collieries. Mr. Richardson left by to-day's train for Halifax. The people of Port Morien as well as those interested in the new company have every confidence in the future of the town and the operation of this important enterprise.

Sydney.—The Dominion Iron & Steel Company will not be seriously affected by the destruction of the Wabana ore piers. At Sydney fully six months' ore is in stock. It will be quite possible for the company to make up the loss by extra effort.

At the new mine of the Nova Scotia Steel & Coal Company three miners were killed on July 6th, through the carelessness of a chain runner.

ONTARIO.

Sudbury.—Prince Luigi, Duke of the Abruzzi, visited Copper Cliff early in July. The Prince arrived in the private car "Cygnet," in which Mr. and Mrs. S. H. P. Pell, of New York were his hosts. The party was entertained while in Copper Cliff by President A. P. Turner.

North Bay.—The Trout Lake smelter, near North Bay, is nearly completed. Already some ore has been treated.

Mr. J. J. Bell, of Toronto, is to take up certain branches of the work connected with gathering information for the Mines Department of Ottawa. The clay industry and certain mining sections of Western Ontario will constitute Mr. Bell's field.

Cobalt.—The Cobalt Right of Way Mining Company on July 16th declared a dividend of 7 per cent., the second within three months at the same rate. Two carloads of ore gave a profit of $61,840 after paying all expenses. So far all mining has been done by hand. But the compressor will be running within a few days.

The following table shows what has been offered and demanded in Cobalt in the way of wages and hours, as compared with the compromise finally rejected by the owners:—

Surface Labor.	Owner's offer, 10-hour day.	Men's demands, 10-hour day.	Compromise rejected by owners, 9-hour day.
Carpenters	$3.25	$3.75	$3.50
Do., helpers	2.50	2.75	2.75
Mechanics	3.75	3.75	3.50
Pipe Fitters	3.00	3.25	3.50
Blacksmiths	3.75	3.75	3.50
Do., helpers	2.50	3.00	2.75
Engineers (hour)	.30	.35	.35
Firemen (hour)	.25	.30	.30
Ore Sorters	2.75	3.00	2.75
Do., helpers	2.50	3.00	2.75
Hammersmen	2.75	3.00	3.00
Teamsters	2.50	2.75	2.75
Hoistmen	2.75	3.00	2.75
Cage or Bucketers	2.25	3.00	2.75
Others on surface	2.25	2.75	2.75

Underground Labor.	Owner's offer, 10-hour day.	Men's demands, 8-hour day.	Compromise rejected by owners, 9-hour day.
Timbermen	$3.25	$3.50	$3.50
Machine men	3.25	3.25	3.50
Do., helpers	2.75	3.00	3.00
Cage or bucketers	2.50	3.00	3.00
Others underground	2.50	3.00	3.00

The miners also asked that not more than 65 (instead of 75) cents per day be charged for board; miners in shafts, 25 cents extra per day. Cooks were to get $80 per month.

The City of Cobalt Mine accepted the nine-hour day and miners' schedule of wages, after its manager had signed the owners' agreement to refuse anything but their own schedule. The Board of Directors of the company took the matter in their own hands and decided to accept the men's terms. Their employes are returning to work. The Nipissing, Coniagas, Trethewey and Cobalt Lake mines are operating with partial staffs. The mine owners are recruiting Italian and other laborers in Montreal. To block this, the miners are circulating notices requesting all sympathizers to refuse employment in Cobalt. In this movement officials of the Western Federation of Miners, residents of the United States, are taking a most active part.

On July 17th Silver Leaf shipped a car of twenty tons, mostly high grade ore. McKinley-Darragh also shipped a care load, 42 tons of good ore.

ALBERTA.

Mr. D. B. Dowling, late of the Geological Survey of Canada, and at present in charge of a prospecting party sent out by German capitalists, has discovered coal not far from the Yellow Head Pass, where the Grand Trunk Pacific and Canadian Northern will probably cross the Mountains.

SASKATCHEWAN.

Regina.—Premier Scott has announced that while steps have been taken to reserve the coal lands discovered northeast of Eagle Lake for the benefit of settlers, nothing had been decided with regard to its development by the Government.

BRITISH COLUMBIA.

