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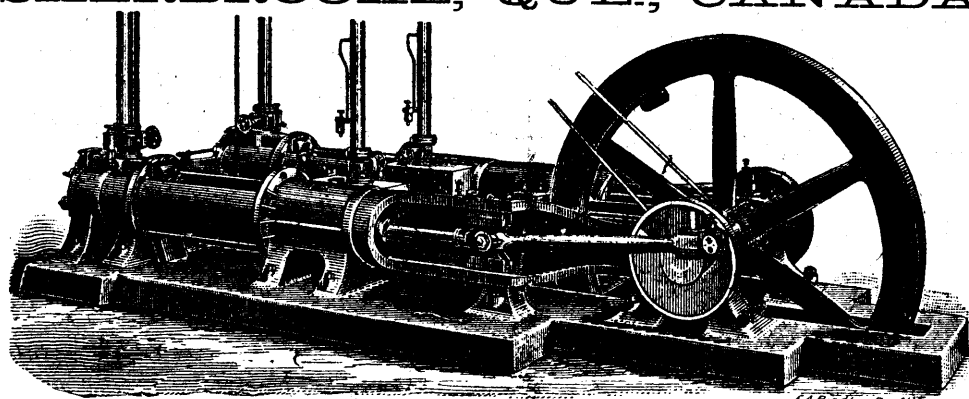
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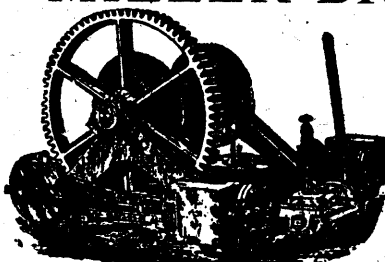
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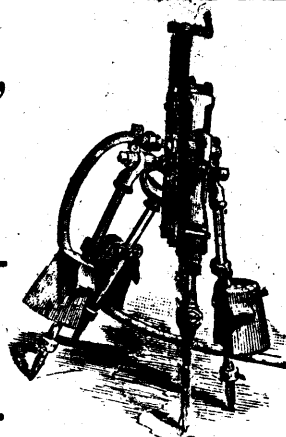


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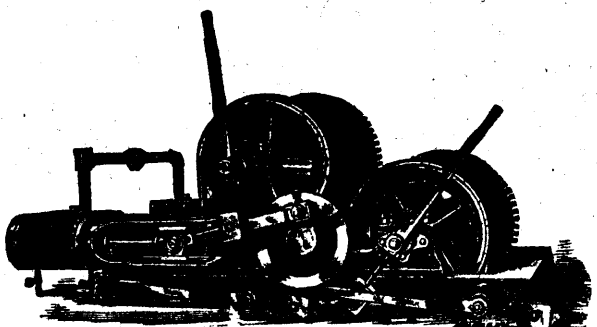
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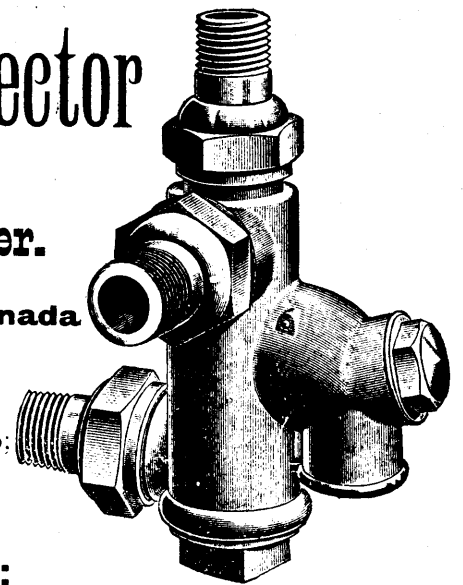
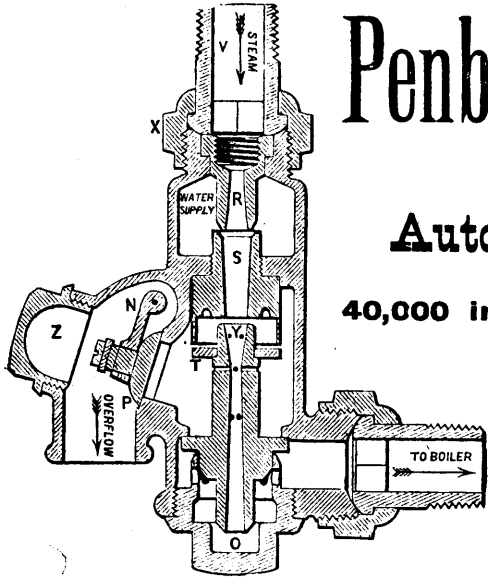
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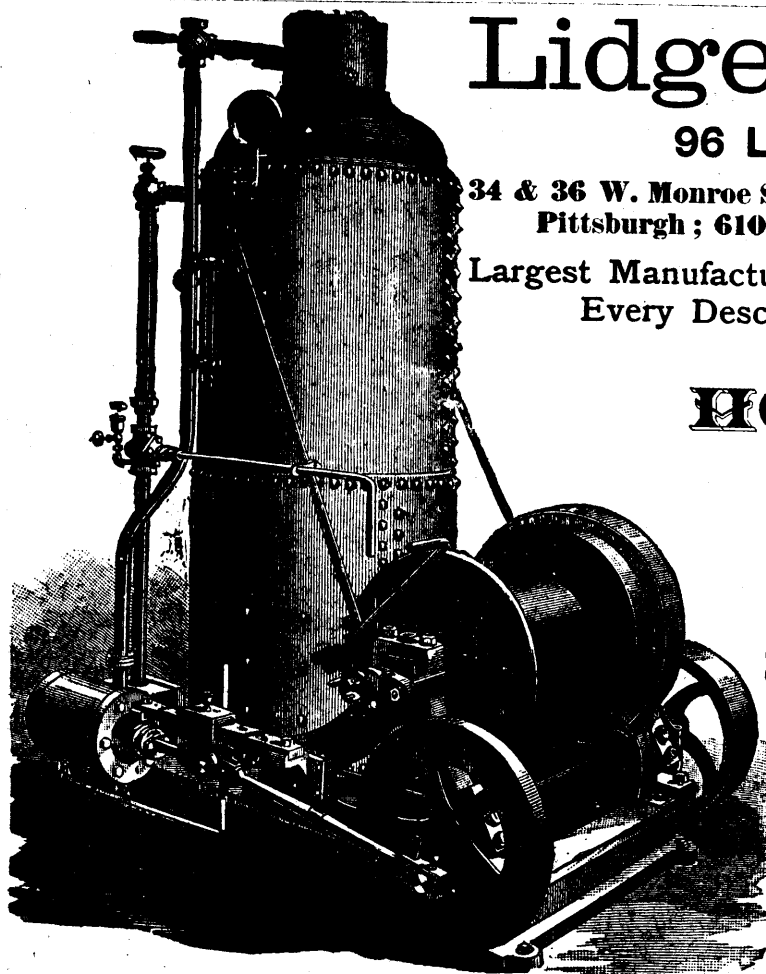
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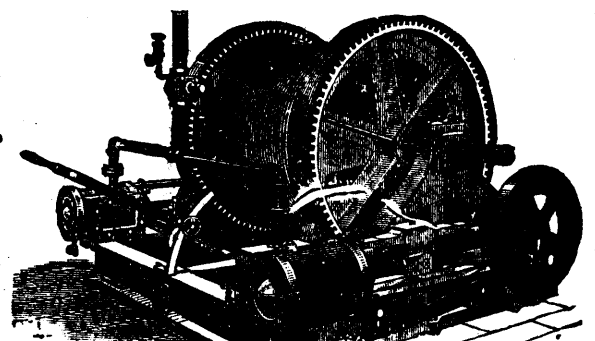
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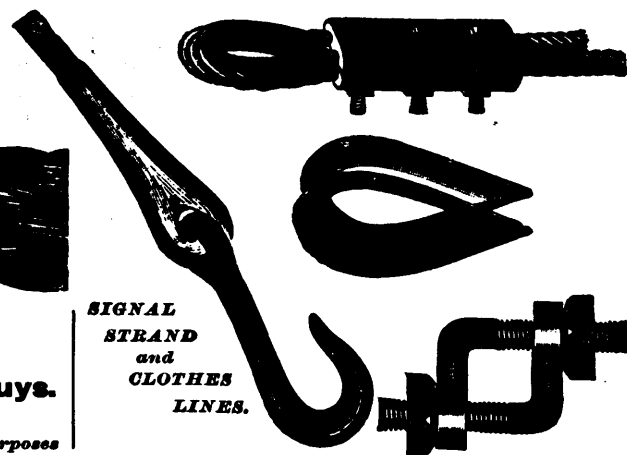
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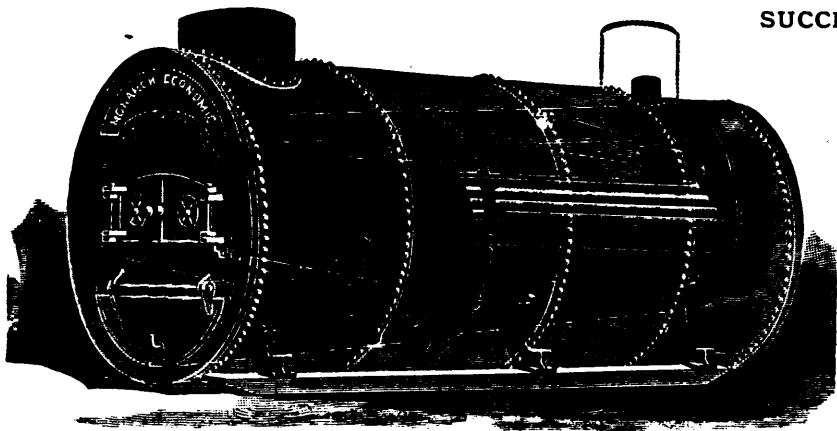
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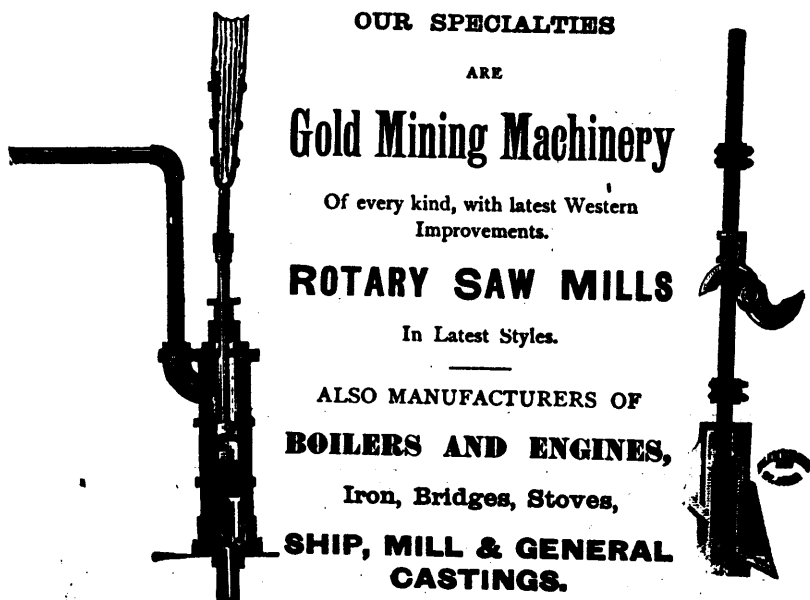
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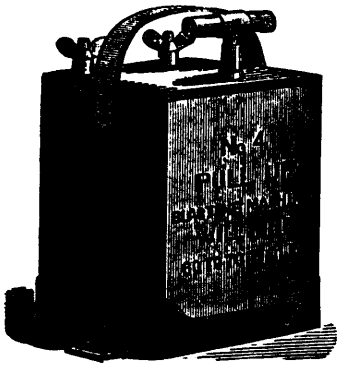
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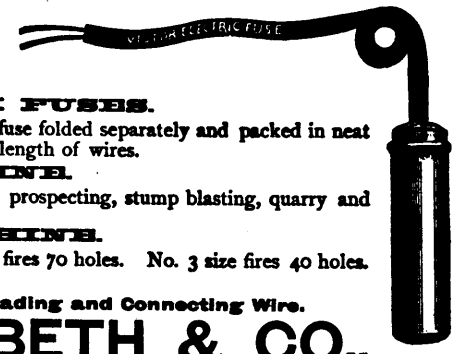
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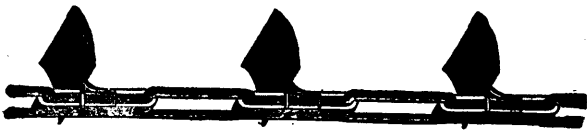
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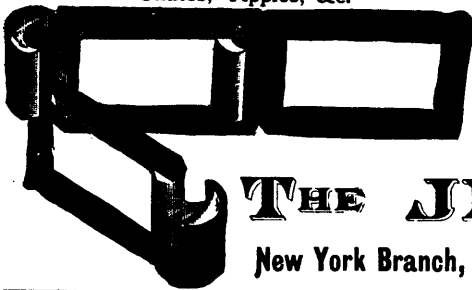
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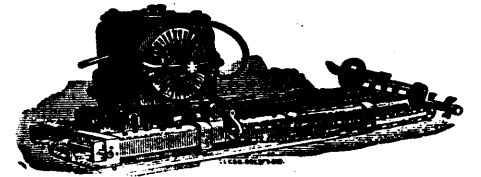
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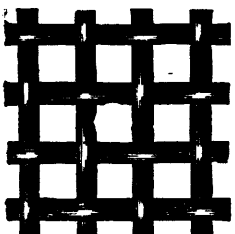
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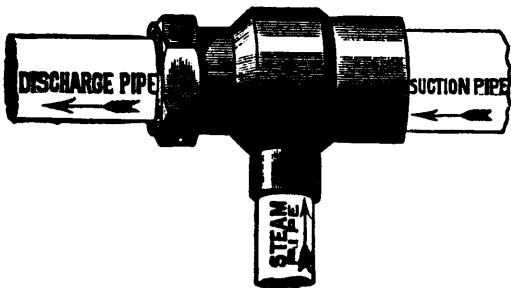
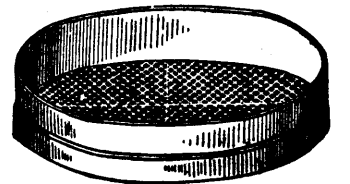
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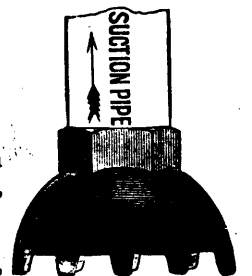
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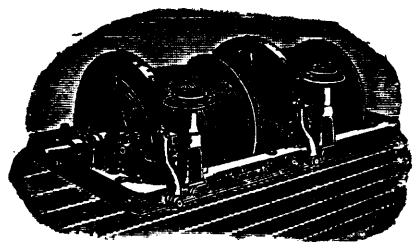
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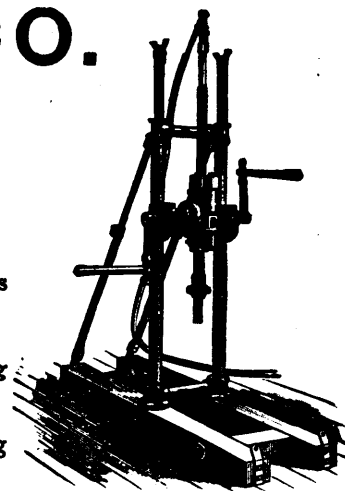
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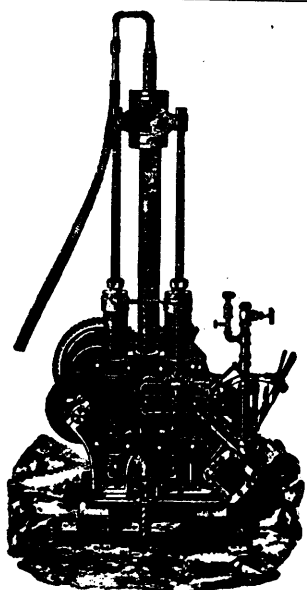
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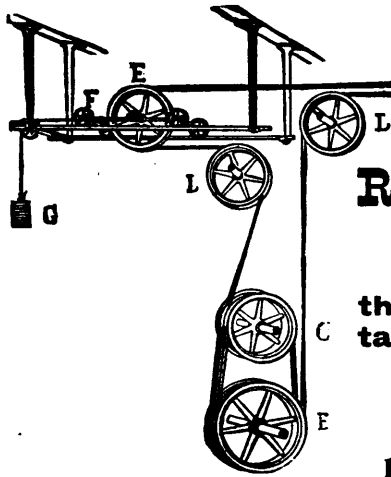
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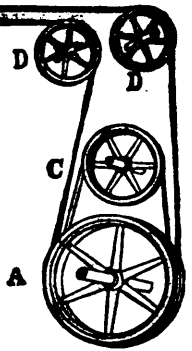
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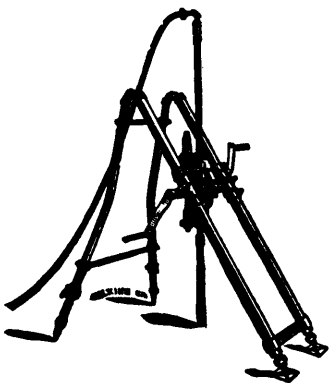
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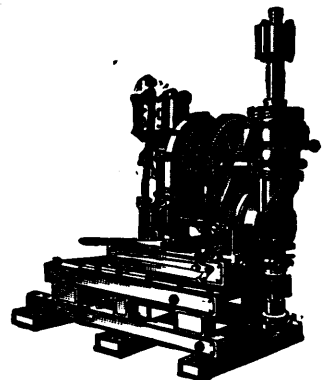
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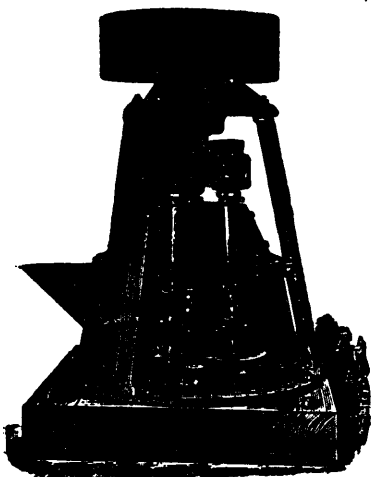
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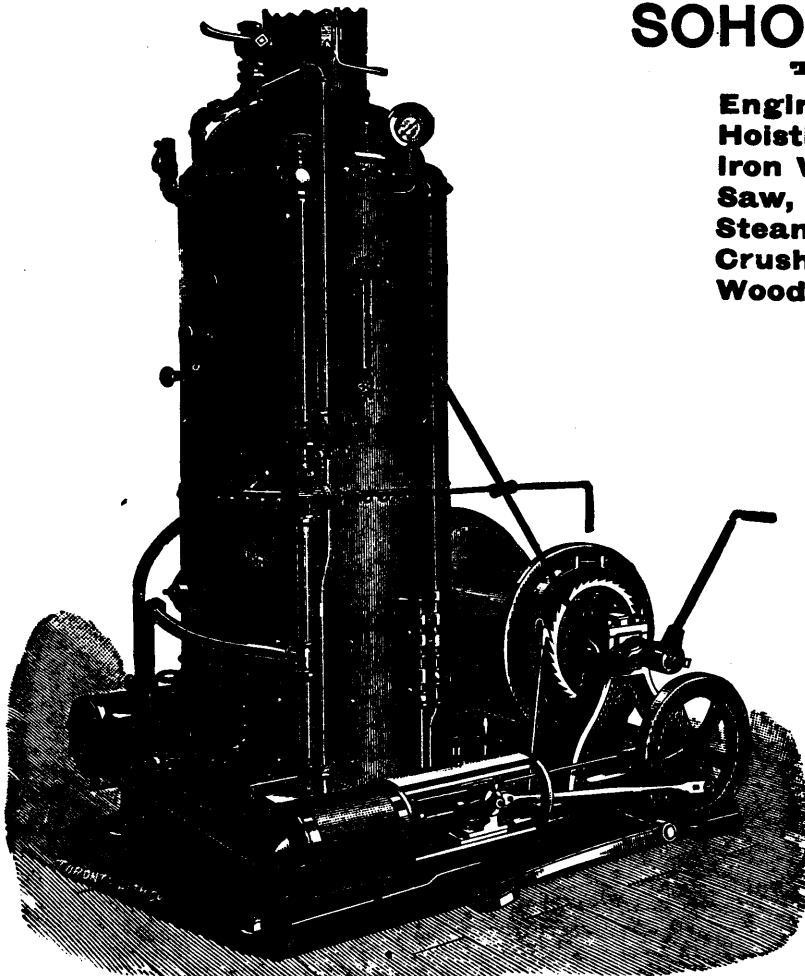
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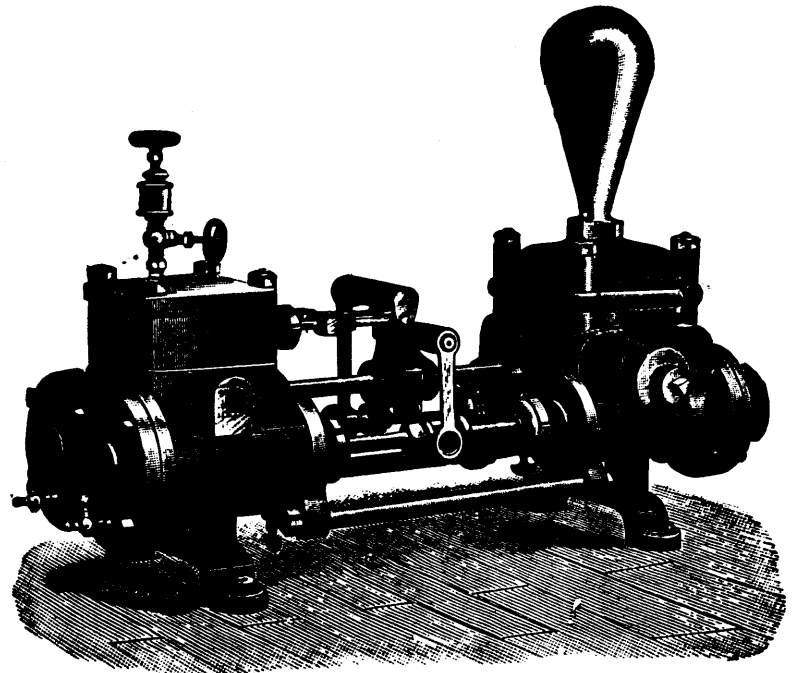
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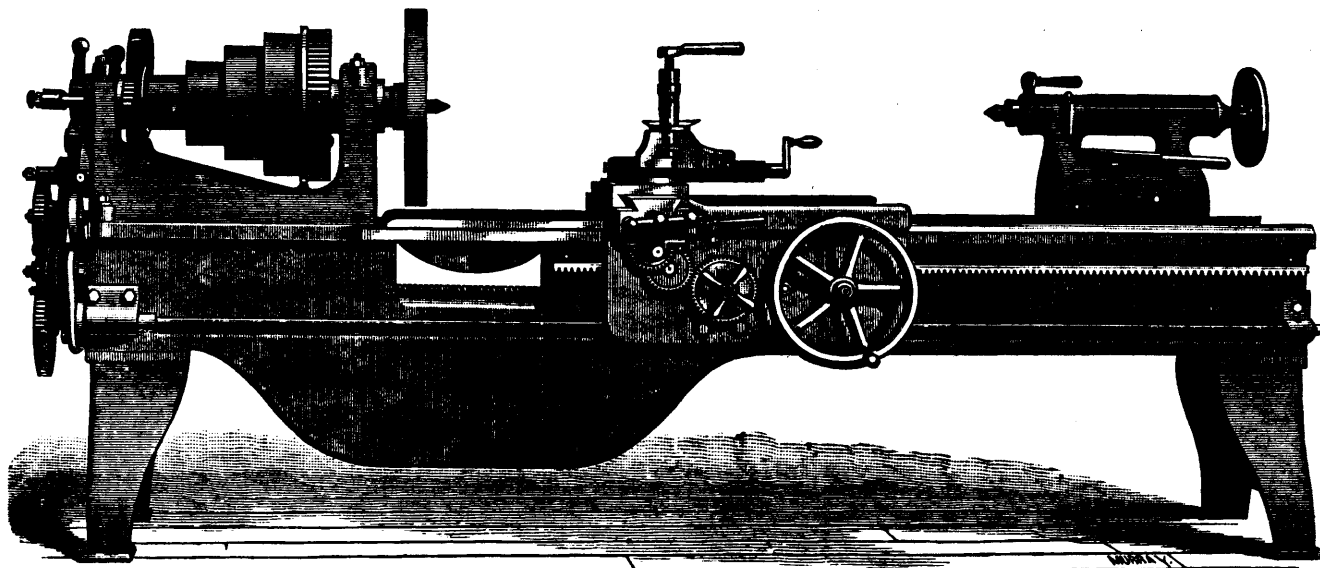
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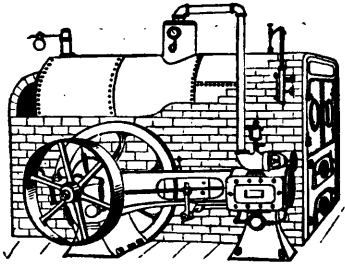
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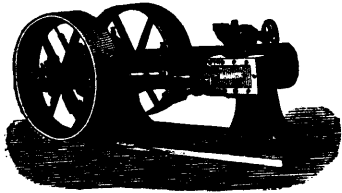
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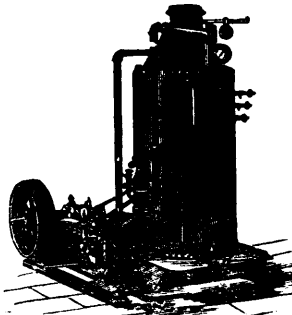
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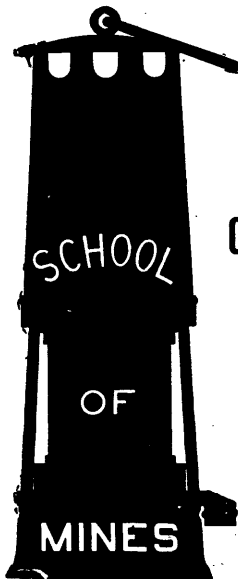
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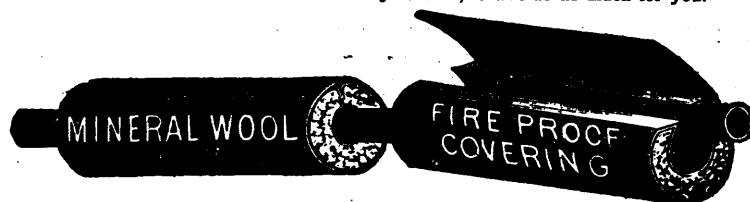
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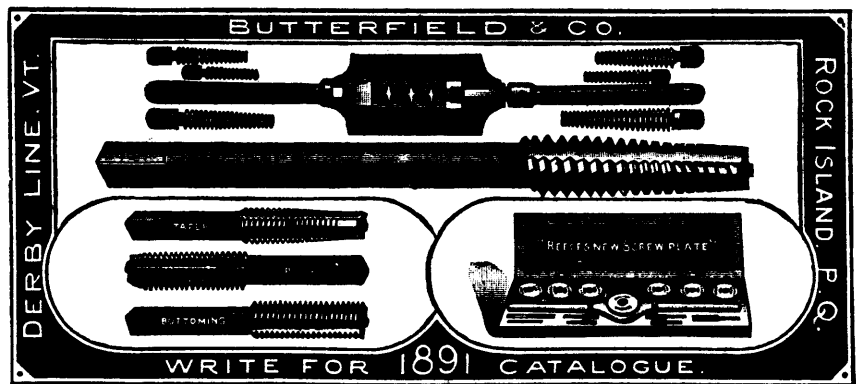
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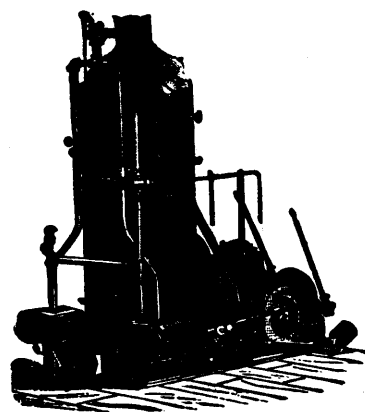
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OTTAWA.

