TABLE 38. AIR CHANGES TAKING PLACE UNDER AVERAGE CONDITIONS EXCLUSIVE OF AIR PROVIDED FOR VENTILATION

KIND OF ROOM OR BUILDING	NUMBER OF AIR CHANGES TAKING PLACE PER HOUR
Rooms, 1 side exposed	1
Rooms, 2 sides exposed	1½
Rooms, 3 sides exposed	2
Rooms, 4 sides exposed	2
Rooms with no windows or outside doors	½ to ¾
Entrance Halls	2 to 3
Reception Halls	2
Living Rooms	1 to 2
Dining Rooms	1 to 2
Bath Rooms	2
Drug Stores	2 to 3
Clothing Stores	1
Churches, Factories, Lofts, etc.	½ to 3

velocities per foot of uncalked crack around the frame, which can be almost entirely stopped by proper calking, and is taken from a paper entitled *Air Leakage*, by Houghten and Schrader. (TRANSACTIONS, A. S. H. V. E., Vol. 30, 1924).

This table also indicates the amount of leakage per foot of crack around the sash including meeting rail for cracks of 1/16 in. and in clearances of 7/64 in., for both plain and average weatherstripped windows, unlocked. It will be noted that this table is divided into two parts, the first part containing values based upon the original test data, and the second part containing the same values reduced by 20 per cent.

According to the authors of the paper: "The values given in the tables are from the tests as made and are probably somewhat higher than those actually found in practice. They represent the leakage when the pressure drop through the window is a certain value which represents a definite wind velocity at right angles to the window. If the wind strikes the window at an oblique angle the component of the velocity at right angles to the window must be considered. Pressure difference between the outside and the inside surfaces of the window for an actual wind will be slightly less for a given velocity because of a building up of pressure within the room before the air leaks out the opposite side of the building. Attention is called to the fact that air leaks in on the windward side of the building and out on the leeward side and, since wind will blow from various directions at different times, heating for any room having only one exposure must be based on the maximum loss. The heating plant, however, need not be figured on the sum of all maximum leakages, but in general only half of the total. However, the table gives accurate comparative figures which are probably not much too high for actual practice. In order to apply these values, a further study of the overall results as found in practice should be made, and the figures modified, if necessary, to fit practical conditions."

Fig. 6 gives the results of tests of a plain double-hung window with various clearances, and is taken from a paper entitled *Air Leakage Around*

Window Openings, by C. C. Schrader. (TRANSACTIONS, A. S. H. V. E., Vol. 30, 1924, No. 704). Four sets of sash were fitted with cracks of 1/16, 1/8, 3/16 and 1/4 in. Each set was tested with clearances varying from 1/32 to 1/4 in. Each test was repeated a number of times because no tests gave exactly the same leakage, and it was necessary to obtain average results. The tests proved that the size of the crack around the perimeter of the sash had no appreciable effect on the leakage. Therefore, the results apply to any window of the type tested with a crack of from 1/16 to 1/4 in. (Most new sashes are fitted with the crack at least 1/16 in., and this crack

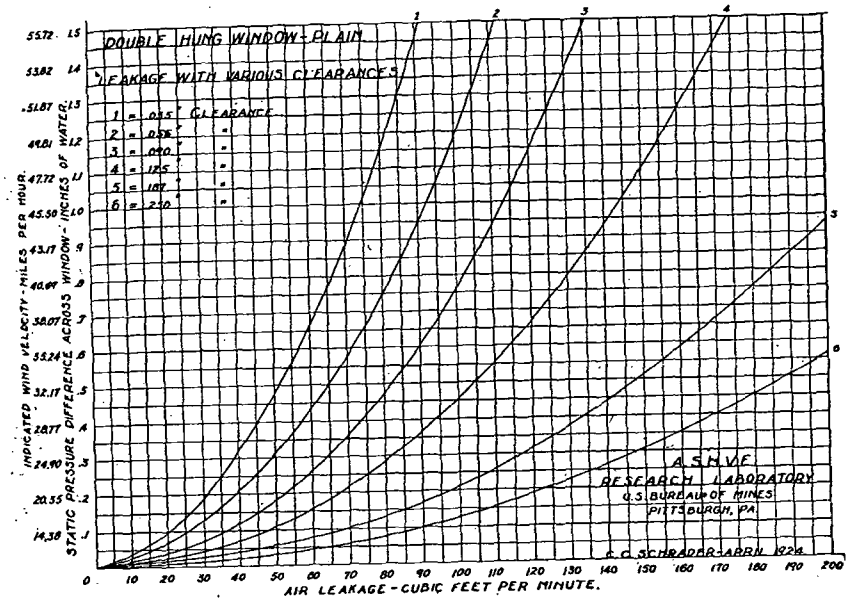

FIG. 6. LEAKAGE THROUGH PLAIN WOOD WINDOW WITH VARIOUS CLEARANCES

Note.—The above curves show the leakage for the total crack. To obtain the leakage in cubic feet per hour per foot of crack, multiply by 60 and divide by 18.25.

becomes greater as the sash dries out and shrinks). Fig. 6 shows that the leakage increases rapidly with increase in clearance.

Double-Hung Metal Sash Windows: Table 40, pertaining to double-hung metal sash windows, is based on data obtained from tests conducted in the Southwestern Bell Telephone Co., St. Louis, Mo., and reported in a paper entitled *Saving Heat in Skyscrapers*, by Houghten and McConnell. (JOURNAL, A. S. H. V. E., Vol. 33, No. 11, Nov., 1927.)

This table contains data for non-weatherstripped windows, locked and unlocked, and weatherstripped windows, unlocked. As in the case of Table 39, the actual test results are reduced by 20 per cent to allow for the building up of pressure within the room before the air leaks out the opposite side of the building.

Rolled Section Steel Windows: Data concerning industrial pivoted,