Feb. 15, 1927. 1,617,527

H. M. KNIGHT

KEY AND KEYWAY

Filed Oct. 27, 1919 2 Sheets-Sheet 1

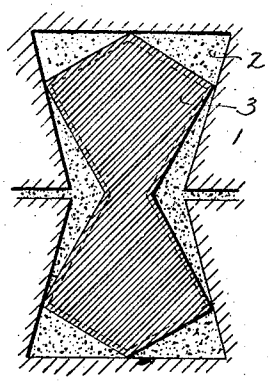


Fig. 1.

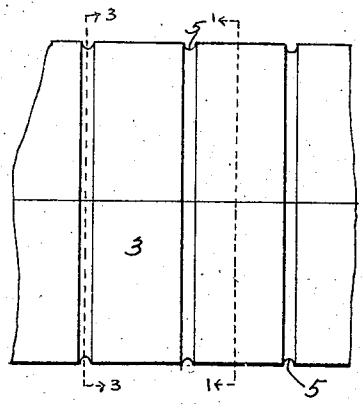


Fig. 2.

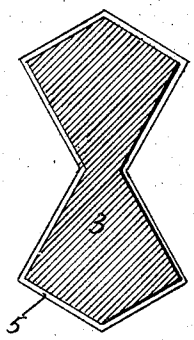


Fig. 3.

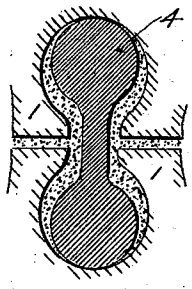


Fig. 4.

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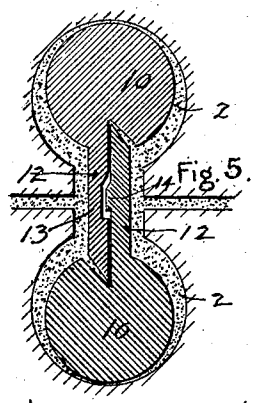


Fig. 5.

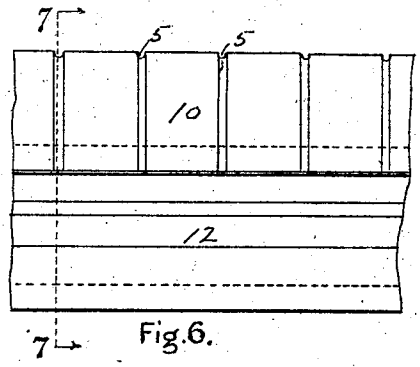


Fig. 6.

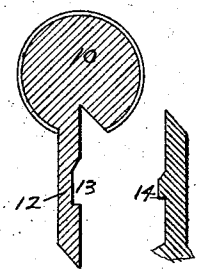


Fig. 7. Fig. 8.

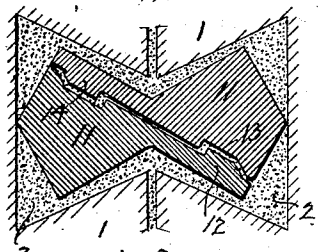


Fig. 9.

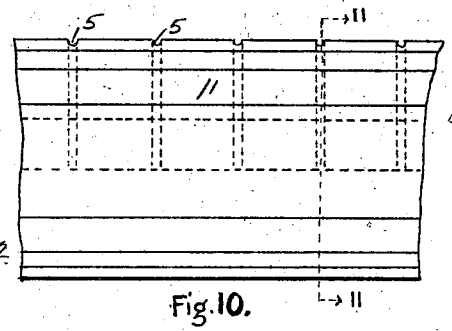


Fig. 10.

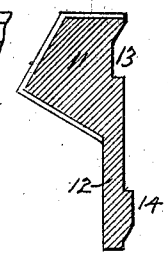


Fig. 11

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UNITED STATES PATENT OFFICE.

HERBERT M. KNIGHT, OF MONTCLAIR, NEW JERSEY.

