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# TEST OF FLOOR COVERINGS FOR POST-OFFICE WORKROOMS

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ABSTRACT

Twenty kinds of floor coverings were tested to learn their relative suitabilities in the workrooms of post offices. The 20 samples included 8 of wood, 5 of concrete, 2 each of asphalt, magnesite, and rubber, and 1 of linoleum. The test consisted in the continuous operation of two post-office platform trucks around a track. The trucks have steel wheels and were loaded to 1,000 and 1,500 pounds, respectively. The results are shown by photographs taken after 60,000 passages of the truck. The results show that maple, linoleum, or perhaps rubber should give satisfactory durability in this service.

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## I. INTRODUCTION

What type of floor covering is best suited to meet the exacting and difficult conditions found in the workroom and on the loading platform of a post office? This question has been before the U. S. Treasury Department, which installs the floors, and the U. S. Post Office Department, which uses them, for a number of years. While experience has been an excellent guide with conventional materials, the lack of service experience naturally prevents the use of any of the newly developed or improved materials now being offered. The service in a post-office workroom is so different from other kinds of service that experience gained from ordinary installations is of dubious value.

In an attempt to answer this question, accelerated wear tests were made during the winter of 1936–37. The floor coverings were selected by the Treasury Department and installed according to their specifications. The test method was designed to duplicate the service conditions found in post-office workrooms. The work was done by the National Bureau of Standards.

## II. DESCRIPTION OF TESTING EQUIPMENT

A concrete slab about 45 feet square by 8½ inches thick was laid on a cinder fill. This fill permitted surface water to drain out from under

the concrete and thereby prevented the slab from becoming unduly wet. On this slab was erected a circular track, about 4 feet wide by 40 feet in diameter, with a metal-sheathed concrete curb on each side. The track was partitioned off by I-beams into 20 sections, each about 6 feet long, the lower ends of which were set in the concrete and the upper faces brought to the level of the finished floor. The exposed face of each I-beam was scored to produce the same conditions as exist at a steel threshold set flush in an opening between a workroom and a loading platform. In each section, a concrete subfloor was laid, the thickness of which was determined by the thickness of the floor covering to be used in that section, so that when the floor covering was applied over the subfloor, the final surface of the entire track was level and flush with the tops of the I-beams.

To protect it from the weather, the structure was surmounted by a frame housing. An attempt was made to heat the building with salamanders, but was soon abandoned as being ineffective and somewhat dangerous.

The testing equipment consisted of two post-office trucks arranged in tandem with a specially designed separate driving wheel, as shown in figure 1. Each truck had two steel wheels 11½ inches in diameter by 2½-inch face. Each truck also had two swivel castors which carried no loads when the truck was properly balanced. One truck was loaded to 1,500 pounds with sand; the other carried the driving motor and trolleys and enough additional load to make 1,000 pounds. The separate driving wheel was 4 feet in diameter and shod with eight wooden blocks, each of which carried a wearing surface of leather, the arrangement being such as to produce a bumping and slipping action between the wheel and the track.

The assembly was guided around the track by rollers attached to the front and rear ends of each truck. These took up the side thrust by bearing against the metal sheathing of the curbs.

## III. DESCRIPTION OF TEST

The concrete slab was poured on June 25, 1936. The concrete subfloors were placed on September 4 to 9. The floor coverings were placed on September 15 to 18. The test was started on October 23. It will be noted that ample time was allowed for the setting and drying of the concrete.

The trucks were driven at a speed of 2 miles per hour. The direction of travel was reversed twice: once on November 19, after 13,015 circuits, and again on December 4, after 30,080 circuits. The track was swept at least once a day to remove loose dust and fragments. The test was stopped on January 15, 1937, after 60,000 circuits. The condition of the floors at that time is shown in the accompanying photographs.

In making each photograph, a fine wire was stretched tautly across the depression in the floor caused by the wear of the truck wheels, the ends of the wire resting upon the unworn surfaces. This wire was made to cast a shadow by placing a source of light over the track with the rays at an angle of 45° with the surface. The distance from the wire to the shadow is therefore equal to the amount of wear which the floor has undergone. The smallest division on the scale shown on each photograph is ½ inch.

