Feb. 19, 1935. H. KLING ET AL 1,991,931

CONCRETE AND CEMENTITIOUS PAVEMENT SLAB

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Fig. 1.

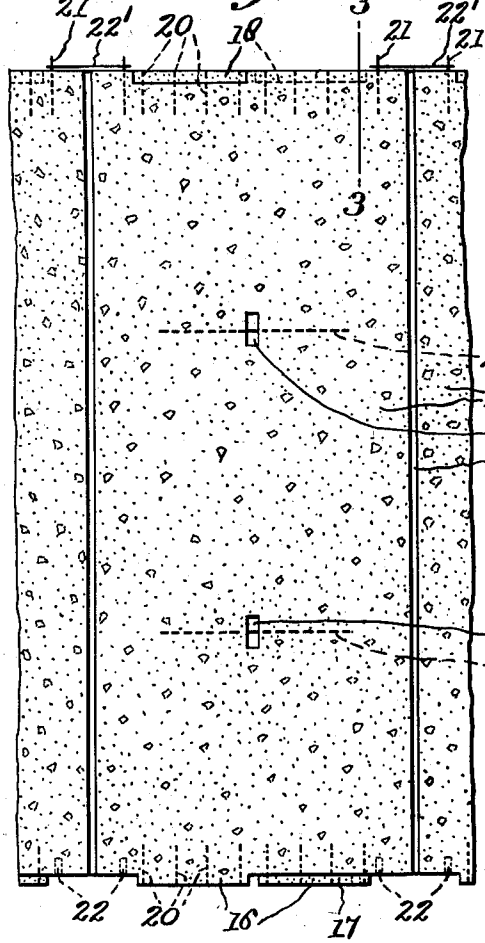


Fig. 4.

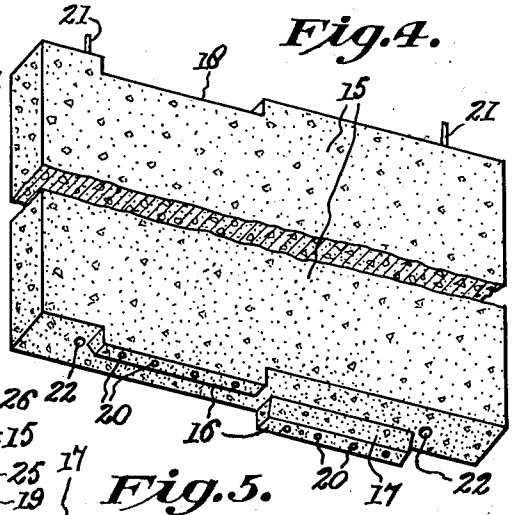


Fig. 5.

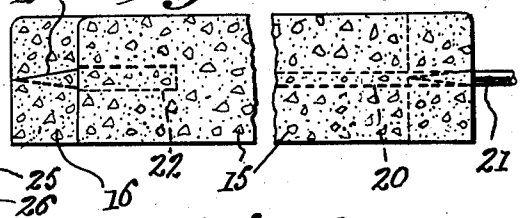


Fig. 6.

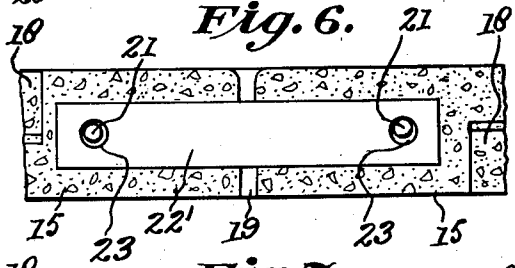


Fig. 2.

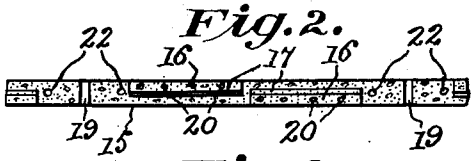


Fig. 7.