KEY AND KEYWAY.

Application filed October 27, 1919. Serial No. 333,563.

This invention has reference to keys for connecting contiguous bodies and while specifically related in its application to unit concrete construction in which the plates are precast, it is not intended to be entirely or exclusively confined thereto.

One of the objects of this invention is to provide a key of a form that will not be parallel to any face or side of the key-ways, thereby insuring a free body of cementitious material between the key and the sides of the key-way. Another object of the invention is to provide a key of such a form that it will be movable within the key-ways of the adjacent contiguous bodies, permitting a latitude of movement without binding the the contiguous bodies or the key. Another object of the invention is to so indent the key by grooves around the periphery as to secure a larger amount of surrounding cementitious material between the key and the sides of the key way. Another object of the invention is to indent the key by grooves so as to increase the amount of cementitious material carried into the key-way by the edges of the grooves. Another object of the invention is to provide such grooves around the periphery of the key, for the purpose of gathering up the cementitious material during the insertion of the key and carrying such cementitious material into the key-way during the insertion of the key. Another object is to provide a key that is self locking and automatic in its operation. Another object is to provide a key that has a multiple of parts interlocking so as to automatically unite upon contact. Still other objects of the invention are to provide keys which while rigid, after final cementation permit certain latitudes of movement, of adjustment during insertion and previous to final cementation.

In the figures, similar numbers refer to similar parts:—Figure 1 is a cross section of a key on line 1—1 of Fig. 2 through the largest cross sectional area of the key, Fig. 2 is a side view of a key, Fig. 3 is a cross section of a key through the bottom of a groove at the point of the least cross section, Fig. 4 is a cross section of a key of "dumb-bell" shape, Fig. 5 is a cross section showing a key locked in position in the key-ways and making up an interlocking key of dumb-bell shape, Fig. 6 is an elevation of half of the interlocking key shown in Fig. 5, Fig. 7 is a cross section of half of the interlocking key shown in Fig. 5 on the line 7—7 of Fig. 6, Fig. 8 is a cross section of the locking fang on half of the interlocking key shown in Fig. 5, Fig. 9 is a cross section of a double interlocking key having straight sides, cemented in position in the key-ways, Fig. 10 is a side elevation of each half of the interchangeable interlocking key shown in Fig. 9, Fig 11 is a cross section of half of the interlocking key shown in Fig. 9 on the lines 11—11 of Fig. 10.

Referring to drawings: 1 are units to be connected by means of key-ways and keys; 2 is a key-way; 3 is a straight line key of trapezoidal cross section; 4 is a curvilinear dumb-bell section; 5 are grooves around the periphery of keys; 6 is a fang extending from the trapezoidal key; 7 are openings in the said fangs; 8 is a ward for use in connection with an automatic locking key; 9 is a fanged key bolt; 10 is an automatic interlocking key of dumb-bell section; 11 is an automatic locking key of trapezoidal section; 12 is a shank to an automatic interlocking key; 13 is a depression in a shank of an automatic interlocking key; 14 is a projection on the shank of an automatic interlocking key; 15 is a modified dumb-bell key.

In the process of uniting units, either of precast concrete or otherwise together, one of the fastening means is a key inserted in a key way. It is highly desirable that on account of inaccuracies in construction that the key for insertion, while being relatively of the same size as the key-way so as not to leave unnecessary space around said key, should also be of such a form as will assure that a sufficiency of surrounding cementitious material shall at all times and under all conditions exist between the sides of the key and the sides of the key-way, and at the same time, that the relative forms of a key of a key-way shall be such as to permit of a certain and comparatively small latitude of motion as between the key and the key-way without binding or fracturing either. The lines of ordinary dove-tailed keys and key-ways either on curved or straight lines are usually parallel so that there is a possibility, that one or more faces of the key will rest directly against one or more faces of the key-way, resulting in no, or an insufficiency of surrounding cementitious material. In the key shown in Fig. 1 and the other figures accompanying this application,