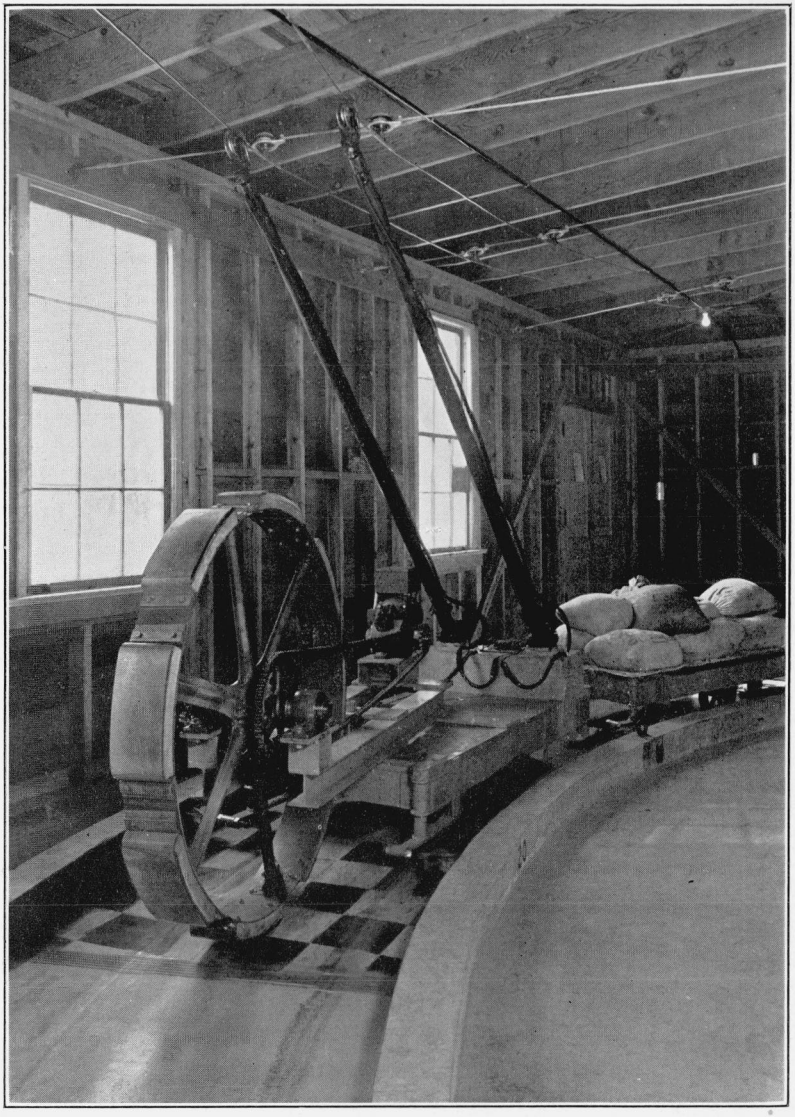

FIGURE 1.—*Floor-testing equipment.*

Two post-office trucks, the forward one loaded to 1,500 pounds with sand, the rear one carrying the motor and trolleys. Leather-shod driving wheel in foreground.

