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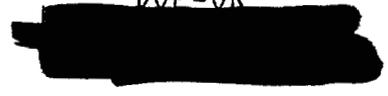
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MONTHLY STATUS AND PROGRESS REPORT
FOR FEBRUARY 1949

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A Report Submitted

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March 8, 1949

W. E. Kelley, Manager

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MONTHLY STATUS AND PROGRESS REPORT

FOR FEBRUARY 1949

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I. ADMINISTRATION

New procedures were adopted with regard to several personnel and organization matters. Meetings were held to discuss personnel classification, wages, and recruitment. Conferences were attended in connection with labor and wage problems existing at AEC contractor sites. Surplus equipment at the Chandler Street Plant, Buffalo, is being disposed of. The question of reimbursement for property transferred was discussed with the Washington Office. Permission was obtained for the temporary use of a War Assets Administration building. Arrangements have been made to procure precious metal required by the New Brunswick Laboratory.

New Procedures

A procedure was established for obtaining monthly reports from cost-type contractors, construction contractors, and fixed-price supply contractors operating on a permanent basis, indicating their personnel strength in accordance with Bulletin GM- 123.

A procedure was devised to insure that the information necessary to maintain the AEC Consultant Directory, published by the Washington Office, would be forthcoming at all times from NYOO Division Directors and from contractors.

Policies and procedures were established regarding (1) centralization of traffic and transportation activities and (2) occupational deferment under the Selective Service Act of 1948.

Personnel Classification and Wage Administration

Preliminary discussions were held to determine the most feasible method to follow in ranking of key jobs by operating officials. This will constitute the next step in the development of a system of job evaluation.

Data were secured for the Washington AEC Office concerning (1) rates paid for various classifications peculiar to the chemical industry, (2) rates paid for various classifications peculiar to contractor organizations dealing with radioactive material, and (3) procedures followed by NYOO relating to wage-rate predeterminations by the U. S. Department of Labor, particularly as they relate to sub-contractors and sub-subcontractors.

Recruitment

Meetings have been held with representatives of each division by the Chief, NYOO Placement, Employee Relations, and Training Branch to discuss the drafts of proposed procedure covering recruitment, selection, promotions, and transfer of candidates. The representatives will hold meetings with their own divisions to acquaint supervisors and employees with new procedures and to obtain suggestions and comments. These suggestions will be further discussed with members of the NYOO Office of Organization and Personnel, who will then transmit them to the Washington Office.

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Contractor Personnel Relations

Several conferences and follow-up meetings were attended to discuss problems pertaining to labor and wages.

CPFF Contractors. Conferences and follow-up meetings were held with representatives of several contractor organizations relative to labor-cost phases of proposed CPFF contracts. Reimbursement provisions covering wages, salaries, and personnel policies were worked out, and most points of disagreement were resolved. The organizations were Friez Instrument Division of Bendix Aviation Co., Burns and Roe, Inc., Foote Mineral Company, Research Laboratories of Bendix Aviation Co., Canton Drop Forge Co., Revere Copper and Brass Co., and Clifton Products Inc.

Report of the President's Commission on Labor Relations of AEC. At the request of the Washington Office, a staff review was made of the report by the President's Commission on Labor Relations of AEC, and comments were submitted to Washington. It was recommended that the suggested mediation machinery should not be employed automatically on government-owned privately-operated AEC projects where all the work at the location was not AEC work. In such cases, a finding of essentiality of the service being performed for the AEC should be made prior to employing the suggested machinery.

Raytheon Manufacturing Company. In order to avoid interference with seniority provisions of the union contract by AEC security regulations, which results in loss of pay to employees involved, the union has suggested that security clearances be effected in advance of lay-offs for non-AEC workers who have qualifications required for AEC work. It was explained to the union representatives that such action would result in building up a large workload of cases for individuals who might never be employed on AEC work. It was explained also that, because it was a problem common with many contractors, the NYOO could not make a decision, but would refer the problem to the Washington Office.

Surplus Equipment at Chandler Street Plant, Buffalo, New York

Representatives from Oak Ridge completed their selection of items of surplus equipment from the Chandler Street Plant, Buffalo, New York. Requisitions are being submitted by them for items desired. Lists of the remaining items are being circulated throughout the Atomic Energy Commission. Any equipment remaining after March 15, 1949, will be disposed of through regular prescribed channels.

Transfer of Property Without Reimbursement

Discussion was held with Mr. M. E. Pitts, Director, Office of Administrative Operations, regarding the provisions of GM Bulletins 99 and 105, covering the transfer of property without reimbursement. In view of the rigid budget requirements, it was felt that in certain cases the requisitioning office should be required to reimburse the transferring office. This matter had previously been discussed by Mr. H. B. Fry, NYOO Staff Assistant, with Mr. L. H. Noble, Assistant to Comptroller, and Mr. F. J. McCarthy, Deputy Director, Office of Budgets, Washington Office. Mr. M. E. Pitts will follow through and advise later as to the decision regarding this problem.

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Request for Igloo at Lake Ontario Ordnance Works

Request was made of the War Assets Administration for a 30 to 60 day loan of an igloo building adjacent to the present disposal area at the Lake Ontario Ordnance Works for the purpose of conducting experiments regarding the storage of K-65 material. Approval and right-of-entry has been granted.

Precious Metals for New Brunswick Laboratory

Arrangement has been made with the National Bureau of Standards for the exchange of iridium for platinum to be used by the New Brunswick Laboratory. Arrangements were also made for the acquisition, without reimbursement, of gold and platinum from various excess sources. The value of these precious metals is approximately \$100,000.

II. PUBLIC INFORMATION

The Teacher's In-Service Program on Atomic Energy began during the month, the first lecture being given by Commissioner Sumner T. Pike. The press continues to display an active interest in AEC activities.

The Teacher's In-Service Program

During February the NYOO Office of Public Information Service assisted the Board of Education of the City of New York with the Teacher's In-Service Training Program on Atomic Energy. The program will comprise a series of fourteen weekly lectures. The first two lectures were delivered by Commissioner Sumner T. Pike and Dr. John R. Dunning of Columbia University. The course is being attended by over 1200 teachers from public, parochial, Yeshiva, and private schools and also by representatives of the Army, Navy, and Air Force and of the New York City Police, Fire, and Sanitation Departments.

The Alfred A. Knopf Co. has expressed keen interest in publishing the text of the lectures, and the D. Van Nostrand Co. is interested in preparing a text-book on the basis of the course. The municipal radio station, WNYC, will record the complete lecture series, including questions and answers after the formal lectures. Broadcasts will commence about midway through the course, and continue on a weekly basis.

Press Relations

Queries from the press increased somewhat during February, and totaled over 150 for the month. The subject matter of queries covered the entire range of Commission activities, with a noted increase of interest in matters of radiation safety.

A press release has been prepared regarding the relocation of the Brush Beryllium Co. in Luckey, Ohio, and plans have been made for its announcement.

