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CIRCULATION.

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CHRISTMAS.

The year that is just about to close has brought success to many a mining camp. From Nova Scotia to the Yukon we are receiving advices that warrant us in expecting largely increased annual outputs. Corporations and individuals have prospered.

The whole beauty of Christmas lies in bringing comfort and joy not only to the members of our own households, but to those whose ways are darkened with suffering and want. And no giving is more seemly, none brings more pure pleasure, than the giving that helps sick and suffering little children.

Our readers will notice in our advertising pages the plea of the Hospital for Sick Children. To the forceful eloquence of this plea we can add nothing beyond the statement that, in our belief, this is one of the noblest and most urgent of all humane institutions.

What better means of truly celebrating Christmas could be chosen by the mining committees of Ontario than in contributing according to their means to brightening the day for sick little children!

MONTREAL RIVER.

There is a discouraging risk attached to any honest expression of opinion about a mining prospect. The most promising surface exposure may lead to nothing. Riches may lie in wait for him who follows a most unlikely outcrop.

But there are prospects and prospects. For instance, in the Nevada goldfields it is not unusual to sink through hundreds of feet of rhyolite before striking pay ore. Knowledge of the immediately surrounding country makes such ventures commercially possible. And there are many analogous cases in the mining districts of foreign countries.

It is well, however, to re-emphasize the plain truth about the Montreal River districts. The most authoritative opinions—here we do not refer to those that are appended to borkers' advertisements—when boiled down agree in all vital respects. These points of agreement may be set out in a few sentences.

The new silver region is worth spending money upon. Several of the properties appear to have exceptional potentialities. The expenditure of money in opening them needs no justification. It is good business.

On the other hand there is not one jot or tittle of common sense in paying hundreds of thousands of dollars for unproved claims. A calm view of the situation reveals at once that there is no basis for such prices. Small quantities of native silver, "strong" outcroppings of calcite, are not mines. Their value is negative, and must remain negative until many dollars are spent in clearing

ground, building roads, and putting in mining equipment. Therefore, it is simply nonsense to talk of selling or buying mines in the Montreal River districts. Let the ardent investor remember that fancy prices are permanent burdens.

Again, when 25 per cent. of your investment disappears in the brokers' pocket, it is not to be gainsaid that only 75 per cent. remains for developing the prospect into a mine. Now, if the stock that you buy is labelled "treasury stock" there is a fair chance of some of your money being applied to the development of the mine. If, however, your company is taking up a page or half a page, or even quarter of a page in the daily papers, it means that you are contributing your quota to an advertising bill amounting in some cases to more than \$15,000 per month. This aids the pulp industry.

The happiest issue from your troubles as an investor (and perhaps the best in the long run) is to buy stock that is labelled promoters' stock, or is not labelled at all. You may then be morally certain that your money will not return to you after many days.

THE CONIAGAS MINES, LIMITED.

During the year ending October 31st, 1908, the Coniagas Mine, of Cobalt, Ont., yielded 1,444,229 ounces of silver at a cost of about 15.6 cents per ounce. Among the fortunate shareholders the sum of \$440,000 was distributed in dividends. There is still, as will be seen from the statement on another page of this issue, a healthy balance left over.

It is gratifying to note that the ore in sight is estimated as carrying thirteen million ounces. In other words there is approximately enough ore developed to maintain production for four years with the present annual output doubled.

There will be, sooner or later, substantial profits reaped from the Company's smelter at Thorold. The concentrating mill at Cobalt has passed through its bilious period. The production of power has been cheapened by means of a gas producer. The mine is in good condition. Twelve of the forty acres held by the company, have been partly developed at a relatively low cost. The deepest level is only 150 feet and we have the official assertive that there is no diminution at that depth of the silver tenor of the ore, which, apparently averages about \$230 to the ton.

We use the word "apparently" for due cause. The report, interesting as it necessarily is, leaves much to be desired. On account of the form into which the principal accounts are thrown it is impossible to determine anything but the total cost of all operations. The plans that accompany the report are clear and instructive.

The Coniagas Mines, Limited, as a corporation has made no appeal to the public. It has, from its inception, minded its own business efficiently. Its expanding operations mean employment for more Canadians and the addition of much clean money to the country's wealth.

SIR HENRY WILKINSON.

When, in the early "nineties" the Lake of the Woods began to attract men of all kinds and conditions, Lieutenant-General Sir Henry Wilkinson was already a picturesque integer of the group of mining men that foregathered at Rat Portage. His mine, the Regina, was one of the producers. However, it produced gold at a prohibitive cost.

Through thick and thin, through good report and evil report, Sir Henry stuck to his mine. Manager after manager failed to make it pay. Sir Henry, with that singular British admixture of tenacity and impracticality, stuck to his guns. We believe that his faith in his mine never waned for a day or an hour.

Sir Henry died at Kenora a few weeks ago. He will be sincerely mourned by all who know or had to do with him. A courteous gentleman, he was above reproach in all his dealings.

But his life was given a deeper color by the consistent frankness with which he professed and followed the teachings of the Christian religion.

Lieutenant-General Sir Henry Wilkinson fought a losing fight, with not one thought of surrender. He fought cleanly and he fought steadfastly. What higher praise can any man merit!

RESCUE APPARATUS IN SICILY.

The use of breathing apparatus is every day becoming better known. In March, 1908, the Testasecca sulphur mine in the province of Caltanissetta, Sicily, developed a dangerous fire in the third level in a section where the sulphur ore was particularly rich. The usual course was to seal hermetically a part or the whole of the mine and wait for weeks or months until the fire died out. In this instance, however, although there was a delay of three weeks in waiting for the apparatus, it took only three days to extinguish the fire.

The rescue apparatus used was of the Westfalia type. It was reported upon as being satisfactory except for the effect of the heavy fumes of sulphur dioxide upon the more sensitive parts. It will be admitted, however, that a test of this sort in a deep sulphur mine is about as searching a trial as can be imagined.

THE BOUNDARY DISTRICT.

Within the past nine years there have been more than seven million tons of ore shipped from the mines of the Boundary District, British Columbia. This year's shipments, amounting on November 21st to 1,274,966 tons, exceed the total for the year 1907.

The largest individual contribution to the grand total of seven million tons is the Granby Mine of the Granby Consolidated. This mine shipped 65 per cent. of the total. Next in order comes the Mother Lode of

the British Columbia Copper Company, which has 20 per cent. to its credit.

It is most encouraging to be able to record largely increased mine outputs for the current year.

THE SKEENA RIVER DISTRICT.

Northern British Columbia is a country of vast distances and of rich promise. Of both the mineral and

the agricultural possibilities of a great part of the immense region drained by the Skeena River, but little is known. What scant knowledge we have, however, indicates that there is room here for a whole generation of prospectors and settlers.

Mr. J. C. Gwillim's article, which appears in this issue of the Canadian Mining Journal, we commend to that restless brotherhood whose members are now and always searching for pastures new.

SKEENA RIVER DISTRICT.

By J. C. Gwillim.

The journey from Vancouver to Port Essington, or Prince Rupert, takes from forty to fifty hours. The trip is made on any of the many boats now calling in on their way to more northern ports. It is a voyage without a parallel in the world—so sheltered from the main Pacific ocean that there is seldom any seasickness. For half the way the eastern shores of Vancouver Island are followed quite closely, a scene of mountains, green islands and glittering seas, or arms of the sea, in every direction. Even now this passage presents an almost continuous succession of steamboats, far apart, but in the days to come, when this desirable land is peopled, and the fisheries, timber, farming lands, and mines are fully developed, there will be a sea-going traffic through these waters which may be greater than that of the Great Lakes at the present time.

Nearly all this traffic at present passes through Seymour Narrows, a channel that may some time be bridged. Through this passage go all the Alaskan boats and fishing boats, also the new traffic between Prince Rupert and Vancouver.

After passing Vancouver Island the land and sea features change considerably. There is the same intermixture of land and water, but the land is more precipitous, and is clothed with a less generous tree growth. There is a general absence of soil; the nakedness of the hilly islands seems only clothed with moss and smaller trees; the beach is a water-mark on the rock which dips steeply into the sea, or a ragged reef-ribbed shallow.

Port Essington and Prince Rupert are both built on uneven, rocky lowlands. Everywhere there seems to be an absence of alluvium or soil; rain, rock, moss and wet beach impress one in the region round the mouth of the Skeena.

The Skeena, like the Fraser, drains a great district from the interior of British Columbia and descends swiftly through the Coast Ranges, but unlike the Fraser has practically no delta. The valley, even at tide water, is comparatively abrupt and narrow. The only flats are narrow, marginal strips, or island bars, covered with great conifers and cotton woods.

Until the present time of Grand Trunk Pacific construction, the Skeena has been the highway only of Indians, Hudson Bay Company boats, and placer miners.

Although the Hudson Bay Company has for years operated steamboats on this river for a distance of 170 miles, from Essington to Hazelton, it is no light undertaking to make the trip.

In Volume III. of the Canadian Mining Institute there is a paper by E. C. Musgrave upon "A Prospecting Trip in Northern America." Mr. Musgrave went to

Hazelton by the old steamer Caledonia (now on the bars of the lower river). The trip up the river, 170 miles, took about three weeks. One week was spent tied up to the bank waiting for the water to rise, the rest of the time in fighting the swift water, with much warping in the worst places.

Midway between Essington and Hazelton is Kitsalas Canyon, a narrow, crooked and short little jagged pair of passages, through a low rock obstruction. A water gauge at this place indicates when it is safe to make the passage, and often boats await the proper conditions of water level for many days.

Our own trip up the Skeena in August last was a lively one. We were hardly over three days from Essington to Hazelton. Construction of the railway is proceeding at many points along the lower portion of the river. The railway follows the narrow marginal flat, or cuts through bold rock promontories which are a part of the steeply rising ranges on that side of the river.

Much of the work of this first 100 miles out of Prince Rupert will be heavy and costly, with little local support after building.

Further up the river there are raised benches of greater extent and less rainfall. Much of this valley is said to belong to a wood pulp concession, and a considerable amount of the most desirable bench lands is occupied by Indians. Nowhere in Canada, perhaps, is there a main highway and its traffic so largely influenced by its Indian population—a somewhat jealous people, also, who do not regard the changing order with much satisfaction.

Arrived at Hazelton, one finds it is a point of dispersion for other more remote places. Although it has been for so long the starting point, and finishing point, of overland journeys to the interior, there seems to be no organized transportation.

The chief means of travel is with pack-horses. These may be hired from the many Indians who traffic in horses and freight throughout the district.

Hazelton is hardly the centre of a productive district; it is more like the funnel entry to the Pacific coast from a great interior region full of possibilities in the agricultural and mining industries.

From Hazelton one can go northwards up the Kispox and Skeent Valleys and into that little known land towards the Yukon; eastwards one hundred miles to the placer camps of Omenica; and beyond it, to the north, are the new Ingenica placers. South-eastwards is the Bulkeley Valley, on the route of the railway, and further south and east the wide belts of agriculture land in the Nechaco and other districts.

Concerning the agricultural possibilities of this region,

it may be said that the valleys appear eminently fitted for any crop where leaf or blade is chiefly required. Roots also do well. The natural vegetation is a matter of astonishment and also, sometimes, of vexation. No frost had damaged anything at Hazelton on Sept. 10th last, when we left.

Concerning the mineral resources, the district is one of great distances, and not yet much prospected excepting a few camps on the Telkwa river, which lies 60 to 80 miles south of Hazelton. Although the district or region as a whole is much easier to get about in than Kootenay, it has only a few trails and few inhabitants, all of whom are a long way from cheap and ready supplies. The main discoveries so far have been in the Babine mountains, 60 miles south of Hazelton, and in the Telkwa river basin, 60 to 80 or 90 miles south by trail from Hazelton. Every pound of supplies is packed in to these places which makes operation a costly and troublesome business.

Although this district has been more spoken of as a copper-bearing district, there are many widely scat-

tered occurrences of silver-lead ores, such as those of Milk Creek, Hudson Bay Mountains, Babine Mountains, and at points on Skeena River above Hazelton, also in Omenica. These places are far apart, and they indicate, at least, a very wide mineralization, and a large enough field for a great number of prospectors.

The copper deposits are of two main types, a large low grade chalcopyrite type in or about dykes, and a small fissure like type of bornite or chalcocite ore.

None of these are within, at present, a reasonable reach of transportation and very little is being done, or likely to be done, until the main-line of railway is built, and there is a further influx of population in the way of miners and prospectors.

Concerning the coal and mineral resources generally, and the geology of the Telkwa country, much information will be found in the summary reports of the Geological Survey for the last two or three years.— (Reports by W. W. Leach, and in the reports of Mr. Robertson, Prov. Mineralogist for British Columbia.)

THE MINING OPERATIONS OF THE DOMINION COAL COMPANY.

ARTICLE III.

By F. W. Gray.

The Harbour Seam.

Next in importance to the Phalen Seam in the Glace Bay Basin ranks the Harbour Seam, so-called from the fact that it crops out in the shore of Glace Bay Harbour and was first worked there. It appears to have been one of the first seams to be mined after the General Mining Association relinquished their monopoly in 1858, and it seems to have been more extensively worked than the Phalen Seam for several years after this. Mr. Richard Brown in his "History of the Coal Fields of Cape Breton" states that the seam was opened in the spring of 1858 by Mr. Archbold, who drove levels in from the shore both at Glace Bay and Bridgeport and shipped the coal to vessels lying at anchor in the open Bay by means of scrows.

Previous to the formation of the Dominion Coal Company the most extensive workings on the Harbour Seam had been carried on by the Glace Bay Mining Company, who owned a small but strategically valuable area that took in the whole of the outcrop of the Hub Seam, a large portion of the Harbour Seam and the shores of Glace Bay Harbour, or rather what was then, as Mr. Brown describes it, "the long, narrow pond at the head of Little Glace Bay." The present harbour is almost altogether artificial. It was dredged out in the first instance by the Glace Bay Mining Company, who built the entrance piers, and are stated to have spent over \$110,000 previous to 1886 in forming the present harbour, which, as the successors of the Glace Bay Mining Company, the Dominion Coal Company now own.

During the past few years the harbour has been still further improved by dredging, and new range lights and buoys have been provided by the Dominion Marine Department.

It is interesting to note that the amalgamation of the two companies working the Harbour Seam in the Glace

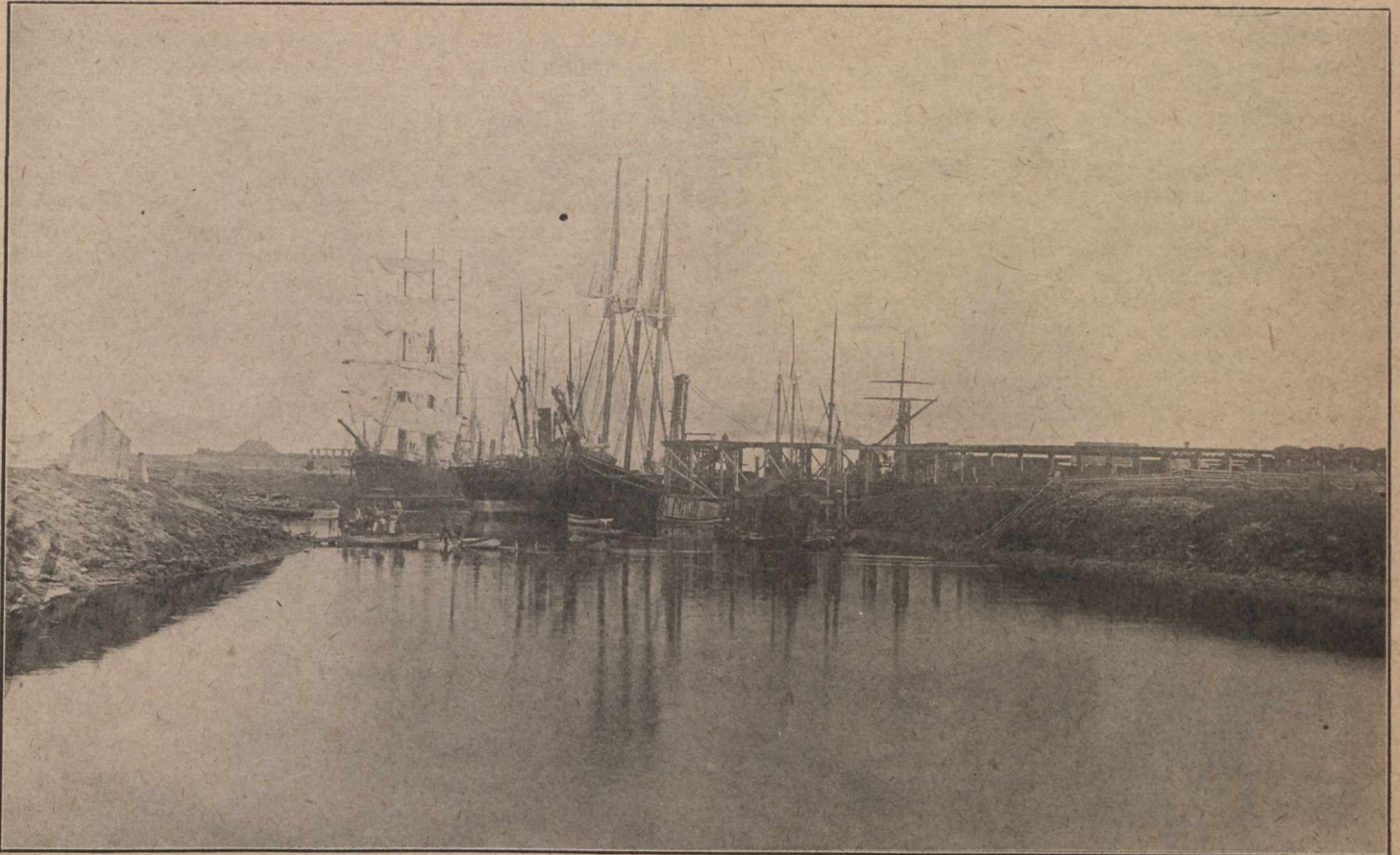
Bay Basin, gave the present company some of their most valuable properties; namely, the key to the submarine coal field at Table Head and Glace Bay Harbour, the International Company's railway to Sydney and shipping facilities to Sydney Harbour.

The seam averages about 5 feet 6 inches in thickness. It yields a hard coal having a high percentage of volatile matter and a comparatively small percentage of ash, which renders it especially suitable for gas-making purposes. Almost immediately above the coal there is a thick bed of sand-stone with shale platings and numerous vertical joints. A certain amount of surface drainage percolates into the layers and flows down the vertical joints, for which reason the Harbour Seam is a little wet in the land area.

The Glace Bay Mining Company sunk a shaft near the shore of the Harbour about forty feet deep, and shipped their coal directly out of the mine car into vessels at the wharf. In 1876 two shafts were sunk about half a mile to the deep of the first shaft, reaching the Harbour Seam at 240 feet and known as the Stirling Shafts. The Harbour Seam was worked from these shafts until the property was taken over by the Dominion Coal Company, who closed the mine in 1895 and allowed it to fill with water. The Stirling Yard is now used as a storage yard for lumber, equipment and general stores used by the Construction Department. During its life about 2,000,000 tons were extracted from the Stirling Mine.