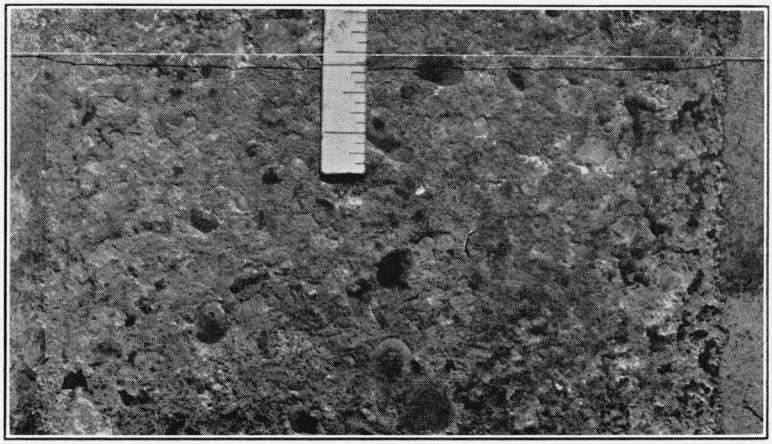

FIGURE 2.—*Plain concrete—no surface treatment.*

FIGURE 3.—*Concrete with abrasive aggregate in wearing surface.*

FIGURE 4.—*Concrete surfaced with 1:3 cement mortar.*

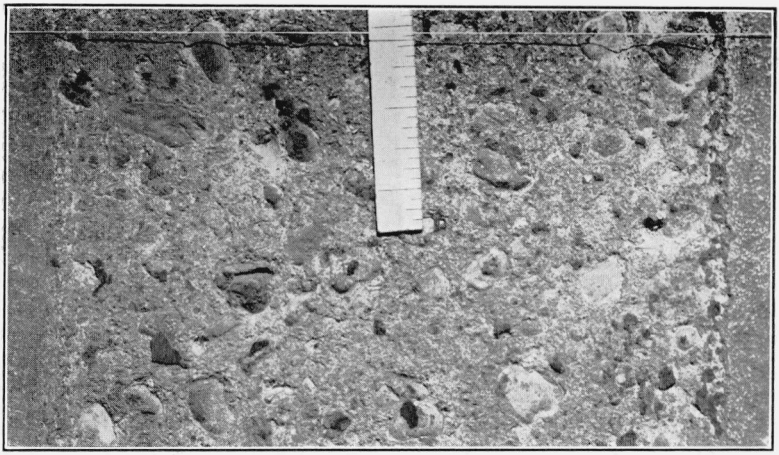

FIGURE 5.—*Concrete treated with three coats of liquid hardener after the concrete had set.*