About twenty-five men are employed in the Cariboo-McKinney mine.

At Spruce Creek, Atlin, a discovery of large gold nuggets has been reported.

The skip service of Le Roi mine main shaft has been extended down in four compartments to the 1,650 foot level. A new wire rope has been put on the tramway and a new crusher installed.

The dam of the Bear hydraulic mine, Cunningham Pass, broke on June 27th, causing about $3,000 direct damage and putting a stop to all piping for the year. The building for the pilton wheel and dynamo was swept away and 160 feet of pipe line, 108 feet of sluice flumes and about 600 feet of ditch were lost. The stable also was destroyed. The loss of the season' water and the consequent stoppage of hydraulicking is, of course, the most serious loss. The dam was 38 feet high and was constructed of log cribbing, well brushed and heavily banked on the upper side with clay and gravel. The area of the water was about 1,000 feet in width by one and a half miles long. About 100,000,000 cubic feet of water was stowed behind the dam. The break was caused by the filling and embankment washing out.

Nelson, B.C.—A new mill is under construction at the Blue Bell mine, on Kootenay Lake, nearly opposite Ainsworth. The cement foundations are finished and the building is well under way. Ten Wilfley tables are to be installed. These are being built in Nelson by the Nelson Iron Works. It is probably that several tables of the Deister type will also be installed. The Deister is of moderate price and occupies less floor space than does the Wilfley. The mill is designed for the recovery of both lead and zinc. After going through the crushers and trommels, a recovery of lead is made in several sets of jigs. The zinc and iron middlings are then put through ball mills and finally over the concentrating tables, where a last clean separation of lead and zinc is made.

Grand Forks.—The Granby Company has officially announced its intention of largely expanding their whole plant. The new 100,000 gallon steel tank is half finished. When it is finished the foundations for the big steel flue chamber will be commenced. The blower building is to be remodelled. Other enlargements will necessitate more bin room and it is planned to enlarge the storage facilities until a capacity of 15,000 tons of ore and 6,000 tons of coke is reached.

Greenwood.—The labor trouble in the Greenwood mining district is over. Under the new agreement miners get $4 per day, sinkers $4.50 and laborers $3. Labor is very scarce.

The Granby Consolidated are keeping up their shipments to an average of 2,000 tons of ore per day. The British Columbia Copper and Dominion Copper are also pushing development. At the Phoenix mines of the Granby and Dominion Companies very active development is being carried on.

In Lardeau mining division the management of the Eva gold mine are preparing for the erecting of a 100 stamp mill. Twenty stamps are now dropping. The Eva is a dividend-paying mine. On the Silver Cup about sixty tons of ore per month is being shipped. The shaft is down 800 feet. On the Beatrice, a silver-lead property, work has been resumed, and the erection of a tramway is being considered. The Silver Dollar Mine has finished erecting a 40 stamp mill.

The Similkameen Mining & Smelting Company is driving a 500 foot tunnel at its Bear Creek mine in the Similkameen valley. The tunnel will, it is expected, open up a large body of low grade ore and will largely increase the output of the mine.

YUKON.

A. Chester Beatty, one of the chief engineers of the Guggenheim Exploration Company, states that the company now controls ten miles of Bonanza Creek, fifteen miles of tubularies and about eighty million yards of hill gravel claims.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

The output of the Cornish tin mines for the first six months of the present year is valued at £295,594, on a tonnage of 2,504 3-4 tons. The avearge price of metallic tin has been in the neighborhood of £190 per ton, a considerable advance over last year's prevailing prices.

It is interesting to note, meanwhile, that one Cornish mine, the Levant, worked since 1820, has to date accomplished the remarkable achievement of having paid in dividends no less than 50,000 per cent. upon its original subscribed capital.

The establishment in Cornwall of a central school of mining and metallurgy is now receiving the consideration of the Board of Education.

FRANCE.

A bill has been passed by the Chamber of Deputies constituting eight hours a maximum day's work in mines. The bill was adopted on a vote of 427 to 123.

UNITED STATES.

