The Dangers of Combustible Roof Coverings.

SHINGLE ROOFS

AS

CONFLAGRATION SPREADERS

BEING

Some Lessons

FOR

The British Possessions Overseas.

TEN ILLUSTRATIONS

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LONDON, 1917.

Published at the offices of
The British Fire Prevention Committee
(Founded 1867—Incorporated 1899)
3 Waterlow Place, Pall Mall
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8 WATERLOO PLACE, PALL MALL

Two Shillings and Sixpence.

CALIFORNIA
The main objects of the Committee are:

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimizing the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

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*The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.*

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*The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.*
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NOTE.

Through the courtesy of Professor Ira H. Woolson, of New York, U.S.A., we are enabled to issue the annexed interesting report of various serious fires spread by means of shingle roof covering and the devastation thereby caused.

This report will be of greater interest to our Colonial members and subscribers where this form of roof covering obtains, for the examples presented clearly show the menace of such a material and the advisability of its use being discontinued.

The local bye-laws of the various urban, rural, district, and County Councils practically preclude the use of combustible material as a roof covering in new buildings in the British Isles, therefore to our home membership the report will not appeal to the same extent as to those overseas, but the effects of the fires shown by the various interesting photographs will be of interest even to them.

The report conclusively proves how dangerous a combustible roof covering is, and the earliest opportunity should be taken to replace such covering with safer material, even where there is no official requirement on the point, and the Committee heartily support the appeal of the authors, addressed in the first instance to the American authorities— but applicable to those in our Colonies—to discontinue the use of such coverings, especially in towns and villages.

It should always be borne in mind that "country districts" may eventually become "town districts," and therefore combustible roof covering of any material should be discouraged.

The Committee have made comparative tests with various forms of roof coverings, which will be found in Red Book No. 151 and others, and it is clearly shown that the path of safety lies in some form of material that is incombustible.

The thanks of the British Fire Prevention Committee are due to the Committee on Fire Prevention of the National Board of Fire Underwriters, U.S.A., for providing the letterpress and the facilities for issuing this Red Book.

ELLIS MARSLAND.

Offices of the
British Fire Prevention Committee,
8 Waterloo Place, London, S.W., 1916.

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Shingle Roofs as Conflagration Spreaders

An Appeal to the Civil Authorities and Civic and Commercial Bodies

There is no problem more in need of earnest attention than the conservation of property by a reduction in the fire waste and the elimination, as far as possible, of the causes which contribute in greater degree to the abnormal loss by fire. The cause of fires can, in large measure, be controlled, but individual action cannot meet the situation. If any material betterment is to be secured it must be at the hands of those charged with the duty of establishing ordinances and having the power to enforce their observance. Any incorporated town, no matter how small, can prohibit by law the use of wooden shingles for roofing, and can enforce such law. They can also establish a proper building code. Would not such action be a step in the right direction? Are not your citizens entitled to this protection?

Wooden shingle roofs, in conjunction with high winds, have devastated parts of the best residential sections of many thriving American cities. Paris, Texas; Augusta, Georgia, and Nashville, Tennessee, are the latest victims of the criminal negligence of building to burn and not for safety.

These cities are but the more recent examples of the ease with which whole districts, including large parts of a city, may be fire swept. Numerous other cases are on record, ranging in the past 15 years from the far distant north of Bangor, Maine, to Jacksonville, Florida, in the south land, Wallace, Idaho, in the west, and Avalon, California, on the Pacific coast.

Between 1860 and January 1, 1916, the total losses due to conflagration have amounted to $1,248,207,000; during 1915 these losses were $22,050,000, and to date in 1916 there have been three conflagrations totaling $16,000,000.

Much of this conflagration loss can be directly traced to the flying brand hazard of shingle roofs. Of the more recent dis-
PARIS, TEXAS, CONFLAGRATION.—LOOKING SOUTH FROM ROOF OF GIBRALTAR HOTEL. RESIDENTIAL SECTION THROUGH WHICH FIRE SWEPT BEFORE REACHING THE MERCANTILE DISTRICT.
asters directly traceable to this evil, the following are given as typical:

May, 1901. Jacksonville, Fla.—Loss $10,050,000. Fire started in outskirts of the city and spread through the residential district to the principal mercantile district. Shingle roofs ignited for blocks ahead of the main fire.