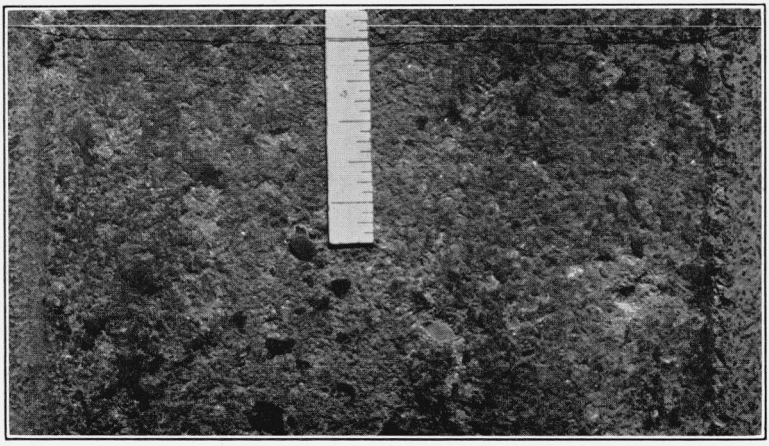

FIGURE 6.—*Concrete with fine metallic hardener in wearing surface.*

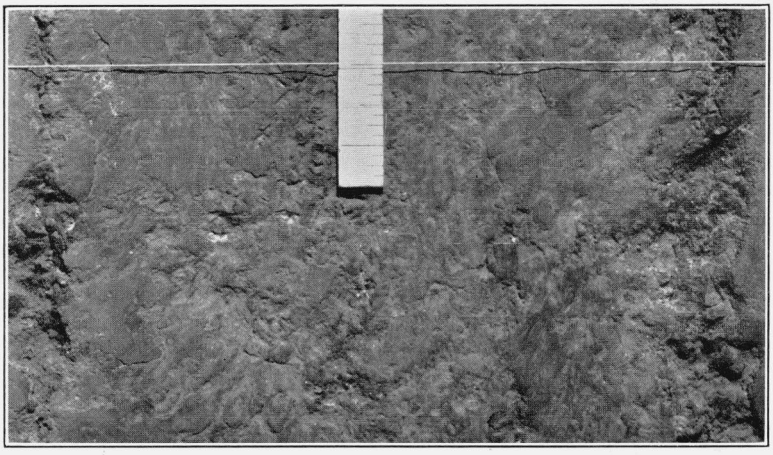

FIGURE 7.—*Asphalt blocks 5 by 12 by 2 inches.*

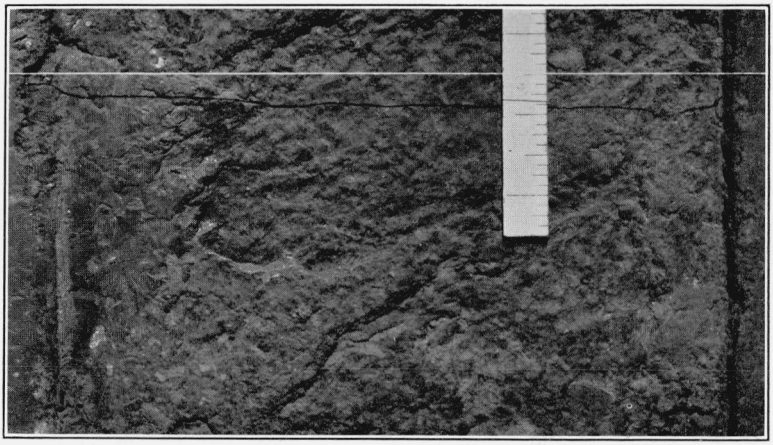

FIGURE 8.—*Asphalt plank ½ inch thick.*

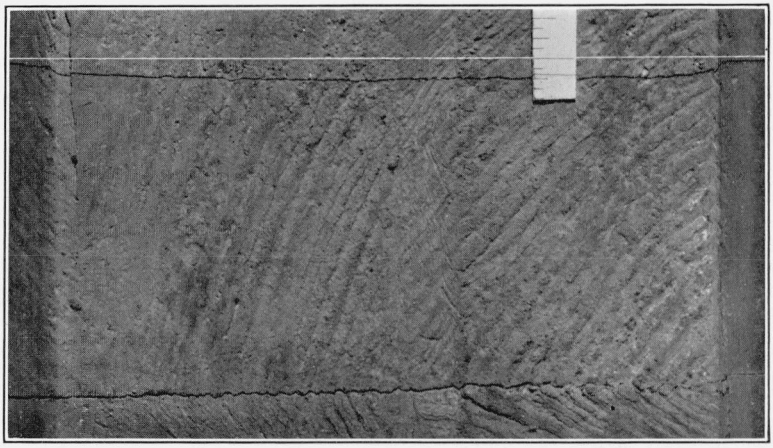

FIGURE 9.—*Southern yellow pine end-grain blocks 2½ inches thick, set in mastic.*