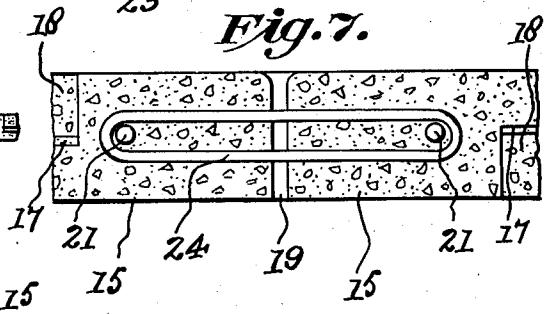
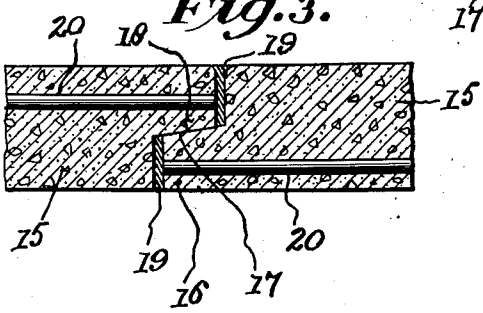


Fig. 3.



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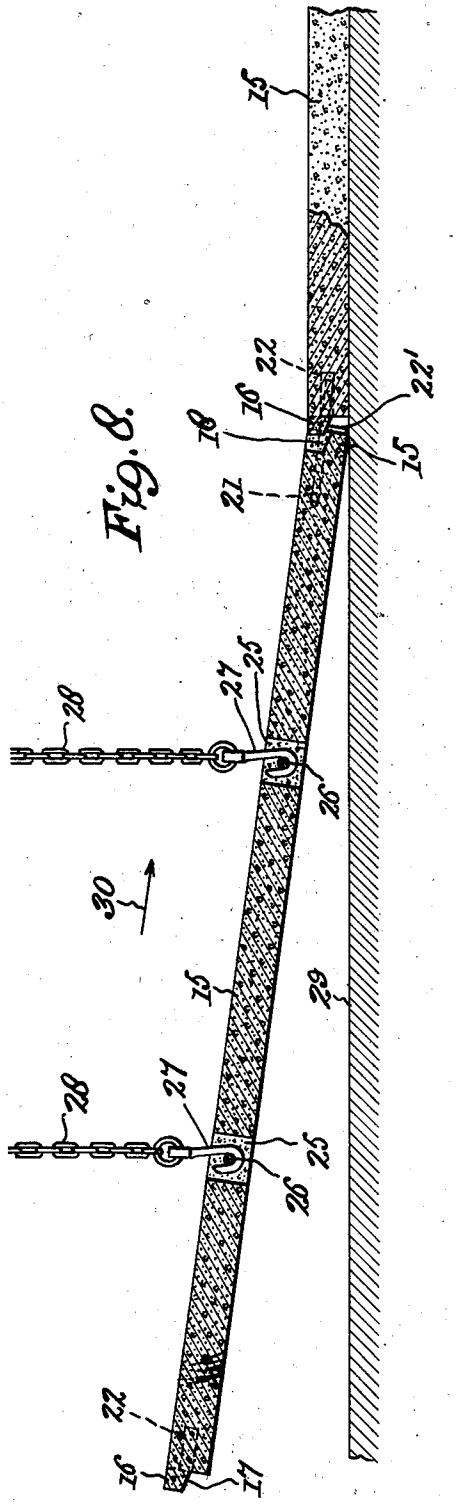


Fig. 8.

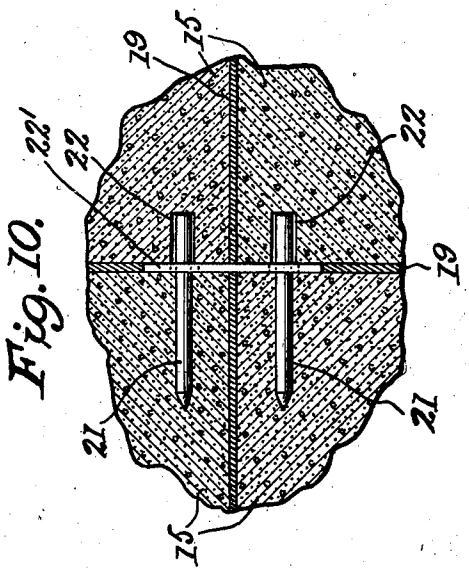


Fig. 10.

