Div. 56 Room 4725 JRS/ecc Paper No.16

April 20 , 1938

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

Please find below a communication from the EXAMINER in charge of this application.

CONWAY P. COE,
Commisioner of patents.

Applicant: Leo Szilard

Haseltine, Lake & Co.
19,W.42nd St.,
New York, N.Y.

Ser.No. 10.500
Filed Mar.11, 1935
For Apparatus for Nuclear Transmutation

Responsive to amendment filed November 9, 1937

The rejection of the claims of record together with newly presented claim 58 is repeated. In order to remove the Nature publication as a reference the applicant should present a certified copy of his filed British application.

It is to be noted that the transmutation of elements by means of neutrons is fully described by the citations made from the Bell System Technical Journal. The applicant covers broadly the principle of transmutation using such rays and more specifically the process and apparatus therefore in which these neutrons are generated by a fast electron stream. Such method of generating neutrons is , however, fully set out by the citation from Physical Review.

With respect to the rejection of the claims upon indefiniteness , it is to be noted that the claims should not be so broad as to constitute a mere statement of the result desired. In re Stack, 87 F (2d) 210.

The rejection of the claims is made <u>final</u>.

EXAMINER

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

DEK:K

June 18, 1940

D

Dr. Leo Szilard,
Columbia University,
New York, N. Y.

Dear Sir:

In connection with your expenses on account of the meeting on June 13th, will you kindly return to me the book of transportation requests together with a statement of incidental expenses, giving the time of departure for Washington and time of return from Washington, so that a voucher for payment may be made?

Respectfully,

NATIONAL BUREAU OF STANDARDS.

fjk

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

CJR:LLC

January 27, 1941

D/ID-900-c

Dr. Leo Szilard,
Department of Physics,
Columbia University,
New York City.

Subject: Removing Boron.

Dear Dr. Szilard:

The graphite block referred to in your letter of January 17th, has been received in good order.

We considered the possibility of removing the boron with chlorine but since we had already started work on the ashing method it was thought desirable to see what results were obtained with it. The quartz apparatus is being built and we hope to start actual work on burning the sample some time during the coming week.

We are also having the apparatus made which will be used in preparing the uranium. It is hoped to have some results on this within the next month.

Dr. Lundell has been ill so I am sending you the above information.

Very truly yours,

Clement J. Rodden

Clement J. Rodden, Chemist.

Copied 1/28/40
H. H.

January 28, 1941

Dr. Clement J. Rodden
National Bureau of Standards
Washington, D. C.

Dear Dr. Rodden:

Many thanks for your kind letter of January 27. We shall be very much interested to hear of the results obtained when you will have burned a sample of graphite in your quartz apparatus. Perhaps after you have gathered some experience we might again have a discussion about the possible loss of boron in the process of ashing. D. P. Mitchell can always arrange for me to come down to Washington, and I shall be glad to do so at any time.

We are, of course, looking forward with great interest to any results which you may obtain in preparing uranium metal.

Yours very truly,

L. S.

LS:H (Leo Szilard)

CC: 1 - Pegram
1 - Szilard
2 - Mitchell

February 27, 1941

Dr. Clement J. Rodden
National Bureau of Standards
Washington, D. C.

Dear Dr. Rodden:

Very many thanks for your letter of February 25. We are very happy to hear that you found time to prepare uranium chloride.

It is regrettable that you had trouble with boron owing to the use of glass in the apparatus. I am very much looking forward to discussing with you other aspects of the boron question sometime in the near future on my next visit to Washington.

Very truly yours,

L. S.

LS:H (Leo Szilard)

cc: 1 - Pegram
1 - Szilard
2 - Mitchell

Div. 56 Room 4725 260 JRS/ecc Paper No. 8

*Address only*
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

MAILED All communications respecting this application should give the serial number, date of filing, and name of the applicant

APR 29 1941

Copy sent attorney.

*Please find below a communication from the EXAMINER in charge of this application.*

Commissioner of Patents.

GPO 11—8623

Applicant: Leo Szilard.

Ser. No. 263,017.
Filed Mar. 20, 1939.
For Apparatus For Nuclear Transmutation.

Leo Szilard,
420 W. 116th St.,
New York, N. Y.

A letter of abandonment signed by applicant has been received in this application on April 26, 1941 and is hereby acknowledged. The application is accordingly herewith forwarded to the abandoned files.

EXAMINER.

3 carbons

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

CJR:MMA

May 9, 1941

Dr. Leo Szilard,
Department of Physics,
Columbia University,
New York, N. Y.

Dear Dr. Szilard:

I have the following comments on your letter of May 7, regarding the uranium subject:

1. I have no knowledge of the Pfanstiehl Co. and so can give no suggestions. Your suggestion that the Brush Beryllium Co. might make the chloride with their usual carbon plus oxide plus chlorine may be a good lead. While we did not have a great deal of success here on a small scale, still the method has been used for the preparation of the chloride.

2. I believe the metal could be obtained in chunks without a great deal of trouble. That is the thought in mind at present and we have a place fixed up where we should be able to make relatively large amounts of chloride i.e., 2 or 3 kilograms per day.

3. In regards to tests on whether the material is pyrophoric or not, the simplest test I can think of is to take a small sample and heat it in air to some temperature and see if it ignites. This temperature should be such as to have about 100% safety factor.

4. The purity of the uranium metal will depend on the raw materials. James on chloride made from pure oxide and calcium which had not been sublimed obtained uranium metal with the following analysis:

| | | | |
|---|---|---|---|
| Uranium..... | 99.31 | Oxygen..... | 0.03 |
| Iron..... | 0.57 | Silicon..... | None |
| Carbon..... | 0.09 | Calcium..... | None |
| | | Aluminum..... | Trace |

The metal was brittle.

On using resublimed calcium the iron dropped to 0.01 but no other values were reported. The metal was still brittle.

I believe the metal we get should run about the same.

Very truly yours,

Clement J. Rodden

Clement J. Rodden

420 West 116 Street
New York City
June 30, 1941

Dr. C. G. Rodden
National Bureau of Standards
N W Washington, D. C.

Dear Dr. Rodden:

D. P. Mitchell informed me that you found 88% uranium metal in the samples No. 35 to 36. Would you be kind enough perhaps to write me a few lines about this point? I am in doubt how to interpret this result; for instance, whether we are to understand that only 88% of the metal is uranium and the rest is made up of other elements ; or alternately whether 88% is metal and the rest contains uranium oxide as well as other elements.

If you could possibly let me know just what was done about this sample it would help in determining what other tests are still necessary.

Yours sincerely,

Leo Szilard

(Leo Szilard)

LS/JC

I am enclosing the values which Dr Hoffman obtained and which I believe is self explanatory,

Weyl Friday off
Flowstein Saturday
off 2

Buckley
Bell

450 West 116 Street
New York City
June 20, 1941

Dr. C. G. Hodgen
National Bureau of Standards
N. W. Washington, D. C.

Dear Dr. Hodgen:

D. P. Mitchell informed me that von Conrad 88% nitrogen
weight in the sample No. 25 of 30. Would you be kind enough
perhaps to write me a few lines about this point. I am in
doubt how to interpret this result: for instance, whether we
are to understand that only 88% of the metal is nitrogen and
the rest is made up of elements ! or alternatively whether 88%
of the metal is nitrogen plus oxygen as well as other
elements.

It may be of some bearing in determining what other tests are
this sample it would help in determining what other tests are
still necessary.

Yours sincerely,

(Leo Szilard)

LS\rc

Buckley
Bell

US Dept of Commerce

C O P Y

C O P Y

UNITED STATES DEPARTMENT OF COMMERCE

Washington

BFS:JT

NATIONAL BUREAU OF STANDARDS

IV-1/Tp
411-643/41

REPORT

on
Spectrochemical Analysis
of

One Sample of Uranium Metal and Two Samples of Thorium Oxide
Labelled as Shown in Table
Submitted by
Division V, Section O,
(Attn. Mr. C. J. Rodden).

Date Submitted: June 30, 1941
Laboratory Nos: IV-1/2227,2230 and 2231
Spectrogram Nos: W-549
Region of Spectrum: 2400-5000 A

The spectrograms were examined for the sensitive spectral lines of the elements as shown in the accompanying table. The qualitative scale used in reporting the relative amounts of the elements in the samples is as follows:

| Designation | Scale value | Designation | Scale value |
|---|---|---|---|
| VS | Very strong | VW | Very weak |
| S | Strong | T | Trace |
| M | Moderate | FT | Faint trace |
| W | Weak | - | Not detected |

In general, the designations VS and S correspond to major constituents (greater than 1%), M and W to minor constituents (1 to 0.01%), and VW, T, and FT to trade constituents (less than 0.01%).

The absence of a designation indicates that a test was not made for that element.

NBS Test No. IV-1/Tp 411/643/41
WASHINGTON, D. C.,
July 11, 1941
Inclosure.

(Signed)

Frederick Bates, Chief,
Optics Division

Copies
1 Pegram
1 Fermi
1 Szilard
2 Mitchell

NBS Test No. IV-1/Tp 411-643/41

TABLE OF RESULTS

| Element | Sample 1 | 2 | 3 | 4 | 5 | Element | Sample 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ag | -? | - | - | | | Mo | - | - | - | | |
| Al | W | - | - | | | Na | - | - | - | | |
| As | - | - | - | | | Nd | | | | | |
| Au | - | - | - | | | Ni | - | - | - | | |
| B | VW | - | - | | | Os | - | - | - | | |
| Ba | - | - | - | | | P | | | | | |
| Be | M | - | - | | | Pb | - | - | - | | |
| Bi | - | - | - | | | Pd | - | - | - | | |
| C | | | | | | Pr | | | | | |
| Ca | - | VW | VW | | | Pt | - | - | - | | |
| Cb | - | - | - | | | Ra | | | | | |
| Cd | - | - | - | | | Rb | | | | | |
| Ce | - | - | - | | | Re | - | - | - | | |
| Co | - | - | - | | | Rh | - | - | - | | |
| Cr | - | - | - | | | Ru | - | - | - | | |
| Cs | | | | | | Sb | - | - | - | | |
| Cu | T | VW | VW | | | Sc | - | - | - | | |
| Dy | | | | | | Si | W | VW | VW | | |
| Er | | | | | | Sm | | | | | |
| Eu | | | | | | Sn | - | - | - | | |
| Fe | - | - | - | | | Sr | - | - | - | | |
| Ga | - | - | - | | | Ta | - | - | - | | |
| Gd | | | | | | Tb | | | | | |
| Ge | - | - | - | | | Te | | | | | |
| Hf | - | - | - | | | Th | - | VS | VS | | |
| Hg | - | - | - | | | Ti | - | - | - | | |
| Ho | | | | | | Tl | - | - | - | | |
| In | - | - | - | | | Tm | | | | | |
| Ir | - | - | - | | | U | VS | - | - | | |
| K | - | - | - | | | V | - | - | - | | |
| La | - | - | - | | | W | - | - | - | | |
| Li | | | | | | Y | - | - | - | | |
| Lu | | | | | | Yb | | | | | |
| Mg | -? | VW? | VW? | | | Zn | - | - | - | | |
| Mn | - | - | - | | | Zr | - | - | - | | |

| No. | IV-1 Lab. No. | Label of Sample |
|---|---|---|
| 1 | 2227 | Uranium Metal No. 45 |
| 2 | 2230 | Thorium Oxide No. 51 |
| 3 | 2231 | Thorium Oxide No. 52 |
| 4 | | |
| 5 | | |

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

CJR:MMA

July 12, 1941

V-4/ID-900-C

Dr. Leo Szilard,
Columbia University,
Department of Physics,
New York City, N. Y.

Subject: Uranium oxide.

Dear Dr. Szilard:

The results on the uranium oxide that was received July 8, 1941 have been completed. The sample was heated at 500° C in an atmosphere of nitrogen and the water evolved absorbed in drierite and weighed.

| Sample No. | % Water |
|---|---|
| 7 | 0.08 |
| 8 | 0.11 |
| 13 | 0.11 |
| 16 | 0.08 |
| 17 | 0.08 |
| 18 | 0.09 |
| 19 | 0.09 |
| 20 | 0.11 |

The uranium metal made by the James method which had a hight density was all recast. We are endeavoring to obtain the chlorine content.

