

McGill University

DEPARTMENT OF METALLURGY

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
PROFESSOR OF METALLURGY.

Montreal, May 25th. 1921

GORDON SPROULE, M.Sc.,
LECTURER IN METALLURGY.

Dr. F.D. Adams,
Dean of Applied Science Faculty.

Dear Dr. Adams:-

In view of the proposal to erect a new building at McGill to house the Metallurgical and other Departments, I wish to take every opportunity to obtain information with regard to the teaching methods and laboratory equipment in the Metallurgical Departments of other Universities.

I expect to be in England on personal business during part of the summer, and wish, while there, to visit the principal English Universities where metallurgy is taught, to study laboratory equipment and to discuss teaching methods with the Heads of Metallurgical Departments.

I would like to visit the Royal School of Mines, London, the Sheffield University, the Birmingham University, the Manchester University and one or two others, and to call on a number of English metallurgists with whom I am acquainted. I should also like to visit a few typical metallurgical plants in order to study the recent advances in industrial metallurgy in England.

As these visits would be made with a view to designing the new metallurgical laboratories, and in the general interest of the

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Montreal, 19.....

GORDON SPROULE, M.Sc.,
LECTURER IN METALLURGY.

2.

Metallurgical Department, I think that the cost should be defrayed by the University, and I should be much obliged if you would authorize me to make the visits on University account.

I suppose that the visits would occupy from two to three weeks.

I remain, yours very truly,

Alfred Stansfield

January
Twenty-third
1923.

Dr. F. D. Adams,
Dean, Faculty of Applied Science,
Engineering Building.

Dear Dean Adams:-

With reference to your letter of the 19th, and Dr. Stansfield's statement that he would like to become a partner of the firm of Stansfield, Roast and Pascoe, Consulting Metallurgists and Chemists, I shall bring the matter before the next meeting of the Finance Committee, which, I am afraid, will not take place until Thursday, February 1st.

In the light of Dr. Stansfield's undertaking that the time he devotes to the affairs of that firm will not in any way impair the service he should render to the Department of Metallurgy in the University, I intend to recommend that the Board of Governors say they have no objection, and I do not think there will be any.

Yours faithfully,

Principal.

For Finance
See committee
Arthur Currie

MCGILL UNIVERSITY
FACULTY OF APPLIED SCIENCE

Head Office:
FRANK D. ADAMS, Ph.D., D.Sc., F.R.S.—DEAN

MONTREAL Jany. 19th. 1923.

Sir Arthur Currie, G.C.M.G., K.C.B., LL.D.,
Principal,
McGill University.

Dear Sir Arthur,

Mr, Harold J. Roast, F.C.S., gives a course of lectures in one branch of Metallurgy in Dr. Stansfield's Department, and Mr. Charles F. Pascoe, F.C.I.C., also give a course of special lectures to extension classes in the same Department of McGill University.

These gentlemen now propose to go into partnership as Consulting Metallurgists and Chemists, and they have requested Dr. Stansfield to become a member of the firm. The firm would be known as Messrs. Stansfield, Roast & Pascoe, Consulting Metallurgists & Chemists, and the work will lie particularly in connection with advice on electrical furnaces, chemico-legal investigations, ferrous, non-ferrous and electro-metallurgy, and analytical chemistry.

Dr. Stansfield informs me that he would like to become a partner of the firm in question, and that he will undertake to see that any time which he devotes to it will not in any way impair his teaching efficiency or the efficiency of his Department.

So far as I can see if Dr. Stansfield undertakes to give us an assurance that such will be the case there is no reason why the University should object to granting him permission to join this firm.

Sir Arthur Currie, (Continued).

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I am writing to enquire whether Dr. Stansfield's proposal has your approval.

I remain,

Yours very sincerely,

Frank D. Adams

Mr Stausfields Report
to the
Board of Trade.

PROPOSED ZINC REDUCTION PLANT

on ILE PERROT.

ALFRED STANSFIELD
D.Sc., A.R.S.M., F.R.S.C.
CONSULTING METALLURGIST
MONTREAL.

Department of Metallurgical Engineering,
McGill University, Montreal.
April 24th, 1930.

The President and Council of the
Montreal Board of Trade.

Gentlemen:

I was instructed by you ⁽¹⁾ to prepare reports on the proposals to establish a copper refinery in the City of Montreal East, and an electrolytic zinc plant on Ile Perrot, these reports being particularly intended to show whether any nuisance or damage to surrounding property would result from the operation of these plants.

I prepared and submitted to you on the 24th of March my report on the proposed copper refinery in Montreal East. I have now prepared and submit herewith my report on the proposal to establish a zinc reduction plant on Ile Perrot.

The problems involved in this case have been far more serious than in the earlier report because (a) the plant will liberate a considerable amount of sulphur dioxide, (b) it will be located in a rural district, not very far from Macdonald Agricultural College, (c) there is danger of acid or other liquors entering Lake St. Louis.

Although I find that the plant can be operated without causing any economic damage, I suggest that you consult the National Research Council of Canada with regard to any possible danger to Macdonald College. The substance of my report will be found in the "Introduction" and "Conclusions".

Yours very truly,

AS/T

(1) Letter from the President, dated March 3, 1930.

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THE PROPOSED ZINC REDUCTION PLANT
on ILE PERROT.

A Report to the Montreal Board of Trade
by Dr. Alfred Stansfield.

Introduction.

Statements have appeared in the press to the effect that the Consolidated Mining and Smelting Company of Canada is considering the construction of a zinc reduction plant on Ile Perrot, and has secured land for this purpose. It is known also that the Canadian Pacific Railway Company has applied to Parliament for authority to construct a branch line to Windmill Point on Ile Perrot, this line being apparently intended to serve the proposed zinc plant.

The intention is, no doubt, to produce zinc by an electrolytic process, like the process in use at Trail, B.C., Great Falls, Montana, and elsewhere. In this process "zinc concentrate", that is, a concentrated or enriched zinc ore consisting mostly of sulphide of zinc, is roasted for the purpose of driving off the sulphur. The roasted ore is treated with sulphuric acid yielding a solution of sulphate of zinc. This is electrolysed, producing pure metallic zinc which is melted and cast into ingots or slabs.

Electrolysis of the zinc sulphate solution also forms sulphuric acid, which is used for the treatment of a fresh quantity of roasted ore, so that little or no fresh acid is needed for this purpose.

The sulphur driven off in the roasting furnaces is nearly all in the form of sulphur dioxide, which is the gas that is smelled when a sulphur match is burned and which is sometimes used to disinfect houses. If all this gas were allowed to escape into the air there would no doubt be a noticeable smell in the direction in which the wind blows from the furnaces, and the gas might affect vegetation over which it passed. The intention is to clean the furnace gases, removing dust and fume by electrical precipitation and other means, and to convert the sulphur dioxide into sulphuric acid, which would be a marketable by-product of the zinc plant.