May, 1904. Yazoo City, Miss.—Loss $2,000,000. A general fire involving practically all the city.

September, 1908. Chisholm, Minn.—Loss $1,700,000. Entire town involved.

April, 1908. Chelsea, Mass.—Loss, $12,000,000. Involved 3,500 buildings and covered nearly 275 acres. Eighteen persons perished. The report on this fire emphasizes the following points:

The dangerous nature of shingle roofs, frame porches, piazzas and accessory woodwork in spreading a conflagration.

The vulnerability of ordinary buildings to sparks and embers, provided the bombardment be long enough, even though the space separating them from the burning buildings is great.
A SNAPSHOT TAKEN WHILE HOT SPRINGS, ARK., WAS BEING SWEPT BY FIRE.
April, 1909. Fort Worth, Texas.—Loss $800,000. The fire originated in the centre of a fashionable residence district, and, fanned by a stiff wind, was beyond control within fifteen minutes after it was discovered. Spreading to the north, it burned its way through thirty-two blocks and continued until it had swept through the yards of the Texas & Pacific Railway.

July, 1910. Wallace, Idaho.—Loss $1,000,000. A small town in the path of a forest fire. The wooden construction and shingle roofs resulted in half the town being destroyed.

April, 1911. Bangor, Maine.—Loss $3,500,000. Fire starting at 4 p. m. Sunday, April 30, swept northward, fanned by a stiff southerly breeze, wiping out practically all the business district and public buildings, and had consumed the best residential district on the northern side before it could be subdued. As the fire burned north, the path of danger grew wider, while sparks set innumerable fires on shingle roofs, many of them a considerable distance from the main conflagration.

February, 1912. Houston, Texas.—Loss $4,500,000. Among the buildings destroyed were 13 industrial plants, 8 stores and 119 dwellings. The wind was blowing at between thirty-five and forty miles an hour, with gusts of fully fifty miles. Heavy pieces of burning boards, full shingles and sometimes long scantlings all aflame were carried by the wind from a burning building for more than a block to the roof of another building, which almost instantly was aflame. The people became frantic, some of them barely getting out of their homes in the earlier stages of the fire.

September, 1913. Hot Springs, Ark.—Loss, $2,225,000. The fire started at about 2 p. m. from a charcoal furnace used for heating flat irons in a one-story shingle-roofed, frame dwelling and boarding-house on Church street near Laurel. Previous to this time there had been no rain for about 7 weeks. The wind was from the northeast and maintained from this direction about two hours, changing to easterly; its velocity at the time was variously estimated and probably was from 20 to 30 miles per hour and increased as the fire progressed.

The territory burned over in the conflagration was 133 acres, including street areas, and was about 3/8 mile long and 3/8 mile
EVEN SUCH A FOREST OF CHIMNEYS AS THIS IS NOT SUFFICIENT TO PERSUADE SOME PEOPLE FROM USING WOODEN SHINGLES.
wide; construction destroyed included 83 brick, 12 brick-veneer and 423 frame buildings. The business district of the city was seriously threatened. The conflagration resulted from poor structural conditions, many buildings with shingle roofs, the high wind and the ineffectual attempt of the fire department to suppress it, handicapped by a very weak water distribution system, which allowed it to get a good start.

In February, 1905, a conflagration in the same section of the city spread over 122 acres; 56 acres of the conflagration area of that time were included in the conflagration area of 1913. The conditions affecting the conflagration of 1905 were without doubt very similar to those of 1913.

**June, 1914. Salem, Mass.—Loss $13,000,000.** Fire lasted 13 hours and covered an area of 251 acres. Starting in the outskirts of the city it spread through the shingle-roof residential district and involved a high value manufacturing section. Of the conclusions drawn the more important were:

"The principle of fire protection should be first applied to construction.

"Wide streets or other transverse barriers have no appreciable effect in stopping a conflagration where wooden buildings and combustible roofs predominate."

**March 21 and 22, 1916. Paris, Texas.—Loss $11,000,000.** Starting in the southern part of the city; flying brands from a small fire were carried by a high wind through the residential section; attempts on the part of the fire department and householders to combat the spread of the flames on shingle roofs were without avail, and the conflagration spread north through the mercantile district. Shifting with the wind, the path of the conflagration extended north and east to points where no more buildings were available for the ever-present flying brands. The buildings involved included 704 dwellings, 192 mercantiles, 522 servants' houses, garages, and stables, and 22 churches and public buildings. Of these 73 per cent. had combustible roofs and 90 per cent. were frame.

