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MR. JOS. M. WILSON, President, in the chair.

THE FIRE-RETARDING QUALITIES OF WIRED-GLASS.

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On November 1, 1893, the Committee of Science and the Arts of the Franklin Institute adopted a report recommending the award, to Frank Shuman, of the John Scott Legacy Premium and Medal, for his machine and process for producing wired-glass. This report, at some length, discusses the varied uses to which wired-glass can be put, and its superiority in numerous applications over the ordinary glass. The question of the fire-retarding qualities of the

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REPORT ON TEST OF THE FIRE-RESISTING QUALITY OF WIRED-GLASS.

A brick test-house, about 3 x 4 feet, inside measurement, and 9 feet high, was constructed in the yard of the Pennsylvania Iron Works, near Fiftieth Street and Merion Avenue. In one side of this structure a wired-glass window was fastened in a wooden frame, covered with lock-jointed tin. In another side, a Philadelphia standard fire-door was hung. The upper part of this door had a pane of wired-glass, 18 x 24 inches, set into a wooden metal-covered frame. The entire roof of the test-house was replaced by a skylight, the sash being constructed of wood, metal-covered; one side of this skylight being provided with three lights of $\frac{1}{4}$ -inch ordinary rough glass, the

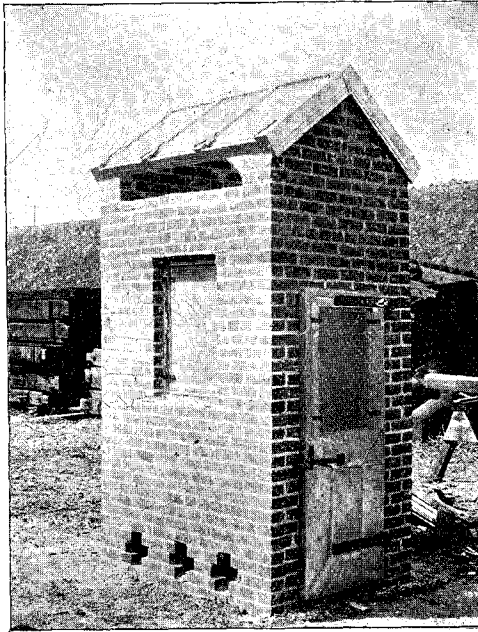


FIG. 2.

other side with three lights of wired-glass. The entire structure was constructed by John J. Husband, in accordance with specifications furnished by the Secretary. The wired-glass used was $\frac{1}{4}$ inch thick, and was manufactured by the Mississippi Glass Company, of St. Louis.

In order to make the fire test as severe as possible, iron grate-bars were placed in the bottom of the test-house, and openings were left in the wall near the ground for free draught. The test house was filled for two-thirds of its height with wood, approximately one-half cord being used. After treating the wood with a liberal allowance of coal oil and resin, the fire was started. In a few minutes the ordinary rough glass in the skylight cracked and pieces began to fall into the fire. The wired-glass in the fire-door soon became red

hot, so that a piece of paper held against it on the outside was easily ignited. The three plates of wired-glass in skylight, subjected to the entire heat of the fire, also became red hot, but retained their positions throughout the test. At the end of thirty minutes, water was thrown on the fire and also on the hot glass. After the fire was extinguished, the three plates of glass in the skylight were found to be cracked into countless pieces, but still adhering together, forming one sheet. The window light, which, as the result showed, was not properly secured to the frame, was found to be of same condition as skylight glass, excepting that a large crack had developed. The plate of glass in the standard fire-door was cracked, the same as the skylight; but having been

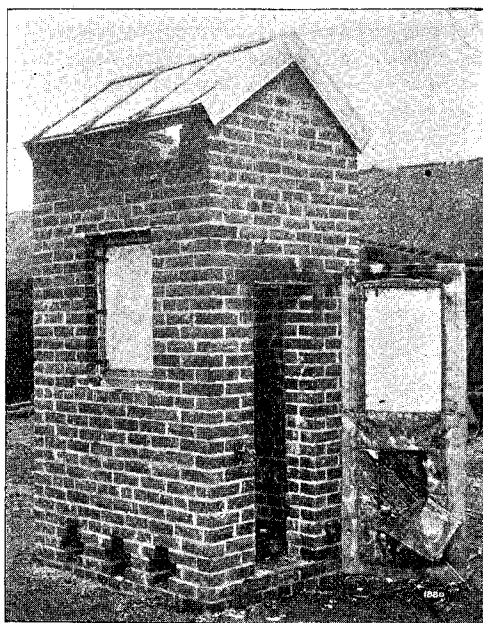


FIG. 3.

well secured into the door frame, it did not give way. The action of the fire on the wooden metal-covered skylight and window frame showed conclusively that this class of construction is far superior to iron framing, no warping or giving way of any portion of the frames being noticed. The fire-door in direct contact with the fire showed but little buckling on the inner side, and no signs of giving way. On removing the tin covering, it was found, however, that the inner layer of 1-inch boards was completely charred through, but that the second layer was only slightly damaged.

The conclusions to be drawn from the test appear to be as follows:

(1) Wired-glass can safely be used in skylights, and in such situations will withstand a severe fire and will not give way when water is thrown on it. A

wooden framing for skylight, covered with tin, all seams lock-jointed and concealed-nailed, is superior in fire-resisting quality to iron framing.

(2) Wired-glass in wooden sash, covered with tin, all seams lock-jointed and concealed-nailed, can safely be used for windows toward an external exposure.

