Aug. 11, 1936. F. KOTHE 2,050,798

ART OF WATERPROOFING BUILDING CELLAR FOUNDATION WALLS

Filed Jan. 12, 1934 2 Sheets-Sheet 1

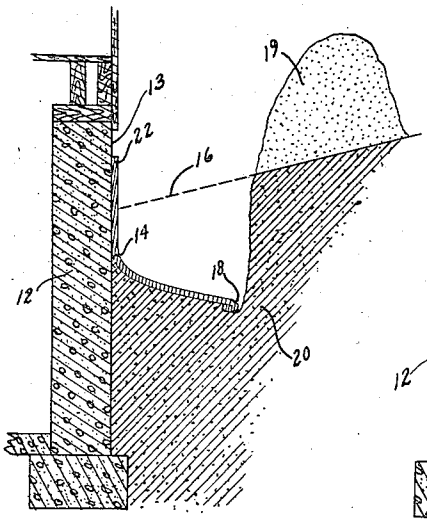


Fig. 1

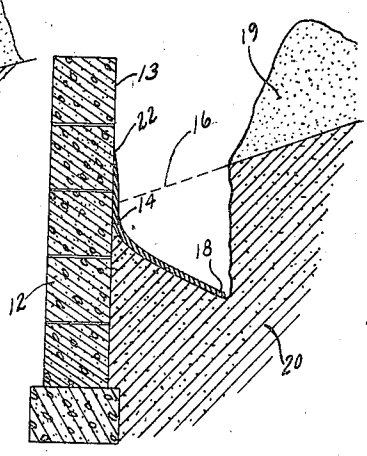


Fig. 2

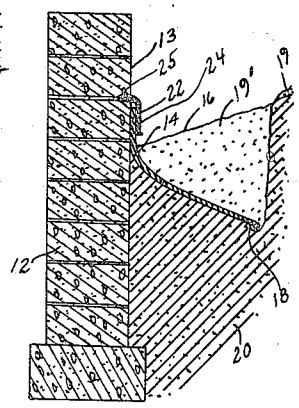


Fig. 3

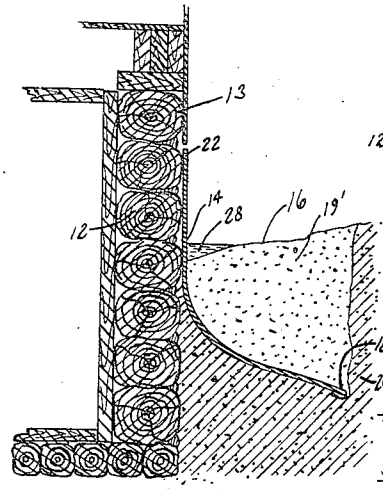


Fig. 4

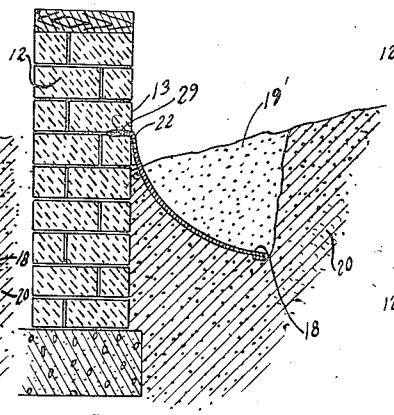


Fig. 5

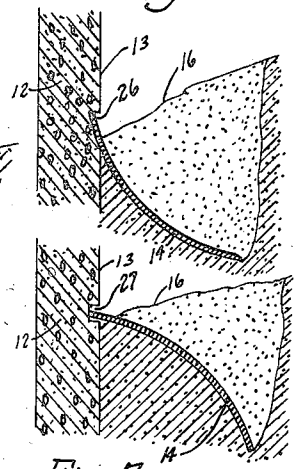


Fig. 6

Fig. 7

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ART OF WATERPROOFING BUILDING CELLAR FOUNDATION WALLS

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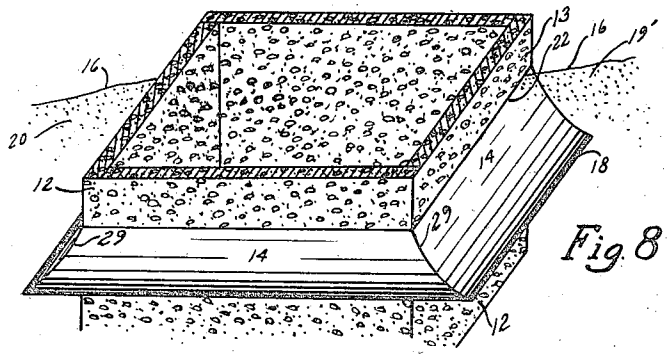