In the analysis of the uranium for oxygen we determine the total uranium which is uranium as metal and also uranium as oxide. A second sample is dissolved in acid and precipitated with ammonia and then ignited to $U_3O_8$. There is no question of the composition of this oxide but the uncertainty lies in the composition of the oxide present in the original metal. The other material present in the original metal must be taken into account and the oxygen determined by difference.

The method you described would give us the uranium metal content. The difficulty in actually determining oxygen is because the uranium is so active the oxygen cannot be removed in a form that we can determine.

Very truly yours,

C. J. Rodden

C. J. Rodden

✓ copies made
7-14-41 LH

July 9, 1941

Dr. C. J. Rodden
National Bureau of Standards
Washington, D. C.

Dear Dr. Rodden:

According to an analysis which was made by the Bureau on uranium metal, there is about 3 percent unaccounted for by any of the impurities which you quote. This is somewhat disquieting, and I wonder if this point could be cleared up in the near future? Do you think that the analysis for uranium content of the uranium metal is so inaccurate that it might account for the missing 3 percent? If that were so, then there would be no need to do anything about the matter just now. However, if this explanation cannot be put forward, then it would be rather urgent to find out something about the nature of the missing 3 percent.

Yours sincerely,

L. S.

LS:H (Leo Szilard)

cc: 1 - Pegram
1 - Fermi
1 - Szilard ✓
2 - Mitchell

July 15, 1941 5

Dr. Leo Szilard
Columbia University
New York City, N.Y.

Dear Dr. Szilard

Sample of Calcium Metal received today. Sample No. 89 labelled Calcium Metal Kunzel, New Furnace, first Batch from Low Calcium Chloride

This metal is very high in Boron I took two samples one of 2½ g and one of 1½ grams, made distillation and estimated the Boron. It was so high I could only get a rough estimate which is about 500. P.P.M.

For a more accurate value I must take a very small sample as 0.1 g

As it is late in the afternoon I shall send a special delivery letter.

Yours respectfully
J. A. Scherrer.

Copied 7-18-41 LH

July 16, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

Our most urgent need at present is to find a calcium chloride which is sufficiently free of boron. You have so far reported upon samples which meet this requirement, but those three samples which were low in boron seemed to be all samples of rather expensive products. May I ask you whether you have now a reliable value for the calcium chloride obtained from the Pittsburgh Plate Glass Company, for which you originally found a low and later a higher value.

Dr. Kinzel has bought about four tons of this stuff which is, by the way, exceedingly cheap, and I would like to tell him definitely whether or not we can use this material. We shall not use it if the boron content exceeds 5 PPM.

Have you any calcium chloride for which you have definitely established a low boron content? This is of great and urgent interest to us, and I should much appreciate your communicating information on this topic as it becomes available, either by telegram or by special delivery letter. The deadline for sending telegrams is about 3 P. M. Washington time, since telegrams sent after that will hardly reach me in time to take any action the same day.

Sincerely yours,

L. S.

LS:H (Leo Szilard)

cc: 1 - Pegram
1 - Szilard
1 - Fermi
2 - Mitchell

July 17, 1941 

In todays determination of Boron in the sample of Calcium metal #89 labelled Calcium metal Kinzel, I obtained a value of 84 parts of Boron per million. While this is a great difference from the first result I am led to believe that the difference is real. The first samples contained light and dark inclusions which it was not possible to avoid on a large sample as 1½ grams and 2½ grams.

Todays samples were small pieces of clean metal. Two separate portions were used and two portions of each were analyzed making four determinations, all of which were about the same.

The first result I likewise had four analyses, all of which agreed, roughly.

From the results I am led to believe that the difference is real, and that the inclusions contain much of the Boron

No samples were received today.

Scherrer

July 18, 1941

Dr. C. J. Rodden
Chemistry Building
National Bureau of Standards
Washington, D. C. N.W.

Dear Dr. Rodden:

I understand that from all the samples of calcium chloride which have so far been analyzed for boron at the Bureau of Standards, only three samples showed a low boron content. Since these three samples represent brands of the more expensive varieties, I wish to ask you if you have samples of other brands which you have received but not yet analyzed for boron. If so, we would very much appreciate your analyzing these remaining brands, particularly if they represent cheeper varieties. I feel that this task is, from our point of view, at present more urgent than anything else the Bureau is doing for us.

Within a few days I shall send you some calcium and calcium chloride marked Kinzel, second sample batch, to be analyzed for boron but the analysis of these samples are not as urgent as the answers to the questions raised in the preceding paragraph.

I am sending a carbon copy of this letter to Dr. Scherrer so that he may act upon it in your absence if this type of work is at present in his charge.

Yours very sincerely,

L-h.

(Leo Szilard)

LS:lh

Physics Department
Columbia University
New York City, New York
July 22, 1941

Dr. C. J. Rodden:
National Bureau of Standards
Washington, D. C.

Dear Dr. Rodden:

I wonder if it is possible for you to produce for us by the James method a recast ~~of~~ uranium metal block of some regular shape--for instance, a circular or rectangular rod of perhaps one inch diameter and one and one-half inch length or something similar?

We would like to make certain measurements on such a rod, but it is not necessary to have the shape very accurate. However, in this particular instance it would be essential to have the purest metal we can get. Therefore, this material would have to be prepared with distilled calcium, and I am particularly anxious that it should not be alloyed with any metal in the process of reduction or in the process of being recast. If the second process is not safe in this respect I would rather do without it and put up with inclusions, lower density, and more irregular shape.

This matter is not of great urgency, but it would be nice if we could have one such sample by the middle or the end of August.

Yours sincerely,

L. S.

(Leo Szilard)

copied 7-23-41 LH

copied 7-29-41 LH

32 Broadway
Dover New Hamp.
July 26. 1941

Dear Dr Szilard

Since writ. to you I received a wire from Dr Lundell say ing everything was going smoothly so I am going to take another week.

While in Berkeley at the Metal Hydride we were discussing the possibility of the sublimed calcium but Dr Alexander was under the impression that patent difficulties were also involved in the manufacture from calcium silicide.

I obtained the thesis on the preparation of the uranium which gives a good deal of information on the preparation of the metal and also beryllium by the calcium reduction method. The method used to sublime the calcium is also given.

Dr. Alexander says he is unable to remelt his metal after it has been once melted a sintered. He is of the impression that it will have to be melted in vacuum. If there is a possibility of using the cast metal I was going to suggest to Dr Briggs that we try to get a vacuum, tilting induction furnace. Dr. Alexander has a place in his factory which I examined, and which could be used for the preparation of uranium from the chloride. The metal in the brass box was presumably reduced twice with calcium hydride which evidently explains why this metal is so much better than the last batch of metal which was received.

Some of the equipment Dr Alexander has could be used for the chloride reduction method. He seems to want the bureau to supply the personnel for the development of the chloride method. I gathered from his conversation that he is a little uncertain as to whether the metal will be used on the side and evidently is a little uncertain about expansion of his equipment.

As you know we can recast our uranium metal without a great deal of trouble and I believe that is the best solution of the problem. If something specific were decided on we might try to get the necessary equipment but since it is rather expensive it is best to go a little slow.

I will be at the above address and could go to Berkeley again during the coming week if any thing new has developed.

I trust I will not inconvenience you by not seeing you Monday.

Sincerely yours.

Clement J. Rodden

Copied 7-29-41 LH

C
O
P
Y

July 28, 1941
(Copied July 29, 1941)

Letter from Eldorado Gold Mining Ltd. arrived for Rodden stating that they have shipped 5 cans, #1 to 5 inclusive, containing samples of Uranium Black Oxide. These are from cans containing Uranium Black Oxide which were sent to Dr. P. P. Alexander at Beverly. Sent at your request. Shipping and statement of their analysis to follow.

Samples have not yet arrived.

Scherrer

P. S. by Mitchell:

Immediate decision should be made as to just what analysis Bureau of Standards should make in addition to

1. Boron content
2. Total moisture content

COPIES

1 Pegram
1 Fermi
✓1 Szilard
2 Mitchell

C
O
P
Y

July 29, 1941
(Copied July 30, 1941)

Have a sample of magnesium from Holton on which the boron is desired.

He is using fine shavings in the preparation of uranium, using it instead of calcium.

The crucibles arrived but are about ½ inch too large. Holton is returning them for exchange to the desired size.

Scherrer

Copies

1 Pegram
1 Fermi
✓1 Szilard
2 Mitchell

July 29, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

I am sending you in a package a sample of calcium and a sample of calcium chloride which belong together, and we should like to know the boron content of these two samples. The samples are labeled "U. C. & C. sent 7/22/41 intermediate calcium" and similarly "intermediate calcium chloride".

In informing us of the result of the analysis for boron I should much appreciate your identifying these two samples by referring to these labels.

Very truly yours,

LS:H

(Leo Szilard)

cc: 1 - Pegram
1 - Fermi
1 - Szilard
2 - Mitchell

C
O
P
Y

July 31, 1941

We tested the samples of calcium metal labeled "U.C. & C. sent 7/22/41 intermediate calcium" #92, and calcium chloride labeled "U.C.&C. sent 7/22/41 intermediate calcium chloride" #93.

Results obtained are as follows:

Calcium metal #92, boron 115. parts per million
Calcium chloride #93, boron 9.6 parts per million

In dissolving the calcium metal I noticed a slight darkening probably due to inclusions of foreign matter. These sometimes occur in pockets. We are wondering if these inclusions may carry boron. We shall test this point tomorrow.

The magnesium which Halton is using has 2.8 P.P.M of boron.

Scherrer

Copies

1 Pegram
1 Fermi
✓1 Szilard
2 Mitchell

August 5, 1941

Dr. C. G. Rodden
National Bureau of Standards
Washington, D. C.

Dear Dr. Rodden:

The conference which I was supposed to attend at Washington has been postponed by a week, and I shall therefore not be in Washington on the 10th and 11th.

Please note that one of the topics for discussion at our next conference ought to be a more detailed analysis of the uranium oxide. Some method ought to be found to remove from the uranium oxide the bulk of the uranium so as to be able to have a spectroscopic analysis of the residue. We are particularly interested in those rare earths which have been previously quoted, and of course we are always interested in boron.

The analysis of uranium metal will come up later as soon as we have boron-free calcium, and we shall again be interested in the rare earths and also in lithium. I am mentioning this so that if you or Dr. Mueller want to have an opportunity to give some thought to the subject you should have an advance notice rather than have the problem suddenly thrust at you.

At my visit in Beverly I discussed with Dr. Alexander various steps which could be taken to prevent oxidation of the metal powder, and we have now fused blocks for uranium made from such protected uranium metal powder. Whether we have actually solved this problem or not I am not yet in a position to say, but I hope to know more when I see you.

Yours sincerely,

LS:H (Leo Szilard)

cc: 1 - Pegram
1 - Fermi
1 - Szilard
2 - Mitchell

August 5, 1941
Dictated August 4, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

I am sending you today by parcel post further samples from the Speer Carbon Company. Will you be kind enough to refer to these samples both by quoting their labels and by designating them as second shipment and the date of my present letter. I would appreciate an analysis for boron both of the samples to which you refer in your memorandum of August 2 and the present shipment.

Please note that this analysis is not as urgent as the other things for which I have been asking, but it would be desirable to have the result before the 20th of August.

Yours sincerely,

LS:H

(Leo Szilard)

cc: 1 - Pegram
1 - Fermi
1 - Szilard ✓
2 - Mitchell

Wednesday
Aug 6, 1941

Dear Dr Szilard:

It seems to me that a large sample would be necessary in order to determine the hydrogen chemically in the melted metal. Is it possible to obtain any more of the material.

What is the situation in regards to calcium? We have shown that subliming removes the boron and believe we can do this on a small scale. We have no more impure calcium with which to work. Since Dr. Alexander has had such excellent results with melting the metal it would appear superfluous for us to do any more work on this phase of the problem.

Your letter concerning the uranium analysis has been received and I would like to know what elements you would desire analyzed for. Cadmium, boron, lithium and rare earths of course are desired.

I do not know if you have received a report on the chlorine contained in the uranium from the brass box #72 which was found to be 0.02%

When do you intend to be in Worlington again? Another problem of determining the hydrogen in the metal is

that during the hot humid weather in Worlington we have very high blanks on our apparatus which would necessitate a large sample.

