March 21, 1933. H. S. WARNER 1,902,271

WALL STRUCTURE

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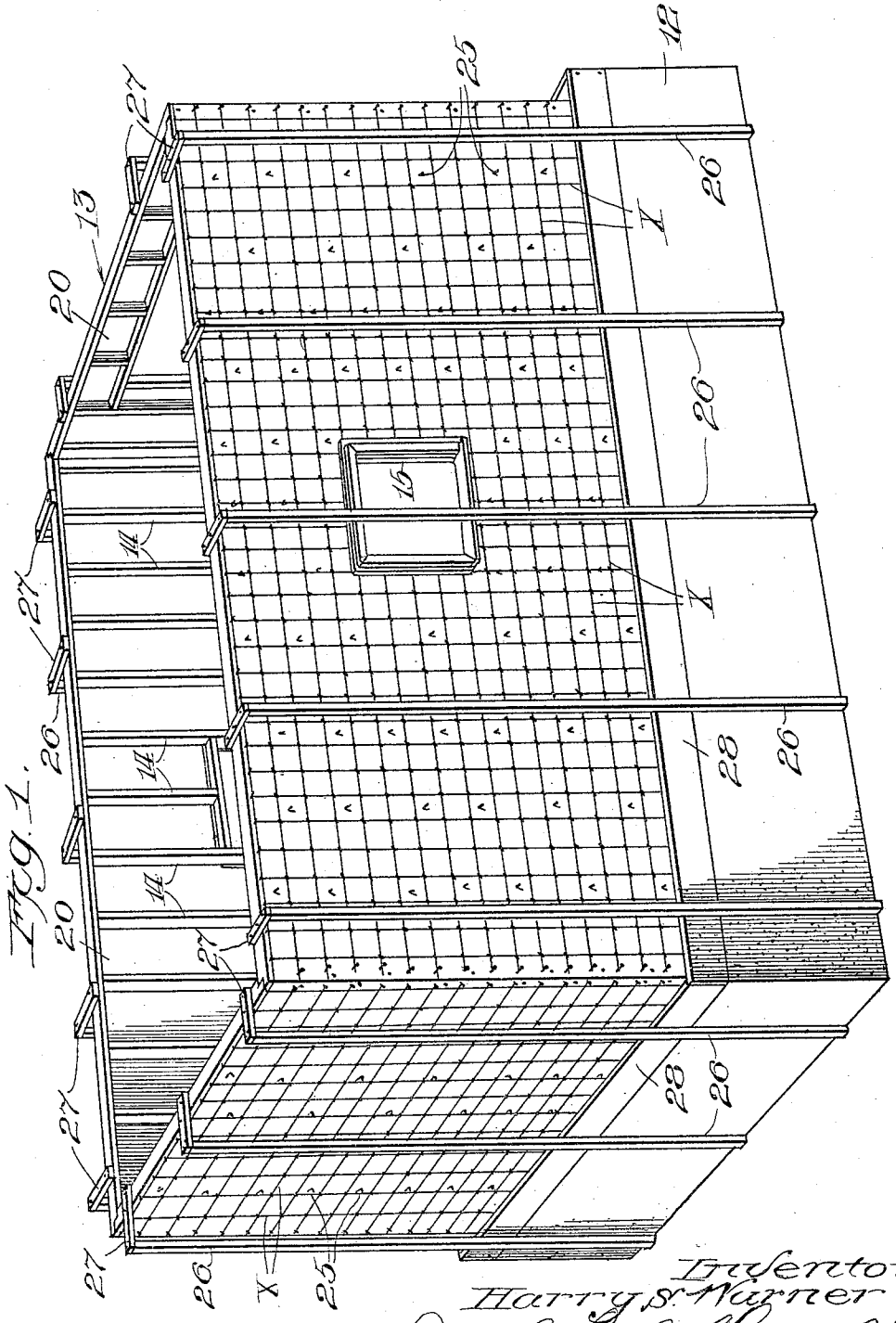


Fig. 1.

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Fig. 2.