In reply to a letter from your President, Mr. S.G. Blaylock, Vice-President and General Manager of the Consolidated Mining and Smelting Company, wrote on February 15th:--

"If our Company builds a Zinc Plant in any settled districts around Montreal it will, of course, be necessary to install dust catching devices and also to put all the gases through a sulphuric acid plant in order that the plant would not be a nuisance to the surrounding country.

Our Company has worked out a process which will enable us to convert practically all the sulphur dioxide into sulphuric acid. It is the sulphur dioxide gas which causes the damage to vegetation.

"I might say that there would be less sulphur dioxide escape from such a reduction plant than there is from industrial areas in the City of Montreal where large tonnages of lower port coal are burned. These soft coals have a high sulphur content and practically all of that sulphur finds its way into the air as sulphur dioxide.

Furthermore, many of the gases given off by the ordinary smelter cannot be successfully treated for the manufacture of sulphuric acid, and consequent recovery of the sulphur dioxide. A zinc plant, however, does not present this difficulty, and I am satisfied that there is no cause for worry in connection with such a plant being built in the vicinity of Montreal.

You will appreciate the fact that we would want the full co-operation of the Montreal Board of Trade in any undertaking that we might carry on in this vicinity, and it is, therefore, a pleasure to reassure your members that such a plant would not be a public nuisance and would be far less offensive than most manufacturing plants."

The zinc produced in Canada during 1929 amounted to 98,000 tons, of which 86,000 tons was obtained by the electrolytic process at Trail. The remaining 12,000 tons represents zinc in ore mined in Quebec and Ontario and exported in the form of ore. The production in Quebec will probably be less in 1930 in view of the closing of the Tetra^eult mine in December last, but a number of the newer mines in Eastern and Central Canada contain zinc ore and will probably produce zinc concentrates which may be available for the proposed reduction plant.

Providing that enough ore becomes available, the district of Montreal should be a suitable place for a zinc reduction

plant, because it would be a convenient centre to which the ore could be brought, because ample electrical power is available and because there would be a growing local market for zinc and sulphuric acid, while the surplus zinc could be exported to Europe. Canada as a whole does not at present use as much zinc as is now produced at Trail, as in 1929 it exported 64,000 tons, mostly as spelter, and imported only 18,000 tons of zinc and zinc products, but the Eastern market could be supplied more conveniently from Montreal than from Trail. Also, zinc concentrates from mines in Eastern Canada, which must at present be shipped to Europe, could be treated in the proposed plant and reduced to metallic zinc before shipment. This would lessen the transportation charge on the ore and should increase the profit to the mining companies. The establishment of this plant on Ile Perrot will also materially increase the industrial activity of the district of Montreal, both directly and indirectly.

It remains to be considered to what extent the proposed plant is liable to cause a nuisance in the surrounding urban and rural communities. For this purpose we need to know the amount and composition of the ores that are likely to be treated, the nature of the process that is likely to be employed, the extent to which the sulphur gases are likely to escape into the air and the possible effect of

such escaping gases. The nature and amount of the residues from this process and the manner of their disposal must also be considered, together with the possibility of a nuisance arising from any discharge of acid or other liquors into the river. The probable industrialization of Ile Perrot should be considered by any public body having the necessary authority in relation to the "zoning" or "town planning" of greater Montreal.

Scale of Operations and Supply of Ore.

I understand from Mr. Blaylock that the smallest plant the Company would construct would have a daily production of fifty tons of zinc and that it is impossible to fix any maximum limit to the output of the proposed plant. At Trail a small pilot plant was built early in the War, by 1923 the production was about 100 tons a day and during 1929 the production was over 230 tons a day. A similar development could be expected at the proposed plant on Ile Perrot, provided the supply of ore increases at the required rate and that a market can be found for the zinc and the sulphuric acid.

The production of zinc in the Province of Quebec during 1929 was nearly 10,000 tons, or 27 tons per day, and I understand that about 100 tons a day may be expected when the newer mines develop their zinc ore. We cannot limit our consideration of possibilities to the ore already in sight, and it is possible that ore may be received from mines further west.

On the other hand, the growth of the plant may be limited by the difficulty of disposing of the sulphuric acid that will be made. As will be shown later, nearly two tons of acid will be made for each ton of zinc, and this acid cannot well be stored in large quantities or shipped great distances.

As a basis for discussion I shall consider a plant having a production of one hundred tons of zinc per day with the reservation that this may ultimately be enlarged to perhaps twice that capacity.

Nature and Amount of the Ore to be Treated.

The "zinc concentrate" or concentrated zinc ore treated by the electrolytic process for the recovery of zinc is the product of ore-dressing operations at the mine, intended to collect the zinc mineral and to reject the gangue and the minerals of lead, iron, copper and other metals. This concentrate consists mainly of zinc sulphide, and usually contains smaller amounts of sulphides of iron, lead, copper and cadmium, with a little silica and still smaller amounts of arsenic and antimony. It may also contain paying amounts of gold and silver. This concentrate is usually in the form of a fine powder.

It is impossible, in advance, to state the probable analysis of the zinc concentrate, as this will vary with the nature of the ore in the mine and with the effectiveness of the dressing operation; it is probable, however, that these concentrates would contain from 40 to 50 percent of zinc and about 32 or 33 percent of sulphur, and these figures will be used for the purposes of this report.

On the basis of 100 tons of zinc per day, and in view of the probable percentage recovery of the process, there would be needed per day about 250 or 300 tons of zinc concentrate.

The Roasting Operation.

In preparation for treatment with sulphuric acid, zinc concentrates are usually roasted in large furnaces of the Wedge type having a number of hearths over which the ore is raked mechanically to expose it to the heat and air for the removal of the sulphur. The gases from these furnaces usually contain about 3 percent of sulphur dioxide, an amount which is rather low in view of the utilization of this gas in the production of sulphuric acid. These furnaces are heated mostly by the oxidation of the ore itself, but a moderate amount of fuel-oil or pulverized coal must usually be burned to maintain the heat to the end of the operation.

I understand from Mr. Blaylock that they have developed at Trail a new roasting process which makes possible the production of a gas containing as much as 7 or 8 percent of sulphur dioxide, which would be decidedly better for the production of sulphuric acid, and that no fuel is needed for the new roasting process.

Production and Market for Sulphuric Acid.