The entire output of the seam from 1858 to the present time is eight and three-quarter million tons, of which quantity five and one-quarter million tons, or 60 per cent. of the whole, has been mined under the present management since 1893.

The two mines at the present time operating on the seam are International Colliery, now known as No. 8,



Glace Bay Harbor 20 years ago. Shows the old Caledonia Pier, and in the distance the Pier of the Glace Bay Mining Company, looking seaward.
Photo loaned by Mr. C. H. Rigby.



Glace Bay Harbor, 1908. Showing Schooner Loading Pier and Shores of Pit Timber, looking seawards.

and No. 9 Colliery which is worked to the same shaft as the Phalen Seam at No. 2.

Dominion No. 8 (International).

The International area was first opened up by shore levels in 1858, as previously mentioned. In 1863 the property was acquired by New York people, who formed the International Coal & Railway Company. This company constructed a railway from the mines to Sydney. The present structure of No. 1 International Pier at Sydney was built by the Dominion Coal Company on the original cribs of the pier first constructed by the International Coal & Railway Company.

Since its commencement the mine has put out 4,600,000 tons, of which quantity 2,800,000, or 57 per cent., has been produced since the property came into the

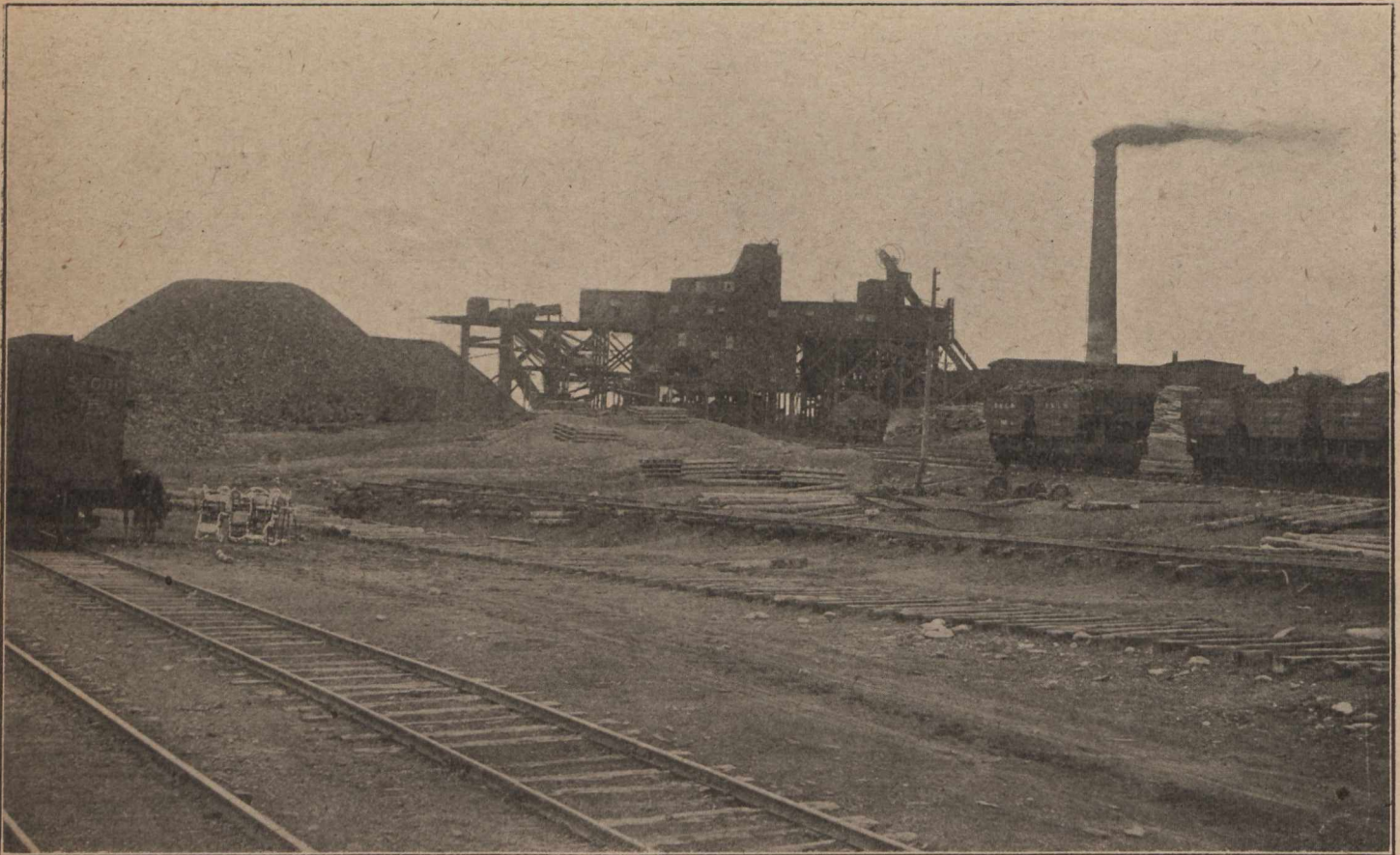
emptied at the screens and returned to the cage. At all the other shaft mines, the dumping cage and end-door mine, cars are used, and the cars do not leave the shaft. The workings are ventilated by an 8-foot fan.

The coal is cut entirely by hand and no machine mining whatever is done.

Although no gas is to be found in No. 8, Marsaut safety lamps are used as a precautionary measure, having been used since 1907. The mine employs about 400 men and has about 50 horses

Dominion No. 9.

The arrangements of this mine, exclusive of the underground workings, were described in conjunction with No. 2 Colliery. The territory at No. 9 is largely



Dominion No. 8 Colliery (International), Harbor Seam.

hands of the Dominion Coal Company. The output at the present time is about 1,000 tons per day.

As is to be expected at such an old colliery, the equipment of No. 8 is not so large nor so modern as at the newer mines. The power consists of one 212 H.P. and one 318 H.P. Babcock & Wilcox boilers, and two old return tubular boilers of 75 H.P. each. The smoke-stack is of brick, 100 feet high and five feet in diameter. There is also a steel stack 70 feet by 3 feet 6 inches diameter. The old hoisting engine is the one originally put down, and is a 16" x 32" horizontal duplex reversible slide valve engine with a drum 8 feet 9 inches in diameter. The shaft, which is the one originally put down, is only 80 feet deep, and with the exception of the Emery Shaft it is the only one of the coal company's mines that has the ordinary rectangular English type of coal cage. The mine cars are run out of the cage at bankhead level,

submarine, but except in this particular the seam differs in no way from that at No. 8. The accompanying plan will give an idea of the arrangements at the pit bottom, and shows the five compartments in the No. 2 shaft. The pit bottom is walled with concrete and supported by I beams, in the same way as the No. 2 pit bottom described previously. The coal is hoisted by the ordinary dumping cage, and is well sorted on picking belts.

For haulage purposes underground, three Porter compressed air locomotives are in use, of the following dimensions: 7 x 12 inches, 4 wheels, 7 tons; 7 x 14 inches, 4 wheels, 10 tons; 10½ x 14 inches, 4 wheels, 15 tons.

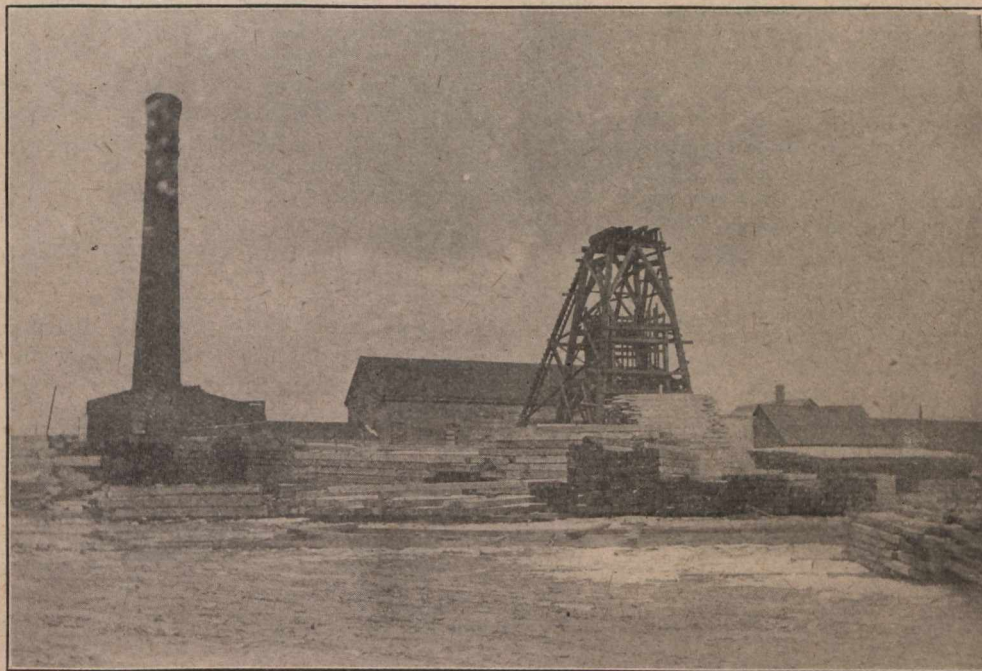
The coal is all machine cut. The output of the mine is from 35,000 to 40,000 tons per month. It employs about 550 men and has 60 horses.

Pumping.

The water from International Colliery was formerly dealt with by steam pumps which discharged through boreholes at a point midway between the shaft of International Colliery and No. 2 Colliery and adjoining the line of the Sydney & Louisburg Railway. Two boilers were situated here and the steam was conveyed underground by a borehole. In 1906 it was decided to replace this plant by a water shaft and an electrically operated hoisting engine. A shaft was sunk 8 feet by 12 feet 6 inches, and was finished at the beginning of 1907. The coal was reached at a depth of 344 feet, but the shaft was continued to a depth of 370 feet for sumpage. The electric water hoist, which is operated by power from the Central Electric water hoist, which is operated by power from the Central Electric Plant at No. 2 Colliery, was made by the Allis Chalmers Bullock Co. It is driven by a 300 H.P. phase motor, 550 volts, 25 cycles, speed 720 revolutions per minute. There are two water tanks of 800 gallons capacity. The height of the lift is 340

One of these papers is by A. E. Barlow, and is entitled "The Origin of the Silver of James Township," and the other is by R. E. Hore, on "Cobalt-Silver Ores of Northern Ontario."

Unfortunately both papers are rather too technical in character and diction to be thoroughly enlightening to the ordinary prospector or miner. Nevertheless the following points are enunciated, namely: That the silver-bearing veins are closely associated with intrusive masses of quartz-dabase; and that these intrusives are in the form of laccoliths, injected more or less horizontally, into older rocks, though the former author seems to have forgotten this at times, or possibly there is some uncertainty in his mind on the point, for he speaks of the diabase in one place as a "batholitic mass," and in another place he refers to the "profound fissuring of the diabase," a phrase which could only be appropriately made in reference to a laccolith, if it were of very great thickness.



The Old Stirling Mine. Yard now used as a Storage Depot for the Construction Department.

feet; hoisting rope $1\frac{1}{4}$ inches diameter; hoisting drum 7 feet by 4 feet.

At Dominion No. 9 Colliery there has been, up to the present, a comparatively small quantity of water, but as the workings extend and the pillars are drawn the quantity of water will doubtless become larger, and it is proposed to install an adequate pumping plant very shortly.

MINERAL VEINS IN THE MONTREAL RIVER DISTRICT.

In Volume II. of the Journal of the Canadian Mining Institute, which has just recently appeared are two papers on the above subject which are of especial interest at the present time, when an army of prospector is rushing northward from Cobalt into the Montreal River District and beyond, and active development work on an extensive scale is about to be undertaken on a large number of mining properties where native silver is known to occur.

In addition to the above statements Dr. Barlow's conclusions are as follows:—

"The rock (diabase) is more highly quartzose than usual.

"The presence of the veins is due to a profound fissuring of the diabase itself, formed probably as a result of the contraction of the rock in cooling, the resultant cracks and cavities being occupied in many cases as fast as they were formed by the later, more acid and hydrated segregations from the same diabase.

"The veins in their simplest forms of development are, therefore, essentially of pegmatitic type, although some of the more complex types and those at the other extreme made up almost wholly of calcite or quartz show little or no evidence of such an origin.

The material of the veins is a diabase-pegmatite usually containing calcite.

In order of formation the principal gangue minerals are feldspar, calcite, quartz.

All the gangue minerals appear to have been derived from the surrounding diabase.

The native silver is not only present in association with these gangue minerals, but is common in the diabase forming the wall rock.

It is rather unfortunate that more exact descriptions of some of the veins are not given, for the impression that these statements leave in the minds of the readers is undoubtedly that the veins are more or less simple and homogeneous, being composed of pegmatite (locally known as "Aplite"), which grades off by decrease of feldspar into calcite and quartz. This, however, is quite different from the conditions which are found to prevail on the ground. When pegmatite is present the veins usually have a distinctly composite structure, one side being composed of pegmatite and the other of calcite, with a fairly sharp line of demarcation between them, although instances may possibly occur where this line is not well defined.

In Mr. Hore's article the principal conclusions drawn by him are as follows:—

"The diabase occurs in most cases in the form of large sills, a few hundred feet in thickness, lying nearly horizontal and parallel to the bedding of the Huronian sediments."

"The Cobalt ores have been deposited from solutions which followed the formation of veins of aplite (pegmatite) in the diabase. Owing to the fact that in the silver deposits in the district the silver minerals are intimately associated with cobalt minerals, the silver is believed to have the same origin."

It is also suggested "that the metallic sulphides and arsenides have been concentrated from the diabase magma by extreme differentiation."

This last statement is distinctly at variance with the preceding one, which states that the ores were formed subsequent to the pegmatite, the last of the aqueous rocks now seen at the surface to consolidate from the fluid condition. With the exception of the presence of sheets of pegmatite occupying parts of the same fissures with them, the veins are similar to those

in the diabase in the vicinity of Cobalt, which have been formed by deposition from aqueous solution. Evidence is entirely lacking to prove that the ores in them have separated out by any process of magmatic segregation from a fluid diabase magma. Any assumption that such is the case is, in my judgment, quite unwarranted.

There can be little doubt but that the fissures in which the silver-bearing veins occur have been caused, as in the Cobalt district itself, by the shrinking of the quartz-diabase or adjoining rock as it cooled and solidified, these fissures being usually normal to the general surface. In some cases they extended to the still molten interior or lower portion of the mass of the quartz-diabase, and allowed this liquid rock to rise up through them, and form narrow dikes.

Thus the dikes were formed after the surrounding diabase had solidified, but while it was still very hot.

As the diabase continued to cool and contract either the fissures in which the dikes of pegmatite had been formed were reopened, or altogether new fissures appeared, and then, and not till then, the mineralizing solutions invaded their fissures and deposited the ores with the calcite gangue, not only in the fissures themselves, but in minute crevices, both in the surrounding quartz-diabase and in the more brittle pegmatite.

It would be better not to speak of these pegmatite (aplite) dikes as "veins," as if they were definite parts of the gangue, the same as calcite and its associated minerals. Nevertheless, the pegmatite would appear to have a distinct significance in defining the positions of the most important fissures, and those which may reasonably be expected to persist to the greatest depths. Thus while it is not directly connected with the origin of the silver ores, any more than the surrounding quartz-diabase itself is so connected, it is an indication of the existence of fissures which extend to considerable depth, and in which ores are likely to be found in greatest quantities.

J. B. TYRRELL.

THE SHALE OIL INDUSTRY OF SCOTLAND.*

R. D. STEUART, F.I.C.

Nature of the Industry.

Shale is mined in much the same manner as coal, and after being broken into small pieces by machinery, is distilled in retorts and gives as products crude oil, ammonia water and fuel gas. The crude oil extracted from a ton of shale varies from 16 to 35 gallons, and the ammonium sulphate 30 to 70 pounds. The refined products of the crude oil are spirit or naphtha 4 per cent., burning oil 33 per cent., gas oil 7 per cent., lubricating oil 20 per cent., solid paraffin 10 to 12 per cent.

The manufacture is allied to the great petroleum industry; only, instead of obtaining the crude oil by boring for it and applying pumps where necessary, as in the United States, Russia, and elsewhere, the shale has to be mined at much expense and retorted to procure the crude oil. The rapid and violent method of the retort gives a much coarser crude oil than the gentle age-taking processes of nature used in creating petroleum; so that besides the extra expense in producing the shale oil there is extra difficulty and expense in refining it. Petroleum often requires only one distillation as far as

lamp oil is concerned, and after a slight treatment with sulphuric acid and soda it is ready for the market. The burning oil from shale requires three or four distillations and chemical treatments, and the proportions of chemicals required is heavy. One advantage that the repeated distillations give is the opportunity afforded for making better fractionated and more homogeneous products.

In a petroleum refinery the stills, being very large, are few and there is not much plant to be seen, the tanks being often under ground. In a Scotch oilworks there are the great benches of shale retorts sometimes over 60 feet high, with the great stacks of numerous series of 3-inch pipes, 30 or 40 feet high for air condensers. There is the 3-story high sulphate of ammonia house, with its high column-stills, the acid saturators for the ammonia, vacuum or other evaporator for the sulphate from the recovered sulphuric acid of the refinery, centrifugal driers, storing bins, grinding mills, etc. In the refining department the stills are small and, on account

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wood cannel seam was from six to six feet thick, of a limited basin-shaped area, and it thinned at the edge. All have been stopped for many years. When American petroleum was imported in large quantity the prices of products fell, the richer cannel coals were used for gas making, and the bastard paraot coals and shales of the Coal Measure, both in England and Scotland ceased to be mined; so that for many years now the manufacture has been confined to the shales of the calciferous sandstone (see p. 587).

Locality of the Industry.

The locality of the industry may be appreciated from the map, Fig. 53.