Vol. XI. MARCH, 1892. No. 3.

### The Manufacture of Iron in Nova Scotia.

The returns of the mineral production of Nova Scotia for the year 1891 show a small general increase. This increase can scarcely be considered flattering in any way proportionate to the extent of her resources and their facility of development. The greatest comfort to be derived from the returns is in the evidence of increased interest in the iron ore deposits. Returns show that it was mined at Londonderry, Pugwash, Torbrook, Bridgeville and Springville. The coal companies have also shown lately an increased interest in coke, the co-factor of iron ore. It is now made at the Albion and Drummond collieries in Pictou, at Gowrie, International and Sydney collieries in Cape Breton, and it is reported that Springhill will shortly begin its manufacture. The Londonderry Iron Co. has prepared for an increased production, and draw their ore from their own mines near their furnaces, as well as from Torbrook and Pugwash. They both buy coke, and in their own ovens make it from Springhill and Pictou slack. The public importance of a large iron ore smelting plant may be estimated from the fact that the Intercolonial Railway delivered at Londonderry station last year 56,000 tons of coal and about 22,000 tons of coke.

The enterprise of a few local capitalists has resulted in a systematic and promising attempt to develop the iron ores of Pictou county, which present enormous deposits of this mineral in every variety sought by the smelter. At the point where the East River of Pictou branches, about three miles south of the Pictou coal field—and the Intercolonial Railway follows the west branch toward Truro—this company has commenced an extensive furnace and plant. The site, between the two branches of the river, selected by Mr. Gilpin, Inspector of Mines, nearly twenty years ago, as the future scene of iron making, presents every advantage—abundance of water, proximity to the main line of railway, unlimited supplies of flux on the ground, and a favorable terminus for a line of railway along the east branch to the iron mines some ten miles away. Their furnace will be sixty-five feet high, and the blast will be heated by three hot-air stoves, a volume of 15,000 feet of air per minute being supplied by two blowing engines of 1,000 horse-power. The production is expected to be 100 tons a day. Coppé ovens

have been built—it is said the first of their kind in America—capable of yielding 75 tons of coke a day. The slack coal for the coke will be washed, so that the percentage of impurity in the coke will not exceed 8 per cent. This brief reference will indicate that the plant is first-class and well planned. The railway is now completed to the mines at Springville and Sunny Brae, where preparations have been made for ample supplies of limonite, red hematite, etc.

Some local capitalists have started the Pictou Charcoal Iron Co. to make charcoal-pig car wheels, special machine castings, etc., from the limonite ores and charcoal of the East River district. Their works at Bridgeville, on the line of the New Glasgow Co.'s line, are rapidly nearing completion. They embrace a furnace some 50 feet high, calculated to yield 5,000 tons a year, a foundry, kilns for charring the wood from some 6,000 acres of woodland acquired by them, etc., and a number of valuable iron ore beds. In addition to these properties, already turning out more valuable than at first anticipated, there are two other large properties containing immense quantities of ore.

Surveys are now being made with a view to extending a railway from this district to Country Harbor on the Atlantic coast. The scheme embraces both the export of raw ore, as well as smelting works. From the unusual facilities offered here for smelting iron ore, it is believed that the estimates putting the cost of a ton of pig iron in Pictou county lower than in the much vaunted Tennessee districts of the United States are well founded. It is anticipated that the high grade of the pig made here will permit of its introduction into the United States, and there is no doubt but that in the event of a lowering of the tariff there, a market will be afforded for every ton Pictou furnaces can produce.

In the meantime the prudent promoters of these young enterprises see a home market secured for their products. The Steel Co. of New Glasgow and local foundries will absorb a large percentage of the output, and the steadily increasing demand for iron for structural purposes will go far to absorb the remainder. The field is still open for further operations, and the next investors will have the advantage of a railway already built into the centre of the iron ore district, estimated at over 200 square miles in extent, and the experience gained by those now at work.

The field open to the iron makers of Pictou, in an equally congenial occupation, is that of iron ship-building. Every year sees the purchase of steamers in England for the coast trade of the Atlantic and the Gulf of St. Lawrence. These steamers of moderate tonnage could nowhere be built to better advantage than on the East River of Pictou. The old builders of wooden ships could, with equal facility, shape the iron vessels, which for many purposes hold their own against even the ocean tramps, the epitome of cheap transportation. Included in the lines of manufacture parallel to that of ship-building, are:

tanks, car iron, mine rails, engines and many forms of iron used in railway work, etc., and the establishment of any large works, for iron vessel building almost insensibly branches into the manufacture of many allied products. These anticipations are not idle dreams, but well within the reach of the shrewd men who have step by step built up the industries of New Glasgow, and are now achieving their successes, not with capital cajoled from foreign investors, but with their own means, invested with discretion and administered with the ready hand of the business man who sees the speedy profit of his venture.

### Those Nova Scotia Maps.

When it became known in 1889 that, because of influences brought to bear on him for colonization surveys in other provinces, explorations and work often in no wise related to the proper objects, as we understand them, of a geological survey, the Director had concluded to change the excellent system, pursued by him for nearly twenty years, of a thorough and detailed survey of the foremost province of the Dominion in the matter of mining development and the publication of the results in a map on a scale of one mile to an inch; and, on the score of economy, to publish the accumulated surveys of the preceding seven or eight years on a scale of four miles to an inch, we did not hesitate to declare that in our judgment a great mistake had been made which would mar the beauty and utility of the work already published, and we characterized the change as a piece of penny wisdom and pound folly.

By one of the characteristic delays of this department, the maps had not been published when ready from year to year but had accumulated to such an extent that the money necessary to publish them all deterred the Director from publishing them at all except on this scale, admitted by those who have examined it as inadequate to represent the work done in that time in the district surveyed.

At that time we contemplated taking the step afterwards taken by the Gold Miners' Association to get the opinion of mining men of the Province on the subject; but we desisted when told that the minister would look into the matter and set it right, as a petition to that effect was presented to him by all the members of parliament from Nova Scotia a few months later. It was urged that as the Province of Nova Scotia was deemed of such importance that two out of fifteen or twenty of the field geologists on the staff were sent there every year at an annual cost of more than \$5,000, and as the survey itself was the chief item, and the publication of the maps only a small part of the total cost, and as the publication of the work of these parties for all this time had so far cost the department little or nothing, means should be taken to publish the accumulated work of these eight years; and in the future to keep the publication up to date; for it seemed reasonable to suppose that the sum of \$6,000 stated to be necessary, could easily be devoted for that pur-

pose out of an annual grant of more than \$100,000, or if not that it could be spread over two or more years. Even the omission of the frequent photographic views of scenery which, in the opinion of the committee of 1884, "should absorb no prominent part of the attention of a field party sent out to study the geology of the country, and certainly should occupy no portion of the published reports" would probably much more than save the annual cost of such maps.

A cheaper process of printing was recommended in the petition, and it was ascertained that by making the sheets of a size of 24 ins. by 20 ins. instead of 18 ins. by 12 ins. the cost of publishing for ten years to date can be reduced to less than \$6,000 without changing the delicacy and accuracy of the lines, as would be done by the process of photo-lithography, which was also suggested, but which requires exceptional skill in the draughtsman and as much time as would be spent by an engraver in lithographing them.

But no notice was taken of this petition by the Minister of the Interior, who followed, instead, the "peculiar judgment and temper of the Deputy Head" with whose obstructive powers he did not care to interfere; and one of the sheets has been issued on the scale against which the members of parliament so strenuously protested, with the result criticized in our last issue by a correspondent who but echoes the wish that "these and other points may soon be so clearly put to our people that the government may find no difficulty in dealing with the matter."

Representations have also been made to the minister by the whole mining community of Nova Scotia, by the Gold Miners' Association, the Nova Scotia Institute of Science, and others. These also have been disregarded by the Minister, or rather a reply was made for him by the Director that if the Nova Scotians required these maps the Provincial Government should bear part of the expense of them—should in other words do what is the plain duty of the Survey and publish a map of some economic value, that would, while making no claim to being perfect or final, embody the information we possess, and present any new information that may be obtained, in such a form as would be useful to the mining interest of the country, and a number of useful details which, if not always understood, will help to interpret obscure points in the geology. The government of Nova Scotia has always been most liberal in its expenditure on behalf of its mining industries; but to publish these maps is not within its functions, but is the duty of the Geological Survey.

We have always insisted that if the Survey cannot be made of value to the mining interests of the country its chief end is unfulfilled. That its chief value to Nova Scotia lies in the maps has been strongly urged by the Inspector of Mines and many others, and by none more strongly than the Director. Nova Scotia is surely entitled to a certain portion of the appropriation for publication as well as for surveys; but whereas the annual expenditure is from \$14,000 to \$15,-

000, Nova Scotia, for the years 1882-1885, seems to have got less than \$300, and since then little or nothing, while large plans and reports on the Northwest, British Columbia, and other parts of the Dominion, showing necessarily much less detail than the maps in question and often the results of rough track surveys, have been published at great expense, as may be seen by reference to the annual reports of the Geological Survey and to the public accounts.

The policy of this department in the matter is characterized by the Antigonish *Casket* as like that of "putting down an expensive foundation for a house, and then building a shanty upon it." In order to carry out the detailed system of investigation which, on account of the position, smallness, variety of geological formation, and extensive industrial mineral deposits of Nova Scotia—which produce one third or one quarter the total mineral yield of the Dominion—is admitted to be necessary, each party spends a season in a district of only from 200 to 500 square miles; or say that the two parties survey 800 square miles. The Minister of the Interior (Hansard Report, June 18th, 1891) has informed the House that each of the published sheets is to cover 3456 square miles; we must therefore wait four and one third years for one sheet, and five such sheets will embrace the whole area of the province. Until now this has been always taken into consideration; and when the government of Nova Scotia in 1880, by a supplementary grant, assisted in the work, the scale of the general map of the gold fields—which occupy nearly half the province—was enlarged to half a mile to an inch. For if the large scale found little to be said in its favor for Cape Breton, much can be said for it in the five counties already surveyed on the mainland in favor of keeping these sheets uniform with those of Cape Breton and of issuing them as soon as ready. But instead of following the average agreed upon, it is now proposed to follow a rule something like: Expenditure for map to be in the inverse ratio of delicate accuracy in survey and public interest in the locality.

Is not the suppression of these maps on the score of economy like a repetition of a case to which attention is called on page 75 of the report of the Committee of the House of Commons on geological surveys, 1884, in which one man was asked to get his report into a dozen pages and certainly not to exceed twenty, while another published a report of 239 pages, illustrated by three maps, fourteen plates and other figures, representing two and a half months' work mostly on Indians! It seems to fully justify the charge of lack of system in the administration of the department brought against it by this committee and others.

We append the correspondence from the leading mineral operators and others submitted to the Minister of the Interior by the Gold Miners' Association in its appeal to have this matter rectified. In the supplement, also published with this issue, our readers will find a clear demonstration—if any is required—

of the absurdity and inutility of Dr. Selwyn's four mile to the inch map. Mr. J. F. Stairs, M.P. for Halifax, is pressing the matter in the department, and if no assurance is given that maps will be amended to the scale of one mile to the inch, will bring the matter up in parliament.

HALIFAX 10th Oct., 1891.

J. F. Stairs, M.P.,

Halifax.

SIR,—The enclosed memorials and attached letters speak for themselves. The Gold Miners' Association of Nova Scotia asks of you and Mr. D. C. Fraser, and your other colleagues from Nova Scotia, that you will present the same to the attention of the House, and that, in the interests of Nova Scotia's welfare, both parties may unite in securing an industry so vital to the welfare and prosperity of Nova Scotia as is her mining industry.

Yours truly,  
(Signed) H. M. WYLDER,  
Secretary.

Copy of Memorial by the Gold Miners' Association of Nova Scotia, addressed to John F. Stairs, M.P., of Halifax, and D. C. Fraser, M.P., of New Glasgow.

Whereas the Geological Survey of Canada has already published a most admirable map of Cape Breton upon the scale of one inch to the mile; and whereas some portions of the mainland have already been surveyed and plotted upon the same scale, with a view to like publication; and whereas the publication of such portions in sheet form has been delayed because of the single desire of the Director of the Survey to have these portions reduced to a scale of four miles, thus nullifying the excellent and minute character of the field work, and rendering the maps of little or no economic value to the mineral industries; and whereas the consensus of opinion of the administration of the mining industry in Nova Scotia, and others, as shown by the letters herewith attached, is in favor of the larger scale. Now, therefore, for the single desire of their associates, by their President and Secretary, the Gold Miners' Association of Nova Scotia do respectfully, humbly, yet urgently, petition your honourable selves and your honourable colleagues from this Province to bring this matter as quickly as possible to the attention of the Federal Government, and to urge upon the proper department thereof the necessity for publishing these maps upon the scale, as originally drawn, one mile to one inch, and do further respectfully request that such representation and such demand be made as voicing the unanimous desire of Nova Scotians for the further prosperity and benefit of their Province.

We are,  
Yours truly,  
(Sgd.) J. M. REID, President,  
(Sgd.) H. M. WYLDER,  
Secretary.

To the Secretary of the Gold Miners' Association.

SIR,—I am in receipt of your favor of the 23rd June, asking for an expression of my views as to the desirability of the maps of this Province now being made by the Geological Survey of Canada being published on a scale of one mile to the inch or on a scale of four miles to the inch.

Having had considerable experience in surveying and mapping, for the Government of Nova Scotia, several of our gold districts—Waverley, Mount Uniacke, Montague, New, Sherbrooke, Oldham—am able to give expression to my views with decision and emphasis.

1. In making a preliminary examination of any gold mining district in Nova Scotia, the first want experienced by me was a correct topographical map or plan of the country. That this is essential to needful information is apparent from the existence, in every gold mining district I have examined, of a great fold or anticline and numerous faults and dislocations, which, in many instances, disturb the continuity of strata and veins to the extent of many hundred feet. Without correct topography folds and dislocations cannot be delineated, and prospecting cannot be successfully carried on except at great expense. The folded structure of the strata in Nova Scotia, coupled with the occurrence of great dislocations, so disturbs the continuity of veins and groups of veins, that unless the topography is represented on a large scale, widely separated groups of veins, some originally continuous, often cannot be identified.

2. The gold in Nova Scotia, so far as known to me, occurs at three different horizons, which may be designated as the black slate (the lowest), the whin and slate belt (next succeeding) and the fossiliferous bird's-eye and Black River limestone (supposed of the New York Survey, lying far above the topography) whin and slate belt. The last two are the most important. A correct topographical map on a scale of one mile to one inch, is the lowest limit, to my mind, which would be of service to the gold mining industry of Nova Scotia for the display of the outcrop of these rock systems.

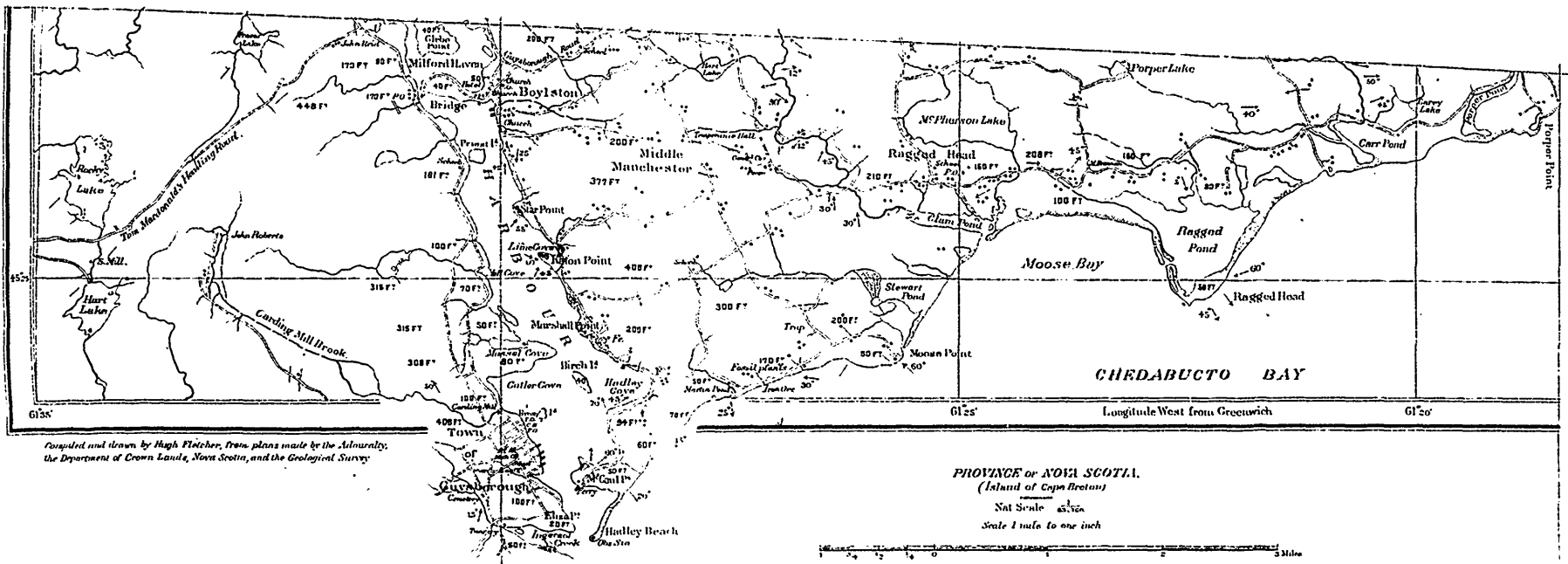
3. The first step to a general knowledge of the probable gold-producing capabilities of Nova Scotia appears to be

SUPPLEMENT TO CANADIAN MINING REVIEW.

**An Object Lesson, mainly for the Hon. the Minister of the Interior, illustrating an outrage perpetrated on the whole Mining Community of Nova Scotia by the parsimonious and blundering policy of the Director of the Geological Survey.**

*The following Sheet shows a portion of Sheet No. 24 of the Cape Breton Maps, published by the Geological Survey of Canada in 1884, on the Mile to an Inch Scale, the geological colors being omitted.*

Of these Cape Breton maps Dr. Selwyn has said: "Apart from geology, they are valuable maps for all purposes for which maps are required, and I think they ought to be engraved on copper plates, and thus be permanently available, as no better or more accurate maps will probably be made of Cape Breton during this century."



The following is on the 4 Mile Scale, being part of Sheet 11 s.w. of Nova Scotia just published, showing the errors, omissions and crowding, unavoidable in the reduction.

An Engraver's estimate, given to the REVIEW, of the cost of engraving and printing in colours on the large scale sheets of all the surveys made during the last ten years, at a cost of \$80,000, is less than \$5,430, or \$543 per annum. Annual expenditure by the Geological Survey for publication about \$15,000. Probable cost of small scale sheets of the same area not less than \$3,000.





a wide publication of a topographical map which would enable a practical field geologist to lay down with accuracy, as determined from time to time, the limits of the three recognized gold-bearing series in the Province. This could not be done well or profitably on a less scale than one mile to one inch. This scale is the least which would allow of the main foldings and dislocations to be subsequently portrayed, and it is near the line of some of these foldings and dislocations that the gold districts lie.

4. The fossiliferous rocks (false-eye and Black River limestone, supposed) I traced last year for about twenty miles. They contain gold-bearing veins in several places. The auriferous outcrop is tortuous, and, owing to the absence of a topographical map on which any reliance could be placed for the purposes of a geologist, a wide and very promising field remains practically unexplored. But with an accurate topographical map on a scale of one mile to an inch, rapid and probably important work could be done by any trustworthy and conscientious amateur geologist.

5. I think that the gold in the fossiliferous rocks of the Province differs in colour and purity from the gold in the Cambrian whin and slate. It is, geologically, from twelve to sixteen thousand feet vertically above it. Its occurrence in Rawdon and Newport townships is of considerable importance, for it may be that from the debris of rocks of the same age much of the gold found in the auriferous conglomerates has been derived. The outcrop of these rocks together with the auriferous conglomerates cannot be delineated for practical purposes on a topographical map of less scale than one mile to an inch. For these and other reasons it seems to me very desirable that every proper effort should be made to secure the publication of the geological map of Nova Scotia on a scale of one mile to one inch. These maps would then be on the same scale as the valuable and beautiful series published by the Dominion Geological Survey delineating the geology of the Island of Cape Breton.

Very truly yours,  
HENRY YOULE HIND,

WINDSOR, N.S., June 25th, 1891.

COW BAY, C.B., July 14th, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association, Halifax.

DEAR SIR,—My absence from home will explain my not replying to yours of the 23rd ult., and it is a pity you did not direct your letter to the secretary of the Cape Breton Coal Association at North Sydney. Mr. McKeen, our M.P., is a member of the Association, and I will write him on the subject and trust that your request may be granted.

Yours truly,  
CHARLES ARCHIBALD,  
Managing Director Gorbic Coal Co.

HALIFAX, N.S., 24th June, 1891.

H. M. Wyllie, Esq.,  
Secretary, Halifax.

DEAR SIR,—With reference to your circular about the Geological Survey maps, we consider it would be a great mistake to have them made on a smaller scale than a mile to the inch. In conversation with Mr. Gilpin, the inspector of mines, he expressed himself very strongly on the subject, saying that we had only to refer to the maps of Cumberland county, which he considers not only useless but misleading. We sincerely hope that you will be successful in having these maps made on a scale of an inch to the mile.

Yours truly,  
S. CUNARD & CO.,  
Agents General Mining Association,  
of London, Eng.

DRUMMOND COLLIERY, WESTVILLE, N.S.,  
June 25th, 1891.

H. M. Wyllie,  
Halifax.

DEAR SIR,—Yours of the 23rd inst. to hand. With reference to the provincial survey now being made, I think it should not be less than one mile to the inch to be of practical utility.

Yours faithfully,  
CHARLES FERGIS,  
Manager, Intercolonial Coal Co.

LONDONDERRY, N.S., June 27th, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association, N.S.

DEAR SIR,—To the explorer and practical miner a geological map on the largest possible scale is of the greatest importance.

The excellent work already done by the Geological Survey would be much impeded by a reduction of map to a scale of four miles to the inch.

Yours very truly,  
G. LECKIE,  
Manager, Londonderry Iron Co., Ltd.

SYDNEY, C.B., June 26th, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association,  
Halifax, N.S.

DEAR SIR,—I am favored with yours of the 23rd inst., and am of opinion that the proposed survey of this Province upon the scale of one mile to the inch, would be infinitely better than one of four miles to the inch as proposed.

Yours truly,  
D. J. KENNELLY,  
Agent and Manager  
Sydney and Louisburg Coal and Railway Co.

SYDNEY MINES, C.B.; NOVA SCOTIA,  
June 27th, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association of Nova Scotia,  
Halifax.

DEAR SIR,—I have received your circular letter of 23rd inst. this morning.

In reply I beg to say that in my opinion it is very desirable that the survey maps of the Province of Nova Scotia should be published on the scale of one mile to the inch. I believe it would add greatly to their usefulness to have them on such sized scale, and I have no objection to my name being used in connection with such views.

Yours truly,  
R. H. BROWN,  
Manager, General Mining Association  
of London, Eng.

NEW GLASGOW, N.S., July 2nd, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association,  
Halifax, N.S.

DEAR SIR,—Your circular of the 23rd June was received in my absence.

I think it would be a pity for the Government to waste money in making a map on so small a scale as four miles to an inch. I think the map should be at least four times that size to be of any practical use.

Yours very truly,  
GRAHAM FRASER,  
Vice-President, New Glasgow Iron, Coal  
and Railway Co.

STELLARTON, N.S., July 2nd, 1891.

Messrs. The Gold Miners' Association—  
H. M. Wyllie, Esq., Secretary,  
Halifax.

GENTLEMEN,—In answer to your enquiry of June 23rd, I have much pleasure in stating I am in hearty accord with your movement to have the maps of the Geological Survey in Nova Scotia published on a scale not less than one mile to one inch. I have before me maps of the coal and iron fields of this county on this scale, and I have no hesitation in saying that maps on any smaller scale would be of little or no practical value. That this request of yours is not unreasonable may be fairly assumed when it is remembered that the whole of Cape Breton is published on this scale, and that the cost in excess on such a scale as four miles to one inch would be but trifling in comparison with the cost of procuring the necessary information in the field.

I am, Gentlemen,  
Yours respectfully,  
HENRY S. POOLE, F.G.S., A.R.S.M., &c.,  
Mgr. Acadia Coal Co., Ltd.

OTTAWA, July 13th, 1891.

H. M. Wyllie, Esq.,  
Secretary Gold Miners' Association,  
Halifax, N.S.

DEAR SIR,—Your favor of the 23rd ult. arrived here during my absence at Cape Breton. In reply I may say that maps of the geological survey of Nova Scotia, made on the scale you suggest, of one mile to the inch, would be much more satisfactory than any that have yet been published. Maps made on a smaller scale, or four miles to an inch, are, in my opinion, of little practical use.

I am, yours truly,  
D. MACKENZIE,  
M.P. and Mgr. Caledonia Coal and Ry Co.

OTTAWA, July 11th, 1891.

DEAR SIR,—I have the honor to acknowledge receipt of your communication of the 23rd ult., asking an expression of my views as to the desirability of the maps now being made by the Geological Survey of Canada being issued on the scale of one mile to the inch or upon the scale which it is understood the Department at Ottawa are contemplating, namely, four miles to the inch.

In reply, I may say it is my opinion it is desirable the maps should be issued upon the scale of one mile to the inch.

Yours faithfully,  
JOHN F. STAIRS.  
M.P. for Halifax.

H. M. Wyllie, Esq.,  
Secy Gold Miners' Assoc'n of Nova Scotia,  
Halifax, N.S.

## The Phosphates of America.

Following the work on this subject by Francis Wyatt, Ph.D., and which was noticed in the issue of the REVIEW for December last, we have another book now publishing in London, England, and compiled by Mr. C. C. Hoyer Millar, who is well known in the various phosphate fields and to the commerce of fertilizers in Europe and America. The scope of this work is thus defined in the Preface:—

"Although there is an abundance of literature upon the subject of the geological formation and chemical analysis of the various phosphates which have hitherto been discovered, yet it appears to me that the practical, though possibly sordid, side of the question has been rather neglected.

"Since, however, the phosphate mining industry is being carried on with the primary intention and hope of obtaining satisfactory returns from a pecuniary rather than a scientific point of view, I have ventured to give in the following pages an account, from a practical standpoint, of my personal investigations during the past few years in the phosphate fields of Florida, South Carolina and Canada. The book is therefore addressed to those who are commercially interested in phosphates, and should it be the means of giving them further information that they would be likely to gather elsewhere, then my efforts will be amply rewarded."

The work comprises 223 pages and is apportioned to the following chapters: I. Introductory, treating of the importance of phosphoric acid in nature; the sources of supply, and the classification of mineral phosphates.