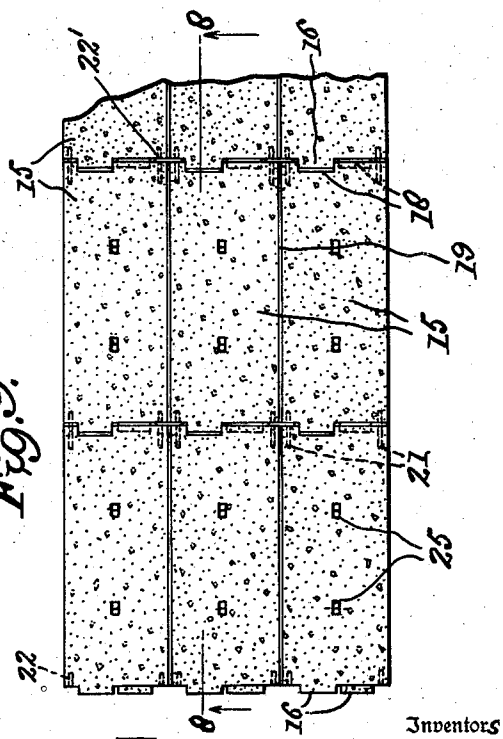


Fig. 9.

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UNITED STATES PATENT OFFICE

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CONCRETE AND CEMENTITIOUS PAVEMENT SLAB

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Application May 21, 1932, Serial No. 612,784

4 Claims. (Cl. 94—12)

The present invention relates to the art of road or highway construction, and has for an object to provide an improved method of constructing roads, and an improved slab or element adapted to be used as the body or upper part of the road.

At the present time, roads of cementitious material are built by conveying to the point of construction the various materials for the mix, frequently by long and expensive hauls, and at such point the materials are brought together and laid in the form of the road by various machines and devices which must be portable, cumbersome and costly to manufacture and operate. Water constitutes a large element in the making of concrete and in the treatment of the road after it is laid, and this element alone is difficult and costly to obtain in many instances where long stretches of highway are made between distant cities or towns. This present method of road building is hampered and delayed by temperature and weather conditions, and the road cannot be used for a considerable time after it is completed.

Various attempts have been made to overcome the above stated, and many other, disadvantages in road or highway building. One method tried out and practiced to a limited extent is to prepare the mix of cementitious material at a fixed point easy of access to the various ingredients or materials used, and to convey the mix in plastic condition to the point of construction. This method does not do away with the various machines and devices, and the work necessary to lay, spread, finish and subsequently treat the finished roadway, nor does it admit of the immediate use of it as the concrete must be seasoned and set before the road is opened to vehicular traffic.

The object of the present invention is to overcome all of these disadvantages and to provide road, street and highway pavement slabs of concrete and other cementitious material which are, first, susceptible of being constructed in locations distant from the site of use of same; second, which may be easily transported from place to place by the aid of suitable handling machinery; third, which are susceptible of being constructed under ideal conditions unaffected by weather and near sources of component materials; fourth, to facilitate concrete and cementitious slab road, street and highway construction and provide pavements which may be used immediately after laying without the usual delay incident to pouring and curing, and which can be taken up and salvaged for use at the same or other locations; fifth, which provide pavements composed of slabs with interlocking transverse joints and anchored together into longitudinal lanes, thereby eliminating heaving or settling of same and shifting of alignment; and sixth, which eliminates in most cases, the necessity of constructing pavements by mixing on the job.

The above, and various other hereinafter detailed and understood, objects and advantages of this invention will be set forth in the following detailed description of the preferred method and construction of the same, the construction referred to being illustrated in the accompanying drawings, wherein:

Figure 1 is a fragmentary top plan view of a portion of a roadway embodying the features of this invention.

Figure 2 is an end view of the same.

Figure 3 is a fragmentary sectional view, enlarged of adjacent ends of consecutively laid slabs, showing the vertical interlock and expansion joint therebetween.

Figure 4 is a detail perspective view of one of the slabs, the intermediate portion being broken away.

Figure 5 is a fragmentary enlarged longitudinal edge view of one of the slabs with the intermediate portion broken away.

Figure 6 is a fragmentary end view of the longitudinal edge portions of adjacent slabs, showing the tie strap and anchoring pins employed.

Figure 7 is a like view showing a slight modification in the form of tie strap used.

Figure 8 is an enlarged sectional view showing a portion of a roadway under construction according to the improved method, and showing the positioning of one of the improved slabs.