Fig. 8

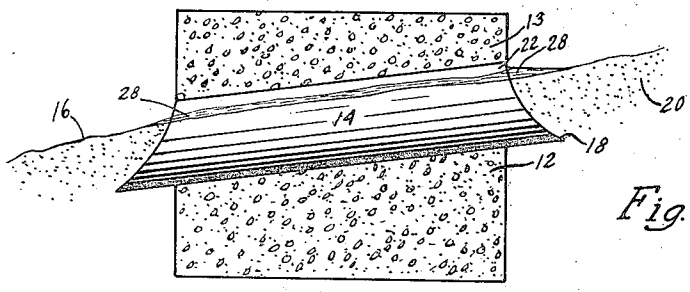


Fig. 9

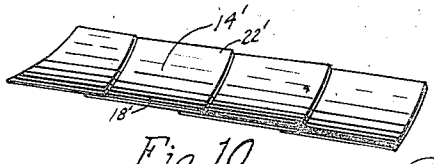


Fig. 10

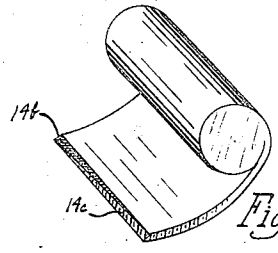


Fig. 11.

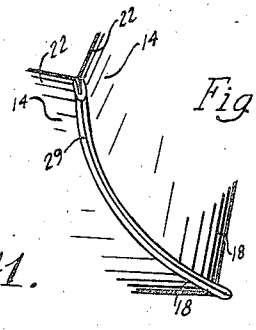


Fig. 12.

Frank Kothe Inventor

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UNITED STATES PATENT OFFICE

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ART OF WATERPROOFING BUILDING CELLAR FOUNDATION WALLS

Frank Kothe, Washington, D. C.

Application January 12, 1934, Serial No. 706,422

12 Claims. (Cl. 72—126)

This invention relates to building cellar waterproofing, especially adapted for residence dwellings, and has for its object the waterproofing and elimination of moisture in excavated cellar construction, having application to new construction work as well as having special application to old buildings with leaking cellar foundations, either with or without shrubbery surrounding the building.

To this end my method consists in providing a protective layer of suitable material around the entire foundation, preferably slanting downwardly and outwardly from near the ground level line or grade at the foundation walls.

For this purpose the protecting layer may be composed of lead sheeting or asphalt impregnated and covered felt, paper, cloth, or any other substance that will successfully withstand the deteriorating and corroding effects of the soil surrounding a dwelling.

It is to be understood that the herein described and claimed method and means may also be applicable to factories, storage cellars, churches, or to any building over an excavated cellar.

Heretofore the waterproofing of cellar foundations has consisted chiefly in a parging of cement, asphalt, tar, or the like directly to the inner or outer walls, or in some form of membranous interlocking of the joints between the floor and walls and between the other joints or spaces in the masonry foundation.

The present invention aims at keeping the drainage water away from the foundation walls rather than attempting to make the walls themselves completely impervious to the effects of moisture.

Examples of the present invention are shown in the accompanying drawings, in which, for illustration, several obvious variations are also shown.

Fig. 1 shows a preferred form of the invention, wherein the depth of my waterproofing membrane is such as to preclude interference with surrounding shrubbery growing around the foundation walls.

Fig. 2 shows a variation, which is cheaper to install since depth at the foundation wall is reduced.

Fig. 3 shows a modification, wherein a narrow strip of membranous material overlaps the upper edge of the main waterproofing membrane.

Fig. 4 shows the application of my waterproofing method to a log foundation.