The gases leaving the roasting furnaces are cleaned and the sulphur dioxide they contain is converted into sulphuric acid, probably by the "contact" process. For this process it is necessary to clean the gases very perfectly, so that all dust and smoke or fume is completely eliminated, and after passing through the sulphuric acid plant, nothing will escape into the air but a proportion of the sulphur dioxide, probably less than ten percent, which has escaped conversion into acid.

Theoretically, one ton of sulphur will produce three tons of 100 percent sulphuric acid, and in view of the probable amount and analysis of the concentrates and the probable percentage recovery of the acid, it appears that a plant producing one hundred tons of zinc per day should also produce about two hundred tons of sulphuric acid.

I understand that the sulphuric acid used in and near Montreal amounts to some 10,000 tons per annum, or less than 30 tons a day, so that there would be no local market at present even for one hundred tons of additional acid, and it would probably be necessary to develop some auxiliary industry, such as the production of fertilizer, in order to use the greater part of the acid that would be produced. An ample supply of cheap sulphuric acid would tend to attract other chemical industries that use large quantities of this acid. In the meantime, the difficulty of storing and shipping sulphuric acid may tend to limit the expansion of the zinc plant.

Production and Disposal of Sulphur Gases.

Basing an estimate on the roasting of 250 to 300 tons of zinc concentrates and allowing for the sulphur that would be left in the roasted ore, about 75 to 90 tons of sulphur per day would be oxidized, producing twice this weight of sulphur dioxide or nearly two million cubic feet per day at the ordinary temperature and pressure.

Mr. Blaylock informs me that they will convert into sulphuric acid and recover at least 90 percent of the sulphur dioxide, and I understand from another source that as much as 96 percent of the sulphur in zinc roaster gases has been turned into sulphuric acid by the contact process. In view of possible troubles in the acid plant, and of the gas that escapes from the roasting furnaces, it will be safer to assume a recovery of 90 percent and to say that about 8 tons of sulphur per day may escape in the form of sulphur dioxide. This amount of sulphur, although apparently large, is very small in comparison with the many hundreds of tons that are thrown out every day by the large smelting plants at Trail, Noranda and Copper Cliff, and is comparable with the amount of sulphur set free in industrial areas of Montreal by the combustion of bituminous coal.

Assuming the furnace gases to contain seven or eight percent of sulphur dioxide, they might amount to more than one million cubic feet per hour. After passing through the sulphuric acid plant, they would contain less than seven tenths of one percent of sulphur dioxide. These gases would be discharged up a tall chimney to remove them as far as possible from the ground, and as they will be cool it will be necessary to employ a fan to drive them up the chimney, or else to heat them by burning coal before they enter the stack. The latter plan will probably be preferable, as the heated gases will tend to rise in the air after leaving the chimney and so will be more diluted before they reach the ground.

The conversion of even ninety percent of the sulphur dioxide into sulphuric acid depends on the efficient operation of the acid plant. In the event of a break-down of this plant a larger portion, or the whole, of the sulphur dioxide would be discharged into the air until the plant could be started again or the roasting furnaces could be closed down. In view particularly of the proximity of Macdonald Agricultural College, it may be desirable for the Company to install absorption towers into which the gases could be passed in the event of a break-down, to lessen the escape of sulphur dioxide until the roasting furnaces can be stopped.

Effect of Sulphur dioxide on the surrounding country.

I understand that the proposed plant is to be located near Windmill Point on Ile Perrot, a place which is over three miles from Beauharnois, over four miles from Ste. Anne de Bellevue, six miles from Chateauguay and ten miles from Lachine. In view of the direction of the prevailing winds, the place has been well chosen, as the gases liberated at the plant will usually be spread over the large expanse of Lake St. Louis.

A comparison can be made between the amount of sulphur that may be liberated from the proposed plant and the amount that is set free in the burning of coal in and near Montreal.

I understand that the coal that is burned in the industrial plants in Montreal contains on an average about $2\frac{1}{2}$ per cent of sulphur. Assuming that one fifth of this remains in the cinders, the combustion of four hundred tons of coal would be needed to set free the eight tons of sulphur which I have considered may be liberated by the proposed plant. In comparison with this, the consumption of soft coal in the district of Ste. Anne de Bellevue is about thirty tons per day, # the use of coal in some steel works in Montreal is about one hundred tons a day and the whole consumption of bituminous coal in Montreal, exclusive of that used by the railways and shipping, amounts to about four thousand tons a day. In this connection it must not be forgotten that much of the nuisance resulting from the combustion of coal is caused by the smoke and other products of combustion, and that these will be almost entirely absent from the gases turned out by the proposed plant.

The effect of sulphur dioxide on vegetation has been studied very elaborately in connection with legal claims for damages that have been made against smelting companies which turn out large amounts of this gas. I have consulted particularly the Report of the Selby Smelter Commission which was published in 1915, and the Report of the Trail Smelter Smoke Investigation, dated January 1930, which was presented at a public hearing in Washington but has not yet been published. I have also consulted, informally, an official of the National Research Council of Canada who has been in close touch with the latter investigation.

This is the average daily consumption during the year, and, as part of this coal would be used for heating during the winter, the consumption of coal during the period of growth may be decidedly less.

It is impossible to make any simple statement of the effect of sulphur dioxide on vegetation, as it depends on the kind of plant or tree, on the length of exposure to the gas and on the condition of light, moisture and other variables. It appears that as little as 0.5 parts of this gas in one million parts of air will have a distinctly harmful effect on some trees and crops, when it occurs in conjunction with high humidity and sunlight and when the exposure is prolonged. Higher proportions, such as one or two parts per million in the presence of light and moisture affect vegetation more rapidly. The effect on animals and men is far less pronounced; the smallest amount that can be detected by smell is about one or two parts per million; no serious discomfort is caused by less than about five parts per million, and even larger amounts do not appear to be actually injurious.

Owing in part to the variable nature of the wind it is impossible to calculate from the amount of sulphur liberated at the plant or from the percentage of sulphur dioxide in the escaping gases what proportion of this gas will be found in the air at any particular distance from the plant. After a careful consideration of information from a number of sources, I am satisfied that the relatively small amount of sulphur dioxide that may be liberated from the proposed plant would be far too small to cause any economic damage to vegetation on either shore of the St. Lawrence. I have not made a sufficiently extensive study to enable me to speak definitely with regard to the part of Ile Perrot immediately surrounding the proposed plant, but this is not important, as I expect that farm land in the neighbourhood of the plant will be acquired by the Consolidated Mining and Smelting Company or by the Canadian Pacific Railway Company, and that the construction of the branch railway line and the zinc plant will cause other plants to be erected and will lead to the industrialization of a substantial part of the island.

