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NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT

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TESTS OF REFRIGERATION AND MISCELLANEOUS EQUIPMENT

Progress Report
April 1 - June 30, 1953

by

P. R. Achenbach
C. W. Phillips
Heating and Air Conditioning Section
Building Technology Division

for

OFFICE OF THE QUARTERMASTER GENERAL

NBS

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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PROGRESS REPORT

TESTS OF REFRIGERATION AND MISCELLANEOUS EQUIPMENT

April 1 - June 30, 1953

OFFICE OF THE QUARTERMASTER GENERAL

Federal Specification AA-R-211c.

At the request of the Office of The Quartermaster General, preliminary work was begun for a revision of the above specification. A letter was sent to all members of the industry, requesting them to submit specifications and other pertinent information on their products. Replies to this letter are now arriving at the Bureau.

Hydraulic Drives.

A preliminary investigation was begun in preparation for a project to develop a prototype hydraulic drive for use with the Quartermaster portable refrigerating equipment. After a conference with representatives of the Office of The Quartermaster General, however, it was decided to cancel the project for the time being.

Longstreth Compressor Tests.

A prototype radial refrigerating compressor was tested to determine its capacity at various operating conditions. Tests were made on the secondary refrigerant calorimeter. A series of tests was made by varying the speed of the compressor from 800 rpm to 2300 rpm in steps, and holding suction and discharge pressures constant. The capacity of the compressor under these conditions ranged from approximately 1600 BTU/hr to approximately 4200 BTU/hr for the low and high speeds, respectively. A second series of tests was made by varying the suction pressure from 4.5 psig to 37 psig in steps, and by holding

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
WASHINGTON, D. C.
1911

REPORT OF THE COMMISSIONER

of the Bureau of Plant Industry for the year ending June 30, 1911.

General Statement

The Bureau of Plant Industry was organized in 1889 as a part of the Department of Agriculture. It has since that time been engaged in the study and collection of plants and animals, and in the propagation and distribution of the same. The Bureau has also been engaged in the study of the diseases of plants and animals, and in the development of methods for their control.

Administrative Statement

The Bureau of Plant Industry is organized into several divisions, each of which is headed by a chief. The divisions are: 1. The Division of Horticulture, which is concerned with the study and propagation of fruit and ornamental plants. 2. The Division of Forestry, which is concerned with the study and propagation of trees and shrubs. 3. The Division of Plant Pathology, which is concerned with the study of the diseases of plants. 4. The Division of Plant Quarantine, which is concerned with the prevention of the introduction of foreign plants and animals into the United States. 5. The Division of Plant Conservation, which is concerned with the preservation of rare and valuable plants and animals. 6. The Division of Plant Industry, which is concerned with the study and propagation of plants and animals for industrial purposes.

discharge pressure and speed constant (1750 rpm). Under these conditions, the compressor capacity ranged from approximately 3100 BTU/hr at the low suction pressure to approximately 13,200 BTU/hr at the high suction pressure. Because of vibration problems, the compressor could not be run at speeds higher than 2300 rpm; however, the mounting of the compressor is being changed now, and it is expected to make tests at speeds up to 4000 rpm.

Thermo-King Plug-type unit model K-10.

This unit was prepared for tests by providing some of the thermocouples and checking the unit out for operation. Tests of the unit are expected to be made during the next reporting period for a range of engine speeds and a range of fan speeds.

1/3rd ton plug-type Refrigerating Units.

At the request of the Office of The Quartermaster General, a series of tests to determine the capacity of two 1/3 ton plug-type refrigerating units at varying engine speeds, and at conditions of 0°F refrigerator temperature and 110°F ambient temperature was continued during this quarter. The two units used for this test were a Thermo-King, Model Q150, and a Carrier unit, Model D731. Engine speeds for these tests were adjusted from 1000 rpm to 3000 rpm in steps of 500 rpm. The Carrier unit evaporator fan was a constant-speed fan, and was driven by a D. C. motor drawing power from the 24-volt battery used for the gasoline engine. At an engine speed of 1000 rpm, the Carrier unit had a capacity of approximately 3000 BTU/hr. The capacity increased steadily as the engine speed was increased, reaching a peak capacity of approximately 4300 BTU/hr at an engine speed of 2700 rpm. At 3000 rpm engine speed, the capacity decreased to approximately 3000

The first part of the report deals with the general situation of the country and the progress of the war. It is followed by a detailed account of the military operations in the various theatres of war. The author then discusses the political and economic conditions of the country and the effect of the war on the population. The report concludes with a summary of the main points and a list of references.

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BTU/hr. No further tests were made with this unit.

The Thermo-King unit, Model 41XG, also driven by gasoline engine, had the evaporator and condenser fans driven by the same belt drive that operated the compressor so that as designed, the fan speed was proportional to the compressor speed. The capacity varied from 4000 BTU/hr at 1800 rpm engine speed, 4500 BTU/hr at 2100 rpm engine speed, to 5000 BTU/hr at 3000 rpm engine speed.

Another series of tests was run in which the fans were operated at constant speed. At engine speeds varying from 1800 rpm to 3000 rpm, the fans were operated at speeds varying from 500 rpm to 2100 rpm. At 2100 rpm engine speed, the capacity of the unit varied from 4400 BTU/hr at 500 rpm fan speed, 5250 BTU/hr at 1800 rpm fan speed to 4200 BTU/hr at 2100 rpm fan speed. Similar curves were observed at other engine speeds. These observations indicated that further study of optimum fan speeds is desirable.

Drifree Dehydrator

Tests of the proprietary dehydrator employing calcium carbide to determine capacity, drying rate and hazards were completed during the preceding quarter. Comparison of the electric hygrometer method of determining moisture content of refrigerant with the P_2O_5 method was completed during this quarter. The first draft of the report of these tests has been completed and review of this draft has been started.

Refrigerator Door Tests

Frames have been prepared for the four warehouse-type refrigerator doors to be tested and a warehouse has been selected for these tests.

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Trailer Air Distribution

Test facilities for the series of tests proposed for determining the most suitable air distribution in refrigerated trailers have been prepared in Bldg. 35 and the first Test Trailer has been installed.

Defrost Tests

Test facilities for the tests of the defrosting system for the Model 2451 gasoline-driven 12,000 BTU/hr plug-type refrigerating unit have been prepared adjacent to Building 4 and calibration of the heat loss of the test warehouse has been completed.

Gasoline Lanterns

Tests were begun on four standard Army gasoline lanterns to determine causes and possible remedies for excessive mantle breakage. Studies were made of several kinds of deflecting devices to prevent liquid gasoline from striking the bottom of the mantle during the lighting process. These studies were also to include comparisons of lantern performance when the generators were packed with steel wool and glass wool twine.

Near the end of the reporting period two Coleman inverted lanterns were received for studies of their performance in ambient temperatures ranging from -4 F to 135 F with special attention to the functioning of the pressure relief device. These tests were given higher priority than those on the standard lanterns requiring that the earlier tests be interrupted.

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