

No. 842,552.

PATENTED JAN. 29, 1907.

G. W. JACKSON.

ART OF CONSTRUCTING RETAINING WALLS.

APPLICATION FILED JUNE 12, 1906.

2 SHEETS—SHEET 1.

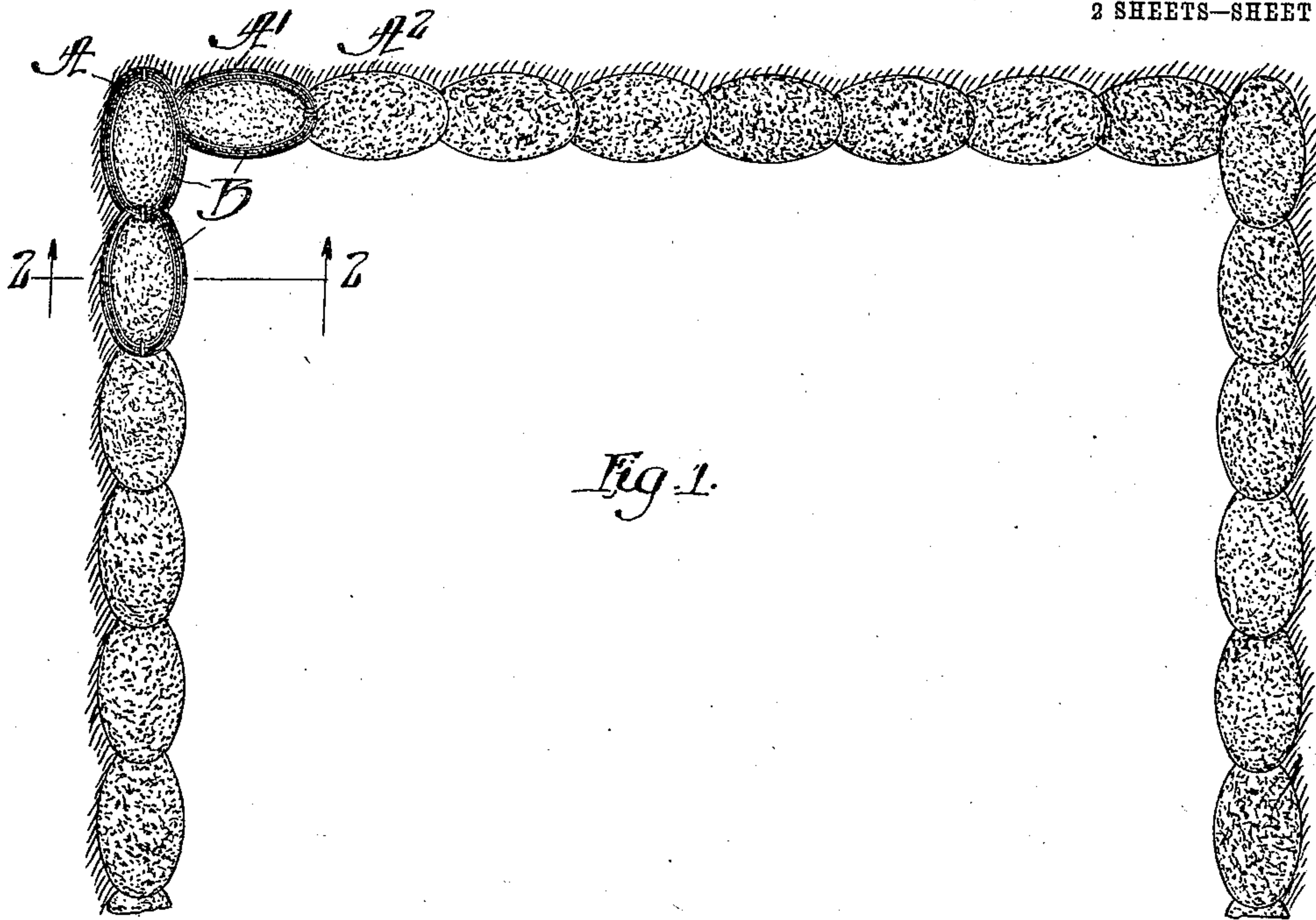
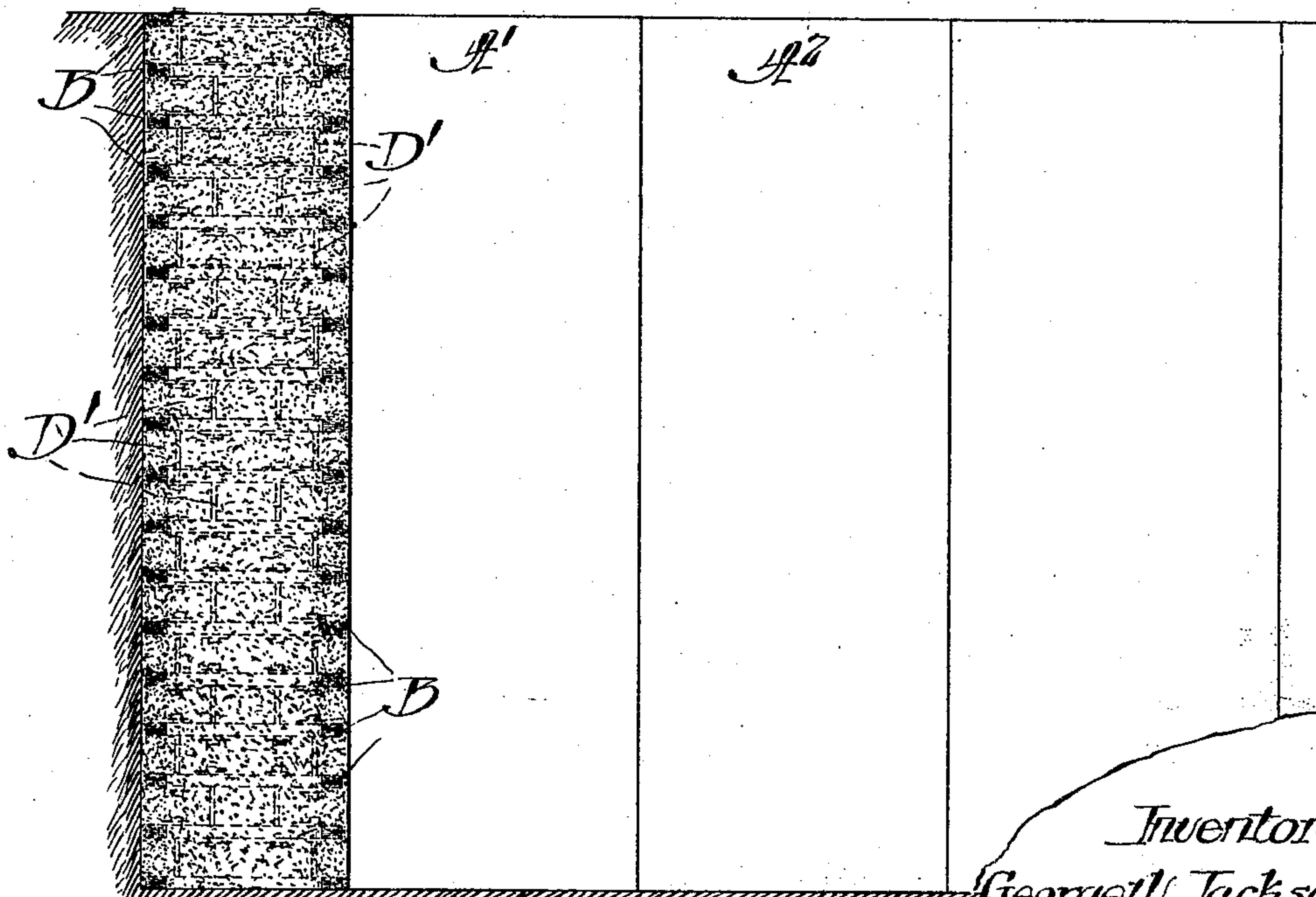