The middle of the shale fields lies thirteen miles due west of Edinburgh. It is a strip of country five to eight miles wide, stretching from the shores of the Firth of Forth north of this point southward for sixteen miles. It passes through the counties of West Lothian and Mid Lothian and ends within the borders of Lanarkshire, near the western termination of the Pentland Hills. It contains the shale working districts of Dalmeny, Philpstoun, Winchburgh, Uphall, Broxham, Mid-Calder, West Calder and Tarbrax. The accompanying map shows the

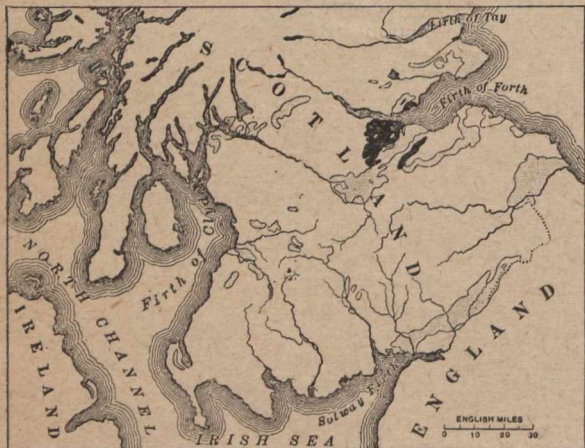


FIG. 53. Map of the south of Scotland, with calciferous sandstone shown darkened and the shale field black.

location of the district and also of the areas of the calciferous. Oil shale beds are found, although not at present worked, in a narrower strip farther east, and not long ago there was an oil work on it near the village of Pentland. A limited continuation of this band is found beyond the Forth in Fife at Burntisland and here also an oil works was in operation fifteen years ago or so. These districts may yield some oil shale in the future. The accompanying section, Fig. 62, page 594, shows the structure of the West Calder shale field. A series of columnar sections at different points is given in Fig. 54, page 579.

History.

The first oil work starting in 1850, there were about 6 in 1860, 90 in 1870, 26 in 1880, 14 in 1890, 9 in 1900, 7 in 1908.

The first government statistics of shale were taken in 1873, 23 years after the start of the manufacture. We give the annual output in Scotland, and, for the sake of space, selecting only every tenth year, for comparison.

1873	524,095 tons shale
1883	1,130,729 tons shale
1893	1,947,842 tons shale
1903	2,009,265 tons shale

Although the number of works was reduced the total production was kept up.

Soon after 1860 American petroleum was imported in large and increasing quantities. At first only lamp oil was imported and the Scots modified their retorts and heats to get a larger proportion of the heavier products. They bought petroleum residuum from America to refine into lubricating oils. Soon the Americans took up the refining of heavy oils for themselves and flooded Britain with it also, and the Scots improved their freezaffin plant to get more solid paraffin. Soon also solid paraffin was imported in large quantities, and now the retorts were lengthened and suited for increasing the production of sulphate of ammonia. Peruvian guano had long been used by the British farmer as an important source of combined nitrogen. By 1880 it began to become exhausted and the price of sulphate of ammonia rose as high as £24 a ton. This put new life into the industry followed by over-production; also the increased import

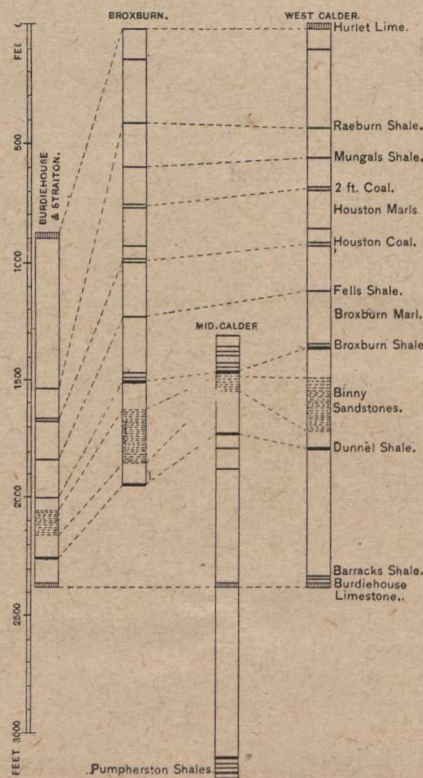


FIG. 54. General section of the West Calder shale field and carboniferous limestone series to the west. (After H. M. Caddell, *Geology of the Oil Shale Fields of the Lothians.*)

of nitrate of soda had by 1890 lowered in large quantities by iron works, coke ovens, Mond gas producers, etc., besides combined nitrogen being made from the atmosphere by electrical means, and although America has harnessed Niagara for that purpose, nevertheless, on account of the increasing demands for nitrogenous fertilizers the price of sulphate has for some years kept up to £12 a ton. There has been keen competition also in later years with petroleum products from Russia and Roumania, and solid paraffin from Galicia. The Scottish industry still manages to exist and some companies to pay a handsome dividend. The price of burning oil during the fourteen years of Young's patent was about two shillings and sixpence a gallon; for many years now the price has been about sixpence.

This history of this war of competition records many defeats, many casualties. Every new move of the competitors swept many oil works out of existence. Every

new step forward in retorting or refining would bring a temporary hopefulness and new works would start, soon again to be stopped. During the 57 years of the existence of the industry 120 different works have been thus started and stopped, some without ever paying a dividend. Much capital has thus been permanently lost. The companies that have kept in existence have succeeded in doing so by improving methods and plant, but principally by increase of size enabling them to cheapen production by concentration.

Retorting and Refining.

There has been great variety in the form of retort and of condenser tried by the numerous works. The first retort used by James Young was a horizontal one of cast iron, of the shape and size then used for gas-making (see Fig. 55). Horizontal retorts were used by others in many sizes and shapes; but Young very soon adopted a small vertical retort of circular section, which was luted into a water trough below, from which the spent shale was drawn in small quantity every hour (see Fig. 56). By and by it was fitted with a bell hopper on top, which was charged every hour, alternately with the drawing every half hour. Soon also steam was injected at the bottom and found to be a great improvement both for quantity and quality of the crude oil. Several retorts were heated by one coal fire and, being dependent on the care of men, they were often over-

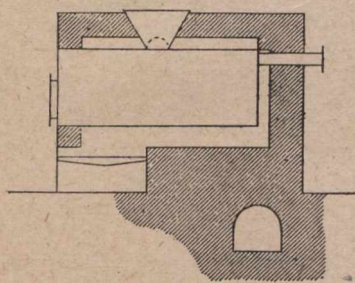


FIG. 55. Horizontal retort.

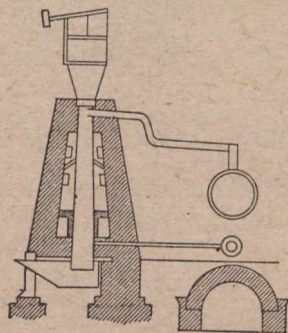


FIG. 56. Old vertical retort.

heated, which spoiled the crude oil and destroyed the retort. The distillation was upwards. The steam helped to diffuse the heat through the mass of shale and to sweep the oil vapors rapidly out of the heat, where the valuable solid paraffin and heavy oil tend to deposit carbon and become decomposed into lighter products. The vertical retorts were increased in size, and oval and other forms were adopted. Some were tried with internal combustion and limited inlet of air but were not successful. William Young tried a double casing, ensuring the gentle heat best for a good crude oil, producing heavy products, solid paraffin and decreased loss in refining. It showed how much could be done in improving the crude oil, but otherwise was a failure.

In 1873 N. M. Henderson invented a retort which, besides giving with precision the gentle heat wanted, also used the spent shale as fuel and thereby reduced the cost of manufacture. Four retorts were erected in one oven over the one furnace; and the spent shale, with its 12 per cent. of fixed carbon, was dropped from each in succession at four-hour intervals and supplied with a limited amount of air; each retort being emptied and recharged every sixteen hours. Steam was superheated in pipes placed in the retort ovens, and the incondensable gases of the distillation were burned in the oven. The very best crude oil was made by this retort, and the ammonia was also slightly increased.

The modern type of retort was the invention of Geo. T. Beilby and William Young, in 1881. By it the ammonia was doubled or more, and much fuel gas was produced. Four metal retorts were connected with a large hopper above (see Fig. 57) common to the four. The distillation was upwards through the cold shale of the hopper where the crude oil was condensed and redistilled. Each retort had an iron upper part where the oil was distilled from the shale at a low temperature.

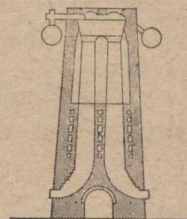


FIG. 57. Young and Beilby retort.

The shale was passed down through the lower part made of firebrick, where it was subjected to as high a temperature as possible without fusing, and acted on by steam. The nitrogen was partly converted into ammonia, and the carbon into producer gas. At intervals in the bench of retorts there was one for coal to act as a gas producer to supplement the retort gas, and the ammonia from it was also saved.

The retorts now in operation are on the Young and Beilby principle. I may mention as examples the Bryson retort (see Fig. 58) and the Henderson retort (see Fig. 59). The Bryson is of circular cross-section, the Henderson oblong. Both are continuous working. In the Bryson there is a table below to support the column of shale, with a revolving arm to take the spent shale from the table and keep up the slow movement downwards. In the Henderson the same result is brought about by the slow motion of two toothed drums. Henderson increased the length greatly, and, with an ordinary shale the retort makes more gas than it requires for its own use. From ground level to top of hopper is 63 feet, and 15 tons of shale are in a retort at a time. The metal part of retort is 14 feet long and 2 feet 9 inches by 1 foot 3 inches at the top. The brick part is 20 feet long and 4 feet 8 inches by 1 foot 10 inches at bottom. The throughput per day is four to four and one-half tons of shale.

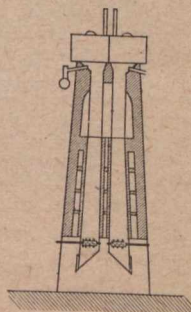


FIG. 58. Henderson retort

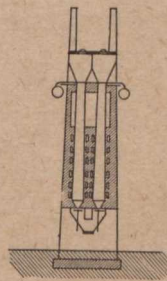


FIG. 58. Bryson retort.

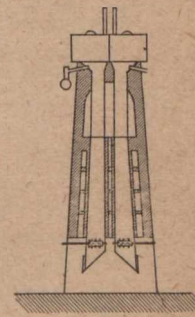


FIG. 59. Henderson retort.

The distillation of the ammonia water is much the same as in large gas works. A large works may turn out thirty tons of sulphate of ammonia per day.

The refining consists of distillations and treatments. The distillations separate the various products from each other by boiling at different temperatures; and the continuous-working, connected-still system of N. M. Hen-

derson is in general use. The chemicals used in the treatments are oil of vitriol which separates a black tar, and caustic soda which also separates a black tar. Distillations and treatments are repeated several times. The amount of oil of vitriol used is about three to four per cent. by volume on the crude oil.

The heavier oils are first cooled naturally and further by freezing machine, and the solid paraffin separated by filter presses, and, generally, further pressed by hydraulic machinery. Both types of ammonia freezing machine are in use, viz., condensed gas and solution. The solid paraffin is refined by sweating, and Henderson's patented method is in use in all the refineries. A little is refined by naphtha pressure. A treatment with cyanide char and filtering through paper is the finishing process.

The cost of mining of the shale varies very much according to the circumstances from 3 to 6 s. per ton. The retorting of the shale costs 1/6 to 2/ per ton. The refining of the crude oil costs 3/4 d. per gallon of crude oil. The lordship charged by the proprietor of the soil is 3 d. to 10 d. per ton of shale. The stirring tanks for the chemicals do not attain the magnificent sizes of the American refineries, the largest being about 40,000 gallons.

Geology.

The Torbanehill or Boghead Mineral.

This was the first mineral used by Young, Meldrum, and Bingley. It was found in a small basin a little to the southwest of Bathgate, two or three miles in diameter; and nowhere else in the United Kingdom.

It may be described as consisting of 20 to 30 per cent. of clay mixed with 70 to 80 per cent. of carbonaceous matter. This is insoluble in benzene, turpentine, carbon bisulphide or petroleum spirit, and is therefore not of the nature of petroleum or bitumen, although it gives petroleumlike products by destructive distillation at 700° or 800° F. The mass of carbonaceous matter seems without structure, and the fossils were found throughout the bed and not merely on the surfaces of seams, as is general with coal. It contained impressions of *Sigillaria* and *Stigmaria*, and the few inches of fire clay below it contained *Stigmaria*, the *Sigillaria* sometimes proceeding upwards through the torbanite in its natural position when living. There are no fish remains, although these are generally found in Scotch cannel coals. The microscope sometimes showed the scalariform tissue of tree ferns, also the spores of ferns in clusters. Torbanite is no doubt the remains of organic matter in its original position and not a product of distillation, as some have suggested; a distillate would have been soluble in petroleum spirit. Renault considers both torbanite and oil shale to be mainly alteration products of masses of gelatinous fresh-water algae from which oxygen has been eliminated, and containing immense numbers of bacteria, especially micrococci. In cannel coals the prevailing vegetable constituents are spores of cryptogamic plants, algae being rare and in many cases absent.

The Torbanehill mineral is of a brown or nearly black color; there were brown and black varieties, and the brown was the richer. It had a yellow or fawn-colored streak without lustre, and subconchoidal fracture, was amorphous, and apparently homogeneous when fresh, but showed distinct stratification when spent in the retort. It was very indestructible and did not deteriorate with weathering. Near basalt dykes it became soft, sticky, and brown, resembling melted india-rubber. In the laboratory it takes fire readily when put to a flame, splits,

does not fuse, burns with a very smoky flame, giving an empyreumatic odor, and leaving a considerable amount of white ash.

The crude oil taken from it was 90 to 130 gallons per ton; sp. gr. about .890. It was richer in the east part of the field than the west, and it deteriorated somewhat with depth. It yielded 44 to 48 per cent. of crude oil and 1 to 1½ per cent. of solid paraffin. It has been analyzed by many chemists.

Heated in a close crucible the mineral gave (Dr. Fyfe):

67 to 70 per cent. volatile hydrocarbons, 6.6 to 16.3 per cent. fixed carbon, and 12.8 to 23.2 per cent. ash.

The following analysis is by Anderson:

Carbon	64.02
Hydrogen	8.90
Nitrogen	0.55
Sulphur	0.50
Oxygen	5.66
Ash	20.32

Total

Ash: Silica	56.09
Alumina	40.04
Peroxide of iron	3.24
Lime	0.34
Magnesia	0.46

Total

The sp. gr. varied from 1.17 to 1.316.

It differs from coal in having a larger proportion of hydrogen and in not leaving a coke on distillation. In ordinary gas coal the proportion of carbon to hydrogen is 100 to 10; with Torbanehill mineral 100 to 14. The geological position was near the base of the coal measures overlying the Millstone Grit.

The seam varies from one inch to thirty inches in thickness. There were vertical joints that cut it into irregular cubes. In a pit at Torbane the section was as follows:

	Feet	Inches
Boghead house-coal	2	7
Arenaceous shale	6	0
Shaly sandstone	0	7
Shale and ironstone containing remains of plants and shells..	0	10
Cement stone (impure limestone)	0	4
Boghead cannel	1	9
Fireclay full of stigmariæ...	0	3

Then came six inches of common coal, and a series of thin seams, one inch or less of black shale, coal, shale, coal, fire clay, etc. The roof above the cement stone contained remains of calamities; the iron nodules, fossil shells of genus *Unio* (E. W. Binney).

The Oil Shale.

Good typical shale is of black or brownish color, fine in the grain and free from grit. It is distinguished by its brown streak, and its resistance to disintegration by weathering. It is tough and sometimes flexible. Under the knife the thin shavings turn up and curl over. Poor shale or "blaes" is friable under the same test; and exposed to the weather soon breaks up into small fragments, and before long crumbles into clay. The richer

shales are nearly black but they are found in all gradations of color through brown to gray, as they decrease in quality. They are made up of fine laminae which become apparent when exhausted of organic matter by distillation. Some shale is "plain," that is, the laminae are parallel with the stratification of the seam. Other shale is "curly," and the layers, as if by side pressure, are crushed into wave-shaped, curled, irregular masses, with black brightly polished surfaces. There are often plain and curly layers in the one seam, one layer having remained rigid while the other slid and folded itself in the places of reduced pressure.

Although generally called bituminous shale, it is free from bitumen, having practically nothing soluble in ether or petroleum spirit. The carbonaceous matter present is also different from coal. Ordinary coals, by low-temperature distillation, give about 25 to 30 gallons per ton of liquid distillate, which is not a crude oil but a coal-tar, and has a specific gravity of over 1.00; and sulphate of ammonia about 20 lbs. to the ton. The high-specific gravity of the tar arises from the large proportion of ringed compounds of the benzene type, etc. In the crude oil of shale the specific gravity is .860 to .880 generally, and it is largely composed of the paraffin or chain series of compounds. There are many shales in the shale measures. The higher ones give a larger yield of crude oil, of higher specific gravity, larger loss in refining and less solid paraffin, and less ammonia. The shales and bastard parrot coals that used to be worked in the higher stratigraphical levels of the coal measures, had still higher specific gravity as of more of the nature of coal, with sp. gr. up to .930 or even .950.

Broxburn seam shale, which may be taken as an example, by ignition in a closed crucible, gave

	Per Cent.
Volatile matter	25.5
Fixed matter	74.5

In the fixed matter 4.95 was carbon, and 69.55 per cent. ash. The ultimate composition of Broxburn seam shale, dried, was

	Per Cent.
Carbon	19.12
Hydrogen	2.94
Nitrogen	0.54

Mills gives the composition of the ash of good average shale as

Soluble in water (containing SO ₃ 0.92 per cent.)	8.27
Silica	55.60
Ferrie oxide	12.23
Alumina	22.14
Lime	1.55
Magnesia	trace
Sulphur	0.94
Total	100.73

Total sulphur in the shale 1.80 per cent. Total sulphur in the ash 1.31 per cent.

Shales from other parts of the world may be rich in oil although coarse-grained, gritty, and not curling under the knife.

As an example of shale from the coal measures, the Leeswood seam of Flintshire may be given. Five to six feet were worked.

Upper portion, smooth cannel 25 to 30 inches thick, gave 16 per cent. of crude oil of .925 to .940 sp. gr.

Then curly cannel, 18 inches, giving 30 per cent. crude oil; sp. gr. .875 to .890.

Then shale or bastard cannel 14 to 24 inches, 12 to 15 per cent. crude oil; sp. gr. .900. In some places this shale was replaced by common bituminous coal, and adhering to the cannel above gave a distillate containing the benzene and naphthalene series of compounds as in coal-tar, and spoiled the burning of the lamp oil.

