No. 837,962. PATENTED DEC. 11, 1906.

W. P. RICE.

RETAINING WALL STRUCTURE AND METHOD OF BUILDING SAME.

APPLICATION FILED MAR. 4, 1903. RENEWED JUNE 11, 1906.

2 SHEETS—SHEET 1.

Fig. I.

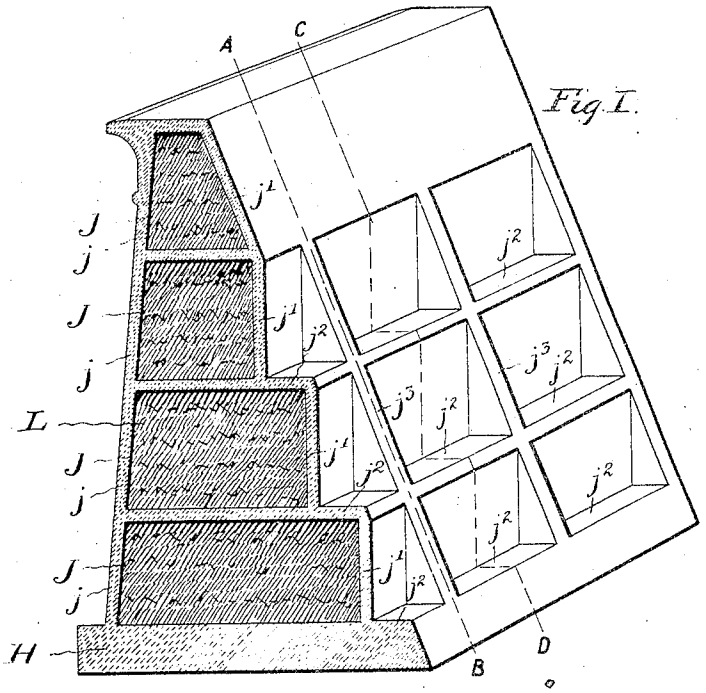
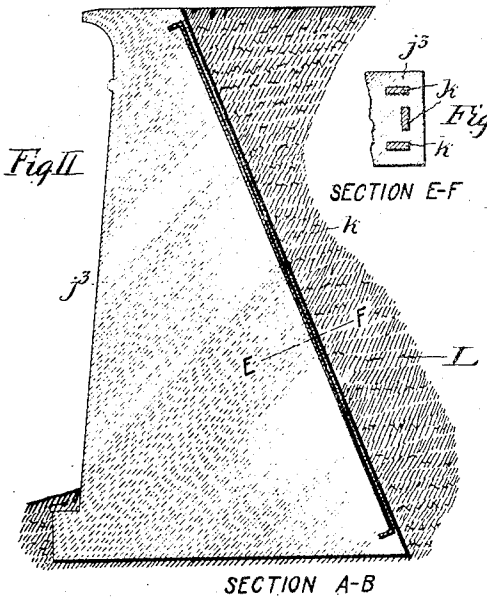


Fig. II.

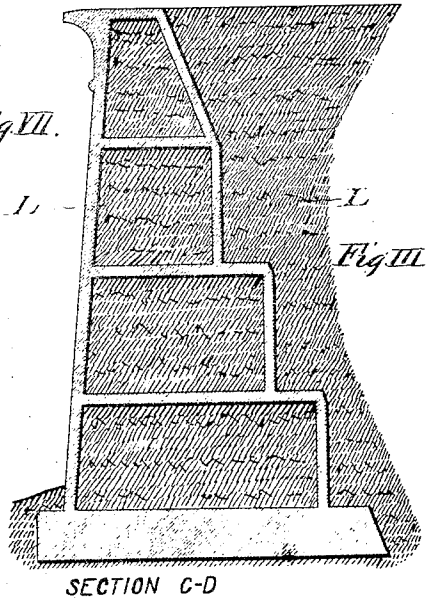


SECTION A-B

Fig. VII.

SECTION E-F

Fig. III.



SECTION C-D

WITNESSES:

S. W. Saywell

M. Merkel

INVENTOR

W. P. Rice,

BY J. A. Fay

ATTORNEY

No. 837,962. PATENTED DEC. 11, 1906.

W. P. RICE.

RETAINING WALL STRUCTURE AND METHOD OF BUILDING SAME.

APPLICATION FILED MAR. 4, 1903. RENEWED JUNE 11, 1906.

2 SHEETS—SHEET 2.

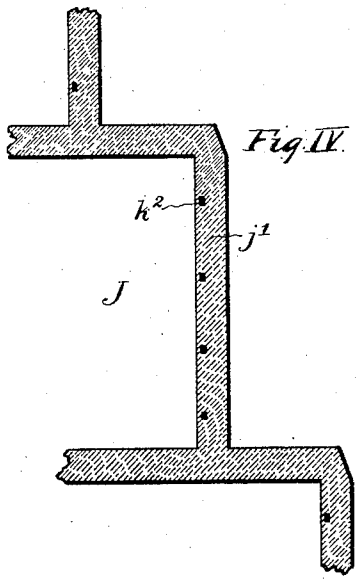


Fig. IV.