II. Florida phosphates: treating of the Peace River phosphate; land pebble mining; the rock deposits; rock mining, and gravel rock mining.

III. South Carolina phosphates; mining of the land and river phosphate respectively.

IV. Canadian phosphates.

An appendix briefly treating of the remaining principal phosphate and guano fields of South America and Europe.

We shall confine our present remarks to chapter IV. and Canadian phosphates, which Mr. Millar deals with in order under the following heads: Geological formation—Description of the Mining Operations—Analysis—Preparation of the Ore—Transport—List of companies operating in 1891—Cost of Production—Shipments—Price of Phosphate Lands—Present Position and Future of the Industry.

The author deprecates the method of contact work formerly effected by farmers in the Ontario district, but adds: "Yet it is probable that these early days and primitive methods resulted in greater gains to the owners of properties than the more recent and regular operations;" and he justly attributes "the erroneous idea prevalent in Europe, that the apatite in the Ontario district is found in shallow pockets only," to this crude method of surface-working formerly carried on by the farmers and land owners.

The principal working mines of Ottawa County are separately referred to, and their dis-

tinguishing character of "capriciously occurring pockets of varying extent," compared with the more regular and vein-like formation of the Perth and Sydenham districts of Ontario.

Speaking of the proportion of marketable ore to the total ground broken in Ottawa County, the author's observations gave the maximum of 25 per cent., and a minimum of one unit, and he considers that anything over 10 per cent. is exceptional, while the probable general average is little if anything over 5 per cent. The average was more favorable in the Ontario mines, where from the vertical fissure, or vein-like banding of the mineral, the ore is sometimes "extracted without removing any appreciable quantity of other matter from which it is entirely distinct."

This average yield of marketable ore has been, and will always be, a very difficult question to answer satisfactorily. The investor naturally enough demands of the expert. How much phosphate is in sight? or: How much phosphate can be relied on per annum? Surmising that our deposits can be gauged with reasonable exactness, as is usual with coal seams, or well-defined metallic veins, Mr. Millar has, we think, fairly estimated the results attained by the mining in Quebec as hitherto effected.

The present manner of "cobbing" or preparing the ore for market, is shown to have developed from the forced high-grade guarantee of 80 per cent. minimum, and the large proportion of "seconds" falling below 70 per cent. attributed to the system of the free use of explosives in confined underground spaces, when, if the phosphate be at all friable, it is broken up almost into powder and irreparably lost.

It is surprising that so little common sense progress has been made in this respect, since a judicious use of black powder, when working in ore ground, would not only avoid this deplorable waste of first-class quality, but be an actual economy in working cost.

The cost of production is taken by Mr. Millar at \$9 per ton at the mines, that is to say exclusive of transport, which may average \$3.81 per ton more, and thus giving the total cost f. o. b. Montreal of \$12 to \$13 per ton.

The prices realized ex-ship in Europe for the various grades of Canadian apatite of 60, 70, 75 and 80 per cent. respectively, over the years 1882 to 1891 inclusive, are quoted, and the fact of the lower qualities not realizing prices in proportion to the value of the first quality is thereby demonstrated, while it is worthy of note that during the last two seasons (1890, 1891) the average value at the mines of 70 and 60 per cent. qualities, was about \$6 and \$3.50 respectively, showing a very serious loss of production. "If, then," Mr. Millar remarks, "the first quality ore has to provide for the loss upon the other two qualities before the possibility of making any profit can be arrived at, it follows that in order to make such an enterprise a success the proportion of first quality ore to the whole must be a high one." Unfortunately just the opposite is the case!

The author calls merited attention to the prices of phosphate lands, mentioning some of the exaggerated figures obtained on the du Lièvre River properties, and puts his own views of the subject on record. These are so interesting that we quote them verbatim.

"In order to arrive at a valuation, the following points have to be considered:—

- (1.) Possible annual out turn and profit.
- (2.) Amount of capital required to be invested for that purpose.
- (3.) Chances of getting back original cost and outlay of plant.

"With these points before us and with the full knowledge of the geological formation of these deposits, and with the results of the various mining undertakings hitherto established, we say unhesitatingly that we do not know of any undeveloped property in Canada for which we could recommend more than £5,000 as a maximum for the purchase of a one-half interest, and this figure is far beyond the entire value of most of the undeveloped properties which we have explored. Turning now to the question of developed properties, these should only be bought upon a valuation of the money spent upon plant and developments, and upon the quality or reserves of ore actually in sight, for what lies hidden is an uncertain quantity.

"The most satisfactory method of operating a property would be upon a royalty of so much per ton extracted.

"These are our views to-day, but it must be understood that a few years ago the position and value of Canadian phosphate properties stood upon a totally different footing. The discoveries in Florida of large quantities of high-testing phosphate, capable of being easily and cheaply mined, have altered the relative value of Canadian lands most materially; for whereas some years back, Canada and Norway were recognised as the only countries capable of producing high-testing phosphate, and that only in small quantities, an enormous new field with illimitable supplies has now been put into active operation."

The paragraphs devoted to "The Present Position and Future of the Canadian Phosphate Industry," will be eagerly investigated by those interested in this industry. We fear that it is only too true that the unexecuted development of high testing phosphates in Florida have caused a temporary, if not a lasting disaster to Canadian phosphate investments. We were wont to deceive ourselves by concluding that as we possessed the richest grade in the market, we could always stand in an independent and unassailable footing against all comers, but we did not sufficiently appreciate the fact, that it is the quantity and not the quality which establishes the market value. Canada attained the maximum yearly output of 30,000 tons in 1890, but according to the statistics published by the *Engineering and Mining Journal* of New York, Florida produced 159,000 tons last year, being its second year of development. We are of the opinion that the latter estimate exceeds the

actual production, but admitting, say 100,000 tons, and the argument still holds good. As a consequence of unremunerative prices Canada fell off 33 per cent. in last year's shipments, and the present year promises a still more alarming decrease in output. Now unfortunately our average cost of production in Canada considerably exceeds that of most other working fields, and certain Florida producers can, for instance, put the ore f. o. b. rails, at \$3 per ton. Canada has the high grade article, but has to dispose of it at a market price governed and established by the more abundant and more cheaply producing fields of supply.

What then, asks Mr. Millar, must be done to keep the Canadian industry from dying out and to prevent the total loss of the heavy capital invested? and he solves this problem by proposing to abolish the present system of "cobbing," which is one of the heaviest expenses in the total production, and would produce only two qualities by a direct method of careful mining, *i.e.*, 80 per cent. and over made by a judicious use of explosive, and direct selection in the mine, and obtaining a residue of, say 62 per cent., this latter class should be ground on the spot and either dispatched to the available markets in the United States or transformed locally into superphosphate. This opinion agrees with the expressions of Dr. Wyatt in his lately published work above referred to, and appears to us to be rational and perfectly feasible.

Referring to the manufacture of superphosphates in Canada, Mr. Millar admits that at the present time only a few hundred tons of fertilizers are used per annum, but adds that the example of other wheat-growing countries must be imitated ere long. This is a big subject, which we must leave for the present.

In resuming, we consider that the work before us has kept well in view the lines laid down in the preface, and without any pretention to confuse the ordinary reader in scientific theories, which in nine cases out of ten he cares nothing about, the author has massed together the well-weighed facts of a practical observer, and the investor or exploitant will find the information here furnished both explicit and reliable, while the practical standpoint has been thoroughly maintained throughout the book, which should therefore prove to be a most useful work of reference for those seeking commercial and practical information on the phosphate fields of America and their possible development.

Nitro-jute is a new explosive, invented by Mr. Otto Muhlhauser. He treats one part by weight of jute fibre with 15 times its weight of a mixture of nitric and sulphuric acids. This product, which weighs about 30 per cent. more than the original fibre, takes fire at a temperature of 167 to 170 degrees C., and contains about 12 per cent. of nitrogen. It is of a brownish-yellow color, and the composition is given by the author as C<sub>12</sub>, H<sub>15</sub>, O<sub>5</sub>, (ONO<sub>2</sub>). It explodes by percussion like gun cotton, and is insoluble in water, ether, benzine or alcohol, but dissolves readily in acetic ether and nitrobenzine.

## EN PASSANT.

The Council of the General Mining Association of Quebec will be received by the Hon. the Commissioner of Crown Lands, at the Parliamentary Buildings, Quebec, on Thursday, 31st instant, when a new Mining Act for the Province will be discussed.

Dr. Bell's long-looked-for report of the Sudbury district is at last issued. Those who have been anticipating a valuable contribution of economic interest will be disappointed, the volume being almost wholly of geological and technical value. A good map accompanies the report.

By the way will the Director of the Geological Survey kindly give us some information of the whereabouts of the long-promised report and map of the phosphate districts? It is now more than three years since this work was begun, and the map was understood to be ready for the public more than a year ago. More light please!

Apropos of the subject of maps reminds us that Mr. J. Obalski, M.E., Government Inspector of Mines at Quebec, and Mr. E. J. Rainboth, D. and P.L.S., have both lately published maps of some value to the owner and operator of phosphate lands in the Province of Quebec. Mr. Obalski's map will be of particular service to investors, inasmuch as it shows the Lots already sold and those still held by the Government.

A fair indication of the demand for mining lands is shown by the report of the Director of Mines for Ontario, which will be issued in a few weeks. The total number of patents issued during 1891 for mining lands in the Province was 289, covering 59,389 acres, for which the Government was paid \$117,514. Of these 289, 46 were for the Rainy River district, 72 for the Thunder Bay district, 139 for the Algoma district, 20 for Nipissing and 21 elsewhere. The new leasing clause of the Mining Act, which came into force in May of 1891, has been largely taken advantage of, for since that time until the present (ten months), nearly seventy-five leases have been granted, comprising about 8,000 acres, the first year's rental paid to the Government aggregating nearly \$8,000. A consolidation of the mining laws of the Province is promised during the session of Local Legislature now being held.

A mining school at Ottawa becomes a possibility under the provisions of the Mining School Act of 1891. If the city will give \$5,000 a year for maintenance and the counties on the Ontario side of the Ottawa \$5,000 each for building and plant the thing can be done. The Provincial Government may be expected to establish in connection with the school a laboratory for the eastern part of the Province and to pay the salary of an assaying chemist who would be on the teaching staff. Ottawa has special advantages to offer in its supply of unlimited water power for electrical purposes in connection with such a school. The most advanced metallurgists admit

that the practical advance of their art lies in the direction of the extended use of appliances for electro-fusion and for the dissociation of natural mineral compounds by electrolysis. It will be easy to place a Mining School at Ottawa in the forefront of institutions where a knowledge of electro-metallurgy can be obtained. By relationship, as the headquarters of the geological survey and the place at which yearly congregate for a time the representatives of all the mineral sections of the Dominion, Ottawa has advantages to contemplate in the possession of such a school which no other place may dream of. Besides all these pleasing anticipations, is it not the case that there is here a degree of interest in mining affairs not second to that of any city in the Dominion.

It is needless to say that the fourth Annual General Meeting of the Gold Miners' Association of Nova Scotia, at Halifax, on the 30th instant, was a success. The greater portion of the day was spent in discussing and suggesting important amendments to the Mining Law, most of which, we are glad to say, there is reasonable prospect of being adopted by the Government. The dinner, entirely *sans ceremonie*, was in every sense worthy of the good fellows who sat down to it. The music, songs, witticism, drolery and fun of the occasion will linger long in the memory of those who, like ourselves, were privileged to be present at the feast.

In another place our Cape Breton correspondent condemns the proposal of the Nova Scotia Legislature to increase the royalty on run of mine coal. The case is clearly stated.

A probable increase in the coal royalty has been known to the trade, for some time, and has been casually discussed by a few of the colliery managers before the Executive Council. The local Government is hard up and thinks it sees an easy way to add to its revenue by simply adding 2½ cents per ton on the coal royalty. The coal interest is, unfortunately, not organized, and unless some move such as that proposed by the Gold Miners' Association is carried quickly into effect, the opposition which this increased royalty naturally creates, will be but individual; it may be general but it is not likely to have the weight which combined representation, forcibly put, would have before the Committee of the House of Assembly.

The views of the trade may be summarised in the following excerpts from a letter received from one of our largest colliery operators:—

"A large amount of capital has been sunk in the coal industry of Nova Scotia—a capital that has not paid an average of 2 per cent. to the adventurers, while the Province has very largely benefited by the circulation of the cash paid to the workmen and the royalty to the Government. The investors risked their money in the ventures in good faith, and when they got a lease given in the Queen's name they trusted that good faith would be kept with them. It is now contended by the present Government that the general acceptance of the terms of the lease has been incorrect: that the royalty is not, strictly speaking, fixed for a term of years, and that by legislation of 1886 the Government has the right to alter the rate of royalty under all the leases at will. If they have, honest investors had better stand firm under Nova Scotian mines, for once let the impetuous local Government find they have in the coal operators an orange they can squeeze at will, and they once taste blood, where will the end be?"

More forcible and no less direct are the views of the managing director of a Pitou county company, who writes:—

"I was notified yesterday that the Nova Scotia Government intend passing a bill increasing the royalty on run of mines coal from 7½c. per ton to 10c. per ton. They have the power to do so; but it is monstrous to attack an industry which has yielded them so large a revenue, while the unfortunate investors induced to go into the Province seldom see anything in the shape of a dividend. Government discouragement to investors by present mining laws is a little strange."

The coal mining industry of Nova Scotia is far too important a factor in the welfare of the Province to be saddled with any burdensome restriction of this kind. The Government has everything to gain from its widest possible extension, and by the introduction of fresh capital to develop its virgin areas but this assuredly will never take place so long as the companies are to be made the target for every revenue-producing scheme that may strike the fancy of the legislature. The Hon. Mr. Fielding, whom we esteem and admire, has so far endeavored to meet the mining community in a fair and friendly spirit, and his mining legislation has been distinctly in advance of any of the other Provinces. In the present proposition he emphatically takes a step to the rear.

This emergency is the coal miners' opportunity to organise. Without unity of action they can do nothing. We heartily commend to them the proposition of the Gold Miners' Association to unite the whole mineral interests of the Province into one strong representative body. Experience in Quebec has proved beyond a peradventure that this is the best method to protect and promote the welfare of the mining industry. We hope to record in our next issue that such an organization has been carried into effect.

Apropos of the question to increase the royalty on run of mine coal Mr. Cahan, the leader of the Nova Scotia legislature, has asked for the following pertinent return, showing:—

1. The amount of coal royalty due from each coal mine or mining company in Nova Scotia on December 31st, 1885.
2. The annual output of each mine as duly declared by the officials of said mining company in each year on which royalty could be lawfully exacted, or collected in each year since December 31st, 1885; also a similar statement showing the output of round and slack coal in each year from each mine.
3. The amount of coal royalty paid by each mine or mining company to the provincial treasury during each year from December 31st, 1885 to December 31st, 1891.
4. The amount of coal royalty due or uncollected from each mine or mining company in the Province on December 31st, 1885, 1886, 1887, 1888, 1889, 1890 and 1891.
5. Copies of all orders in council passed since December 31st, 1885, providing conditions under which coal royalty from any mine or mining company in the Province, or providing for any rebate or remission of royalty due in favor of any mine or mining company.

These returns should furnish in themselves the very strongest argument against any further imposition of taxation upon the coal producer.

The use of pure nickel in the manufacture of liquid measures in France is made legal by a decree of Jan. 30, 1892. Within three months after the issuance of this decree no pewter measure will be accepted for official verification containing in their composition over 10% of lead or other metals ordinarily found in the pewter of commerce.

The *Coal and Iron Trades Journal* is our authority for the following paragraph, of interest to Canadian producers of nickel:—

"A company has been formed at Havre (France) for the manufacture of nickel. It is having a factory constructed on the Tanarivis Canal, and has concluded an important contract with the government for nickel-plating Lebel rifles. The mineral used has hitherto come from New Caledonia, but is henceforth to be imported from Canada."

Nickel-steel armor plates, of English make, are discussed in the late report of Lord Hamilton, First Lord of the Admiralty. Two firms have produced 10 1/2 in nickel-steel plates, and their tests are said to compare favorably with those of the same type of plate made in other countries. Extensive orders have been placed for the use of this armor in the secondary defence of battle-ships. But for greater thicknesses than three or four inches, says Lord Hamilton, the inquiry is not yet sufficiently complete to warrant its adoption. Its manufacture is, however, being widely extended under the liberal patronage of the British Admiralty.

Returns from the Dominion lands agents show that during the past year twenty entries were made for mining locations other than coal. The total area of mining locations sold in the North-West Territories up to date is 1,152,56 acres, which realized \$5,846.50. All minerals, with the exception of coal, on Dominion lands within the railway belt in the Province of British Columbia, are now administered under the mining laws of that Province. This is in accordance with an arrangement made between the Federal and Provincial Governments, and ratified by Orders in Council dated the 11th and 28th of February, 1890. The agreement may be terminated at any time by either Government.

We presume that one of the first economies of the new Quebec Government will be the immediate dismissal of the retinue of useless political proteges and "hangers-on" in the Department of Crown Lands, notably these worthies ironically dubbed "mine inspectors." If we are to have official mine inspection—and everyone will admit that it is eminently desirable if efficient—let us have men whose qualification will be something more than effete shoemakers or played-out political hirelings. One competent inspector is amply sufficient for the requirements and present status of the industry anyway.

One of the many surprises in store for Mr. Mercier and his gang of unscrupulous "hoodlers" was the utter rout of their representative in Ottawa county. Rochon, the late Liberal member, held the seat by close upon a thousand votes, but at the late election was wiped out by Tetreault to the tune of four hundred. Needless to say the Conservative member was materially assisted by a solid mining vote. A very great deal of his success was due to the indefatigable exertions made on his behalf by Mr. S. P. Franchot, the genial and burly vice-president of the General Mining Association. S. P. worked like a Trojan, striving nothing to secure the return of honest government and a wise

mining policy. He has earned, if nothing else, the gratitude of the whole mining interests of the county.

That the mining interest was very much in evidence at the late election is also shown by the return of Mr. James King, one of the vice-presidents of the General Mining Association, for Megantic, by the largest majority ever known in that constituency. The asbestos, copper and other mineral interests went solid for Mr. King. The new member, as everybody knows, holds a very large mining interest in the Province.

The DeBoucherville administration having pledged itself to repeal the obnoxious features of the Quebec Mining Act, its return to power by such a magnificent and overwhelming majority is the subject of congratulation and rejoicing among the mine owners and operators of the Province. It is not unlikely that a deputation from the General Mining Association will wait upon the new Government at an early date to discuss any new Bill that may be projected. Certain it is that no new measure will be thrust upon the mining community in the high-handed and arbitrary manner of its predecessor.

Here is a pointer for the new Government: The mining section of the London Chamber of Commerce, at a meeting held on the 26th ult, unanimously adopted the following resolution:—"That the payment of royalties upon the gross product of metalliferous crown mines is injurious to the industry and to the interests of the country, and that the principle should be adopted for paying the royalties of such mines out of profits."

From a recently issued report on "Strikes and Lock-outs of 1890," by Mr. John Burnett, labor correspondent of the London Board of Trade, it appears that during that period 182,779 persons have, after strikes, received advances of wages to the aggregate amount of £28,193 per week, while 31,078, persons have, by the same means, obtained reductions of working hours averaging two and four-fifths hours per week. But it also is shown that without strikes—that is to say, by negotiation and other amicable ways—225,710 persons have obtained advances of wages amounting to £28,054, while 53,254 persons have obtained an average reduction of hours of two and two-thirds. On the other hand, 10,483 persons, after unsuccessful strikes, have had wages reduced to the extent of £1,082; while, without strikes, 2,639 persons have had wages reduced to the aggregate amount of £566.

From statistics furnished by that model blue book, the Annual Report of the Minister of Mines for New South Wales, we learn much of interest and value respecting the status of the gold mining industry in that prosperous colony. During the year 1890, the production of gold gave employment to 12,589 persons, of whom 5,597 were Europeans and 707 Chinese operating alluvial ground. The yield of alluvial gold was 58,829 ozs., 12 dwt., 15 grs., that from quartz crushed 58,832 ozs., 5 dwt., 21

grs., or a total gold product for the year of 117,661 ozs. 18 dwt. 12 grs., of a value of £438,249 19s. 3d. sterling. The machinery used in the various gold mining districts was valued at £459,26 sterling.

The total value of the gold exported from the Province of British Columbia in 1891 was \$358,176. 1,199 miners found employment in this industry. The returns for the previous ten years were:—

|      |       |             |
|------|-------|-------------|
| 1881 | ..... | \$1,046,737 |
| 1882 | ..... | 954,085     |
| 1883 | ..... | 794,252     |
| 1884 | ..... | 736,165     |
| 1885 | ..... | 713,738     |
| 1886 | ..... | 903,651     |
| 1887 | ..... | 593,709     |
| 1888 | ..... | 616,721     |
| 1889 | ..... | 588,923     |
| 1890 | ..... | 494,436     |

The progress of the coal mining industry in British Columbia may be seen at a glance from the following table, compiled by Mr. Dick, the Inspector of Mines:—

|                    | Tons.     | Exported..... | Tons.   |
|--------------------|-----------|---------------|---------|
| 1888, coal output. | 489,300   | .....         | 365,714 |
| 1889, do ..        | 579,830   | do ..         | 443,675 |
| 1890, do ..        | 678,141   | do ..         | 508,270 |
| 1891, do ..        | 1,029,097 | do ..         | 806,479 |

The output by collieries was:—

|                          | Tons.   |
|--------------------------|---------|
| Nanaimo Colliery.....    | 527,457 |
| Wellington do .....      | 345,182 |
| East Wellington do ..... | 41,666  |
| Union Colliery.....      | 114,992 |

Mr. Dick, in his report, speaks most hopefully of the prospects of the trade during the coming season. He says: "Owing to the absence of an equitable reciprocity treaty between Canada and the United States, within the past few months excessive shipments of coal from distant countries to California have so disturbed the balance of supply and demand that existed during the greater part of the past year, that a prudent diminution of output and shipment of coal took place generally from the collieries of the Province, in order to ease off the glut that was brought about by such extraordinary deliveries into California, and it is calculated that early in the spring the market will have assumed its normal condition, and that the collieries of British Columbia will be worked up to their highest power, with a brisk trade, which is a result devoutly to be wished for, on behalf of our very numerous and deserving body of miners in this Province, who have been for some time working only four days or less a week, while their personal, family and household expenses have been going on all the time at full rate. Otherwise, I can truly say that the collieries of Nanaimo, Wellington and Comox were never in better condition than now, and that prospects never looked so well for putting out coal; and it may be expected that after the present lull in the coal market blows off, we shall see every mine worked to its full capacity and to the best advantage of all concerned."

A Cleveland, Ohio, firm has recently constructed an immense coal bucket, 7 feet high, 5 1/2 feet in diameter, and capacity of holding 3,280 pounds of bituminous coal. It tips as easily as the small buckets.

A most important movement for the mining industries of Nova Scotia was made on the 15th of March, when gentlemen representing coal, gold and iron mining, held a meeting in Halifax and made a provisional organization until the 30th inst., for which date a call has been issued for a general meeting of all persons directly interested in the formation of a mining association which shall represent all the various mining and mineral interests of the Province in combination, for mutual benefit and protection. Mr. H. M. Wyld, secretary of the Gold Miners' Association, has consented to act as provisional secretary, and may be addressed at Box 520, Halifax, N.S.

The Kingston Board of Trade has petitioned the Ontario Government to explore and test by means of the diamond drill the veins and ore deposits of the mineral region of the eastern part of that Province. The petition goes on to say:

"Your petitioners respectfully pray that the exploration of the mineral formations carrying magnetic iron ore, phosphate of lime, nickeliferous ores, galena and other economic minerals, may be undertaken by the Province to the extent that the scientific data necessary to guide the capitalist and miner may be as readily procured in this as in other countries where the mining industry is fostered by scientific investigation and education under government auspices."

No public money could be better expended than in an appropriation for this purpose.

In a paper on the subject of "Laurentian Phosphates," read at the Baltimore meeting of the American Institute of Mining Engineers, Mr. John Stewart, Ottawa, makes a suggestion worthy of note respecting the treatment of low grade ores by chemical action, whereby the phosphoric acid might be extracted in soluble form. He says:—

"This suggested process consists in exposing the finely pulverized ore to sulphurous and sulphuric acid vapors, assisted by water-spray. This might be done on a large scale by dropping the material through a tower built on the principle of the well-known Gerstenbofer furnace, but much higher (100 feet would perhaps be a necessary height). The triangular prisms constituting the cross-shelves could be made of acid-proof brick or covered with lead. Other details of arrangement will suggest themselves to those familiar with the operations of the Stieffelt or the Gerstenbofer furnace, and need not be elaborated here. Possibly a revolving cylinder-roaster might be found applicable instead of the high tower. The action of sulphurous and sulphuric acid when used together in forming the soluble phosphates is more energetic than when either is used separately. The sulphurous vapors required could be conducted to the apparatus from kilns in which the pyrites of the region had been roasted to obtain them. The reaction in the apparatus could be assisted by adding with the water-spray a little nitric acid. After a simple separation by settlers and buidlers of the sand and superphosphates, and evaporating and drying the latter, a concentrated and highly valuable marketable product would be obtained. At Buckingham and Ottawa, producer-gas, made from saw-mill waste, and consisting almost entirely of carbon monoxide, could be used to aid in washing, steam-raising, and evaporating. Water power is available for mechanical purposes in most of the phosphate districts. If a highly concentrated superphosphate is made, it must be packed in barrels since it is very hygroscopic."

A recent official report from Newfoundland contains some interesting observations on mining in that colony, its present condition and prospects. Owing to the absence of roads through the interior, mining is still confined to within a mile or two of the sea coast. The mines being worked are for copper ores, antimony, iron pyrites, and galena. This industry is yet in its infancy, but the country gives promise of great development in this direction. Ores of anti-

mony, zinc, molybdenite, manganese, chromite, nickel, hematite, gold, silver, etc., are all known to exist; while of the earthy minerals and non-metallic substances there is a great variety, and in many cases an abundance of material; marbles, granites, slates, serpentines, ornamental stones, sandstones, limestones, soapstone and gypsum abound, and asbestos, fluor spar, graphite, mica, etc., are all found. Clays suitable for the manufacture of brick and coarse pottery are abundant. During the past year valuable seams of coal have been discovered in the vicinity of St. George's Bay. Prior to this the St. George's Bay carboniferous area was generally thought to be destitute of coal seams, and as being occupied almost entirely by the carboniferous limestone and millstone grit series. Sir William Dawson, of Montreal, has, however, given it as his opinion that specimens which he has examined indicate a development of the coal measures not unlike that of Eastern Cape Breton, with which the beds may be connected under the gulf, and he adds that the Government of Newfoundland would do well "to inform the English Government of the value of the coal deposits on the west coast and their prospective importance to Britain and Newfoundland as well as to the other colonies. You have the nearest coal to England on this side the Atlantic." Subsequent investigation has brought to light 27 feet of coal, the analysis of which gives a percentage of carbon not inferior to that of Cape Breton coal. This, together with the large deposits of magnetite existing in the same locality, cannot fail, when capital and skilled labour are employed in working them, to add greatly to the prosperity of Newfoundland.

The correspondence recently published in these columns anent Mr. R. H. Ahn has drawn from that voluble worthy a long rigmarole, mostly egotistical, part pugnaicous, and bulky enough to completely fill the pages of the present issue of the REVIEW. It has been consigned to the waste-basket.