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III. PRODUCTION

A final green salt research meeting was held at NYOO. Plant recommendations and engineering cost proposals will follow. The disposition of uranium scrap croppings resulting from the metal quality program is under study. Discussions were held regarding development work on the use of CX as a refinery feed, and a program of action was decided upon. Plans have been completed for the storage of radium sludge in 55-gallon steel drums at the Lake Ontario Ordnance Works. Preliminary tests at the Harshaw Chemical Company indicate that the brown oxide plant will begin operations within a few weeks. The Joslyn Manufacturing & Supply Company will shortly submit a formal proposal for the rolling of uranium rods and the machining of slugs for the Chalk River Pile. A representative of Battelle Memorial Institute is carrying out tracer studies on monazite extraction solutions at Oak Ridge National Laboratory to determine which rare earths are interfering with the extraction of uranium and thorium.

Project-purity magnesium for the bomb reduction of uranium metal has been prepared successfully from low grade magnesium ingots at the New England Lime Company in preliminary runs. Difficulties have been encountered in the procurement of graphite for metal production operations.

To fulfill the Materials Development Reactor requirements, additional beryllium casting facilities will be installed at the Beryllium Corporation and the Brush Beryllium Company. It is anticipated that the already-existing AEC-owned plant at The Beryllium Corporation will be in regular production sometime in March. Since additional extrusion facilities will be required to meet the accelerated program, a contract has been negotiated with the Canton Drop Forging Company to operate the Adrian, Michigan, extrusion plant.

The chlorinator at Clifton Products, Inc., used for converting beryllium oxide to chloride, has been examined to determine the health and safety hazards involved in its operation. Provisional approval has been given Clifton to operate the high temperature beryllium electrolyte units. Production operations at the new Brush plant at Luckey, Ohio, are scheduled to start on August 1, 1949.

The contract with Burns and Roe, Inc. for the operation of the "Sheer-Korman" pilot plant for the production of beryllium chloride has been signed, and construction will be under way in the early part of March. A letter contract has been issued to the Brush Beryllium Company for the construction and installation of a beryllium producing plant at Luckey, Ohio. Engineering and designing are in process, and the actual equipment movement to Luckey awaits approval by the Munitions Board.

Security problems at Sylvania were reviewed in great detail, since it is anticipated that enriched uranium will be handled there shortly. As a result of meetings with Dr. Etherington, Dr. Ashcraft, and representatives of NYOO, Sylvania will submit powder metallurgy compacts of uranium and zirconium.

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The dissociation of zirconium halide and the subsequent continuous casting of the metal were reviewed at the National Research Corporation Laboratories. A contract has been negotiated with the University of Louisville for research and development work on the separation of hafnium and zirconium by distillation. Further discussion will be held with Rohm & Haas as to the possibility of ion exchange methods for separating hafnium and zirconium. A proposal is expected from Titanium Alloy Manufacturing Company for development work on the production of zirconium metal by a modified Bureau of Mines process. Argonne requirements of low-hafnium zirconium metal together with other Commission requirements for normal zirconium necessitated contracts with the Foote Mineral Company to supply normal crystal bar and low-hafnium crystal bar. In accordance with the decisions reached at the January 26 meeting of the Zirconium Advisory Committee, Brush has been requested to submit a proposal for the preparation of ductile zirconium by the vapor-phase reduction of zirconium tetrachloride with sodium. The Zirconium Advisory Committee reviewed proposals previously submitted and made recommendations for additional paths of investigation.

Source and fissionable material accountability surveys were extended, and sampling and analytical procedures were improved.

Continuous Process for Green Salt Manufacture

On February 17, 1949, the last formal meeting of the green salt research program was held at NYOO. Several processes have now reached the stage where large-scale production development may be undertaken, and, consequently, research meetings are being suspended. The final meeting was attended by representatives of Harshaw, Linde, Mallinckrodt, and Carbide & Carbon, as well as by AEC officials from Oak Ridge, Washington, D. C., St. Louis, Cleveland, Tonawanda, and New York.

Mr. E. W. Powell of the K-25 Laboratory Division reported that the electrolytic reduction of UO_3 in HF to UF_4 in a mercury cell had been investigated. The material so formed contains varying amounts of water of hydration and is sometimes difficult to filter. Carbide & Carbon does not anticipate any large-scale work on this type of process.

The Division is also continuing its investigation of the spray decomposition of uranyl nitrate. It has proved possible to decompose a uranyl nitrate solution in a heated stainless steel column to produce a very low bulk density UO_3 . By collecting the UO_3 in a screw conveyor at the bottom of the column and simultaneously passing hydrogen and anhydrous HF over the material, a 95% conversion to green salt is obtained. The UF_4 produced, however, contains small amounts of black oxide, orange oxide, and unconverted nitrate.

Information on the vibrating-tray reactor, which is being developed by the Carbide and Carbon Corporation Development Group, was presented in detail. In experiments using a monel vibrating tray, 10" x 12" x 6", UO_2 was converted to UF_4 at the rate of 10 pounds per hour in a single pass, with yields ranging up to 80%. When the UF_4 produced was fed to another vibrating tray

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concurrently with 40% fluorine, a 70% conversion to hexafluoride was effected, with a retention time of only 24 minutes. It is not clear why these data were presented, since the feasibility report submitted by Carbide indicated that experimental conversions in the range 95-98% had been attained and these operations would not be economically feasible except at such higher efficiencies.

Carbide & Carbon presented preliminary design and cost studies for a plant capable of producing 10,000 pounds of uranium hexafluoride per day using the vibrating-tray technique. It was estimated that it would take an additional six months to test completely the proposed type of equipment, automatic controls, and methods of operations. As a basis for these design studies, Carbide & Carbon used the high conversion figures given in the feasibility report.

Research at the Mallinckrodt Chemical Works has been concentrated on the uranium tetrafluoride reaction, employing a two-furnace type reactor with a ribbon flight screw conveyor. Experimental work has been conducted with different modifications and sizes of this type of reactor. Conversions in excess of 97% are commonly attained, and the equipment has proved otherwise satisfactory. To complete the evaluation of this reactor, a quantity of green salt will be produced in the 3' diameter experimental reactor and tested by several metal bomb reductions. The evaluation of these metal production runs will indicate whether or not the Mallinckrodt type reactor is altogether satisfactory for full-scale plant operation. An engineering cost proposal from Mallinckrodt will be presented to NYOO early in March.

The Harshaw Chemical Company, like Carbide & Carbon, has performed research and development work on both the uranium tetrafluoride and the uranium hexafluoride reactions. In the conversion of UO_2 to UF_4 , Harshaw has employed a batch-type reactor consisting of steel drum, 12" in diameter and 8' long, and containing a paddle-type agitator. It has been possible to produce green salt at the rate of 450 pounds per 24-hour cycle, with a conversion of 95%. This yield is sufficient to give an overall efficiency of better than 98% for conversion to UF_6 by the Harshaw process. Caking of the reactor material has been successfully prevented by having very little clearance between the paddles and the shell walls and by having each paddle overlap slightly. In the conversion of UF_4 to UF_6 , a reactor similar to that used in the UF_4 conversion, but made of nickel, is employed. Conversions of better than 99% have been obtained using reasonably short-time cycles.

Harshaw anticipates that sufficient information will soon be available from experimental studies to permit presentation of a formal engineering study. A proposal for the design of a plant capable of producing 12,000 pounds of UF_6 per day will be submitted to NYOO early in March, 1949.

