point, though we do not yet have accurate measurements of the exact values. The best indications which we so far have suggest that a cavity with Q_0 of the order of 2000 at room temperature has a value of the order of 7000 at 30°K, whereas at 4°K the value is of the order of magnitude of 10^6, a large part of the increase apparently coming over a narrow temperature range. This would indicate conductivity at 4°K of 10^6 times as great as at room temperature, and a skin depth of the order of 50A. Further measurements are in progress, with the aim of getting more reliable measurements, finding whether the residual resistance indicates a true bulk resistivity of the Pb or comes from some extraneous source, and comparing with results on other materials. Later in the program, other wavelengths will probably be investigated as well.

The refrigerator, as has been mentioned, was developed by Professor S. C. Collins of the Department of Mechanical Engineering at the Institute. He has actively assisted in the low temperature part of the project, and we are greatly indebted to him for his assistance. We are also indebted to Dr. W. E. Henry for assistance with the temperature measurement.

* This paper is based in whole or in part on work done for the Office of Scientific Research and Development under Contract OEMsr-262 with the Massachusetts Institute of Technology.

[1] H. London, Proc. Roy. Soc. **176A**, 522 (1940).

[2] See forthcoming paper in Rev. Sci. Inst.

A Helium Cryostat

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A HELIUM cryostat, constructed at the Massachusetts Institute of Technology on an AAF contract,* has been assembled and tested with the cooperation of personnel of the Research Laboratory of Electronics and the use of its facilities. This machine provides an experimental chamber which can be cooled to very low temperatures, that of liquid helium and below. The refrigeration is produced by the adiabatic expansion of helium within a well-insulated inclosure. A 10-hp compressor circulates gaseous helium in a closed cycle. A counter flow heat exchanger makes possible the compression of the helium at room temperature and its subsequent expansion at very low temperatures with almost no loss of refrigeration.

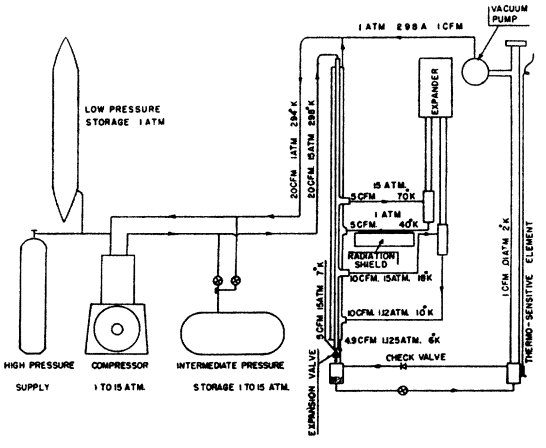

FIG. 1. Flow diagram for helium liquefier.

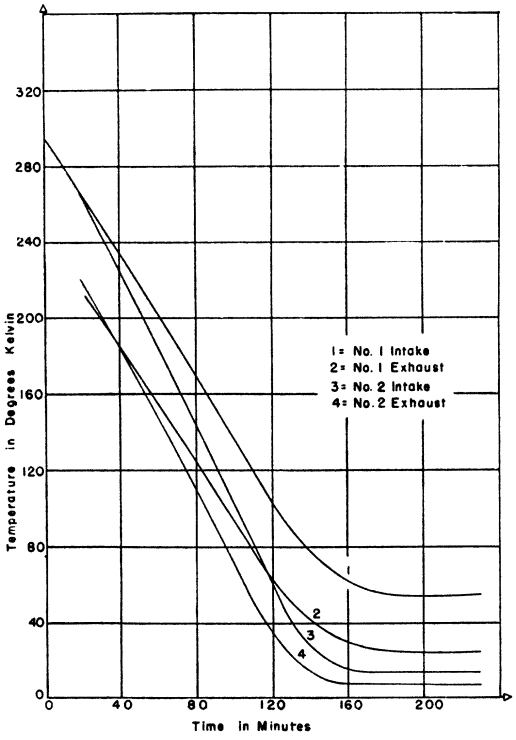

FIG. 2. Performance characteristics of helium liquefier.

Accessories to the cryostat are the compressor, already mentioned, water-cooled after-cooler, oil separator, liquid air-cooled charcoal traps to remove gaseous impurities, 1-atmos. gas holders, and instruments for temperature measurements. The last item includes thermocouples, constant volume gas thermometer, hydrogen vapor pressure thermometer, and helium vapor pressure thermometer.

The flow diagram of the complete assembly is shown in Fig. 1. The outermost shell is the vacuum case. Next is the radiation shield which is attached to the inner wall of the vacuum case. Immediately inside the inner wall of the vacuum case is the heat exchanger, one channel of which is a helix of one-quarter inch finned brass tubing. The helix occupies the annular space between two thin-walled stainless steel cones. The annular space constitutes the second channel of the heat exchanger. Compressed helium flows in the tube, expanded helium in the annulus. The two expansion cylinders and their connections to the heat exchanger appear in the center of the drawing.