The total gold yield for Queensland for the past year is stated at 559,392 ounces, the last quarter showing a total of 147,009 ounces, as compared with 139,941 ounces in the September quarter. The year's yield is less by 51,195 ounces than for 1890, but the latter half of the past year shows up with an advantage of 14,503 ounces over the first half. The Charters Towers field contributed 211,605 ounces, Rockhampton 149,567 ounces, Croydon 63,114 ounces, Gympie 58,887 ounces, Etheridge 31,384 ounces, Ravenswood 13,424 ounces, Eidsvold 10,713 ounces, Palmer 10,719 ounces, Gladstone 6,504 ounces, Clermont 3,549 ounces, and Gayndah 4,451 ounces.

Charters Towers, Queensland's best gold field, yielded dividends in excess of a quarter of a million pounds sterling during the year 1891. The developments on this field have been remarkably good, the deep workings below 1,000 feet giving good pay ground.

Some interesting statistics of the cost of producing copper in the Lake Superior, Montana and Arizona mining districts, during 1889, are given in the United States Census Bulletin (No. 96). The results are tabulated as follows:

| Copper Produced. | Cost of Mining. |                    | Cost of Concentrating and Smelting. |                    | Total cost per lb. Copper. |
|------------------|-----------------|--------------------|-------------------------------------|--------------------|----------------------------|
|                  | Total.          | Per lb. of Copper. | Total.                              | Per lb. of Copper. |                            |
| Michigan:—       |                 | Cts.               | \$                                  | Cts.               | Cts.                       |
| 87,455,075...    | 7,478,828       | 8.55               | 985,595                             | 1.25               | 9.8                        |
| Montana:—        |                 |                    |                                     |                    |                            |
| 97,868,064...    | 3,204,415       | 3.27               | 6,297,538                           | 6.43               | 9.7                        |
| Arizona:—        |                 |                    |                                     |                    |                            |
| 31,362,685...    | 1,146,819       | 3.65               | 1,257,892                           | 4.01               | 7.6                        |

\* In Michigan, mineral of 74.26 per cent.; in Montana, matte and Bessemerised bars; and in Arizona, bars and matte.

A recent official report states that the gold mining industry in Dutch Guiana is steadily increasing. A slight decline in production has occurred during the last two years, but this is to be attributed largely to placer owners building their hopes on companies and syndicates buying their land, and, in the meantime, ceasing the developments necessary to keep up the average returns. The auriferous belt extends throughout the three Guianas from Cayenne to Venezuela in an easterly and westerly direction, in width about 100 miles. The formation of the gold belt is metamorphic slates, schists and occasional dykes of sandstone and gneiss. Mining has been principally confined to alluvial washings, and very satisfactory results have been so far obtained. The amount of gold exported increased from 475,953 grammes in 1879 to 1,029,777 grammes in 1888. Last year the export amounted to 987,218 grammes. The government has done nothing to open up the country by the construction of roads, or making the river more navigable for small steamers, to advance the mining interests of the colony. It is only during the past two years that any attention has been given to quartz mining, and the developments during this time have produced highly satisfactory results.

The question of blasting in fire damp mines has been solved, so far as the Prussian mines are concerned, says the Berlin correspondent of a contemporary, by simple prohibition at all points at which accumulations of fire damp are indicated by the safety lamp. This prohibition extends to all underground workings in close draught connection with points not free from fire damp. Blasting with black powder or other slow explosives is also forbidden in underground workings in which inflammable coal dust is known to form. In all cases it must be determined before blasting that there are no accumulations of fire damp within eleven yards. This solution of the question meets with general approval among experts. It is regarded, however, as expedient that blasting with black powder, or similar slow explosives, and with gelatinised nitro-glycerine and the like, without

special safety cartridges, should be entirely prohibited at points with an outflow of fire damp, coal dust, etc., as recent experience has shown that dry coal dust involves danger of combustion, and that even the last mentioned explosives afford no adequate security, even in the absence of fire damp. It is also demanded that blasting at such points should be permitted only to experts certificated by the official Board of Mines.

Mr. A. P. Lacey, a Duluth contractor, believes he has solved the question of the prevention of coal dock fires by the invention of a system of ventilation by condensed air pressure. Pipes for conveying the air will be laid along the bottom of the dock with openings every few feet. An air pump will supply fresh air to the coal and thus prevent the accumulation of gases and heat which originate spontaneous combustion. In connection with the system will be built a large tank for the storage of soda gas, the same as used in chemical engines, and in case a fire should break out this gas can be forced through the pipes and at once reach the seat of the fire.

It will be remembered that soon after roborite was placed on the market some complaints were made by the colliers in the North of England, of the unhealthy nature of its fumes. A joint committee, representing the Durham Coal Owners' Association and the Durham Miners' Association, was appointed to investigate the matter, and their report has been made public. The most important point decided by the professional gentlemen engaged in the investigation is that the products of the explosion of roborite and tonite are not more deleterious than the products of the explosion of gunpowder. As both roborite and tonite are safer and more powerful explosives than gunpowder, their use, now that their true nature has been fully disclosed, ought to be largely extended. With regard to the effect of the explosion of roborite, no chemical evidence was obtained of the presence of nitrobenzene, and throughout the enquiry no case of nitrobenzene poisoning was met with. The elucidation of these two important facts ought to dispose of any objections workmen may still have to the employment of roborite and tonite, and the same remark applies to the presence of carbon monoxide. It is stated by the experts that, with regard to the production from roborite, tonite, or gunpowder of the monoxide, the quantity found in average samples of air collected in the place is small, and is so quickly dissipated by the air current as to have been detected only in traces at an interval of five minutes after the firing of the shots. The investigators, therefore, having regard to the rapid and progressive dissipation of the fumes by the air current, base a strong recommendation upon this fact, namely, that an interval of at least five minutes be allowed to elapse after the firing of the shot before the hewers re-enter the place where the shot has been fired. An equally urgent recommendation is added to the effect that, as part of the gases detected in the fumes are produced by the burning of the fuse, cartridges should be fired by electricity.

The use of natural gas as a fuel in rolling mills and steel works has greatly decreased within the last two years. The record of the works using this fuel in the manufacture of iron and steel was 6 in 1884, 68 in 1886, 96 in 1887, 104 in 1889, while in Jan., 1892, only 74 were using natural gas in whole or part. Of the works still using this fuel 45 are in Pittsburg and Allegheny Co. and 11 elsewhere in Western Pennsylvania. Of the others, one is in West Virginia, 11 in Ohio and 6 in Indiana. Two years ago there were 60 works so run in Pittsburg and Allegheny Co. This decline in use is due to a shrinkage in the supply, and the manufacturers have either returned to the use of bituminous coal or use producer gas made from coal.

Statistics of boiler explosions in 1891, compiled by the Hartford *Locomotive*, report that of a total of 257 explosions, 68 were in saw-mills and other wood working establishments, 35 were of portable boilers, 22 of locomotives, 23 at mines and oil wells, 17 on steam vessels and 16 at rolling mills, the others being variously distributed; 263 lives were lost, the lowest number in five years; 371 persons were injured as against 351 in 1890, 433 in 1889, 505 in 1888, 388 in 1887, and 314 in 1886. A summary of the work done by the inspectors of the Hartford Steam Boiler Inspection and Insurance Company shows that 137,741 boilers were examined in 71,227 visits of inspection. Total number of defects, 127,609. In 526 cases the defects were found so dangerous that the boilers were condemned. Of the 10,858 dangerous defects found, leakage around tubes was the most common, 2,877 cases of that nature being reported. Defective rivets came next, with a total of 1,097; and the most dangerous classes are incrustation and scale, 676; and fractured plates, 672.

A directory of the iron and steel works in the United States for 1891, just published, contains much matter of value with reference to these important industries. The aggregate capacity of the 539 blast furnaces, enumerated as being in operation during that period is placed by the owners at 16,296,793 tons net, or an aggregate weekly capacity of 313,400 net tons, and a weekly average of 551 tons for each furnace. In November, 1887, the weekly average per furnace was 363 tons, and in November, 1889, it was 440 tons. The remarkable growth in the last four years can be better expressed as follows in aggregate capacity:—

|                                | Net tons.  |
|--------------------------------|------------|
| Nov., 1887, 582 furnaces ..... | 10,990,993 |
| Nov., 1889, 375 do .....       | 13,168,233 |
| Jan., 1892, 369 do .....       | 16,296,793 |

The abolition of the old-style small coal cars has been decided on by the Reading and Jersey Central Railway. The little cars have been the cause of many destructive and expensive wrecks. They are so light that when a train's speed is too suddenly checked they "hump" in the middle of the train with disastrous results. Large investments are to be made in new rolling stock to replace the old. Already nearly 2,000 large gondola cars have been ordered for the

coal traffic, besides many other heavy box cars. Two hundred and fifty of the box cars will have a carriage capacity of 50,000 pounds apiece. The new equipment will have automatic couplers, and the box cars will be provided with air brakes.

The Government Geologist for Queensland has issued a very favourable report with regard to the coal discoveries in that colony, in the course of which he describes the find as the most remarkable ever made in Australia, and estimates the total amount of fuel in the field at 50,000,000 tons. "Last year," he adds, "the output of coal for the whole colony was 338,344 tons, the largest output of any year; so that over the area already proved only, there is sufficient coal to last 150 years, with an output equal to that of the whole colony last year. There is not the slightest doubt, however, that the coal exists over a much larger area." It is expected that steps will be taken to place the field in direct communication by railway with Gladstone, which in some quarters is estimated as the best deep water port on the eastern coast of Queensland. About 60 miles of the line will have to be constructed at a cost of £200 per mile. No information is given as to the quality of the newly discovered coal, and in the absence of that it is difficult to form even an estimate of the real value of the new field.

## CORRESPONDENCE.

### The Geological Survey's New Map of Nova Scotia.

SIR,—The characteristic inconsistency of Dr. Selwyn, the Director of the Geological Survey Department, in not considering the branch of economic geology in Nova Scotia as that of the first importance to the various mining districts, is too well illustrated in his having the maps plotted and published on a microscopic scale. Economic geology is to the various sections, such as North Hastings or any other province, that of the first importance when it is made with scientific exactness in the construction of the plans which are necessary to aid in recording the details, both scientific and economic. Scientific exactness and economic usefulness cannot be secured on a microscopic scale, for these maps must be on a scale so that "the who runs may read, and who so reads may understand." In other mining sections, such as North Hastings iron and gold district, and in the Lieves phosphate district, he has yielded to the demand that the scale is to be forty chains (one-half mile) to one inch. The necessities of the mining industry of Nova Scotia demand plans or maps on an equally clear and comprehensive scale for the various mining sections of this Province.

MINE OWNER.

MONTREAL, Que., 2nd March, 1892.

### Sudbury Nickel Deposits.

SIR,—In the June number of your valuable journal I read with much interest the able and comprehensive paper of Alfred Barlow, M.A.—perhaps the most complete description of our mining enterprises yet offered to the public. It is impossible for a stranger to be perfectly certain of all the statements collected by him, and I trust he will excuse a few trifling corrections and additions by an early prospector.

*Wallace Mine.*—He stated that no true vein has been found at the Wallace mine; and the same statement occurs in the report of the Ontario Mining Commission. The true lode was found under the stringers mentioned by Murray, and I can show it for a distance of above two miles W. by S. from the shaft. A parallel vein runs south of it, with a fair show of nickel, changing to iron as it goes westward. They are separated by a mass of hornblende, which frequently overlies the more northerly vein. One mile north there is a very fine vein of hematite, which runs into nickel ores as it goes eastward from the iron.

*Waters.*—I located the deposit of nickel north-west of Waters in July, 1885, for McAllister. It differs slightly from the Sudbury deposit, in that the samples from the Murray when the rock-cut began—November, 1885—made the first assay in Sudbury, by dissolving natural sulphates, and proved the presence of copper by immers-

ing an axe in the solution. I located the hills north-west of the Stobie 11th May, 1884, and the *Lady Macdonald* in November following. I believe that there are a number of mineral lands crossing Algoma from N.E. by E. to S.W. by W., and maintaining great regularity of direction through long distances.

American capital seems to be the chief factor of progress yet; but Ontario may possibly awaken to the wealth of her heritage before it is all in foreign hands.

T. FROOD.

WALLACE MINES, 27th Feb., 1892.

### The Coal Royalty in Nova Scotia.

For some time past there have been rumours that the Local Legislature would increase the royalty on coal from 7½ cents on "round" coal now paid to the Government to ten cents per ton on the "run of mine" product. Matters took a practical turn on the 16th inst. when a number of the leading operators, with representatives of the other mineral industries, met in Halifax and made preliminary arrangements for the organization of a united association. A deputation also waited upon the Government and the Legislative Assembly submitted a statement covering the objections taken to any further imposition on the present rate paid. The memorial was as follows:—

"That the Government has issued three classes of coal leases:—

"First:—Those in accordance with original terms and with section 102 of chapter IX of the fourth series of Statutes.

"Second:—Extended original leases with renewals nominally, in accordance with section 105, chapter VII of the Fifth Series.

"Third:—New leases with modifications authorized by Legislation of 1886 and subsequently.

"That in the case of the last no question of 'right' is raised when it is proposed to increase the rate of royalty.

"The holders thereof pray for clemency, and a careful consideration of the returns they receive for the outlay they may incur.

"In the case of the second class the holders contend they accepted the Form of Renewal offered by the Department of Mines in 1886 without investigation, naturally assuming that their full rights would be respected by the Crown officers, and that they were unaware that other lessees were receiving Forms of Renewal more in accordance with their original leases, and they have reason to believe that the forms given to and accepted in ignorance by them, were drafted without the knowledge of the Government or the opinion of the Attorney General of the day.

"The holders of the first class contend that the proposal to increase their rate of royalty touches the SANCTITY OF CONTRACTS, that besides retaining their original leases the renewals they hold are not new leases to be affected by the Legislation of 1886 and subsequently, with one exception.

"The original leases read that they were renewable on the same terms, conditions and covenants as are contained therein—with one exception which the Legislature could alter in or after 1886. That the Department of Mines has acknowledged that the lessees complied with the conditions, covenants, and were entitled to renewal on the same terms, conditions and covenants as in the original lease.

"The contention hence is that the leases they hold are extended or renewed leases, not new leases.

"Further, that the whole spirit of a lease is to secure to the lessee, on complying with certain conditions, a title good for the term of years on payment of a maximum rental or royalty: that a document reserving to the landlord the right to increase at will such payments would place him in the position merely of a 'tenant at will,' a position wholly incompatible with the expenditure a proper working of a coal mine in this country entails.

"And this contention the lessees are ready to leave for trial in the Courts of Justice. (Not agreed to.)

"Holding this contention they are advised that the Legislature did act as their right reserved in the clause of the lease: "Provided that the Legislature may revise and alter the royalty imposed by these presents in or after 1886 as they may think fit when they amended the Act in 1885 and applied it to the renewals of 1886.

"Having then altered the royalty in 1886, their right to alter the royalty after 1886 may be exercised in good faith with the lessees prior to each of the subsequent renewals contemplated in the original lease, the next being in 1906; but not during the current period of any term of renewal as now proposed by the Government.

"Further, that the late introduction of clauses into the Mines and Minerals Act reserving to the Legislature the power to increase at will the rate of royalty defined in future leases is arbitrary, unfair and inexpedient, and is contrary to the true spirit of a lease made in the sacred name of Her Majesty the Queen: But that it also implies that the power (with justice) of the Legislature did not allow of such a contention being held prior to the passage of the amendments to the Act.

"Lessees have contended that if the rate of royalty can be and is increased without a breach of faith on the part of the Legislature they will be at the mercy of the increased necessities of the country, and entirely disproportionate to the extension of their industry and the returns they receive for their hazardous business. In reply they have been told by the Government they are willing to fix a maximum rate if the lessees agree, to which the counter reply has been made:—The leases now held on renewals state a maximum rate for the current period of renewal, and to

allow the justice of the proposed increase would be to acknowledge that the power the Legislature had been used to override previous legislation on the faith of which large expenditures had been made and the good name of Nova Scotia was pledged, and that if so used there was no guarantee that the maximum now (if) placed would be respected but that the same power might be subsequently exercised to again override this new maximum rate.

"The lessees wish it to be clearly understood that in these contentions they regard the Government as in breach of mineral rights entirely distinct from the Legislature with power to tax any industry, to regulate contracts, and confiscate property without indemnity.

"They exceedingly regret that necessity has forced them to refer to this power, and they have done so only because it has been impressed upon them by the Government of the day that this power lay with the Legislature, as it lay with the Local Government of Prince Edward Island to confiscate without indemnity the lands of absentee landlords (bills disallowed) and with the Quebec Government to modify the rate of interest on debentures (bill withdrawn.)

"The body of the lease (omitting unnecessary legal phraseology) reads as follows:—"The company, their successors, shall be entitled to a renewal thereof, for such extended term, upon the same terms, conditions and covenants as are contained in these presents provided the company are and shall continue to be bona fide working the area and complying with the terms, covenants and stipulations herein, and provided also that the Legislature shall be at liberty to revise and alter the royalty imposed by these presents in or after the year 1886 as they may think fit. Yielding the rent or royalty of six pence, Halifax currency, for every ton of coal of 2240 pounds except coal now known in the Province as slack coal and except coal to be used by the workmen of the company or to be used in carrying on their operations which shall be wrought and sold or otherwise used and consumed.

"And that the said company shall keep one or more books of account wherein true entries shall be made of all such coal as shall from time to time be wrought or gotten forth and sold or otherwise used and consumed by the said company, displaying in such accounts large coal from the said slack coal: and in case the entries do not so distinguish the large coal from the slack coal the whole quantity, so far as applicable to the payments of the said royalties hereby reserved are concerned, shall be considered as large coal.

"The Mining Association asks to have sub-section (e) of section 105 of chapter 7 of the revised Statutes retained. It reads:—"In the cases of leases that are eligible for renewal in which the conditions of renewal embodied therein are different from those prescribed by this chapter, and the lessees thereof are unwilling to have such conditions altered, the commissioner shall have power to renew said leases on the terms contained therein, and as prescribed by chapter 9, Revised Statutes Fourth Series, and no other.

"They also request to have added to section 113 of the present revision the words 'prior to each period of renewal.'

"To have the words 'or of any Act heretofore passed' of section 116 struck out.

"Also section 122 omitted.

"It was also contended:—It is one of the conditions of the lease that 'slack' coal separated from lump coal shall be exempt from payment of royalty.

"It is contended that the landowners are justified in making the rate of royalty exclusively on run-of-mine coal except with the consent of the lessee."

### The Provincial Mining Association of Ontario—Outcome of a Convention Held at Sault Ste. Marie.

A convention of parties interested in the development of the mining industry in Ontario, was held on 31st at Sault Ste. Marie. The following were appointed officers provisionally:—

President—James Connec, M.P.P.  
First vice-president—James Stobie.  
Second vice-president—Capt. J. S. Skews.  
Secretary—John McKay.  
Treasurer—Duncan Boie.

Directors—*Kat Portage*: Messrs. Young, Gaver, Lyon, Hrylton; *Fort Arthur*: Messrs. McMillan, G. H. Macdonnell, W. E. Burke, T. Marks, L. O'Connor, S. Lutz, James B. Miller, A. J. Duncan, Joseph Cozens, F. Rogers and M. McFadden; *Brute Mines*: John Nicholas, John Knight, Thomas Sullivan, Samuel A. Marks and David Jackson; *Thessalon*: W. J. McKinley, Frank Marks, M. McLeod, James B. Dolie; *Sudbury*: W. B. Hammond, James A. Orr, F. L. Sperry, H. McConnell, W. J. Skynner; *Toronto*: Arthur Harvey, W. Hamilton Merritt, John Taylor, E. F. Morris and H. W. Darling.

### Resolutions Adopted.

The following resolutions were passed:—

"(1) That royalties on mineral being a most pernicious tax on labor and capital, the terror of all mining capitalists, and the great cause of the present dullness in mining interests, this convention in the most emphatic manner pronounces against all royalties on minerals.

"(2) That the local Crown land agent's office should be the only office at which applications for mining lands

can be made, and the duty of such officer should be to receive and transmit consecutively applications for free grant and mining lands within his jurisdiction and keep the same for public inspection. To facilitate such inspection he should keep in his office, in a conspicuous place, easy of access, a list showing the number of each application, the date upon which it was filed, as well as the date of the discovery to which it relates and the date of the expiration of the same under any regulations relating thereto, together with the name of the applicant or applicants and their address, and having a reference by number to a description of the land so applied for on a map or place, which he should also keep, showing the area covered by each application, which plan should also show a land patented and the date of the issue of the patent and the name and address of the patentee.

### For the Settler Only.

"(3) This convention expresses its delight to notice that the Patrons of Industry of Ontario declare almost unanimously in favor of reserving the public lands for the actual settler, and hereby most emphatically recommend that all lands be open for all persons of the age of eighteen years and above to the extent of five acres only each, any who takes possession within three months from date of application and upon residing thereon for three years, clearing and cultivating ten acres, building a house 60x20 or upon spending \$300 in mining development, shall be entitled to obtain a patent therefor without any reservation of either pine or mineral, and which he may at any time before issue of the patent elect to purchase same at the usual price of mining land and obtain patent at any time within the usual reservations and shall retain his homestead right.

"(4) That we would strongly urge that the price of all mineral lands in the Province should be the same, and that \$2 per acre is an ample price therefore, and should be payable \$1 cash and balance on or before one year from date of application.

"(5) That the unwritten custom known as or called "Blanket application" regulation we condemn and pray that it be abolished.

"(6) We recommend that the Crown land agents be paid partly by salary, with the privilege of charging the locattee and the purchaser a reasonable price for each lot located or sold, to be fixed by Government.

### Public Highways, School of Mines, Etc.

"(7) That liberal land or money grants similar to those made by the Dominion Government should be made for the building not only of highways, but railways throughout unsettled portions of the Province. There are millions of acres of Provincial lands which are wholly inaccessible by any other than a canoe route and cannot be mined without roads. The judicious and liberal expenditure of money in roads, and in some cases, where experience has proved the value of the district, in railways, would tend not only to promote the agriculture, but the additional sale caused by such expenditures would more than reimburse the Province for its outlay, besides adding largely to its population and wealth.

"(8) That a school of mines should be established at some central mining point in the district, where a practical knowledge of mining, smelting and refining ores may be obtained.

"(9) That the price of mining lands belonging to the Department of Indian Affairs be reduced to \$2 per acre. Inasmuch that we trust the Dominion Government will not place an export duty on nickel, as we believe the effect would be disastrous.

"(11) That this Mining Convention is delighted to see the good and large display of roots, cattle, grains and agricultural products generally, of all kinds, raised by farmers residing within the district of Algoma and exhibited at the fall show of the Eastern Algoma Agricultural Society, now being held at Sault Ste. Marie. The exhibits we have seen at this show prove conclusively that the Eastern Algoma possess the greatest possible agricultural resources, and we trust that every effort will be made to let the world know something about the good agricultural resources which exist in Algoma.

"(12) That the Ontario Government be requested to appropriate a sufficient sum of money to make a suitable display of the vast and rich minerals of Ontario at the Chicago World's Fair."

### The Province of Algoma.

The following resolution was moved and seconded, and after full discussion was deferred until the next meeting of the association:—

"That this convention would respectfully petition the Parliament of Canada and the members of the Legislative Assembly of Ontario to enact necessary legislation to create that portion of the Dominion of Canada and Province of Ontario which is bounded on the south side by the State of Minnesota, by Lakes Superior and Huron and the French River, on the east by the Province of Quebec, on the north by the James and Hudson Bays, on the west by the Severn and Wastikwa Rivers and the Province of Manitoba, containing about 275,000 square miles, into the Province of Algoma, believing that it is principally a mineral and timber country and the wealthiest portion of Canada in natural resources, and that in a few years Algoma would be the banner Province of this grand Dominion of ours, and would be to the general benefit of Canada."

### Ontario Mining Policy.—Resolutions Submitted to the Government by the Sault Ste. Marie Board of Trade.

We would humbly and respectfully submit to the most serious consideration of the Legislative Assembly of Ontario the resolutions contained in the *Sault Express* of April 18th, 1891, and the resolutions unanimously passed by the Provincial Mining Association of Ontario in October, 1891.

We would further humbly submit:—

"That the mines of the United States pay a larger per centage on the capital invested in them than was received from any other class of industrial undertakings in that country during 1891; and that they have never been operated at so great a profit as during the said year, the value of the output of same being estimated at \$1,000,000, or 100, being fifty times that of the output in Canada.

"That while Minnesota imposes a royalty on mineral contained in her State lands, yet the United States owns thousands of square miles in the said State fully as rich in mineral as the said lands belonging to the said State, and that they are having same surveyed and otherwise preparing to open this vast tract which contains, it is estimated, about \$250,000,000 worth of pine besides other valuable timber.

"That the actual settlers will be able to obtain a patent to 100 acres containing part of the value of from \$1,000 to \$10,000, and in some cases containing mineral of greater value by residing thereon fourteen months and performing certain settlement duties and paying an entry fee of \$10.

"That the said United States Government lately opened for settlement a similar tract of land near Ashland, Wisconsin, of 150 square miles, containing \$2,000,000 of pine of the same value located in a few hours by actual settlers among whom there were not a few Canadians.

"That the depression in prospecting and the mining industry in Ontario was caused by the imposition of a royalty on mineral and other detrimental legislation.

"That Algoma is somewhat similar to Minnesota, principally rich in mineral and timber until the same becomes somewhat settled and then the agricultural lands become valuable.

"That the poor man at present is absolutely and almost helplessly debarred from obtaining any interest in pine or mineral lands in Ontario and is driven to the United States to obtain such an opportunity as above mentioned.

"That we fear an extensive exodus will take place from Ontario to Northern Minnesota unless equally liberal homestead laws are enacted respecting Crown lands in Ontario.

"That if all the pine and mineral in the alternate townships were reserved for the actual settler, who upon residing three or five years on 160 acres and clearing and cultivating fifteen to thirty acres and upon paying an entry fee of \$10, should be entitled to a patent thereof with all the pine and mineral thereon.

"That to encourage the construction of colonization railways northward to Hudson Bay, the other townships with all the pine and mineral should be given to such railway companies to the extent of 12,800 acres per mile (which is the area granted to the Winnipeg and Hudson Bay Railways in the North-West Territories.)

"That the grants to both the actual settler and railway company shall be subject to timber dues of \$1 per thousand on all pine, payable as the same is cut.

"That under such a law there would be given to 500,000 to \$100,000,000 paid into the treasury of Ontario in respect of timber dues, which would be sufficient to keep the Province from direct taxation for about seventy-five years.

"That Ontario laws, we are convinced, offer less incentive to the explorer or actual settler than any other civilized or semi-civilized nation in North or South America notwithstanding the boundless extent of Canada.

"That Algoma is the richest portion of Canada in natural resources and if given to the actual settler and colonization railway companies, as hereinbefore set forth, it would soon contain a population of 1,000,000 which would furnish a tremendous impetus to the prosperity of Old Ontario.

"That the development of the mining industry is as important to Canada as that of farming and more so than that of manufacturing, and we submit that mining legislation satisfactory to those interested in mining should be enacted.

"That the United States have reserved almost its entire public domain for the actual settler and have ceased to hold lands for speculation, and this course is not questioned by the electors for the country.

"That while the honorable opposition members were unanimous previous to the general election to give the pine as well as the mineral to the settler, yet after the election was over no effort was made to secure such legislation, but on the contrary, at the first opportunity, deprived the actual settler of the mineral as well as the pine.

"Wherefore we would humbly and respectfully petition the Honorable Legislative Assembly of Ontario to enact laws in accordance with the foregoing suggestions.