Fig. 1.

Fig. 2.



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Inventor:  
Georgell Jackson  
by Robert Brown  
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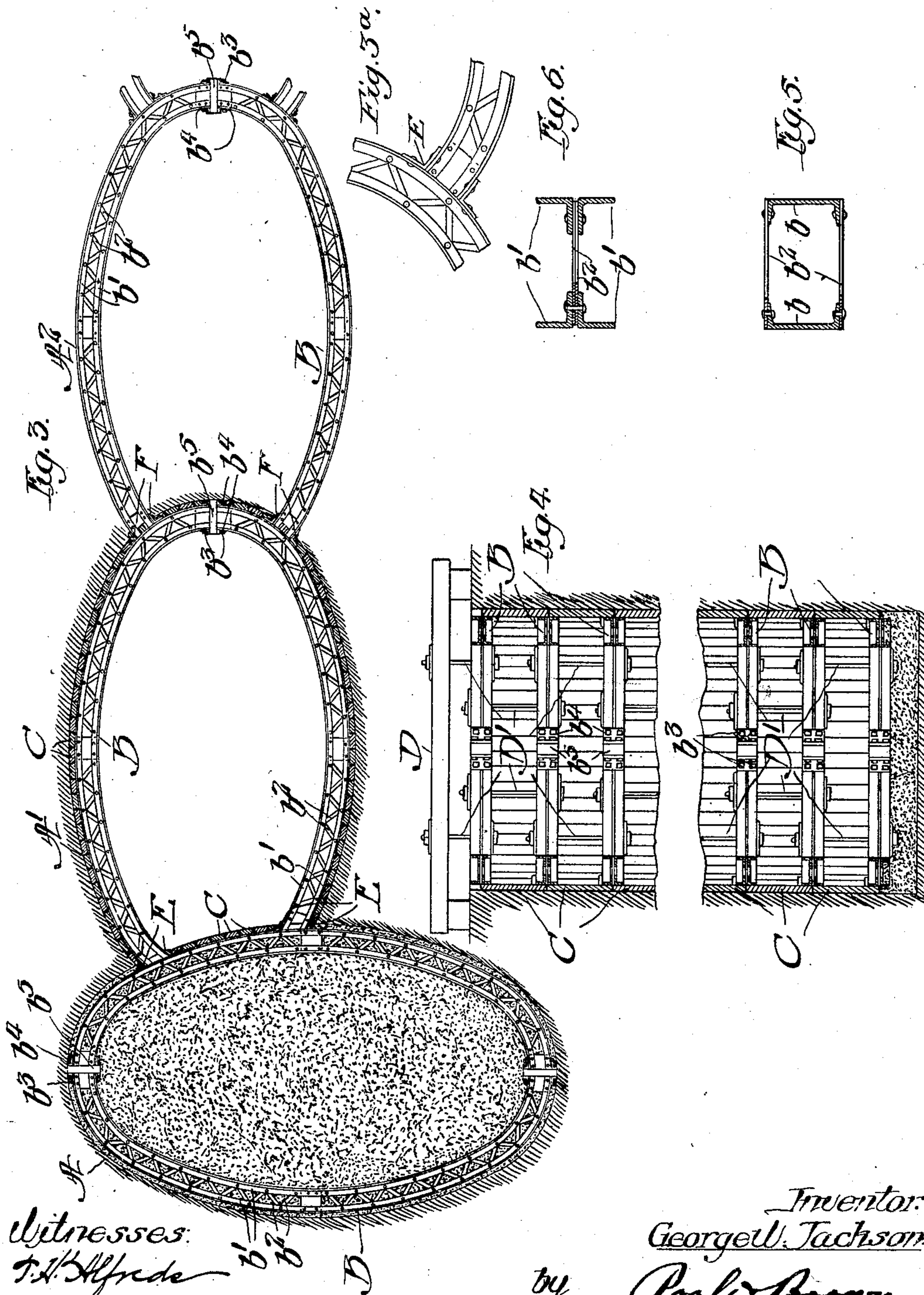
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

GEORGE W. JACKSON, OF CHICAGO, ILLINOIS.

## ART OF CONSTRUCTING RETAINING-WALLS.

No. 842,552.

Specification of Letters Patent.

Patented Jan. 29, 1907.

Application filed June 12, 1906. Serial No. 321,362.

*To all whom it may concern:*

Be it known that I, GEORGE W. JACKSON, a citizen of the United States, of Chicago, in the county of Cook and State of Illinois, have  
5 invented certain new and useful Improvements in the Art of Constructing Retaining-Walls; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accom-  
10 panying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in the art of constructing retaining-walls for  
15 excavated or depressed areas constructed in the earth—such, for instance, as the underground areas or spaces in which are constructed the underground stations of a subway or tunnel-railway and like uses. The  
20 invention refers both to the structure of such retaining-walls and to the method of constructing the same.

The object of the invention is to simplify and cheapen the cost of constructing such  
25 retaining-walls and to produce a retaining-wall having great strength to resist the lateral pressure of the earthen sides of the excavated area.

A retaining-wall made in accordance with  
30 my improvements comprises a plurality of concrete piers, separately constructed in the earth, located side by side and joined or connected from the upper to the lower ends thereof in such manner as to produce a continuous concrete wall. The term "con-  
35 crete" is intended to include material that is placed in the excavation in a plastic state and which subsequently hardens to retain permanent form. Said piers are of such  
40 dimensions as to be capable of being individually constructed by the use of simple appliances and attended by minimum danger of the sides of the excavations collapsing or caving inwardly.