Special consideration must be given to any possible effect on the Macdonald College at Ste. Anne de Bellevue. Dean Barton of this college has obtained statements from the Departments of Chemistry, Plant Pathology and Agronomy from which it appears that even apart from what might be called economic damage these Departments fear that the effect of even occasional exposure of their crops to small amounts of sulphur dioxide would have a serious effect on their experimental work.#

Some extracts from these statements are given in an appendix to this report.

That is to say that Macdonald College, established and maintained at great expense not merely for educational purposes but for conducting research work for the advancement of Canadian agriculture, requires a pure country air. Amounts of sulphur dioxide that would not be noticeable under urban conditions may still be enough to detract from the value of this work.

The problem is very difficult, as not only is it almost impossible to determine whether some slight damage may occasionally be caused by sulphur dioxide from the proposed plant, but damage may also result from chemical and other industrial plants that may be built on Ile Perrot, and it does not appear possible to exclude industrial plants permanently from the vicinity of Ste. Anne de Bellevue. I suggest that the whole question of danger to Macdonald College should be submitted to the National Research Council of Canada, which has recently made an elaborate investigation into the effect of smelter smoke on plants and animals.

Disposal of Residues from Zinc Plant.

When the roasted zinc ore is treated with sulphuric acid, the zinc does not all dissolve and a residue is left, containing iron, lead, zinc and other ingredients of the ore. This residue may amount to more than one third of the original ore, and it must be treated again to recover the lead, gold and silver, when these are present in sufficient amount, and the remainder of the zinc. One method, the Waelz Process, is to heat the residue in a rotating tube furnace, driving off the zinc and lead as a fume which can be recovered by electrical precipitation, scrubbing or filtration. Another process is to smelt the residue in a closed electric furnace, producing a zinc-lead fume and lead bullion which contains the gold and silver.

It is impossible to state certainly what process would be used for the treatment of these residues, but there would not be any considerable production of sulphur dioxide and nearly all the fume and dust would be recovered, so that there would not be much smoke.

Effect on the River.

In regard to the proposed zinc plant it is desirable to consider whether any acid or other liquors would be discharged into the river and whether any such discharge would be likely to create a nuisance. Such acid liquors may result, for example, from the cleaning of roaster gases in preparation for the contact process, or from the humidifying of furnace gases in preparation for electrical precipitation of fume and dust. As the proposed location of the zinc plant is above the point in the river at which the City water supply is taken, it must be considered whether any effluent from the plant would be likely to reach the intake and whether it would affect the water in any way.

The water flowing past Montreal comes in part from the St. Lawrence and in part from the Ottawa rivers, which mix to some extent by the time they reach the intake of the City water supply. I have obtained figures for the maximum and minimum flow of both of the rivers, and also the chemical analyses of the St. Lawrence river, the Ottawa river and the Montreal City water. It appears that any effluent from the proposed plant is liable to reach the City intake, but that it will be so diluted that no harm can possibly result. The water of both rivers contains in solution a considerable amount of calcium carbonate, and this is amply sufficient to neutralise any amount of sulphuric acid that would be likely to be discharged.

In view of the intention of the Company to locate their plant near a part of the river that is at present largely free from industrial pollution, the Board of Trade should consult the Department of Marine and Fisheries at Ottawa with regard to the probable effect on the fish in Lake St. Louis of liquors containing sulphuric acid or sulphates of iron, zinc and other metals. # In any case the Company should be restricted in regard to the amount of such liquors that may be discharged at any time and should be required to filter any wash-waters containing lead, arsenic or other objectionable suspended matter before allowing such waters to enter the river.

This will of course be unnecessary if the Company can undertake that there will be no such discharge.

Conclusions.

1. From a commercial and industrial point of view the proposed plant should be an important asset to the City of Montreal, as it would increase the industrial activity of this district both directly and indirectly and would afford employment for hundreds and possibly indirectly for thousands of men. It should also benefit those mines of Eastern Canada that contain important quantities of zinc ore, as at present this ore can only be marketed by shipping it to Europe.

2. In view of the amount of zinc ore that is likely to be treated and the provision for converting the resulting sulphur dioxide into sulphuric acid, I consider that the amount of sulphur that will escape into the air as sulphur dioxide may be about eight tons a day, an amount that would be produced by the daily combustion of some four hundred tons of bituminous coal. The furnace gases at the plant would be carefully cleaned and they would be free from the soot and dust which constitute the greatest nuisance resulting from the burning of coal.

3. In view of the location of the plant, and the probability that adjacent portions of Ile Perrot will be occupied by industrial plants, I do not think it likely that any economic damage to vegetation will result from this discharge of sulphur dioxide.

4. I consider that any liquors from the plant that may be discharged into the river are liable to reach the intake of the Montreal water supply, but in view of the immense amount of water with which any discharge will be mixed there is no danger of the water supply being contaminated. In particular, even a large discharge of sulphuric acid would be completely neutralized by the calcium carbonate in the water. I think, however, that the Company should be restricted in regard to the amount of any acid liquors that they may discharge and that any wash-waters carrying lead, arsenic or other objectionable suspended matter should be filtered before they are allowed to enter the river. In this connection the Department of Marine and Fisheries at Ottawa should be consulted regarding the possible effect on the fish in Lake St. Louis of liquors containing sulphuric acid or sulphates of iron, zinc or other metals.

5. In view of the frequency of important changes in metallurgical practice, it is impossible to predict with any degree of certainty what process or processes may be employed in the treatment of ores in this plant, or even the character of the ores that may be treated. I can merely state that in my opinion it is possible for the Consolidated Mining and Smelting Company to treat such ores as I have indicated without causing any economic damage to surrounding vegetation or to

users of the river. The Company has a wide knowledge of the effect of smelter smoke on vegetation, and if they establish a plant in a settled community they must be prepared to face any expense that they find necessary to avoid the production of a nuisance, as they will be liable to incur serious legal claims in respect of any economic damage that may result.

6. Apart from the possibility of economic damage to the surrounding country, the Board of Trade should consider the location of the proposed plant in relation to the "town-planning" or "zoning" of Greater Montreal. This is not merely as regards the plant itself, but in view of the industrial development on Ile Perrot that is likely to follow the establishment of this plant and the building of a branch line of the Canadian Pacific Railway. In general it appears that the western suburbs of a large city should be reserved for residences and holiday resorts, while large industries, particularly those burning large amounts of coal, should be placed in the eastern part of the city, which is usually less valuable as a residential area. On the other hand, as the workers in these industries cannot afford to travel far to their work, it is desirable that large industries should not all be concentrated in one area where it is impossible or undesirable for the workers to reside, but should be grouped in units of moderate size

which should be placed so far apart that each unit can be surrounded by residential areas. The subject of town-planning is quite outside my province, and I leave it for the consideration of the Board.