Very truly yours

Clement J. Rodden

N.B. Since the samples received from Eldorado were open in paper containers I hardly think the moisture determination will mean a great deal. Dr Hautton is going to run one which was received in a sealed container as well as the same sample which was received in the open envelope.

Their Sample #75 = 0.55 % water

Their Sample #125 = 0.63 % water.

Letter from Rodden says
The boron on the solid metal of Aug 4. 1941 on a preliminary run show about 60 p.p.m.

Wire this to Sa.

August 12, 1941

Dr. C. J. Rodden
Chemistry Building
National Bureau of Standards
Washington, D.C.

Dear Doctor Rodden:

I am sending you today by railway express a large package containing a large number of glass bottles which are numbered and which contain uranium oxide. A small number of bottles have been previously sent to you and analyzed for moisture. Perhaps you could store the bottles previously sent along with the present shipment so as to have everything in one place.

Kindly note that these uranium oxide samples are from the first 8 tons of uranium oxide delivered by Eldorado Gold Mines Ltd. to Columbia University. Further action as to an analysis carried out on these samples should await the outcome of our future discussions of the subject.

Yours very truly,

LS

(Leo Szilard)

LS:LH

Copies
1 Pegram
1 Fermi
1 Szilard
2 Mitchell

(L. Szilard)
Columbia University
in the City of New York
DEPARTMENT OF PHYSICS


Dr. C. J. Rodden
Chemistry Building
National Bureau of Standards
Washington
D. C.

JIH:GFH
V-4

1559

Standards

1320602 Operation and Administration,
National Bureau of Standards, 1942

CONFIRMATION COPY

Dr. L. Szilard,
Department of Physics,
Columbia University,
New York, N. Y.

Sulfide metals as oxides Columbia number 7 contains 0.68 number 49 contains 0.79. Metal hydrides number 144 contains 0.54 number 376 contains 0.65. Spectrochemical analysis later.

J. H. Hoffman,
NATIONAL BUREAU OF STANDARDS.

J H Hoffman tcw

THIS MESSAGE WAS TELEPHONED
AT THE TIME SHOWN ON THE
REVERSE HEREOF, AS CHECKED.

X Western Union ..... Postal
..... Navy Dept. ..... War Dept.
..... Radio Corp. of America

August 27, 1941

Dr. J. I. Hoffman
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Hoffman:

I am sending you with today's mail a bottle which has been labeled, "$U_3O_8$ No. 560 Box Eldorado Szilard August 27, 1941." This is a sample from the second lot of four tons which has been delivered to Columbia, and we are very anxious that you should determine the total $H_2S$ metals and have a spectroscopic analysis made. We are particularly interested in any lines of cadmium which may be present.

The analysis of this particular sample is urgent, because I understand that this sample is believed to be considerably worse than the samples which you have ~~ordered~~ already tested.

Yours sincerely,

(Leo Szilard)

LS:MEB

Copy to Dr. C. J. Rodden
Copies
1 Pegram
1 Fermi
1 Szilard ✓
2 Mitchell

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

# WESTERN UNION

1201

R. B. WHITE
PRESIDENT

NEWCOMB CARLTON
CHAIRMAN OF THE BOARD

J. C. WILLEVER
FIRST VICE-PRESIDENT

SYMBOLS

DL = Day Letter
NT = Overnight Telegram
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

NAJ14 26 GOVT=WASHINGTON DC AUG 16 1142A

DR L SZILARD= Kings Crown Hotel

DEPT OF PHYSICS COLUMBIA UNIVERSITY=

SULFIDE METALS AS OXIDES COLUMBIA NUMBER SEVEN CONTAINS 0.68 NUMBER 49 CONTAINS 0.79 METAL HYBRIDES NUMBER 144 CONTAINS 0.54 NUMBER 376 CONTAINS 0.65 SPECTROCHEMICAL ANALYSIS LATER=.

J I HOFFMAN NATIONAL BUREAU OF STANDARDS.

1205P

0.68 49 0.79 144 0.54 376 0.65.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

1# SAMPLES FROM
BOX NOS

88
463
500
557
598

8/29/41

SENT TO BUR. OF STDS.

DR. SZILARD

Woodley 1720

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

JIH:MMA

August 30, 1941

V-4

Dr. Leo Szilard,
c/o Columbia University,
Department of Physics,
New York City, N. Y.

| | | Columbia No. 16 | Metal Hydrides No. 144 |
|---|---|---|---|
| 1. | Total insoluble in $HNO_3$ = (Includes $SiO_2$ + $SnO_2$ | 0.45 % | 0.27% |
| 2. | $SiO_2$ = | .34 % | 0.21% |
| 3. | Insoluble, exclusive of $SiO_2$ but including $SnO_2$ = | .11 % | 0.06% |
| 4. | Ag = | .0025 % | 0.001% |
| 5. | Pb = | .013 % | 0.018% |

6. Cu, Mo, As, Sb in process of determination.

Cu = 0.15%

| | | $U_3O_8$ No. 560 |
|---|---|---|
| 1. | Total insoluble in $HNO_3$ = | 0.37% |
| 2. | $SiO_2$ = | .28% |
| 3. | Insoluble, exclusive of $SiO_2$, but including $SnO_2$ = | .09% |
| 4. | Total metals of the $H_2S$ group, as oxides = | 0.48% |

(This oxide apparently contains more impurities than any other so far analyzed by me.)

Very truly yours,

James I. Hoffman

James I. Hoffman

Form 259
11—10563

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

# National Bureau of Standards

## REPORT

on SPECTROCHEMICAL ANALYSIS of

Two Samples of Residues and
Three samples of Uranium Oxide

Submitted by

Division V Section 4
Attn: Dr. J. I. Hoffman

Date Submitted: August 27 and 28, 1941
Laboratory Nos: IV-1/2346-2349; 2353
Spectrogram Nos: W-564
Region of Spectrum: 2400-5000A

The spectrograms were examined for the sensitive spectral lines of the elements as shown in the accompanying table. The qualitative scale used in reporting the relative amounts of the elements in the samples is as follows:

| Designation | Scale Value | Designation | Scale Value |
|---|---|---|---|
| VS | Very Strong | VW | Very Weak |
| S | Strong | T | Trace |
| M | Moderate | FT | Faint Trace |
| W | Weak | - | Not Detected |

In general, the designations VS and S correspond to major constituents (greater than 1%), M and W to minor constituents (0.01 to 1%), and VW, T, and FT to trace constituents (less than 0.01%).

The absence of a designation indicates that a test was not made for that element.

NBS Test No. IV-1/Tp
WASHINGTON, D. C.,
August 30, 1941

Frederick Bates, Chief,
Optics Division

Inclosure. (Tentative Report)

BFS:AEH

NBS Test No. IV-1/Tp

## TABLE OF RESULTS

| Element | Sample 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Ag | VW | VW | T? | ##? | --? |
| Al | M | S | - | - | - |
| As | - | - | - | - | - |
| Au | - | - | - | - | - |
| B | - | - | - | - | - |
| Ba | T | T | - | - | - |
| Be | - | - | - | - | - |
| Bi | T? | T? | -? | -? | -? |
| C | | | | | |
| Ca | W | M | W | W | W |
| Cb | - | - | - | - | - |
| Cd | - | - | - | - | - |
| Ce | - | - | - | - | - |
| Co | M | W | - | - | - |
| Cr | W | W | - | - | - |
| Cs | | | | | |
| Cu | W | W | VW | VW | VW |
| Dy | | | | | |
| Er | | | | | |
| Eu | | | | | |
| Fe | VS | VS | M | M | M |
| Ga | - | - | - | - | - |
| Gd | | | | | |
| Ge | - | - | - | - | - |
| Hf | - | - | - | - | - |
| Hg | - | - | - | - | - |
| Ho | | | | | |
| In | - | - | - | - | - |
| Ir | - | - | - | - | - |
| K | - | - | - | - | - |
| La | - | - | - | - | - |
| Li | | | | | |
| Lu | | | | | |
| Mg | M | M | VW | VW | VW |
| Mn | W | W | VW | VW | VW |

| Element | Sample 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Mo | W | W | - | - | - |
| Na | - | - | - | - | - |
| Nd | | | | | |
| Ni | M | M | - | - | - |
| Os | - | - | - | - | - |
| P | | | | | |
| Pb | W | W | -? | -? | -? |
| Pd | - | - | - | - | - |
| Pr | | | | | |
| Pt | VW | VW | - | - | - |
| Ra | | | | | |
| Rb | | | | | |
| Re | - | - | - | - | - |
| Rh | - | T | - | - | - |
| Ru | - | - | - | - | - |
| Sb | - | - | - | - | - |
| Sc | - | - | - | - | - |
| Si | M | M | M | M | M |
| Sm | | | | | |
| Sn | W | W | | | |
| Sr | - | - | - | - | - |
| Ta | - | - | - | - | - |
| Tb | | | | | |
| Te | | | | | |
| Th | - | - | - | - | - |
| Ti | - | VW | - | - | - |
| Tl | - | - | - | - | - |
| Tm | | | | | |
| U | S | S | VS | VS | VS |
| V | M | M | - | - | - |
| W | W | W | - | - | - |
| Y | - | - | T? | T? | T? |
| Yb | | | | | |
| Zn | VW | VW | - | - | - |
| Zr | - | - | - | - | - |

| No. | IV-1 Lab. No. | Label of Sample |
|---|---|---|
| 1 | 2347 | Insoluble No. 16 = 0.11% |
| 2 | 2349 | Insoluble No. 144 = 0.06% |
| 3 | 2346 | $U_3O_8$ No. 16 |
| 4 | 2348 | $U_3O_8$ No. 144 |
| 5 | 2353 | $U_3O_8$ No. 560 |

copied by MEB 9/2/41

Aug 29, 1941

Dear Dr Szilard

Enclosed find some results on boron for various samples. Sample sent to Metal Hydride. We originally took the top of the can for No 144 and got

Original 16 p.p.m.

Recrystalized 8 p.p.m.

We have used several kilograms of this material for various work and today we ran another boron on it and found 4 p.p.m. I believe this is due to a variation in boron content of the sample. There may have been some unavoidable contamination in the top of this can.

| | | | |
|---|---|---|---|
| Can No 100 | # 303 | Metal Hydride | 4 p.p.m. |
| 101 | # 376 | " " | 4 p.p.m. |
| 102 | # 445 | " " | 6 p.p.m. |
| 103 | # 500 | " " | 6 p.p.m. |

Boron on Snow White Lime from American Cyanid 3.0 p.p.m.

Boron on some $CaCl_2$ anhydrous made from

Siena limestone and Grosetti HCl gone
1.4 ppm boron.

Dr Hoffman will send you a special
delivery tomorrow on his results.

Rodden.

Sept 4, 1941

Dear Dr Sylland

Following are the results on some $U_3O_8$ Samples

| Our Number | Yaen Number | Calendrig Number | Boron PPm |
|---|---|---|---|
| 134 | | 29 | 7 |
| 135 | | 36 | 7 |
| 136 | | 54 | 7 |
| 137 | | 60 | 6 |
| 138 | | 82 | 7 |
| 139 | | 91 | 7 |
| 140 | | 105 | 5 |
| 141 | | 163 | 5 |
| 143 | | 202 | 6 |

We have found some rare earths in number 144 - Tb Fluoride residue shows Dy - Y - Yb - Er, ~~Sc~~.

We are taking 10 lbs of 118 (Yaen No) and are getting the insoluble and sulfide graysor. After getting these we are going to try and get the rare earths on this lot. The silica dishes have arrived and these are being used in this work.

Rodd

No. 16 on No 144

AS. + 86

0.17 %

AS + 86

0.30 %

98

98.3

September 4, 1941

Dr. J. A. Scherer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherer:

I am sending you with today's mail a glass bottle filled with a solution of calcium chloride. This bottle is labeled, "Calcium Chloride Solution, Room 713 Merck September 4, 1941." We would very much appreciate an analysis for boron, and, as far as we are concerned, this boron analysis has precedence over all other boron analyses which you may be doing for us at present.