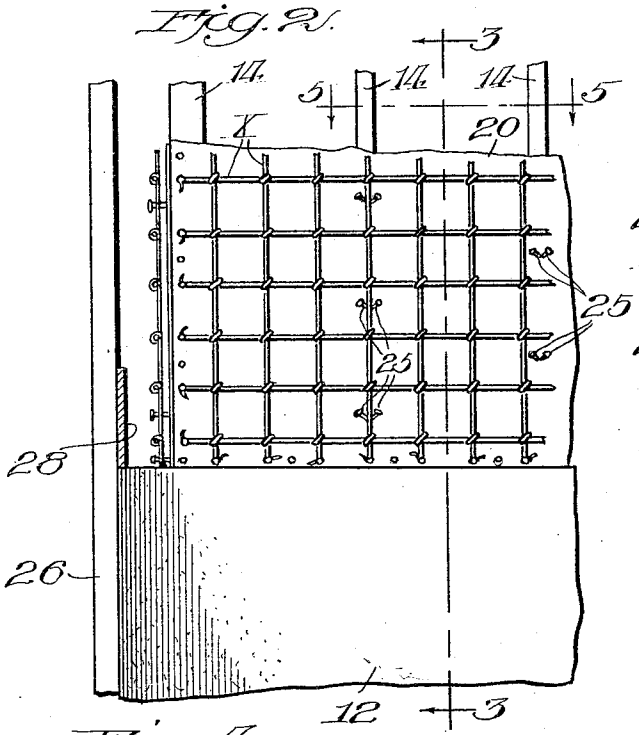


Fig. 3.

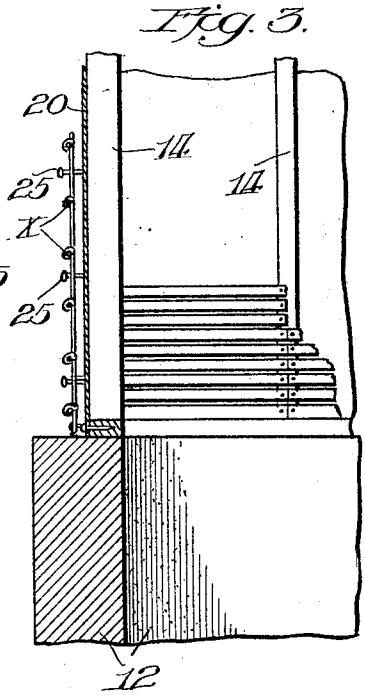


Fig. 4.

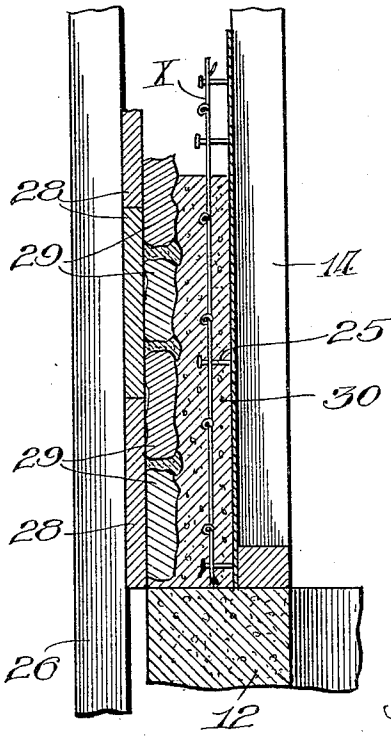


Fig. 5.

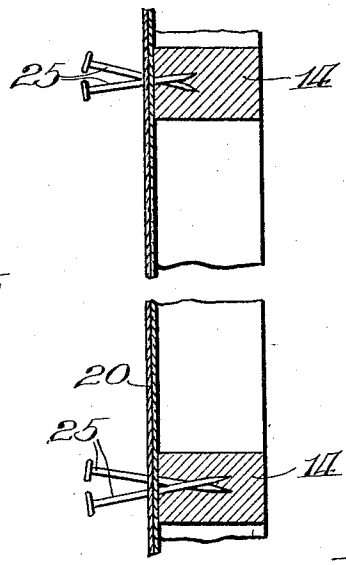
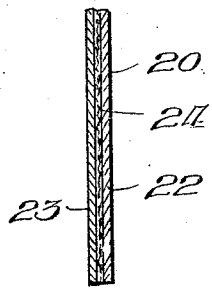


Fig. 6.