7. I do not think that the sulphur dioxide liberated from the proposed plant will cause any material damage to the crops or trees of Macdonald College, but in view of the importance of the work that is carried on there, and of the extensive study of the effect of smelter gases on vegetation that has recently been made by the National Research Council of Canada, I would not feel justified in taking full responsibility for this branch of the enquiry and suggest that you refer to the Research Council the question of any possible danger to Macdonald College.

Respectfully submitted,

Department of Metallurgical Engineering,
McGill University, Montreal.
24 April, 1930.

APPENDIX.

Extracts from Letters from Macdonald College.

Macdonald College,

April 14th, 1930.

"It seems clear from your letter and from the information we have that while the location and treatment of the fumes will tend to minimize the risk, the possibility, it would seem to us the probability, of danger under certain conditions that are likely to obtain will still remain. From our point of view it is not only the risk of substantial damage to crop production but also the much more vital thing of interference in any form or to any extent, direct or indirect, with plant life, that is of serious concern.

The prevailing direction of the wind from the location mentioned is not toward Macdonald College, but it is not uncommon for us to have a South wind almost directly from the point indicated and not infrequently accompanied by high humidity, because rain usually follows. There does not seem to be any

evidence that a distance of four miles will afford sufficient protection. Moreover, information available points to the danger of even very small quantities of the gas in the air. When one adds to these considerations the human element in operation, there can be only one conclusion and this is that the establishment of such a plant as is proposed would involve grave risks for Macdonald College and McGill University."

(Signed) H. Barton.
DEAN.

Macdonald College,
April 9th, 1930.

"I feel that due to insufficient knowledge of the whole problem it is impossible at the present time to predict with the proper degree of certainty the influence of fumes from such a refinery and absorption plant, upon vegetation, covering all possible circumstances that might arise during its operation. Thus there seems to be a great risk in establishing such an industry in this agricultural and residential district. In view of this, I should oppose the erection of the proposed refinery until such time as convincing and reliable data are available which would assure that such an undertaking would do no harm to vegetation."

(Signed) John G. Coulson,
Ass't. Professor of Plant Pathology.

Macdonald College,
April 9th, 1930.

"..... it is abundantly clear that a concentration of one part of SO₂ per million parts of air, even under optimum conditions for a crop, will result in much damage to it.

"Even though the proposed mill is to be located some four miles away and our prevailing wind is not towards us, it is conceivable that such a concentration would sometime reach Macdonald College and do much damage to our crops. Apart from this direct effect upon the crops it would have a disastrous effect on our work and function. This Department functions in large measure through investigations and breeding work with field crops. The alteration of the conditions under which plants grow, no matter how slight or no matter for how short a time, would make our results inapplicable and render our work useless."

(Signed) R. Summerby.

Professor of Agronomy.

Macdonald College,
April 14th, 1930.

"The sulphur dioxide from the combustion of one ton of sulphur would, if uniformly distributed through the air, covering an area of 8 square miles to the depth of 100 ft., amount to one part per million. With a wind blowing from the direction of the smelter it seems probable that the concentration of injurious gas might easily become dangerous to the College farm and that there would be still greater danger of damage to vegetation in the surrounding country, the beauty of which is a valuable asset to the College property."

(Signed) J. F. Snell.

Professor of Chemistry.

McGill University

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
BIRKS PROFESSOR OF METALLURGY.

DEPARTMENT OF METALLURGICAL ENGINEERING

GORDON SPROULE, M.Sc.,
ASSISTANT PROFESSOR.

HAROLD J. ROAST, F.C.S., F.C.I.C.,
LECTURER IN METALLOGRAPHY

CHARLES F. PASCOE, F.C.I.C.,
SPECIAL LECTURER.

MONTREAL

Sir Arthur W. Currie, K.C.B.
Principal, McGill University,

Holland Cove,
Charlottetown, P.E.I.
2nd. August 1933

Dear Sir Arthur,

Your letter of July 27th., with regard to Mr. Roast's use of the metallurgical laboratories, has been forwarded to me in Prince Edward Island, where I have been spending a few weeks with my wife and daughter.

Mr. Roast's use of the laboratories for his commercial work was begun as a temporary arrangement and has been continued from time to time.

When I left Montreal, Mr. Roast's plans were uncertain and I therefore asked Mr. Glassco to continue the present arrangement for a few weeks until Mr. Roast could settle his own affairs.

I learn from your letter that Mr. Roast is now asking that this arrangement shall be continued for at least another year. In view of the greater permanence of the proposed agreement, I should like to have a further conversation with Mr. Glassco, in regard to details, before this agreement is made, and shall be glad if you can leave the matter open until my return to McGill, which will be before the end of this month.

Mrs. Stansfield joins me in kindest regards,

Yours very sincerely,

Alfred Stansfield

July 27th, 1933.

Professor Stansfield,
Department of Metallurgy,
Engineering Building.

Dear Professor Stansfield,

Yesterday I had a visit from Mr. Roast, who wished to be assured that the arrangements which now prevail between him and the University as to the laboratory should be continued for at least another year. He told me of the intimation he had had from the University that the arrangements might be discontinued.

He has since seen Mr. Glassco, who tells me this morning that he is agreeable that matters stand as at present. Mr. Roast assured me that you had no objection, and I am now writing to ask what your views are. Mr. Roast tells me that the presence of his employees in the laboratory is of value to our students, because they are always available for consultation.

I believe he pays \$50 a month for his office space in your building and that this year he will be paid \$25 for what he says amounts to about one and a half hours' work a week for the metallurgical students.

I think the complaint arose among some of our former graduates, that his association with the University was placing him in a preferred class. But he is no longer designating the laboratories as "Roast Laboratories, McGill University" and I think the objection is largely removed.

I hope you are enjoying your vacation.

Ever yours faithfully,

Principal

August 7, 1933.

Harold J. Roast, Esq., F.C.S., F.C.I.C.,
Department of Metallurgical Engineering,
McGill University.

Dear Mr. Roast,

I have, as promised, written to Professor Stansfield and in reply he asks if the matter can be left open until he returns to McGill which will be before the end of this month. In my letter to Professor Stansfield I intimated that I had no objection to a greater permanence being given to the present arrangement.

With all good wishes,

I am

Yours faithfully,

Principal



MCGILL UNIVERSITY

Department of
Metallurgical Engineering,
April 27th, 1933.

Sir Arthur Currie,
Principal and Vice-Chancellor.