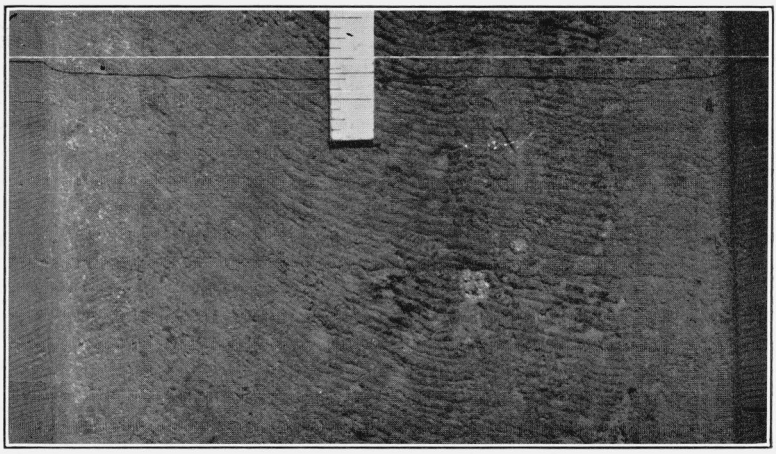

FIGURE 10.—*Douglas fir end-grain blocks 2½ inches thick, set in mastic.*

FIGURE 11.—*Quarter-sawed red oak 25/32 inch thick, set in mastic.*

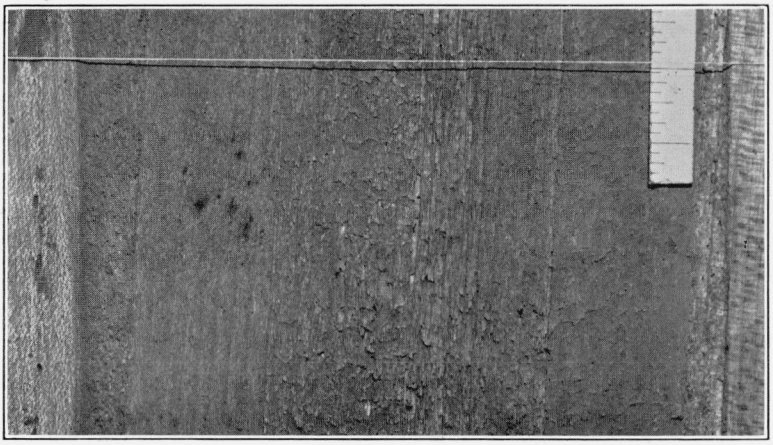

FIGURE 12.—*Maple, edge grain 2⅛ inches thick set in mastic.*

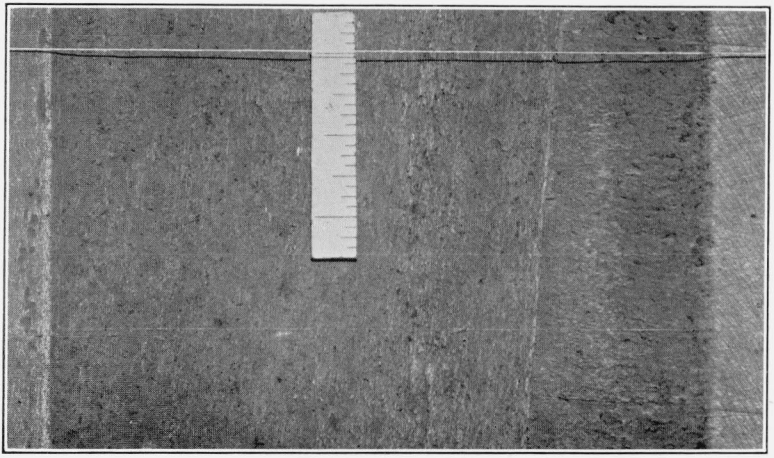

FIGURE 13.—*Maple unit blocks 31/32 inch thick, set in mastic.*

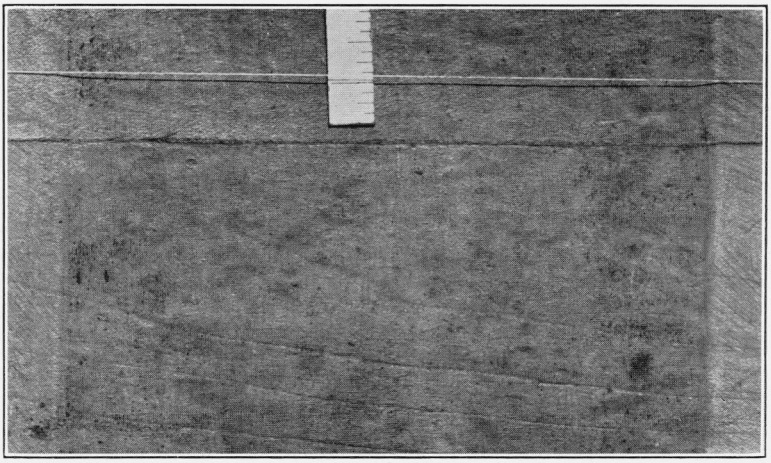

FIGURE 14.—*Maple plain strips* $^{33}/_{32}$ *inch thick, set on sleepers.*
Finished with one coat sealer, two undercoats, one finish coat.

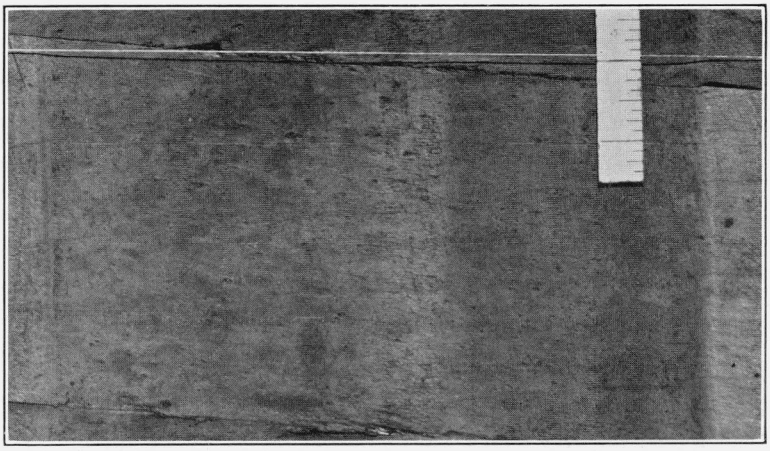

FIGURE 15.—*Maple plain strips* $^{33}/_{32}$ *inch thick, set on sleepers.*
Finished with one coat sealer and one finish coat.