THE SAULT STE. MARIE BOARD OF TRADE,

(Signed) W. H. PLUMMER,

President.

(Signed) JOHN MCKAY,

Secretary.

Dated March 3rd, 1892.

### The Nickel Deposits of Algoma.\*

By JAS. B. HARRISON, SURVEYOR.

It would be safe to say that since the first discovery of the veins and massive deposits of phosphate in Ontario and a few years later in Quebec, described by the late Dr. F. Sterry Hunt as early as 1840 in reports of the Canadian Geological Survey, no discovery in the mineral field in Canada has attracted more general attention, or assumed greater importance in the arts than that of the newly found deposits of nickel ore in the districts of Nipissing and Algoma. There are, however, aside from its attractiveness commercially, many features of more than passing geological and mineralogical interest in connection with this subject which claim our most immediate attention. To these let us turn first and principally:

Confining ourselves within the limits at our disposal in this paper more particularly to the geological conditions of the nickel deposits themselves, we shall merely observe in passing that as regards the general geology of these districts, we have to do principally with rocks of the Laurentian and Huronian formations, and with certain dark argillaceous slates and siliceous mafic breccia of possibly earlier origin. The rocks of the Laurentian series most frequently met with consist of gneisses and hornblende-granite, while in the Huronian series occur quartzites, greywackes, felites, quartz-diorites and clay slates. The country shows unmistakable signs of denudation and is abundantly watered by rivers, small streams and innumerable lakes forming a network over the face of it.

Since the year 1882, when copper ore was unearthed in an open cut, about four miles north west of where now stands the town of Sudbury, during the construction of the Canadian Pacific railway, and where now, upon the later discovery of nickel-bearing ore, H. H. Vivan & Co. have recently erected a smelter for its reduction, up to the present time 1892, the history of such ore has been of almost monthly occurrence, and hardly a year has passed without adding its quota to the more important "finds" made. We are thus indebted in the first instance to the prospector for empirical knowledge upon our subject, and to the chemist for discovering its possible economical importance.

As regards the geological and lithologic conditions under which our nickel deposits occur, it is interesting to note that we have to do, in almost every instance, with very similar modes in this respect. Upon the lines of contact between the Laurentian and Huronian formations, or within the latter formation itself, there occur more or less lenticular and elongated formations (extending often for many miles) of a crystalline igneous rock composed of a trichite feldspar, and consisting of numerous varieties, known as diorite, upon whose line of contact in turn, or in the body of this rock itself, a nickeliferous pyrrhotite of varying richness and massive nature outcrops, and assumes the form of lenticular masses (more rarely in more or less well defined veins) and frequently associated and intermixed with chalcopyrite. Dykes of crystalline diorite intersect the Huronian rocks at irregular intervals and are often found in the neighborhood of such deposits.

It is worthy of remark that this nickel-bearing rock is often more or less densely impregnated with mineral without forming more than a small fraction of its bulk, a fact which seems to indicate that some process of cooling had taken place before these mineral particles had run together, as in the formation of a "pocket" of ore.

Such veins and masses are frequently encountered in the rocks of the district and an associate in the deposits under consideration. The veins or masses of quartz, it may be added here, are frequently found to carry gold, and traces of silver, especially in cases where the quartz predominates in such mixtures of rock and ore. It is also characteristic of these deposits that they may often be recognized by the reddish or yellowish deposits of earth and weathered ore upon the surface, a process of nesitization hastened by forest fires; while in the green lush certain moss-covered air-holes and a noticeable sagging of certain portions of the surrounding surface due to oxidation, most frequently where much copper is present, but it must also be noted that a second and equally valuable class of deposits, especially as regards quantity, carries much less copper, and is apt to fail to appear. On the contrary, you have "struck it" by mere accident upon breaking off a piece of the ringing ore with the pick or hammer. The yellowish "gossan" above mentioned, and the ore in the vicinity, not infrequently run high in platinum in the form of the new mineral discovery by F. L. Sperry and named after him "Sperryite." This mineral is successfully mined in the district. The "rites" are washed out in a pan "lead," and pass on to the top of platinum. Other nickel ores occur in the district as nickellite, gerstlerite, and millerite, but have not yet been developed to any great extent.

It will be seen from the above that the direction of the contact of the different formations governs that of the deposit, and is generally in a north-easterly and south-westerly direction. Such "lead" may often be followed for miles across the country outcropping at irregular intervals quite definitely, and yield best in lowest ground. These "leads" run more or less parallel to each other, following the "diorite." Their width is subject to great irregularity, varying from a foot or so to a hundred or even more in exceptional cases upon the surface. The experience already gained in mining here justifies the opinion held by many that these lenticular ore bodies in-

crease or diminish in width as we descend, conformably to the contact in a general way, and that similar shaped ore bodies occur again at greater depths and of varying size and richness. As regards this latter characteristics we find upon the whole that the ore increases in some cases very markedly in richness as depth is reached.

Of the nature of the nickeliferous material it has been doubted whether the nickel occurred as sulphide in the pyrrhotite or in a free state finely disseminated through its mass, but it is present in any specimen of the ore in varying quantities and runs from 1 per cent. to 6, 8 and 10 per cent. and sometimes exceeds even this. The average for the district is in the neighborhood of 3 per cent. in nickel and about the same in copper, and is thus well qualified for the manufacture of the metal by the use of the accompanying rock. The finer grained varieties of medium hardness being looked upon with favor, but boulders of various descriptions of rocks, such as quartz-syenites, quartzites, greywackes or crystalline schists together with various species of diorite are often found imbedded in the ore body.

Less frequently the deposit exhibits a well defined foot wall only, and takes on the semi-nature of a vein. At other times the deposit is a confused mass of rock and ore, while again we meet thousands of tons of solid ore in sight, but in no case has a deposit yet been entirely exhausted, and the supply may thus be said to be practically unlimited. The Canada Copper Co. at an approximate depth of 7000 feet, is stopping large quantities of ore, and the company has been mining successfully since the latter part of the year 1888, and has recently still further enlarged its plant.

While it may be said of our nickel deposits that there is no doubt that many discoveries will yet be made on the lines above indicated, upon the further discovery of belts of diorite northwards and southwards as exploration and the ore is pushed in the direction of the latter, it is true that in a general way an erroneous notion prevails in certain quarters as to the absolutely unlimited extent of our nickel bearing rocks, and in lieu of personal exploration a glance at the map lately issued by the department of the Geological Survey at Ottawa will convince the most sceptical. Again, it must not be forgotten that large tracts of the nickel bearing rocks are already known and disclosed to the public, and that the mineral we have been considering.

I pass over the questions arising in the metallurgy of nickel, and consider for a moment, finally, the developmental and commercial aspect of the subject and its claims to our attention.

As regards the development already accomplished, we have to admit that United States enterprise and capital have done the credit of having broken the ice for us. The Canada Copper Co., a misnomer as we are all now well aware, was the first to discover the invaluable resources of our nickel mines. It is largely due to Dr. E. Peters, jr., who laid the foundation of accurate and economic metallurgical knowledge in the schools of Germany, that he found here a fitting field for the exercise of his unquenchable thirst for the study of the metallurgy of nickel and copper, and he may look back with pardonable pride upon his success. His system of treating our nickel ores in improved water jacketed cupolas has stood the test of the successful handling of these ores in a wholesale way, and in making way for further efforts in the concentration of such products, as lately introduced by the same company. The Dominion Mineral Co. on the other hand, has been equally successful, followed with great success, practically upon the same lines, under the management of Messrs. Atwood and Ferguson. This company, in the short space of a few months, put into active operation a smelter upon their property in Hazelard township, a few miles north of Sudbury, and has lately suspended operations to make way for others upon a larger scale.

H. J. Vivan & Co., of Swansea, Wales, whose property lies about three and a half miles north-west of Sudbury, have also succeeded in treating our low grade ores upon English principles, and have a large and efficient plant, at present operated under the management of Messrs. Henricksen and Edwards. This plant was constructed under the management of Messrs. Merry & Merry, (father and son), well known in the district.

The last companies named commenced operations about two years ago. During the last season a fourth venture has made rapid progress, some 25 or 30 miles from Sudbury, in Drury township, where development upon the Travers or Inez mine is being pushed rapidly with the best prospects of success. The machinery will soon be all in place, and the large roasts of ore are ready for the smelter. A fifth enterprise upon a property situated about thirty miles from Sudbury in the township of Lorne, and controlled by Chicago and Sulbury parties, has recently commenced operations, of which we will doubtless hear more in the near future. Lying over the nickel bearing portions of these districts are situated dozens of first-class properties which are as yet but little known and almost entirely unexplored, but from many of them we may expect to obtain most important results. Even a superficial examination of many of these will convince any expert, that we have here, by the simple but generous gift of nature, a treasure-trove of priceless value.

In any discussion of the best means of further developing these resources, from what has been already stated it may be easily gathered that we have in our power the choice of appealing either to foreign or to foreign capital, or both. The advantages to be derived are, however, quite different in their character and effects. An army of non-resident stockholders necessarily abstract from home circulation a vast amount of money in successful enterprises, while on the other hand we have to contend at present with an investing public to whom the legitimate claims

\*Paper read by J. M. Clarke before the Canadian Institute, 25th Feb., 1891.



for investment in this field are but little known, and the effects of such investment still less. We are, necessarily, a young and comparatively inexperienced country in such ventures, but little acquainted with these as a people. The day is, however, not far distant when such shall have ceased to be the case when an era of speculation will have given place to the more solid and substantial utilization of our natural mineral resources.

The principal difficulty so far met with lies in the nature of the circumstances of the case. New and valuable discoveries in the mineral field will all know excite wide-spread influence in the mere hope of acquisition, but the capital, so expended aside from a small and insignificant portion speedily regained in lucky speculation, is but small in comparison with that required to win a lasting profit ultimately from the bowels of the earth, and many enter without full knowledge of all these facts, and fail, therefore, to grasp their full significance.

The chief idea in the acquisition of individual and national wealth in a country, apart from its commercial relations with other countries, lies in a just and reciprocal exploitation of its natural resources, and in its mutual dependence upon each other. The miner must have food and raiment, and the farmer must have the best means of cultivating the soil and a market for his produce. And right here it will be in place to emphasise the fact that no industry is more likely to assist the farmer, in the long run, in giving him a successful competition with the outside world which secures to him in return its products as he needs them. A single mining company, it must be said, has a monthly pay roll in these districts of from ten to twenty thousand dollars when mining its own ore, and this implies no mean consumption of farm produce.

It is impossible to say what the exact production of nickel in Canada has been up to this date, but an idea may be formed by giving the statistics of 1899 as quoted by John Stewart in a valuable article in the *Engineering and Mining Journal* of January and last. In that year the product was 1,336,627 lbs. valued at \$1,002,470. Since that time we had a large increase in the production of nickel and copper matte.

The question of the hour, now that a reliable source of these valuable metals has been discovered, is that of their most economic refinement. Edison's success in refining copper cheaply by electric methods has aided in increasing a feeling favorable to the extension of these methods to the refinement of other metals, including nickel, although in the case of this metal it is claimed that its oxide is more suitable for the well-known alloy it forms with steel. In a country like ours, abounding in valuable water power, a bright future would thus be opened to us in their utilization metallurgically, nor shall we have reached our highest development until nickel and copper are separated and refined at home.

An effort is at present being made in these districts in the establishment of a custom's mill, to develop still further their resources in the nickel field, and is meeting with the success it so well deserves from every quarter. It is in the development of natural resources alone that the hope of our young country lies, and any policy which has anything short of this in view must be pronounced at once short sighted and injurious. We have the privilege of rising to a position of eminence by our own advantages, and of seizing upon every opportunity of legitimately developing them, or the dire alternative of suffering others, outsiders, to continue to reap what we should. As Canadians we have been entrusted with nursing into life and activity important interests; with us rests the solution of the problem, and no where is our mission of more lasting importance to the general welfare of the country at large than in the mineral field.

#### Discussion.

After Mr. Hammond's paper was read the President invited discussion.

Mr. J. RIDOUT said he would like to have further information as to the methods of refining nickel and as to the percentage of nickel in ore required in order to make its working commercially profitable. He thought steps ought to be taken to secure the establishment of a refinery in this country.

Mr. GEO. MICKLE, M.E., stated that ore carrying 1% of nickel would, under favorable conditions, pay well. In his opinion the nickel in the Sudbury district existed in the form of a sulphide. There were isolated instances of arsenides of nickel, but sulphides were the general rule. There were several methods of extracting nickel from the matte, but electrolysis was the most satisfactory method. In some instances gold and silver were found with the nickel, but their absence was the general rule. The nickel in the ore had taken the place of a corresponding quantity of iron. In many of the discussions on the subject the strong chemical affinity of nickel for sulphur had been overlooked. There was no such affinity between gold and sulphur and hence the scientific difficulties of explaining the presence of gold in mispickel.

Mr. A. HARVEY doubted the theory of Dr. Bell as to the formation of nickel. He thought the better opinion was that the process of formation of nickel was not igneous. The late Dr. Sterry Hunt favored the aqueous theory. He called attention to the fact that the International Convention of Geologists had decided that the names "Huronian" and "Laurentian" should be eliminated from geological nomenclature.

Mr. E. A. ALVINS stated that in making an analysis of magnetic ore from Algoma, he found considerable

quantities of gold and silver and asked if the presence of gold and silver in magnetic ore was general.

Mr. DEWAR had, in a number of instances, found both gold and silver. He disputed Mr. Mickle's statement as to the presence of arsenides. He had found arsenides to be of frequent occurrence.

#### Gold Quartz Reduction.\*

By A. H. CURTIS, B.A.

The author reviewed the principal crushing and pulverising machines employed in the reduction of gold quartz, considering that term to include all auriferous silicious rocks, from true quartz to conglomerates such as the "laneket" of Witwatersrand. Many of the machines were equally applicable to the treatment of other ores. The manner in which gold occurred in veins and other deposits was described, and a list of the principal mechanical processes of gold extraction was given. The author then proceeded to classify and describe the more important crushing and pulverising machines, and to indicate their respective merits and defects.

1. *Oré Crushers or Rock Breakers.*—These are used for the preliminary coarse-crushing of quartz, and were subdivided into—(A) Machines on the reciprocating jaw principle, including the Cornish roller, the Blake and Dodge gyratory crushers, as the Comet crusher, and the Gates rock and ore breaker. The machines of Blake and Dodge differed chiefly in the method of suspending the movable crushing jaw; and the latter, being a comparatively fine-crusher, was more particularly suited for mills of moderate capacity. In the Gates and Comet crushers, a gyratory motion was imparted to a vertical shaft, and on the upper part of which a breaking-head was mounted. Both jaw and gyratory crushers were serviceable machines, the defects of the former being of small importance in regard to their use as gold-quartz crushers.

2. *Crushing Rolls.*—These were considered under three heads:—(A) Cornish rolls, with lever-and-wheel compression. (B) Improved Cornish rolls, with steel buffer-journals or india-rubber rollers possessing many merits, but having smaller capacity and durability than jaw or gyratory crushers, which were, therefore, preferred for coarse-crushing. (C) Krom's rolls possessed great strength and durability, and were capable of much finer crushing than Cornish rolls. The author described this type at length, being of opinion that no more efficient dry-crusher has hitherto been devised. Dry-crushing was, however, only recommended where water was not abundant, or where the subsequent concentration of the ore, and the separation of the gold were accomplished by dry methods.

3. *Stamps.*—These are fine pulverisers. The varieties described were:—(A) Gravitation stamps, which are lifted by rotating cams and fall by their own weight; (B) special forms of stamps, including oscillating pneumatic, steam, elephant, and other varieties. The merits and defects of gravitation stamps were discussed at considerable length. The principal merits consisted in the simplicity of construction and working; while the great weight and certain features of their crushing action constituted serious disadvantages. Within certain limits, and under certain conditions, stamps were efficient pulverisers. In large mortars had a sufficiently large discharge area, and the ore was very carefully fed into them, there was considerable risk of loss of gold, owing to the production of "slimes," as well as to overstepping of the precious metal contained in the gangue. As wet-crushers of extremely hard ores, gravitation stamps could not be extensively used. Huskisson's and Sibbald's pneumatic stamps, and the ordinary steam stamp, were, in the author's opinion, more adapted for medium than for very fine pulverising, owing to the difficulty attending the use of thin screens in mills of such large capacities. The elephant stamp, in which a certain saving of power was effected by the use of springs, was a useful prospecting plant. The author preferred Krom's rolls stamps for dry-crushing. The Huntington mill, which granulates the material of pneumatic ore, was recommended in place of stamps for the wet-crushing of clayey, brittle, or soft quartzes.

4. *Roller and Edge Running Mills.*—Two varieties were considered:—(A) The Bryan roller quartz mill, in which three metal rollers revolve in a circular pan or mortar, the arrangement being that resembling the Chilean mill. Mercury was used before the pan for amalgamation. The construction of the machine was faulty, and there was great wear and tear, as well as appreciable waste of power; while with pyritic ores there was necessarily considerable sickening of mercury in the pan. (B) Huntington's centrifugal roller quartz mill. Three or four rollers, suspended from a rotating circular frame or disk-driver, were urged outward by centrifugal force to a circular steel ring die, against which the ore was pulverised. Mercury, for amalgamation, was placed at the bottom of the mill, the rollers being so suspended as to pass freely over it, without coming in contact with it and stirring it up. Faxman's patent roller-head, an improvement on the older construction, was described. The mill was recommended by the author for clayey quartzes (which required a certain amount of pulchery before the gold was liberated), for quartzes of medium hardness, and for grinding coarse tailings.

5. *Ball Pulverisers.*—In these machines, coarse crushed ore, or coarse tailings, were pulverised by a ball, or balls, of chilled iron, steel, or other durable metal re-

volving on a circular track or path. This grinding path may be vertical or horizontal, preferably the latter. Several varieties were described. The principal objections to ball pulverisers as a class were the great wear and tear of grinding-surfaces, and the amount of power required to drive them. The author's opinion was, as grinders of coarse tailings, or of ore already more or less finely comminuted.

6. *Pneumatic Pulverisers.*—Contrivances in which small fragments, or coarse particles, of ore are hurled against each other by the action of two opposing currents of air, or in some other manner, with such force as to cause them to be finely pulverised. The author described the principal machines of this kind, and pointed out that the high speed at which they generally required to be driven was a decided disadvantage, entailing an excessive amount of driving power.

7. *Miscellaneous Grinders or Pulverisers.*—Under this head were described:—(A) The Niagara mill, in which the ore was pulverised by a heavy edge-runner, contained in a metal drum rotating in a hollow horizontal axis, through which the ore was exhausted by a fan as soon as it was sufficiently finely comminuted. Where dry-crushing was advantageous, the author, for reasons specified, preferred Krom's rolls. (B) The Howland pulveriser, consisting of a circular pan in which the ore was granulated against a steel ring die by twelve disks or rolls, which lay on a horizontal carrier plate, rotated by a heavy driving roll. These rolls were urged outward by centrifugal force, and rotated against it by friction. The action somewhat resembles that of the Huntington mill, which the author considered a more efficient machine.

8. *Grinding and Amalgamating Pans.*—These are used for grinding to minute particles ore already more or less finely reduced by other machines, and subjected to subsequent concentration; and, secondly, to effect the amalgamation of the gold contained in the pulp with mercury introduced into the pan. The numerous varieties of grinding-pans were briefly referred to, but did not call for any special criticism.

In some general conclusions, the author indicated the particular classes of work for which the more important coarse-crushers and fine-pulverisers were severally adapted, and enumerated their essential features. The author pointed out that prime cost was a secondary consideration in selecting reduction machinery. Weight, amount of power required for driving, cost of renewals, and simplicity or otherwise of construction, were economic considerations of great importance.

#### Sulphuric Acid From Iron Pyrites.

At Beaufort, S.C., and at Savannah, Ga., sulphuric acid has been made from iron pyrites, but the business commenced on a large scale in Georgia when the \$50,000 plant of the Coweta Fertilizer Company went into operation three weeks ago at Newnan. A couple of months ago active work was begun, and now a \$50,000 plant is in operation, making one hundred tons of sulphuric acid a week.

The method is to burn Spanish ore containing 53 per cent of sulphur and 47 per cent of iron. When the furnace is once heated the sulphur in the ore is all the fuel that is needed. The sulphur gas has some oxygen, but not enough to make sulphuric acid. To supply this deficiency nitrate of soda is burned and forms a gas which carries oxygen. The two gases are carried into an immense lead chamber with a capacity of one hundred thousand cubic feet. Here chemical action takes place, the result of which is that oxygen goes from one gas to the other, and gives the sulphur gas enough oxygen to make sulphuric acid. The acid takes the liquid form and sinks to the bottom of the chamber. This process fills the bottom of the chamber about four inches deep in a week. It is so large that every inch of the acid in the bottom amounts to twenty-five tons.

It is said that the Spanish ore costs, delivered, \$9 a ton, and two tons will make as much sulphuric acid as one ton of Sicilian brimstone, which costs, delivered, about \$36. Here is \$18 against \$36 for material; but, of course, this is not all saving, for it costs more to manipulate pyrites than brimstone in the manufacture of sulphuric acid. The residue of the burnt ore contains at least 90 per cent of iron, and must become an important feature in the economy of acid manufacture. So far it has required a larger quantity of coal to melt the iron ores at southern furnaces than at others, because of the low percentage of metallic iron. A mixture of the rich residuum of pyrites after the sulphur has been burnt out would probably reduce the proportion of coal needed to melt iron ore of less richness. This fact is well recognized in Spain, and the companies who mine and ship the pyrites make it a part of their contract that the residuum shall belong to them after the sulphur has been burnt out.

Condition of Miners in Hungary.—The number of persons employed in the mines of Hungary is 35,533, of whom 29,830 are men, 5000 are boys from twelve to sixteen years old, and the remainder are women. The average wages earned in Spain, and the mines are seventeen to nineteen pence, and in the coal mines, twenty-five to thirty-one pence. In the mineral mines, the work is usually carried on at night, but if day work is done, there are three shifts of eight hours. In coal mines work is usually done in two twelve-hour shifts, with an allowance of two hours in each shift. The miners are usually lodged in houses built by the companies, who also sometimes supply necessaries at cost price. Strikes are rare and are of short duration.

\*Abstract of paper read before the Institution of Civil Engineers, February 2nd, 1902.

## Manufacture of Patent Fuel.\*

By JAMES CLARK

In consequence of the enormous increase in the output of coal during recent years, a proportionate increase has taken place in the amount of small coal brought to the surface. Where screening is carried on extensively there is a great deal of very small coal made, and there are only two ways to dispose of this small, viz. either to coke it when the quality will be of no purpose, or manufacture it into patent fuel. Until quite recently the various processes used have been regarded as trade secrets, and the works in most cases shut against strangers.

The first recorded attempt to introduce the manufacture of fuel into England was in the year 1594, and is described in a work by a lawyer named Sir Hugh Platt entitled "A new, cheap and delicate fire of coke balls." He describes his project as one to sweeten sea coal so as to make it a substitute for wood in domestic economy. He then describes how he made it by mixing loam in a tub of water and making it into a very fine pap and then mixing it with sea coal which had been previously bruised with a hammer.

The word patent was first applied to artificial coal in 1799, when the Marquis of Chalmers obtained protection for a suitable process, his object being first to prepare large from small coal by passing the latter through sieves made of wood or metal, and secondly consolidating the small coal by mixing it with earth, clay, cowdung, tar, pitch, broken glass, sulphur, sawdust, oil cake, wood, or any other combustible ingredient.

There are about 385 specifications relating to patents for inventions of artificial coal made from small coal, between the years 1799 and 1885, some relating to the machinery employed and some relating to the process of manufacture.

Fuel making did not become an important profession for steam-generating until after many costly experiments had been made; and of all the materials tried pitch remains the only one in regular use. The methods of making fuel may be grouped under three heads:—

First—Process requiring drying in an oven after compression, such as the Farina process, which was thoroughly tried a few years ago and which completely failed.

Second—What is called the dry process, which is still used to a certain extent and which consists in passing coal and pitch through hot cylinders over a furnace.

Third—The steam process, which effects the mixing of the pitch by means of hot dry steam.

The last mentioned process is one which is now almost universally adopted. The coal owners on the continent go in more largely for fuel making than we do, and I am sorry I cannot describe some of their appliances, but probably some of the other members who have seen them may be able to furnish some particulars in the discussion of this paper. The production of the fuel trade in this country is South Wales, where from 10,000 to 70,000 tons per month are shipped abroad. Blocks of various sizes are made, and some of the works made what they call "coals" for shovelling into the furnaces; they are 55 lbs. weight.

The most modern complete factory erected in this country is that at Newport in Monmouthshire, where the whole arrangement for receiving the coal and converting it into fuel and shipping it into the holds of sea-going vessels is complete. At these works about 400 tons can be made per day.

Patent fuel possesses the advantage over coal of requiring less storage, as a ton of fuel occupies 31.5 cubic feet, as against 41 cubic feet for coal.

The calorific power as against coal is slightly less when the coal is fresh worked, but fuel can be kept a long time, showing no depreciation after years of exposure, whereas coal would be valueless if kept a very short time.

Up to the present time has been little used for domestic purposes, in consequence of a prejudice against the smell of the pitch, but this is gradually wearing away.

I will now describe a small plant erected at Ormeston S. Colliery two years ago by the Uxside Engineer-

ing and Rivet Company (Ltd.) As shown on Plate LXII, A is a small pitch-mill fitted on the top of the hopper; B is a distributor for dividing the proper quantity of coal and pitch; C is a disintegrator for grinding and mixing the coal and pitch together; D is a pug-mill, where the coal and pitch are stirred and heated to the proper consistency for compression. B2 is a pan-mill to receive the coal and pitch, with revolving arms in it to fill the moulds; C2 is the press cylinder for pressing the blocks; D2 shows the amount of compression, 2½ inches on each block, which equals 12 cwts. pressure to the square inch of block surface. D3 is where the block is lifted off after it is finished; E is a section of the stamper that presses the block; F is the lever on the end of the piston rod that lifts the stamper by means of what is called a hammer, resting on the centre of this lever. When the moulds are filled the table is turned around horizontally, a tooth at a time, by a kicker on the upright shaft that passes through the pug mill to the top of it, and they are passed around to the top of the hammer, where

attend to the press and pug mill, two laborers to take away the blocks and load or store them, and one boy to fire the boilers; in all there are two boys. The machine turns out 3 tons of fuel per hour. The quantity of pitch used is from 9 to 10 per cent. of finished fuel. This process is similar to Yeaton's; but we consider it a much shorter cut, and the mode of pressure in this case is much safer, because of the table does not come exactly to the very same place, the hammer gets a hold of the stamper all the same; and if anything were getting into the mould, the hammer would simply put on the usual pressure and return without doing any harm, which would not be the case if two hammers or plungers were applied, as in Yeaton's; they would require to travel the full distance or break something. In our experience we find the principal things to attend to in making good fuel are to see that the proper quantity of pitch is filled in mixed with the coal, that they are both properly ground and mixed in the disintegrator; that the steam for the pug mill is kept up to the proper pressure, and that the nozzles conveying

the steam into the pug mill are in order. We have two nozzles into the pug mill; one about 12 inches from the bottom of the mill, and another about 6 inches further up on the opposite side of the mill. The diameter of these nozzles is from ¾ in. to 1 in., screwed into a ¾ in. tube. The height from the bottom floor to where the coal is filled into the hopper is 23 feet. The small coal, as it comes from the coal miners, is emptied by the pit-head-man into a well made to receive it from the screening platform. The pitch is hoisted up an inclined plane in hatches to the same platform, and emptied on the opposite side of the hopper.