The calciferous sandstone series of the Lothians contains over twenty different seams that have been or are capable of being worked. The ones lying on the higher stratigraphical level may yield as much as 45 gallons crude oil to the ton, the lower ones less, the lowest about 16 gallons. With ammonia it is the reverse, the upper ones least, 20 pounds or so, the lower ones most, 50 to 70 lbs. to the ton. The gradual change in the nature of the seams as they get deeper may partly arise from the greater age of the deeper ones, combined with the higher temperature to which they have been subjected. There are many seams of igneous rock intruded among the

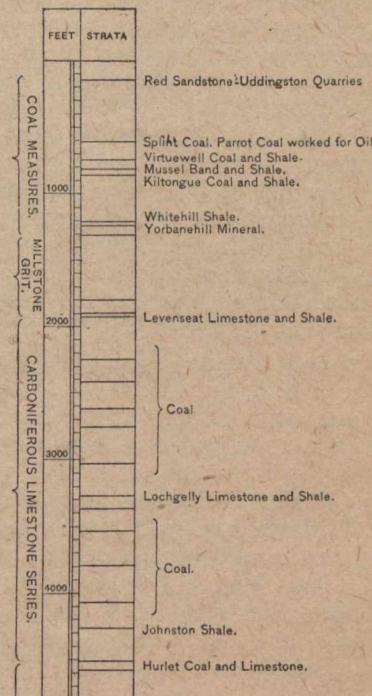


FIG. 60. Generalized columnar section of the shale fields of Mid and West Lothian.

shales, and the heat of these would help to cook the deeper ones to gentle decomposition; for what we have in the shales is the residue of a gentle, age-taking decomposition of organic matter giving results something like destructive distillation. The resulting gases have sometimes escaped; but with an impervious roof they accumulated under pressure and escape when a bore is sunk into the strata. Shale subjected to heat in a covered vessel at about 600° F. or 300° C. distills off almost all the carbon and hydrogen but leaves behind 63 per cent. of the nitrogen (Beilby). Coal at 300° C. in a closed vessel loses a considerable weight but none at all of the nitrogen (Carrick Anderson). So that age, along with the increased but still mild temperature of the greater depths, goes a long way to account for the decreased yield of crude oil but increased yield of ammonia for the deeper shales. The higher shales tend to give a crude oil of higher specific gravity than the lower ones, with less solid paraffin, and this partly arises from age and heat also; but not altogether. Sometimes within a

few feet of each other, as in the Leeswood shale before mentioned, there are seams, one of which gives a high, the other a low, gravity of crude oil, from a difference in the original materials deposited—a difference in the proportion of coal-giving materials. A seam of shale, good near the outcrop, often deteriorates as to quantity of oil as it dips deeper under superincumbent strata.

Entomostraca are common in many shales together with fish and plant remains. Animal matter may sometimes add to the proportion of ammonia extracted from shale.

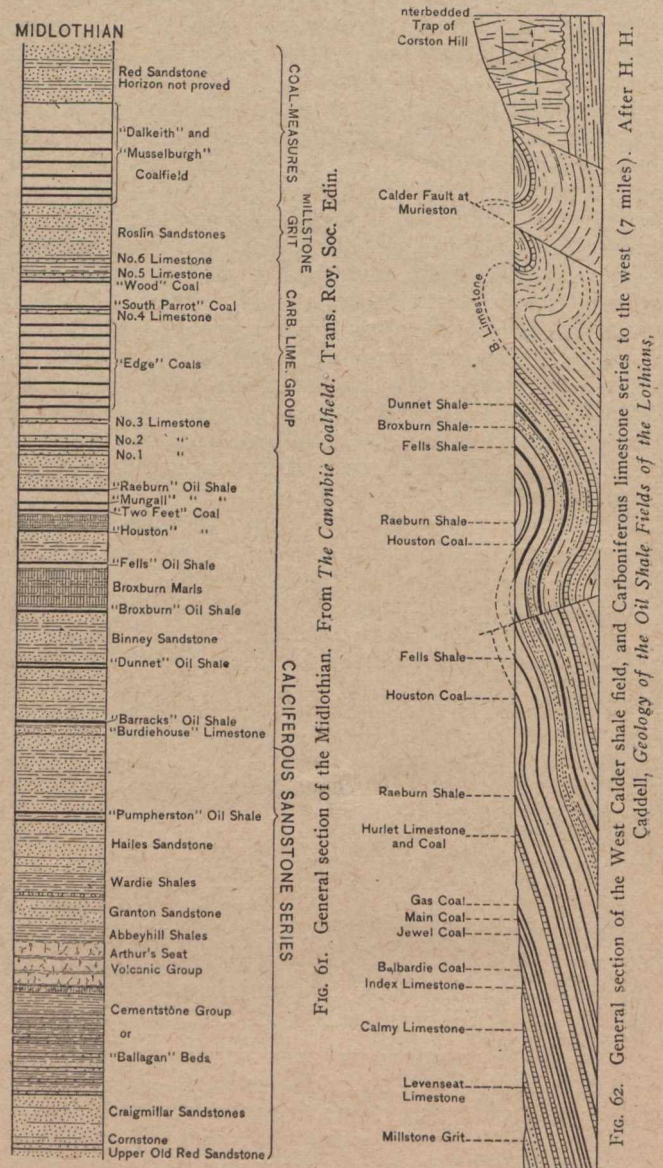
The Calciferous Sandstone.

This is the lowest division of the carboniferous system. Its distribution is shown on the map, Fig. 53. It comes under the Carboniferous Limestone and rests comfortably on the upper Old Red Sandstone. There is a triangle of this formation in the Lothians bounded on the north by the Frith of Forth, on the west by the Bathgate Hills, and on the southeast by the Pentland range of hills. An anticlinal fold or arch coincides with the general line of the Pentlands, and the Lower Old Red Sandstone and Upper Silurian are brought to the surface. Denudation has removed all the carboniferous rocks from the Pentland Hills just as in the calciferous sandstone district all the higher divisions of the carboniferous system have also been ground off. The country north of the Pentlands would have been reduced to an approximately level plain had it not been diversified by masses of intrusive igneous rock which here and there have produced little hills with the ordinary crag and tail form due to glacial erosion, the crag towards the west and tail towards the east. These relations are illustrated in the section, Fig. 62.

The calciferous sandstone of Scotland consists of two subdivisions: (1) A lower one, the cement stone series or Ballagan beds, varying in thickness from less than a hundred to several thousand feet, made up of alternations of thin clayey limestone or cement stone bands, thin micaceous sandstones, shales and mud stones, but no oil shales. They are evidently lagoon deposits. These crop out towards the east, and a large part of Edinburgh is built upon them. (2) A higher one, the oil shale series, over 3,000 feet thick, which contains the many good shales, and crops out toward the west and forms the good shale country already mentioned, stretching from the Frith of Forth to the southwest end of the Pentlands. There are in it white, red and yellow sandstones, blue, gray, green and red marls or clays, blue and black shales, thin coals, fire-clays and estuarine limestones. The sandstones are of great importance for building stone, a considerable proportion of Edinburgh and other towns being built from them. The limestones also are of great economic importance, and besides serving for mortar and for agricultural purposes, have supplied vast quantities of limestone for the iron furnaces of the west of Scotland. The seams of limestone afford great assistance in defining the positions. The richest oil seams of shale lie between the Hurler limestone which is the upper limit of the oil shale sub-formation, and the Burdiehouse limestone which for long was considered the lower limit; but 800 feet below this position the Pumpherston shales occur. Both Hurler and Burdiehouse are well known and easily recognized; and certain thin seams of limestone, although of little value economically, are so persistent over the field that they are good guides to the borer in determining his exact position.

One significant feature of the district in connection with the history of the oil shales is the abundant develop-

ment of igneous rocks. There are beds of volcanic tuff lying interstratified with the sedimentary strata over considerable areas and in definite positions. There are volcanic necks in seven or eight localities; and sheets of dolerite that cover great areas, one in particular. It has preferred to intrude itself into the position of some good shale or other, not always keeping to the same horizon, however, and at some places itself splitting into several distinct sheets. Over a large area this sheet will only average a few feet, but at certain places it swells out in laccolitic fashion to 80 feet or more. These sheets have generally been intruded when the sediments were



comparatively level. Since then the strata and sill together have been wrinkled into great waves, a succession of synclines and anticlines, and these have a general trend north and south. There are four great faults across the shale field with the same general direction—east to west at first and sweeping down to southwest or south. The displacement is often 1,000 feet, sometimes nearly 2,000 feet. The down-throw is to the north except in the most northerly. There are many smaller faults and many branches to these. At one place a dyke of igneous rock 100 feet wide has destroyed the shale for 70 feet on each side of it. There was no gas in the

burned shale; but on mining a road through the basalt dyke it was found to be itself charged with inflammable gas under considerable pressure. There was also a spring of brine. The distillation products had been permanent gas. Where, in another place, the sill 5 feet or so thick had taken the place of a shale and destroyed it, there were cavities in the sill partly filled with a yellowish semi-solid hydrocarbon, something like vaseline, and the cavities were lined with crystals of calcite, or, rarely, with barite. The hydrocarbon had the composition, carbon 84.35 per cent., hydrogen 12.83 per cent., nitrogen 1.68 per cent., trace of sulphur (R. Tervet). No doubt the hydrocarbon was the product of distillation of the shale and the temperature of the sill had not been high enough to convert all permanent gas. There was no outlet for the vapors and they had to make room for themselves in the molten trap. Another good seam of shale lying only 8 feet below the sill was not in the least harmed; another proof of comparatively low temperature. The strata at the time would probably be under water and water-logged, which would help to keep down the temperature, and also shut in the vapors. Often the shale comes close to the igneous rock and is quite good until it practically touches. Sometimes, however, the temperature has been destroyed for a good many fathoms both above and below.

The calciferous sandstone towards the west dips under the coal measures. When it rises again to the surface farther west at the other side of the coal basin, there is no sign of shale. It dips also under the edge coal to the east, and when it comes to the surface again beyond the coal field the shales have either disappeared entirely or become so attenuated as to be not worth working. The calciferous sandstone covers a large area in other parts of Scotland; but altogether without oil shale, or with a mere suggestion. So the circumstances suitable for deposits of oil shale seem to have been confined to this limited locality.

The strata of the oil shale field being wrinkled into numerous waves as described, the result of the folding and also of the faulting is to bring again and again the same seams to within working distance of the surface over a considerable area. Instead of having one clean strike north and south the outcrop of the shales forms a wide-stretching network. In searching for shale in a new locality many bores have to be put down, and trial pits, to make certain the shale is sufficiently extensive to be worth the expense of a mine or pit shaft, otherwise faults or intrusive whin may render the whole undertaking fruitless. There is boulder clay over most of the field, sometimes more than 200 feet deep, and this conceals the indications that might be expected on the surface; and often there is little information to be gleaned from stream sections.

Boring to 100 fathoms costs about £300, to 200 fathoms about £800 or £1,000. Sinking a mine costs £15 to £30 a fathom. These all vary much at different times and according to the circumstances.

General Section of the Shale Districts.

The Hurlet limestone and coal is the upper limit of the shale subformation.

Strata. 450 ft. at West Calder, 400 ft. at Broxburn, etc., consisting of blaes, ironstone ribs, black-band ironstone, pebbly sandstone, etc.

Raeburn Shale. 3 to 6 ft. thick, giving 40 to 55 gallons of crude oil to the ton and 14 lbs. sulphate of ammonia. Worked in limited areas towards the

southwest. In the south Cobbinshaw field there is another shale about 100 ft. above the Raeburn.

Strata. 140 ft. at West Calder, 190 ft. at Broxburn; blaes fire-clay, sandy blaes, ironstone bands, etc.

Mungle Shale. 2 ft. 35 gallons crude oil, and 30 lbs. sulphate of ammonia. Not much worked.

Strata. 130 to 190 ft.; chiefly blaes with fire-clay and iron-stone bands.

Two-foot Coal. 1 to 3 ft. Varies from cannel coal in one district to smithy coal in another. Worked a little at one time at Broxburn along with a thin shale and an ironstone. Immediately above the two-foot coal in some districts are interbedded volcanic tuffs.

Strata. Houston Marls. 230 ft. They are green or reddish, massive, amorphous, mudstone-like beds, hard when fresh but crumble down when exposed. In beds of a yard or two in thickness separated by thin bands of a harder and more permanent nature; homogeneous and structureless within the limits of the bed. Unfossiliferous. It has been suggested as accumulation of volcanic dust, but it contains much less silica than the most basic of volcanic rocks. Silica 35 to 40 per cent., ferrous oxide about 3 per cent., ferric oxide 6 per cent., alumina 20 to 22 per cent., lime about 11 per cent., carbonic acid 11 per cent., etc., deposited in water during a long cessation of oil-shale-making conditions.

Gray Shale of Addiwell. Less than 2 ft. generally. Not much worked. Composed largely of entomostraca, "squeezed together like grains of linseed in oil-cake."

Strata. 60 ft.; blaes, fire-clay, etc.

Houston Coal. 4 to 6 ft. The lowest coal that has been worked to any great extent in Scotland. It lies 2,000 ft. lower than the lowest workable seam of the carboniferous limestone. It is an inferior coal, pyritous, and with blaes interbedded. It had been much worked at the outcrops in very early times, but is not worked now.

Strata. 150 to 250 ft. thick. The principal shale of the West Calder district. Extensively worked all over the shale district. 26 to 40 gallons crude oil and 20 to 35 lbs. sulphate of ammonia.

Strata. 150 to 250 ft. thick. Extensively worked all over the shale district. 26 to 40 gallons crude oil and 20 to 35 lbs. sulphate of ammonia.

Strat. Broxburn Marl. 135 to 270 ft. Immediately under the Fell's shale there is limestone 3 to 5 ft. thick, that the borer looks for as proof that the shale is Fell's. Then come greenish, marly or ashy clays with very hard cement stone from 1 inch to a yard in thickness. There are no sandstones.

At Oakbank 12 ft. above the Broxburn seam there is—

The Big Shale, 4½ ft., 22 gallons, and 13 feet higher still

The Wee Shale, 1½ ft., 36 gallons. These are generally wanting elsewhere.

Broxburn Shale. This has always been an inferior shale in the West Calder district, 4 to 6 ft.; but it is the principal shale at Broxburn, Oakbank and other localities. At Broxburn there are three seams:

The Broxburn Gray, about 6 ft., 23 gallons, 35 lbs.

The Broxburn Curly, 5½ ft., 26 gallons, 38 lbs.

The Broxburn, 5 to 6 ft., 28 to 35 gallons, 40 lbs.

At Oakbank, where these three seams are found along with the two extra ones above, 16 ft. under the Broxburn seam there is another shale of 4 ft. the Wild Shale.

Strata. 400 to 500 ft.; blaes and marl on top and then the Binny Sandstone, thick massive beds which have been extensively worked for building stone throughout the district. Blaes and marl below.

Dunnet Shale. 4 to 12 ft. 24 to 333 gallons crude oil and 24 lbs. sulphate of ammonia. The principal shale at Pentland, Duddingstone and Burntisland, and extensively worked in other districts.

Strata, 400 to 600 ft. Sandstone, blaes, and limeribs, 10 fathoms below the Dunnet seam at Broxburn there is a stratum saturated with petroleum and brine.

Barracks Shale. Sometimes 8 ft. thick and yielding 22 gallons per ton, but generally thinner and poorer in oil.

Strata. 40 ft. blaes. Sometimes only 5 ft.

Burdiehouse limestone. Sometimes as much as 64 ft. thick and both quarried and mined. Extensively worked throughout the region. Burned for local use for building and other purposes, and sent off in great quantities to the iron works of the west of Scotland. A fresh-water or estuarine limestone, with numerous fossil fishes, and distinguished by the abundant remains of a small ostracod crustacean *Leperditia Okeni* var. *Scotoburdigalensis*. It often rests upon a characteristic pavement called the "Buckie fake," containing the small gasteropod *Platyostomella Scotoburdigalensis*. Some places this limestone is only 10 ft. thick or less.

Strata. 678 ft. at Broxburn. Blaes with thick sandstones in the centre.

Pumphreeston Shales.

No. 1, or Jubilee Seam. 8 ft. 18 gallons crude oil, 55 lbs. sulphate of ammonia.

Strata. Blaes, 14 ft.

No. 2, or Maybrick Seam. 5 ft. 16 gallons crude oil, 60 lbs. sulphate of ammonia.

Strata. Blaes and ribs, 13 ft.

No. 3, or Curly Seam. 6 ft. 20 gallons crude oil, 60 lbs. sulphate of ammonia.

Strata. Fakes, blaes, 12 ft.

No. 4, or Plain Seam. 7 ft. 20 gallons crude oil, 60 lbs. sulphate of ammonia.

Strata. Blaes, etc., 12 ft.

No. 5, or Wee Seam. 4 ft. 18 gallons crude oil, 60 lbs. sulphate of ammonia

Bibliography.

A full account of the geology of the shale fields may be found in the "Memoirs of the Geological Survey of Britain: The Oil Shales of the Lothians," 1906. Also "The Oil-shale Fields of the Lothians," by H. M. Cadell of Grange, in *Trans. Inst. Min. Eng.*, 1901, or *Trans. Edin. Geol. Soc.*, VIII., p. 116.

The history of the development of the retort is given by Dr. George T. Beilby, F.R.S., in *Jour. of Soc. of Chem.*, 1897, p. 876. Refining is described in same journal, 1889, p. 100.

PERSONAL.

Mr. J. J. Drummond has returned to Midland, Ont.

Mr. A. C. Flummerfelt, of Victoria, B.C., has been visiting Montreal on business.

Mr. K. Hasekawa, a mining engineer from Japan, who represents the Furnkawa Mining Co., is in the Boundary (B.C.) district visiting various mines.

Mr. A. A. Hassan, of Cobalt, is in Toronto. While engaged by the Victoria Mining Company, Mr. Hassan uncovered several veins on that property.

Mr. T. J. Drummond, president of the Canada Iron Corporation, Limited, has returned to Montreal after a tour through Nova Scotia and New Brunswick.

Mr. Elijah Heathcote, late inspector of mines in the Province of Alberta, has been appointed superintendent of the collieries of the Crow's Nest Pass Coal Company at Coal Creek. Mr. Heathcote was in the employ of the company some years ago at the Carbonado Colliery.

Mr. Jos. L. Danziger, B.S., formerly of the Department of Chemistry, Columbia University, has been appointed manager of the Canadian Behrend Dry Concentrator Co. and will have full charge of the Technical Department of the Company. Mr. Danziger is a man of recognized ability in his profession, and has made a specialty of concentration of ores, metallurgy, and industrial chemistry. His recent work in Cananea, Mexico, and in the Lake Superior copper field, perfecting systems of concentration of low-grade ores and mill tailings, was very successful. Mr. Danziger is a firm believer in the principle involved in the Behrend System of dry concentration, based upon familiarity with its operation on many ores, during the past six months, which, with laboratory testing work on Cobalt and other ores of Canada, eminently fits him for economic work in the field of the Company's operations.

Under the present United States tariff the duty on the principal metallic ores is as follows:

Antimony ores	free
Cobalt ores	free
Copper ores ..	free
Gold ores	free
Nickel ores	free
Silver ores (not containing lead)	free
Tin ores	free
Zinc ores	free
Lead ores (on lead contents) 1½c. per lb.	

The Dannert gas, the new German illuminant for small towns, is made from oil and coke, and is much cheaper than water gas, which it somewhat resembles. The coke used in its production is less than a third of that consumed for a like amount of coal gas. The new gas yields a bright flame, and, as there are no by-products, the process of manufacture is simple.

BROMO-CYANIDING OF GOLD ORES.

In Volume XII. of the Transactions of the Australasian Institute of Mining Engineers there is an interesting paper on bromo-cyaniding of gold ores, by Mr. E. W. Nardin.

At the Hannan's Star mine the process was installed and the plant erected by the London-Hamburg Company. An extraction of 91 per cent. was guaranteed on sulphide ore carrying 15 dwt. of gold. The new features in the process are fine grinding by means of tube-mills, and the addition of bromo-cyanide solution to the vats under ordinary cyanide treatment. The difficulty of obtaining bromo-cyanide solution at reasonable cost was met by the London-Hamburg Company, who supply the mixed salts at a very satisfactory price.