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Fig. 7.

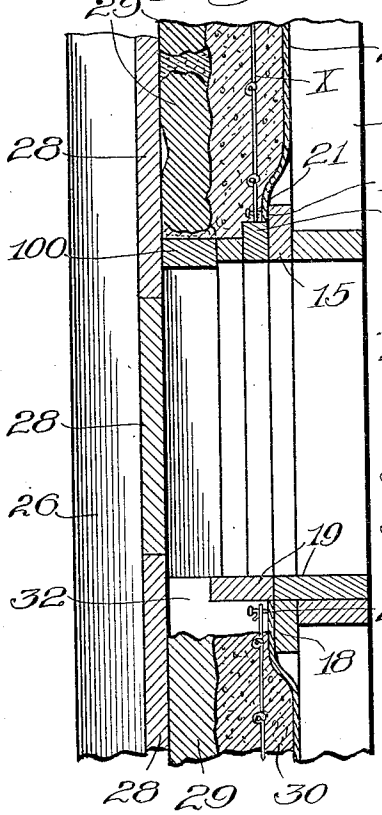


Fig. 8.

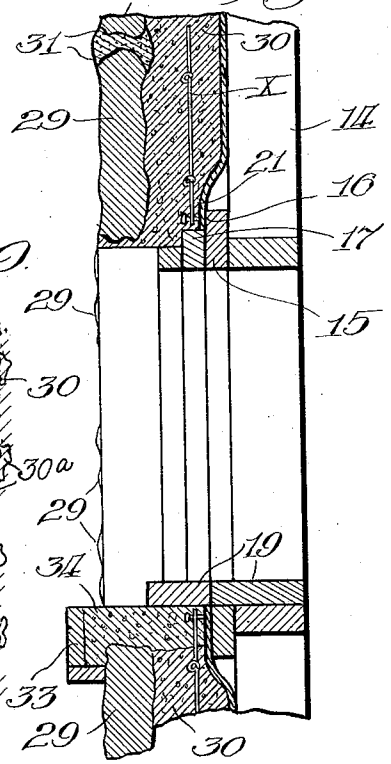


Fig. 9.

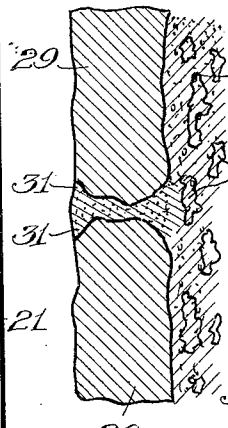


Fig. 10.

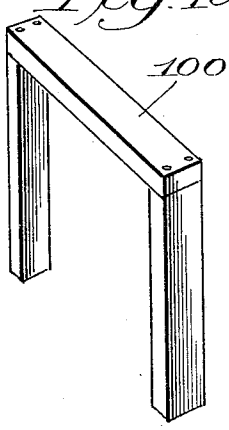
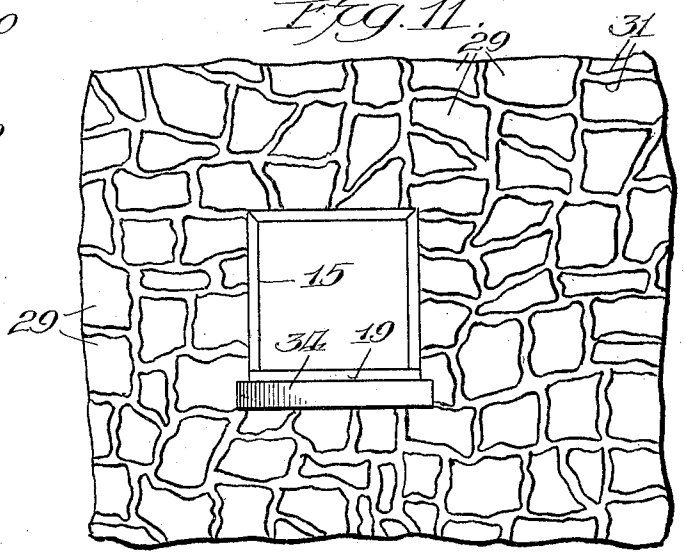


Fig. 11.