Uranium Metal Quality Program

Because of the additional cropping which is being carried out to improve the quality of the metal billets produced at Electro Met and Mallinckrodt a large amount of uranium scrap has been accumulating. Five hundred pounds of

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this material was shipped from each of the two producers to Oak Ridge for testing purposes. A study is under way to determine whether Oak Ridge will be able to use the entire output of this material, which is being produced at a rate of approximately 6400 pounds per month.

Feed Material for Mallinckrodt Chemical Works

During the latter half of 1949 the receipt of raw material will be made up of pitchblende and CX material. The latter is an impure calcium uranate produced by leaching of low grade ore and tailings with H_2SO_4 and subsequent precipitation with CaO. It is possible that during the latter half of the year most of our raw material receipt may consist of CX material. For this reason efforts are being made to extend the pitchblende inventory to carry Mallinckrodt through the rest of the year by supplementing the ore feed with high grade uranium concentrates. The feed schedule for Mallinckrodt has been revised so that the present inventory of pitchblende will last through December 31, 1949. After this date it is anticipated that the principal raw feed material will be the CX leach product.

Development Work on CX as a Refinery Feed

A meeting was held at NYOO among representatives of Mallinckrodt, MIT, and the AEC. The two major points discussed were (1) the experimental work at MIT which is important in the development of the process now proposed for making CX and (2) the factors involved in modifying the proposed process so that the raw-materials supplier's new leach plant will turn out a product which the Mallinckrodt refinery can process at a minimum cost.

Current samples of CX material contain large amounts of calcium sulfate and other impurities. Under present plans the CX concentrate is to be produced by lime neutralization of a sulphuric acid leach of pitchblende and torbernite tailings. The plant which will produce this material is to be placed in operation by the foreign supplier in the near future. Mallinckrodt has encountered considerable filtration difficulties in processing test samples of this material. This apparently results from the fact that the calcium sulfate present in the CX is converted to a temporarily soluble form during acid digestion only to be re-precipitated during filtration. As a result the filter media and pipe lines become plugged. To remedy this difficulty, either costly departures from the present refinery process or a large amount of added filter capacity would be required.

Mallinckrodt's discussions centered around the possibility of substituting other precipitating agents for the lime in order to produce a CX product presenting a less difficult filtration and processing problem at the refinery. Magnesia was originally recommended by MIT as the precipitant in the leach operation. Because magnesia was not available at the plant site, lime was selected as the precipitating agent. It is hoped that the use of magnesia might reduce processing problems.

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As the result of the discussions, the following action will be taken:

1. Mallinckrodt will estimate the capital and operating costs for the following alterations in the plant process:
 - a. Calcining cake before feeding to process.
 - b. Sulphuric acid, caustic soda, and nitric acid treatments.
 - c. Proposals for refinery process changes that may be developed in the current work.
2. Mallinckrodt will continue studies on the present lime-precipitated cake.
3. MIT will ship approximately 1,000 pounds of ore tailings to Mallinckrodt to permit small-scale leach and precipitation studies with magnesia.
4. When the studies outlined under No. 1 have been carried out, the AEC will contact the CX supplier and arrange a visit by Mallinckrodt technical personnel to the supplier's new plant to discuss the results.

It was emphasized that the above program should be carried out quickly, particularly those parts dealing with changes in the preparation of CX cake, inasmuch as the supplier contemplates initiating plant operations in the near future.

Storage of Radium Cake

It was mentioned last month that NYCO has undertaken the problem of retaining in trusteeship the radium sludge resulting from the processing of pitchblende ores. A test program is being carried out at Mallinckrodt to evaluate various protective drum coatings and bags for use in the 55-gallon steel drums that will be employed for long-term radium cake storage. While tests have not yet been completed, it appears that polyethylene bags have the most suitable qualities. Because it will be necessary to start lining drums early in March, it has been decided to go ahead with the use of bag liners of this material on a temporary basis. Since water vapor does diffuse through the bag, it will also be necessary to use a paint coating on the inside surface of the steel drum. The best material for this purpose appears to be a paint produced by the Inland Steel Company. The test program, however, will be continued until all possible materials have been evaluated.

Arrangements have been completed to store the barrels of radium sludge at the Lake Ontario Ordnance Works. Linde Air Products Company has agreed to handle the material on a temporary basis. Approval is now being awaited from the War Assets Administration for the use of the existing concrete igloos at the Ordnance Works as long-range storage areas. As soon as such approval is obtained, studies will be carried out to determine the suitability of these structures for storage of radioactive materials.

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Activity at Harshaw

A standard operating manual has been drawn up for the new brown oxide plant at Harshaw Chemical Company, and a copy was submitted to Mallinckrodt for comment. Sufficient preliminary tests have been conducted to provide favorable indications that the plant will start operations within a few weeks.

Provisions have been made to store the radioactive ash produced in the UF₆ manufacturing operation at Lake Ontario Ordnance Works.

Uranium Rods for the Chalk River File

Representatives of the New York and Washington AEC Offices attended a meeting in Chicago with the Vice President of the Joslyn Manufacturing and Supply Company. This meeting was held to initiate arrangements with Joslyn for rolling uranium rods and subsequent machining of slugs for the Canadian Chalk River pile. The technical specifications and medical considerations were discussed. The company is interested in undertaking the work and has requested that all pertinent details be presented in writing, after which a formal proposal will be submitted by Joslyn to NYOO.

Metal Recovery from Monazite Sands

The NYOO Production Division contract with Battelle Memorial Institute is concerned with the development of a practical process for recovering thorium and uranium in relatively pure form from monazite sands. These sands consist mainly of the phosphates of the rare earths, together with thorium, and smaller amounts of uranium. Preliminary studies of this problem demonstrated that treatment of the monazite with strong caustic solutions represented an excellent method of breaking up the mineral and removing the phosphates. The resulting mixture of thorium, uranium, and rare earth oxides could then be dissolved in nitric acid to provide a solution suitable for solvent extraction. Many variables in the process have been investigated, and details of the caustic soda treatment are believed to be understood.

It has been realized for some time that a preliminary chemical separation of the bulk of the rare earths from the thorium and uranium would greatly simplify the solvent extraction operations. Preliminary solvent extraction work has been less successful than had been anticipated in developing a process which does not require such a separation. To aid in solving this problem, a representative of Battelle is now at ORNL conducting tracer studies on monazite extraction solutions. It is hoped that, as a result of these tracer studies, the rare earth materials that are giving the most trouble can be determined and a process developed for their preliminary separation.

Project-Purity Magnesium

The New England Lime Company was successful in preparing project-purity magnesium from both normal Dow electrolytic and Spokane ingot magnesium. This company used the same methods that were used in the successful preparation

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of calcium metal under another program. Analyses of this magnesium were made at both Mallinckrodt and the National Bureau of Standards. The magnesium produced from the low-grade starting materials was better than specifications. A contract is to be written with the New England Lime Company to renovate a bank of retorts to produce 10,000 pounds of project-purity magnesium from Dow and/or Spokane ingots on a pilot-plant scale.