Yours very truly,

S

(Leo Szilard)

LS:MEB

Copies

1 Pegram
1 Fermi
1 Szilard
2 Mitchell

September 5, 1941

Dr. J. I. Hoffman
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Hoffman:

May I repeat for the sake of greater precision what I discussed with you today over the telephone. It seems to me that we would most likely arrive at a satisfactory over-all picture concerning our uranium oxide problem if we did four things:

(a) Hunt down the dangerous elements, i.e., silver, cadmium, arsenic, antimony, which are in the sulphide group;

(b) Hunt down the rare earths;

(c) Determine cobalt;

(d) Determine chlorine and nitrogen.

Instead of looking for any other element, it would probably be quite sufficient to determine what percentage of the material is uranium after the insoluble and the sulphide metals have been removed. This last point would be very important, particularly if it can be done with good accuracy. Naturally, if only 98% were uranium (after removal of the sulphides and the insoluble), then we would have to worry about the composition of this mysterious 2%, but, if 99.5% were uranium, then for the time being we need not worry about the composition of the remaining 1/2%.

Yours sincerely,

(Leo Szilard)

LS:MEB
Copy to Dr. Rodden
~~Copies: 1 Pegram, 1 Fermi, 1 Szilard,~~ 2 [illegible]

Sept. 10, 1941

Dr. Leo Szilard,
Columbia University,
New York City.

Dear Dr. Szilard.
The bottle filled with calcium Chloride solution received Monday was labelled "Calcium Chloride Solution Room 713 Merck September 4, 1941." Our laboratory number 144. All four of the bottles tested the same.

Boron content is 1.0 P.P.M of the solution by weight.

We also have the Boron on the following samples: marked Dr. Leo Szilard, Columbia University

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample no. | 140 | Uranium Oxide | bottle | no. | 105 | 5.0 P.P.M |
| " | 141 | " | " | " | " 163 | 5.0 " |
| " | 142 | " | " | " | " 184 | 8.5 " |
| " | 143 | " | " | " | " 202 | 5.7 " |

Sample no. 133 marked $U_3O_8$ from Box 560 Eldorado, Szilard, Aug. 27, 1940.
Boron 8.0 P.P.M.

Yours respectfully,
J. A. Schouer.

STANDARD TIME INDICATED

RECEIVED AT

2708 B'WAY, N. Y. C.
NEAR 104th STREET
AC. 4 - 9899

TELEPHONE YOUR TELEGRAMS TO POSTAL TELEGRAPH

Form 16

# Postal Telegraph

Mackay Radio
Commercial Cables

TELEGRAMS CABLEGRAMS RADIOGRAMS

All America C
Canadian Pacific Telegraphs

(41)

THIS IS A FULL RATE TELEGRAM, CABLEGRAM OR RADIOGRAM UNLESS OTHERWISE INDICATED BY SYMBOL IN THE PREAMBLE OR IN THE ADDRESS OF THE MESSAGE. SYMBOLS DESIGNATING SERVICE SELECTED ARE OUTLINED IN THE COMPANY'S TARIFFS ON HAND AT EACH OFFICE AND ON FILE WITH REGULATORY AUTHORITIES.

SEP 15 1941 10 01 AM

N.WA114 20 GOVT=TD WASHINGTON DC 15 935A

DR L SZILARD=

:DEPT PHYSICS COLUMBIA UNIV NEWYORK NY=

WILL BE IN NEWYORK TOMORROW MORNING CONCERNING URANIUM OXIDE EXPECT TO GO TO PORTHOPE WIRE WHEN I CAN SEE YOU=

:C J RODDEN NATIONAL BUREAU OF STANDARDS.

copied by MEB 9/24/41

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

CJR:MMA

September 22, 1941

V-4

Dr. L. Szilard,
Department of Physics,
Columbia University,
New York City, N. Y.

Dear Dr. Szilard:

Under separate cover we are sending to you the insoluble in $HNO_3$ residue and the sulfides from 10 1/2 lbs. of your No. 118. The rare earth fraction will be sent later.

The sample of beryllium has 8% insoluble and could not contain more than 63% beryllium. This figure includes beryllium as beryllium oxide and also any iron, etc., which would be precipitated with ammonium hydroxide.

Scribner has found iron, silicon, aluminum, and chromium in large amounts, and calcium, magnesium, copper and nickel in smaller amounts.

Very truly yours,

Clement J. Rodden

Clement J. Rodden

Chem. Dept. 867

Chandler

September 24, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

I am sending you with today's mail a sample of calcium chloride from Baker and Adamson which is a division of the General Chemical Company. I understand that this material is manufactured by Allied Chemicals, and the sample was secured through Professor Urey.

We should appreciate an analysis for boron, and it would be desirable to have the value not later than Monday morning of next week.

We shall have to talk next time about your results on the boron content of graphite coke which you have looked up yesterday.

Yours sincerely,

(Leo Szilard)

LS:MEB

copies
1 Pegram
1 Fermi
1 Szilard
2 Mitchell

September 25, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

I am sending you with today's mail a sample of calcium chloride from the J. T. Baker Chemical Company, Phillipsburg, New Jersey. This sample should be analyzed for boron. Please note that this analysis is not very urgent, and that it would be sufficient to have the result by the 15th of October.

Yours sincerely,

(Leo Szilard)

LS:MEB

Copies
1 Pegram
1 Fermi
1 Szilard
2 Mitchell

Sunday,
Oct 5/41

Dear Dr Syford

Since last seeing you I have been up to the National Research Council in Ottawa with a view to distilling the magnesium. I also went to Beauharnois and we have arranged to get the plant erected for subliming calcium as soon as possible. We are going to supply the equipment and Dr Alexander has been given a contract for $9500 for fixing up the plant and supplying labor etc for the production of not to exceed 5000 lbs of calcium. The payments are to be extended over 6 months after the installation of the plant.

In some experiments I made here I found that the

rare earths were soluble in $Na_2CO_3$ solution but that if this solution were made alkaline with NaOH the rare earths were precipitated. It would require considerable $Na_2CO_3$ to keep the uranium in solution however.

We have received 10 lbs from Podkar but no designation of what it is has been received.

From some information I received from Stedman in Canada (He wrote the negative received on the preparation of metallic uranium) I am led to believe we are receiving Belgian uranium and not Canadian. Stedman says Canadian uranium (pitchblende) has no

molybdenum whereas Belgian Congo pitchblende has. The material we have received on the large lot has considerably molybdenum. It might be well to check on the abundance ratio in the two varieties to see if there is any difference.

The new material that Alexander made and which Mr Schoen sent you values on yesterday show that the distilled Calcium has boron in it. I wonder if this is distilled material and not sublimed. We are going to sublime some. If it is distilled the boron may come from spraying of the baily calcium.

Rodden

Copies for
1 Pegram
1 Fermi
1 Szilard ✓
2 Mitchell

October 18, 1941

Dr. J. A. Scherrer
Chemistry Building
National Bureau of Standards
Washington, D. C.

Dear Dr. Scherrer:

I am sending you with today's mail sample of calcium from the Kemet Laboratories. This calcium is supposed to be part of the material which was distilled by this Company and which yielded distilled calcium containing about ten parts per million of boron. It would be of interest to see if this calcium which I am sending you today has a particularly high boron content, and, therefore, an analysis for boron performed at your convenience would be appreciated.

Yours sincerely,

LS

(Leo Szilard)

LS:MEB

CONFIDENTIAL

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

NRD
Olm

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

IN YOUR REPLY
REFER TO FILE

HTW:KSV December 2, 1941. D

Memorandum to: Dr. L. Szilard

The following instructions have been received from the Office of Scientific Research and Development:

"The Uranium Section is in the future at all times to be designated as Section S-1 rather than as the Uranium Section which has been the custom in the past. In the interest of secrecy it is desired that the name Uranium not be used under any circumstances when referring to this Section."

H T Wensel
H. T. Wensel,
Technical Aide, Section S-1.

Enclosure

Lawrence

# The University of Chicago

Metallurgical Laboratory

MIDWAY 0800
EXT. 1290

July 10, 1942

Mr. Alexander B. Blair
National Bureau of Standards
Washington, D. C.

Dear Mr. Blair:

You asked me to give you a record which you might use to determine whether I have made any patent~~ed~~able inventions in the past. In the following you will find a collection of ideas concerning the nuclear chain reaction. I have in each case indicated the approximate date and the type of record which is available. I hope that you will find this list useful for the purposes of the investigation which you are carrying out for the U. S. Government.

While I have included in this list references to ideas prior to June, 1939, it seems to me doubtful whether it will be possible to go back further than June, 1939. However, this is for you to ~~change~~ say. I have indicated with a star what I personally consider to be a real invention. The other ideas to which I did not put a star may or may not form inventions. I find it rather difficult to draw a sharp line between an idea which was fairly obvious on the basis of what everybody knew, and an idea which was really an original idea. Therefore the number of stars will have to be increased or decreased according to how severe a criterion we want to apply in determining what represents an invention.

1.* The conception of nuclear chain reaction which is maintained by means of neutrons as well as the general ~~ideas~~ laws to which such a chain would follow were first described by me in a British patent application, filed

in 1934, which I assigned to the British Admiralty. This patent has been sealed secret and was never published.

An American patent application was filed in March 1935, within one year of the filing date of the original British application. ~~Photo~~ copies of the ~~patented~~ pertinent pages of this American application could be procured and ~~can~~ be put at your disposal. These pages were cancelled before the patent was issued so that the published patent contains no reference to chain reactions and contains only such other matter as is of no interest from the point of view of national defense. (Uranium and thorium are explicitly mentioned in these pages.)

2. Early in January, 1939 (about January 10, but I can, if needed, establish the exact date) I learned from E. P. Wigner, in Princeton, of Hahn's discovery, that uranium is split by neutrons into two heavy fragments. I described orally to Dr. Wigner why I would expect that neutrons are emitted in this process and I explained to him the connection between these phenomena, and the possibility of maintaining a chain reaction in uranium. I also expressed the determination to establish the existance of the neutron emission by direct experiment and to follow up this experiment with the building of a chain reacting unit. Various memoranda written between the above mentioned conversation with Wigner and March, 9, 1939 are available, if required, in the form of photo copies, and contain, among others, the following points:

~~(a) Determination of the approximate ratio of uranium to water for which a chain reaction may be expected to go in a homogeneous mixture.~~

(a) Statement that the separate layers of water and uranium oxide can be used in place of a homogeneous mixture. (No statement was however made that such inhomogeneous systems can be expected to be

better from the point of view of the fission chain reaction than homogeneous mixtures).

b.) ~~The~~ statement concerning the advantage which can be derived by surrounding the chain reacting unit with ~~a~~ scattering material.

c.) Formulae were given to determine the approximate size of the chain reacting unit.

d.) A statement was made that instead of using only uranium, one may use uranium which has been enriched in the isotope 235 by subjecting uranium hexafluoride to one of the known diffusion methods which may be used to enrich one of the two isotopes.

e.) A statement was made that the delayed neutron emission, though ~~we can, place~~ week will play an important role ~~for~~ in making it easier to stabilize the chain reaction, ~~and~~ It was described that the chain reaction can be stabilized by moving a neutron absorber ~~intermittently~~ into ~~the~~ and out of the power unit and ~~in such a way as to be~~ stated that one may part of the time above and part of the time below the critical condition at which the chain reaction is divergent. ~~III Induced by radiation.~~

3.* Conception of a chain reaction in a system containing uranium and carbon. Orally communicated to Professor ~~P~~laczek, June, 1939, (~~from~~ some references for this contained in a letter from Professor ~~P~~laczek to me, dated June, 1939.)

a.) Calculation of the uranium-carbon system, July and August, 1939. The following systems were considered:

Plain layers of uranium oxide imbedded in carbon, infinite cylindrical rods embedded in carbon, and sphere shaped uranium oxide bodies imbedded in carbon.

The conviction that a carbon-uranium system ~~can~~ might be made to work and that it has great technical advantages over a uranium-water system

is stated in letters addressed to Fermi, early in July, 1939. These letters indicate the approximate ratio of uranium oxide to carbon and state that the uranium oxide might be used in layers, and that it would be, in any case, used in some "canned" form in graphite. Letters addressed to other persons and also letters concerning negotiations for obtaining ash-free graphite, all dated July, 1939, are available, if required.

Calculation concerning sphers of uranium in graphite orally communicated to Professor E. Teller, July, 1939.