Fig. 5 is similar to Fig. 3, except that the upper part of the main membrane itself serves the purpose of the extra protecting strip.

Fig. 6 and Fig. 7 show variations of means of attached the waterproofing membrane to the exterior foundation wall.

Fig. 8 is a semi-transparent view in perspective, showing the arrangement of the waterproofing membrane around a building.

Fig. 9 shows a lengthwise view of the underground membrane, being a cross-section approximately at right angles to a cross-section such as is shown in Figs. 1 to 7.

Fig. 10 shows a variation of the structure of the membrane.

Fig. 11 shows a method of rolling membranous material.

Fig. 12 shows a suggested method of sealing the membrane joints at the corners of the foundation.

Before entering into a more detailed description of the drawings figures, a brief explanation is deemed desirable.

Some soils, specially around parts of Atlantic City, N. J., are sandy and constantly permeated with water to a short distance below the surface. Such a condition is not strictly within the purview of the present invention, since moisture is constantly adjacent the foundation walls, during dry weather as well as during rainy weather. The usual condition, however, all over the world, is that the soil has a natural downward drainage, and becomes dry further and further below the surface, the longer the periods between rains, thus bringing about destruction to vegetable life in case of drought. On this type of soil, the upper surface is apt to be more or less hard during the periods between rains, due to sun-baking, thus encouraging the flow of surface water down grade during a subsequent rainstorm.

At least two sides of a building, in most cases, are adjacent an up grade, i. e., a grade leading upward from the wall thereof, and whether the foundation wall below grade has been waterproofed or not, on its surface, it is obvious, in most cases, that rainwater will flow towards these walls.

Even if earth be banked around a building, if the surrounding land has a naturally steep grade, the surface rainwater will, if unusual in amount, accumulate and seep through the soil of the earth bank (soil being porous), and thus reach the outside surface of the foundation wall where it will again accumulate and flow down to the bottom, directly adjacent the wall.

The foundation wall forming an obstruction, the downflowing surface water will flow towards it and then vertically downwardly along the outside of the foundation wall, so that in many cases

a layer of water covers the outside of the foundation wall, below grade on at least one or more sides of a dwelling or other building, during a rain. It is no surprise therefore that the water penetrates through imperfections in the foundation wall, due to poor construction, or to cracks due to expansion and contraction at joints incident to varying hot and cold temperatures.

It is therefore the main object of this invention to prevent surface rainwater or any other surface water from ever directly reaching the foundation wall; to keep the water from sinking into the earth any appreciable distance below grade, at any point closer than three to seven or more feet from the outside of the foundation wall, from which point the water can diffuse in all directions, but without permitting accumulation of solid moisture adjacent the outer part of any outer foundation wall below grade.

A porch built on one side of a building beyond its foundation wall is effective in eliminating moisture on the inside of the cellar adjacent that foundation wall. Even after a heavy rain, investigation will show that below a large area of the central portion of such a porch the soil will be very dry even several feet below grade, providing the porch itself does not leak water.

But obviously a porch or other upper structure surrounding an entire building is undesirable.

The present invention serves just as effectively for keeping the rainwater away from the foundation wall below grade, without the accompanying undesirable features. A pathway or shrubbery around a building can exist as well with as without the membranes used in the present invention.

In Fig. 1 is shown the earth **20** graded along line **16** (hereinafter called the grade), toward a foundation wall **12**. The first step in the present method may consist in digging a trench around the building. The shape and size of this trench for adequate waterproof protection will depend chiefly on three conditions, namely, the type of soil, the depth of the foundation below grade, and the provision for shrubbery, if desired. The trench should be both deeper and wider for loose sandy soil, as compared with heavy clay soil, due to the more rapid and greater sidewise diffusion of water therein. The trench should extend away from the outside surface **13** of wall **12** a distance about equal to half the depth of said wall **12** and from that point downwardly below the grade about the same distance. If evergreen trees, such as Norway spruce, are to be planted near the wall, owing to large roots, the shape of the ditch would differ from that if roses are to be planted. Shrubbery varies in its moisture, drainage and root requirements which should be taken into consideration. If no shrubbery is to be planted, the depth of the trench near the wall need not be so great, and then the more cheaply dug trench of Figs. 2, 3, 5, 6, 7, may be used.