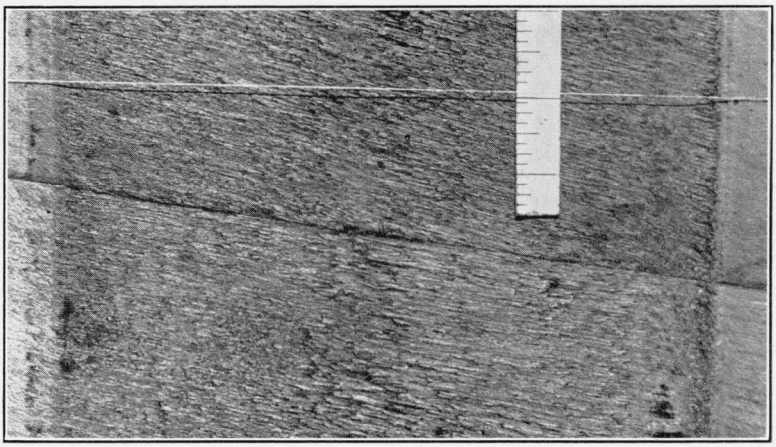

FIGURE 16.—*Maple plain strips* $^{33}/_{32}$ *inch thick, set on sleepers.*
Finished with two coats linseed oil and turpentine.