References to calculations concerning infinite cylindrical rods orally communicated to Teller in August, 1939, and to Fermi, in September or October, 1939. (Further mention of cylindrical rods reached ~~the~~ at later occasions stressing advantages from a practical point of view. For instance, at the meeting of the uranium sub-committee, August, 1941. (present, Breit, Fermi, Wheeler, Pegram, Urey, Eckart, Allison and Smyth; notes made by Professor Breit available, if required). Complete formulae for case of cylinders were collected in August, 1941. Numerical calculations made by Feld, at my request, August, 1941). Drawings of hollow uranium tubes forming hexagonal lattice summer 1941.)

Advantage of spheres and advantage of using metal instead of oxide from the point of view of efficiency of the chain reaction stressed in memorandum of October, 1939, submitted to Dr. Briggs.

b.) Use of Bismuth for cooling considered in detail August 1939

5. Use of heavy water as second best to carbon, and making chain reaction with uranium, suggested in letter to Fermi, July, 1939.

6. Paper submitted to Phys. Rev. February, 1940, (Publication delayed, at my request, in view of the possible importance of the subject matter to national defense) contains the following points:

a. Expresses the conviction that chain reaction will, in fact, work ~~give~~ in a system composed of a lattice of uranium metal spheres imbedded in graphite. It gives a detailed but admittedly approximate ~~theory to~~

formulae

to determine the proper size of the uranium metal spheres, and the proper ratio of uranium to graphite.

b. It states that the chain reaction may be stabilized by moving a~~n~~ neutron absorber from a place of low neutron density to a place of higher neutron density within the chain reacting unit.

c It states that liquid bismuth can be used for cooling in ~~a~~ of the chain reacting unit.

* d It states that by keeping the uranium cold and the graphite hot, and even by allowing both uranium and graphite to heat up, the efficiency of the chain reaction may be improved. (that the ~~fission~~ efficiency of a chain reaction can be improved by keeping the uranium in the surrounding graphite cold, and heat insulating the cold part from the bulk of the graphite which may be allowed to heat up, was explained by me in greater detail at the meeting of the Uranium Sub-committee in August, 1941. Reference has been made further above. This effect is at present called differential cooling).

A statement is made in the paper concerning the time interval within which the controls used artificially stabilize the chain reaction, have to respond, and this time is calculated to be of the order of a few seconds.

Ins 7

7.) ~~Be surrounding U spheres~~
~~Uranium time Vho Nov. 1940~~

Patents file

**Metallurgical Laboratory**

September 4, 1942



Dear Mr. Blair:

You asked me to give you a record which you might use to determine whether I have made any patentable inventions in the past. In the following you will find a collection of ideas concerning the nuclear chain reaction. I have in each case indicated the approximate date and the type of record which is available. I hope that you will find this list useful for the purposes of the investigation which you are carrying out for the U. S. Government.



While I have included in this list references to ideas prior to June, 1939, it seems to be doubtful whether it will be possible to go back further than June, 1939. However, this is for you to say. I have indicated with a star what I personally consider to be a real invention. The other ideas to which I did not put a star may or may not form inventions. I find it rather difficult to draw a sharp line between an idea which was fairly obvious on the basis of what everybody knew, and an idea which was really an original idea. Therefore the number of stars will have to be increased or decreased according to how severe a criterion we want to apply in determining what represents an invention.

*1. The conception of nuclear chain reaction which is maintained by means of neutrons as well as the general laws to which such a chain would follow were first described by me in a British patent application, filed in 1934, which I assigned to the British Admiralty. This patent has been sealed secret and was never published.

An American patent application was filed in March 1935, within one year of the filing date of the original British application. This application contains the following passage:

"a. <u>Pure neutron chains in which the links of the chain are formed by neutrons of mass number 1 alone.</u> Such chains are only possible in the

presence of a metastable element. A metastable element is an element, the mass of which (packing fraction) is sufficiently high to allow its disintegration into its parts with liberation of energy. Elements like uranium and thorium are examples of such metastable elements; these two elements reveal their metastable nature by emitting alpha particles. Other elements may be metastable without revealing their nature in this way."

Formulae were given for the size of the unit which must be exceeded in order to have a divergent chain reaction.

~~The chain reacting unit.--~~

Copies of the pertinent pages of this American application could be procured and could be put at your disposal. These pages were cancelled before the patent was issued so that the published patent contains no reference to chain reactions and contains only such other matter as is of no interest from the point of view of national defense.

2. Early in January, 1939 (about January 10, but I can, if needed, establish the exact date) I learned from E. P. Wigner, in Princeton, of Hahn's discovery, that uranium is split by neutrons into two heavy fragments. I described orally to Dr. Wigner why I would expect that neutrons are emitted in this process and I explained to him the connection between these phenomena, and the possibility of maintaining a chain reaction in uranium. I also expressed the determination to establish the existence of the neutron emission by direct experiment and to follow up this experiment with the building of a chain reacting unit. Various memoranda written between the above mentioned conversation with Wigner, and March 9, 1939, are available, if required, in the form of dated photo copies, and contain, among others, the following points:

a.) Statement that separate layers of water and uranium oxide can be used in place of a homogeneous mixture. (No statement was however

made that such inhomogeneous systems can be expected to be better from the point of view of the ~~Mainn~~ efficency of the chain reaction than homogeneous mixtures).

b.) Statement concerning the advantage which can be derived by surrounding the chain reacting unit with scattering material.

c.) Formulae were given to determine the approximate size of the chain reacting unit in terms of various nuclear constants the value of which at that time was not known.

d.) A statement was made that the delayed neutron emission will play-- in spite of its weakness, an important role, inasmuch as it makes it easier to stabilize the chain reaction. It is described that the chain reaction can be stabilized by moving a neutron absorber into and out of the power unit. It was stated that this could be done in such a way that the unit would be part of the time above and part of the time below the critical condition at which the chain reaction is divergent.

*3. Conception of a chain reaction in a system containing uranium and carbon. Orally communicated to Professor Placzek, June, 1939, (some reference to this contained in a letter from Professor Placzek to me, dated June, 1939).

a.) Calculation of the uranium-carbon system, July and August, 1939. The following systems were considered:

Plain layers of uranium oxide imbedded in carbon, infinite cylindrical rods imbedded in carbon, and sphere shaped uranium oxide bodies imbedded in carbon.

The conviction that a carbon-uranium system might be made to work and that it has great technical advantages over a uranium-water system is stated in letters addressed to Fermi, early in July 1939. These

letters indicate the approximate ratio of uranium oxide to carbon and state that the uranium oxide might be used in layers, and that it would be, in any case, used in some "canned" form in graphite. Letters addressed to other persons and also letters concerning negotiations for obtaining ash-free graphite, all dated July 1939, are available, if required.

Calculation concerning spheres of uranium in graphite orally communicated to Professor E. Teller, July 1939.

References to calculations concerning infinite cylindrical rods orally communicated to Teller in August, 1939, and to Fermi, in September or October 1939. (Further mention of cylindrical rods repeatedly at later occasions stressing advantages from a practical point of view. For instance, at the meeting of the theoretical sub-committee, of the Uranium Committee, August, 1941. (Present, Breit, Fermi, Wheeler, Pegram, Urey, Eckart, Allison and Smyth; notes made by Professor Breit available, if required). Complete formulae for case of cylinders were collected in August, 1941. Numerical calculations made by Feld, at my request, August, 1941. Drawings of hollow uranium tubes forming hexagonal lattice, Summer 1941).

Advantage of spheres and advantage of using metal instead of oxide from the point of view of efficiency of the chain reaction stressed in memorandum of October, 1939, submitted to Dr. Briggs.

b.) Use of Bismuth for cooling considered in detail, August 1939.

5. Use of heavy water as second best to carbon, and making chain reaction with uranium, suggested in letter to Fermi, July 1939.

6. Paper submitted to Phys. Rev. February, 1940, (Publication de-

layed, at my request, in view of the possible importance of the subject matter to national defense) contains the following points:

a.) Expresses the conviction that chain reaction will, in fact, work in a system composed of a lattice of uranium metal spheres imbedded in graphite. It gives detailed but admittedly approximate formulae to determine the proper size of the uranium spheres and the ratio of uranium to graphite.

b.) It states that the chain reaction may be stabilized by moving a neutron absorber from a place of low neutron density to a place of higher neutron density within the chain reacting unit.

c.) It states that liquid bismuth can be used for cooling the chain reacting units.

*d.) It states that by keeping the uranium cold and the graphite hot, and even by allowing both uranium and graphite to heat up, the efficiency of the chain reaction may be improved. (That the efficiency of a chain reaction can be improved by keeping the uranium and the surrounding graphite cold, and heat insulating the cold part from the bulk of the graphite which may be allowed to heat up, was explained by me in greater detail at the meeting of the Uranium Sub-committee in August 1941, to which reference has been made further above. This effect is at present called differential cooling).

A statement is made in the paper concerning the time interval within which the controls used artificially stabilize the chain reaction, have to respond, and this time is calculated to be of the order of a few seconds.

7. The use of uranium spheres surrounded by one layer of beryllium metal was considered between June and November 1940. A memorandum giving sizes of the uranium sphere and the beryllium layer is available. (dated photo copies).

Concerning Separation of 235.

A. The suggestion to enrich uranium in 235 by applying a diffusion method to uranium hexafluoride was made by me in March, 1939. (dated photo copies available).

B. The suggestion of separating uranium 235 by means of a centrifuge in which a counter current is maintained by maintaining a temperature gradient along the axis (rather than by boiling with liquid) was made by me in May 1940. At that time a drawing was made to illustrate this principle, and this was submitted to Dr. Urey, Dr. Wigner and Dr. Fermi.

C
O
P
Y

September 4, 1942

Dear Mr. Blair:

You asked me to give you a record which you might use to determine whether I have made any patentable inventions in the past. In the following you will find a collection of ideas concerning the nuclear chain reaction. I have in each case indicated the approximate date and the type of record which is available. I hope that you will find this list useful for the purposes of the investigation which you are carrying out for the U. S. Government.

While I have included in this list references to ideas prior to June, 1939, it seems to be doubtful whether it will be possible to go back further than June, 1939. However, this is for you to say. I have indicated with a star what I personally consider to be a real invention. The other ideas to which I did not put a star may or may not form inventions. I find it rather difficult to draw a sharp line between an idea which was fairly obvious on the basis of what everybody knew, and an idea which was really an original idea. Therefore the number of stars will have to be increased or decreased according to how severe a criterion we want to apply in determining what represents an invention.

*1. The conception of nuclear chain reaction which is maintained by means of neutrons as well as the general laws to which such a chain would follow were first described by me in a British patent application, filed in 1934, which I assigned to the British Admiralty. This patent has been sealed secret and was never published.

COPY



An American patent application was filed in March 1935, within one year of the filing date of the original British application. This application contains the following passage:

"a. Pure neutron chains in which the links of the chain are formed by neutrons of mass number 1 alone. Such chains are only possible in the presence of a metastable element. A metastable element is an element, the mass of which (packing fraction) is sufficiently high to allow its disintegration into its parts with liberation of energy. Elements like uranium and thorium are examples of such metastable elements; these two elements reveal their metastable nature by emitting alpha particles. Other elements may be metastable without revealing their nature in this way."

Formulae were given for the size of the unit which must be exceeded in order to have a divergent chain reaction.

Copies of the pertinent pages of this American application could be procured and could be put at your disposal. These pages were cancelled before the patent was issued so that the published patent contains no reference to chain reactions and contains only such other matter as is of no interest from the point of view of national defense.

2. Early in January, 1939 (about January 10, but I can, if needed, establish the exact date) I learned from E. P. Wigner, in Princeton, of Hahn's discovery, that uranium is split by neutrons into two heavy fragments. I described orally to Dr. Wigner why I would expect that neutrons are

emitted in this process and I explained to him the connection between these phenomena, and the possibility of maintaining a chain reaction in uranium. I also expressed the determination to establish the existence of the neutron emission by direct experiment and to follow up this experiment with the building of a chain reacting unit. Various memoranda written between the above mentioned conversation with Wigner, and March 9, 1939, are available, if required, in the form of dated photo copies, and contain, among others, the following points:

a.) Statement that separate layers of water and uranium oxide can be used in place of a homogeneous mixture. (No statement was however made that such inhomogeneous systems can be expected to be better from the point of view of the efficiency of the chain reaction than homogeneous mixtures.)

b.) Statement concerning the advantage which can be derived by surrounding the chain reacting unit with scattering material.

c.) Formulae were given to determine the approximate size of the chain reacting unit in terms of various nuclear constants the value of which at that time was not known.

d.) A statement was made that the delayed neutron emission will play--in spite of its weakness, an important role, inasmuch asit makes it easier to stabilize the chain reaction. It is described that the chain reaction can be stabilized by moving a neutron absorber into and out of the power unit. It was stated that this could be done in such a way that the unit would be part of the time above and part of the time below the critical condition at which the chain reaction is divergent.