Dear Sir Arthur,

The Electrochemical Society (of America) is holding its annual meeting in Montreal next month, and I was asked to write a paper on the "Canadian Electric Furnace Industry." I enclose a preprint of this paper and think you may find it of interest to glance through the first page and the "conclusion" on page 180. I was elected a vice president of this Society a few years ago and I have been asked to preside at a symposium on "Electric Furnace and its Products" at the Montreal meeting.

Yours very sincerely,

April Stampfield

AS:S

April 29, 1933.

Dr. Alfred Stansfield,
Department of Metallurgical Engineering

Dear Dr. Stansfield,

Thank you for sending me the pamphlet containing a paper which you have written on the "Canadian Electric Furance Industry". I shall read it with interest, and I congratulate you on being elected Vice President of the Electrochemical Society of America.

Ever yours faithfully,

Principal

P.S. I have not written
to the Metallic Roofing Co.
but will do so if you
wish or you might forward
my letter.

I would be glad to
~~the~~ have their letter & ads
for filing. W.S.



CABLE ADDRESS,
"METALLIC," TORONTO.
A.B.C.57: Edition & Private Codes used,
also Western Union Code.

Cor. King and
Dufferin Streets.

Toronto, 2 Canada March 11th, 1930.

All orders accepted or contracts made by us are subject to strikes, accidents, or other delays beyond our control.

McGill University,
Montreal, Que.

Attention Sir Arthur W. Currie

Dear Sirs:-

Re: Copper Steel

We are extensive manufacturers of various Sheet Steel Products, and for some time past we have been disseminating information to our customers and the public on the advantages of the addition of a small amount of Copper to Sheet Steel from the standpoint of durability.

We are now contemplating the issue of a pamphlet along these lines, and in searching for data, opinions, etc. we have come across the attached page, taken from a publication of the United States Steel Corporation. It is our intention at present to reprint at least some of the opinions quoted, but we should greatly like, in addition, to be able to quote opinions of CANADIAN authorities.

With this in mind we write to enquire if the proper person in your Organization - presumably your Professor of Metallurgy - would be good enough to express a brief opinion on the merit of Copper Steel as compared to Non-Copper Steel or Iron, and we should of course like to have permission to publish this opinion.

It is doubtless superfluous for us to mention that Copper Steel is not a trade marked nor patented product, but can be, and is, produced by practically all Steel producing Companies, including the Steel Co. of Canada.

Shall appreciate hearing from you as promptly as convenient, and if you can see your way clear to let us have the opinion requested we can assure you that it will be put to good use.

Yours truly,
The Metallic Roofing Co. of Canada, Limited.

G.G. Complin
Manager.

*To Prof Mansfield,
Deal with this as
you see fit but let me know
11/27/30 A.W. Currie*

"The conflagration hazard will hang over every town and village so long as wooden shingles are used for roofings."—Insurance Post



CABLE ADDRESS,
"METALLIC", TORONTO.
A.B.C. 5th Edition & Private Codes used.
also Western Union Code.

Cor. King and
Dufferin Streets.

Toronto, 2 Canada, March 21st, 1930.

All orders accepted or contracts made by us are subject to strikes, accidents, or other delays beyond our control.

McGill University,
Montreal, Que.

Dear Sirs:-

Attention Sir Arthur W. Currie

Thank you for your letter of March 18th enclosing Professor Stansfield's letter of the 17th. We note with regret that Professor Stansfield has not made a personal investigation of Copper Steel, and is therefore unable to give us an opinion.

Thank you nevertheless for your trouble in the matter.

Yours truly,
The Metallic Roofing Co. of Canada, Limited.

G. G. Complin
Manager.

March 18th, 1930.

The Metallic Roofing Co. of Canada, Limited,
King and Dufferin Streets,
Toronto, 2. Canada.

Dear Sirs,

Replying to your letter
of the 11th March, I am enclosing you letter
from our Professor of Metallurgy.

Yours faithfully,

Principal.

Ford Motor Company of Canada
LIMITED

ADDRESS ALL
COMMUNICATIONS TO THE COMPANY

HEAD OFFICE AND FACTORY
EAST WINDSOR, ONTARIO

Montreal Branch

Montreal, Que. April 7th., 1933.

Sir Arthur W. Currie, G.C.M.G., K.C.B.
Principal and Vice-Chancellor,
McGill University,
McGill University,
Montreal.

Dear Sir,

The writer wishes to thank you for your communication of April 4th. which clarifies the stand which you considered advisable to take in connection with the matter discussed between us last Friday.

We wish to express our great appreciation for the time you devoted to the matter, and while regretting the inclusiveness of the statement which Professor Sproule is prepared to make, we can do nothing but abide by your decision.

This information is being conveyed to
Mr. Campbell.

Faithfully yours,

P. N. Mainquay
Branch Manager

PNM:L

April 4, 1933.

Mr. S. N. Mainguy,
General Manager,
Ford Motor Company,
Strathearn Avenue,
Montreal W.

Dear Mr. Mainguy,

Since your visit to me last Friday, I have given considerable thought to the matter we discussed and I do not see what I can do.

We allow Professor Sproule to make metallurgical tests for private people and organizations, and I do not see how we can ask him to suppress his findings. If we did that, we should never allow our staff members to make these tests for people.

I am sorry his findings were so sweeping and if he is utterly confounded on the witness stand, that is his own affair and he must accept the consequences. I cannot see how the University can possibly be brought into the matter, because the opinion he expressed was his own. The University can have no opinions on such matters, nor can it stand behind any opinion on such a matter expressed by its employees.

I am returning herewith the memorandum left with me.

Yours faithfully,

Principal

Our ins. co. lawyer

F.P.Brais, K.C. 286 St.James St. W.

Ruck, plaintiff, vs. Irwin (F.M.Co.) defendant

Mr. Job metallurgist, Milton Hersey Co.

Beaumont " C. Ford Co.

Prof. Sproule

Plaintiff's lawyer Adolphe Gardner, K.C. 309 Themis Bldg.

Metallurgical Dept. of McGill: "Inherent and latent defects
in said hub and in particular, to inherent and latent defects
in its design, casting, construction, workmanship and
manufacture. "

\$6381.50

Hibbard & Gosselin, 132 St.James St.

McGill University

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
BIRKS PROFESSOR OF METALLURGY.

GORDON SPROULE, M.Sc.,
ASSISTANT PROFESSOR.

HAROLD J. ROAST, F.C.S., F.C.I.C.,
LECTURER IN METALLOGRAPHY

CHARLES F. PASCOE, F.C.I.C.,
SPECIAL LECTURER.

DEPARTMENT OF METALLURGICAL ENGINEERING

MONTREAL, March 29th, 1932.

Sir Arthur W. Currie, G.C.M.B., K.C.B.,
Principal,
McGill University.