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Patented Mar. 21, 1933

1,902,271

UNITED STATES PATENT OFFICE

HARRY S. WARNER, OF JOLIET, ILLINOIS

WALL STRUCTURE

Original application filed April 21, 1930, Serial No. 446,010. Divided and this application filed October 29, 1930. Serial No. 492,027.

My invention relates more particularly to concrete walls of buildings, the present application being a division of my pending application for United States Letters Patent Serial No. 446,010, filed April 21, 1930; and my object, generally stated, is to provide a construction of wall which may be erected more economically than walls as hitherto provided.

Certain of my specific objects are as follows:

To provide for the production of a wall structure of concrete faced to present the appearance of a stone wall and which may be erected economically and quickly and the facing-forming bodies of which will be positively held against displacement.

To provide for the sufficient insulation of the walls with the maximum economy of structure.

To provide for tight joints at the window and door frames positioned in the wall structure.

To minimize the subjection of the wall structure to damage by the freezing of moisture therein.

To render the wall structure air and water tight without requiring calking or a similar operation; and

To avoid the necessity of providing temporary forms for molding the rear surfaces of the concrete wall portions which are required to be removed after the concrete has set.

Referring to the accompanying drawings:

Figure 1 is a perspective view of a building the walls of which, constructed in accordance with my invention, are shown as in the process of erection.

Figure 2 is a fragmentary view of the base portion of the structure shown in Fig. 1.

Figure 3 is a section taken at the line 3—3 on Fig. 2 and viewed in the direction of the arrows.

Figure 4 is an enlarged view like Fig. 3 and of the structure therein shown with certain parts omitted, illustrating the facing-equipped concrete wall portion of the building in the process of construction.

Figure 5 is a broken enlarged plan sectional view taken at the line 5—5 on Fig. 2 and viewed in the direction of the arrows.

Figure 6 is a section taken through the insulating building paper used in the construction of the wall structure.

Figure 7 is a broken vertical section taken through a portion of the wall structure at a window opening therein showing the structure in the course of its erection.

Figure 8 is a view like Fig. 7 and of the structure therein shown illustrating the manner of forming the concrete sill for the window opening.

Figure 9 is a fragmentary section taken through the concrete wall portion and its stone facing illustrating in detail the manner of anchoring the pieces of stone to the concrete of the wall portion.

Figure 10 is a perspective view of a removable frame member used at the window frame for molding the concrete which extends outwardly around and beyond the window frame; and

Figure 11, a fragmentary face view of the finished wall structure.

In the constructing of the building shown in the drawings, the surrounding wall portion of which is constructed in accordance with my invention, the foundation therefor and represented at 12, is first built. A framework, represented generally at 13, to occupy a position at the rear face of the concrete wall-portion to be erected as hereinafter described, is then constructed to rest, by way of example, upon the foundation 12. The framework 13, which may be of the ordinary balloon frame type as shown and comprising vertical studding 14 as commonly provided, is thoroughly braced in position, the partitions to be provided in the building being placed, and the sub-floors to be provided laid, preferably before the erection of the concrete wall-portion, for utilizing the bracing effect thereof on the framework 13.

Where the framework is to be provided with window or door openings the frames therefor are then assembled with the framework 13 in the final position to be occupied by them. In the construction shown the opposite side walls thereof are represented as

each provided with a window opening to illustrate the placing of window frames in position in the framework. These window frames are represented at 15 and are preferably of the construction shown in Figs. 1, 7 and 8 to provide along their vertical sides and across the tops thereof a series of outwardly-extending flanges 16 and 17 and across their undersides outwardly extending flanges 18 in the plane of the flanges 16, the sill-portion of the window frame being represented at 19, it being understood that this stepped flange construction would also preferably be provided as to such of the door frames as may be provided in the wall structure.