*3. Conception of a chain reaction in a system containing uranium and carbon. Orally communicated to Professor Placzek, June, 1939, (some reference to this contained in a letter from Professor Placzek to me, dated June, 1939).

a.) Calculation of the uranium-carbon system, July and August, 1939. The following systems were considered:

Plain layers of uranium oxide imbedded in carbon, infinite cylindrical rods imbedded in carbon, and sphere shaped uranium oxide bodies imbedded in carbon.

The conviction that a carbon-uranium system might be made to work and that it has great technical advantages over a uranium-water system is stated in letters addressed to Fermi, early in July, 1939. These letters indicate the approximate ratio of uranium oxide to carbon and state that the uranium oxide might be used in layers, and that it would be, in any case, used in some "canned" form in graphite. Letters addressed to other persons and also letters concerning negotiations for obtaining ash-free graphite, all dated July, 1939, are available, if required.

Calculation concerning spheres of uranium in graphite orally communicated to Professor E. Teller, July, 1939.

References to calculations concerning infinite cylindrical rods orally communicated to Teller in August, 1939, and to Fermi, in September or October, 1939. (Further mention of cylindrical rods repeatedly at later occasions stressing advantages from a practical point of view. For instance, at the meeting of the theoretical sub-committee, of the Uranium Committee, August, 1941. (Present, Breit,

Fermi, Wheeler, Pegram, Urey, Eckart, Allison, and Smyth; notes made by Professor Breit available, if required). Complete formulae for case of cylinders were collected in August, 1941. Numerical calculations made by Feld, at my request, August, 1941. Drawings of hollow uranium tubes forming hexagonal lattice, Summer 1941).

Advantage of spheres and advantage of using metal instead of oxide from the point of view of efficiency of the chain reaction stressed in memorandum of October, 1939, submitted to Dr. Briggs.

b.) Use of Bismuth for cooling considered in detail, August 1939.

5. Use of heavy water as second best to carbon, and making chain reaction with uranium, suggested in letter to Fermi, July 1939.

6. Paper submitted to Phys. Rev. February, 1940, (Publication delayed, at my request, in view of the possible importance of the subject matter to national defense) contains the following points:

a.) Expresses the conviction that chain reaction will, in fact, work in a system composed of a lattice of uranium metal spheres imbedded in graphite. It gives detailed but admittedly approximate formulae to determine the proper size of the uranium spheres and the ratio of uranium to graphite.

b.) It states that the chain reaction may be stabilized by moving a neutron absorber from a place of low neutron density to a place of higher neutron density within the chain reacting unit.

COPY



c.) It states that liquid bismuth can be used for cooling the chain reacting units.

*d.) It states that by keeping the uranium cold and the graphite hot, and even by allowing both uranium and graphite to heat up, the efficiency of the chain reaction may be improved. (That the efficiency of a chain reaction can be improved by keeping the uranium and the surrounding graphite cold, and heat insulating the cold part from the bulk of the graphite which may be allowed to heat up, was explained by me in greater detail at the meeting of the Uranium Sub-committee in August 1941, to which reference has been made further above. This effect is at present called differential cooling).

A statement is made in the paper concerning the time interval within which the controls used artifically stabilize the chain reaction, have to respond, and this time is calculated to be of the order of a few seconds.

7. The use of uranium spheres surrounded by one layer of beryllium metal was considered between June and November 1940. A memorandum giving sizes of the uranium sphere and the beryllium layer is available. (dated photo copies).

POL-96-B

VAP:mg

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. PATENT OFFICE
MAR 3 1954
MAILED

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

Serial No. 664,732 Filed April 25, 1946 Division 70

For Reactors

Applicant Leo Szilard and Gale J. Young

Assignee U. S. Government

SECRECY ORDER
(Title 35, United States Code (1952), sections 181-188)

NOTICE:- To the applicant above named, his heirs, and any and all his assignees, attorneys and agents, hereinafter designated principals.

You are hereby notified that your application as above identified has been found to contain subject matter, the unauthorized disclosure of which might be detrimental to the national security, and you are ordered in nowise to publish or disclose the invention or any material information with respect thereto, including hitherto unpublished details of the subject matter of said application, in any way to any person not cognizant of the invention prior to the date of the order, including any employee of the principals, but to keep the same secret except by written consent first obtained of the Commissioner of Patents, under the penalties of 35 U.S.C. (1952) 182, 186.

Any other application already filed or hereafter filed which contains any significant part of the subject matter of the above identified application falls within the scope of this order. If such other application does not stand under a secrecy order, it and the common subject matter should be brought to the attention of the Patent Office, Division 70.

If, prior to the issuance of the secrecy order, any significant part of the subject matter has been revealed to any person, the principals shall promptly inform such person of the secrecy order and the penalties for improper disclosure.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the alleged invention disclosed in this application; nor is it any indication of the value of such invention.

THIS ORDER IS EXCEPTED FROM THE PROVISIONS OF ANY GENERAL PERMITS.

Arthur W. Crocker

Assistant Commissioner

SH

Leo Szilard
P. O. Box 5207
Chicago, Illinois

Gale J. Young
C/O Roland A. Anderson
U. S. Atomic Energy Commission
1901 Constitution Avenue
Washington 25, D.C.

Roland A. Anderson
U. S. Atomic Energy Commission
1901 Constitution Avenue
Washington 25, D.C.

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

January 9, 1952

IN YOUR REPLY
REFER TO FILE
4.9

Dr. L. Szilard
University of Chicago
Chicago, Illinois

Dear Dr. Szilard:

Ed McMillan has just written to me in connection with an extra chapter I have to add to the next edition of my monograph on the cyclotron. He has very kindly attempted to clarify the early history of the development of phase stability.

In the course of the letter he refers to a German patent application which you made in 1934 in which reference is made to the principle of phase stability.

I am writing to you therefore to ask whether you would be so kind as to give the reference to this application and whether you could also please amplify in any way upon its general scope. Perhaps you would be able to spare or lend me a copy of the application?

Thanking you, I am

Yours sincerely,

W. B. Mann

W. B. Mann
Chief, Radioactivity Section

P.S. I would also be interested to know whether your patent application also referred to the "drawing out" of the orbits by change of frequency or magnetic field.

Thanks you very much. W. B. M.

216a

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

February 6, 1952

IN YOUR REPLY
REFER TO FILE

4.9

Dr. L. Szilard
University of Chicago
Chicago, Illinois

Dear Dr. Szilard:

On the 9th of January, 1952, I wrote to solicit your kind help on a point of historical importance in connection with a last chapter which I am writing for my monograph on the cyclotron. Unfortunately, since I have received no reply, I feel that the letter must have gone astray and as I am being "chased" by the publisher, I feel that I had better insure against possible loss of the previous letter by writing again.

In trying to get the historical details correct, I wrote to Ernest Lawrence and received a reply from Ed McMillan, in the course of which he referred to a German patent application which he said was made by you in 1934, in which reference was made to the principle of phase stability. In order to make my references to this subject complete, I would be most grateful if you could kindly give me the reference. I also would be interested to know whether your patent application may have referred, too, to the "drawing out" of the orbits by change of frequency or magnetic field. Is it also possible that you might have a spare copy of your patent application which I could borrow temporarily?

Thanking you, I am

Yours sincerely,

W. B. Mann

W. B. Mann, Chief
Radioactivity Section

PS As I understand you may be spending some time in Colorado I will ask that the letter be forwarded in the event that you are now there. I imagine that that is why you did not receive my last letter.

W. B. M.

216

5650 Ellis Avenue

February 13, 1952
Your file number 4.9

Dr. W. B. Mann, Chief
Radioactivity Section
National Bureau of Standards
Washington 25, D. C.

Dear Dr. Mann:

Many thanks for your very kind letter of February 6th. I am sending you under two separate covers:

a) A copy of a German patent application, the date of which is shown on the copy, which contains a description of the principle of the cyclotron, including a discussion of the stability of the orbit brought about by having the magnetic field decrease in strength with increasing radius. I do not believe that a patent was ever issued on the application.

b) A further copy of a British patent application which I filed in 1934 (provisional application). It describes the principle of operating an accelerator in which the frequency of accelerating voltage increases with time. It explains the principle of phase stability and mentions the rotating condenser as a means of bringing about the variation of frequency. No patent was issued on this application.

I hope that these documents will serve your purpose and I would appreciate very much if you could return them to me when you are through with them since they are the only copies I was able to find.

Yours sincerely,

LS/sds

Leo Szilard

215

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

February 20, 1952

IN YOUR REPLY
REFER TO FILE

4.9

Professor Leo Szilard
The University of Chicago
Institute of Radiobiology & Biophysics
5650 Ellis Avenue
Chicago 37, Illinois

Dear Professor Szilard:

I am writing to ask you a couple of questions in further elucidation of your two very interesting patent applications which you were so kind as to send me. I hope that you will permit this further intrusion on your time.

The first is for the number, for reference purposes, of the provisional British application. It is my belief that provisional numbers are granted and in this event it would be most useful. I may, however, be quite wrong in this respect.

The second question is regarding a statement in the British application to the effect that in the case of the synchronous transformer utilizing the applied high frequency electric field the frequency should first increase and then decrease. Actually in the synchro-cyclotron the accelerating action takes place with the frequency decreasing only, the increase occurring merely to return the frequency to normal before the next burst of ions. In your paper you suggest that the increase in frequency should occur during that part of the acceleration at energies where the relativity effect is not significant. In the German application, however, you already recognize that the velocity v is proportional to the radius r and that the angular velocity is therefore constant, i.e. a constant and not increasing frequency is necessary so long as the mass m of the ions remains constant.

I would be very grateful if you could kindly clarify this slight discrepancy for me. I find your papers most intriguing and remarkable, however, in their clear appreciation of the problem of obtaining high energy ions and I am most grateful that I have been able to include this little quoted but clearly earliest recognition of phase stability. Is there also perhaps a number for the German patent application? What relation too does this bear to Wideroe's paper? As far as I can see yours ante-dates his, but as yours is an application and the date that of submission, we should perhaps in that case compare the date on which he submitted his paper for publication. I imagine that Lawrence may also have been unaware of your application at the time, but I would greatly appreciate any further information you could give me on this point.

With kindest regards and very many thanks,

Yours sincerely,

W. B. Mann

W. B. Mann, Chief
Radioactivity Section

A-3

5650 Ellis Avenue

February 27, 1952
Your Reference No. 4.9

Dr. W. B. Mann, Chief
Radioactivity Section
National Bureau of Standards
Washington 25, D. C.

Dear Dr. Mann:

Many thanks for your very kind letter of February 20th which I shall attempt to answer paragraph by paragraph.

At one time I had a copy of the provisional British application together with a receipt showing the number and date of the application, but I lost this and the only thing that I have left is the photocopy which I sent you. The provisional application was filed in 1934 and it is possible that number and date could be obtained from the British Patent Office.

The statement I made in the British application that the frequency should first increase during that part of the acceleration during which the relativity effect is not significant is made in connection with an instrument in which the ions circle not between two simple pole pieces (such as are used in the cyclotron described in the German patent application), but between the pole pieces of a number of magnet segments (such as shown in one of the figures attached to the British application). In this case the average magnetic field to which the circling ion is exposed increases with increasing radius and this is the reason why the frequency has to be increased at first. Later on, when the relativity correction becomes predominant, the frequency has to decrease. The case of the cyclotron is a

special case of the more general case discussed in the British patent application. If the magnet segments are moved radially towards the center of the arrangement, the gap between the segments becomes smaller and smaller, and finally when it vanishes we have the magnetic field of the cyclotron which does not increase with increasing radius. In that case the time interval during which the frequency has to increase (before it starts decreasing) shrinks to zero.