Except for a shortage of miners in Colorado, which still continues to occupy the premier position among the gold-producing States of the Union, conditions are eminently satisfactory, and more activity is being displayed than at any previous period. This includes not only the development of new mines, but the reopening of old abandoned properties, which now, however, thanks to the appreciation in the values of metals and improvement in mining and metallurgical methods, may be worked at a profit. The immense water power to be derived from the mountain streams of Colorado is, moreover, being turned to account and important electrical power plants are being installed with a view to supplying energy to the mines and replace steam.

The report of Mr. Argall, the manager of Stratton's Independence, was presented at a recent meeting of shareholders in London. The report stated that there were 600,000 tons of ore on the dump, averaging in value $3.60. It was expected to save 70 per cent., or $2.52 per ton, of these values at a cost of $1.52. When Mr. Argall's plan for treating the low grade ore left in the mine is put into practice, profits from this and other sources are expected to realize between £40,000 and £50,000 per annum.

For the first six months of 1907 the Utah mines distributed profits aggregating over three million dollars.

Many important new discoveries are reported to have been made this year of iron ore on the Mesabi range. It is also expected that production from the area will show a further increase this year.

AUSTRALIA.

At the opening of the Parliament of West Australia, the Governor in his speech from the throne took occasion to refer to the prosperous condition of the mining industry of the country which, he showed, had already produced gold, copper and tin to the value of £76,000,000, while nearly £16,500,000 in dividends had been paid by the mines.

In the Orange district of New South Wales a number of mines worked for copper some thirty-five years ago and then abandoned are about to be reopened. Two of these properties are already in successful operation.

Some fine diamonds have been taken recently from the Yowah field in Queensland, near the New South Wales border.

WEST AFRICA.

The official report on mining in the Gold Coast and Ashanti for the year 1906 has been issued, and shows a gold production of 210,111 ounces, as against 153,959 in 1905.

SOUTH AFRICA.

The Johannesburg correspondent of *The Mining Journal* (London) anticipates a considerable reduction of costs on the Rand during the next two years, and, he states, the strike of the white miners will assist towards that end. The strike is meanwhile still in progress and there have been several demonstrations.

An association of coal owners has been formed in the Transvaal with the object of putting a stop to the cutting of prices. The whole of the output will be dealt with by the association, the prices being fixed in the respective districts by the calorific value of the coals.

According to statistics compiled by Mr. Ross E. Browne, the general average costs of operating mines on the Witwatersrand is as follows: Developing, 1.659 shillings per ton; mining, 11.980 shillings; milling, 3.084 shillings; cyaniding, 2.904 shillings; total, 19.627 shillings; average number of comparison tons per month, 16,961.

New Companies

Empire Cobalt Mines, Limited, $3,000,000, Cobalt.

Cobalt Silver Bell Mines, Limited, $8,000,000.

The Cobalt-James Mines Company, Limited, $250,000, Toronto.

COMPANY NOTES

At the eighth annual meeting of the North Star Mining Company, Limited, held in Montreal on June 26th, a net profit of $27,000 was reported on the year's operations. The company's mines are situated near Cranbrook, B.C.

One hundred thousand shares of Cobalt-Foster treasury stock will be issued at 75 cents per share of one dollar par value. The allotments will be made on the basis of one share of new stock for nine of old, to shareholders of record of July 10th.

A writ has been entered against the firm of H. Harlan & Company and A. B. Harlan, of Toronto, by J. T. Eastwood. A court order is asked, to compel the defendants to account for all profits in connection with the Leith-Nipissing Silver Cobalt Mining shares.

The O'Brien Silver Mine of Cobalt paid the Provincial Government the sum of $116,000,546.31 on July 16th. This is the royalty due the Government for the quarter ending July 1st, 1907. The Government receives twenty-five per cent. of the total output of the mine at the pit's month.

STATISTICS AND RETURNS

The output of the Crow's Nest collieries for the week ending July 12th was 24,015 tons; daily average, 4,002 tons.

DOMINION COAL COMPANY.