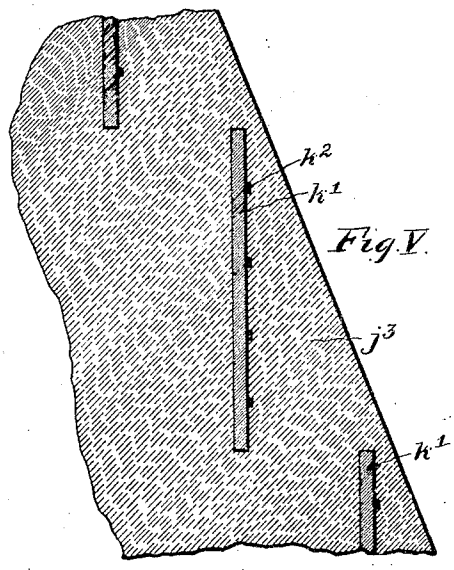


Fig. V.

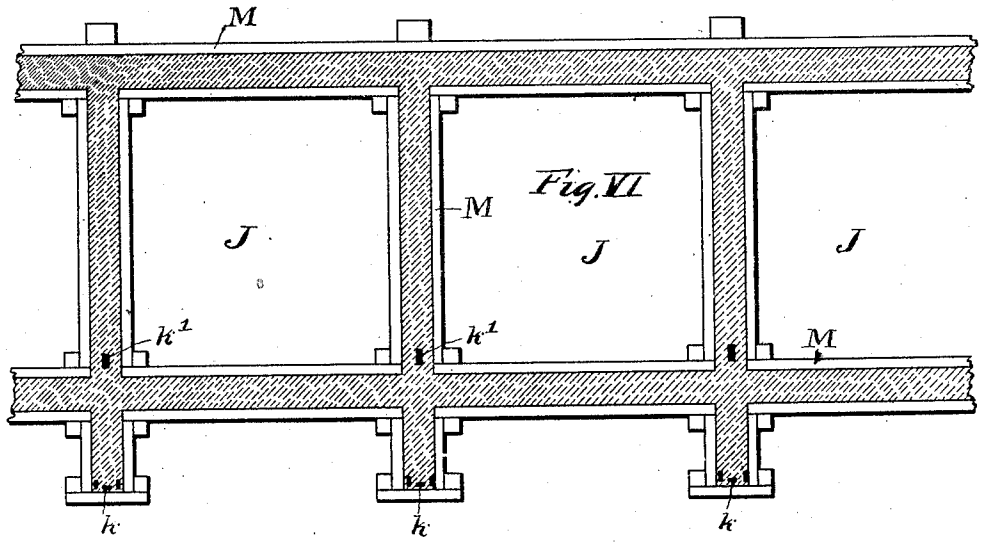


Fig. VI.

WITNESSES:

G. W. Saywell

A. E. Merkel

INVENTOR

W. P. Rice

BY J. D. Fay

ATTORNEY

UNITED STATES PATENT OFFICE.

WALTER P. RICE, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-THIRD TO ARTHUR E. MERKEL, OF CLEVELAND, OHIO.

RETAINING-WALL STRUCTURE AND METHOD OF BUILDING SAME.

No. 837,962. Specification of Letters Patent. Patented Dec. 11, 1906.

Application filed March 4, 1903. Renewed June 11, 1906. Serial No. 321,202.

To all whom it may concern:

Be it known that I, WALTER P. RICE, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Retaining-Wall Structures and Methods of Building Same, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to structures for retaining-walls, wing-walls for arches, culverts, &c., dams, breakwaters, &c., its object being to provide a construction of such character having the required characteristics incident to their use and to render their construction as advantageous as possible from the standpoint of economy.

The said invention consists of means and a method hereinafter fully described, and specifically set forth in the claims.

The annexed drawings and the following description set forth in detail certain means embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents in perspective a section of a retaining-wall embodying my invention and resulting from my above-mentioned method. Figs. II and III represent transverse sections of such a wall, taken upon the planes indicated by the lines A B and C D, respectively, Fig. I. Fig. IV represents an enlarged transverse section of a part of the rear or tension side of said wall, taken upon the plane indicated by lines C D, Fig. I, one of the reinforcing-rods being omitted. Fig. V represents on a scale similar to that of Fig. IV a transverse section of a part of the rear side of such wall, taken upon the plane indicated by line A B. Fig. VI represents a section of the lower part of a portion of such wall, taken upon a horizontal plane, a number of molding-boards in position and illustrating in part the method of constructing the wall. Fig. VII represents a detail section, on an enlarged scale, of a part of the rear portion of the wall and taken upon the plane indicated by line E F, Fig. II.

I shall first describe the structure itself and then the method by which I produce that structure.