Most of the treated ore was low-grade; hence the percentage extraction appears to be low. But the average value of residues for 1904 and 1905 were 1 dwt. 2 grs. and 1 dwt., respectively, on ore averaging 10 dwts 7 grs. and 8 dwt. 9 grs., respectively. On high grade ore the process was equally successful. In 1903, 15,000 tons of ore from the Brown Hill Extended mine, carrying 4 ozs. gold per ton, and containing telluride, were treated. The average extraction was 95 per cent.

The average cost for bromo-cyanide Hannan's Star sulphide ore was 9.75 pence per ton of ore treated, a saving of 2 shillings per ton as compared with roasting.

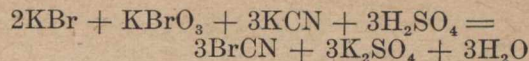
The process followed at the Hannan's Star plant in July, 1904, at the time Mr. Nardin took charge, was modified later. At that time the ore from the breaker was dry-crushed in two No. 5 Krupp ball mills, fitted with steel wire screens of 27 holes to the linear inch. From the mills it passed to a mixer, over amalgamated plates, and to a classifier at the end of the tube mill where the slimes overflowed to the slimes pump, and the underflow went to the tube mill. The tube mill discharge was elevated back to the classifier and again separation. The slimes pump delivered to two sets of spitz-luten, the underflows from which passed back to the tube mill, and the overflows to the pointed settling boxes, where the pulp was thickened before passing to the agitator vats. The object was to slime all the ore to pass a sieve of 150 holes to the linear inch. In practice about 5 per cent. would remain on the 150 sieve, but the whole of it would pass through the 100.

There were four agitator vats of 50 tons dry ore capacity each. Each took about 16 hours to fill, representing 75 tons of ore per day through the ball mills. A mechanical sampler arranged between the ball mills and the mixer, cut out a definite quantity of ore periodically. This gave the day's sample.

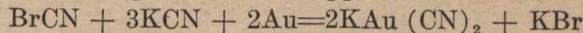
A vat, when full, was given its charge of KCN. Three hours afterwards a "dip" KCN residue sample was taken and the charge of Br CN solution added. After agitation for 20 hours, lime was added and the vat "pressed." The quantity of Br CN to be added varied according to the residues of preceding vats and the value of the ore being treated.

Every sixth frame in a filter press was sampled, and the bulk sample from the whole vat quartered down to represent the final residue of that vat. The KCN residue was washed on a small vacuum filter and assayed after drying. From the daily ore samples, KCN, and final residues, the total extraction and extraction by plain KCN and by Br CN were determined.

The bromo-cyanide solution is made according to the following equation:—



Its action upon the ore is supposed to be as follows:—



The mixed salt as obtained from the London-Hamburg Company contained:—

40% to 44% of Br as K Br
20% to 22% of Br as KBrO₃

A 30-lb. working charge is usually made up thus:—

H ₂ SO ₄	50 lb.
KCN	20 lb.
Mixed salts	36.8 lb.

The KCN is 93% material, and the H₂SO₄ 63 per cent. (chamber acid). The solution is made in a closed wooden vessel, fitted with rotating arms and holding 200 gallons. The H₂SO₄ is mixed with a portion of the water first and allowed to cool. The KCN, dissolved in sufficient water to fill the vessel, is then added, and the mixed salts gradually stirred in. The whole is agitated for six hours. A dip sample is taken and tested with a standard Na₂S₂O₃ solution, using potassium iodide as an indicator. The standard solution is made so that 1 c.c. equals 0.02 BrCN, and for this about 93.6 grains of ordinary crystallized Na₂S₂O₃ .5H₂O are dissolved in one litre of water.

A solution of copper sulphate is used for standardizing the Na₂S₂O₃ solution. The copper sulphate solution is made by dissolving one grain of pure copper foil in acid, converting to sulphate, and dissolving in 100 c.c. water. In testing Br CN solution, 5 c.c. are usually taken, Na₂CO₃ solution added till alkaline, and then acetic acid till acid. A few crystals of KI and some starch solution are then added, and the whole titrated with the standard Na₂S₂O₃ solution.

In other mines direct titration with Na₂S₂O₂ without first neutralizing the H₂SO₄ is in vogue. The results from this method have been proven to be usually low and irregular.

The vats should be kept under KCN treatment until the KCN residue is known. The alkalinity should then be corrected and the Br CN added.

Br CN does not act well in a too alkaline solution. The best action is obtained when the alkalinity is either about 0.01 per cent. or nearly neutral.

Mr. Nardin sums up the results of certain experiments thus:—

1. The daily ore sample should be taken in the morning and assayed as soon as possible, so as to know what was the value of the ore passing to the vats in the previous 24 hours.

2. The pulp should have a long KCN treatment.

3. A vat should be kept under KCN treatment until the value of the KCN residue is known.

The alkalinity of the vat should then be determined and corrected to 0.01 per cent. by H₂SO₄ before adding Br CN.

5. The quantity of Br CN added should then be determined from the value of the KCN residue, the tonnage of the vat, etc.

6. Lime added to the ore during crushing should be varied according to the alkalinity test after KCN treatment, so that the plant solution tests about 0.02 per cent.

7. Lime water should be made and added to the vats or to the solution from the presses, instead of adding lime to the vats.

8. All metallic iron should be removed in some way from the ore before treatment, as it is both a cyanicide and bromo-cyanicide.

HOSTOTIPAQUILLO AND THE LERMA RIVER.

Written for the Mining and Scientific Press

By Ezequiel Ordóñez.

(Editor's Note:—Since a number of Toronto and Halifax men bought a group of mines in this district last winter (among these are the Mololoha and Albarradon, mentioned in this article), it is thought that the article will be of interest to some of our readers. Moreover, the article is a very clear, really vivid, description of a mountainous mining region, and is therefore of general interest. Mr. Ordóñez is one of the best known geologists in Mexico, and was formerly Sub-Director of the Geological Survey.)

In view of the geological features and the great extent of the veins, Hostotipaquillo is one of the most important localities in the western Sierra Madre, Mexico. It lies within the District of Tequila of the State of Jalisco, in a mountainous region that is cut by the canyon of the river Santiago or Lerma, and is therefore in the region of high mesas, deeply carved by tremendous erosion. In no part of the country can one better appreciate the true physiographic character of the western Sierra Madre. The plateau has been the result of the piling of volcanic material upon an ancient land surface. There is now a marked difference in the two sides along one portion of the canyon. The south side, of which belongs to the central plateau, is 3,400 feet above sea level, while the opposite side, which belongs to the Sierra Madre, presents elevations that almost reach 6,500 feet above the sea, but on the plateau, long sierras rising above the plains reach and even exceed that elevation. The Santiago River, from the northwest of Guadalajara to Hostotipaquillo, has excavated its own bed, almost at the southern foot of a group of mountain ranges running northwest and appearing to terminate in the central plateau. Only a few of these ranges seem to be continuous farther south, and therefore the Sierra Madre presents different widths to the north and south of that river in the District of Tequila. The width of the Sierra Madre is so far reduced to the south of the river that if it were not for the northwest prolongation of the Eatzatlan ranges and the great barranca de Mochilticte, the Sierra Madre would be interrupted near the parallel of 21 degrees 30 minutes north latitude, to reappear subsequently farther south and with greater vigor in the regions of Pigintos and Mascota. If that interruption had been established there would have been a convenient pass in Central Mexico to reach the Pacific Coast, by only crossing a series of high tablelands from Guadalajara to Tepic.

The Cananea, Rio Yaqua & Pacific Railway, which will shortly connect the Mexican Pacific Coast with the great central plateau, by way of Tepic and Guadalajara, has encountered great difficulties in running through the narrow pass in the Sierra Madre to the northeast of Eatzatlan. Although the final route through that region has not yet been decided, it is important to notice that the railroad will not pass far from the town of Hostotipaquillo. It is said by railroad men that a line to cross the ranges and the barranca will require many bridges and viaducts, which in the aggregate will amount to one and a half miles, as well as several tunnels aggregating about the same length. It is well known that the western support of the great central plateau of Mexico is essentially eruptive in character, and that the mineral

resources of that region have been exposed by deep erosion, because the high western edge of the central plateau was first covered with rhyolites and dacites that formed high mesas overlying the veins. These veins, which run through the underlying andesites, diorites, and Tertiary granites, would never have been revealed if there had not been carried off toward the coast a formidable volume of the acidic younger material that composed the marginal mesas. At present these mesas in the Sierra Madre are broken in every direction by deep ravines in which numerous veins appear.

The Santiago River is one of the most important in Mexico, with a length of nearly 1,200 kilometres, having its rise in the eastern corner of the high valley of Toluca from several springs that together form the muddy lakes of Lerma and Almoloya. This river bears the name of Lerma to the point where it discharges into lake Chapala, at about the middle of its course. Chapala was, in former times, a wide valley drained by the river, but at the beginning of the Recent era, a barrier of basaltic lava converted the valley into a large basin. After that the basin was broken by erosion, restoring the river to the ancient channel on its way to the ocean. In cutting its way through the Sierra Madre, the Santiago River exposed a mineral territory not less than 30 miles long in the neighborhood of Hostotipaquillo, the outcrop of veins ribbing the mountains in their slope to the river bed. In all this large territory are distributed the groups of mines called La Cobriza, Cinco-minas, Santo Domingo, San Pedro Análec, Mina Grande, Quebradilla, as well as those of El Favor, San José, San Francisco, Cabrera, La Castellana, Refugio, Jora Vieja, and others not situated on independent groups of veins. The mineral system is seen to extend without interruption where erosion has already washed away the overlying strata newer than the veins. In this same region, and at short distances apart, are other famous mining districts, such as Le Yesea, Bolanos, which, like some of the former, belong to a different political division. The town of Hostotipaquillo, the chief seat of the municipality, is outside of the mining area, as it is situated on the edge of the central plateau where it descends into the canyon. The geological structure of the Sierra Madre and of the central plateau is clearly and simply exhibited in this region. It is seen that the central plateau owes its elevation, as is well known, to the successive heapings of volcanic rocks upon older eroded lands. In this connection, any one could view a beautiful landscape from any of the high peaks that lift their heads about the right border of the Santiago canyon north of Hostotipaquillo. A trip to this region for this sole purpose would be worth the trouble. From a great height, supported by uniform steep slopes, the geologist contemplates, over the horizontal line of the plains that form the central plateau, the volcano of Tequila with a great lava mass crowning its summit. The immense cone of this high volcano appears to repose on a large platform of lava, which is bathed by the waters of the Magdalena Lake. The nature of the ground is as suggestive as the landscape; rhyolites and dacites are the constituents of the mesas, and on such material rests the entire volcano of Tequila. These rocks lie on the Miocene andesites. In these andesites are found the veins along the lower level near the river and in the high hills in the neighborhood. The mountains are also frequently

crowned by remnants of rhyolite mesas in the form of bluffs. In the steep walls of the canyon are found blocks of columnar basalt in the form of cliffs and cornices; these are the remains of a basaltic plain over which the present river flowed, 1,200 feet above its present bed, and for a distance of no less than 50 miles.

The Rio Grande de Santiago has three times re-excavated its own bed in its passage through the Sierra Madre. The river first started by flowing through a large valley bounded by mountains of eruptive rock, because it must be stated that the rhyolites that formed the mesas did not spread over prolonged andesitic sierras, but over independent *massifs* close to each other, each with its own history of volcanic evolution, although many of the *mas-*

waterfall, called the Niagara of Mexico, exists where the great stream ceases to serve agricultural uses and is converted into a source of motive power. The backward erosion of the waters, assisted by movements in block, have ended by re-establishing the old river bed, for the second time, in the form of a gorge with cliffs, afterward becoming gentle slopes. Lastly, this old valley has become the scene of a new geologic change. The uniform slope of the bottom favored the flow of a stream of basaltic lava many miles long and 100 to 300 feet thick. The erosion cut through and brought down these basaltic masses, allowing the river to return to its old bed. This third period of erosion in the Pleistocene and Recent eras, appears to have been more intense and prolonged



The State of Jalisco, Mexico.

sifs were synchronous. The Miocene Valley became continually deeper by erosion, and by displacements due to faults along the dikes so numerous in the mining district of Hostotipaquillo. In the Pliocene era, the great overflow of rhyolite constituting the mesas, filled the basin of the rivers and interrupted the course of the waters, which soon commenced to run again over the mesas, filled up the basin of the river and interrupted the course of the waters. These soon commenced to run again over the mesas as well as underground, following their old channel. Near the coast, the river precipitates itself in falls and rapids, which continually work backward, as has been done in the east by the falls of Juanaacatlan on the same river near Guadalajara. This

than the two earlier, seeing that after the waters reached their former bed, they have continued their work of excavation, so that it is now 1,000 feet lower.

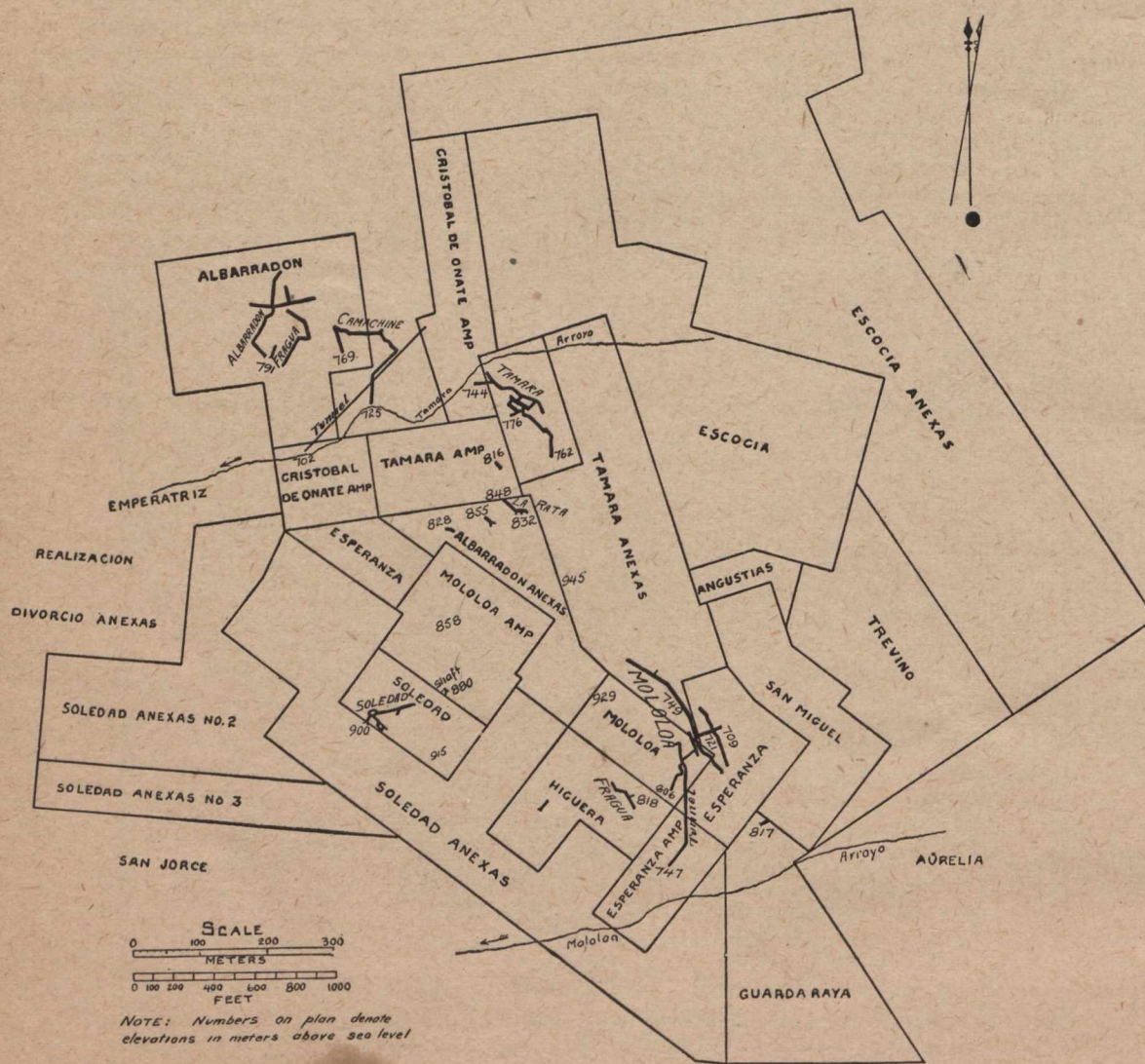
In this brief history of the Rio Grande de Santiago no mention has been made of the period in which the veins were formed; this probably was immediately before the appearance of the rhyolites forming the mesas. Nor has mention been made of the phenomena connected with the appearance of the dikes, some of which are older and some newer than the veins, nor of the fluctuations of surface-elevation on a large scale in the Sierra Madre.

The mining region of Hostotipaquillo has been worked ever since the commencement of the colonial period

in spite of the rough character of the ground, of the vicinity of warlike Indians in earlier days, and of the entire absence of roads. The last mentioned difficulty exists even at the present time. In the year 1804, Humboldt refers to the Hostotipaquillo mines as celebrated, and in the report presented by the Mining Deputation of Hostotipaquillo to the Provincial Mining Board, in 1824, ample data with respect to the old mines denominated La Famosa, Deseada, El Refugio, Mololoha, El Tabor, La Espada, San Jose, Quebradilla, Mina Grande, and others were given. Some of these old mines are now undergoing development with large capital in the hands of companies, mostly American.

A complete list of all the companies now contributing

part of the water-power to be developed by the plant of the San Pedro Anasco Co. The Cabrera group of mines belonging to the Virginia Mining & Milling Co., has been producing from the Cabrera mine for many years. The Company is now erecting a concentration and cyanide plant to have a daily capacity of 200 tons, and will obtain power from Santiago river. The mill will be erected close to the river bank, and the ores will be brought down from the mines by a cable tramway. The San Antonio Mining Co. is operating the San Jose, Las Palomas, San Antonia, and other mines. It is also operating the small Socorro mill, which is one of the oldest in the district. The San Antonio mill has 10 stamps, partly driven by electricity. The process employed is the pa-



to the activity of the district cannot be given, but several are worthy of special mention. The Cinco Minas property, belonging to Martinez and Cardenas, has under development four or five mines. The property represents an approximate value of 500,000 piastres. Part of the ores from the Cinco Minas are treated in the Hacienda de Santo Tomas by the patio process. The El Favor Mining Co. operates an extensive property, of which the El Favor mine is the chief. Some of these mines show ore to the value of several million pesos. The Company is planning the erection of a large concentration and cyanide plant in which it will treat its abundant supply of low-grade ores. It will utilize a

patio, and the tailing is concentrated in the old Mexican way. The Jalisco Mining Co. has the Mercedes, Dona Ema, and other mines close to the old Mololoha and Hundido mines. Work is being pushed by an American company in the famous Casados mine. The exploratory work recently started has led to the discovery of a large quantity of ore. The Company is erecting a concentration and cyanide mill, besides exporting high-grade ore. The San Felipe Mining Co. operates a mine near the village of Jocotlan. It also possesses a small concentration and cyanide plant, which is equipped with stamps, Bryan mills, and other modern machinery. The Santo Domingo Mining Co. has operated an extensive group of

mines, and completed considerable development work with the help of machinery. The principal mines operated by this Company are the Santo Domingo, Esperanza, Nombre de Dios, and El Favor. It is said that the Company has temporarily suspended work. The Castellana mines have for some years past been worked successfully with English capital. They now have a mill, driven by electric power, with a capacity of 40 tons per day. This Company utilizes a small part of the waters of the Santiago river for motive power. The Cia. Minera de San Pedro Analco operates an important group of mines on the right bank of the Santiago with satisfactory results. Some of the mines in this group are considerably developed. The San Pedro mill has six-stamp-batteries which crush 60 tons per day. The ores are treated by the patio process, although with rather high losses of silver.