The German patent application certainly had a number and I thought that the document I sent you gave it, but if it doesn't it might be rather difficult to obtain it now from the German Patent Office.

I am sending you enclosed a copy of another German patent application which preceded the one I sent you earlier. This deals with a linear accelerator. I remember that Wideroe's first paper appeared not long after my applications were filed.

It was my intention to build some of these machines and I turned over my patent applications to a colleague, Dr. D. Gabor, who at that time was with the Siemens Company and who thought that he might enlist the support of that company for this task. Nothing came of this, however.

I have never published anything on this subject and E. O. Lawrence had no way of knowing of my plans. I am certain that what he did was entirely independent. The same holds for McMillan's contribution.

If you have any further questions, please do not hesitate to raise them.

Sincerely yours,

Leo Szilard

LS/sds
Enclosure

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

June 18, 1952

IN YOUR REPLY
REFER TO FILE

4.9

Professor Leo Szilard
The University of Chicago
Institute of Radiobiology & Biophysics
5650 Ellis Avenue
Chicago 37, Illinois

Dear Professor Szilard:

I am returning herewith the two German patent applications which you so kindly lent me last February. I hope that I have not kept them too long, but have only just finished the revision of the monograph.

I have, however, been unable to identify the British patent number, but since I will be going to the United Kingdom next month, I am wondering whether you would mind my taking the first few pages of the photostat (the first 7 are separated from the rest of the patent application), with a view to identifying it at the Patent Office?

I am also enclosing herewith a copy of the references which I have made to your work and would appreciate any comments you may have regarding its accuracy. On second thoughts, I have felt that it might be better to delete the sentence beginning "It is interesting....." at the bottom of page 2 and continuing at the top of page 3, since the dates of the German patents are some one and two years, respectively, later than Lawrence and Sloan's and Lawrence and Edlefsen's papers on the two methods. Possibly, in the light of your much earlier suggestion of phase stability, these two references would detract from the historical interest, rather than add to it?

Thank you again for your kindness in letting me see these patent applications.

With kindest regards,

Yours sincerely,

Wilfrid B. Mann

W. B. Mann, Chief
Radioactivity Section

Enclosures

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

September 3, 1952

IN YOUR REPLY
REFER TO FILE
4.9

Professor Leo Szilard
The University of Chicago
Institute of Radiobiology and Biophysics
5650 Ellis Avenue
Chicago 37, Illinois

Dear Professor Szilard:

I am returning herewith, and with very grateful thanks, the copy which you were so kind as to lend me of your British patent application. During my recent visit to England I was able to identify this and, for your information, you might like to know that the application number is 5730 and it is dated 21st of February 1934.

Incidentally on looking through the photostats again, I note that figure 5 is missing. As, however, there appears to be a jump from figure 4 to figure 6 in the text and as figures 1 to 6 are still stapled together, as when I received them, I feel reasonably sure that I cannot have mislayed it.

I believe that in my previous letter I suggested that reference to your German patents rather detracted from that to the British patent which contained your suggestion of phase stability, especially as the German patents were, in fact, at a slightly later date than Lawrence's papers. I therefore deleted the sentences in question and trust that you will approve of this.

Once more, I would like to thank you for your kind help.

With kindest regards,

Yours very sincerely,

Wilfrid B. Mann

W. B. Mann, Chief
Radioactivity Section

Enclosures

POL-96b

VAP:mg

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

F-43

U. S. PATENT OFFICE

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

DEC 23 1952

MAILED

Serial No. 323,453 Filed Dec. 1, 1952 Division 70

For Chain Reactions

Applicant Enrico Fermi and Leo Szilard

Assignee - - - -

SECRECY ORDER

NOTICE:- To the applicant above named, his heirs, and any and all his assignees, attorneys and agents, hereinafter designated principals.

You are hereby notified that your application as above identified has been found to contain subject matter, the unauthorized disclosure of which might be detrimental to the public safety or defense, and you are ordered in nowise to publish or disclose the invention or any material information with respect thereto, including hitherto unpublished details of the subject matter of said application, in any way to any person not cognizant of the invention prior to the date of the order, including any employee of the principals, but to keep the same secret except by written permission first obtained of the Commissioner of Patents, under the penalties of Public Law 256, approved February 1, 1952, 66 Stat. 3.

Any other application which contains any significant part of the subject matter of the above identified application falls within the scope of this order. If such other application does not stand under a secrecy order, it and the common subject matter should be brought to the attention of the Patent Office, Division 70.

If prior to the issuance of the secrecy order any significant part of the subject matter has been revealed to any person, the principals shall promptly inform such person of the secrecy order and the penalties for improper disclosure set out in Public Law 256, 66 Stat. 3.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the alleged invention disclosed in this application; nor is it any indication of the value of such invention.

For your information the cited statutes are reprinted in the enclosed circular.

THIS ORDER IS EXCEPTED FROM THE PROVISIONS OF ANY GENERAL PERMITS.

John A. Marzall

ASSISTANT Commissioner

Enrico Fermi
5327 University Avenue
Chicago 15, Illinois

Leo Szilard
1155 E 57th St.
Chicago 37, Illinois

Roland A.Anderson
U.S. Atomic Energy Commission
Washington 25, D.C.

POL-96b

VAP:mg

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. PATENT OFFICE

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

DEC 22 1952

MAILED

Serial No. 323,451 Filed Dec. 1, 1952 Division 70

For Chain Reactions

Applicant Enrico Fermi and Leo Szilard

Assignee - - - -

SECRECY ORDER

NOTICE:- To the applicant above named, his heirs, and any and all his assignees, attorneys and agents, hereinafter designated principals.

You are hereby notified that your application as above identified has been found to contain subject matter, the unauthorized disclosure of which might be detrimental to the public safety or defense, and you are ordered in nowise to publish or disclose the invention or any material information with respect thereto, including hitherto unpublished details of the subject matter of said application, in any way to any person not cognizant of the invention prior to the date of the order, including any employee of the principals, but to keep the same secret except by written permission first obtained of the Commissioner of Patents, under the penalties of Public Law 256, approved February 1, 1952, 66 Stat. 3.

Any other application which contains any significant part of the subject matter of the above identified application falls within the scope of this order. If such other application does not stand under a secrecy order, it and the common subject matter should be brought to the attention of the Patent Office, Division 70.

If prior to the issuance of the secrecy order any significant part of the subject matter has been revealed to any person, the principals shall promptly inform such person of the secrecy order and the penalties for improper disclosure set out in Public Law 256, 66 Stat. 3.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the alleged invention disclosed in this application; nor is it any indication of the value of such invention.

For your information the cited statutes are reprinted in the enclosed circular.

THIS ORDER IS EXCEPTED FROM THE PROVISIONS OF ANY GENERAL PERMITS.

John A. Marzall

Assistant Commissioner

Enrico Fermi
5327 University Avenue
Chicago 15, Illinois

Leo Szilard
1155 E 57th St.
Chicago 37, Illinois

Roland A. Anderson
U. S. Atomic Energy Comm.
Washington 25, D.C.

VAP:mg

POL-96b

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

U. S. PATENT OFFICE

DEC 31 1952
MAILED

Serial No. 323,452 Filed Dec. 1, 1952 Division 70

For Chain Reactions

Applicant Enrico Fermi and Leo Szilard

Assignee - - - -

SECRECY ORDER

NOTICE:- To the applicant above named, his heirs, and any and all his assignees, attorneys and agents, hereinafter designated principals.

You are hereby notified that your application as above identified has been found to contain subject matter, the unauthorized disclosure of which might be detrimental to the public safety or defense, and you are ordered in nowise to publish or disclose the invention or any material information with respect thereto, including hitherto unpublished details of the subject matter of said application, in any way to any person not cognizant of the invention prior to the date of the order, including any employee of the principals, but to keep the same secret except by written permission first obtained of the Commissioner of Patents, under the penalties of Public Law 256, approved February 1, 1952, 66 Stat. 3.

Any other application which contains any significant part of the subject matter of the above identified application falls within the scope of this order. If such other application does not stand under a secrecy order, it and the common subject matter should be brought to the attention of the Patent Office, Division 70.

If prior to the issuance of the secrecy order any significant part of the subject matter has been revealed to any person, the principals shall promptly inform such person of the secrecy order and the penalties for improper disclosure set out in Public Law 256, 66 Stat. 3.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the alleged invention disclosed in this application; nor is it any indication of the value of such invention.

For your information the cited statutes are reprinted in the enclosed circular.

THIS ORDER IS EXCEPTED FROM THE PROVISIONS OF ANY GENERAL PERMITS.

Thomas F. Murphy
Assistant Commissioner

Enrico Fermi
5327 University Avenue
Chicago 15, Illinois

Leo Szilard
1155 E 57th St.
Chicago 37, Illinois

Roland A. Anderson
U. S.Atomic Energy Comm.
Washington 25, D.C.

AUG 1 1952

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

Information for Persons Affected by Secrecy Orders under Public, No. 256, approved Feb. 1, 1952. 66 Stat 3, (655 O.G. 607)

This form is forwarded with each secrecy order, or as a notice that the sections marked have not been properly followed in a petition for modification or rescission of the secrecy order:

| *Your Petition No.* | *Date* | *Ser. No. of Application* | *Petition Filed* | *Our No.* |
|---|---|---|---|---|

1. RECEIPTS:

The secrecy order is directed to the applicant, his heirs, and any and all his assignees, attorneys, and agents, hereinafter designated principals. Each principal receiving an order should personnally sign a receipt (PO 218) and return it without delay to the Commissioner of Patents (attention Division 70).

2. COMPENSATION

Any matters with respect to the following should be referred to the Department or Agency who caused the Secrecy Order to be issued.

1. Making the details of your invention available to the Government for consideration in connection with research or development programs.

2. Compensation in the event that use of the invention is made by the Government.

3. Any claim in accordance with Section 3 of the Law.

No modification of the Secrecy Order is required. However, there should be included in any papers submitted, a power to inspect and make copies or, preferably, a copy of the application.

3. PROSECUTION:

A secret application must be prosecuted under the Rules of Practice until a notice is received from the Examiner that all the claims then in the case are allowable. The prosecution of the case is closed by such a notice (or by any ordinary notice of allowance followed by a withdrawal from issue because of a secrecy order), but the application will be withheld from issue during such period as the national interest requires (Public, No. 256). No final fee is due in a secret application because no "notice of allowance" (Rule 311) stands therein; if already paid the fee will be refunded.

If any nonsecret application contains any significant part of the subject matter of a secret application, it is the duty of the applicant to call such applications and the common subject matter to the attention of this Office. Such a notice should include any known data as to the possible futility of a secrecy order in the nonsecret application, including such facts as would appear in a petition to rescind. If in such an application, the final fee is due it should be paid, but to give the Patent Office time for a decision as to secrecy the applicant should request a deferred issue.

Appeals to courts and interferences must not involve violation of secrecy orders. Maximum effort will be made in this Office to treat all applications in a manner to preserve the rights of the parties.

4. MODIFICATION OR RESCISSION:

If for any reason it appears that a secrecy order should not be maintained, or that it is necessary to make a disclosure not previously authorized, a petition to withdraw or modify the

order should be addressed to this Office. A modification or rescission of the secrecy order in one application permits disclosure of the subject matter of that application although covered in part by secrecy orders in other applications.

Petitions may be in letter form (preferably on legal size paper), but should be identified as petitions in the heading of the letter and should clearly express what is being requested, although several separable requests may be included. A brief statement of the novel subject matter of the secret application will aid in the prompt consideration of each petition. Requests for especially prompt action should be very briefly stated at the foot of the first page and should include any pertinent dates involved. The requirements include:

(1) Copies.—In view of the fact that consideration of the material is given by more than one agency, each exhibit, unless very extensive, affidavit, and petition to modify or withdraw should be accompanied by a duplicate copy (such copy need not be executed, a typed or stamped signature is adequate). Particularly in the case of a petition which applies to more than one application, further copies may be required. The requirement for duplicate copies does not apply to mere notices, such as those required for applications involved in general permits. A single copy of the Specification and Drawings of the subject application, together with letter, in duplicate, permitting authorized representatives of the affected Government agencies to inspect such Specification and Drawings must be submitted unless the invention has been tendered to the Government under the Law and a copy or copies have been submitted to a Government agency in which instance a reference identifying the agency will be sufficient.