The general form of the structure is that of a pyramid, but is susceptible to all the variations in cross-section incidental to recognized practice in retaining-wall designs, the pyramid form being that customarily used for this purpose. Upon a base H, of concrete or cement or other similar indurating material, is formed a continuous connected homogeneous mass of rigidly-set concrete or cement forming top, bottom, and side walls of a series of superimposed cavities J segregated from each other. These cavities are of equal width but of varying cross-sectional area, as shown, and have their front walls j all formed of one continuous mass of concrete or cement, forming the flat front surface of the retaining-wall. As illustrated, each series consists of four cavities; but, as will be readily understood, any required number may be provided. The rear or tension walls j' of all but the upper cavity of each series are formed by upright walls of concrete or cement, and the general cross-section of the whole structure being trapezoidal the rear end of the top walls of the two lower cavities and the rear end of the base H are left exposed, forming shelves j^2, having substantially horizontal surfaces intersecting the plane of the rear side of the retaining-wall. Passing transversely through the structure and separating each series of cavities is a concrete or cement wall j^3 integral with and forming a part of the separating mass of concrete or cement forming the cavity-walls. These transverse walls hence form common side walls of adjacent cavities of adjacent series, as will be understood. The front of each of the said walls j^3 terminates in the plane of the front of the retaining-wall, and its rear terminates in the plane of the rear thereof, as shown, the top and bottom terminating in the plane of the top and bottom, respectively, of the retaining-wall, as shown in Fig. II.

In the middle of the rear or tension portion or fibers of each wall j^3 are reinforcing-rods k, extending substantially throughout its length, as shown in Fig. II, they being embedded in the concrete or cement during the process of construction in the well-known manner of reinforcing concrete or cement and other indurating material. Opposite the ends of the rear cavity-walls and em-

bedded in the walls j^3 are a number of upright bars k', parallel with such rear walls. Through each of the latter extend a series of horizontal bars k^2, whose ends engage the upright bars k', as shown in Fig. V. Such construction transfers the strain or tension in the rear walls j' to the bars k', and hence to the transverse walls j^3. In the place of having a single reinforcing-rod k in the walls j^3 a number of such rods may be used and suitably placed, as illustrated in Fig. VII.

Each of the cavities of each series is filled with a non-integral substance L, such as earth, this substance being tamped and compressed to form a compact mass of substantially the same specific gravity as the concrete or the cement and filling the cavities completely. These segregated non-rigid masses of non-integral material are hence fixed relatively to each other by means of the homogeneous intermediate integral mass of rigid concrete or cement forming the connecting surrounding walls.

In constructing the above-described structure I begin by laying a portion of the base portion H and form in succession the walls of the cavities by means of molding-boards M, Fig. VI. As fast as the bottom, ends, and sides of the cavities are completed and sufficiently set I fill the cavities with the non-integral material L, which is tamped or packed down firmly to form a compact mass. For this purpose any non-integral material may be used. Among these materials natural earths—such as clay, sand, gravel, loam, iron-ore dust, &c.—are most advantageously used, since they are practically always at hand and involved in the construction of structures of this nature. The covering-wall is then formed, completely inclosing such mass of non-integral material. These cavities are formed consecutively and filled, as above described, until the whole structure is complete. In this manner I am able to utilize a practically costless material almost always at hand to form a large proportion of my improved structure and at the same time obtain all the physical characteristics required—that is, a gravity section or a solid section which resists overturning or sliding under exterior pressure by virtue of its dead-weight.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention—

1. A structure consisting of a connected, rigid homogeneous mass forming a plurality of segregated superimposed cavities; and non-integral material such as earth filling such cavities.

2. A retaining-wall structure consisting of a shell of concrete or cement formed with an adjacent series of superimposed cavities, each series being separated by a transverse upright partition.

3. A retaining-wall structure consisting of a shell of concrete, formed with an adjacent series of superimposed cavities, each series being separated by a transverse upright partition, extending beyond the outside surface of one side of such shell, and with transverse surfaces intersecting the plane of such outside surface intermediately of said partitions.

4. A retaining-wall structure consisting of a shell of concrete or cement formed with interior cavities separated by upright transverse partitions extending transversely through the structure, and means for transferring the stress or tension on the rear walls of said cavities to said partitions.

5. A retaining-wall structure consisting of a shell of concrete or cement formed with interior cavities separated by upright partitions extending transversely through the structure, bars embedded in said partitions, and bars embedded in the tension portion of the walls of said cavities and engaging said partition-bars to transfer tension from said walls to said partitions.

6. A retaining-wall structure consisting of a shell of concrete or cement formed with interior cavities separated by upright walls extending transversely through the structure, and provided with means for transferring the stress or tension in longitudinal walls of such cavities to such transverse walls.

7. A retaining-wall structure consisting of a shell of concrete or cement formed with interior cavities separated by upright walls extending transversely through the structure, and provided with means for transferring stress or tension in the tension side of longitudinal walls of such cavities to such walls.

8. The method of constructing a built-up structure for retaining-walls and the like, which consists in forming upright transverse and horizontal walls of a continuous integral mass of indurating material to form a series of superimposed cavities, and filling such cavities prior to their complete closure with a non-integral material such as earth.

Signed by me this 24th day of February, 1903.

WALTER P. RICE.

Attest:
G. W. SAYWELL,
A. E. MERKEL.