Before we erected this plant we stored hundreds of tons of this gum in the workings; now it is all drawn, and whatever is left over after supplying the colliery with steam is made into patent fuel. Our coal is so soft and drossy that we entered into an arrangement with our coal miners when we first opened out the colliery, to riddle all the coal over a ¾ in. sieve, and that enabled us to make a better job of screening it into pens and nuts for the market.

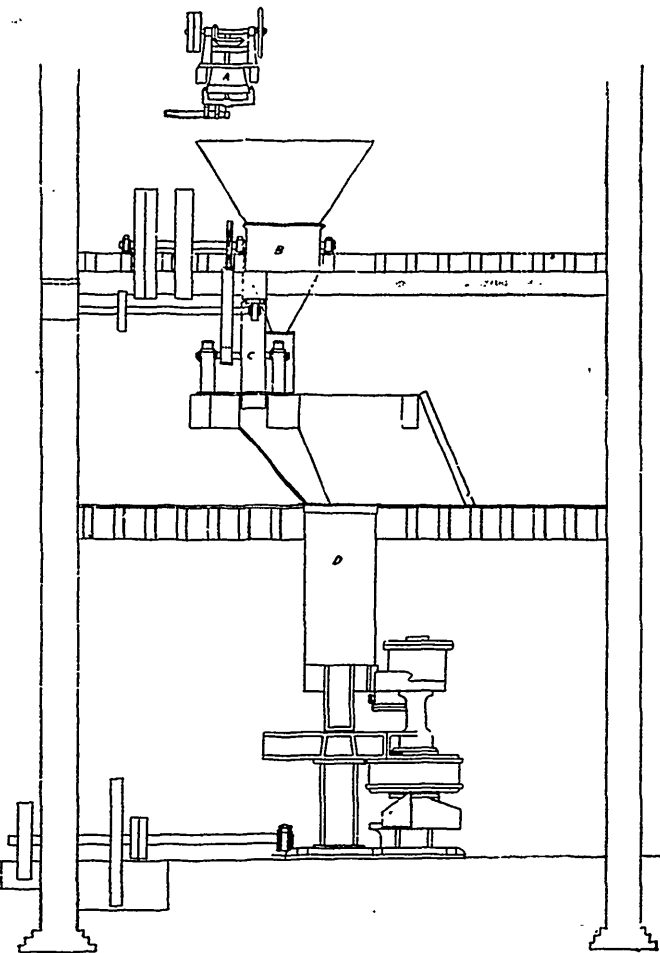
The size of the briquette we make is 6 inches by 4 inches by 3½ inches, and it weighs four pounds. We only make one size. Stevenson Macadam, Esq., Ph. D., Sc., Lecturer on Chemistry, Edinburgh, says in his analysis of the fuel, that the patent fuel manufactured by the Ormeston Coal Company proves that it is of excellent quality for general combustion purposes. It is well made, burns freely and evolves a good heat. The fuel is of first class quality for household purposes.

## The Ore Fields of Peru.—

According to a recent report of the U. S. minister at Lima, petroleum promises to become the most important industry of Peru, the oil fields being said to cover 7,500 square miles, while the Pennsylvania oil region is confined to somewhat narrower limits. The refined kerosene manufactured by the London & Pacific Petroleum Co. at Talara, near Paita, in northern Peru, has so far displaced the American article that it is impossible to purchase any thing but Peruvian kerosene in Lima.

The first shipment to this market from Talara was made in Dec., 1889, and now almost the whole west coast of South America is supplied with the Peruvian article. Three new companies with large capital were organized in London during the early part of the current year, for the purpose of working the petroleum beds between Paita and Tumbler.

**The Use of Block Petroleum in the Navy.**—It is stated that experiments with block petroleum in a torpedo boat have been made under the auspices of the Admiralty at Davenport. The object is to ascertain its actual value as a fuel. The great objection that experts have hitherto had to liquid petroleum is that it would require specially constructed boilers in which to burn it, which would also require specially constructed tanks for storage purposes. It is said that block petroleum is really much more powerful as a heat-giving agent than coal, and it is possible to attain a speed of 3 knots an hour more in a given time than would have been possible with ordinary fuel.



PATENT FUEL MACHINE. Fig. 1.

the blocks are pressed. After they are pressed they are passed on with the stampers rising on an inclined plane, and when the moulds get to the opposite side of the press from the hammer, the blocks are above the level of the table and are lifted off there, and then the stampers are passed along on a descending plane into the pan mill for filling. Immediately above the pan-mill, and on an eccentric that works the slide valve of the press cylinder and causes the piston to give the blow. The whole of this machinery is driven by a pair of coupled engines, 10 inch cylinder and 20 inch stroke, supplied with steam at 40 lbs. pressure. The speed of the engine is 60 revolutions per minute. The speed of the main shaft of the fall plant is 95 revolutions per minute. The pug mill and press cylinder are supplied with steam at 70 lbs. pressure from a small multivalve boiler, 7 feet long by 3 feet 6 inches in diameter, with 28 tubes of 3 inches internal diameter. It required one man on the top to fill in the coal, one boy to fill in the pitch, one pressman on the bottom floor to

\* Read before the Mining Institute of Scotland.

**Draining in Mines.\***

By MR. HENRY DAVEY, M.I.C.E., Westminster.

The author dealt with some of the leading general principles involved in methods of draining mines under the most important conditions of both coal and metalliferous mining. In treating of draining during sinking operations, he said the conditions vary greatly in sinking for coal or for ore. In the former case the shaft or pit is usually completed before the coal is worked; in the latter the shaft is generally deepened during the working of the mine, and is, therefore, never in a permanent condition. Temporary steam pumps might be used to advantage for small quantities of water from moderate depths, but for any important work a surface engine with bucket pumps, having proper lower appliances, should be adopted. Pumping water was not a costly operation if proper and sufficient pumping plant was employed for the work, but if this plant is insufficient the loss often is very serious. Even with proper plant, sinking through water-bearing strata is slow and costly, because of the delay occasioned by the sinkers having to work in water. Heavy pumping under such conditions could be expedited by the use of jet pumps and other auxiliary appliances, by means of which it was unnecessary to lower the main pumps so frequently. Hydraulic pumps might be used to great advantage. Many special appliances of this nature might be employed if they could be procured when wanted, but no one kept special appliances. Makeshift plant was procured and the sinking in consequence became slow and costly. The author said that for many years he had been convinced that a sound investment would be found in the establishment of a depot where the best sinking appliances might be obtained on hire or purchase. In sinking shafts and wells through water-bearing strata, great cost was usually incurred and much time taken up. The subject was of considerable local importance because of its bearing on the sinking of mining shafts. The problem was simply that of keeping down the water in water-bearing strata in advance of the sinking operations, so that the excavation of the shaft should be done in dry ground. The ordinary method was to lower a pump or pumps in the shaft, and to sling the pumps from time to time as the sinking progressed; obviously the excavation had to be performed in water, and if the quantity of water was great a large portion of the work had to be done by the men working in two or three feet of water. To facilitate the work and reduce the water in which the men had to work, a sump was made under the section pipe of the pump, and it was the keeping this sump excavated in advance of the other work which was most difficult and tedious.

In the plan proposed by the author the pump would be placed in a borehole made before the commencement of the sinking of the shaft. It was necessary that *debris* should not go down the borehole in quantity sufficient to choke it up. That is provided against by means of a heavy taper shield of cast steel surrounding the pump and resting on the edge of the borehole. This shield is perforated with holes inclined upwards towards the pump, to allow water to get into the borehole, but to exclude *debris*. The shield is made very heavy, and by its own weight follows the excavation around the pump and also protects it from injury through the blasting of the rock. The pump is made without a foot valve, the rod of the bucket working through the seating of the valve which rests on the top of the working barrel. By this arrangement the drawing of the bucket also draws the valve, and should the bottom of the borehole be filled up with sand it can be removed by lowering a sand pump. The bore holes should be made to a greater depth than that required for the pump, to provide space for sand and *debris*. The application of this pump would be to suit the local circumstances and the geological formation of the strata to be passed through. In some situations the shaft might be drained by means of boreholes outside. It was usual and necessary to have duplicate pumping engines, and where two engines were made to pump from the same well, the well must be very large to accommodate two sets of pumps. Such a well would be usually from 12 to 14 feet in diameter. A simple borehole could be made cheaply and expeditiously. Four 30-inch boreholes could be put down in a small fraction of the time required to sink a 12-foot well in the ordinary way. Instead of making a large well the author puts down four boreholes to accommodate the pumps for duplicate pumping engines. The boreholes being completed, the pumps are lowered into them and coupled up to the permanent engines. The author held that it was true economy to have a pumping engine large enough to do the work at half or even one-third its full speed, or what might be called two or three times too big. He was at present putting down large pumping plant at great cost to recover a colliery drained

because it was formerly drained by means of underground steam pumps. The practice had been to put down a new pump for every new feeder, but one day a big feeder broke in and the pumps were soon under water and the colliery also.

Underground pumping engines had been largely employed of late years, but the author thought it a mistake to take steam underground. It was not possible to get dry steam to underground engines through pipes carried down the shaft, and with wet steam the engine would give a low duty. He had found the engines on the surface could be made to work with one-half the steam required by the best underground engines for the same work. In some places underground pumping engines were more suitable than surface engines, but in most of such cases the pumping was better and more economically done by means of hydraulic pumps from an engine on the surface. He instanced the installation of Messrs. John Denton & Co., at the Grimsthorpe Colliery, Sheffield. The work was, previously done by means of steam pumps, but the steam was such a nuisance underground, the mine was made so hot, and the steam pipes and plant gave so much trouble, that Messrs. Denton resolved to try another plan. The shaft is an inclined one. There are three hydraulic pumps placed in different parts of the mine.

three hydraulic pumps were placed in different parts of the mine, which is 1,100 feet deep.

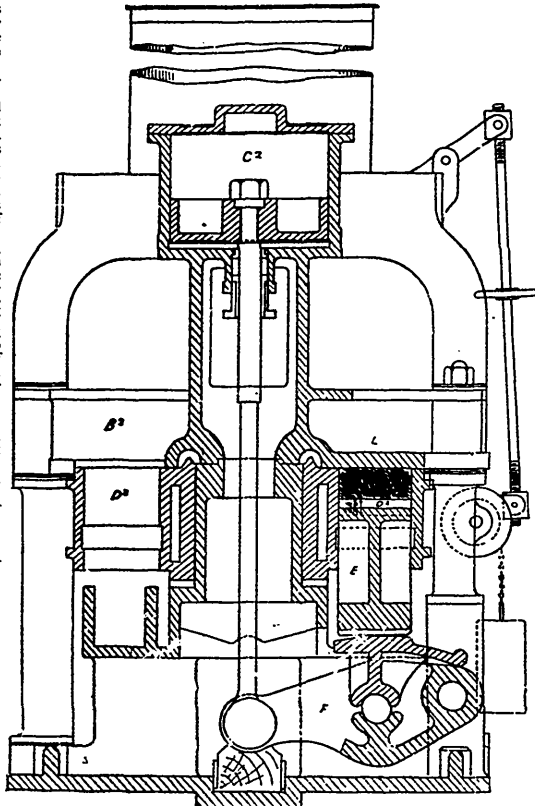
In opening the discussion Mr. Bagley, the president, said that with regard to the establishment of depots where pumping machinery might be hired, he thought that an idea which mining engineers would readily approve. Members of the institution would remember that some fifteen years ago they visited the Whitburn colliery. At that pit an extraordinary amount of water was encountered during the sinking operations, and the pumping machinery was quite inadequate to cope with it. The expense for mining machinery would have been greatly appreciated by the owners, but resort had to be had to the various marine engine building works on the Tyne and Wear, and marine engines were planted, with very little foundation, all around the mouth of the pit, these doing duty as pumping engines. These improved pumps enabled the company to keep down the water, and the pit was thus saved from being drowned out. Eventually the Chaudron pump was adopted and the sinking completed. This was an illustration of what would be the value of a central depot such as Mr. Davey apparently proposed, available for all England.

A letter was read from Mr. Addison L. Stevenson, chief mining engineer for Messrs. Bell Bros., and the oldest mining engineer connected with the Cleveland Institution. He was unable to be present, but stated that hitherto he had escaped the necessity of having any very powerful permanent pumping engines. When sinking Lumpsey mine they passed through feeders of 1,700 gallons per minute, and at North Shelton the officials stated that they were favored with but three as pumps. In both cases they were shut off by metal tubing, leaving the mine quite dry below, but they remained above only so long as they did not work the pillars. A short time since he looked at the question of how best to deal with it, and it seemed to him then that one or two of Mr. Davey's engines placed in the center of a basin, or at some point which would allow the deepest part to be reached by an undeviated drift, and so avoid a very heavy column, would be the best way, the various mine owners combining in a joint scheme. If the discussion was adjourned, he could perhaps attend and explain this scheme fully when he had got the consent of the parties interested.

Mr. Jeremiah Heed, M.I.C.E., Middlesbrough, quite agreed with the remarks of the author as to the difficulties of sinking operations where there was an excess of water. They could not get pumping engines made in a hurry to cope with an influx of water. He knew of one case in the Forest of Dean, which which he had to do. They had had much difficulty for three years in carrying on operations, owing to the lack of proper pumping machinery. They had gone about the country getting machines wherever they could. He thought if a depot were established for mining machinery it ought to include other things besides pumps. There ought to be apparatus for combating gas disasters, such as helmets, etc., for enabling explorers to enter workings filled with noxious gases. Mr. Davey had explained the system of pumping that he advocated. The old system with the suction valve right at the bottom of the sinking, and the motive power a long way off, and conveyed by spear rods, seemed to him cumbersome and awkward. Instead of rods Mr. Davey carried down water in pipes. The system was a good one, but yet it seemed to him it had its disadvantages in the slowness with which the pumps would work and the liability of the water in the pipes to freeze and stop the whole concern. Mr. Davey rather advocated the supply of water to towns for domestic purposes from wells in preference to gravitation schemes. It would be particularly interesting if Mr. Davey would indicate the precise geological strata in which they might rely upon getting any great quantity of water.

Mr. T. D. Ridley, Redcar, said his experience had mostly been confined in respect to draining water, to the clearing of it out of workings. In reconstructing the Thames embankment he began to use chain pumps, which were seldom seen in these days, and were not considered economical. But he found that for the purpose of clearing foundations they were most economical; they would lift almost anything, and could be relied upon not to break down. He had used chain pumps a good deal ever since. It was a good point to keep the pump considerably in advance of the excavation. He knew the importance of having the men kept dry and working clear of the water. If they could keep the shaft dry by putting down boreholes outside of it there could be no difficulty in keeping the men dry. He had been draining the town of Henley-on-Thames, and had met with much difficulty in sinking shafts, but if he had put boreholes down outside each, as Mr. Davey suggested, the work would perhaps have been more expeditiously carried out.

Mr. William Hawdon asked if the system could be carried out in very soft ground, because it appeared that if they bored a hole without tubing it the ground would fall in and choke the pump.



PATENT FUEL MACHINE. Fig. 2.

The first lifts 150 gallons per minute, 300 feet high; the second, 137 gallons, 300 feet high; and the third, 30 gallons, 300 feet high. The power is supplied from the surface through pressure pipes 4 inches, 3 inches, and 2½ inches in diameter, at 700 pounds per square inch. The pumping plant cost £1,547 and the pipes £517.

The author stated that he had devoted considerable attention to the system of applying hydraulic power to underground machinery, and he gave particulars of the hauling and pumping engines at Altham colliery, the New Russia Company's collieries, and the Quebrada copper mines. He expressed his conviction that for vertical shafts, where considerable quantities of water had to be dealt with, the pumping could be more safely and economically performed by means of surface engines and pump rods than by any other means. Where, however, their use is inadmissible, the system of hydraulic transmission is the most economical, convenient and practicable, not only for pumping, but also in many cases for hauling purposes. Conveying steam underground for pumping purposes was to be avoided, if possible, except under special circumstances. The author mentioned that several installations had been put down for pumping by electrical power. He also cited a colliery near Marseilles where

\* Abstract of paper read before the Cleveland Institution of Engineers, Middlesbrough, February 29, 1892; with discussion thereon.

Mr. Illyd Williams, Lanthorne Ironworks, enquired whether the shield and tubing were not liable to be fractured through the use of explosives near them. Mr. Davey, in reply after answering a query about the sure of the jet pump, said the president had alluded to the suggestion for the establishment of a depot where proper sinking appliances might be kept. The speaker explained that what he meant was that specially designed machinery, rather than ordinary machinery, should be kept. He agreed that apparatus for contending with sudden surges of water, for use in reply after answering a query about the only danger of the water freezing in the tubing was at the top; the heat of the mine was sufficient to keep it all right further down. Where it was liable to freeze, a small quantity of glycerine was added to the water. With regard to boreholes in soft ground, they would have to be lined to keep the ground from falling in, and in some cases it would be necessary to put through the way down. The shield and tubing were made exceptionally strong to resist the effects of shots.

#### Underground Surveying.

In a work bearing this title, and which is now being prepared for the press by a mining engineer, directions are given for the use of the improved Hedley dial, made by Messrs. John Davis & Son, Derby. It is stated that the magnetic needle without a check is not a safe guide in underground surveying. Any person who will attend to directions given in this work, and to make a survey wherein no attraction has been taken into account, magnetic attraction, will require no further argument to convince him that a survey made with a rigid dial is at best a very doubtful operation. Ferruginous substances are plentiful in almost all mines, some visible enough, some, however, not visible to the senses of the surveyor. Such substances act in the needle of the dial, and if no method be adopted to neutralize their attraction, or to dispose of its erroneous readings, these surveys may be doubtful and worthless, and cannot be otherwise than a source of disappointment and perhaps disaster. The costly and cumbersome theodolite is out of all question for general use in mines, and its angular readings give no idea as to the separate bearings of the headways, and no check is obtained to the readings. The new and improved Hedley dial not only meets all the requirements of the mining surveyor, but by its aid surveys can be made with mathematical certainty. It is often found in using old plans of collieries that magnetic readings have been solely relied upon, and that disastrous results have occurred in consequence of the magnetic attraction giving the wrong location of old workings. At a time some good and reliable instrument was invented, it is also some good and reliable method of underground surveying were explained for the use of colliery managers and learners, so that surveys, when made, may be affirmed to be accurate—certain—and as far as possible admit of demonstration. The improved dial counts from the north from left to right 10, 20, 30, 40, etc., and the outside check figures commence at the right, and by arranging the figures to facilitate their reading by the operator, the instrument is left to right 10, 20, 30, 40, etc. In commencing an underground survey, the following directions are given by the author.

Do not really commence at the pit's eye, because that is not so impossible to get a true reading on account of the subsidence of the soil. Set up the instrument (such as is found in most pits) and take from two separate stations its magnetic bearing, then tighten the collar attached to the ball and socket, slacken the clamping screw, turn the sights of the dial by means of the rack and pinion screw, until the vernier reads the same degree as the bearing just taken. The bearing and length thus taken will serve as the bases of subsequent operations. Then tighten the clamping screw and slacken the collar, and by means of the loose collar direct the sights of the instrument between the same stations as before, and if the needle and vernier readings are the same, the dial is in adjustment to survey the whole of the underground workings from the base line just taken. We will suppose, in order to be understood, that the bearing of the dial and the vernier reading to be 40 degrees 200 links. Then by means of the loose collar at the end of the line from which you wish to continue the survey, and by means of the loose collar direct the sights to the other end of the line, and if the angle reads as we have supposed, 40 degrees, tighten the collar, slacken the clamping screw, and by means of the rack and pinion screw direct the sights to the next station, which suppose to read 30 degrees 200 links. Then by means of the clamping screw and slacken the collar, and move the instrument to the next station. Set up the instrument truly over the station, and by means of the loose collar direct the sights to the last station. [If the needle and vernier readings agree, there is no attraction. If they differ, the amount of magnetic attraction is the difference between the magnetic and vernier readings. The amount of attraction is always to be taken in preference to the magnetic, because it will be found in practice that, when there is no attraction, the magnetic and vernier readings will again agree, and this will be found the case throughout the survey, and give unobscured proof that the work is right.] Again tighten the collar and slacken the clamping screw, and by means of the rack and pinion direct the sights to the next station which suppose to be 40 degrees 200 links. Then tighten the clamping screw and slacken the collar. Fix the instrument truly over the station, and by means of the loose collar direct the sights to the last station. Then tighten the collar, slacken the clamping screw, and

by means of the screw of the rack and pinion direct the sights to (we will suppose the pit shaft) the next station, which is to degrees 200 links. It is necessary to observe two things—First, that in all the sights taken in the direction of the pit shaft, the eye of the surveyor must be at the north sight, and, in taking a sight from the pit shaft, must be at the south sight. Secondly, if, as we have supposed, the base line is some distance from pit's eye, the survey notes must be entered from the top of the note book downwards, instead of upwards as is usual. The readings and the notes will be precisely the same as they would have been had the survey commenced at the pit shaft. The plotting also may be done as in ordinary cases.

In every survey, by using the improved Hedley dial, the work is verified as it goes on, the true magnetic bearings being registered, which cannot be said of any other instrument, the theodolite not being exempt. If no divided road can be found in the pit, then get up the tram rails, say, for 20 yards, and remove all other iron for the same distance, so that one magnetic bearing may be obtained without attraction. The survey may then go on as before described. It may perhaps be advisable here to note that some fine used in making the surface survey, (say, the level of some mineral line, or survey instrument, set upon the surface by fixing in the ground at least two or three permanent marks as stations, and corresponding marks and stations legibly marked upon the colliery plan. The mining surveyor may then at any time check the pit shafts and boundaries, and prove the accuracy of the plan. If the surveyor will take the bearing of this line, he can check the magnetic bearing instrument. It is a fact that different instruments, especially if they are made by different makers, vary in reading the same line. The writer has known them vary 1½ degree; but if the foregoing directions are attended to, and the bearing of some line taken, and the magnetic meridian fixed accordingly, uniformity, instead of diversity, would be the result. This method also will meet the difficulty of the variation of the compass, because the meridian may be checked at any time, and as often as it is considered necessary by the surveyor.

#### Testing for Gas in Mines.

This was the seventh of a series of lectures arranged by the Millard Counties branch of the National Association of Colliery Managers. Prof. Clowes, who illustrated his subject by many interesting experiments and also by means of diagrams, pointed out that the term "gas testing" should refer only to the best ways of detecting the presence of low percentages of fire-damp in air, and of measuring this amount. This involved the careful use of an appropriate safety lamp or other apparatus. Any form of safety lamp in unskilled hands would indicate percentages of fire-damp exceeding about 6 or 7 per cent.; such mixtures make the flame increase in size, and then flare and flicker, or they totally extinguish it if the proportion of gas was high. Then signs of the presence of gas could not be mistaken, and they were supplemented in some of the less perfect forms of lamp by the burning of the gas itself inside the lamp. When the proportion of gas to be detected fell below 2 per cent., however, only the careful use of a suitable lamp or apparatus would serve to detect it and increase its amount. It might be urged that very low percentages of gas needed not to be detected, as they gave rise to no risk of explosion. This statement, however, certainly required qualification, in the light of what was said with regard to the influence of the presence of fine coal dust. Air containing less than 2 per cent. of gas became explosive if it was mingled with coal dust, and accordingly in dusty mines percentages of gas less than those which could be found by an ordinary lamp, must undoubtedly be looked for. Then, again in order to test the sufficiency of the ventilation, and more especially to ascertain that the air reaching the mine by the downcast was properly divided up into the splits, so that each split got its full share, it was absolutely necessary to ascertain periodically the percentage of gas in the "returns." The percentages of gas to be determined in the returns would usually be below the lowest quantity detectable by an ordinary safety lamp. If there should be any doubt as to the soundness of the method, the most perfect means of gas testing, simply because they did not wish to know the worst concerning the state of the ventilation of their mines, either as regarded its amount or its proper distribution, the feeling must surely give way in the present age of scientific progress, and in view of the preventable danger which was incurred by such carelessness. The satisfactory and trustworthy methods of gas testing at present known depended upon the fact that even the smallest percentages of gas in air, which could not be kindled by a flame, would yet burn completely if they were kept in contact with a sufficiently hot surface. The most satisfactory gas indicator as yet produced was that of Living, of which Prof. Clowes gave an interesting description. The only objections which seemed to be raised to the use of this apparatus in the mine were, that it was costly; that it necessitated the carrying of a special apparatus, and that some trouble had arisen from the spirals being rendered useless by fusion of the metal, caused by over heating them. If no simpler and less costly and troublesome apparatus was available, these objections surely were not of very great weight, and seemed sufficient to render the apparatus of little use. The apparatus had been treated since its invention in 1850. The lecturer also referred to the apparatus devised by Maurice, which he described as sound in principle, adding that it was doubtful, however, whether it was as

simple in practice as that of Living. Speaking of the "flame cap" test, he said that its delicacy had recently been greatly increased. The examination of lamps specially designed for gas-testing had been undertaken in Prussia, and had resulted in the recommendation of an extremely sensitive lamp devised by Pieler. The examination of the sensitiveness of certain modified lamps had also been reported upon by a Royal Commission on Accidents in Mines. More recently the lecturer had devised a special apparatus for the purpose, and his experiments had shown that it was possible to construct a Hepplewhite-Gray lamp, as modified by Mr. James Ashworth, was capable of detecting and measuring extremely low percentages of gas. In the latter they had a lamp which was at once a good lighting and a good testing lamp. Probably more might yet be done in the matter of producing safety lamps, and an arrangement for gas-testing might be applied to a lamp which had been proved to be free from the reputed danger of burning benzoline, or inflammable spirit of any kind, and yet give good flame caps. What was to be desired was a flame which should not only be pale, but bright and sufficiently large. As far as his experiments had gone they indicated that the flame of burning hydrogen fulfilled all the conditions required for a very delicate gas-testing lamp. It is possible to have more to say about that in a future lecture. Prof. Clowes described an apparatus which he had constructed for testing the sensitiveness of lamps for gas-testing. The apparatus furnished a ready means of testing the sensitiveness of safety lamps as gas indicators, and he was at present applying it to other matters of interest in connection with gas testing.

#### Amalgamation Without Overflow.

[Australian Mining Standard.]

"One of the biggest difficulties those interested in gold mining have had to face since the year 1890 has been the saving of fine gold by the ordinary battery and paste process. A number of the mines in this colony, and for the matter of that throughout Australia and New Zealand, promise very rich returns when first discovered. Huge lodes, such as the old Junction Reef (now Mandurama), with gold well distributed throughout, due in most cases, it is presumed, to thermal spring action, look like becoming dividend-paying stocks as soon as the nature of the ore is better experience teaches another lesson; the first crushing often is the last, or at best the mine struggles on, until, tired of paying calls, shareholders drop out one by one, and what promised a fortune, oft times spells ruin. Why is this? Simply because the mercury is unable to seize the gold, the rush of water from the battery carrying the fine gold to the surface, or the water so formed forming a kind of solution. Chlorination, of course, is specially suited to this type of ore, but in many cases, where large dykes or lodes have to be put through, as at Pambula, in New South Wales, and at Kautoutu in New Zealand, chlorination is far too expensive a means of extracting the gold where a mass of low grade ore has to be put through. The great Mercury mine, however, has experiments at Pambula have lately been conducting a series of experiments with the object of saving their fine gold in an economical manner. The last and best trials made by these companies were at the Ballarat School of Mines, where amalgamation without overflow was put to a crucial test, in each case with the gratifying result that 96 per cent of the precious metal was secured. What this means to the great Mercury mine, for instance, can easily be imagined when it is understood that notwithstanding all the at least gold-saving adjuncts during the last six months, 1,260 tons of ore worth £4 17s 10½d. a ton have been put through for a saving of £1 9s 1½d. only, or in other words over two-thirds of the gold has gone to waste (for the time being) in the tailings, and the loss of fine gold in the present instance is the same as that which should be secured by the holders' hearts. And now for the *modus operandi*, which, it must be remembered, is not hedged in big royalties to anyone, rights, patent or otherwise. The ore to be treated is first calcined, then put through a rock-breaker or stamper latery in a perfectly dry state; if the latery is used, ordinary precautions, of course, must be taken to prevent water, or the like, from getting on the surface of the workmen. The ore is then transferred to the Chilian mill and made to the consistency of porridge, the quicksilver being added. When the principal work of amalgamation is done, experience soon teaching the amount of grinding necessary, from the Chilian mill the paste (so to say) is passed to a wheeler or any other good pan of a similar type, when the gold-saving operation is completed.