**March 22, 1916. Nashville, Tennessee.—Loss $1,450,000.** Shortly after the fire started, 33 frame dwellings, 100 to 1,000 feet southwest, were on fire; 18 of these had shingle roofs. With this fire practically under control, burning shingles were
AUGUSTA, GA., CONFLAGRATION.—RESIDENCE IN PATH OF FIRE; NON-COMBUSTIBLE ROOF PREVENTED IGNITION BY FLYING BRAND, BUT BUILDINGS TO THE RIGHT HAD SHINGLED ROOFS AND DIRECT EXPOSURE CAUSED DAMAGE SHOWN.
carried across an 1,800-foot clear space and ignited other shingle-roofed frame dwellings, which in burning set fire to the other buildings by direct exposure, thus nullifying the advantage gained by the use of brick walls and non-combustible roofs. The path of the conflagration extended for a distance of 2½ miles and burned a total area of 64 acres in a period of less than 5 hours. The fire consumed approximately 648 buildings, principally dwellings, classified as follows: Frame buildings with shingle roofs, 159; frame buildings with fire-resisting roofs, 180; brick with shingle roofs, 1; brick with fire-resisting roofs, 79; frame stables, garages and outhouses, 229.

March 22, 1916. Augusta, Ga.—Loss $4,500,000. This fire originated in the mercantile district in a building of joisted brick construction, but otherwise lacking in all modern building features tending to restrict the spread of fire. The quickness with which this building was destroyed and with which the fire spread to other buildings emphasizes the need of property restrictive building laws, adequately enforced. Twenty minutes after the department arrived, the fire had spread to other buildings and had assumed conflagration proportions.

The fire progressed almost without hindrance until, after destroying a large part of the mercantile district, it was reduced in width to one-half block, with a few buildings in its path. At this point, 6th street, frame buildings and shingle roofs became more prominent, the block exposed being in part residential.

A shifting of the wind quickly involved other buildings, and shingle roofs in the purely residential district below 5th street were soon ablaze in all parts for blocks ahead of the real conflagration. Handicapped by the more important fire in the mercantile section, the fire department could not effectively protect this residential district, with the result that residences in 7 large and 21 small blocks were completely consumed.

The total area involved was 160 acres, with 569 frame buildings and 111 brick buildings. A fair proportion of the residences, particularly the better ones, had tin roofs, but shingle roofs were interspersed sufficiently to allow ignition by direct exposure after the shingle-roofed buildings had caught from flying brands.

All of the last three conflagrations, particularly the one at Nashville, were influenced by the state of the weather. The
AUGUSTA, GA., CONFLAGRATION.—INCOMBUSTIBLE ROOFING ON THIS HOUSE ENABLED THE FIRE DEPARTMENT TO STOP THE FIRE ALTHOUGH HALF THE BUILDING WAS DESTROYED BY THE SHINGLE-ROOFED BUILDING EXPOSING IT.
Augusta conflagration was least affected and, therefore, while its performance is less theatrical, it is the more convincing, for like the other two, it demonstrates the active danger in which all of our cities find themselves so long as wooden shingle roofs are allowed to predominate.

Shingle roofs are directly and solely responsible for the proportions assumed by the conflagration in Nashville; even with a 51-mile gale blowing as it was, and although burning brands can be transported long distances in much lighter winds, the fire, after crossing a clear space estimated at more than 1,800 feet, could hardly have at once assumed such proportions as to be beyond the control of a well-equipped, well-organized fire department, had not shingle roofs been encountered. This is to a lesser degree true of Paris, which unfortunately had its high value district in the path of the conflagration.