Graphite Program

During the past two months, both Mallinckrodt and Electro Met have placed orders with the National Carbon Company for future graphite requirements. National Carbon advised that they were unable to fill these additional orders and that all procurement of graphite for the AEC had been withdrawn from their field offices and was being centered in their New York Office. Electro Met had previously placed orders with National Carbon for sufficient material to last them through June of this year. However, as a result of the additional work of recasting metal scrap from the rolling operations and a slight increase in production, the quantity ordered was not sufficient. When additional graphite was requested from National Carbon, Electro Met was informed that National Carbon did not have sufficient graphitizing capacity to permit filling of further orders.

On February 16, NYOO was notified by Hanford that they had approximately 30,000 pounds of graphite stored at Oak Ridge in the form of fine-grained AGR electrode, 7" diameter by 60" long. Since Hanford had no further use for this material, they released it to NYOO. On the following day, the NYOO Production Division was informed that Hanford had completed arrangements to purchase from National Carbon approximately 250,000 pounds of Type CS-312 electrode, 12" in diameter by 60" long. This material had been produced from National Carbon's green stock in the Morgantown plant and will serve as a reserve stockpile for Hanford operations. The material will be shipped to Oak Ridge and will be available for use by NYOO in the event of an emergency.

General Electric is entering into discussions with Great Lakes Carbon to see if that company can supply some of the current requirements for the Hanford metal operations. The Hanford AEC office has requested that the NYOO Production Division contractors should not approach Great Lakes Carbon, pending the outcome of the General Electric negotiations. The NYOO Technical Procurement Division had in the past obtained crucible graphite from the International Graphite & Electrode Corporation at St. Marys, Pa. Mallinckrodt will investigate this source of supply. Mallinckrodt has on hand or on confirmed order sufficient supplies of graphite to last through September, 1949.

NYOO informed Electro Met regarding the graphite which has been made available by Hanford. The company was told that they would be given a sufficient quantity of this graphite to continue operations through June, 1949. They now have on hand or on confirmed order sufficient supplies of graphite to last only through April.

In response to a request for information regarding their graphite requirements, the company reported to NYOO that their non-Commission operations produced scrap graphite from which some of the parts required for the metal operation could be machined. They indicated that the matter was under study and that NYOO would be informed later of the amount of graphite that would be required to continue operations through June.

Beryllium Casting and Extrusion

To fulfill the requirements of the Materials Development Reactor, additional facilities for casting and for extrusion are needed, and arrangements have been made to provide them.

The Beryllium Corporation. In the past Commission requirements for cast and extruded beryllium were supplied by MIT. Large scale requirements for the Materials Development Reactor necessitated the construction early in 1948 of a Government-owned casting plant at The Beryllium Corporation. Difficulties have been encountered in adapting operations to the 8" castings required and in making furnace improvements. Recently, The Beryllium Corporation with the assistance of MIT personnel has completed the conversion of their furnaces from stopper-rod type to bottom-pull type. It is anticipated that The Beryllium Corporation will produce acceptable billets during the month of March. During February efforts were expended toward the development of operational techniques.

Massachusetts Institute of Technology. MIT has produced castings to fill the 3" x 3" shape requirements for Oak Ridge. These castings are scheduled to be extruded in the early part of March at Revere. The Wyman-Gordon Company plant in Grafton, Mass. was inspected by NYOO and MIT personnel for possible use in the extrusion of beryllium. However, in view of the time required to install the extrusion press as well as the cost of approximately \$120,000 for the move and installation, this approach was not considered feasible.

New Facilities. Due to the urgency in the Materials Development Reactor schedule, it will be necessary to increase the casting production capacity. Discussions were held with MIT concerning the further expansion of casting facilities at The Beryllium Corporation and Brush Beryllium Company and the design of the latest type of casting furnace to be installed. One additional furnace will be installed at the Commission-owned casting plant at The Beryllium Corporation, and negotiations were begun with the Brush Beryllium Company for installation of the improved MIT type of furnace at Luckey, Ohio.

Adrian, Michigan. Heretofore, all Commission requirements for extruded beryllium were filled by MIT, which performed the necessary extrusions either at Revere Copper and Brass Company, Detroit, or with the University's own 300-ton extrusion press. The equipment at Revere is limited to rod extruders and two presses (up to 2,200 tons.) With the high flux Materials Development Reactor requirements becoming increasingly urgent, and the possibility appearing that presses of greater capacity may be needed, it was decided at a meeting in Washington, attended by the Reactor Steering Committee and representatives from AEC and MIT, that additional extrusion facilities should be prepared. Accordingly, the Adrian, Michigan, extrusion plant of the Canton Drop & Forge Company was visited by personnel from NYOO and MIT, and discussions were held concerning the operation of the 2,750-ton tube and rod extruder. This was followed by a meeting in the New York Office with representatives of the Canton Drop & Forge Company during which a cost-plus-fixed-fee type of contract was negotiated for operation of the 2,750-ton extrusion press at Adrian. A letter contract is being prepared and will be issued in the early part of March. Funds for the operation will be made available by the Argonne National Laboratory.

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Revere Copper and Brass Company. Negotiations were held with the Revere Copper and Brass Company of Detroit, Michigan, concerning a contract for extrusion facilities at their Detroit, Michigan, plant. It is anticipated that Revere will charge the Government approximately \$100 per hour for the use of the press. Revere, with AEC assistance, will also expedite the installation of a new 2,400-ton press for AEC use.

Beryllium Development and Production

Health and safety problems in connection with beryllium production are being studied. New methods for preparing BeO are being investigated. Special shapes prepared by Brush for the GE pile have been formally approved by GE officials. Negotiations are under way to procure 500 pounds of high-purity beryllium metal from Brush.

Development Work at Clifton Products, Inc. The chlorinator for converting beryllium oxide to chloride was tested and air samples were taken by the NYOO Medical Division. Results are not yet available, but operation appeared completely satisfactory and the chlorinator is ready for use. Health and safety changes in the high-temperature beryllium electrolysis units were completed in the middle of February, and the equipment was tested in the presence of a Medical Division representative, who took air samples during the operation. It was observed that considerable fuming occurred in the electrolysis cellroom when the charge was poured and this fuming persisted for some time. Inasmuch as the electrolysis cells are isolated and remotely operated, provisional approval has been given Clifton to operate the electrolysis equipment, including the chlorinator, provided no one is permitted in the cellroom for eight hours after pouring the charge. This time factor is arbitrary and will be made more firm once detailed information regarding the period of fume persistence has been obtained from analysis of the air samples.

Clifton will shortly initiate a program aimed at the preparation of coarse-grained samples of BeO from the decomposition of beryllium oxalate. It is felt that by operating at moderate temperatures, roughly equivalent to the normal calcination temperature used by Clifton for calcining hydroxide, a far coarser-grained oxide will be obtained from decomposition of the oxalate yield than from hydroxide calcination.

Brush Beryllium Company. Brush submitted a revised proposal for research and development activities during the six-month period, January 1 through June 30, 1949, and final negotiations were held in February for a definitive contract to cover research and development presently being conducted under letter contract AT-(30-1)-510.

A triangular filler and a fluted retainer have been prepared at Brush by powder metallurgy. These shapes are required for the GE pile, and both have been favorably appraised by the GE people concerned. The large-scale laboratory equipment for preparation of beryllium sponge (2 kg. batches) by the vapor-phase reduction of beryllium chloride with sodium is expected to be completed shortly.