**Russian Petroleum.**—A recent report by the United States Consul at Batoum furnishes statistics of the condition and progress of the Russian petroleum trade. The production of crude oil in the Baku district during 1890 averaged nearly 80,000 barrels, of 42 gallons each, per day, as against 68,000 barrels daily in 1889. Early in 1891 the amount was increased to as much as 125,000 barrels a day, owing to the best work of four new wells. In 1890 the high price as greatly stimulated drilling, and the increase in the production of all petroleum products over 1889 was 36,342,075 gallons, of which 32,277,235 gallons were exported.

## MINING NOTES.

(FROM OUR OWN CORRESPONDENTS.)

## Nova Scotia.

## General.

The suit of Stuart vs. Mott, for an interest in the proceeds of the sale of the Dufferin mine in March, 1889, will be heard at this session of the Supreme Court in Halifax.

## Caribou District.

The Lake Lode Co., once managed by L. L. Wadsworth, is advertised to be sold by the sheriff early in April, under attachments for debt.

## Goldenville.

Little is doing in this district. Messrs. Miller have acquired the old Coburg property, and have pumped out the shaft and cleaned it up preparatory to undertaking work in early spring.

## Killag.

The Provincial Co., which is operating the property purchased from Messrs. Stuart *et al*, have decided to sink a new shaft on the Stewart lode, some 300 feet further east, and to erect near this shaft (which will be a vertical one) a combined shaft house and stamp mill building. The plans for this structure have been fully prepared, and Mr. D. S. Turnbull, of Beaver Dam and Kennew, has been engaged to superintend its erection.

## Malaga.

The original pay chute of the Rabbit lode has been cut by the Malaga Mining Co. in a shaft some distance to the westward of the older workings, and the quality of the quartz is reported to be better than has ever been taken out of this lode before, which, to those knowing the lode, means very rich quartz, as this lode has given returns of several ounces to the ton. This company has shown a balance on the right side of the ledger for some time now, and the business management of Mr. G. A. Wade, the manager, is an example for other companies who have good mines which are not profitable.

The Boston Gold Mining Co. is rapidly approaching its boundary line in working out the pay chute. Unless precautionary measures are taken this company will soon have low grade ores to mill.

## Montagu.

Men are being laid off in this district, the management of the combined mines having decided to curtail work and expenses for the present.

## Oldham.

The Standard Gold Co. are using air drills in driving levels (the 150-ft. and 450-ft.), but have adopted hand-drilling for the stopes, having found that hand-drilling in the back stopes gave the best results.

The vertical shaft of the Napier Mining Co. is going down very slowly owing to the water. It adorns of the rock and pebbles falling of the rock encountered. So far nothing of value or importance has been cut, and at the present rate of sinking it will be July 1st before the workings reach the objective point.

## Renfrew.

Attachments are the order of the day apparently, as this is the third district within a month which has had attachments made for debt. The employees of the Empress mine attached for wages due, but there is no likelihood that an execution will be issued, as funds to pay all bills are understood to be en route for the mine.

## Stormont.

The sale of the North Star Company's property is advertised for April 20th. Rumors are afloat that a stay of proceedings will be issued on behalf of an interested creditor, and that the property is likely to be idle for some time.

## South Uniacke.

Messrs. Thompson & Quirk deny the report that they intend erecting a new mill, but a new engine will be placed in the existing mill. The quartz from this mine maintains its high grade of character of from 10 to 20 ounces per ton. (Official returns of the yield from this property from October, 1889, to 31st December, 1891, report a yield of 3,201 ounces 15 dwts. gold from 298 tons rock crushed.)

## Whiteburn.

Mr. G. J. Partington desires us to make correction of the news item concerning the Graves mine, which appeared in the February issue. Although the mine has not been operated on *company account* for some months past, yet Mr. Partington, as manager of the Whiteburn G. M. Co., has permitted certain portions of the property to be worked on *tribute*, the product for February from that source being 38 ounces from 37 tons. Mr. J. M. Reid, whose name appeared, has no connection with the mine whatever. The programme of the company for the coming summer has not yet been made public.

## Waverley.

The West Waverley Gold Co. dropped the stamps of their new mill for the first time on the 25th inst. The

large compound condensing air compressor is working most satisfactorily, and the company is now in position to become a steady though small producer.

Work on the East Waverley tunnel was resumed the 1st of March.

The tribute work on the Lake View property is reported as doing well.

Tribute has also been let on the Winslow Junction property.

## Cape Breton.

The quantity of coal shipped during January and February was very small in comparison with the summer months. Nearly all the mines are busy getting ready, either for summer work or banking coal on the surface to be in readiness for shipping.

Considerable discussion has been carried on with regard to the Hon. Mr. Fielding's action in advising his government to increase the royalty on coal from 7½ cents to 10 cents per ton on run of the mine coal. For the information of some of your readers, a few words on this question may be of interest.

Chap. 7, Mines and Minerals, contains the following on royalties:—

"Sec. 104.—Coal, nine cents and seven-tenths of a cent (9½) on every ton of two thousand two hundred and forty pounds of coal, except—

(a.) Slack coal, that is, coal that shall have passed over a screen, the bars of which are not wider apart than ¾ of an inch.

(b.) Coal used by the workmen employed in and about the mine for domestic purposes; and

(c.) Coal used for mining operations in and about the mine from which such coal has been gotten."

Nearly all the collieries in Cape Breton agreed with the Department of Mines to pay on run of the mine coal a royalty of seven and one-half cents per ton instead of the nine and seven-tenths as specified on round coal. The difference being, as stated in the Act, round coal to pay nine and seven-tenths, and the small coal, which would go through the ¾ inch opening in the bars, would be free.

Run of the mine coal is coal just as it is taken from the miner, and on what they are paid, and contains all the round and slack. On this coal the owners have been paying seven and one-half cents per ton on all the coal shipped if as run of the mine, or if they shipped round coal and slack coal separately, as of course nearly all do, the round and slack were added and gave "run of the mine."

On the 18th of February, the agents and managers received a circular letter from the Department of Mines, stating that it was the intention of the Government to increase the royalty on run of the mine coal from seven and one-half cents per ton to ten cents per ton, and on screened coal, from nine and seven-tenths, to a figure in proportion to the advance on the run of mine, and that if the Bill became law that it would take effect from date.

In many cases contracts had been entered into before the receipt of this letter, and arrangements made with men for banking rates as, for instance, at Victoria mines, where the men received an advance of 3 cents per ton on last year's banking rates, the increased royalty (on 25,000 tons which they generally bank) came down hard.

The Ontario mine, at Big Glace Bay, has been sold to American parties, so says report; but it is early yet to communicate what they propose to do. As soon as possible the management will be interviewed by your correspondent and a full description of the property will be given. It has long been acknowledged to be one of the most desirable coal properties in the market, and the reported selling price is \$50,000. Mr. Thomas Routledge, of Sydney, has had the selling of it, and his many friends will be glad of his success.

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Halifax, N.S.

The fine open winter has been very favorable to all outside works, and also demonstrates that shipping at Little Glace Bay and Cove Bay, and the Port of Sydney, can be carried on for nearly every month of the year or until the drift ice in March comes on the coast.

*Sydney and Louisburg Co.*—Considerable work at the reserve levels has been accomplished underground and banking commenced on the 15th of February, which was considered a remarkably early date. At the Emery mine of this company a compressed air plant of the Ingersoll-Steeple pattern, was set up by the Ingersoll Rock Drill Co. of Canada, and several of their coal cutting machines are now at work in the mine and doing good work. The work of these machines are being watched with great interest both by men and masters as to the quantity of coal these machines can mine, and as to the relative cost in comparison between machine work and manual labor. It is rather early yet to form any conclusive decision as to their adaptability for all kinds of coal, but as a certainty that in the near future a large quantity of coal will be machine mined.

This company are also making extensive repairs to their shipping pier in Sydney, for the quick dispatch of steamers next year.

*Victoria Mines.*—An advance of three cents per ton has been granted to the miners on banking rates, and these mines are now working steadily in putting out their usual bank of coal, which comes up generally to the large quantity of 25,000 tons.

Considerable machinery is to be added in the machine shops in the way of lathes and other equipment.

*International Mine.*—The shipments from this colliery at Bridgeport have been, during the past two months of the year, nearly all by rail to supply the contract held by the mine for the coal for the Cape Breton section of the Intercolonial railway, and in sending some coke to the steel works and glass factory at New Glasgow.

Extensive improvements are being carried out on the bank. The pit-head being raised 8 feet to lengthen the screens, which will allow of greater facilities for screening and cleaning the coal, a subject which has always received great attention at this mine.

The Murphy fan erected last year gives good satisfaction, and continues to run steadily.

*Caledonia Mines.*—Banking commenced here in the middle of February, and the levels are being driven and the bank head for the deeps lengthened and put in order.

Great preparations have been made to put the surface arrangements up to a most efficient standard. In the engine room a 20x30" air compressor has just been placed on a concrete bed, pipes put down the pit to lead the compressed air to the coal cutting machines and underground pumps. A large cut stone boiler house and engine room are nearly completed. Two new cylindrical boilers are in place, and two 75 horse power tubular boilers are daily expected from the Jencks Machine Co., Sherbrooke, Que., which will give them a heavy battery of boilers. A new iron smoke-stack has also been erected for increased draught. A new blacksmith forge, 100x40" has been erected and fitted up for blacksmith's shop, car building and pick sharpening.

*Gowrie Mines.*—Considerable coal was shipped during January and a less quantity in February, but coal was raised nearly every day to supply the twelve coke ovens which are kept constantly burning, the coke being stacked ready for shipment to Little Bay, Newfoundland, in the summer.

Some years ago a fault was encountered in the west level which cut out the coal. This winter a diamond drill was purchased by the company and a bore hole put down from the bottom of the level and the coal found and proven to be nearly 6 feet in thickness; this of course demonstrated that the Gowrie seam extended on the other side of this fault.

The wharf has almost been entirely built again under the able supervision of master wharf builder McAuley, and is in good order for an increased shipment of coal over and above last year. Banking has not yet commenced at this colliery, but the levels and deeps are being pushed ahead night and day, to be in readiness for the coming season's work.

*Little Glace Bay.*—At the Sterling pit, a new hoisting engine, made by Matheson & Co., New Glasgow, is being placed in position. This engine is of the most improved pattern and design, and is considered to be a fine piece of work. A new set of pumps are being put in place. In the pit, deeps are being driven to the dip of the shaft, and levels turned off. These deep inclines will open up a large area of coal on the harbor seam, and give an increased output to the mine.

They are also doing their usual harbor improvements, and the coming summer vessels entering the harbor will have a wider entrance by 25 feet than previous.

**Gardiner Mines.**—Banking has been carried on since early in January, and considerable coal was sent away, both to the International pier for vessels and for local trade in Sydney and points east, and also to the Inter-colonial railway. Though this coal has been but a short time on the market it has become quite a favourite and though it was late in the shipping season of 1891, when the Burchell Bros. were able to place any coal on the market, they succeeded in doing a good year's work, and are now pushing on their works for an increased output this year.

### Quebec.

The Asbestos Club met in the club house at Black Lake, on 28th ult., Capt. Matthew Penhale in the chair. Among the new members elected were: the Hon. John Macintosh, M.P.P., Mr. W. B. Ives, M.P., and the recently-elected member for Megantic county—Mr. James King, M.P.P.

Arrangements are well in hand for the visit to the townships of the General Mining Association of the Province, in June. A successful meeting and an enjoyable outing are promised to all visiting the asbestos region on this occasion.

The electric transmission of power at the New Rockland slate quarry has been installed and gives satisfaction.

We have pleasure in announcing that the Jenckes Machine Co., of Sherbrooke, Que., has been appointed the sole representative and manufacturer of the diamond drills, patented and manufactured extensively in the United States by the American Diamond Rock Boring Co. of New York.

### Ontario.

A meeting was held in Toronto the other day to organize a company having for its object the construction and operation of a blast furnace in that city. The proposal was received favorably. A deputation will wait upon the local government to ascertain if it will aid such an enterprise. The mayor of Toronto has expressed his views in favor of a grant of land favorable for a site free of taxation. This is a project well deserving attention at the hands of local capitalists, and we hope to hear soon that it has materialized.

### Sudbury District.

The mining men of Sudbury are asking the Ontario Provincial Government for a subsidy of \$3,000 to establish a nickel ore laboratory. They also ask a similar amount for four years to secure the services of an assayer, and advocate the establishment of smelters at Sudbury and Port Arthur. The requests are under consideration.

The *Sudbury Journal* says: The new manager of the Dominion Mineral Co'y, Mr. Cameron, arrived in town on the 15th inst, and will take up his residence at the mine in a day or two. Our reporter called on him at the Secretary's office, but was politely informed that as "he was not a Yankee, but a Scotchman, he declined to be interviewed." (We didn't intend to ask for an interest in the Co'y.) The offices of the company will also be removed from town to the Blezard Mine, and doubtless operations on an extensive scale will be commenced soon.

Messrs. DeMorest & Johnson, surveyors, of this place, are about to issue a most complete map of the Sudbury mining district, embracing the territory from Warren on the east to Straight Lake on the west and Massey on the Soo line. The plan will show each surveyed township, the lots patented and leased up to the 1st of March last, and also all mining locations on record in the Crown Lands Department. The size of the map will be 3½ by 5 feet, with sufficient blank space left to add, each year, any new survey and locations which will be made on the 1st of March in each year, at a small cost.

It is confidently expected that the Blezard will reopen under its new management and the fact that they have given a large contract for cord-wood to be delivered at the mine confirms this. Two new smelters will be put in during the spring—one by the Chicago Nickel Company, and the other by the Straight Lake Nickel Company, of which W. B. McMurrich, of Toronto, is president. The three new Bessemer furnaces of the Canadian Copper Company are now in full operation. By them the proportion of nickel in the matte is more than doubled as compared with that produced by the old furnaces.

There are also signs of activity in the vicinity of Webbwood, on the Sault branch of the C.P.R. While it is difficult to report accurately the extent of the sales of mining locations, yet there are sales being made at fair prices and good properties are changing hands.

Sudbury has already subscribed \$5,000, or ten per cent. of the stock now offered for sale by the latest candidate for public support in the mining industry of this district, the Sudbury Customs Smelting Co., Ltd. This is the first venture of the kind in the nickel region, although no new thing elsewhere, and its progress will be watched throughout with interest.

### Port Arthur District.

The mining school question was discussed at the last meeting of the Port Arthur Council, and when some of

the members suggested that in giving \$3,000 they would be paying rather dearly for their whistle, the Mayor brought them to time by saying that if Port Arthur didn't care for it, Fort William would probably take it. It was decided to submit a by-law to the people.

Two holes have been bored down fifty feet on Cape Mamaise property under the direction of Captain Thomas Tretheway, and the diamond drills have struck copper for the optionists so rich that the diamonds will cut no further.

Silver has been struck on location R 20, near the Badger.

The Y-One Company organized in Cleveland and Chicago is reported to be perfecting arrangements for an early and vigorous opening of this mine.

Further rich finds of silver are reported from the Port Arthur district.

### Rat Portage.

Work on the L'Divir, Gold Creek and Gold Hill locations is being continued. Application has been made for a charter for incorporation of the Canadian Homestake Mining Company, Limited, to work the Yellow Girl Bay location. The provisional directors and those taking stock in the concern are local men of good standing and it is expected the company will be able to set to work without delay and show what can be done here.

The prospects of the reduction works are very promising. There are several gold prospects in the Lake of the Woods district now being developed and more to follow. Mr. Brent has made many improvements in the machinery of the mill since he took the management, and has greatly reduced the cost of operation. As it will be of interest to many of our readers, we give a list of prices charged for the reduction of silver ores:—

| VALUE OUNCES.    | PERCENTAGE. | CHARGES.       |
|------------------|-------------|----------------|
| 20 —30 .....     | 90          | \$8.00 per ton |
| 30 —200 .....    | 90          | 10.00 "        |
| 200 —1000 .....  | 95          | 10.00 "        |
| 1000 —1500 ..... | 97          | 30.00 "        |
| 1500 —2000 ..... | 98          | 50.00 "        |

There is no doubt that the reduction works at Rat Portage will prove of great value to the miners in that district.

Rat portage has recently been "simply wild," over alleged great discoveries in the district, yielding most unusual amounts to the ton.

### Hastings Co.

The Belleville *Intelligencer*, writing of profitable gold mining in Hastings county, says that Mr. F. R. Lingham had with him 70 ounces of gold, worth \$15 per ounce, the product of 170 tons of ore taken from the Lingham gold mine, in Belmont. In addition to the bullion there was 916 pounds of concentrates, valued at \$668, which would make the total yield of the 172 tons of ore \$1,718, or \$10 per ton. This is most satisfactory, as the cost of mining and reducing the rock is rather less than \$3 per ton, and the result will be a great impetus to gold mining in this section. The company is making preparations to put in a mill which will crush 100 tons per day. It will be operated by electricity, the power being obtained at Deer River and transmitted a distance of two miles. Their mill and process—Crawford's patent—is the only one which has treated the ores of this region with entire satisfaction. A practical miner, who is interested in a gold mine in Kaladar, having learned of the successful operation of the Crawford process of reduction of the gold-bearing rock of the Lingham mine, arranged with the managers of that concern for a test of 11 tons from his location. The weather and the roads, which were alike bad, prevented the delivery of more than seven tons at the mill, but this was put through and the result proved highly satisfactory, showing that the mine can be made to yield a handsome profit.

### Petrolia Oil District.

The course of crude prices, while gradually tending downward, has not been decisively indicative of a permanent decline. Business has continued very dull, and few features of interest have transpired. The almost complete absence of speculative interest on the part of any outside operators combine to be a feature of discouragement, and the purchase of the raw material is in the hands of a few manufacturers. The price of refined oil keeps very low, and the chances are that the fall trade for 1892 will still witness the keenest kind of competition between manufacturers of illuminating oil. The drillers are kept busy all over the oil territory, both Petrolia and Oil Springs, and any amount of four and five barrel wells are reported, but as there are quite a few neophytes in the business we must cut the product of their wells down somewhat. There has hardly ever been a well drilled in the Petrolia oil region but what has been over estimated. Once in a while we hear of a producer who will underestimate rather than the opposite, but the great majority will incline to the former. The person, however, to become most seriously affected is he who happens only occasionally to gaze upon the outpouring of a well. As a rule his imagination becomes exercised and he spreads himself all over the territory without hope of limitation, and a well that perhaps is pumping about a half a barrel a day is put down in his estimation as going about two or three barrels.

### Manitoba and North-West Territories.

The number of applications for coal mining lands during last year was 107, and 11 of the applicants were given the privilege of purchasing, within a specified time, the location for which they applied, and 18 of the applicants were given permission to prospect thereon. Five of them bought the land applied for, or a portion thereof, and one of the applicants being a homesteader was permitted to mine coal by paying 5 per cent. royalty on the coal mined.

The revenue for the year derived from the sale of coal lands was \$8,898.75, being an increase of \$7,236.25 over the previous year. The total area of coal lands sold up to date is 13,079.76 acres, and the total amount received therefor, \$135,070.07.

In the Annual Report of the Department of the Interior the following reference is made to the regulations in force governing the disposal of minerals on Dominion lands under its control:—

"The arrangement between the Provincial and Dominion Governments, that all minerals, with the exception of coal, on Dominion lands in the Province of British Columbia, are to be administered under the mining laws of the Province, is still in force. The only amendments which have been made to the Mining Regulations since my last report are those set forth in the Order in Council of the 18th of December last, by which an applicant for a petroleum location, who has otherwise complied with the requirements of the regulations, may be able to obtain an entry for a location upon his making affidavit that from indications he verily believes that petroleum exists on the location applied for—the location, however, not to be sold to the applicant until a period of five years from the date of entry prescribed by the regulations, unless he can, in addition to compliance with the requirements aforesaid, furnish proof to the satisfaction of the Minister of the Interior that he has at least one oil well in operation thereon, and is producing therefrom petroleum in paying quantities; and provided, further, that if at the end of five years from the date when the date the applicant obtains entry he cannot furnish such proof, the entry shall be cancelled and the rights and privileges of the person obtaining the entry shall thereupon cease and determine in respect of such location. The regulations, before they were thus amended, provided that no mining location or mining claim should be granted until actual discovery had been made of the mineral applied for within the limits of the location or claim. This being the law, it prevented a large number of applicants from receiving entry for petroleum for which they had applied, because they were not able to make the requisite affidavit of actual discovery; it was thought that this might operate to retard the development of lands supposed to contain petroleum. Since the regulations have been amended, as explained, the Agent of Dominion Lands at Lethbridge has granted eighty-four entries for petroleum locations in townships 1, 2, 3 and 4, ranges 29 and 30, west of the 4th meridian."

The Canadian North-West Coal company has struck a rich four foot seam of coal in the tunnel at Canmore.

Mr. Cochrane, manager of the Canmore mines sent about 100 tons of the semi-anthracite smokeless coal from Canmore aboard the Empress of China on her last trip to Vancouver. The coal will be tested, and if satisfactory Captain Tillett will strongly recommend the C.P.R. Steamship company to adopt it altogether on the Pacific liners. Mr. Cochrane is pushing the merits of the Canmore coal before the greatest users with a view to extending trade. Some of it was tried on the ships of the Pacific squadron and proved satisfactory.

During the year about 170 applications were filed with the agent of Dominion lands at Lethbridge for petroleum locations situated in townships 1, 2, 3 and 4, ranges 29 and 30, west of the 4th meridian, and in townships 1 and 2, range 1, west of the 5th meridian, in the district of Alberta; but as the applicants could not furnish affidavits in accordance with the requirements of the mining regulations that they had discovered petroleum on the locations applied for, entry could not then be granted to them.

As it was thought that this provision of the regulations might operate to retard the development of lands supposed to contain petroleum, it was amended by an Order in Council of the 18th of December, 1890, so that now an applicant who has otherwise complied with the requirements of the regulations is able to obtain an entry for a location upon his making affidavit that from indications he verily believes that petroleum exists on the location applied for. The location, however, not to be sold to the applicant within the period of five years from the date of entry prescribed by the regulations, unless he can, in addition to compliance with the requirements aforesaid, furnish proof to the satisfaction of the Minister of the Interior that he has at least one oil well in operation thereon, and is producing therefrom petroleum in paying quantities; provided further, that if at the end of five years from the date when the applicant obtains entry he cannot furnish such proof, the entry shall be cancelled, and the rights and privileges of the person obtaining the entry shall thereupon cease and determine in respect of such location.

The majority of the applicants above referred to will now be in a position to obtain entries for the locations applied for.

The Alberta Railway and Coal Company has now an output of 1,000 tons a day. Of this Canadian customers take about 300 or 400 tons; the balance goes to the various business and mining centres of Montana. The company is still sinking shafts, and it is anticipated that by the first of July it will have increased its output to 2,000 tons a day, and will have a market for that quantity if it can be forwarded.

At Canmore the Canada North-West Coal and Lumber Syndicate is opening up what was known as the Brinkerhoff claim. The output from this mine is about 80 tons per diem, but a tunnel is being constructed which, when completed, will intersect four seams of coal, enabling them all to be worked, so that in the future the output may be indefinitely increased. The seams intersected are of various qualities, so that a variety of requirements in coal can be met.

The mines at Cochrane are not now being operated by the Canada North-West Coal and Lumber Syndicate, which seems to have devoted the whole of its energies to the development of the property at Canmore. The company, it is stated, intends shortly to open coking ovens, this coal being particularly valuable for the production of both gas and coke.

## British Columbia.

### Cariboo District.

Mr. Bowron, Gold Commissioner, reports the gold yield from the district during last year as follows:—

|   |           |
|---|-----------|
| Barkerville division.....                         | \$ 63,450 |
| Lightning Creek.....                              | 33,850    |
| Quesnelle Mouth.....                              | 30,600    |
| Keithley Creek.....                               | 57,100    |
| Estimated product from 15th Nov. to 31st Dec..... | 10,000    |
| Total.....  | \$195,000 |

The Black Jack Quartz Co. has sunk to the depth of 125 feet, and after running 75 feet of a drive through very hard rock, finally struck the ledge again. The vein is about five feet in width. Having proved the continuance of the ledge downwards the company will, this spring, start on the 70 foot level to take out and work the ore in their small mill, and have the sulphurets worked on the Government test works.

Thirty-one mica claims were located near the Tête Jean Cache, in this district, by a Mr. Bennett and party of Kamloops.

The Waverley Hydraulic Co. of Grouse Creek had a gratifying season, the claims having yielded about twice the amount of any previous year, which gives evidence that the company will soon be in the pay gravel they have so long struggled to reach.

Mr. St. Laurent, of Quesnelle, reports the discovery this season of gold in paying quantities, by a party of Chinese miners, on a large creek, a tributary of Quesnelle River, which flows into that stream some 20 miles from its mouth on the north side. The creek is from 20 to 30 miles in length, and five Chinese, working about five miles from its mouth, took out about \$2,000 during the season.

On the South Fork of the Quesnelle River, there are two companies—the Victoria Hydraulic Mining company and the South Fork Hydraulic Mining company—which, during the past season, have been pushing their work ahead as fast as it was possible for them to do, in the way of digging ditches and other work necessary to the opening up of their hydraulic mines, and, owing to the nature of the country they are operating in, both companies have certainly done a great deal of work for the season. The Victoria company has now a great number of seven miles of ditch, five feet wide on the bottom, seven feet wide on top, by twenty-four inches deep. This ditch brings the water from Spanish Lake upon the ground they are going to work, on Coquet Creek, at the lower end of Quesnelle Lake. This company has other locations, which it intend opening as soon as it is possible to get the necessary water. During the season, they have employed, upon an average, four hundred whites and fifty Chinese. Their works are well advanced, and early next season they expect to be in full operation. The South Fork company have about five miles of their ditch completed. Their ditch is four feet wide in the bottom, six feet on the top, by twenty-two inches deep. This part of their work is through a very rough country, a great deal of blasting and rock cutting having been done to avoid fluming. They have also completed a large reservoir, which will enable them to use their hydraulic pipe ten hours out of the twenty-four just as soon as they can get ready. This they expect to be able to do during the coming season. This company during the season has employed, upon an average, ten whites and thirty-five Chinese, and will continue to push their work as fast as possible until they get their mine opened. Both these companies will have an ample supply of water during the whole mining season when their ditches are completed and in working order.

Quesnelle is very active just now, as the machinery for the Victoria Hydraulic Co. is being put up. The works are expected to be thoroughly fitted up in the fore part of the summer.

A hydraulic company, composed of English capitalists, will commence the opening up of William's Creek early in the spring. This company has been promoted by Mr. J. D. Whitaker. The ground on William's Creek, from the Baller claim to a point above Barkerville, has been acquired, altogether a distance of about a mile. A space will be excavated at the lower end, where a hydraulic elevator will be placed which will carry the tailings to the surface, where they will be taken off in the flume.