The membrane **14** is shown laid curved in the ditch. This curve may approximate a half parabola, or a quarter of an ellipse in cross-section. It is obvious that the membrane may be formed by bending into two planes, with a sharp angle between them, but the curved surface trench is easily made, and obviates any sharp bends in the membrane with its consequent weakening of the membrane material.

After the trench is dug, membrane **14** will be laid lengthwise therein, as shown, with portion **22—14** against the vertical wall **13**, and portion **14—18** extending at an angle outwardly and preferably also downwardly therefrom. It is preferable that the upper end **22** terminate at least 6 inches above grade at wall surface **13**, and it is also desirable that edge **18** be reinforced as shown.

It is also understood that the wall end of the membrane could begin below grade, if desired, but since rainwater accumulates at **28**, as shown in Figs. 4 and 9, such possible procedure would not prevent probable leakage of water above the point of attachment of the membrane to the wall, though it is not believed that this would do any very appreciable damage compared with what could leak in without the membrane in place.

The soil removed from the trench is shown at **19**. After this soil has been removed, it is necessary to smooth out the bottom of the trench with a rake or the like, so that membrane **14** will lay on a solid, fairly smooth curved surface, to prevent wrinkling and cracking of the material of membrane **14**, on removing and replacing the soil **19** again in the trench, over the membrane, as shown at **19'** in Figs. 3, 4, 5. Before the soil is replaced in the trenches, the corners **29** (see Figs. 8, 12) must be clamped tightly by some suitable clamping means rendering the corner joints watertight, perhaps with the aid of asphalt or the like, as in Fig. 12.

There are many materials out of which the membranes **14** and clamps **29** may be made, and I do not wish to restrict myself to the use of any particular material. Various materials that will resist deterioration or corrosion of the soil are in part as follows: lead, stainless steel, mica, glass, slate, lava, cement, concrete, asbestos, magnesium, rock, marble, sand, paper, felt, wood, wood-veneer, in compounds, compositions or mixtures including creosote, bichloride of zinc, tar, asphalt, mineral pitch, wax, paraffin, rosin, or the like. Ordinary composition fireproof shingles have been dug out of the ground after several years showing no appreciative signs of deterioration, and roofing material containing a good percentage of asphalt may be used for membrane **14**, using lead or stainless steel for clamps **29**, or for portions exposed to the air.

Membrane **14** may be in sections, as shown in Fig. 10, overlapping as shown for the grade shown, the joints suitably bonded by some asphaltic compound, if desired, separate sheets **14'** being used, with upper and lower edges **22'** and **18'** respectively, but due to the heaving and buckling movements of the soil, due especially to the alternate heaving and freezing and thawing of the soil in the winter time, the single integral piece construction, with an integral membrane on each side and only four corner joints is believed almost absolutely essential to a good waterproofing job.

The sheath may be rolled and shipped in double layer rolls, **14*b*** and **14*c***, as suggested in Fig. 11.

Where the surface **13** is wavy, as in concrete block construction, the crevices between **22** and **13** should be suitably sealed, though this is by no means essential, since the few raindrops that would enter between **13** and **22** would hardly do much harm, assistance being given in this respect by the usual overhanging roof of the building, and the real damage ordinarily being done by an accumulation of surface water, as shown at **28** in Figs. 4 and 9, which would ordinarily flow down along surface **13**, but which, by the present invention, is deflected downwardly and outwards along the top of the membrane **14** to its edge **18**, where, if proportional dimensions are correct, it can do little or no harm.

In Fig. 2 we note that the top edge 22 is tapered to a close fit to wall 13, which may be accomplished by means of tar, asphalt, or the like at the upper edge.

Figs. 3 and 5, 6, 7, are applicable to new construction. In Fig. 3, a long narrow strip of lead, or the like, is inserted between a layer of brick and bent down over the top edge 22 of membrane 14. In Fig. 3 the upper overlapping portion 22 of the membrane should perhaps preferably extend below grade.

In Fig. 5, the upper part of membrane 14 is bent inwardly at 29, between layers of brick. In Figs. 6, 7, asphalt or the like should fill the spaces between the membrane and wall, at 26, 27, in the recesses in the wall 13, into which the upper edges of the membranes 14 are inserted.