Figure 9 is a fragmentary top plan view of a section of roadway embodying a plurality of the slabs of this invention, and showing the coupling means between the adjacent end portions of the slabs, and

Figure 10 is a fragmentary enlarged sectional view taken horizontally through a portion of the roadway, showing the adjacent corner portions of the slabs, and the interlocking means therebetween.

Referring now to the drawings, and first to Figures 1 and 9, according to the present invention the improved roadway is built up chiefly of a number of independent long slabs 15 which may be of any desired width and length for practicability in handling and in roadway structure, and each of whch may be of suitable width conforming

to that of a traffic lane, and in Figure 9 the road is shown as comprising three traffic lanes. Each slab 15 is composed of a suitable cementitious material composition of any suitable character, such as cement, sand, broken stone, gravel pebbles and the like, which may be of any desired thickness, or which may vary in thickness according to the conditions of the roadway desired. It is also apparent that in the manufacture of the slabs 15 the same may be given either straight line formation as shown, or may be given any other suitable shape or curve to conform with the roadway.

According to this invention, the slabs 15 are independently manufactured or molded and are completed in every respect at a suitable point of manufacture which is easy of access to the materials and which may be accomplished by stationary molds, machines and the like.

The slabs when completed are then conveyed either by rail or vehicle to the point at which the road is being built so that the road may be laid or built rapidly, and as the slabs are in finished form, the road may be immediately used as soon as the slabs are swung into place.

In order to carry out the step of the method in laying the slabs and interlocking the same consecutively lengthwise of the road or the traffic lanes each slab is provided at one end with a pair of tongues or projections 16 which, as shown in Figures 3 and 5, are co-extensive with one flat face of the slab and which are of a height equal substantially to one-half the thickness of the slab. Each tongue 16, however, is of less than half the width of the slab and the tongues are arranged in offset or staggered relation toward the opposite or lateral edges of the slab so that the tongues are offset not only laterally but also vertically with respect to each other. The inner faces 17 of the tongues 16 flare inwardly toward the body portion or end of the slab so that, as shown in Figure 5 the inner surface portions of the tongues overlap and provide extensive and overlapping abutting shoulders for holding the slab against edgewise or lateral displacement when assembled in the road structure.

It will also be noted that the tongues or projections 16 are spaced inwardly at their outer ends from the lateral edges of the slab, Figures 1, 2 and 4 showing this structure clearly so that the tongues present end shoulders or abutments which further reinforce the slab against lateral displacement.

The opposite end of the slab 15 is provided with a pair of sockets or recesses 18 which correspond in size and shape to the tongues or projections 16 and which are adapted to receive the tongues therein. It will be noted from Figures 1 and 4, particularly, that one of the sockets 18 opens through the top of the slab 15 while the other socket 18 opens through the bottom thereof, and the tongues and sockets are so proportioned that when adjacent slabs are interfitted in endwise engagement with each other there will be left a space or recess at each end of each tongue or projection 16 for receiving a suitable plastic substance 19 forming an expansion joint. From Figure 3 it will be noted that the inclined or flaring face 17 of the projection 16 fits tightly against the adjacent inclined wall of the socket or recess 18 so that the end portions of adjacent slabs are supported one upon the other with a sliding fit, and the inclination of the contacting surfaces may be varied to suit conditions of installation and use and so as to hold the upper surface portions of the slabs in alignment or in substantially a common plane.

The body portion of the slab 15 may be provided with any suitable reinforcement for strengthening the same, and each slab is provided with reinforcing bars or rods 20 which extend lengthwise into the adjacent projections or tongues 16, and are preferably co-extensive with the tongues so as to reinforce and strengthen the tongues to withstand the various pressures to which they are subjected incident to retaining the slabs against vertical as well as transverse movement. The reinforcing bars or rods 20 are embedded in the slab 15 near its opposite ends, may be in any desired number and may extend backwardly into the slab 15 to any desired extent to adequately reinforce the tongues or projections 16.