As a general thing all the mills in the Hostotipaquillo district which treat the ores by the patio process give poor returns, as these ores are not adapted to that treatment. The cyanide process will give better results supplemented by concentration. The San Pedro Analco Co. has undertaken an important work in the construction of a dam 300 ft. long across the bed of the Santiago river, creating a fall of about 25 ft. Three turbines will be set up to handle a large volume of water, and develop 1500 hp. in an electric plant. The construction of this dam across the river reflects great credit on the builders and on the company. They have had to overcome enormous difficulties and incur heavy expenses. When the power plant has been installed, the San Pedro Analco Co. will re-construct its mill in accordance with modern principles.

Carlos Romero, of Ezatlan, Jalisco, is the owner of an important group of historic mines, such as Albarradon, La Famosa, Deseada, La Espada, La Quebradilla, La Descubridora, and others. He was formerly the owner

of the Mololoha mine, which is famous in local history. The mining region of Hostotipaquillo already involves a valuation of nearly 35,000,000 piastras.

The veins in this region traverse andesite, dacite, and seldom diorite, and it is not a rare thing to find the veins also in breccia and in andesitic tuff. As a general rule, the veins are wide and continuous, especially in the eastern parts of the district, where veins are found with a width of 34 ft. The matrix is quartz and calcite. Large bonanzas were found in the old mines, but the dissemination of the ore throughout the veins gives this district special importance. Its future depends on the utilization of concentration and cyanidation. As a general rule, the ores carry little gold, the most valuable mineral being silver sulphide, sometimes accompanied by galena, pyrite, and blende. There are also small quantities of copper ore, carbonate near the surface, and chalcopyrite below. In the oxidized zone, where secondary modifications have taken place, the veins contain manganese, oxides, ferruginous clays, native silver, and in some cases, chlorides and bromides of silver. Practically the deposits form a series of linked veins running northwest, following the general orogenic axis of the region. The veins are frequently intersected by faults, but displacements are not great; they are also cut by dikes. The veins sometimes follow the direction of the older dikes for a long distance.

The enormous extent of the Hostotipaquillo mining region, the number and width of its veins, the abundance of its low-grade ores, the facilities afforded by the topography, the abundant natural resources, the completion of the railroad, will make Hostotipaquillo one of the most important mining districts of Mexico. For motive power, the Santiago river offers immense possibilities. It is reported that the Federal Government has given concessions for about 200,000 hp. to be developed along this stream.

EXCHANGES.

The South African Mining Journal, October 31, 1908.—In this number of our contemporary we find instructive records of mining and milling costs. One example is worth quoting. Knights Deep mine during the year ending July 31st, 1908, had an ore output of 504,890 tons; 200 stamps were kept in commission. The total yield of gold was £680,561, or an average of 26s. 11d. per ton. This average yield was lower by 2s. 1d. than during the previous year. But increased capacity and a large reduction in working costs brought the profits per ton up from 8s. 2d. to 10s. 1d. Instead of a 10 per cent. dividend a 25 per cent. payment was made. A payable ore reserve of 1,438,000 tons has been developed.

The Mining World, November 28, 1908.—"Methods Used in Sealing Off Underground Water," is the title of a paper by Edmund B. Kirby.

Known methods of sealing off or reducing incoming flows of water have not found any wide application in mining. They are generally excessive in cost and uncertain in result. Mr. Kirby's patent consists primarily in introducing into subterranean flows of water entering a mine, any kind of subdivided matter

capable of being carried by those flows towards their exits and of being deposited in and choking up the passages leading to these exits. Finely subdivided clay, held in suspension by the water, is mostly preferred. Other materials, such as sand, with tailings or slimes, cement, saw-dust, horse-manure, chopped hay, etc., may be used.

This method has been employed to seal water flows for a distance of 240 feet,

The Mining Journal (London), November 21, 1908.—A most interesting leading article is our contemporary outlines, "The Future of New Zealand Alluvial Gold-fields." It is stated that "it is only by such painful experience of diminishing profits as the fields have been and are still undergoing that they can attain to a healthy condition, and that investors can see for themselves that they are not throwing money into a hole and losing it."

Apparently both dredging and sluicing operations are not advancing; but local interests and the geological survey have been and are most active in exploiting new ground and in investigating systematically the whole field. Confidence is felt that dredging and sluic-

ing will be carried on in the future with much better prospects of success.

Electrochemical and Metallurgical Industry, November, 1908.—In the course of a paper on "Electrolytic Gold Refining," in this number of our contemporary, Dr. Emil Wohlwill takes exception to certain deductions of Dr. J. W. Richards. Dr. Wohlwill also reaches the following conclusions concerning electrolytic gold refining:—

1st. Before employing the process and before calculating its requirements and results, it is necessary to make a preliminary investigation as to whether the available raw gold alloy is suitable for electrolytic treatment.

2nd. If the raw gold alloy is found to be suitable, experience must decide on the current density to be used, according to the composition of the anode material.

3rd. If interest is to be charged for the gold, it is necessary and easy to modify the conditions of operation in such a way that the interest charge becomes a minimum.

The Engineering and Mining Journal, November 28, 1908.—Walter Renton Ingalls discusses most illuminatingly the question, "Has the value of gold depreciated?" Mr. Ingalls opposes the theory that the rise in commodity prices is due to the increased production of gold. He contends that (1) a great increase in gold production may occur without increasing wages and without attracting any large number of men away from previous occupation; (2) the profit derived from the production of gold is rarely expended at the place of production, but is distributed among many investors in the commercial countries of the world; and (3) much of what is considered to be profit is really not so.

Mr. Ingalls points out that labor unionism and the increasing inefficiency of labor have contributed to enhancing the prices of commodities. "It is scarcely to be doubted that the prices of commodities will continue to fluctuate in the future as they have in the past, independently of the world's production of gold,

the effect of which upon prices at any time in the world's history has been but ephemeral and has been due to conditions that long since ceased to exist."

INDUSTRIAL SECTION.

Mine and Quarry, October, 1908.—The Sullivan Machinery Company issues this bright monthly. It contains several specially written and particularly practical articles. One of these, entitled, "A New Departure in Mine Power Plants," by George M. Crawford, describes the installation of the Cowanshannock Coal and Coke Company, at Yatesboro, Pa. Here is a central electric generating plant from which current is wired to substations, where the air compressors and motors that drive the machinery in each part of the field are located. All the air-compression and coal-cutting machinery was purchased from the Sullivan Machinery Company.

Canadian Westinghouse Co., Limited, Hamilton, Ont., Circular No. 1126.—Westinghouse Types C and CL transformers for pole mounting are illustrated in this circular. These distributing transformers operate in oil. Temperature rise is thoroughly guarded against, and complete insulation is thoroughly provided for.

Catalogue No. 11, Pennsylvania Crusher Co., Philadelphia, U.S.A.—The Pennsylvania Hammer Crusher for crushing coal is susceptible of quick adjustment. No shut down is necessary. By a turn of a hand wheel the cage is raised closer to the hammers. This is only a matter of seconds. In case of choking, or when inspection is necessary, the cage may be instantly dropped.

Crushing is becoming more and more essential as a preparatory step to coking, whether the coal is to be washed or not.

The Pennsylvania Crusher Co. also manufactures the Pennsylvania Bradford Coal Cleaner, Coal Cleaner and Hammer Pulverizer (combined), Magnetic Separator, Rotary Crushers, Single Roll Crushers, Rock Crushers, Portable Rock Crushers, etc., etc.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—The Dominion Coal Co.'s output for November was only 244,000 tons, which is 90,000 tons less than the previous November. The output for the year to date is 3,347,000 tons compared with 3,317,000 tons at the end of November, 1907. From present indications the tonnage for the year will be practically the same as that of last year, or slightly over 3½ million tons. It was anticipated at the beginning of the year that the output would reach 3¾ million tons, but in the face of the depression that has been general over the Dominion it is really a matter for congratulation that the Company have found it impossible to maintain the same output as in the previous twelve months, and to stave off the inevitable period of short work for so long. The break comes after a long and uninterrupted spell of prosperity, and it is confidently hoped that it is but temporary. Indications are not wanting of a return of confidence in the United States, and

the mines there are beginning to feel the benefit of the increased demand for their product. This will relieve to some extent the persistent American competition which has been felt all Summer in the Montreal and Toronto districts, and which has had a grave bearing on the trade conditions in Cape Breton. It is perhaps not fully realized how very strenuous this American competition is becoming. In slack times when small profits or sufficient return to cover expenses are gladly accepted in order to keep the mines in operation and retain the workmen, it can be easily seen how convenient a dumping ground the Upper Canadian provinces and the large centres of population at the head of the Great Lakes may become for American operators. No one who has given thought to this matter but must confess that Canadians have all to gain and nothing to lose by weakening their tariff barriers. They are already but too weak to withstand the pressure of the enormous coal resources of the United States until such

time as our own coalfields shall have been fully discovered and developed. Nova Scotian coal owners at last cannot afford to coquet with their friends in the States, nor can their workmen. The trade that is providing work for the members of the U.M.W.A. is the very same trade that is causing slack time in Cape Breton. There can be no friendship or reciprocity between American and Canadian coal interests, without serious detriment to the latter. The interests of master and man are the same in the matter. Those members of Canadian labour organizations or of trade leagues who favor amalgamation with the United States might profitably read the fable of the lion and the mouse that they may remember in the old "Fourth Reader." It is an illuminating lesson to take a good atlas and compare the cities, towns, and villages south of the frontier of Canada with the sparse lettering above that line, and then to study the mineral maps of the U. S. Geological Survey: Virginia, Pennsylvania, Alabama, Tennessee, etc., etc., side by side with the publications of our own Geological Survey. True it is that our Canadian mineral resources are yet unknown and may be only dimly guessed at, but it is also true that the stronger our tariff walls, the more quickly will they be discovered and opened up. Charity begins at home, and when one is dealing with a nation that has defied individualism and monetary success, we cannot afford sentiment. In Nova Scotia at any rate our ways lie separate.

U. M. W. A. vs. P. W. A.

4th December, 1908.

The event of the week in the mining towns has been the ignominious failure of the perjury charge preferred by the representatives of the U.M.W.A. against the Grand Secretary of the P.W.A. It would tax the impatience of any reader to explain on how flimsy and intangible pretexts the charge of perjury was based. It is a fortunate thing for the purses of the ratepayers that such tiresome and perfectly useless cases are not often tried. The amount of legal hair splitting and learned argument that can be gathered around a point which the ordinary person would settle in five minutes puzzles a good many people. It will puzzle still others when the bills have to be paid.

The remarks of Judge MacGillivray on the situation are worthy of quotation. He referred to the good record of the P. W. A. and expressed his surprise at the unity and continuity exhibited by the history of this organization since its formation 26 years ago. It must have had good leaders and good managers to have accomplished all it had done. It was a great pity that any leader of the Association should be brought before the Court on a criminal charge as the result of a difference among the members, and that the funds of the membership were being frittered away in litigation. In finishing his judgment his Honour said: "The prisoner has been put in a position in which he should not have been placed, and in which he would not have been put except for the action pending against the Grand Council—were it not that there was too much anxiety by Counsel to get information for use in the Civil Court. I have already, in other cases, had occasion to condemn this practice. Spite and revenge are not the law of the land, and should not be the foundation for putting into effect the processes of the law, especially when the Crown must pay all the expenses of the trial except the costs of the prisoner's Counsel. In my opinion if this prosecution had been founded on the allegation of the prisoner having committed the offence and had not been ancillary to another action it would never have been brought".

An interesting sequel to the trial is an open letter from the Grand Secretary, in which he charges the local organizer of the U. M. W. A., one of the leading spirits of the prosecution, with misappropriation of the funds of Pretoria Lodge,

and states that he himself had protected this man from arrest and criminal prosecution.

What will most of all appeal, we think, to the Nova Scotian members of the P. W. A. in the learned Judge's remarks is his advice to steer clear of international union. We have on several occasions expressed the same view in stronger terms, and it is gratifying to find this opinion is also held by a gentleman so competent to give one. Canadian labour unions cannot afford union with those of the United States, particularly when engaged in trades that enter into commercial competition. If the iron vessel and the earthenware pitcher go to the well together some day something will be broken. Professor Shortt, whom no one can justly accuse of partiality, has recently expressed himself as opposed to international union in this matter and as favoring the fostering of a national spirit in trades unionism as well as in other matters pertaining to the welfare of the people.

No empire in the world's history was ever founded on a truer democracy than that of our own, and nowhere in all its vast realms has it produced a fairer flower than in Canada. We do not want the peculiar methods favoured by American unions to destroy the innate love of law and order which characterizes our people. We can dispense with that feature of industrial warfare which ranges on one side the deputy sheriff with his loaded Winchester, and on the other murder, bomb-throwing and the red rage of unbridled anarchy. They are foreign to our country and our empire, and we think our miners will be wise if they do not join hands with organizations that use such methods.

BRITISH COLUMBIA.

Rossland.—The situation at the Le Roi No. 2, Ltd., is improving. The official confirmation is now at hand regarding the strike on the 500-foot level of the rich big ore body that was pierced by diamond drill. Several wide veins were cut, and assays from the core gave returns of as high as \$73 per ton. The diamond drill hole was put down in the direction of the top of stope No. 3 on the 700-foot level.

During the month of October the Le Roi mine here made a better showing than it has for many months. It is estimated that the profits on the company's operation were in the neighborhood of \$50,000. During that month 6,861 tons of ore were shipped to the Northport smelter, that returned an average value of \$18 per ton. During the year last reported on by the company's directors the average value of ore shipped was \$10.02, but a much larger tonnage was shipped than during the year 1906, when the average value per ton was \$10.50. However, it is pleasing to see that the Le Roi can, with a little effort, get in and make a good showing once in a while. The amount expended for development during October was lower than it has been running, \$1,500. It is important to note in connection with this month's work that most of the ore was mined in the 1,650-foot level of the Le Roi, where the gold values predominate, the copper falling away to some extent.

Ore shipments from Rossland district has been rather heavy during the last few months, and it now looks as though the Centre Star group would exceed their total tonnage for last year, by the 31st of December next, to the extent of over 50,000 tons. The Le Roi No. 2, Ltd., shipments will not differ much one way or the other, while the Le Roi record will fall about 35,000 tons under the shipments for 1907. But this may not have an important bearing on the moneymaking features of the company's operation, as the ore that was shipped should prove to be of a higher grade than that sent to the smelter during 1907.

The first assessment levied by the White Bear Company under the new organization has been paid up. Another assessment should place the company in shape to go ahead with the

work that was planned prior to the last closing down. The shaft will be deepened, with the prospect of getting into rich ore regions that are thought to lie at depth on this property. If the White Bear ever did stand a chance to make a paying mine, it is with conditions as they now are at the mine. Some good ore has been opened up, but not in what is known as large quantities in this camp of large lodes. As the ore has improved with depth, it looks as though the hopes of the mine lay still deeper in the ground.

Mr. W. D. Matthews, of Toronto, president of the Consolidated Mining and Smelting Co. of Canada, visited the Centre Star group and the company's smelter at Trail during the past week. Mr. Matthews was well satisfied with the way affairs were moving with the company's property in this section. There is little doubt but that the report of the Consolidated for the last year will prove favorable, as things have gone well with the mines and smelter of this organization during the past twelve months.

Boundary.—The declaration of a 2 per cent. dividend by the directors of the Granby Company was received with satisfaction throughout this district. This is the second dividend the Granby Company have paid out of their earnings this year, which goes to prove that the expense of mining and smelting has been reduced by the management to a minimum figure, this being absolutely necessary for the realization of profit when selling copper on a low-priced market. The Granby Company have paid ten dividends since December, 1903, amounting in all to \$3,508,630.

The entire battery of eight furnaces has been in operation at the Granby smelter during the past week, including the remodeled furnace, which is giving good results.

Ore shipments from the Granby mines alone should pass the million ton mark before the end of the year. This year the Granby will exceed the shipments of 1907 by over 400,000 tons. As it is officially stated that there is a greater reserve of ore, developed by diamond drill and other development work, in the Granby mines than they have shipped so far this year, there must be nearly a million tons of ore "in sight."

Shipments from the Mother Lode will exceed those for 1907 this year by approximately 100,000 tons, while the shipments from the Oro Denoro will exceed the output of the Emma for 1907 by 65,000 or 70,000 tons.

Mr. Frederick Keffer, consulting engineer for the British Columbia Copper Co., with a small staff of assistants, has made an examination of the more important of the mines of the Dominion Copper Co., including the Brooklyn, Mountain Rose and Sunset. While no information has been given out, it may be that one of the big consolidations would like to lease these mines, treating the ore in the larger and more up-to-date smelters than that of the Dominion Copper Co. at Boundary Falls. The proposition is feasible.

The output of the Snowshoe mine is now being divided between the company's smelter at Trail and the Greenwood smelter of the B. C. Copper Co. This is along the lines that the output of the mine was handled last year.

The National Trust Co., in the Supreme Court at Vancouver, has asked for judgment on the \$800,000 mortgage they hold of the Dominion Copper Co. The application was opposed by counsel. Mr. P. F. Roosa, manager and provisional liquidator for the Dominion Copper Co., has gone to New York City in connection with reorganization matters.

With the ore sent from the Boundary during the last couple of weeks the Boundary ore shipments pass the 7,000,000 line. The Granby shipped over 65 per cent. of this heavy tonnage, the Mother Lode mine about 20 per cent., and the other smaller properties in proportion.

The Keremeos Copper Co., controlled by Spokane mining men, has been registered as an extra-provincial company. A contract has been let for a 1001-foot tunnel. The company has three promising claims in the Similkameen.