In constructing a retaining-wall embody-  
45 ing my improvements I proceed generally as follows: After the lines on which the retaining-wall is to be built have been determined the first operation of constructing the  
50 wall is to sink or construct a pier in the earth, which is hereinafter termed a "unit-section" of the wall. After the first pier is completed another pier is in like manner constructed at the side thereof and is joined  
55 or connected during its building with the

completed pier in such manner that the two finished piers form a short section of a continuous wall. Thereafter the wall is completed by constructing other piers in like manner at the sides of and joining them to  
60 the completed piers or wall units. After the wall has been completed around the area to be excavated, if such wall is designed to inclose said area, the earth within the surrounding or partially-surrounding retaining-  
65 wall is removed, leaving the retaining-wall to support the sides of the excavation.

I prefer to employ in the construction of the individual piers or wall units sectional lagging and lagging rings or supports so ar-  
70 ranged that the excavation for each pier is made in successively-lower sections of a predetermined depth, and as each section is excavated it is lined with the lagging supported by the lagging-rings referred to,  
75 thereby minimizing the danger of collapse of the side walls of the excavation. After the excavation is completed and the sides thereof lined it is filled with plastic concrete or like material, and when the body of concrete  
80 hardens the pier-wall unit is completed. I may employ the form of lagging and lagging-supporting rings for lining the excavations in constructing the piers or wall units such as  
85 is shown in my application filed of even date herewith, Serial No. 321,361, for improvements in the art of constructing the walls of shafts formed in the earth. Such lagging-supporting rings (which in the construction  
90 shown in my aforesaid application constitute reinforcing-rings for the shaft-wall) are preferably made of laterally trussed or braced construction, thereby safely per-  
95 mitting the use of relatively light construction combined with ample strength of the lining of the excavation to resist collapsing thereof. The said lagging-supporting rings of the lining of the adjacent wall units are preferably connected together, so that the  
100 finished retaining-wall embraces in its construction a continuous metal structure embedded in a continuous concrete wall.

I have shown in the drawings herein one approved form of retaining-wall in which is embodied the structure hereinabove referred  
105 to; but it will be understood that such structure may be considerably varied within the scope of the invention.

As shown in the drawings, Figure 1 is a horizontal section of an inclosing retaining-  
110



wall embodying my invention. Fig. 2 is a vertical section, on an enlarged scale, taken on line 2 2 of Fig. 1. Fig. 3 is a horizontal section of three units of the wall, showing the same in different constructional stages. Fig. 3<sup>a</sup> is a detail illustrating the manner of joining the reinforcing-rings of adjacent wall units that are embedded in the wall units. Fig. 4 is a fragmentary vertical section of the lined excavation preparatory to placing the concrete therein. Figs. 5 and 6 are cross-sections of two forms of lagging-supporting rings.

I will first refer briefly to the manner of constructing a single wall unit and to the apparatus employed and will thereafter describe the manner of joining said units to finish the wall.

As shown in the drawings, referring more specifically to Figs. 1, 2, and 3, A A' A<sup>2</sup> designate the several units of the wall, the said units being characterized by slight differences in structure, owing to the location thereof in the wall. The unit A is located at the corner of the wall, the unit A' next adjacent to the corner unit and joined thereto, and the units A<sup>2</sup> constitute the units of the side walls. The said piers or wall units are different from each other only in the manner in which they are united to adjacent units. The lagging and the lagging-supporting rings of the different units will be designated, therefore, by the same reference-letters.

B designates the lagging-supporting rings, and C the lagging supported thereon and constituting the lining of the excavation which is first formed and thereafter filled with concrete. The cross-section of the wall units, as herein shown, is that of an oval, and this form, while not essential, is well adapted to the construction of retaining-walls. The form of lagging-ring herein shown comprises a laterally trussed or braced ring consisting of inner and outer members made of commercial-shape rolled bars joined by lateral braces. The said inner and outer members of the rings may consist of channel-bars *b b*, as shown in Fig. 5, or may consist of angle-bars *b' b'*, as shown in Fig. 6. The brace or truss bars *b<sup>2</sup>* extend obliquely between said inner and outer members and are riveted or otherwise secured thereto. For convenience of inserting the rings into place they are made of two parts joined by means of bolts *b<sup>3</sup>*, extending through lugs *b<sup>4</sup>* at the ends of said parts. In order to facilitate the fitting of said rings in the excavation, filling-pieces *b<sup>5</sup>* are inserted between the ends of said parts of the rings.