In Augusta, shingle roofs did not start the conflagration but served to extend it, after having enabled the fire to reach across two very wide streets, not entirely in the direction of the wind. Testimony of eye-witnesses is to the effect that the first building on the south side of Broad street to catch fire was a frame shingle-roofed building in the rear of No. 212 Broad street, near Second street. At this time the main body of the fire was be-
PORTION OF BURNED DISTRICT TAKEN FROM AN AEROPLANE.
MONUMENTS IN THE CEMETERY OF HOMES. SOME OF THESE BUILDINGS HAD TIN ROOFS, BUT THE SHINGLE-ROOFED BUILDING WAS A SUFFICIENT EXPOSURE TO DESTROY THEM.
tween 6th and 7th streets, four blocks west. This point is of paramount importance as demonstrating the part played by shingle roofs in this conflagration. A report made by Frank G. Reynolds, Chief of Fire Department, and endorsed by Nisbet Wingfield, City Engineer and Commissioner of Public Works, states:

"The spread of fire on the six- and five-hundred blocks on the north side of Broad street was due entirely to the sparks igniting shingle- roofs on the out-houses and dwellings in rear of north side of Broad street, below 6th street.

"Shingle-roofs on both sides of Broad street became ignited from a shower of sparks when the wind changed slightly towards the southeast.

"The fire spreading from Broad to Ellis streets was due to the intense heat from the frame buildings igniting the shingle- roofs across to the opposite side of Ellis street. (This also was the condition between Ellis and Greene streets.) The sparks ignited shingle- roofs on the opposite side of Greene street (south side) in the same manner as on lower Broad, causing buildings on both sides of the street to become ignited, almost simultaneously.

"A second fire occurred at 2:20 A. M., while the lower end of the City was burning; this originated in a shingle-roofed shack
(cause supposed incendiary), and destroyed four frame buildings with shingle-roofs. This fire could have been just as serious as the fire then raging in the lower end of the City, but for the motor apparatus (sent from Savannah and Macon) and one Augusta pump; these motor pumps were immediately sent to check the spreading flames, which they succeeded in doing after one hour of hard fighting.

"Personally, I have always opposed shingle-roofs for the reason that they are conflagration breeders, and during a high wind and low temperature we have had as many as seven fires in two hours. Twenty-nine shingle-roof fires occurred during the Riverside Compress fire of November 3rd, 1915. This is conclusive that shingle-roofs are a menace to any city, hence the covering with shingle-roofs should not be permitted within the City limits. Only fireproof roofings should be permitted in erecting new buildings or in making repairs on old roofs."

Can any city afford to continue to jeopardise its safety by allowing this severe hazard to exist? The question has been answered by numerous cities, as given in the list attached hereto, but usually only after the dread danger of a conflagration has been brought home to the citizens by the destruction of a part of the city.

Action is urged on all municipal authorities towards the elimination of these conditions. Augusta, Ga., and Paris, Texas, following the conflagration, adopted complete building codes, essentially as outlined in the Building Code recommended by the National Board of Fire Underwriters. Such a code should be adopted and enforced in all cities, but pending this it is extremely necessary to reduce the prevailing serious hazard of wooden shingle roofs by the passing of an ordinance restricting new roof coverings and extensive repairs to fire-resisting surfacing. An ordinance embodying this feature is given on page 18.

The National Board also appeals to the various civic and business organizations to lend their co-operation towards the furtherance of this step in the reduction of the enormous wastage of the country's resources, realizing that the abnormally high fire loss is a drain on the economical life of the country which affects all business interests.
PARTIAL LIST OF CITIES WHICH HAVE ENACTED ORDINANCES REQUIRING THE USE OF FIRE-RESISTIVE ROOFINGS WITHIN THE CITY LIMITS.

Wilmington, Del.        Lawrence, Mass.
Jacksonville, Fla.      Fall River, Mass.
Tampa, Fla.             Somerville, Mass.
Columbus, Ga.           Salem, Mass.
Hoboken, N. J.          Charleston, S. C.
Paterson, N. J.         El Paso, Texas.
Newark, N. J.           Richmond, Va.
Penobscot, Va.

Massachusetts State House Bill No. 2470 requiring fire resisting roofings has been adopted by the following municipalities:

The following suggested ordinance is as given in the Building Code of the National Board of Fire Underwriters.

AN ORDINANCE.

Providing for fire-resistive roof coverings and specifying fire test for approved fire-resisting roofing.