Fig. 4 shows the invention applied to a log foundation. It is assumed that the trees for these logs were felled in the winter, when there was no sap flow in the trees, and that the logs are well seasoned and perhaps creosoted. If such wood is kept dry there will be little or no decay. Cracks between the logs are to be filled by suitable chinking, as is well known, inside and outside, with clay mortar, or the like. The present invention makes such a foundation practicable, though, due to the deteriorating effects of even a slight amount of moisture on wood, membrane 14 should extend both deeper and further away from the log surface 13 than for masonry construction.

If membrane 14 is to be applied to a building already surrounded with shrubbery, trees, etc., the work should be done in either late fall or early spring, so the shrubs may be removed and heeled in elsewhere, while in dormant condition, and again replaced after the work is done.

It is understood that membrane 14 may extend at an angle straight outwardly from the wall, may be corrugated or curved convexly or concavely or convexo-concavely, or vice-versa, from the wall; also, that it may be reinforced at both upper and lower edges for strengthening and prevention of wear due to flow of accumulated rain water.

Also, the exact order of procedure in applying the herein described and claimed method is not considered too important. Obviously the membrane may be attached to the wall before the trench is dug, for example, if desired, or other obvious or equivalent changes in the order of procedure without departure from the inventive concept.

What I claim is:

1. The combination with a building cellar foundation wall, of a subterranean integral membrane, of material resistant to deterioration and corrosion by the soil, and of uniform thickness, extending around the outer portion of the cellar wall, on each side thereof, from a point a few measurement units above the grade line adjacent each side wall, vertically downwardly and then at an angle outwardly and downwardly, and terminating underground a suitable distance away from each side wall and below the adjacent grade surface, for deflecting surface rainwater a distance away from said foundation wall, for preventing access of water or moisture to any part of said building foundation wall, especially below grade.

2. The combination as set forth in claim 1, wherein the said membrane is of non-uniform thickness.

3. The combination as set forth in claim 1, wherein the upper edge of the membrane is covered by a strip of suitable material, fixed in a recess in the wall, and bent outwardly and downwardly over the upper edge of the membrane.

4. The combination as set forth in claim 1, wherein the upper edge of the membrane is itself inserted in a recess in the wall or between joints in the masonry or other material thereof, any remaining spaces in the wall above the membrane being preferably tightly filled with suitable sealing material, for sealing purposes.

5. The combination as set forth in claim 1, characterized in that each membrane comprises separate portions, overlapping each other in such a way that water cannot flow downwardly by gravity between the joints.

6. The combination as set forth in claim 1, wherein the upper edges and corner joints of said membranes are permanently and effectively sealed against leaking of water by gravitation between the wall and said upper membrane edge or at the joints between the membranes.

7. The combination with a building cellar foundation wall of integral membranes of uniform thickness and of suitable material, extending around the outer portion of each side of said wall, from a line extending the full length of each wall on the wall near the adjacent grade line, then at an angle outwardly away from said foundation wall, for deflecting surface rainwater a distance away from said foundation wall, for preventing access of water or moisture to any part of said building cellar foundation wall, especially below grade.

8. The combination as set forth in claim 7, characterized in that the membrane is of non-uniform thickness.

9. The combination as set forth in claim 7, characterized in that the upper edge of each of the membranes is covered with a strip of suitable material, fixed in a recess or joint in the wall, and bent outwardly and downwardly over the upper edge of each membrane.

10. The combination as set forth in claim 7, characterized in that the upper edge of the membrane is itself inserted in a recess or between joints in the masonry or other material thereof, that part of said recess or joint in the wall above said membrane insertion being preferably filled with suitable sealing material for sealing purposes.

11. The combination as set forth in claim 7, wherein each said membrane comprises separate portions, overlapping each other, one on top of the other in the direction of ascending grade, so water cannot flow downwardly by gravity between joints.

12. The combination as set forth in claim 7, characterized in that the upper edges and corner joints of said membranes are permanently and effectively sealed against leakage of water by gravitation between the wall and said upper membrane edge, or at the joints between the membranes.

FRANK KOTHE.