(2) Verification.—All statements made must be verified by an affidavit of a competent person aware of the facts, properly signed, notarized, and sealed.

(3) Interest.—Petitioner must expressly state the right, title, or interest under which he claims authority to disclose the subject matter covered by the petition.

(4) Government contracts involved.—The petition should be supported by a statement by one having personal knowledge of all the facts (or a statement setting forth that a diligent investigation has been made in places where information relating to contracts should be found and to the best of the knowledge and belief of the person making the affidavit) that neither the invention of the application nor any material part thereof was developed under or is otherwise related to any Government contract with the principals except as follows: . . . . . .

4A. RESCISSION:

In addition to the above general requirements a petition to rescind must set forth substantial reasons therefor, including:

(1) Publication.—Complete data as to any issued patents or other publications disclosing the invention, and copies thereof.

(2) Public Use.—Any known data as to public use at any time.

(3) Disclosure.—Complete data as to any foreign applications or other foreign disclosure of the invention, including the names of the consignees and the secrecy status. The mere *fact* that foreign secrecy orders have been refused or rescinded is of much less importance than the *reasons* for such action. The importance of foreign filing as a ground for rescission depends particularly on the war status of the country involved as enemy, neutral, or allied.

(4) Completeness.—The allegation that the prior patents or publications or the foreign applications disclose everything disclosed in the United States application.

4B. MODIFICATION:

The secrecy order provides "_____ you are ordered in nowise to publish or disclose the invention or any material information with respect thereto, including hitherto unpublished details of the subject matter of said application, in any way to any person _____." In certain instances, this order is modified by a permit issued by the Commissioner at the same time as the secrecy order. The secrecy order prohibits disclosure of the subject matter of the particular application and that part of the subject matter of all other applications which also exists in the secret application; accordingly, keeping others informed of the progress of an invention or patent application, or the preparation and filing of any subsequent application relating to the secret application, requires a modification of the secrecy order only if it is necessary to disclose the secret subject matter to any person not having knowledge of the subject matter of the secret application.



The Patent Office and other agencies wish to avoid any action leading to possible violation of secrecy orders. Therefore the principals should inform all their agents that where papers are filed *(a)* by a person not of record, or *(b)* relating to such matters as: (1) issuance of a license for transmitting subject matter to foreign patent offices or other consignees; (2) appointment of a new attorney; (3) recording of an assignment to persons not of record, dated after the secrecy order; or (4) mailing of photostats to persons not of record, it should appear of record that the subject matter of the particular application was (or will be) properly disclosed to such person, i.e., prior to the issuance of the secrecy order or under a modification and with notice of the secrecy order. If, for any reason, it appears necessary to make a disclosure not coming within the provisions of a previously granted permit, a petition for modification of the order should be submitted and in addition to the above general requirements must set forth:

(1) Any known data as to the possible futility of the secrecy order, including such facts as would appear in a petition to rescind.

(2) The name, address, business, and citizenship (if a naturalized citizen, the name of his native country and the date of his naturalization) of each person to whom it is desired that the disclosure be made.

(3) The purpose of the proposed disclosure.

(4) A statement vouching for the reliability and integrity of the proposed disclosees.

(5) In special types of petitions:

Disclosure to employees.—Additional verified information may be required including (*a*) the duties, in relation to the invention, of each of the proposed disclosees; (*b*) the length of employment of such persons in the present company; (c) a statement by a responsible officer of the company employing the persons to verify their integrity and loyalty; (*d*) a statement of assurance by a responsible officer of the company employing the proposed disclosees that the disclosure would not be detrimental to the public interest or war effort and that the number of such persons is the minimum number necessary.

Disclosure by foreign filing.—The *requirements* of the secrecy and license sections of the law are separate and distinct, but petitions under these requirements may be co-pending. A *permit* (or modification) is required to provide for any *disclosure* of secret subject matter. Consignees should be considered on the same basis as any other disclosees (see (4) above). If the permit is granted, designated consignees and appropriate personnel of the foreign patent office and other necessarily involved foreign government agencies are the only proper disclosees. If no consignee is named the papers can only be sent directly to the foreign patent office. Foreign secrecy as implied or required in every foreign filing permit requires either that secrecy be imposed by the country of filing or that petitioner can (under usual patent practice of the country, or as a condition on the filing of the application) prevent publication or opening to public inspection, and will do so by any necessary means, including abandonment. The law requires a *license* from the Commissioner of Patents for filing a *foreign* application on an invention made in the United States whether or not secrecy and disclosure are involved, but such license will be denied if violation of secrecy is probable. Petition for such license must be made in accordance with rules and regulations prescribed by the Commissioner as provided in the Law. Copies of the regulations may be obtained upon request addressed to the Commissioner (attention Division 70).

Disclosure under General Permits.—In certain instances "general permits" can be obtained. These permits are limited to patent applications of specified subject matter, ownership, or both, according to the form of the permit. A petition for a general permit (to include future secrecy orders) should list all applications now secret to be covered by the permit and should be definite as to the class of persons and subject matter involved; unnecessary breadth may result in delay or denial. A copy of the general permit will be entered in each application file listed either in the petition or in a later notice as required by the permit; the notice will be filed in this division. General permits and amendments thereto are open to inspection by anyone who may disclose under their authority.

PO-216
(5-56)

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

VAP:wft

U. S. PATENT OFFICE

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

SEP 11 1956

MAILED

Serial No. 323,452 Filed Dec. 1, 1952 Division 46

For Chain Reactions

Applicant Enrico Fermi and Leo Szilard

Assignee U. S. Government

RESCINDING ORDER

The Secrecy Order dated December 31, 1952 prohibiting disclosure or publication of the subject matter of the above entitled application under the provisions of Title 35 United States Code (1952) 181-188 is hereby rescinded. Normal prosecution is continued and any suspension thereof because of the secrecy order should now be removed. This rescinding order does not affect the provisions of any classified government contract or existing laws relating to espionage and national security.

All security classification markings appearing in this file have been cancelled.

Arthur W. Crocker

First Assistant Commissioner

Enrico Fermi
5327 University Avenue
Chicago 15, Illinois

Leo Szilard
1155 E 57th Street
Chicago 37, Illinois

Roland A. Anderson
U. S. Atomic Energy Commission
Washington 25, D. C.

Film A-3

file

March 20, 1953

Dr. W. B. Mann
Chief, Radioactivity Section
National Bureau of Standards
Washington 25 D.C.

Dear Dr. Mann,

I am writing to thank you somewhat belatedly for your letter of September 3, 1952. In this letter you wrote, among other things, that my German patents were at a slightly later date than Lawrence's papers. I would appreciate your letting me know the correct references to Lawrence's papers. I assume that they are contained in a new manuscript and that it would not be much trouble for you to dig them out.

With kind regards,

Sincerely,

Leo Szilard

LS/llt

R-27

# U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D. C.

April 7, 1953

IN YOUR REPLY
REFER TO FILE NO.
4.9

Prof. Leo Szilard
The University of Chicago
Institute of Radiobiology
and Biophysics
Chicago 37, Illinois

Dear Professor Szilard:

Very many thanks for your letter of March 20, 1953 and once again for your kindness in allowing me to see copies of your very interesting patent applications.

I have looked up the dates as I have them noted down in the manuscript and find that the linear resonance references of Lawrence are E. O. Lawrence and D. H. Sloan, Proc. Nat. Acad. Sci. 17, 64, 1931 and D. H. Sloan and E. O. Lawrence, Phys. Rev. 38, 3021, 1931. The first cyclotron reference is E. O. Lawrence and N. E. Edlefsen, Science 72, 376, 1930.

I hope that these references will be of use to you.

With kindest regards.

Yours very sincerely,

Wilfrid B. Mann

W. B. Mann, Chief
Radioactivity Section

F - 43

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON 25

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS

June 25, 1953

IN YOUR REPLY
REFER TO FILE

4.5

Professor L. Szilard
University of Chicago
Chicago, Illinois

Dear Szilard:

I have been looking recently into questions of electron polarization, and in the process I looked at a paper by Rupp in which he claims collaboration with you. This paper is in Vol. 33 of the Physikalische Zeitschrift and gives also as an added reference a joint paper in Naturwissenschaften, 19, 44, 1931. In spite of the fact that many of the papers of Rupp have been discredited, I cannot believe that any part with which you collaborated would be entirely wrong and that is why I would like to find out from you what part of those papers you are willing to certify as acceptable nowadays. In particular, I am interested in the electron velocity which was used because rumor had it at one time that Rupp never had in his laboratory any power supply going above 100 kv.

Any information on this subject, together with your present views on the polarization of electrons, would be very much appreciated.

With best regards.

Sincerely yours,

L. Marton

L. Marton, Chief
Electron Physics Section

July 23, 1953

Dr. L. Marton, Chief
Electrical Physics Section
National Bureau of Standards
Washington 25, D. C.

Dear Dr. Marton:

I have your letter of June 25 in which you asked about my joint paper with Rupp, published in 1931. During this work, a few things seemed funny to me, and I went to the point of inserting some of the films myself and also developing some of them myself after exposure.

However, since I had no suspicion of fraud, I did not check whether the films which I developed had not been preciously exposed. In the light of subsequent information, I am afraid I cannot vouch for any of the pictures obtained, and for all I know, they all may have been faked.

Neither of those two papers that you mentioned are acceptable, in my opinion.

Very best regards,

Leo Szilard

LS:jda

K-5

DEPARTMENT OF COMMERCE

United States Patent Office
Washington

May 24, 1955

Pennie, Davis, Marvin & Edmonds
Room 1800-247 Park Avenue
New York, N. Y.

Dear Sirs:

Enclosed herewith is a copy of a petition for access to application of Leo Szilard, Serial No. 236,017, in which you appear as attorneys of record.

Action on this petition will be withheld for one week from the date hereof to enable you to present your objections, if any, to the granting of the petition.

Very truly yours,

/s/ J. SCHIMMEL

Law Examiner

Enc: 1

Strauch, Nolan & Diggins
111 E Street N. W.
Washington, D. C.

K-5

E1885
26:DE
COPY:DE

IN THE UNITED STATES PATENT OFFICE

| | |
|---|---|
| In re application of | ) |
| LEO SZILARD | ) |
| Serial No. 236,017 | ) |
| Filed: March 20, 1939 | ) |
| For: APPARATUS FOR NUCLEAR TRANSMUTATION | ) |

PETITION FOR ACCESS

Hon. Commissioner of Patents

Washington 25, D. C.

Sir:

This is a petition for access to and permission to make copies of the above-identified application cited in an Official proceeding before the Atomic Energy Commission Patent Compensation Board by the Office of General Counsel for the Atomic Energy Commission.

We have been requested by Roland A. Anderson, Esq. of that Office to apply for access to and a copy of the above-identified application through the Patent Office to eliminate any question of authenticity of any of the papers forming part of said application.

It is respectfully requested that the undersigned attorneys be granted permission to inspect said application file and purchase a copy of any or all parts as desired.

Respectfully submitted,

/s/ STRAUCH, NOLAN & DIGGINS
Strauch, Nolan & Diggins



COPY

K-5

COPY:DE

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

file

June 30, 1955

Rec'd July 1, 1955

| | | |
|---|---|---|
| In re application of | : | |
| Leo Szilard | : | |
| Serial No. 263,017 | : | |
| Filed March 20, 1939 | : | Petition for Access |
| For: Apparatus for | : | |
| Nuclear Transmutation | : | |

Strauch, Nolan & Diggins petition for access to the application of Leo Szilard, Serial No. 263,017, on the ground that it was cited in an Official proceeding before the Atomic Energy Commission Patent Compensation Board. Respondent opposes the petition, indicating that a copy of his objections has been sent to petitioners.

Since there is no showing that respondent was in any way responsible for the citation referred to, the showing presented is deemed to be insufficient to warrant granting access over respondent's objections.

The petition is denied.

/s/ ARTHUR W. CROCKER

Assistant Commissioner

Strauch, Nolan & Diggins
1111 E Street N. W.
Washington, D. C.

Pennie, Davis, Marvin & Edmonds
Room 1800 - 247 Park Avenue
New York, New York