Heavy building paper, preferably waterproof and represented at 20, is then applied, in stretched condition, against the studding 14 at the outer face of the framework 13 to extend entirely over this framework, as shown, except at such of the window or door openings as may be provided therein, the paper being well lapped at all of the joints between the sections thereof.

At the window and door openings the marginal edges of the paper surrounding these openings is lapped against the outer faces of the surrounding flanged portions 16 and 18 of the frames as exemplified by the lapping of the paper at its margins 21 against the outer faces of the surrounding flanges 16 and 18 of the window frames illustrated.

In Fig. 6 is represented, by a cross sectional view, a kind of paper which I prefer to employ, this paper being formed of flatwise-opposed layers 22 and 23 of relatively heavy paper, with an interposed layer of pitch-coated fiber 24.

Heavy wire mesh or other suitable metal concrete-enforcement x and which in the case of relatively thick walls would be in the form of metal bars, is then secured to the framework 13 to extend over the entire outer face thereof, except at the window and door openings, and in horizontally spaced relation to said framework for reinforcing the concrete wall-structure to be built around the framework 13 as hereinafter described.

The reenforcement is preferably located approximately one inch from the face of the paper 20 and where formed of different sections, the ends of the sections are lapped and preferably secured together, so that the reenforcement is practically coextensive with the outer surface of the framework 13.

In the construction shown, provision is made for anchoring the framework 13 at its studding 14 to the concrete wall portion hereinafter described the anchorage means for this purpose comprising any suitable means secured to the studding 14 and projecting outwardly therefrom to become embedded in the concrete. The particular means shown comprise nails 25 which are driven through the paper 20 and into the studding 14 and at least the greater number of which are preferably grouped in pairs and in outwardly diverging relation as shown.

The reenforcement may be secured in the position above stated in any desirable way as for example as shown in the drawings where wire mesh is used, by connecting the reenforcement to certain of the nails 24.

Following the erection of the framework, covered with the paper 20 and supporting the reenforcement as above described, the concrete portions of the wall at the outer surface of the framework 13 is erected.

Preliminary to the beginning of the pouring or casting of the concrete suitable false work to serve as the outside form for the concrete wall structure is secured in place. These forms in the construction shown comprise uprights 26 spaced from the framework 13 and secured at their upper ends to the framework by braces 27, and removable form-boards 28 which are positioned on edge in superposed relation to each other at the rear of the uprights 26.

In the building of the concrete wall which, in the particular illustrated embodiment of my invention, is formed with a facing composed of pieces 29 of relatively thin stone positioned on edge, the facing and the concrete wall portion represented at 30 and forming the backing therefor, are erected by alternate step-by-step operations. Thus the pieces 29 of stone forming the lower portion of the wall would be set into place against the inner faces of the mold boards 28 and relatively fine texture cement concrete in which coloring matter or waterproof material, or both, if desired, is incorporated, is forced from the inside of the mold outwardly into the joints between the stones 29, sufficient cement being used and the necessary force applied, to cause each stone to be surrounded by a band, so to speak, of the concrete and also cause the concrete to extend against the mold boards 28 and into a position in which it laps the marginal edges of the stones 29 as represented at 31, thereby interlocking the stones 29 with the concrete in which they are framed and firmly holding the facing stone in position against outward movement relative to such concrete, as well as forming a water and air tight joint between the stones and the concrete.

Before the concrete applied to the joints between the stones as stated has set, the concrete for forming the backing 30, or main wall portion of the wall structure, is poured or cast into the space between the stones 29 and the building paper 20 to substantially the height of the lower portion of the facing installed in place as above stated, the reenforcement becoming embedded therein. The concrete forming the backing portion 30 is of relatively coarse aggregate and is preferably not closely packed whereby voids at intervals

are created therein purposely as represented at 30*a* in Fig. 9. The backing-forming concrete being cast as stated before the concrete in the joints between the stones 29 has set, the concrete of finer texture penetrates, at the rear portion of the facing, the coarser aggregate concrete as represented in Fig. 9, thereby producing a close union between these different bodies of concrete, forming a firm anchorage therebetween and producing a monolithic concrete structure.