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The target date for operation of the new Brush plant at Luckey, Ohio, has been tentatively set as August 1, 1949. Recent developments in the operation of the pressure furnace at Cleveland, Ohio, indicate that metal assaying 99.5% or better can be produced in this furnace. Negotiations are under way to procure 500 pounds of this metal for evaluation. Included in the negotiation will be arrangements for remelting some technical stock in the pressure furnace and converting it to the high purity of 99.5% or better.

Beryllium Plant Construction

New facilities have been arranged for the production of beryllium, and plans and designs are being studied for the construction of two new plants.

Burns & Roe, Inc. Negotiations have been completed with Burns & Roe for the construction and operation of the "Sheer-Korman" pilot plant at Maspeth, Long Island, to produce beryllium chloride. It is anticipated that work will begin in the early part of March.

Brush Beryllium Company. Following the selection of the Brush Beryllium Company process by the Commission, a letter contract with Brush for the construction and installation of a beryllium producing plant at Luckey, Ohio, was executed. Engineering is proceeding on the plant, although actual moving of facilities awaits the action of the Munitions Board. A meeting was held with Brush to discuss plant layout and equipment requirements. A procurement schedule will be made up, and the Commission will assist in expediting any long-delivery items. To have a plant layout satisfactory from a health and safety viewpoint, it is necessary to obtain filtering equipment which will permit operation below tolerance limits, especially during the removal of filter cake. Difficulty is expected in obtaining such equipment. Brush will investigate filtration equipment, and attempt to design an arrangement which will satisfy health requirements for beryllium air concentration during all operations. It is felt that it will be very difficult to keep the plant limit down below 2 micrograms per cubic meter, the tolerance level.

Powder Metallurgy Progress

Security problems pertaining to AEC work were discussed with representatives of Sylvania Electric Products at a conference held early in February. Substantial agreement has been reached on the matter of fencing and protective lighting for the laboratory buildings. The urgency of this work was emphasized in view of the fact that Sylvania will probably handle enriched uranium within the next few months.

Discussions were also held regarding the budget for the present and the next fiscal year. It was pointed out that, because Sylvania had undertaken several new studies for Argonne National Laboratory and Oak Ridge National Laboratory, a deficit of approximately \$75,000 would occur for the fiscal year 1949. The additional programs involved include (1) the preparation of sandwich-fuel elements for Argonne National Laboratory, (2) the preparation of hot-and cold-pressed sintered uranium samples with and without grain growth inhibitors for thermal cycling tests by Argonne National Laboratory, (3) measurement of

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diffusion rates of uranium and zirconium, etc. for Argonne National Laboratory, (4) measurement of the thermal conductivity of zirconium for Argonne, (5) measurement of thermal expansion for Argonne, (6) measurement of creep in zirconium for Argonne, and (7) preparation of varied grain-size sintered samples of U, U-Be, and U-Cb for irradiation studies at Oak Ridge National Laboratory. A transfer of funds to eliminate the \$75,000 deficit has been requested.

A meeting was held at Sylvania with Dr. Etherington and Dr. Ashcraft of Argonne National Laboratory to review the status of the studies which are being conducted at Sylvania for the Power Pile Division. Initial samples of sandwiches prepared by powder metallurgy were displayed, consisting of U-Be meat (two per cent uranium) clad with a bread of zirconium containing approximately two per cent beryllium. These samples did not conform to the required dimensions. To date, it has not been possible to get a satisfactory bond between zirconium and the U-Be meat without alloying beryllium with zirconium. Sylvania has also prepared a sandwich consisting of uranium-zirconium meat (two atomic per cent uranium) clad with zirconium.

General satisfaction relative to the progress was voiced, and it was requested that samples of material consisting of U-Zr meat with zirconium bread be submitted to Argonne National Laboratory early in March, if possible. In undertaking the problem of bonding bread to meat, Sylvania made a cursory investigation of the zirconium-beryllium system and found that five phases existed, the most interesting of which occurred at 60 per cent beryllium, 40 per cent zirconium. At this composition only one phase exists, which appears upon x-ray examination to be a simple cubic crystal. This may prove highly interesting, in view of the fact that zirconium and beryllium themselves are normally close-packed hexagonal crystals. It is also known that this alloy has a high-melting point (above 1350°), which has not yet been determined. The possibility suggests itself that perhaps this alloy might be relatively malleable by virtue of its cubic configuration. Further investigation is in progress.

In connection with the sandwich problem, Sylvania will also submit zirconium powder which they prepare by converting zirconium crystal bar to zirconium hydride powder and degassing as well as samples of 2% Be-98% Zr alloy.

Zirconium Development

Several research programs have been arranged and contracts have been awarded for studying the development of processes for the production of zirconium

Metallurgical Project at MIT. Several experimental reductions of zirconium oxide with carbon have been conducted at 1850°C under vacuum, but only negligible metal yields were obtained. It is planned to continue this reduction work, using metallic silicon in place of carbon. It is felt that the silicon will be a more active reductant than carbon.

In view of Bureau of Mines and MIT experience which demonstrates that zirconium picks up carbon when melted in a graphite crucible, MIT has prepared a graphite crucible lined with zirconium carbide, in the hope that the carbide lining will reduce the carbon pick-up. Experimental melting in this carbide-lined crucible will be undertaken shortly.

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National Bureau of Standards. Dr. Wichers of the National Bureau of Standards has reported that, in carrying out a hafnium-zirconium separation by phosphate precipitation, he was able to reduce the hafnium content from 2 per cent to 0.05 per cent in four steps. Because of this comparative success, it has been decided to transfer \$4000 to National Bureau of Standards to cover the cost of accelerated laboratory studies on this method for the balance of fiscal year 1949.

Oak Ridge (Y-12). G. Cluett of Y-12, Oak Ridge, discussed in a visit to NYCO the fact that his laboratory would be interested in investigating hafnium-zirconium separation by liquid extraction and pressure distillation. He was advised to submit in detail a proposal on the methods they would propose to investigate. Mr. Cluett felt that these studies could probably be financed under their existing funds.

Rohm & Haas Co. Rohm & Haas submitted a report to NYCO covering an investigation they conducted on their own initiative, aimed at separating hafnium from zirconium by ion exchange. The results were somewhat encouraging, although the hafnium concentration had been reduced to only approximately one per cent and the salt concentrations were relatively low. A meeting has been scheduled for March 1 to discuss with Rohm & Haas the possibility of further work on this method under an AEC development contract. The possibility of their undertaking studies on hafnium-zirconium separation by the classical oxychloride crystallization method will also be discussed.

Titanium Alloy Manufacturing Co. Dr. Urban, Director of Research of the Titanium Alloy Manufacturing Co., was contacted with regard to his company's status on zirconium. He indicated that they were presently giving fullest possible attention to titanium and that they could push development work on zirconium metal production only under a development contract with the AEC. Dr. Urban felt that the refinements they had effected in the Bureau of Mines process for titanium were applicable to zirconium as well. These improvements include a newly developed refractory for melting titanium and zirconium. A proposal will be submitted by the company shortly.

Brush Beryllium Company. In accordance with decisions reached at the January 26 meeting of the Zirconium Advisory Committee, Brush has been requested to submit a proposal for a study on the preparation of ductile zirconium by the vapor-phase reduction of zirconium tetrachloride with sodium. This work has been assigned to Brush because of the background they have obtained on the use of similar techniques for beryllium.