a key has been provided in which no part of any face, whether the same shall be made up of straight or curvilinear lines, shall rest on any face continuously for any area of the key-way, the point of contact of keys and key-ways being linear and not superficial and by reason of the fact that all lines are out of parallel, it is possible to secure a considerable latitude of motion of the various units and component parts with reference to each other, and with reference to the key without rendering it impossible to insert the key or to adjust the units or parts after such insertion. While in the drawings accompanying this application, the lines as shown are considerably out of parallel, in practice this lack of parallelism will not be as great as indicated in the drawings, the unparallel relation being exaggerated for the purpose of clarity.

One of the essential features to the success of any system of uniting contiguous bodies by means of keys and key-ways is that there shall always be a sufficiency of cement or binding material between the facings of the keys and key-ways respectively. In inserting long keys into long key-ways, it is difficult and quite often impossible to be sure that a continuous body of cement is between the different faces. For the purpose of assuring that the cementitious material is carried into the joint, grooves are made at intervals around the periphery of the key. When the key is inserted, the said grooves collect the cementitious material and become thereby carriers of the said cementitious material throughout the entire length of the key and key-way. A longitudinal forward and reversal movement of the key within the key-way during or after insertion serves to completely fill both the grooves and the spaces, thereby assuring a solid and complete joint.

Fig. 5 illustrates a dumb-bell key, so called, in which the lower half is inserted in the key-way of the lower unit when that unit is placed in position and before the upper unit has been placed with a certain amount of cementitious material around the said key and within said key-way. The cementitious material is then placed upon the joint between the two units to be united and the upper unit, into the key-way of which the other half of the dumb-bell key has been inserted with a certain amount of cementitious material, is placed in position upon the lower unit, previously in position. The effect of such an operation is to force the shank of the lower half outwardly, and until the side of the shank rests against the outer throat of the key-way. With the continued lowering of the upper unit, the point of the shank of the lower half of the key is forced into the V shaped slot in the head of the upper half of the key, and is brought into vertical position again in such a way as to cause the projection on said shank to lock with the depression in the extended shank of the upper half of the key. The movements and the interlocking of the two shanks are similar during the process of locking, both shanks being moved apart and toward each other at identical times and by similar forces. As both key-ways have a certain amount of cementitious material placed therein and as the joint has had a surplus of cementitious material placed therein and as before the lowering of the upper unit, the cement upon the joint and in the key-ways is forced around the various portions of the keys and in setting up holds them in permanent and fixed position as is represented in Fig. 11 in the case of the dumb-bell key and Figs. 9 and 11 in the case of the straight line key.

What I claim is:—

1. In a structure of the class described, a multiple of units, edges to said units, the edges of adjacent units being juxtaposed, alined re-entrant grooves in said juxtaposed edges, interior faces to said grooves made up of arcs of circles, a key, heads to said key, a shank connecting said heads, said heads being in said grooves and exterior faces to said heads made up of arcs of circles differing in radii from those of the faces of the said grooves.

2. In a structure of the class described, a multiple of units, edges to said units, the edges of adjacent units being juxtaposed, alined re-entrant grooves in said juxtaposed edges, interior faces to said grooves, a key composed of a multiple of interlocking parts, heads to said key, shanks connected to said heads, said heads being in said grooves, and exterior faces to said heads angularly disposed relative to adjacent faces of said grooves.

3. In a structure of the class described, a multiple of units, edges to said units, the edges of adjacent units being juxtaposed, alined re-entrant grooves in said juxtaposed edges, interior faces to said grooves, a key composed of a multiple of interlocking parts, heads to said key, shanks connected to said heads, said heads being in said grooves and exterior faces to said heads, said faces of said heads being without superficial contact with the said faces of the said grooves.

Signed at New York city, in the county of New York and State of New York, this 24th day of October A. D. 1919.

HERBERT M. KNIGHT.