Nelson.—The mining interests of the Slocan are looking forward with some interest to the decision of the Supreme Court of Canada in the case of Byron S. White Co. vs. the Star Milling and Mining Co., of Sandon. It is expected that this case will be disposed of by the court before the holidays, and as it will establish a precedent which will affect Slocan mining to quite an extent in the future, hence the interest. It seems the B. S. White Co. followed a lode, of which they claim to have the apex, which dipped into a claim owned by the Star Company. The apex may be traced through several claims of the White Company on the surface, and indications of ore are easily followed along the vein on the 300-foot level. There is a barren strip on the 600 level where the ledge has faluted and, as the writer understands the case, the point of contention is whether this barren strip extends to the surface and makes what legally may be termed another vein, or whether the ore body would be designated as one vein that had faulted and the apex rights having been established that the company having the apex may follow that vein into the vertical lines of the adjoining property.

This will be the first important decision that has been given by the Supreme Court in British Columbia mining law, and the outcome is being looked forward to.

Several Spokane mining men visited the reduction works of the Canada Zinc Co. during the past week, and they say that if the process proves a success for the treatment of zinc ores, it is very likely that a similar plant will be built at Coeur d'Alene, Idaho, to treat the lead-zinc ores of that district.

Mining men here have noted with interest the resolutions passed by the trustees of the Spokane Chamber of Commerce and Denver and Missouri interests protesting against the reduction of the tariff protection now on lead and zinc products, as the matter, to a small extent, affects the zinc-lead miners of the Slocan at the present time. The present duty is 1½¢ per lb. on lead ore and 2½¢ per lb. on lead bullion. Very little lead is shipped to the United States for consumption, but there is an occasional shipment to some point in the States for manufacture, and when the manufactured article is exported from the United States a rebate is granted, a small sum being withheld for charges.

The power lines are now into the Silyer King mine, and the electrically operated pumps will soon have the mine unwatered. As soon as this is accomplished it is the intention to begin work on the lower levels of the property.

The zinc smelter of the Canadian Metal Co. at Frank is being dismantled, and will soon only be a matter of history. While the company received what appeared to be valuable concessions at Frank, they were too far from the source of the product they were to treat, and the freight rates had much to do with the failure of the enterprise.

Even New Denver is sharing in the prosperity that is noticeable in the Slocan. The Molly Hughes has been again opened up and a small crew put to work.

A two weeks' run of the four-stamp mill at the Nugget has resulted in a \$5,000 gold brick, one-half of which it is estimated is clear profit.

About \$250,000 of French capital has been placed into alterations and improvements about the Blue Bell in the last 18 months, and the property is now in good form for a heavy production. The stamp mill (110-ton), which is capable of treating a large tonnage, has been running more or less steadily

since July, and has treated 15,000 tons of Blue bell ore. The company has shipped over 2,000 tons of concentrates to Trail smelter.

The Iron Mask mine at Kamloops has been sold to West Duluth mining men, and a force of twenty men put to work.

It is the intention to work about 100 men at this mine in the spring. Lack of smelter facilities has handicapped the Kamloops mines considerably in the past, and it is now thought that a small smelter will be erected near the Iron Mask. This would prove a great stimulus to the Kamloops copper properties.

GENERAL MINING NEWS.

NOVA SCOTIA.

Sydney Mines.—Owing to scarcity of shipping the Nova Scotia Steel and Coal Company has closed all but its No. 3 Colliery.

Halifax.—It is expected that the new Technical College will be completed next July.

NEW BRUNSWICK.

St. John.—Chatham has been provisionally selected by the Canada Iron Corporation as a shipping port for their iron ore from the deposits near Bathurst. It is possible that a smelter will be erected there also.

ONTARIO.

Sault Ste. Marie, Dec. 3.—The steel plant of the Lake Superior Corporation closed down this morning at 6 o'clock, according to the statement of General Manager Franz, from lack of orders. Rolling for the last order of the Transcontinental Railway was finished this morning.

The management announces that the plant will re-open on January 1. The blast furnaces will continue operating in full force.

Sudbury.—The Crystal stamp-mill, near Lake Wahnapiatae, has been closed temporarily on account of shortage of fuel. During the recent forest fires the Company's entire stock of cordwood was burned.

Cobalt.—The Flynn property, near Cross Lake, has been purchased by a small syndicate of Toronto men, under the name of the Pontiac Mining Company. Very little silver has been discovered. One vein of calcite and smaltite has been worked to a small extent.

The concrete foundations of the O'Brien concentrating mill has been completed. The frame work is now under construction.

Development work on the properties of La Rose, Cons. Mines Co. during the month of October was as follows: La Rose mine, 493 feet and 764 cubic yards of sloping. Princess mine, 104 feet. University mine, 18 feet, some open cut work. Violet mine, 1,090 feet of trenching, besides a small amount of open cutting.

An average number of 242 men were employed on the company's properties during the month. A contract has been entered into with the American Smelting and Refining Co. for the treatment of La Rose low grade ores at Denver. This

contract is more favorable than the schedule under which La Rose ores have been marketed in the past.

The Green-Meehan and Red Rock Cobalt concerns, which have been amalgamated, will be called the "Mount Royal" in future.

BRITISH COLUMBIA.

Frank.—The zinc smelter of the Canadian Metal Company is being dismantled.

Michel.—The pay roll of the Crow's Nest Coal Co. for Michel for October is \$97,800.

Nelson.—Where a year ago only the Queen mine and a stamp mill were working on Sheep Creek, at present there are six others, the Kootenay Belle, Bonanza, Mother Lode, Golden Fern, and Nugget. The Queen has improved its water supply and has added 10 stamps to its mill. Two 20-stamp mills are projected, the first for Mother Lode and Kootenay Belle, together, and the second for the Nugget.

Sandon.—Up to November 28, the Reco mine has shipped 456 tons to the Trail smelter. At that date there was a pile of 5,000 sacks awaiting the first substantial fall of snow when rawhiding will be commenced. There is much ore, also, broken in the stopes, and the chutes are full. It is believed that the Reco can ship a carload a day during the winter. Since 1905, during which year the Reco paid \$20,000 in dividends, the mine has not been worked with uniform success. But last spring it was leased to an Italian miner, who is doing exceedingly well.

Nelson.—The second Relief mine, opened first in 1896 by Finch and Cameron, is being worked successfully under lease by Messrs. Hudson and Bell. A 10-stamp mill is in operation. The vein worked ranges from three feet to 12 inches in width. Nearly all of the ore is reported as payable.

The Mother Lode mine in the Sheep Creek camp, is shipping good ore to the smelter.

Rossland.—Electric power is being installed at the Silver King and Victoria mines, near Nelson.

A 500-foot tunnel is to be driven into Wallace Mountain to cut the veins of the Bell Mining Company's properties.

Vancouver.—Near the old Cornell workings, on Texada Island, abounded twelve months ago by an English syndicate, after a quarter of a million dollars had been spent, it is reported that a large body of copper-gold ore has been encountered. Insufficient development has been done to make any final statements about the size and character of the vein. But it promises well.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

The continued depression in the South Wales coal export trade is being severely felt, and large numbers of the coal miners are on the verge of starvation.

Wales is the only gold-producing area in the British Isles, and the output is not large. In 1907, 12,978 tons of gold ore,

valued at £5,625, were produced, as against 17,384 tons, of the value of £5,343, for the previous year. It was practically all raised in Merionethshire, where it occurs in quartz veins traversing the Cambrian rocks.

The Durham Coal Trade Conciliation Board has reduced coal miners' wages 3¼ per cent.

FRANCE.

Important experiments as regards coal-dust explosions were recently made at the French Government's testing galleries at Lievin, which demonstrated that grisontine couche, employed for the last two years in the coal mines of Northern France, is a safety explosive, and that by placing in sections deposits of inert matter throughout the galleries danger in case of accidents was limited.

The French Government has proposed important amendments to the mining laws, which will open the way to the acquisition of mines by the state whenever such a step appears advisable.

The first steel ingot ever cast in Denmark was recently produced at the new works of Messrs. Burmeister & Wain, at Copenhagen.

RUSSIA.

Large quantities of Russian iron ore have lately been shipped to Silesia, but in view of the injurious effect of this trade on the Russian iron industry, the Government has decided to enforce strictly the existing regulations prohibiting it.

The Societe des Usines Metallurgiques de Moscow has erected tin-plate plant and imported 27 workmen from South Wales.

AUSTRO-HUNGARY.

The Austrian mining authorities have issued new regulations for the prevention of fire in the oil districts, compelling every oil well owner to provide adequate storage facilities for his output.

UNITED STATES.

Two new coal fields have been discovered in Indiana. Northwest of Bloomfield, Green County, workmen drilling for water struck a vein of workable thickness at a depth of 130 feet, and in the course of drilling a well in Bartholomew County a farmer encountered a rich vein 25 feet thick about 100 feet down.

Cripple Creek, Colo., bids fair to reach the quarter-billion mark in production by the close of the year, the total output of the camp up to the end of October being \$248,374,312. The present year's output so far has exceeded that of the entire

years 1907, both in tonnage and value, the yield for the ten months ending with October being 632,426 tons, valued at \$13,496,299. By the adoption of modern methods in the treatment of low-grade ores, thousands of tons are utilized that were formerly thrown out on the dump.

Two new quicksilver mines are being opened on the Pacific Coast. One is the Florence Mack, west of Coalinga, Fresno County, Cal., and the other near Ione, Humboldt County, Nev., where a reduction plant is being installed.

On November 28th an explosion occurred in the mine of the Pittsburg-Buffalo Coal Co., at Marianna, Pa., which resulted in the death of 135 men. Immediately before the disaster a mine inspector had completed a two-days' inspection of the workings, which revealed no cause for apprehension. The force of the explosion was so great that woodwork about the mouth of the shaft was blown a distance of 2,000 feet. Most of the victims were suffocated by smoke, as the explosion put the ventilating fans out of order.

MEXICO.

A rich telluride gold deposit has been discovered in an almost inaccessible bluff in the Arteaga mining district in the western part of the State of Chihuahua.

JAPAN.

The metallic production of Japan for the six months ended June 30th was as follows: Gold, 35,905 oz.; silver, 1,706,443 oz.; copper, 24,348,834 lbs.; iron, 18,318 long tons. The exports of copper amounted to 2,458,253 lbs.

AUSTRALASIA.

The smelting companies of Wallaroo, Australia, have decided to use German coal in future on account of its relative cheapness as compared with the coal of New South Wales. The difference is due to the cheapness of labor in Germany.

The low price of silver has resulted in the discharge of a number of miners at the Colon Peaks, Yerranderic, N.S.W., as the cost of production leaves no margin of profit at present rates.

A rush to the Poseidon country, Victoria, has set in owing to some rich finds of gold near Tarnagulla.

COMPANY NOTES.

At the recent Dominion Copper Co. meeting there was re-presented approximately \$500,000 of the \$800,000 bonds. General Manager White, of the National Trust Co., presided, and stated that the property is likely to be sold.

No plan for reorganization was presented, but the following committee of bond-holders was appointed to examine the situation and report: Hon. W. W. Foster, John A. Sleicher, Warren Castle, Prof. Stebbins, H. H. Melville, and Messrs. Williamson and Shields.

The La Rose Consolidated Mines Co. announces that a contract has been entered into with the American Smelting and Refining Co., for the treatment of the low grade of the former, at Denver. This contract is more favorable than the old contract.

The Kerr Lake Mining Company has declared the regular quarterly dividend of 3 per cent. payable December 15. Books close December 6, and re-open December 17.

The Cobalt Central has announced officially that a dividend of 2 per cent. will be declared in December.

The directors of the Buffalo mines met yesterday and declared a dividend of 5 per cent. and a bonus of 1 per cent. per month for the current quarter, this being at the rate of 32 per cent. for the year.

The Cobalt Silver Queen Co. has decided a quarterly dividend of 2 per cent. Heretofore the company has also declared an additional 2 per cent. bonus at the quarterly period, but owing to the fire on July 12 last this extra disbursement has been suspended for the present.

The shareholders of the City of Cobalt Mining Company at a meeting on November 30 authorized the directors to increase the capital from \$500,000 to \$1,500,000, each shareholder to receive three shares for every one now held. They also decided to issue the stock now in the treasury to the shareholders pro rata, being 10 3-4 shares for every hundred shares.

The directors decided after the meeting to pay a 10 per cent. dividend on the 15th of January on old capital; \$500,000, and to add a large quantity of machinery to the plant. The

last dividend was five per cent., or twenty per cent. per annum. The new rate represents forty per cent. per annum.

After a lengthy session on Nov. 30th, the directors of the Crown Reserve Mining Company the directors decided to pay a dividend on the capital stock, of 12 per cent., and a bonus of 4 per cent., making a total disbursement of 16 per cent. to stockholders.

The twelve per cent. dividend is for the half-yearly period, ending December 31, 1908. In future the dividends will be on a six per cent. quarterly basis, which is at the rate of twenty-four per cent. per annum.

Bonus payments will be made quarterly and will be in accordance with the surplus earnings of the company. In this respect it is interesting to note that, after allowing for the current disbursement, the company will have by the end of this year in cash on hand and owing by the smelters in excess of \$250,000, while there will be at least \$100,000 of ore in the ore house. The surplus would be sufficient to pay another twelve per cent. bonus on the company's stock.

The company has paid for plant and equipment houses and miscellaneous expenditure out of earnings, and have been working on proper mining methods for less than eight months of the year.

The books close December 15 to January 15, both days inclusive, and the dividend will be paid January 15. The annual meeting will be held January 13.

THE CONIAGAS MINES, LIMITED—DIRECTORS' REPORT.

To the shareholders of The Coniagas Mines, Limited:

Gentlemen:—

During the past year your Mine has been operated without interruption with a force of about 125 men.

The Concentrating Mill has been extended and twenty stamps have been installed, with an economical gas engine to run the mill, and increased concentrating machinery. Ten more stamps will be installed immediately, and the capacity of the mill (and therefore of the mine) will be increased to about 90 tons per day, as against about 45 tons during the past year.

Additional camp accommodation for the men has been provided, and many dwellings have been erected and rented to

the married employees as shown on plan accompanying this report.

A new shaft has been sunk near the mill to the 150 feet level and all ore is hoisted in this shaft and dumped direct into the mill.

The ore in the lower level is found to carry equal values to that found in the upper level, and the accompanying plan shows that a large amount of ore has been developed on that level without any dead work whatever, veins having been found running in directions suitable for the proper development of the mine. (The accompanying plan of the mine shows the conditions up to Sept. 30th only, in order to get printing done in time for the Annual Meeting.)

The Keewatin formation has been encountered in the westerly part of your mine in both levels, cutting out the veins, and proves to be dipping very uniformly to the east and south, indicating that probably a very productive portion of your property has not yet been reached. The underground workings and surface explorations may now be considered to cover an area of about 12 acres of a total of 40.

Your Directors desire to express their appreciation of the efficiency of the entire staff during the past year, and of the spirit of harmony and enthusiastic co-operation shown in all departments.

The following table shows the work done to date, and the work done during the past year ending October 31st, 1908.

	Total to Oct. 31, '08.	To Oct. 31, '07.	Done During past year.
Cross cutting	641 feet.	545 feet.	96 feet.
Shaft sinking	422 feet.	150 feet.	272 feet.
Drifting.. . . .	3756 feet.	1660 feet.	272 feet.
Winzes	94 feet.	00 feet.	94 feet.

Estimate of total rock excavated to Oct. 31st, 1908:

Cross cutting	2,280 tons (barren ground)	2,280 tons
Drifting	12,980 "	
Stoping	13,680 "	
Open cutting	4,680 "	
Shaft sinking	1,400 "	250 "
Winzes	320 "	
	<hr/>	<hr/>
	35,340 "	2,530 "



VIEW OF THE CONIAGAS MINE, COBALT, ONT.

Of the above total	35,340 "
Barren rock	2,530 tons
Mill rock in surface dumps.....	14,796 "
Mill rock in stopes	3,950 "

21,276 " 21,276 "

Estimate of rock that has been milled..... 14,064 "
of which there is stocked 4,000 tons of jig tailings with a silver content of about 13 ounces per ton to be recrushed.

From the above amounts the rich ore was hand picked from about 33,000 tons, and 14,064 tons have been concentrated, yielding 297 tons of concentrates.

The total silver produced by this property during the past year is 1,444,229 ounces, making a total to date of 3,444,000 ounces, and a careful estimate of the ore in sight as actually developed by the under-ground workings amounts to thirteen million ounces.

The average price obtained for silver for the past year was 52.3c. per ounce, as against an average price for the previous year of 67.05c. an average difference of 14 3/4 c. per ounce.

Your Company owns the issued capital stock of The Coniagas Reduction Company, Limited, with the exception of six shares, issued to directors to qualify.

The works at Thorold are now handling the product of your mine and are running commercially as regards the production of refined silver and refined white arsenic, and we expect to place refined cobalt oxide and nickel oxide on the market very shortly, thus refining and marketing all the valuable constituents of your Ores by a process which is confidently expected to yield a substantial profit.

The Coniagas Reduction Company, Limited. Dominion Government Charter. Capitalization, \$250,000.00; par value of shares, \$100.00. Directors: R. W. Leonard, President, St. Catharines, Ont.; Alex. Longwell, Vice-President, Toronto; Milton L. Hersey, Montreal, Que.; W. M. Boulbee, Toronto, Ont.; Welland D. Woodruff, St. Catharines; R. L. Peek, Thorold, Ont.

All of which is respectfully submitted. R. W. Leonard, President and General Manager.

THE CONIAGAS MINES, LIMITED.

After careful examination of the books and vouchers of The Coniagas Mines, Limited, for the 12 months ending Oct.

31st, 1908, I beg to report that I find the books systematically kept, from which the following abstracts are correct. R. Fowlie, Auditor; St. Catharines, Ont., Nov. 17th, 1908.

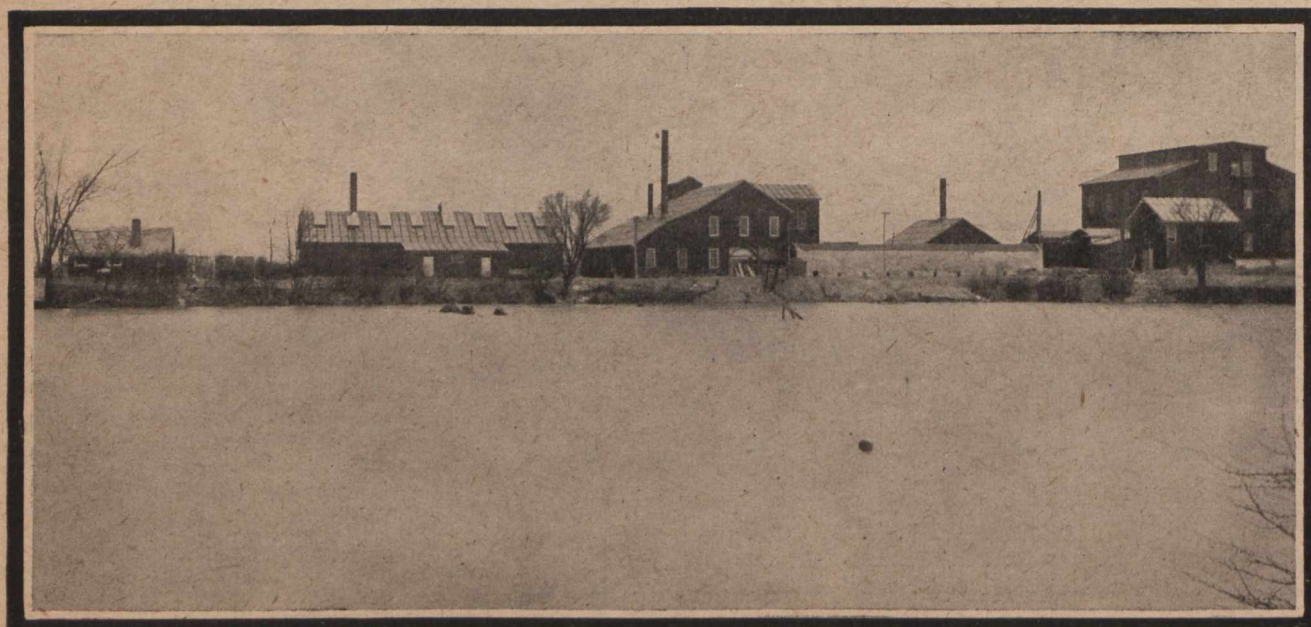
Financial Statement for the Year Ending Oct. 31, 1908.