Be it ordained by the as follows:

SECTION 1. All buildings except as given below shall have roof coverings of approved standard quality, such as brick, concrete, tile, or slate; or highest grade of tin roofing, or of asbestos shingles, or of built-up roofing felt with gravel or slag surface, or of built-up asbestos roofing, or other roofings of like grade which would rank as Class A or B under the test specifications of the National Board of Fire Underwriters.

Exceptions:
(a) Dwellings;
(b) Frame buildings;
(c) Buildings not exceeding two stories or 30 feet in height and 2,500 square feet in area, and not used for factories, warehouses, or mercantile purposes.

SECTION 2. The quality of roofing for all dwellings and other buildings exempted in Section 1, shall be as therein specified; or may be of grade not lower than that meeting the requirements of the test specified in Section 10, or of grade which would rank not lower than Class F, under the test specifications of the National Board of Fire Underwriters.

SECTION 3. A layer of deadening felt at least 1/16-inch thick shall be placed between metal roofing and the supporting woodwork.

Note.—The purpose of the felt is to prevent quick ignition of the wooden decking when the roof is exposed to burning brands or radiated heat.
SECTION 4. The wooden planking and sheathing of roofs shall not in any case be extended across side or party walls.

SECTION 5. Any roof having a pitch over 60 degrees, placed on any building over 40 feet high, except towers or church spires, shall be constructed of iron or steel frames filled with fireproof material not less than 3½ inches thick, and shall be covered with approved roofing.

SECTION 6. All flashings shall be of metal properly incorporated with the roofing material. Copper flashings are recommended.

SECTION 7. The top and sides of dormer windows shall be protected the same as the roof.

SECTION 8. This ordinance shall not be construed to prohibit the repairing of a wooden shingle roof, provided the building is not increased in height, but the renewal of such a roof is forbidden. No existing wooden shingle roof, if damaged more than 10 per cent., shall be repaired with other than approved roofing.

SECTION 9. Within 10 years from the date of adoption of this ordinance, any and all roofs now covered with wooden shingles, or other material which will not meet the requirements of the test specified in Section 10, shall be replaced with approved roofing material corresponding with the requirements for new buildings.

SECTION 10. Fire Test for Approved Fire-Resisting Roofing. The roofing shall at least withstand the attack of burning fire brands for 5 minutes with a wind pressure of 5 miles per hour, without ignition of a clear, dry, white-pine decking beneath it; and shall not crack and expose the decking, nor slip badly, nor convey or communicate fire badly, nor produce a serious flying-brand hazard when thus exposed. The test shall be made with the sample at the maximum angle of inclination advocated in practice for the roofing. The brands shall consist of at least ten strips of seasoned hard maple 2 inches square and 3 feet long, formed into a frame or grid with a 1¾-inch space between
them. The complete grid shall be thoroughly ignited and burning before application to the roof sample, which latter shall extend on all sides at least 18 inches beyond the edges of the grid.

SECTION 11. Repealing Section. All former ordinances of the City of affecting or relating to the Construction or repairing of roof coverings and all other ordinances or parts thereof inconsistent herewith, are hereby repealed.

SECTION 12. Date When Ordinance Is to Take Effect. This ordinance shall take effect upon approval by the Mayor.
INSPECTED ROOF COVERINGS.

In Sections 1 and 2 above, reference is made to roofings of various classes as determined under test specifications of the National Board of Fire Underwriters. In addition to roofings of recognized standard for dwellings, such as tile, slate or tin, various other materials are suitable, if of satisfactory quality and manufacture and properly laid on the roof.

Roof coverings tested and inspected in accordance with these specifications bear labels of the Underwriters' Laboratories attached to each container of finished roofing or roofing material. It is recommended that where tests can not be readily made, only such roofings be used as have been listed by the Underwriters' Laboratories, which issues semi-annually a printed list of makes, giving the class and manufacturer. These lists can be obtained by application from the National Board of Fire Underwriters or from local insurance organizations.

As regards the fire hazard, roof coverings are classified as (1) Standard, (2) Fire Retarding, and (3) Flammable.

1. Standard—Includes the Underwriters' Laboratories' Classes A and B.

2. Fire Retarding—Includes the Underwriters' Laboratories' Classes C, D, E and F.

3. Flammable—Includes the Underwriters' Laboratories' Classes G and H.

For dwellings, Standard or Fire Retarding roof coverings are acceptable. For mercantile and other business property Standard roof coverings should be used.
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