Zirconium Production

Because the Commission's requirements for zirconium metal have increased significantly, it has been necessary to increase the production quantities from Foote Mineral Company and to arrange for additional production by the Bureau of Mines.

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Foote Mineral Company. A previous contract with the Foote Mineral Company for 100 pounds of crystal bar has been completed. However, additional Commission requirements of normal zirconium for Battelle, G.E., Westinghouse, and MIT has necessitated the issuance of a contract for the production of an additional 25 pounds of normal zirconium crystal bar to supply the experimental needs of the Commission. To fulfill Commission requirements for low-hafnium zirconium metal, a contract has been prepared for the Foote Mineral Company under which they will produce 10 pounds of low-hafnium (less than 1/10% hafnium) zirconium crystal bar and will also operate a $ZrCl_4 \cdot PCl_3$ distillation column to produce low-hafnium zirconium oxide.

Bureau of Mines. The Bureau of Mines has agreed to extend its arrangement for the production of 100 pounds per month of zirconium metal beyond March, 1949. Funds have already been transferred for 450 pounds of zirconium metal. This material will be shipped to Commission laboratories by April, 1949. An additional transfer of funds to the Bureau will be made to cover 100 pounds of metal per month for the period April, 1949, to September, 1949. This transfer will take place sometime in March.

Zirconium Advisory Committee

On February 23, 1949, the Zirconium Advisory Committee met again and reviewed the status of pertinent programs within AEC, as well as the decisions for action made at the previous meeting of the Committee. Some of these decisions pertain to matters discussed above under the contractors in question. Dr. Wainer and Mr. Goodridge of Horizons, Inc. attended the morning session of the meeting to answer questions regarding their proposal for the investigation of methods for effecting hafnium-zirconium separation and zirconium metal reduction. It has been decided that, of those studies proposed by Horizons, only zirconium preparation by fluoride electrolysis will be considered for possible investigation, and Horizons will be advised of this decision. It was stressed that Dr. Larsen of Wisconsin University, who has an extensive background of hafnium-zirconium separation by phosphate precipitation, should meet Dr. Wichers of the National Bureau of Standards. Arrangements for such a meeting will be made. It was also decided that Westinghouse Electric Corporation, Bloomfield, N.J., should be contacted to learn of their background in zirconium preparation by electrolysis.

Source and Fissionable Material Accountability

During the month representatives of the NYOO Metal Accountability Branch visited Simonds Saw & Steel Co. in Lockport, New York, to set up an accountability station. Instructions regarding records, procedures, and transfer of material were discussed with the designated Simonds accountability representative. This included the method of preparation, classification, and distribution of SF shipping forms for the transfer of material. The records to be maintained to check the reasonable relationship of the weight of the billet rolled to the rod produced were also discussed. The monthly reports for submission to the New York Office were reviewed.

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A survey of SF accountability procedures was made at the Vitro Manufacturing Co. in Pittsburgh, Pa., by the survey team from Oak Ridge and a representative of NYOO. The final report will be rendered to the Washington Office by the Oak Ridge survey team. It was recommended that a permanent record should be set up for recording the SF shipping forms covering receipts and shipments, and that studies should be made on the assay of input material, carbonate residue cake, and effluent water. With respect to the latter recommendations it was stated that the twenty-five-year-old method of uranium analysis used in the Vitro Laboratory would tend to give a low assay on the input and a high assay on the carbonate cake. Furthermore, the possibility of assaying the effluent water to 0.03% by this method was questioned.

Sampling and Analytical Procedures

A program for the improvement of the sampling and analytical procedures at the Vitro Manufacturing Co. was started. The first step was a visit by Vitro Manufacturing Co. representatives to the Middlesex sampling plant, to examine and discuss the sampling equipment. Subsequently, the Chief, NYOO Analysis and Development Branch, visited Vitro to examine the types of material being received and to discuss the analytical and sampling procedures being used. Vitro has started work on new methods of analysis, and will send samples of its waste solutions and cakes to the National Bureau of Standards for uranium analysis every week until new analytical methods have been developed, and the results are in agreement.

During the month, the NYOO Analytical Records Section, in conjunction with the Raw Materials Division, prepared a chart which plots the differences in the advised vendor's assay on Q-11 material and our accepted assays for each lot of this material over the past few years. This chart indicates that the difference between these figures, which became apparent last summer, is probably due to a change in the vendor's method of sampling the hand-picked Q-11 material. This chart will be used by the Raw Materials Division.

In addition to the normal Middlesex functions of sampling and shipping, a small 8-foot-cube portable building was constructed for use in tests to determine the amount of radon which may leak out of drums sealed in various ways. The drums are placed in this building, which is almost air-tight, for a measured length of time, and then the air inside is sampled for radon. The first such tests have been conducted under the supervision of the NYOO Medical Division, but the results are not yet available.

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IV. ENGINEERING

The substructure of the AEC training building at the University of Rochester is well advanced and will be completed in March. Bad weather delayed construction of the Facilities Building at Mallinckrodt Chemical Works, extending the terminal date to March 17. Construction progressed on the Mallinckrodt Boiler House, and the contractor for the Plant 6E Building moved an office onto the site preliminary to commencing construction. Alteration of an existing building for the New Brunswick Laboratory continued; work is behind schedule because of delays in delivery of materials and equipment. Building of offices, locker room facilities, and a guard house was begun at Harshaw Chemical Company. Instructions were issued pertaining to AEC participation in the Munitions Board Program for allocation of private industrial capacity.

University of Rochester

A. Friederich & Sons Company, contractors for the substructure work of the AEC training building, have completed 70% of the work under their contract. The work will be 100% complete on March 18.

Plans and specifications for the superstructure building were completed February 28 by the architect and will be mailed to prospective bidders early in March.

Mallinckrodt Chemical Works

Inclement weather has continued to delay construction of the Facilities Building, necessitating an extension of the completion date to March 17. The George L. Cousins Contracting Company has completed pouring concrete for the roof slab and ground floor slab. A roofers' strike has postponed laying of the roof. Outside walls have been completed up to the second floor, and tiling of the first floor shower and drying-room walls has been completed.

The J. S. Alberici Construction Company has completed 5% of the construction work on the Boiler House. Laying of the entire fire line and about 80% of the sewer line has been completed. May 4 is the scheduled terminal date for Boiler House construction. The start of this contract was postponed six weeks because of delay in completing the foundation contract. Redesign of the foundation and adverse weather have held up foundation construction work. No equipment will be installed in the Boiler House until work on the structure is further advanced.

Robert Paulus Construction Company, contractor for Plant 6E building, moved an office onto the site and commenced layout work.

New Brunswick Laboratory

Alterations to the interior and exterior of the existing building which will house the New Brunswick Laboratory are 42% complete. On the overall construction the contractor, Frank Belluscio & Sons, Inc., is seven

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days behind schedule, largely because of delays in delivery of equipment and materials. This may result in an extension beyond April 1 for final completion. On that date, however, facilities will be adequate to permit occupancy and commencement of laboratory operations. Suppliers are being asked to consider the urgency of need so that deliveries may be made in advance of previously promised dates, thereby shortening the time planned for completion of the remaining work.