Output, 1st to 15th July, 1907:—	Tons.
No. 1	20,230
No. 2	24,270
No. 3	15,240
No. 4	24,420
No. 5	19,030
No. 6	6,490
No. 8	10,810
No. 9	14,730
No. 10	4,250
	135,470

Ore shipments from the Cobalt camp for June, 1907:—

Mine.	Tons of 2,000 lbs.
Buffalo	143.72
Coniagas	778.10
Colonial	20.00
Drummond	22.04
Foster	20.00
Kerr Lake	47.00
LaRose	211.30
Nipissing	371.82
O'Brien	62.77
Right of Way	64.67
Silver Queen	62.29
Trethewey	110.85
*Temiskaming Cobalt	40.00
Total	1,954.56

Canada—230.18 tons, or 12.24 per cent.
England—40.00 tons, or 2.05 per cent.
United States—1,675.38 tons, or 85,71 per cent.
*Shipped from Haileybury.

Half yearly report of Cobalt camp for 1907:—

Shiping Mine.	Half yearly totals of tons.
Buffalo	539.18
Coniagas	1,431.41
Cobalt Central	77.33
Colonial	40.38
Cobalt Townsite	68.12
Drummond	22.04
Foster	70.18
Green-Meehan	90.39
Kerr Lake	125.10
LaRose	398.79
McKinley-Darragh	30.00
Nipissing	1,404.89
Nova Scotia	15.00
O'Brien	1,175.21
Righ of Way	67.27
Red Rock	20.00
Silver Queen	194.57
Trethewey	620.84
Temiskaming & H. B.	27.95
Temiskaming	27.45
Temiskaming Cobalt	59.91
University	30.69
Total	6,544.70

	Can.	Eng.	U.S.A.	Totals.
January	285.62	.....	703.51	989.13
February	162.69	15.00	703.80	881.49
March	194.72	1.90	830.97	1,027.59
April	160.54	19.91	352.70	533.15
May	194.31	.....	964.47	1,158.78
June	239.18	40.00	1,675.38	1,954.56
	1,237.06	76.81	5,230.83	6,544.70

Canada—1,137.06 tons, or 18.90 pe cent.
England—76.81 tons, or 1.17 per cent.
United States—5,230.83 tons, or 79.93 per cent.

Cobalt ore statement for the week of July 7th to 13th, 1907:—

July 8th, C.P., 4090, Coniagas Mine, American Smelting & Refining Company, Per Amboy, N.J., 62,000; $99.20.

July 8th, C.P. 56748, Coniagas Mine, American Smelting & Refining Company, Perth Amboy, N.J., 62,000; $99.20.

July 8th, C.P. 38742, Coniagas Mine, American Mining & Refining Company, Perth Amboy, N.J., 65,520; $104.82.

July 10th, C.P. 21794, Coniagas Mine, American Smelting & Refining Company, Perth Amboy, N.J., 65,690; $105.10.

July 11th, N.Y.C. 46953, Coniagas Mine, American Mining & Smelting Company, Perth Amboy, N.J., 64,000; $102.40.

July 10th, Soo 21524, Foster Mine, Canadian Copper Company, Copper Cliff, Ont., 52,000; $72.80.

July 11th, G.T. 8284, Buffalo Mine, Charles L. Dennison, New York, N.Y., 60,000; $96.00.

July 11th, L.V. 83038, McKinley-Darragh-Savage, McKinley-Darragh-Savage Manufacturing Company, Newark, N.J., 80,000; $128.00.

Grand Ttotals—511,210; $807.52.

British Columbia.—For the week ending July 6th the following shipments of ore were made in the districts named:—

	Week. Tons.	Year. Tons.
Boundary shipments	36,573	539,685
Rossland	5,988	138,983
Slocan-Kootenay	2,803	64,509
Totals	45,364	743,177

Granby, it is figured, will lose $598,170 as a result of the 3-cent-a-pound reduction in the price of copper. Calumet and Hecla will drop $3,000,000, and Amalgamated Copper no less than $6,000,000.

The following shows what the 3-cent reduction in the selling price means to each concern, as well as the earnings per share on 25-cent copper, and the loss sustained by each share on account of the price reduction.