In constructing a wall unit or pier the excavations are made in short vertical sections the depth of which depends upon the nature of the earth being excavated, and after each sectional excavation is completed the lagging-supporting rings and lagging are placed in such excavations, the sections being suc-

cessively excavated and lined in this manner in the same general manner as set forth in my aforesaid application until the full depth of the excavation is reached. Thereafter the lined excavation is filled with a solid body of concrete or like material. The several vertically-separate lagging-supporting rings are suspended from each other and from timbers D at the top of the excavation by suspension-rods D' in the manner shown in Fig. 4. If desired, the lagging C may be removed as the concrete or other filling is placed, this depending upon the nature of the earth in which the excavation is made.

The lagging-supporting rings of the corner-wall unit or pier comprise a complete oval or other cross-section used. The lagging-supporting rings B of the next adjacent wall-sections are interrupted or cut away at the ends thereof adjacent to the corner unit, as shown in Fig. 3, and the cut-away ends of said rings are joined to the rings of the unit A in any suitable manner, as by means of angles E, bolted to said rings, as shown in Figs. 3 and 3<sup>a</sup>. In a like manner the lagging-supporting rings of the units A<sup>2</sup> are each interrupted at one end and joined to the adjacent ends of the lagging-supporting rings of the unit A' by means of like angles F.

In Fig. 3 the pier or wall unit A is shown as finished, the unit A' is shown in readiness to receive the concrete, while the unit A<sup>2</sup> illustrates a lagging-supporting ring apart from the lagging or before the lagging had been placed thereon. It will be understood that each wall unit will be completed and the concrete allowed to set before the excavation for the next adjacent unit or units is commenced. After the several wall units have been completed to surround the desired area the earth is removed therefrom. The retaining-wall resulting from the construction described is composed of a series of united concrete piers reinforced by the rings B and the suspension-rods D', when the latter are employed, it being observed that the concrete body of one unit unites with the concrete body of adjacent units in a manner to produce a continuous wall. This construction obviously produces a wall of great strength to resist lateral pressure of the earthen walls of the excavation and may be constructed at an economical expenditure of material and labor.

It will of course be understood that my improved retaining-wall may comprise a straight wall-section or a partially or wholly inclosing wall, as the circumstances require or permit.

I claim as my invention—

1. The improved retaining-wall described for excavated areas, comprising a plurality of separately-constructed wall units located side by side, each unit embracing a solid column or pier of concrete and the concrete



structure of said units being built one into another to constitute a continuous concrete wall.

2. The improved retaining-wall described for excavated areas, comprising a plurality of separately-constructed concrete piers or wall units located side by side and joined to constitute a continuous wall, and reinforcing-rings embedded in said piers.

3. The improved retaining-wall described for excavated areas, comprising a plurality of separately-constructed concrete piers or wall units located side by side and joined to constitute a continuous wall, and reinforcing-rings embedded in said piers, said reinforcing-rings being united to provide a continuous reinforcing metal structure throughout the length of the wall.

4. The improved retaining-wall described for excavated areas, comprising a plurality of separately-constructed concrete piers or wall units located side by side and joined to constitute a continuous wall, reinforcing-rings embedded in said piers, and suspension-rods for said rings also embedded in the concrete body of the units.

5. The method of constructing retaining-walls which consists in separately constructing concrete piers or wall units in the earth side by side and forming each pier partially in an adjacent pier to constitute a continuous concrete wall.

6. The method of constructing retaining-walls which consists in separately constructing concrete piers or wall units in the earth, embedding metal structures therein, and

joining the concrete and metal structure of adjacent wall-sections at the time the last wall-section or pier is constructed to form a continuous concrete wall.

7. The method of constructing retaining-walls which consists in separately constructing concrete piers or wall units side by side and joining them to constitute a continuous wall, wherein the construction of each unit consists in constructing an excavation in the earth in successively-lower sections and lining said sections as they are excavated with successively-lower sections of lagging and thereafter filling the lined excavation with concrete.

8. The method of constructing retaining-walls which consists in separately constructing piers or wall units in the earth side by side wherein each wall unit is constructed by excavating successively-lower sections in earth, lining each section as it is excavated with a section or course of lagging supported by laterally-separated lagging-rings, filling each lined excavation with concrete and uniting the concrete and lagging-ring structures of adjacent wall units to constitute a continuous wall.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 8th day of June, A. D. 1906.

GEORGE W. JACKSON.

Witnesses:

HOWARD VANSOIK,  
A. L. McADOO.