Harshaw Chemical Company

Work was started on February 7, 1949, on the rehabilitation of a portion of a Harshaw Chemical Company building for use as an office for both AEC and Harshaw personnel. The plans include the construction of office and locker room facilities for Plant PB-13 and the construction of a new guard house for control of visitors and plant personnel. The work is 40% advanced and will be completed by April 1.

Mobilization Planning

Instructions were issued to NYCO Division Directors and Area Managers regarding their function in AEC's participation in the Military Establishment's Munitions Board Program for allocation of private industrial capacity. Forms for submitting information on plants required under mobilization were forwarded with instructions. The information compiled will enable the AEC to correlate with the Munitions Board its requirements for industrial capacity along with those of the Army, Navy, and Air Force. Representatives of NYCO Staff Engineering Division will conduct a detailed discussion of the allocation of private industrial capacity before NYCO officials at the staff meeting of March 4.

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V. RESEARCH AND DEVELOPMENT

Nuclear physics research is continuing at Columbia University. Two new research contracts have been instituted at Johns Hopkins University; they provide for studies of nuclear reactions and hydrogen isotopes. Work is progressing on the remote identification of orebeds. The design of a uranium recovery process is now 31% complete.

Nuclear Physics Research at Columbia University

Iron, chromium, carbon, and ruthenium have been investigated with the neutron velocity spectrometer. The collimating system for the scattering measurements has been investigated. Radiation detection devices and techniques for photographic detection of nuclear tracks are being improved for greater accuracy. Sulphur 35, copper 64, radium E, carbon 14, and arsenic 76 have been investigated with the helical focussing beta-ray spectrometer. Much of this work has been reported in the Physical Review.

Tracer Techniques in Mineral Engineering

A progress report has been issued by MIT on the program of using radioactive tracer techniques in the investigation of basic phenomena in mineral engineering. This report has been distributed to Commission and non-Commission installations in order that interested persons may know that an advisory board and a research program are available to give attention to their problems.

Johns Hopkins University Contracts Nos. AT(49-1)-309 and 310

Two new research contracts have recently been instituted with Johns Hopkins University. The first, Contract No. AT-(49-1)-310, calls for a research program in the field of nuclear reactions. It will include studies of comparative angular properties of the ground state and 480 Kev state of Li^7 , search for a state in Be^7 analogous to the 480 Kev state in Li^7 , and investigation of short-range alphas from $\text{F}^{19} + \text{protons}$. The research is being carried out under the general direction of Prof. D. R. Inglis, Physics Department, and will continue until June 30, 1950. A 1.5 Mev electrostatic generator is available for this program.

The other contract, No. AT-(49-1)-309, calls for a research program dealing with the spectroscopy of hydrogen isotopes. The initial work will include photography of the TH, T₂, and TD spectra under high dispersion, and studies of changes in the spectrum under different discharge conditions. Wavelength measurements will be made on plates, including some exposed at Argonne National Laboratory, and quantitative intensity measurements will be conducted. Parts of the program will be carried out in collaboration with Argonne National Laboratory. This program is being carried out under the general direction of Prof. G. H. Dieke, Physics Department.

These contracts will supplement and expand the previous scope of research activities in these fields at Johns Hopkins University.

Remote Identification of Uranium Orebeds

Research and calculations are being continued to evaluate the possibility of detecting uranium and thorium-bearing ores at a distance from the orebed by measuring the helium content in the ground. A literature search has been conducted, and pertinent references have been listed. On the basis of a rough analysis of the situation, a procedure for collecting helium was suggested in a report prepared for Mr. W. G. Fetzner, Grand Junction Extension, Raw Materials Operations Office. Several additional core samples from the region surrounding carnotite orebeds have been sent to Prof. P. Hurley at MIT for helium analysis and alpha counts.

Uranium Recovery

Progress by the Kollex Corporation in designing a process for recovering uranium from Hanford waste solutions approximates the scheduled rate. As of February 1, the job was estimated as being 31% complete, as compared to a scheduled completion of 42%. The difference between actual and scheduled progress is explained by the limitations on detailed design work requested by the Commission.

During February studies were accelerated in the test basin at the M. W. Kellogg plant in Jersey City to determine the feasibility of underwater operation of process equipment. Experiments to date have not revealed any serious difficulties, although they have shown that many details of equipment maintenance must be worked out. It is still too early to give a definitive answer on the operational problems associated with an underwater plant. The first laboratory studies on ion-exchange decontamination of weak solutions of fission products, such as may be encountered in an underwater plant, have been gratifying. Continuing experiments should demonstrate whether basin water contamination can be readily removed. A subcontract with Thompson Products Co. has been approved for development of suitable gaskets for disconnect valves. The Thompson disconnect is a device which may prove suitable for making and breaking process lines when equipment is underwater.

Process chemistry is now fairly well established. One problem has been the relation between uranium and phosphate in various stages of the process. Some concern has been felt over the behavior of solutions in the solvent extraction system after the uranium has been removed and the phosphate to uranium ratio has thereby been increased. The Argonne redox group has offered to check the stability of such solutions in the near future.

Tests at Sharples have showed that a sodium diuranate slurry can be separated by centrifugation in Sharples "Nozjector" equipment.

VI. BROOKHAVEN NATIONAL LABORATORY

The Cosmotron Project is in the construction stage. Steel for the magnet is on order; the power equipment is being built; the construction of the office building has been started; and the magnet foundation is complete. Basic design studies are also continuing. The construction of the hospital kitchen was authorized, and the 70-ton frame for the high pressure cloud chamber was installed.

Cosmotron

The Cosmotron Project is now entering upon the third stage of its progress toward completion. The first, or conception, stage was completed by the end of 1947. In this stage the method for accelerating protons to the billion-electron-volt range was chosen; the fundamental problems were solved on paper; and the basic design parameters were established for machines to operate at 2.5 and at 10 BEV. Early in 1948 the second, or design, stage was actively entered; this involved laboratory tests, computations, and frequent consultations with manufacturers. Although that stage is not yet completed, much of the work has now passed on to the third, or construction, stage. Steel for the magnet is on order; the power equipment is being built by Westinghouse Electric Corporation; construction of the office building has begun; and the magnet foundation is complete. The present schedule calls for the installation of all major components by the end of this year. The fourth, or testing, stage will then commence, after which the machine will enter the final, or operating, stage. It is hoped that this stage will be reached before the end of 1950.

Magnet. The magnet is 73 feet in diameter, and includes 1600 tons of steel. Three scaled-down models have been operated under conditions designed to simulate, as closely as possible, the operation of the actual magnet. It has been necessary to measure the magnetic field accurately and to observe changes in field that might occur in one ten-thousandth of a second. A detailed, theoretical study of the magnet has been conducted, and reasonable agreement has been found between theory and experiment. Work has also been done on the design of a digital computer, which will be needed to solve problems involving synchronization of radio frequency oscillation and the varying magnetic field in the cosmotron.

On the basis of these results the design of the magnet has been frozen. It will be constructed of 3456 half-inch plates, welded together in blocks of twelve. Except at the welds, there will be no short circuits between one plate and the next. A special type of impregnated paper will be used as lamination insulating material, capable of standing the high pressure when the plates are welded. The paper will be a 3-ply lamination of fish paper and metal foil; the latter will serve to detect the presence of shorts between the plates. Bids on this work have been received, and a contract has been let to Bethlehem Steel Co. for delivery of the steel by August, 1949.