It may be here stated that this union between the concrete of different textures, together with the adhesion between the rear faces of the stones 29 and the concrete backing and the provision of the concrete lapping-portions 31 is of great advantage as thereby the stones 29 are firmly held against outward displacement relative to the backing 30.

Upon completing the lower portion of the facing and of the backing 30 the next superposed portion of the facing is built and the backing therefor cast in place, before the lowermost portion of the backing has set, and these alternate operations continued until the wall of the desired height has been completed whereby the entire wall structure thus becomes monolithic.

Before the facing and concrete-backing is built about the window or door frames, a yoke-shaped removable frame 100 is applied to the window or door frame to fit between the outer face of the frame and the adjacent mold board 28, as represented of the frame 100 in Fig. 7 for molding that portion of the concrete which extends outwardly beyond the window or door openings.

In the building of the concrete-faced wall structure as described, where the windows or doors are to be provided with concrete sills, the facing and the backing 30 are built to such a height across the lower sides of the window or door frames that spaces are provided below these frames as represented at 32 of the window opening shown in Fig. 7. After the concrete wall portion has set the yoke frames 100 at the outer faces of the window or door frames are removed together with the false work forming the outer mold wall and mold sections such as the one represented at 33, for defining the outer surfaces of the cement sills, such as the sill 34, for the window or door openings, applied to position as shown of the section at 33 in Fig. 8, and the concrete for forming the sill portion then poured or cast.

It will be understood from the foregoing that the paper 30 serves as the rear wall of the form in which the concrete is poured or cast. In forming the wall portion this paper not only affords an economical mold wall which may be left in place to form a part of the wall structure, whereby "sheeting" as commonly employed is rendered unnecessary thereby reducing expense and eliminating from the wall a layer which expands and contracts with moisture changes, but also aiding greatly in the insulating of the wall structure and the rendering of the same impenetrable by moisture.

The disposition of the marginal edges 21 of the paper at the window or door openings, relative to outwardly extending flanges thereon, as shown and described, is of advantage inasmuch as in the casting or pouring of the concrete to form the backing 30 pressure is applied rearwardly against these lapping edges forcing them into firm contact with the flanges referred to and producing air and water tight joints around the window and door frames.

The provision of the reenforcement for the concrete and located at the exterior surface of the paper 20 serves, in addition to reenforcing the concrete, to exert a sufficient resistance to the lateral flow of the concrete for relieving the paper 20 from pressure by the concrete tending to unduly bulge the paper, whereby it is possible to use paper for the inner mold wall of the wall structure, without requiring the provision of a relatively expensive backing for the paper.

The provision of the voids in the concrete-backing 30 is of advantage inasmuch as any moisture penetrating into the concrete wall structure finds it way into such voids where ample room is provided for the expansion of the water in freezing thereby avoiding undue stress on the wall structure. Furthermore, because of these voids the heat insulating quality of the wall is improved.

It will also be noted that the stability of the concrete wall structure is enhanced, and the entire wall structure rendered more stable and rigid, by reason of the anchoring of the concrete wall portion to the framework 13 at the studding 14 thereof as above described.

As is customary in buildings employing a framework such as the framework 13, the interior finish comprising lath and plaster or other suitable material, is applied to the inner faces of the studding 14, the air spaces between this interior finish and the paper 20 also serving to augment the insulating of the structure against heat-transmission therethrough.

While I have illustrated and described a particular embodiment of my invention, I do not wish to be understood as intending to limit it thereto as the same may be embodied in other forms of structures without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. A wall-structure comprising a framework, a wall portion of concrete at the outer surface of said framework, pins secured to, and extending forwardly from, said frame-

work, and reenforcement for said wall portion secured to said pins and embedded in said concrete, all of the reenforcement being spaced from said framework.

2. A wall-structure comprising a backing of relatively coarse aggregate concrete and a facing therefor formed of separate bodies of material, and relatively fine texture concrete interposed between adjacent ones of said bodies and lapping the margins of the outer faces thereof and anchored in the concrete forming said backing, said backing being formed with voids, for the purpose set forth.

HARRY S. WARNER.