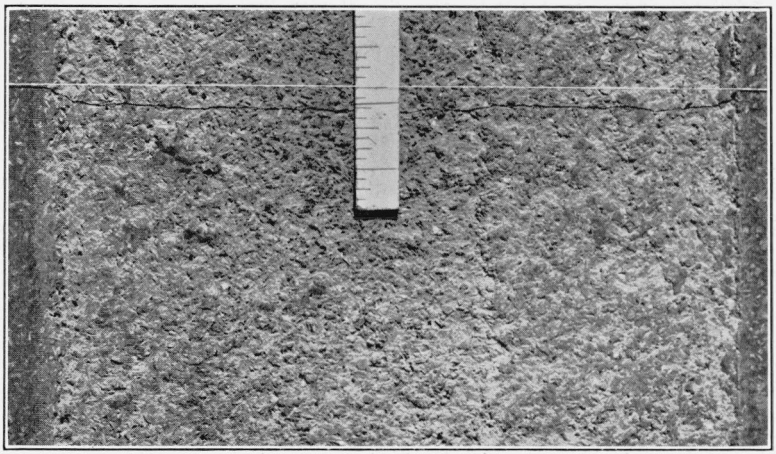

FIGURE 17.—*Magnesite with hardwood fiber aggregate 1 inch thick.*

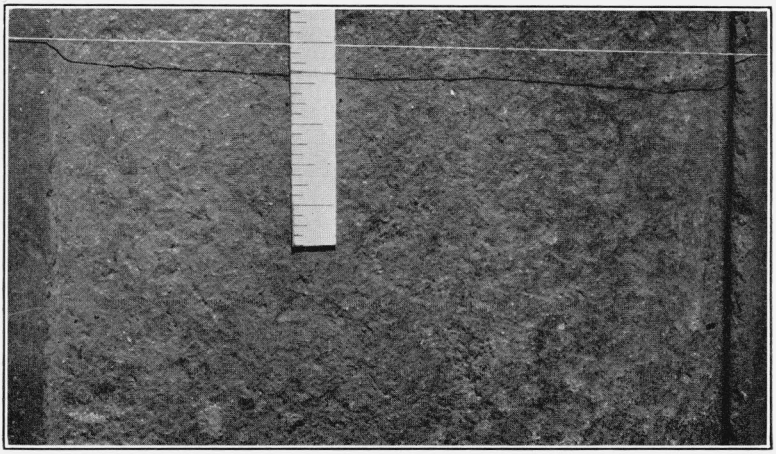

FIGURE 18.—*Plain magnesite ½ inch thick.*

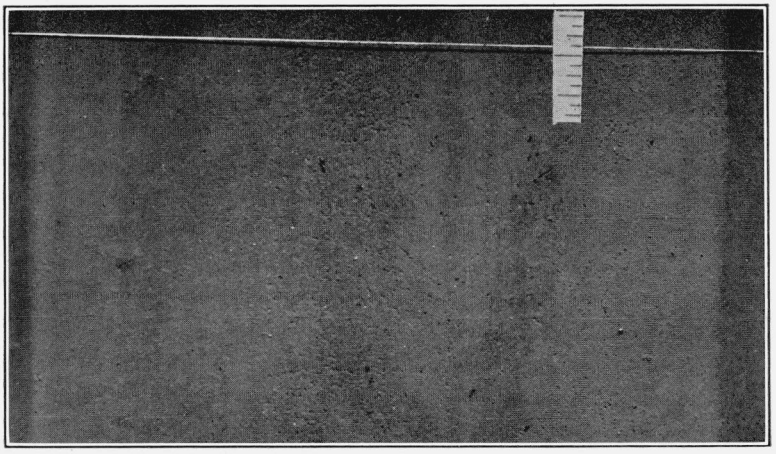

FIGURE 19.—*Battleship linoleum ¼ inch thick.*

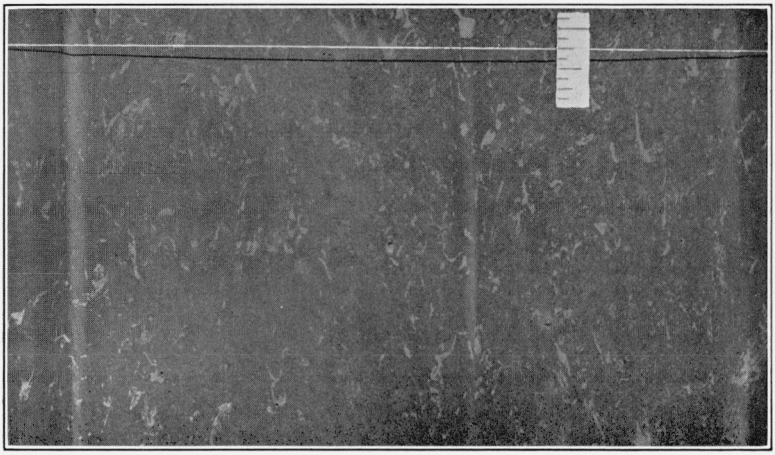

FIGURE 20.—*Rubber sheet ¼ inch thick.*

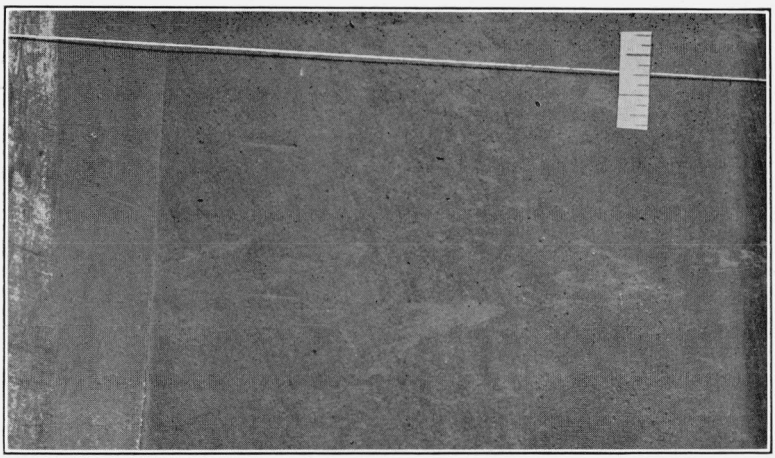

FIGURE 21.—*Rubber tile ¼ inch thick.*

## IV. RESULTS

The 20 specimens tested included 5 of concrete, 8 of wood, 2 of magnesite, 2 of asphalt, 2 of rubber, and 1 of linoleum.

For those interested in the details of construction, complete specifications used in laying these floors may be had free upon request addressed to the National Bureau of Standards, Washington, D. C.

Concrete specimens 2, 3, 5, and 6 were made of 1 : 1 : 1½ concrete 1½ inches thick. Number 2 was given no surface treatment; number 3 had an abrasive aggregate in the wearing surface; number 5 was treated with three coats of liquid hardener after the concrete had set; and number 6 had a fine metallic aggregate or hardener in the wearing surface. Number 4 was made of 1:3 cement mortar, ¾ inch thick. The photographs show that the cement-mortar finish (no. 4) did not stand up well under this test. The plain concrete (no. 2) was not particularly durable, nor was it much improved by any of the three treatments tried.

Asphalt specimen 7 was made of blocks 5 by 12 by 2 inches set in ½ inch of mortar. Specimen 8 was asphalt plank, ½ inch thick. The surfaces of both block and plank roughened quite readily under this treatment, and for this reason they could not be kept clean by sweeping. The plank showed considerably more wear than the block.