(3) Wired-glass can safely be used in fire-doors to elevator shafts and stairway towers, where it is necessary to light said shafts.

(4) In office buildings, hotels, etc., where it is undesirable to have elevator shafts entirely enclosed and dark, wired-glass permanently built into a brick or terra-cotta shaft, or arranged in a wood metal-covered frame, can safely be used.

(5) Wired-glass plates, securely fastened in standard fire-shutters, can safely be used toward an external exposure. In this case, the fact that a possible fire in a building, all windows of which are protected by fire-shutters, can much more readily be detected from the outside through the wired-glass, is of importance.

Mr. Edward Atkinson, President of the Boston Manufacturers' Mutual Insurance Company, witnessed a test of the fire-retarding quality of wired-glass, in Boston. I quote from Circular No. 69, issued by him in April of this year, as follows :

FIRE-RETARDENT WINDOWS.

There are many places in our risks where it would be very desirable to brick up windows if the light could be spared, but where the requirements for light render it necessary to leave the spaces as they are, often protected with automatic shutters, but sometimes under such conditions that the risk must remain unguarded.

The intervention of wired-glass will, in such cases and in many others, suffice to retard the passage of fire in a fully adequate manner. This glass, originally invented for skylights, is now being applied to fire-retardent purposes. It has been introduced in some of the Western cities, around elevators, in place of the ordinary iron cages. It may be used in our risks for similar purposes.

First, it may be remarked that while, at the beginning, when used for skylights, some defects were disclosed in the differential strain on the glass and the wire under the heat of the sun, that fault is claimed to have been entirely removed. It would not affect the present purpose.

Second, a test of the fire-resisting properties of this wired-glass was witnessed by the undersigned in the vicinity of the Boston Plate Glass Company, on A Street, South Boston. What might be called an iron stove was constructed in the form of a fireplace with a wired-glass blower. It was 3 feet high, 1 foot in depth from face to back, 2 feet wide on front. It was set up on bricks, so as to give a draught all around, and was open at the top. The plate of glass which formed the blower was 18 x 34 inches. This fireplace

was filled to the top with hard wood, and resinous wood upon which kerosene oil had been poured, which was set on fire, resting in front against the glass.

The first effect was to cover the inside of the glass with soot, but after about fifteen minutes the soot was burned off, leaving the glass clear, as at the beginning. The stove was re-charged, and this intense heat affected the glass for nearly half an hour. A stream of cold water was then thrown on the glass from the outside. Presently the fire was put out with another stream and the glass was showered from within. The effect was to crack the glass into millions of pieces; but, being held by the wire, none fell out, neither did the glass spring or bend. It held its place even while the iron of the stove was twisted and bent.

This glass has already been placed at dangerous points in a few of our risks, and may be recommended in all places where the light must be retained, but where it is desirable to put in a fire-retardent material. We have as yet no experience in the test of this kind of window under actual fire.

The glass on which these tests have been made, which is intended for windows or doors, is $\frac{1}{4}$ inch thick, but it is made up to 1 inch in thickness. The $\frac{1}{4}$ inch is, of course, too heavy for the ordinary window frame, nor should any wood be used in the setting of the glass unless absolutely protected. Instructions will be given for placing it in metal frames. This glass is made up to 1 inch in thickness, and that thickness, properly supported beneath, might in many places be suitable to put into floors for the purpose of giving light in dark basements or elsewhere; of course, being placed so as not to be subjected to trucks with iron wheels or other danger of chipping.

It is clearly indicated from the above that wired-glass can safely be used as a fire-retardent in numerous ways. From personal experience, I am led to believe that metal-covered wood framing is superior to iron frames for holding the glass in place.

In closing, I would say that the capability of the wired-glass to withstand a temperature beyond the melting point of glass, appears to be attributable to the fact that the network of wire in the glass acts as a good conductor of heat, and thereby prevents the accumulation of sufficient heat to melt the glass; and although it may thereby be softened and rendered pliable, the network of wire prevents the glass from giving way by reason of its own weight when softened by the heat.

The accompanying illustrations will serve to render the preceding descriptions of tests more intelligible.

Fig. 1 shows a window of wired-glass in iron framing, built in a brick wall of a building in Newark, N. J. This window was subjected to a very severe fire, which ultimately destroyed the entire building. The photograph was taken several weeks after the fire.

Fig. 2 shows the brick test-house in the yard of the Pennsylvania Iron Works, Philadelphia, before being subjected to the fire test.

Fig. 3 shows the test-house after having been subjected to the fire test.

PANTASOTE, A NEW FABRIC.

[*Being the report of the Franklin Institute, through its Committee on Science and the Arts, on the products manufactured by the Pantasote Leather Company, of Passaic, N. J.*]

[No. 1772.] HALL OF THE FRANKLIN INSTITUTE,
PHILADELPHIA, December 9, 1895.

The Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, acting through its Committee on Science and the Arts, investigating pantasote leather, reports as follows:

The products, called by the manufacturers "Pantasote," include fabrics of various kinds intended to serve the same uses as leather in upholstering, carriage-furnishing, book-binding, trunk- and bag-making, mural decoration, etc.

It is made by applying a composition (of which the ingredients and mode of treatment are not disclosed), to the surface of textile fabrics of various kinds, and paper. The successive steps in the process of manufacture are described in sufficient detail to enable it to be clearly understood, in a communication furnished by the manufacturers, and which accompanies this report as an appendix.* These details, as will appear from the appendix, have been very intelligently worked out, and a plant of considerable magnitude, equipped with specially designed machinery, was

* Filed in the committee's archives.