Each slab is also provided at its end with longitudinally extending anchoring pins 21 which are adapted to engage in suitably formed sockets 22 in the opposite end of an adjacent slab. The anchoring pins 21 are located near the corners of the slab and are adapted to receive thereon tie straps 22′ adapted to engage across the adjacent end portions of slabs 15 which are disposed in parallel relation or which lie side by side in the road structure. It will be noted, particularly from Figure 1, that a space is left between the longitudinal edges of adjacent slabs 15. The tie straps are of sufficient length to provide for this space, and from Figure 6 it will be noted that the openings 23 in the opposite end portions of the tie straps 22′ are relatively large as compared with the size of the anchoring pins 21 so as to accommodate the connection to variations in the expansion and contraction of the slabs under temperature and the like changes.

Of course, these spaces are filled in with a suitable joint material which may be of a plastic substance poured into the joints, or may be of prepared joint strip material adapted to be fitted or placed in the joints either after the slabs are in place, or during the positioning of the slabs. It will be noted from Figure 9 that the tie straps 22′ are held in place upon anchoring pins 21 by the end portions of adjacent longitudinally placed slabs so that the pins 21 engage at their free ends in the sockets 22 and thus the tie straps are held securely between the adjacent ends of slabs and cannot escape therefrom until the slabs are completely separated. The pins 21 are proportioned to carry out this anchoring of the tie straps.

In Figure 7 there is shown a slight modification in the structure of the tie strap. In this case the tie strap 24 may be in the form of a link of wire or the like which is engaged at its opposite overturned or looped ends upon the pins 21. This admits of the desired relative movement of adjacent slabs as the slot of the link takes the place of the enlarged openings 23 in the bar type of tie strap 22′ shown in Figure 6. Of course, the links 24 are proportioned as to length to admit of the desired separation or movement of the slabs during expansion and contraction.

In order to facilitate the handling and positioning of the slabs, which may be of relatively large size and which may have a weight of thirteen tons, more or less, the slabs are provided with intermediate longitudinally spaced apart openings or recesses 25 which may be of desired depth, and which may extend entirely through the slab, if desired, as shown in Figures 1 and 8.

Supporting bars or rods 26 may be embedded in the body portion of the slab 15 in position such that the intermediate portions of the bars 26 intercept the recesses 25 so as to be exposed to the open ends of the recesses for the reception of supporting hooks 27, shown in Figure 8, which are carried upon hoisting chains or cables 28 from any suitable crane or hoist which is constructed to travel over the road as it is laid. In disposing the suspension and reinforcing rods 26 toward the opposite ends of the slab 15, the chains or cables 28 when supporting the slab may be widely spaced apart so that first one chain may be lowered so as to lower one end of the slab and admit of the interfitting of the lowered end of the slab against the adjacent end of a prior laid slab. The other chain 28 may now be lowered so that the slab may be swung downwardly toward the sub-surface 29 of the roadway.

At the same time, the chains 28 may be given a movement or tension toward the lower end of the slab, as indicated by the arrow 30 in Figure 8. This causes the slab 15 which is being lowered to move into interlocking relation with the already placed slab and causes the inclined surfaces 17 of the projections 16 to engage against the correspondingly inclined walls of the sockets 18 and thus securely interlock the slabs and maintain the same in proper alignment both transversely and vertically. This insures the proper positioning of the second slab as it is brought to rest upon the sub-surface of the road.

These slabs 15 constitute the body portion of the road and the sub-surface or base of the road may be of any suitable construction dependent upon the conditions met with during the preparation of the road for the top or body portion thereof. It is apparent that the laying of the road according to this invention, and with the slab 15 constructed as above described, may be carried on irrespective of climatic or temperature conditions because the actual mixing and setting, and curing of the concrete may take place indoors and under the desired temperature conditions, and the only plastic operation required in the laying of the road is in placing the expansion joint material, and this may be of prepared strip form which is not injured by low temperatures. After the slab 15 has been properly placed upon the sub-surface, the hooks 27 may be disengaged from the rods 26 and the openings or recesses 25 may be filled or plugged with any suitable plastic or other material found suitable.