### Slocan Lake District.

Sixty-four mineral claims have been recorded at Nelson since the 1st of January—60 of them in January. Most of the claims are situate in the Slocan Lake section of the division.

The Kaslo-Kootenay Land and Improvement Co. have entered into an agreement with the North-Western Sampling and Milling Co. for the erection of a sampling works on the water front of Kaslo City. The works will cost not less than \$15,000.

Through the enterprise of the Kaslo City people a trail about 17 miles in length has been made from Kaslo, on Kootenay Lake, to Fish and Bear Lakes, about 5 or 6 miles from the Noble Five, and just as soon as possible this trail will be continued right up to the mines. It will afford the most feasible route for shipping all the ore and mineral from that section of the country out to Kootenay Lake, and from Kaslo there is water communication with Bonner's Ferry, where the Great Northern can be taken east or west, or to Nelson, where the C.P.R. is accessible. From Kaslo the ore can also be shipped very conveniently to the new smelter at Pilot Bay. This will make Kaslo the distributing point for all the mines within the area of some 25 miles, and there are now within that radius more than 75 to 100 locations.

The work on the Montezuma claim, 6 miles from Kaslo, has developed into one of the most wonderful prospects in the Kootenay country. This claim is lower down the mountains than any other, and is the only one yet ready for working this year. Most of the prospects are on the higher levels; they are covered thickly with snow, and though all the snow has gone from Kaslo it will be impossible to go out to the hills for another month.

### Illecillewaet District.

The little village which is the home of most of the prospectors who have been the pioneers of this camp, is situated on the main line of the Canadian Pacific Railway, about 400 miles east of Vancouver, and 2,400 west of Montreal. Most of the surrounding mines are situated about 3,000 feet from the railway track; but when one remembers that in only one place there is a claim further away than 20 miles, it is difficult to realize from the long climb is greatly modified by the nearness to shipping facilities, and in cases like the Lanark, etc., ore will be brought to the track and sampling works below by means of an aerial tramway, at an expenditure of not more than a few cents per ton. For many years this mining centre has been a silver-lead producer of no inconsiderable amount; but during the summer and fall of last year renewed vigor was thrown into the camp by the discovery of the now well known Fish Creek lode. In consequence of this rich find many prospectors were led to make tracks for the locality, and gradually the vein was traced for four miles, with an average width of four feet. The principal work in hand, however, in this district is the development of the Lanark mine, where there is a large amount of ore being taken out of the 400-foot level. This level was run in to tap the vein discovered above, which resulted successfully. With an average assay of about 58 oz. of silver per ton, and lead 40 per cent., one can easily calculate the profits in working such a body of ore as has already been found. The width of the main vein is 27 feet. This has been traced from the surface and intersected at a depth of 90 feet, and throughout good concentrating ore, the extent of which is unlimited, owing to the fact that it extends below the cross-cut already made.

The Maple Leaf is a valuable property carrying very high grade galena, and is an extension of the Lanark. A good deal of work has been done, and with the present showing the probabilities are that this, with other claims, will be developed shortly by English capital.

### Nanaimo.

The foreign shipments of coal for February from the New Vancouver Company was 21,588 tons; Wellington, 21,886; Union, 8,660, and East Wellington, 2,369.

A meeting of the Miners' and Mine Laborers' Protective Association will be held soon as possible, to consider the advisability of cabling the different workings in the mines. A few of the miners here have always been anxious to make some changes around the works. These changes very frequently do more harm than good. It is believed this cabling will bring more expense on the companies without benefit to the miners. Some of the "bloody" here are looking for new changes and are anxious to dictate to both men and managers. A large number of men have been idle for the past three months,

and a great many of them might be working but for such men as are turning unionism into a curse instead of a blessing.

Since the Wellington strike began on May 17th, 1890, the Miners' and Mine Laborers' Protective Association have expended the sum of \$84,033 in support of those men in their struggle to get the strike.

The wires for the electric tramway in No. 1 shaft, N. V. C. Co., are now all strung, and directly the motors arrive the cars will be worked by electricity, causing a great saving of time and materially increasing the daily output.

Mr. Haggart, who has been sinking the shaft for the Wellington collieries near Departure Bay, has been compelled to stop sinking for the present, owing to the inrush of water being in excess of the ability of the machinery to handle. Larger machinery will be brought from the No. 4 shaft, and a permanent pit head and hoisting frame will be erected. It will be nearly three months before the work of sinking will be re-commenced. This shaft is situated about a mile west of the Wellington mine, and salt water, just at the Big Bend in the Wellington colliery railway.

The long-wall system has been adopted at the North-field mine.

A coal company has been formed in South Westminster by several well known men interested in property south of the river. Boring for coal will be started immediately in various parts of the district, and the drilling as soon as possible.

Letters just received from Nicola Valley contain the good news that Mr. J. A. Green has succeeded in striking a vein of splendid coal on Mrs. A. A. Green's property, the seam being six feet three inches in thickness and of uniform excellence. The strike was made only about half a mile from the old shaft, from which the neighborhood has been supplied with fuel for months, and as the coal is of a quality seldom met with, and there appears to be plenty of it, the development of the mine will, no doubt, be proceeded with as expeditiously as possible. The land through which the seam extends is part of 2,100 acres belonging to Mrs. A. A. Green, and has long been known to be rich in mineral. It is convenient to rail, and the mine can, and no doubt will, be worked with advantage.

### Ainsworth District.

The Miner says: Many are beginning to believe that the Krao is sure to be one of the best mines in the Kootenay Lake country, basing their faith on the present appearance of that property. It is claimed there is ore everywhere work has been done. The south drift is now in 80 feet, and the north 55 feet. The Scotch is also showing up finely, the drift being in 17 feet.

### Nelson District.

Work has been commenced on the Silver Queen, the claim recently sold to a Montreal company. John Robinson, of the Grizzly, will act as superintendent until spring.

The Silver King tunnel is now in over 800 feet. A vein of ore, nearly a foot wide, has been struck on the south side, the ore being similar to that in the big ore body on the north of and parallel with the tunnel. This is said to indicate that this ground contains one of the largest deposits of ore on Lead Mountain.

The smelter is getting on nicely. There are now 35 men at work, and the dock and approach on the lake side of the peninsula are just about completed. Everything will be ready for buying ore about the 1st of July.

The south drift on the Danly is in 50 feet from the cross-cut tunnel, and its face is in ore of entirely different character from that first encountered. The gangue is quartz carrying grey copper, and is of the same character as that found in the Silver King. All the indications are that a good-sized ore body is close at hand.

A Trail Creek colliery can be mentioned: "Of the claims bonded lately the following can be mentioned: The Wye, Eagle, the Virginia, and two-thirds of the Iron Mask, bond \$14,000, cash \$1,000; one-third of the Iron Mask bond \$4,000; cash, \$400; the Cliff, bond \$10,000; cash, \$1,000; the St. Elmo, bond \$6,500; cash, \$650. A number of lots in Trail have also changed hands. A pre-emption has been taken up near the Le Roi mine. There is also a little stir at the Penit d'Oreille River; several applications to lease large tracts of abandoned placer ground have been sent in. Altogether, things down here are beginning to run very smoothly."

Mr. D. C. Corbin, of Spokane, while in Washington, had an interview with Acting Secretary Spaulding, relative to the importation of ore from British Columbia. The smelters being at a standstill, it is necessary that importers give bond for the payment of duty. The Treasury Department has decided to send Major Ruitz to Little Dallas, where the ore is unloaded.

Frank H. Doty, of the Doty Engine Works, Toronto, has completed a contract with Captain Tibbetts, of the Kaslo-Slocan company, for the engines and machinery of

a steamer to ply on the Columbia River into British Columbia.

Mr. F. S. Barnard, M. P., who returned recently from Spokane, says that his visit to that busy city was for the purpose of discussing with others interested the affairs of the Columbia and Kootenay Steam Navigation Co. The first steamer on the route this season is expected to leave Little Dallas on the 15th of March—a little earlier than usual. There will be daily communication, with four steamers running, between Spokane and Nelson before the 1st of April.

### CANADIAN COMPANIES.

**The Canadian Homestake Mining Co. of Ontario, (Ltd.)**—Will apply for incorporation with the object of dealing in, buying and selling mineral properties and mines, and operating the same, and smelting ores, in the County of Algoma. Head office, at the Village of Rat Portage. Capital, \$1,250,000, in 250,000 shares of \$5 each. Applicants are: David L. Mather, lumberman; and Robert A. Mather, lumberman; both of the Village of Keewatin, in the District of Rainy River; William Travers Creighton, lumberman; James M. Savage, lumberman; and Jeff Hildrich, miner, all of the Village of Rat Portage.

**The Cayuga Natural Gas Co., (Ltd.)**—Gives notice of application for a charter to supply natural gas for heating and lighting purposes in and around the town of Cayuga, Ontario. The said town will be the chief place of business. Capital is \$200,000 in 100 shares of \$200 each. Those applying are as follows: David Thomson, physician; John Johnson, clergyman; L. Barber, merchant; Alex. Mitchell, merchant; John A. Haslial, hotel-keeper; John A. Murphy, law student; Edward C. Campbell, editor; George R. Powell, jeweller; all of the town of Cayuga, in the County of Halldand and John Carmody, contractor, Dunnville.

**The Canadian Mineral Wool Co., (Ltd.)**—Desires incorporation under the Dominion statutes for the purpose of acquiring the premises, patents, stock, machinery, etc., of Messrs. Gast & Co., Toronto, in dealing in mineral wool and asbestos, the manufacture and sale of mineral wool, asbestos and other insulating material; and the manufacture of improved pipe and boiler covering under patent number 23,345, known as "Lambton's Patent." Head office, Toronto. Capital stock, \$400,000, in 400 shares of \$1000 each. The applicants are James Black Perry, Toronto, John Edward Armstrong, Taunton, Mass.; Frank Joseph Gast, manufacturer, Toronto; Euphemia Perry, wife of the said James Black Perry, and James Munro Sinclair, accountant, Toronto.

**Bell's Asbestos Co., (Ltd.)**—This company held its ordinary general meeting at the Cannon-street, Hotel, E. C., last month, under the presidency of Mr. John Bell, who, in moving the adoption of the report and accounts, reminded the shareholders that at the last meeting he told them the directors had made very important forward sales of crude asbestos. He had now to state that from these sales they would derive a large profit than had ever been previously obtained from them, or any asbestos mine. In November last the board advised the shareholders that they thought it desirable to join in the united action of the principal asbestos mines in Canada to restrict the output of material by closing the mines during the winter months to prevent over-production. Nothing had interfered with their ordinary good fortune, no failure of production had occurred, but it got abroad that money was to be made out of asbestos mining, and a stimulus was thus given to the opening of other mines. A considerable shrinkage subsequently took place in the consumption of the manufactured article, both in this country and on the Continent. Then came indications of a glut in the raw material, and the principal mine owners of Canada approached them on the subject of again restricting the output and their company came to the conclusion that they had better join in the movement. They had

averted the embarrassing state of the market with regard to the produce with which they had to deal. With regard to the trade and manufacture of asbestos, there was "a decline during the early part of the year, but later on, owing to the perseverance with which the directors and managers of the company continued to give the best value for money that anybody in the trade could give, the tide had turned, and a greatly improved state of trade had been steadily maintained. They had, however, been content with much lower prices than in previous years. Times were depressed and they had to meet their customers as well as to face competition. During the past year they had sold in bulk more asbestos than they had ever sold before. (Applause.) The reports and accounts were adopted unanimously. A resolution was afterwards passed sanctioning the payment of 7s. 6d. per share, making with the interim dividend a total distribution of 10 per cent. for the year.

**Canadian Phosphate Company.**—The third annual meeting of this company was held in London during the month, Mr. E. Packard, chairman of the company, presiding. The following is an excerpt from the directors' report submitted:—"It is with extreme regret that your directors have to report that unfavorable anticipations have been realized. The quantity of phosphate marketed during the first two years' working, now under review, was 7,206 tons of uncolled ore, and during the second 2,621 tons up to August 29th, 1891, when the mining operations were discontinued. The actual cost of bringing this ore to bank was about the same as in previous years, but the amount realized by the sales was very materially less than the former reports. The reasons of this were two-fold: (1) Owing to the admixture of deleterious elements with the phosphate in some of the pits, and the soft nature of the ore in others, the quantity of first class quality was very much less than the ordinary proportion to the total quantity produced. (2) Owing principally to the competition of the phosphate from the States and deposits, the prices obtained for second and third-class qualities in Europe fell to a point considerably below cost of production. Judging from the weekly reports received, and basing their calculations upon the result of former years, your directors were under the impression at the time when the resolution was passed to declare an interim dividend, that the mines were being worked at a substantial profit. It was only at the close of the season, subsequent to the payment of the dividend, that it transpired that not only was the quantity of 80 per cent. quality far short of the estimates made, but that the quality of the second grade was in most instances below the minimum percentage guaranteed, which caused the buyers to make serious deductions from the price at which the ore had been sold. Work was continued at the mines until the end of August, 1891, the weekly reports from the Crown Hill mines being particularly favorable, but the bad results obtained from the old mines necessitated the stoppage of work in the meantime. The influence of the new discoveries and heavy shipments of high-grade phosphate from Florida has been very prejudicial to the interests of the Canadian phosphate mining industry, but prices will doubt improve before long. Owing to the favorable outlook at the Crown Hill mines, your directors anticipate that it will not be long before satisfactory arrangements can be entered into for the recommencement of work on this part of the property, either by royalty or by contract. In the meantime a lumber contract has been entered into, and logs are being cut and hauled to the mill bank. The mill is being constructed in order to grind the low grade, contracts for the sale of which have been already made for delivery to western points."

**Thunder Hill Mining Co.**—At a meeting held on 25th ult., the following directors were appointed for the year: Major J. Nicholls, Foster Macquerry, D. R. Kerr, W. F. Bullen, W. T. Taylor, F. T. Child, J. S. Bowler, all of Victoria, B. C.; J. H. Twigg, J. M. Browning, of Vancouver. It was decided to increase the capital to \$500,000.

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**The Northwestern Sampling and Milling Co., (Ltd.)**, has been incorporated with a capital of \$100,000 shares. The object of the company is to develop mines, acquire mining properties, and the reduction and refining of ores. The headquarters are at Nelson. Ernest Arnoldi has become manager. He will have charge of the new works at Nelson.

**The Southwestern Coal Co.** has been organized in New Westminster, and a committee has been appointed. Arrangements are to be made with the property owners on the south side of the Fraser River to go on any piece of property and drill for coal under certain conditions.

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Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and in smelted gold valued at \$18.00 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which one square mile can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department free of charge, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 7½ cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

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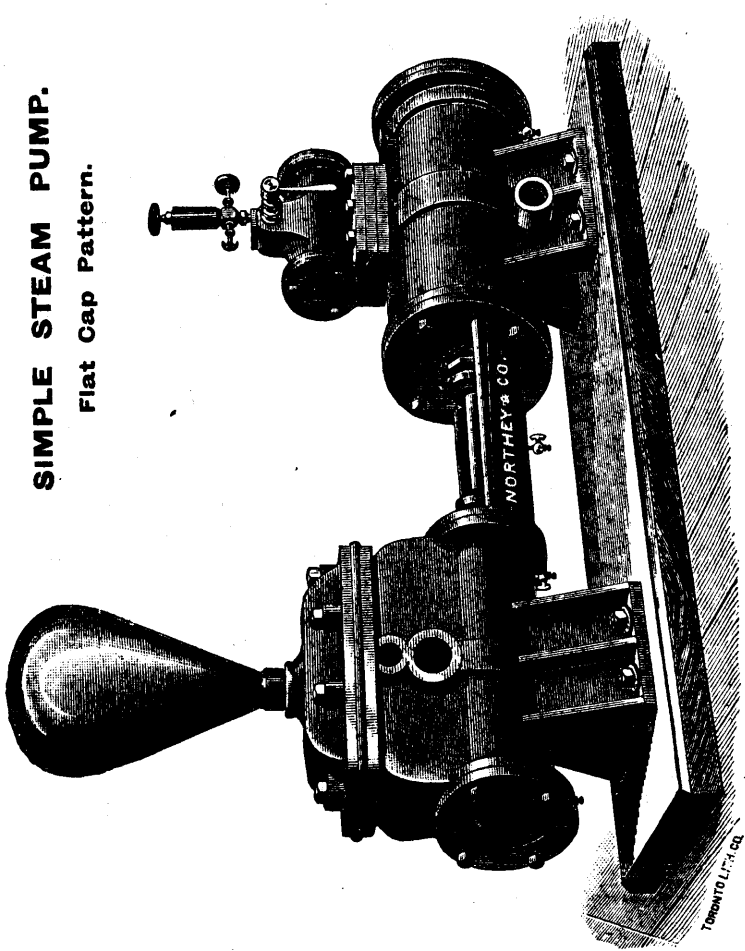
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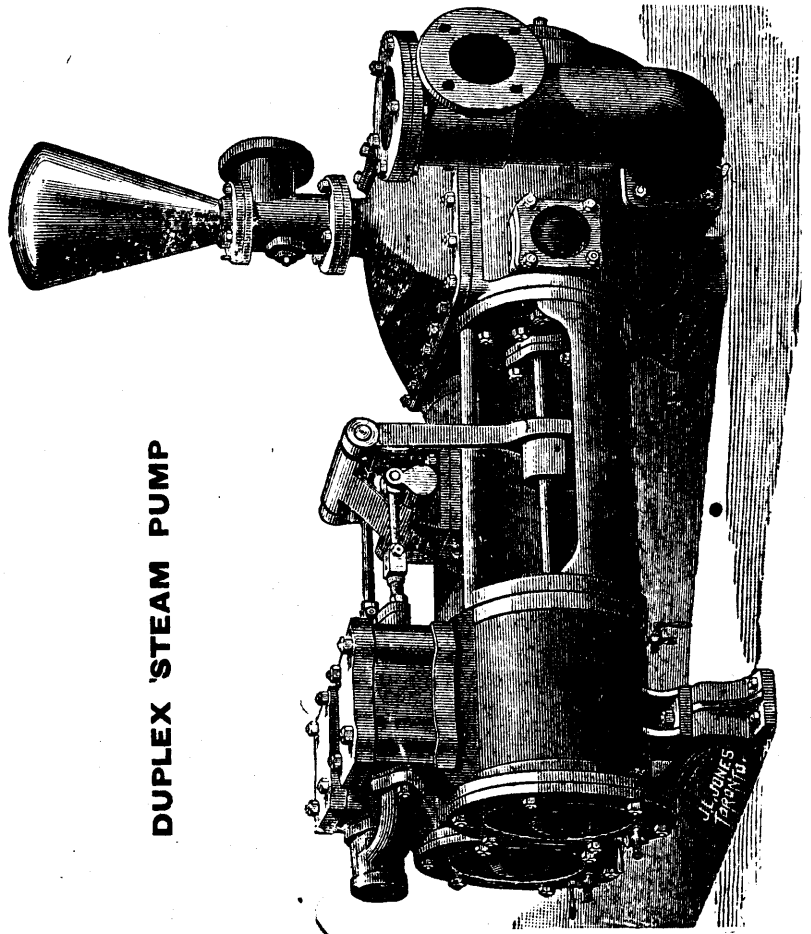
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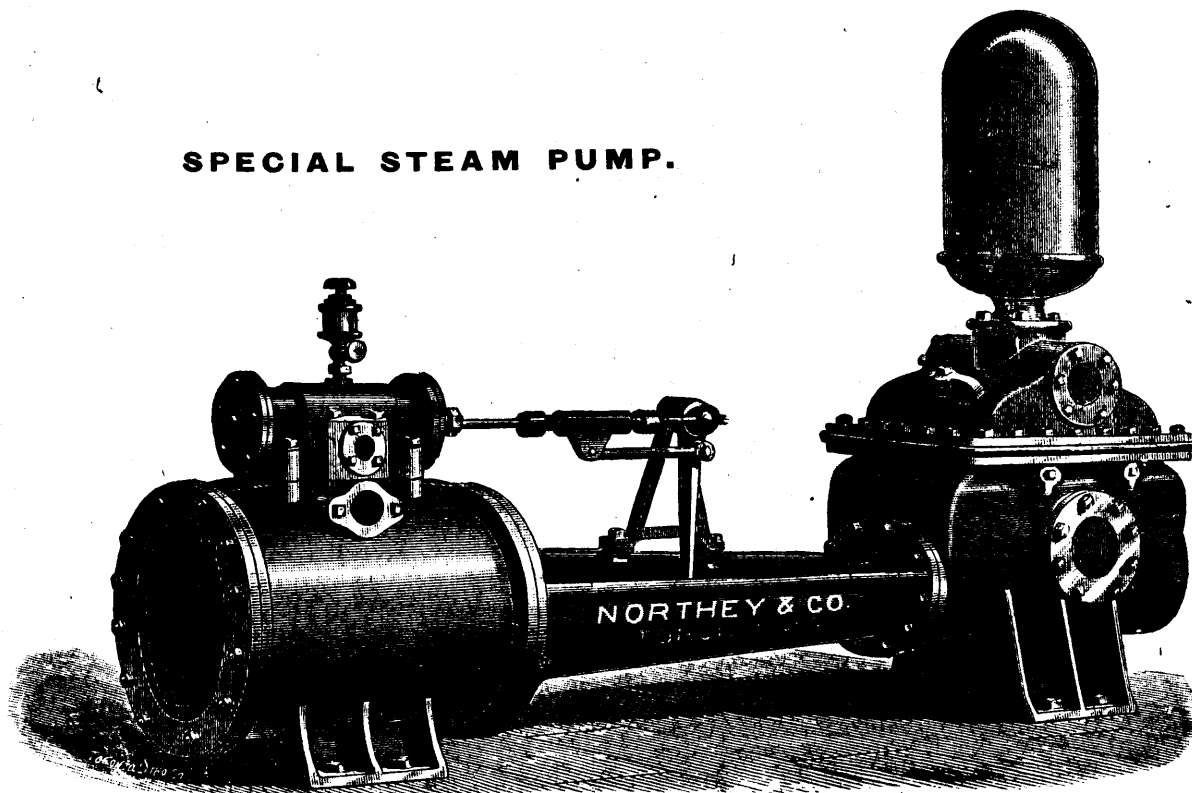
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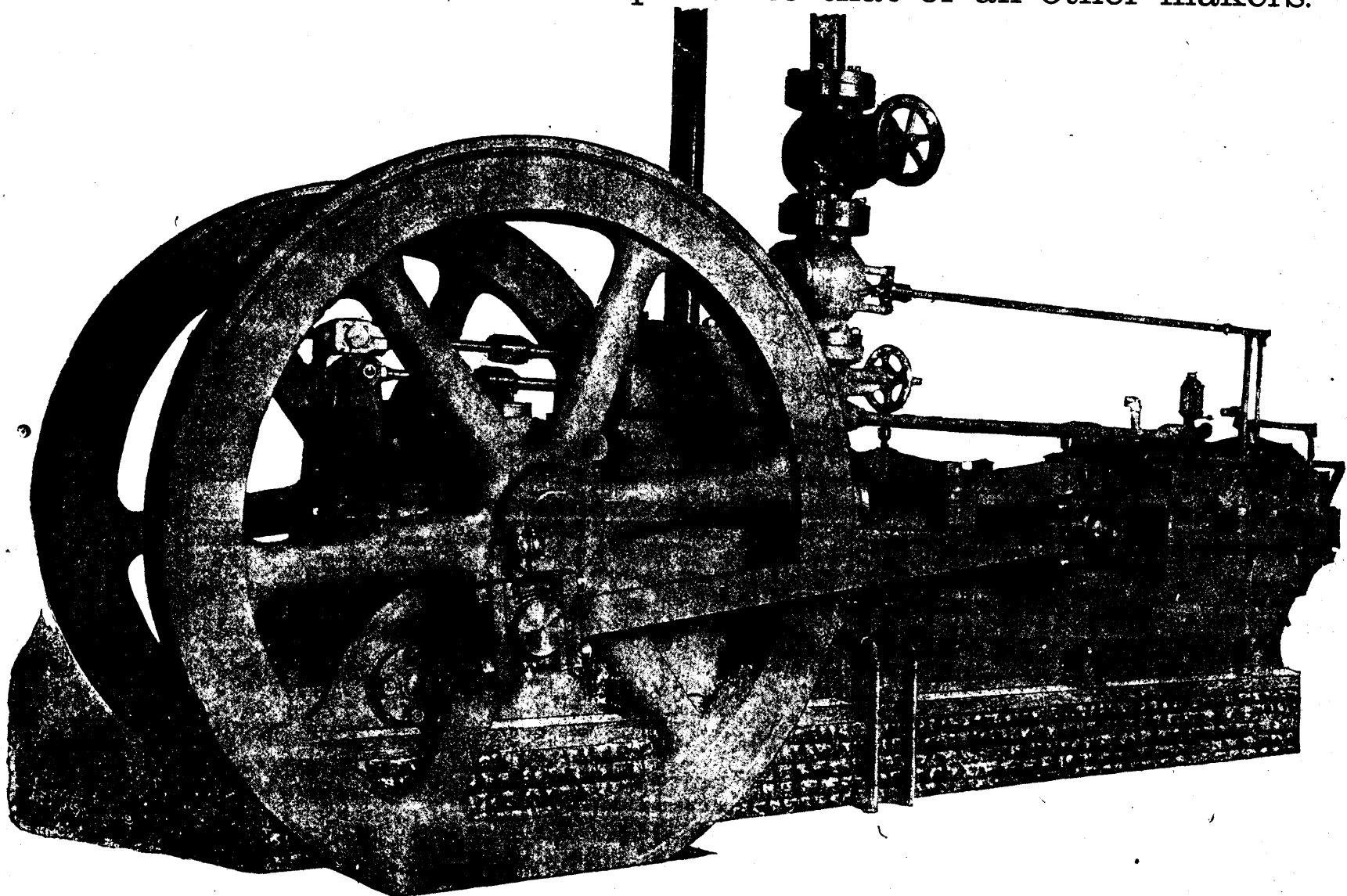
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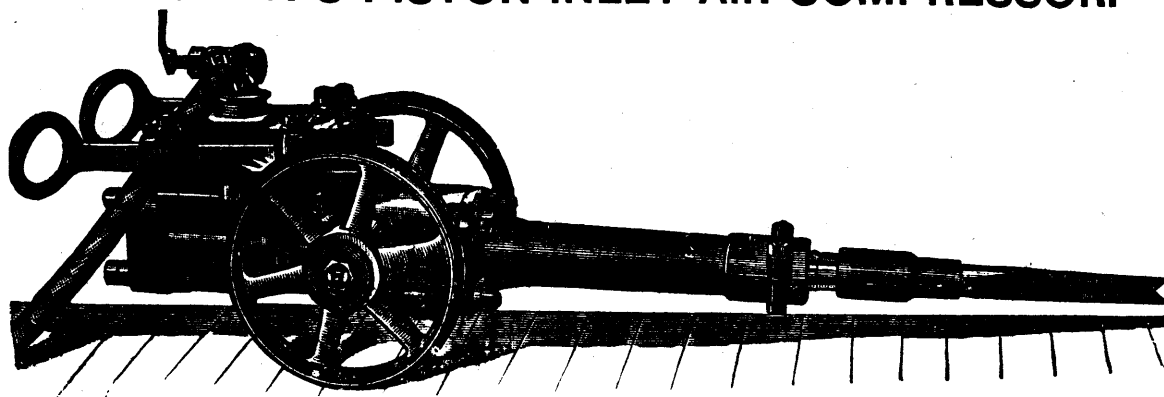
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