Assets.	
Mines and Minerals	\$3,985,700.00
Office equipment	200.00
Machinery and plant	68,237.95
Camps and buildings	82,153.56
Camp equipment	2,502.51
Camp supplies inventory	1,580.52
Coniagas Reduction Co. stock	100,000.00
Accounts Receivable	262.58
Cash on hand and in Bank	173,742.31
Ore in transit	173,993.91
	\$4,544,373.34

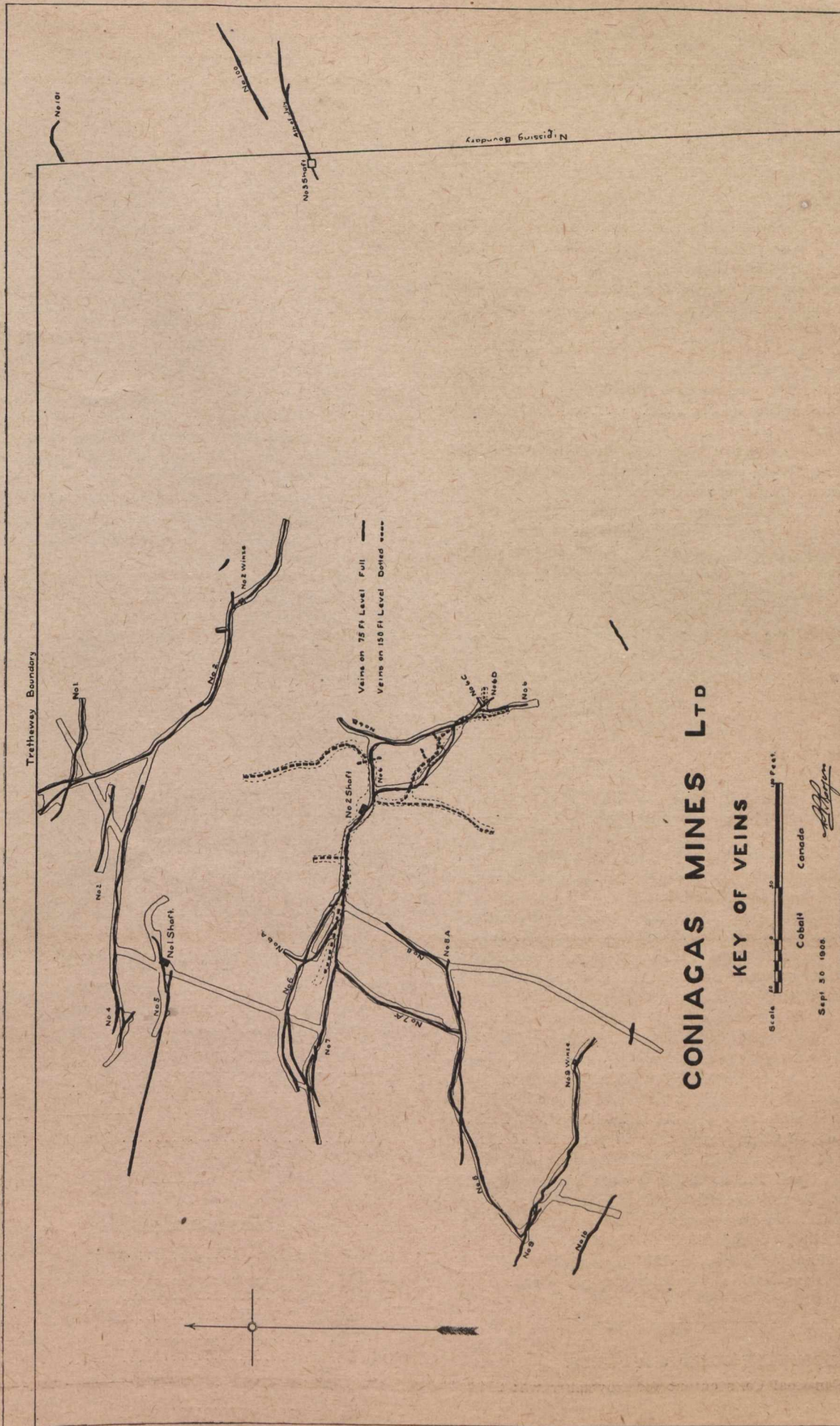
Liabilities.	
Capital stock	\$40,000,000.00
Unclaimed wages	45.31
Dividend payable	120,000.00
Accounts payable	107,847.73
Surplus	326,480.30
	\$4,554,373.34

Examined and found correct, R. Fowlie, Auditor; J. J. Mackan, Secretary; St. Catharines, Ont., Nov. 17th, 1908.

Working Account.	
To Administration and Supervision	\$22,360.91
“ camp expense	13,090.28
“ Lands and Roads	9,962.33
“ Mining	84,164.69
“ Fuel, oil and waste	26,314.65
“ Milling and sorting	30,196.38
“ Sale of ore	11,372.36
“ Legal expenses	2,665.01
“ General expenses	109.50
“ Transportation and travelling	781.83
“ Taxes and Royalty	24,458.64
“ Balance to loss and gain	501,194.08
	\$727,194.66



THE THOROLD SMELTER OF THE CONIAGAS REDUCTION COMPANY.



CONIACAS MINES LTD

KEY OF VEINS

Scale 0 20 40 Feet

Cobalt Canada

Sept 30 1908

A. J. P.

By Ore revenue	709,414.61
“ Camp revenue ..	15,391.59
“ Interest and Discount	1,514.36
“ Rent ..	874.66
	<hr/>
	\$727,194.66

Loss and Gain.

To Dividend paid Jan. 1st, 1908 ..	\$80,000.00
“ “ “ Mar. 1st, 1908 ..	80,000.00
“ “ “ May 1st, 1908 ..	80,000.00
“ “ “ July 1st, 1908 ..	80,000.00
“ “ payable Nov. 1st, 1908.....	120,000.00
“ Balance, (surplus to date	326,480.30
	<hr/>
	\$766,480.30

By balance, (gain) from Oct. 31st, 1907.....	\$264,762.22
“ Mine Profit for year ending Oct. 31st, 1908, as shown in working account ..	501,718.08
	<hr/>
	\$766,480.30

Examined and found correct, R. Fowlie, Auditor; J. J. Mackan, Secretary; St. Catharines, Ont., Nov. 17th, 1908.

The annual meeting of the Nova Scotia Silver Cobalt Mining Company, Limited, held at the office of the company, 171 St. James Street, Montreal, was attended by a large number of shareholders.

The financial statement of the company was exceedingly gratifying, in view of the fact that this property is now being developed with due regard to the future shipments of ore.

The consulting engineer of the company, Mr. Benjamin B. Lawrence, explained at some length to the meeting that to make regular shipments of ore it is necessary to get the mine fitted up for the economical handling of the large body of ore known to exist on this property.

The profit for the year on the shipments of ore amounted to\$104,117 04
This does not include a large quantity of screenings ready for shipment, which will be sold this winter, netting the company at least 150,000 00
The second-class ore is also estimated to net the company within the next six months at least..... 100,000 00
This would make a total of.....\$354,117 04
For ore extracted during the year at a cost to the company of 103,198 00

Leaving a surplus on ore account of.....\$250,919 04

The ore body exposed in the mine from the report of our consulting engineer varies from 4 to 8 feet wide, and has been tapped on the lowest level, namely, 165 feet from the surface, where some very rich silver veins have also been found.

The directors have every reason to believe that dividends on this property will be paid some time next year.

The machinery, buildings, and equipment are considered the best in the camp. The shareholders ought to be congratulated on the future prospects of this property.

The company decided to accept an offer of 65 cents a share for the balance of the treasury stock.

The following directors were re-elected: D. M. Steindler, president; Mortimer B. Davis, Vice-President; Jacob A. Jacobs, Secretary-Treasurer; A. M. Bilsky, Managing Director; A. M. Reaper, Director.

STATISTICS AND RETURNS.

The official bulletin of the Antwerp bureau of commerce, which undertakes annually the task of compiling the coal output statistics of the entire world, has just announced the following figures for the year 1906, the last for which definite results have been obtainable. The world's total coal output for 1906 amounts to 893,249,557 tons, as against 844,194,217 tons in 1905. Ten years ago, in 1896, the grand total was 546,742,207 tons, in 1886 it was 303,207,780 tons, in 1870 it was 203,321,112 tons, and in 1850 only 89,881,357 tons—a striking record of the progress of the world's industries. The first place as a coal-producing country is held by the United States of America, whose record for 1906 was 375,397,000 tons, more than 42 per cent. of the total. This place it has held since 1899. The second place upon the list is held by Great Britain, with a record of 251,050,000 tons, over 28 per cent. of the total. Germany comes next, with 136,480,000 tons, about 15 per cent. of the total, and France makes a very bad fourth, with 34,313,000 tons. A very interesting development is shown by Japan and Canada. Japan appears to have increased her production from 1,243,000 tons in 1905, to 12,500,000 tons in 1906, while the Canadian production in 1906 amounted to 9,916,000 tons, or five times as much as it was twenty years ago.

DOMINION COAL SHIPMENTS.

The Dominion Coal Co.'s output for November was 244,304 tons; shipments, 233,558 tons.

Shipments from the collieries of the Cumberland Railway and Coal Company, for the month of November, were 26,709 tons.

BOUNDARY SHIPMENTS.

Granby	23,252	952,828
Mother Lode	9,847	250,897
Snowshoe	2,219	28,831
Oro Denoro	590	54,746
Sally	20	128
Other mines		22,511
	<hr/>	<hr/>
Total	35,928	1,309,941

ROSSLAND SHIPMENTS.

Centre Star	4,762	159,408
Le Roi	2,303	71,994
Le Roi No. 2	574	26,738
Le Roi No. 2, milled	260	9,970
I. X. L.	3	6
Other mines		1,282
	<hr/>	<hr/>
Total	7,902	269,398

NOVA SCOTIA STEEL OUTPUT.

Nova Scotia Steel's outputs for November were: Coal, 54,400 tons; pig iron, 4,580 tons; steel, 3,600 tons.

The output of the Crow's Nest Coal Company collieries for the week ending December 4 was 18,457 tons a day average of 3,076 tons. Week ending December 6, 1907, 23,212 tons, a daily average of 3,869 tons.

The output of the Crow's Nest Coal Company collieries for the week ending November 27 was 17,728 tons; daily average, 2,956 tons; week ending November 29, 1907, 21,800 tons; a daily average of 3,637 tons; week ending November 30, 1906, 13,736 tons, a daily average of 2,289 tons.

Shipments of ore from the Cobalt camp last week slightly exceeded the previous week, when they amounted to 635 tons. Last week they amounted to 700 tons.

The total shipments for the week were 1,401,960 lbs., or 700 tons, and the total for the year so far is 42,816,550 lbs., or 21,481 tons. Details follow:—

Mine.	Nov. 28. Week ending	Jan. 1. Since
Buffalo		1,016,950
Coniagas	64,000	2,261,288
Cobalt Lake		404,623
Crown Reserve	60,000	890,688
Cobalt Central		527,935
Chambers-Ferland		442,890
City of Cobalt		1,368,000
Drummond		1,291,520
Foster		437,300
Kerr Lake		1,152,794
King Edward		127,240
La Rose	217,910	8,360,370
McKinley-Darragh	240,000	3,271,470
Nipissing	248,130	3,784,160
Nova Scotia		487,675
Little Nipissing		40,110
Nancy Helen		408,977
Peterson Lake		41,237
O'Brien	191,920	6,420,857
Right of Way		1,300,770
Provincial		143,210
Silver Leaf		372,900
Silver Queen	153,000	1,709,390
Silver Cliff	40,000	198,100
Townsite		292,300
Temiskaming	60,000	1,114,880
T. and H. B.	60,000	2,253,666
Trethewey	63,000	3,232,470
Watts		561,680

BRITISH COLUMBIA ORE SHIPMENTS.

The following are the ore shipments for the week ending Nov 21st, and year to date:—

Boundary shipments	35,915	1,274,013
Rossland shipments	5,878	261,496
Slocan-Kootenay shipments	2,795	113,437

The total shipments for the past week were 44,588 tons, and for the year to date 1,648,946 tons.

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	22,017	929,576
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B. C. COPPER CO.'S RECEIPTS.

Greenwood, B.C.

Total	11,807	295,206
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CONSOLIDATED CO.'S RECEIPTS.

Trail, B.C.

Total	7,962	290,205
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LE ROI SMELTER RECEIPTS.

Northport, Wash.

Total	1,408	76,914
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The total receipts at the various smelters for the past week were 43,194 tons, and for the year to date 1,619,503 tons.

The following are the ore shipments for the week ending Nov. 28:—

SLOCAN-KOOTENAY SHIPMENTS.

Whitewater Deep	79	807
Whitewater Zinc (Okla.)	462	6,507
Whitewater, milled	700	27,100
St. Eugene	356	23,737
Queen	27	918
Queen, milled	420	9,750
Second Relief, milled	145	2,780
North Star	101	3,902
Blue Bell	171	1,613
Rambler Cariboo	20	1,086
Granite-Poorman, milled	250	10,125
Kootenay Bell, milled	70	2,040
Idaho Alamo	81	818
Reco	32	456
Richmond	89	2,435
Nugget, milled	110	490
Early Bird	20	20
Elkhorn	17	17
Other mines		21,986
Total	3,150	116,587

The total shipments for the past week were 46,980 tons, and for the year to date 1,695,926 tons.

B. C. COPPER CO.'S RECEIPTS.

Greenwoods, B.C.

Mother Lode	9,847	250,897
Oro Denoro	590	54,746
Snowshoe	1,200	1,200
Total	11,637	306,843

GRANBY SMELTER RECEIPTS.

Grand Forks, B.C.		
Granby	23,252	952,828

CONSOLIDATED CO.'S RECEIPTS.

Trail, B.C.		
Centre Star	4,762	159,408
Le Roi No. 2	574	26,738
Idaho Alamo	81	818
Snowshoe	1,019	27,631
I. X. L.	3	6
Blue Bell	131	1,613
St. Eugene	356	23,737
Whitewater Deep	79	807
Richmond	89	2,435
Reco	32	456
Rambler Cariboo	20	1,086
Early Bird	22	22
North Star	101	3,902
Elkhorn	17	17
Sally	20	128
Other mines		48,750
Total	7,326	297,531

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp, and those from Jan. 1 to date:—

	Week ending	
	Dec. 5.	Since Jan. 1.
	Ore in lbs.	Ore in lbs.
Buffalo		1,016,950
Coniagas.	59,000	2,320,288
Cobalt Lake		404,623
Crown Reserve	176,000	1,066,668
Cobalt Central		527,935
Chambers-Ferland		443,890
City of Cobalt	85,140	1,453,140
Drummond		1,291,520
Foster		437,300
Kerr Lake		1,152,794
King Edward		127,240
La Rose	282,000	8,642,370
McKinley-Darragh	60,000	3,281,470
Nipissing	237,870	8,588,240
Nova Scotia		487,675
Little Nipissing		40,110
Nancy Helen		408,977
Peterson Lake		41,237
O'Brien	128,030	6,548,887
Right of Way		1,300,770
Provincial		143,210
Silver Leaf		372,900
Silver Queen		1,709,390
Silver Cliff		198,100
Townsite		292,300
Temiskaming	60,000	1,174,980
T. & H. B.	60,000	2,313,666
Trethewey	127,200	3,359,670
Watts		561,680

The total shipments for the week were 1,275,240 pounds, or 637 tons. Total shipments from Jan. 1 to date are 43,187,074 pounds, or 21,693 tons.

LE ROI SMELTER RECEIPTS.

Northport, Wash.		
Le Roi	2,303	71,994
Queen	27	918
Other miens	555	6,887

Total

	2,885	79,799
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The total receipts at the various smelters for the past week were 45,100 tons, and for the year to date 1,664,603.

MARKET REPORTS.

Dec. 8.—Connellsville coke, f.o.b. ovens:—

Furnace coke, prompt, \$1.85 to \$1.90.
 Foundry coke, prompt, \$2.15.

Metals.

Dec. 8.—Tin, Straits, 28.85 cents.
 Copper, prime Lake, 14.50 cents.
 Lake arsenical brands, 14.50 cents.
 Electrolytic copper, 14.25 cents.
 Copper wire, 15.75 cents.
 Lead, 4.25 cents.
 Spelter, 5.15 cents.
 Sheet zinc, 7.50 cents.
 Antimony, Cookson's, 8.125 cents.
 Aluminum, 24 cents.
 Nickel, 40 to 47 cents.
 Platinum, \$22.50 to \$23.50 per ounce.
 Bismuth, \$1.75 per lb.
 Quicksilver, \$45 per 75 lb. flask.

Silver Prices.

	New York.	London.
	cents.	pence.
November 21.....	49 7-8	23 1-16
“ 23.....	49 5-8	22 15-16
“ 24.....	49 1-4	22 3-4
“ 25.....	49 1-4	22 3-4
“ 26.....	—	22 5-18
“ 27.....	48 1-2	22 3-8
“ 28.....	48	23 3-16
“ 30.....	48 3-8	22 5-16
December 1.....	47 7-8	22 1-8
“ 2.....	47 5-8	22
“ 3.....	48 1-4	22 1-4
“ 4.....	48	22 1-8
“ 5.....	48 3-8	22 5-16
“ 7.....	48 1-2	22 3-8
“ 8.....	48 3-8	22 5-16

In the manufacture of alcohol from peat, a Danish company, with one experimental plant in Denmark and one in France, has found the cost to be about one-fourth of that made from potatoes. In the process of manufacture, the cellulose or fiber of the peat is converted by sulphuric acid into a soluble carbohydrate, and this is fermented by a special yeast.