It is apparent that in laying the roadway the desired thickness, dimensions and curvatures of the slabs may be readily determined in advance and the slabs may be manufactured continuously and in advance so that from the point of manufacture the slabs may be easily and quickly conveyed to the point of laying along the roadway and the roadway may thus be completed and ready for use just as fast as the slabs may be transported and as fast as the slabs may be laid in consecutive order lengthwise of the roadway. The interlocking of the slabs is quickly accomplished because the tie plates 22', or 24, may be slipped over the anchoring pins 21 immediately prior to the bringing together of adjacent ends of the slabs and while the second slab is still in tilted position. The outer ends of the pins 21 engage in the sockets 22, and the latter are of sufficient size, as shown in Figure 8, to admit of the pins entering the sockets without damage or injury either to the pins or to the adjacent slabs.

As soon as the pins enter the sockets, the tie straps or plates 22' are held against displacement and merely ride upon the pins as the second slab is lowered and advanced into position.

In some instances, it may be desired to provide a top layer or surface coating of concrete asphalt, bituminous concrete or the like over the roadway which is built up of the slabs. The slabs are capable of supporting this top layer and provide a strong and durable support therefor which may be quickly and easily manufactured and laid. Thus the use of the slabs 15 overcome, even where the top layer is provided, to a large extent all of the material handling, mixing and time consuming setting or curing operations which are now met with in the present day building or laying of roads.

Applicants are fully aware that cementitious slabs have heretofore been constructed for road, street and highway pavements with various types of joints and reinforcements. Applicants are also aware that precast concrete slabs have been used for bridge decks and floors of buildings. However, all of the prior construction known to applicants do not admit of the precast or manufacture of traffic lane or road slabs which are so constructed and provided with interlocking means as to admit of the quick laying of the road without other building or complicated operations.

Applicants have particularly in mind the building of roads in road units which comprise the individual sections in their entirety, which may be made at a remote point from the road where easy access may be had to materials and machinery, and which may be quickly dropped into place to immediately provide a complete road ready for immediate use.

This new method may be accomplished particularly by the improved construction of the slab and by the particular and novel interlocking joints and the tie straps with their anchoring pins.

In the manufacture of the slab 15, before it is shipped or transported to the point of road construction, the slab may be constructed with a suitable top or wearing surface of asphalt, tar or other suitable material or composition so that the slab in its entirety will provide a complete and finished road section. These slabs may be made in different widths as traffic lanes are constructed in different widths and it is desired to have each slab of dimensions which comprise road sections of the size which are now generally made by the spacing apart of expansion joints which are formed in the material after it is laid and before it is set. It is desired by using the slab and the method of this invention to produce a road which is constructed in accordance with the present day construction with its expansion joints and relatively large slab sections to permit the necessary expansion and contraction of the material and to cause it to separate on prescribed lines, which in the present case are the expansion joints provided between the slabs.

What is claimed is:

1. A cementitious slab for roadways, comprising a cast long road section having projections at one end and corresponding recesses at its other end, anchoring pins carried by said body portion at its end and near the corners thereof, said body portion having sockets in its opposite end corresponding to, and adapted to receive the

pins of an adjacent longitudinally alined slab, and tie straps detachably mounted on said pins to lie between adjacent ends of abutting slabs and projecting beyond the longitudinal edges of the slab for interlocking engagement with the corresponding slabs of a parallel traffic lane.

2. A cementitious slab for roadway construction, comprising a body shaped and constructed to provide a traffic lane section having staggered projections at one end and corresponding sockets at its other end, whereby to provide between the interlocking ends of adjacent slabs a staggered lap expansion joint anchoring pins carried by the body near its corners, and tie straps mounted on said pins.

3. A pre-cast cementitious road slab adapted to be laid on a sub-surface to provide a roadway, comprising a cast body portion proportioned to provide a length of a traffic lane, said body portion having at one end integral laterally and vertically offset projections with inclined walls facing toward the medial plane of the body portion and having in its opposite end sockets for receiving the corresponding projections of an adjacent slab and with the respective upper and lower walls of the sockets inclined for slidably engaging the inclined walls of the projections and provide an expansion joint between adjacent slabs and hold the adjacent slabs against relative displacement.

4. A roadway comprising a plurality of traffic lane sections having oppositely stepped opposite ends, said sections disposed in end to end engagement with the adjacent oppositely stepped ends interlocked and with the vertical walls spaced apart to allow expansion and contraction thereby setting up a staggered expansion joint and the intermediate walls in contact to hold the sections in line at their upper sides anchoring pins at each corner of each section, and a tie strap mounted on each pair of pins.

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