A fair amount of experience in operating the machine has been gained. One has reasonable assurance of success

in the attainment of liquid helium temperature level on each attempt.

Figure 2 gives the time rate of cooling. Note that approximately two hours are required to reach the liquid air level (80°K), three hours for liquid hydrogen (20°K) and four hours for liquid helium (4°K). In going from 20°K to 4.2°, the boiling point of helium, a large quantity of gaseous helium accumulates in the experimental chamber. Since the gas must be cooled from room temperature it represents a sizable refrigerative effort on the part of the unit.

* W33-038ac-13866.

Proceedings of the American Physical Society

MINUTES OF THE MEETING AT CHICAGO, JUNE 20–22, 1946

THE 272nd meeting of the American Physical Society was held at Chicago in the buildings of the University of Chicago on Thursday, Friday, and Saturday, June 20–22, 1946. There were 585 registrants, and about a thousand people present in Mandel Hall at the session of Thursday morning. While the registration did not match the two previous meetings nor the largest of the Washington meetings of old, this was by far the largest meeting ever held away from the Atlantic seaboard, and its disadvantage with respect to the few just mentioned is fully explicable by the greater spacing of the centers of physics in the Midwest. Incidentally it was much the largest summer meeting of our history. The Secretary thanks A. J. Dempster, A. E. Shaw, Miss Alberta Jeffrey (secretary of the Department of Physics), and her colleagues for their assistance with the local arrangements.

This will be long remembered as the great nuclear-physics meeting at which a large amount of the work done under the famed "Manhattan Project" was finally brought to light. It is understood that the clearance authorities were laudably assiduous in carrying through with great dispatch the complicated process in the short available time—too short indeed for many who for one good reason or another were unable to prepare in time, and whose contributions may appear at later meetings. A certain number of nuclear-physics papers also came from other than Project sources, and three and a half of the sessions were filled with contributed papers from other fields of physics. There were 97 contributed papers altogether: the abstracts follow.

The programme was enriched with eight invited papers mostly from the Project: the titles and the speakers are given hereinafter. Even the speech of Mr. Seaborg was well attended, though an emergency required it to be given on short notice twenty-four hours before the time allotted. Attention is drawn to the list of scientists on whose work was based the survey by H. H. Goldsmith: this list, not available when the Bulletin was issued, is printed *infra* after the title of the paper.

The dinner of the Society was held on Thursday evening at the Hotel Shoreland, with an attendance of 300. The after-dinner programme consisted almost wholly of the address by A. H. Compton "Physics Research and the Release of Nuclear Energy."

The Council met on Friday afternoon, and elected nine candidates to Fellowship and one hundred and sixteen to Membership: their names are appended.

Elected to Fellowship: W. N. Arnquist, T. B. Brown, H. H. Goldsmith, Victor Hicks, P. E. Lloyd, W. H. Pielemeier, D. H. Rank, M. M. Shapiro, and O. C. Simpson.

Elected to Membership: Edward F. Allen, Frank L. Allen, Mark E. Amdursky, Lowell O. Anderson, Alan Andrew, Joseph Ballam, E. Bleuler, J. W. Bond, William Brauner, Willard E. Buck, William Irving Burg, Alan C. Byers, Paul A. Caldwell, Hans M. Cassel, T. S. Chambers, Richard S. Christian, James Stacy Coles, Kenneth C. Crumrine, Robert B. Duffield, Edgar Everhart, Hubert H. Evinger, Arnold Feldman, Rogers B. Finch, Sister Germaine Fogarty, S.L., Judson Cull French, Ernesto E. Galloni, Clifford S. Garner, Norman E. Gibbs, Homer T. Gittings, Jr., Donald Arthur Glaser, Harold Goldberg, Nicholas E. Golovin, Eugene Paul Gross, P. C. Gugelot, Anatole M. Gurewitsch, Edwin E. Hahn, Jr., Norman S. Hall, Jr., Martin D. Herbst, Melvin A. Herlin, O. Huber, George Gaynor Hyde, Jack Howard Irving, Julius L. Jackson, Nithipat Jalichandra, Sidney Kaufman, George P. Kerr, Jr., George P. Kirkpatrick, Wilfred Konneker, John Herbert Ladd, Arthur E. Laemmel, Simon Larach, Albert H. Lasday, James L. Lauer, Norman T. Lavoo, Lawrence Lee, Sam Legvold, John J. Lentz, Abraham Sidney Levenson, Paul Luger, Paul Thomas Masley, James J. McGlynn, John Armin McIntyre, Howard Oldford McMahon, W. Lathrop Meaker, H. Medicus, William Ralph Mercer, R. C. Meyer, Louis Milgrom, Carlton W. Miller, Herbert I. Miller, Horace L. Newkirk, Robert H. Noble, Arthur S. Nowick, Russell S. Ohl, Benjamin J. Patton, Martin A. Paul, William Perl, Melvin A. Preston, Samuel J. Raff, Milton A. Rothman, Sylvan Rubin, Matthew Sands, Marcello Damy de Souza Santos, Arthur