Dear Sir Arthur:

Your letter of March 23rd arrived too late to guide me in listing my requirements for departmental appropriations as, at the request of the Dean, I had submitted my estimates before the 21st instant. In view of the financial difficulties of the University I had, however, reduced these estimates, apart from wages, by more than 20 per cent.

Also, as I understand that at the present time it is more important to economise than to keep our equipment up to date, I have refrained this year from purchasing some pieces of new apparatus that we had in view, and as a consequence there is a considerable amount of unspent money ⁽¹⁾ standing to the credit of this Department.

(1) This sum arises partly from unspent appropriations, partly from a special equipment fund belonging to this Department, and partly from the sale of a piece of apparatus which we no longer need.

Sir Arthur W. Currie.

March 29th, 1932.

If you wish me to take up the matter of these appropriations again and to consider more carefully the possibility of a further reduction, I shall be glad to do so. In any case I shall look carefully into our expenses and see what economies can be carried out during the coming year.

Yours very truly,

Alfred Stanfield

AS:S

November 23rd, 1931.

Sir Arthur Currie, G.C.M.G., K.C.B., LL.D.,
Principal.

Dear Sir Arthur:-

I enclose a copy of a letter received from Dr. Stansfield referring to the matters which I discussed with you recently, viz.

- (1) the re-arrangement of work necessitated by his illness, and particularly the additional burden and responsibility placed upon Professor Sproule.
- (2) the suggestion that Mr. E. J. Carlyle recently appointed Secretary of the Canadian Institute of Mining and Metallurgy, should be asked to give a course of lectures on the Metallurgy of Copper during the second term of this session.

As I stated when discussing this matter with you, I hope that the Finance Committee will give a bonus to Mr. Sproule for the current session. He has had to assume considerable responsibility and take up work which he has not hitherto done, and I think a bonus of \$400. to \$500. might be awarded for the session. This could be paid in instalments, say at the end of the first and second terms. I am sure Mr. Sproule would appreciate it.

MS

I believe the suggestion of inviting Mr. Carlyle would be an excellent one. Dr. Stansfield will not be fit to resume full work in the second term, and as Mr. Carlyle is an expert in the metallurgy of copper, we could not do better than secure his services. I have conferred with Professors Stansfield and McBride, and they think that a sum of \$300. should cover the cost of such a course, which would have to be paid for at a special rate in view of the circumstances.

I recommend both these proposals for the favourable consideration of the Finance Committee.

Yours faithfully,

G. Brown, Dean.

McGill University

DEPARTMENT OF METALLURGICAL ENGINEERING

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
BIRKS PROFESSOR OF METALLURGY

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LECTURER IN METALLURGY

CHARLES F. PASCOE, F.C.I.C.
SPECIAL LECTURER

MONTREAL, November 23rd, 1931.

COPY.

Dean E. Brown,
Faculty of Engineering,
McGill University.

Dear Dean Brown,

In view of my enforced absence from the University, I asked Mr. Sproule at the beginning of the session to give my lectures on General Metallurgy to the fourth year students, taking up first the metallurgy of iron and steel as he is familiar with that part of the subject. Although I hope to be able to return to the University after Christmas I should not, at first, attempt to take up the whole of my regular work, particularly as it is somewhat heavy in the second term. I have recently learnt of the return to Montreal of Mr. E. J. Carlyle, and it seems probable that he will be willing to give a series of lectures on copper smelting, starting after Christmas.

Mr. Carlyle, who graduated here in 1904, has had a very wide metallurgical experience chiefly in connection with the metallurgy of copper, and I think it would be very satisfactory if he would give perhaps fifteen lectures on copper smelting, following the lectures on iron and steel that are now being given by Mr. Sproule. Mr. Carlyle's lectures would occupy seven or eight weeks, after which I would carry on the course to the end of the session. Mr. Carlyle has just been appointed Secretary of the Canadian Institute of Mining and Metallurgy which has its rooms in the Drummond Building, and it seems probable that he will be able to visit the University twice a week to give the lectures.

Mr. Carlyle has practised copper metallurgy in Russia as well as in the United States; he was Smelter Superintendent of the British America Nickel Company at Sudbury, and since 1926 has been Superintendent of the Shorey plant of the American Smelting and Refining Company in Peru. Professor McBride considers that we should ask Mr. Carlyle to give these lectures, and I think that a fee of perhaps \$300. would be suitable for the course of fifteen lectures.

During the autumn months Mr. Sproule has been giving two lectures a week as mentioned above; he has also (in addition to his ordinary work) given two lectures a week on metallurgical calculations, and some hours per week in post-graduate instruction that I would usually have given. After Christmas he will be relieved of the lectures on general metallurgy and of the graduate work, but I shall probably have to ask him to give instruction in metallurgical laboratories and metallurgical design, and possibly one or two lectures per week.

In view of the additional work that is being given to Mr. Sproule this session I think it would be very desirable for the University to give him some bonus or additional remuneration for the present session.

I shall be very grateful if you can obtain the necessary authority to engage Mr. Carlyle to lecture on copper smelting and to pay Mr. Sproule a bonus for his extra work.

Yours very truly,

(Signed) ALFRED STANSFIELD.

3182 THE BOULEVARD
WESTMOUNT, P.Q.
October 29th 1931

Sir Arthur W. Currie, G.C.M.G., K.C.B.
The Principal,
McGill University,
Montreal.

Dear Sir Arthur,

It is now more than four weeks since my return from the hospital at St Stephen where I was very seriously ill and confined to my bed for eight weeks. I am making satisfactory progress towards health but Dr. Scrimger tells me that I cannot return to the University, even for light work, before the New Year at the earliest.

I am however overseeing the work of my Department, and I have been able to give instruction, in my own house, to some of the senior students.

My daughter Ellen, who is an M.A. of McGill and gave instruction for two years in the English Department, calls at my office every morning for my mail and other papers, and types my replies at my house in the afternoon. It would help me very much in utilizing the months during which I must still be partly invalided if I could have her assistance in my correspondence and in filing and arranging the papers and cuttings in my Department, and I am writing to ask whether you would sanction her appointment by the University on a part time basis to help me for the remainder of this session.

Part of her time is at present occupied in educational work, but she would be able to give me enough time to meet my requirements.

I may say that during the thirty years that I have taught at McGill I have had no secretarial assistance beyond the typing of letters, and that the present would be a good opportunity for a thorough overhauling of the papers in my Department.

My daughter could call at your office if you care to see her about this arrangement.

Yours very sincerely,

Alfred Stansfield

Dr. Alfred Stansfield,
Department of Metallurgy.

Mr. Glasseco
will you please
attend to this for me
20/10/31. A.W.C.