Wood specimen 9 was made of end-grain blocks of Southern yellow pine, 2½ inches thick, set in mastic. Number 10 was the same as no. 9, except that the wood was Douglas fir. Number 11 was quarter-sawed red oak, $^{25}/_{32}$ inch thick, set in mastic. The remaining specimens were all maple: No. 12, edge grain, $^{17}/_{8}$ inch thick, set in mastic; no. 13, unit blocks $^{31}/_{32}$ inch thick. set in mastic; no. 14, plain strips $^{33}/_{32}$ inch thick, set on sleepers and treated with one coat of sealer, two undercoats, and one finish coat; no. 15, same as no. 14, except that the two undercoats were omitted; no. 16, same as no. 15, except that the treatment consisted of two coats of linseed oil and turpentine.

The photographs show that the end grain (nos. 9 and 10) and the quartersawed grain (no. 11) wore appreciably under this test. Of the maple floors, there is little choice between the edge grain (no. 12) and the flat grain (no. 13); both stood up very well. Of the three methods of finishing examined, the four-coat job (no. 14) is better than the two-coat job (no. 15), and both are better than the linseed-oil finish. The differences, however, are in the appearance and the ability to keep the floor clean; there is not much difference in the wear.

Magnesite specimen 17 contained an aggregate of hardwood fiber and was 1 inch thick; no. 18 was ½-inch plain magnesite. Both of these specimens showed wear to such an extent as to indicate their unsuitability for this kind of service.

Specimen 19 was ¼-inch battleship linoleum. This showed very little wear. There was a tendency to creep in the direction of the traffic, but the movement was not sufficient to break the bond between the linoleum and the concrete subfloor.

The first sample of rubber tile (no. 20) could not be made to stick to the concrete. It was finally taken up on November 14 and replaced by sheet-rubber flooring ¼ inch thick. The second sample of rubber tile (no. 21) adhered somewhat better, but it caused a great deal of trouble, tiles having to be replaced every few days. The results indicate that rubber will withstand the service fairly well, if some adhesive can be found to hold it to the concrete.

## V. SUMMARY

The results show that, for this particular service, maple, either flat or edge grain, linoleum, and, perhaps, rubber should give satisfactory durability. The different types of finishes used for maple flooring may improve its cleanability but have little effect on its durability. A better adhesive to hold linoleum and rubber flooring to concrete is needed. If this can be found, perhaps the rubber flooring will be as good as the linoleum. The amount each floor was worn is shown in table 1.

TABLE 1.—*Wear of various flooring materials after 60,000 truck cycles*

| Figure | Material | Wear (thirty-seconds of an inch) |
|---|---|---|
| 2 | Plain concrete | 3 |
| 3 | Concrete with abrasive aggregate | 3 |
| 4 | Concrete surfaced with 1:3 mortar | 21 |
| 5 | Concrete with liquid hardener | 3 |
| 6 | Concrete with metallic hardener | 4 |
| 7 | Asphalt blocks | 2 |
| 8 | Asphalt plank | 7 |
| 9 | End-grain southern yellow pine | 4 |
| 10 | End-grain Douglas fir | 4 |
| 11 | Quartersawed red oak | 4 |
| 12 | Edge-grain maple | 2 |
| 13 | Maple unit blocks | 2 |
| 14 | Maple strips, 4-coat finish | 2 |
| 15 | Maple strips, 2-coat finish | 2 |
| 16 | Maple strips, linseed-oil finish | 2 |
| 17 | Magnesite with hardwood fiber | 5 |
| 18 | Plain magnesite | 7 |
| 19 | Linoleum | 1 |
| *20 | Rubber sheet | 3 |
| 21 | Rubber tile | 1 |

* The sheet-rubber flooring was subjected to only 46,985 truck cycles.

## VI. INTERPRETATION OF RESULTS

This test was designed to compare the relative merits of floor coverings for use in post-office workrooms and on loading platforms. The test simulated the ordinary trucking found therein, but not the gouging which might be caused by the dropping of heavy parcels with sharp corners. This service is quite out of the ordinary. The results of the test, therefore, should not be interpreted as indicating the relative merits of various floor coverings when used under other conditions.

WASHINGTON, August 17, 1937.