	Red'n by 3c dec.	Earn per share.	Loss per share.
Cal. and Hecla	$3,000,000	$170.00	$30.00
Tamarac	420,000	25.00	7.00
Quincy	585,000	26.00	5.85
Osceola	557,654	26.00	5.80
Cal. and Arizona	1,124,109	30.00	5.62
Wolverine	290,451	30.00	4.84
Granby	598,170	18.00	4.43
Amalgamated	6,720,000	20.00	4.36
Mohawk	280,567	13.50	2,81
Copper Range	970,589	13.00	2.53
North Butte	985,977	15.00	2.46
Anaconda	2,848,915	12.00	1.85
Utah Cons.	556,019	12.00	1.85
Shannon	358,920	5.00	1.20
Butte Coalition	749,853	4.50	.75
Total	$20,046,224		av. $5.46

New Dividends

The directors of the International Coal & Coke Company have declared a quarterly dividend of 1 1-2 per cent., payable August 1st, to shareholders of record July 15th. This is an increase of 2 per cent. per annum over the former dividend, and means a disbursement of $42,000, or at the rate of $168,000 per annum.

METAL, ORE AND MINERAL MARKET

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—10 to 14 cents per lb.
Arsenic, white—7 1-2 to 7 3-4 cents per lb.
Barytes, crude—$11.25 to $14.50 per short ton.
Bismuth—$1.50 to $1.75 per lb.
Cadium—$1.40 to $1.46 per lb.
Carbons for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chronium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.
Corunaum—7 to 9 1-2 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$25 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Mlybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 to 50 cents per lb.
Platinum, ordinary metal—$26 per ounce.
Platinum, scrap—$20 to $21 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump, 10 1-4 to 11 1-2 cents per unit.
Quicksilver—$41 to $42 per 75 lb. flask.
Talc—$18 to $23.50 per ton.
Tungsten, pure metal—$1.25 per lb.
Tunsten ore, 60 per cent. pure—$400 per ton.
Tin—40 1-4 cents per lb.

MARKET NOTES.

Spelter.—Market is dull, despite lower prices. Now York 6.05 cents per lb.; London, £24 per long ton.

Lead.—The London market is weak, otherwise there are no changes of note. New York, 5.25 cents per lb.; London, £20 for Spanish lead.

Tin.—Tine is decidedly weaker. New York, 40 1-4 cents per lb.; London, £183 for spot.

Copper.—Reduction in prices has not encouraged business. The market stands, New York, electrolytic, 20 3-4 to 21 1-4 per lb.; lake, 21 1-2 to 22 cents; London, £94 for spot.

Silver.—July 5th, 67 3-8 cents per ounce; July 6th, 67 3-8 cents per ounce; July 8th, 67 5-8 cents per ounce; July 9th, 67 3-8 cents per ounce; July 10th, 67 1-4 cents per ounce; July 11th, 67 3-8 cents per ounce; July 12th, 67 1-2 cents per ounce; July 13th, 67 3-8 cents per ounce; July 15th, 67 5-8 cents per ounce; July 16th, 67 7-8 cents pe rounce; July 17th, 68 1-8 cents per ounce. Mexican dollars, 52 7-8 cents.

The ore receipts and lead contents in pounds from Hall Mining & Smelting Company's Slocan mines for the first five months of the current year are given below:—

	Ore.	Lead.
January	883,207	299,197
February	2,433,461	883,845
March	4,516,382	2,041,103
April	413,344	182,401
May	2,554,681	1,321,808

A mining deal that will mean a great deal for the development of the mining resources of the district around Port Arthur, Ont., has been closed. R. J. Anderson, of Minneapolis, has purchased from J. W. Andrews his lead property in Dorion Township, consisting of 316 acres. It is said to be very rich in lead. Mr. Anderson has had men at work for a week prospecting. It is the intention of Mr. Anderson and his associates to develop the property on a large scale. Already 20 men are at work mining ore and this number will be increased. Roads are being cut into the property from the railway track, and it is the intention to erect a smelter at the mine as soon as possible.

We have received from Merralls Engineering, Limited, 1123 Broadway, corner 25th street, New York, copies of their several catalogues. Merralls Engineering, Limited, have a factory in Ottawa, Ont. Hence, they are prepared to fill Canadian orders promptly. Their specialties are their stamp mills, described in this column recently, and the "Record" Vanner. Their six stamp mill (double three stamp battery) will handle 40 to 50 tons per day at approximately 20 horse-power. The "Record" Vanner has a new panning or jerk motion and a long, adjustable stroke. It makes a clean separation and a selective delivery of all mineral particles.