October 31st, 1931.

Dr. Alfred Stansfield,
Department of Metallurgy,
McGill University.

Dear Dr. Stansfield,

I am glad to know that you are making satisfactory progress towards complete recovery from your recent serious illness, but I am sure you should follow Dr. Seringer's advice and not leave the house too soon.

With reference to your daughter, whom I know, helping you during the remaining two months of this year to do some work at home, I am asking Mr. Glasco to see her and make arrangements.

With all kind wishes,

I am,

Ever yours faithfully,

Principal.

33.
3800
\$
\$
\$
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\$
\$

McGill University

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
BIRKS PROFESSOR OF METALLURGY.

DEPARTMENT OF METALLURGICAL ENGINEERING

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LECTURER IN METALLOGRAPHY

MONTREAL

CHARLES F. PASCOE, F.C.I.C.,
SPECIAL LECTURER.

Chipman Memorial Hospital.

St. Raphael, N.B.

Sept 20th 31.

Sir Arthur W. Currie F.C.M.G., K.C.B.

Dear Sir Arthur.

I am writing to thank you for your very kind letter of Sept. 17th, and appreciate very much your sympathetic interest in my previous illness.

I have made satisfactory progress and had expected to go home tomorrow but a minor trouble will delay my return for a few days.

Although of course I shall be unable to resume my regular duties for a considerable time, my doctor says that I should take on a moderate amount of work as soon as I am able and I believe I can carry on the correspondence and general administration of my department in the near future if I can have the assistance of a secretary who could come to my house.

My wife joins me in thanking you for your kind sympathy.

Yours very sincerely
Alfred Stansfield

September 17, 1931.

Professor Albert Stansfield,
Chipman Memorial Hospital,
St. Stephen, N. B.

My dear Professor Stansfield,

While I was away on a brief vacation I heard of the very serious illness you have suffered, and in conversation with Dean Brown he told me of having news from you. I was glad to learn that you are well on the way to recovery and that you expect to return to Montreal in the course of another fortnight. We are all, of course, very sympathetic, but are profoundly grateful that they were able to get you into the hospital in time to save your life. You must take time to recover completely. I have told the Dean that I shall gladly approve of any arrangements he sanctions for carrying on your work. About that you must not worry. Your main object now is to get back your former strength.

Please remember me kindly to your wife,
and with all good wishes,

I am,

Ever yours faithfully,

Principal

Chipman Memorial Hospital.

St. Stephen, N. B.

Sept 12th 31.

Dear Brown.

Thank you very much for your letter of Sept. 5th and for your kind sympathy in regard to my illness.

I have been very seriously ill, and have been in hospital for more than five weeks, but am making steady progress and hope to be able to return home in about two weeks.

I appreciate your kind offer in connection with the work of my Department.

I understand of course that I shall

be unable to lecture for some time
after the beginning of the session, and
I have already been making the
necessary arrangements in view of this.

I have asked Sproule to give my
lectures to the 4th year Miners for the
1st term giving him an outline of the
course and information regarding
Expts which I will supplement with
my own lecture notes when I get
home.

My lectures on Metallurgical
calculations to the 4th year Miners
and also to the 3rd year Metallurgists

must I think be postponed for the present.

I expect one 4th year Metallurgist and believe that I can give him instruction myself, possibly in my own house.

My doctor advises me to take up a moderate amount of work as soon as I am able.

I am able to read and dictate letters and no doubt a Secretary could be arranged for to assist me in my work.

Col. Stedman of the Canadian Air

Force had arranged to take a special course with me this autumn and I have written to see whether he wishes to change his plan in view of my illness.

I see from your letter that you have been appointed Dean of the Faculty, please accept my best-wishes and believe me

Yours very sincerely
Alfred Stimpfield

Personal and Confidential

McGill University
15th. May, 1931

Dear Sir Arthur,

In conversation with you yesterday I did not refer to my salary, although I have served the University for over thirty years and it is a long time since I have had any increase. You asked me a question however about my outside income and I realise that I must have given you far too favourable an impression of my financial position.

Apart from my salary from the University, I have no income on which I can count. I have usually made in recent years from \$400. to \$900. in professional work, though I did better last year, but this is entirely uncertain and my income this year will probably be under \$200. I do not expect much improvement in the future.

I have always lived very economically and some years ago I had begun to make an appreciable income from investments. Like yourself however I have had very serious losses and my capital has been practically wiped out. I do not see how I can make ends meet when it becomes necessary for me to retire on the Carnegie pension.

Yours very truly,

Alfred Stanfield

May 15, 1931

Professor Alfred Stansfield,
Department of Mining and Metallurgy,
McGill University.

Dear Professor Stansfield,

I have carefully noted your letter of yesterday. In any questions I asked you about outside income I was not curious; but simply, I hoped that you would tell me that you had added a little to your income in that way. I know that our salaries at McGill are low, and I am always glad to learn of a professor increasing his income in any way which does not interfere with his responsibility to the University.

Ever yours faithfully,

Principal

McGill University

ALFRED STANSFIELD, D.Sc., A.R.S.M., F.R.S.C.,
BIRKS PROFESSOR OF METALLURGY.

GORDON SPROULE, M.Sc.,
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LECTURER IN METALLOGRAPHY.

CHARLES F. PASCOE, F.C.I.C.,
SPECIAL LECTURER.

DEPARTMENT OF METALLURGICAL ENGINEERING

MONTREAL, September 24th, 1927.

Sir Arthur W. Currie, G.C.M.G., K.C.B.
Principal, McGill University,

Dear Sir Arthur:-

In reply to your letter of September 20th., I have read with great interest the list of subjects for research received from the Imperial Institute.

We are not at present undertaking any of the researches mentioned in that list, but we have conducted some of these researches in the past and I shall be very glad to co-operate with the Imperial Institute in this connection if I can be of any service.

In Section III.- MINOR METALS, we have made researches on the production of pure titanium oxide from ilmenite, and have also made researches on the production of ferro-titanium in the electric furnace.

In Section VIII.- LEAD AND ZINC, I made researches for a number of years on the electric smelting of zinc ores, and we have also done a little work on the production of zinc by electrolytic methods.

I shall be glad if I can be of use in this connection, and remain

Yours very truly,

Alfred Stansfield

May 10, 1926.

Dr. Alfred Stansfield,
Professor of Metallurgy,
McGill University.

Dear Dr. Stansfield:-

It gives me great pleasure to note the formation of the Montreal group of the American Society for Steel Treating and the co-operation which the metallurgical department of McGill has offered.

This is to my mind one of the ways in which the University can most usefully show its desire to assist the community, and I am sure that your work will be productive of extremely good results.

Yours faithfully,