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Five hundred gallons of water per minute will be used to carry away the 800 KW of power dissipated in the magnet winding. All physical turns of the coil are to be cooled in parallel. Water will be fed to each of the two manifolds at each magnet quadrant at a pressure of 40 lb/sq in. (gauge). There will be a closed water system, cooled by evaporative coolers and purified by a permutit demineralizing system with a vacuum deaerator.

The windings will be insulated from the magnet by a 3/8" molded form slipped on each section. The return windings will be insulated from ground by 17/32" of laminated plastic. The maximum turn-to-ground potential will be 3500 volts. The coil will be fabricated by a contractor yet to be selected. It will be protected from open circuits in the connecting lines by a spark gap. A generator resistor connected to ground will short the coil if a ground short occurs.

Power Supply. The power supply consists of a 40,000-KVA generator coupled to a 40-ton flywheel. It has been decided to use AC machinery and mercury-arc rectifiers. The expected rate of cycling is 12 pulses per minute. Designs have been made to draw the magnet energy from the flywheel and, after the accelerating cycle is over, to return most of the magnet energy to the flywheel, thus avoiding undue transient loading of the Long Island power lines. The contractor, Westinghouse Electric Corporation, promises delivery late this year.

Radio Frequency. The primary design problems are:

1. The source of a varying frequency of 0.3 - 4.1 megacycles.
2. The amplification of this varying frequency to a high power level.
3. The coupling of this power into the protons to be accelerated.

The first problem has been met by synchronizing the impulses of the two klystrons. With this device good frequency stability can be obtained. The frequency must be very accurately controlled by a signal derived from the ions themselves, which will shift the frequency so that the ion beam is kept in the desired orbit.

The second problem, which involves the development of a wide-band power amplifier, needs further study.

The third problem requires a large radio frequency transformer with a core of about a ton of magnetic material. The best material seems to be a ferrite developed by Philips Lamp Works, Eindhoven, Holland.

Vacuum System. Theoretical predictions have been made of the degree of vacuum necessary in order that the proton will not be unduly scattered by residual gas atoms. The vacuum system will probably be constructed of ceramic sections. Test sections have been fabricated by the General Ceramics Co., and will shortly be tested for ability to stand up mechanically under evacuation.

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Building. The basic building design has been completed in collaboration with Skidmore, Owings and Merrill. The cosmotron housing will be approximately 120' x 200' x 25'. Because of the penetrating nature of the radiation emitted, the machine will be sunk 10 feet below ground level. Space will be provided for generators, control equipment, research areas, preparation docks, and research offices. Other connected buildings will house shop, stock, and office space.

The reinforced-concrete foundation for the cosmotron itself was completed last December and should be well settled by Spring, when building construction and magnet installation will begin.

Hospital Kitchen

Capital improvement authorization No. 10, providing for the construction of a hospital kitchen and special medical services, was approved on February 2, 1949. The kitchen is required for adequate supervision of food preparation for hospital diets. Additional rooms will be constructed for such special services as basal metabolism, electro-cardiogram, audiogram, and eye testing. Facilities will also be furnished for medical and hospital records and storage of supplies. Bids have been received for this work, and construction will start early in March.

Cloud Chamber Project

The 70-ton frame for the high pressure cloud chamber was installed in the particle physics laboratory. The heavy frame is necessary to sustain the 300-atmosphere operating pressure for the chamber. Bids will be received during the first week in March for the erection of a motor-generator house to contain the cloud chamber power supply.

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MEDICAL

A survey of the health hazards associated with uranium rolling operations was conducted at Simonds Saw & Steel. New forms have been prepared for recording medical information regarding NYOO employees exposed to special health hazards.

Survey at Simonds Saw and Steel

During the period January 10-21, 1949, a special survey was made of rolling operations on uranium rods at the plant of the Simonds Saw and Steel Company, Lockport, New York. Other similar surveys have been made in the past. The latest study was made after the ventilation equipment had been completely installed and after all previous recommendations of the NYOO Medical Division had been complied with, except for the placement of gratings on each side of the roller floor. In addition to the usual control purposes of routine surveys, it was planned that this survey would investigate the correlation of urinary levels of uranium with air exposure data to assist in the determination of permissible levels of uranium dust.

Regular urine samples were taken of all the plant employees involved in the rolling, beginning four days before the commencement of operations. Collection of these samples continued two weeks after the rolling was completed, so that a study could be made of the rate of excretion of uranium in urine as correlated with air exposure data. General air samples were taken at all significant locations in the plant before the run and again during the run at the same spots. Breathing zone samples were also taken of all employees while engaged in the actual work. Further air samples were taken two weeks after the end of operations to study the rate of disappearance of contamination from the air.

The relationship between air and urine levels and the nature of retention in urine will require much further investigation. This survey showed a substantial lowering of dust concentrations, and further reductions are expected from the installation of floor grates. The latter will be ready for the next rolling. Future rollings will be carefully watched, since even with the improvements which have been instituted, the employees are still exposed to a higher level than desirable. Of the 30 employees under study, six inhaled dust concentrations from 27 - 37 times the preferred level, and eight were exposed to 10 - 16 times the preferred level. The remaining 16 employees were exposed to 1.4 - 4.6 times the preferred level.

Medical Forms

On the basis of the specific needs of NYOO medical forms have been revised to incorporate information which should be compiled regarding all employees exposed to special health hazards of Commission work. These forms have been designed to record a maximum of information, to avoid the possibility of carelessness on the part of the examining physician, and to take

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into consideration problems of storage and possible microfilming. A special folder has been designed to hold all medical forms and radiation records for each employee. This folder will also provide a summary of the entire record at the termination of employment, which is the last opportunity to review the records critically, obtain additional medical information, and eliminate inconsistencies.

VIII. LICENSING

Since March, 1947, the Licensing Division has issued 1731 licenses in the following categories:

	March 1947 Through <u>Feb. 1949</u>	During <u>Feb. 1949</u>
Producers	279	2
Processors	34	-
Distributors	279	2
Consumers	<u>1139</u>	<u>39</u>
	1731	43

Nearly all of these licenses are for one year's duration. Approximately 809 have been renewed for an additional one year period. Others will be extended from time to time as their expiration dates are reached and applications are made for renewal.

Examination of the inventories and records of domestic processors, distributors, and consumers of source material continued during the month.

The following exports were authorized during February:

Incandescent Mantles	815,161 *	
Thorium Nitrate	11,436.0	lb.
Thorium Dioxide	11.1	cz.
Thoriated Tungsten Wire	1.7	lb.
Uranium Nitrate	0.25	lb.
Uranyl Acetate	8.50	lb.
Uranyl Formate	0.11	lb.

Shipments of incandescent mantles were made to 38 countries. Quantities of thorium nitrate for the manufacture of mantles were sent to Canada, China, India, and Italy. Thoriated tungsten for vacuum tubes was shipped to Canada, France, and Mexico. All other exports involved small quantities of uranium or thorium to be used for analytical and medicinal purposes.

* The ThO₂ content of these mantles is estimated at 815 lb.