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QUAY WALL

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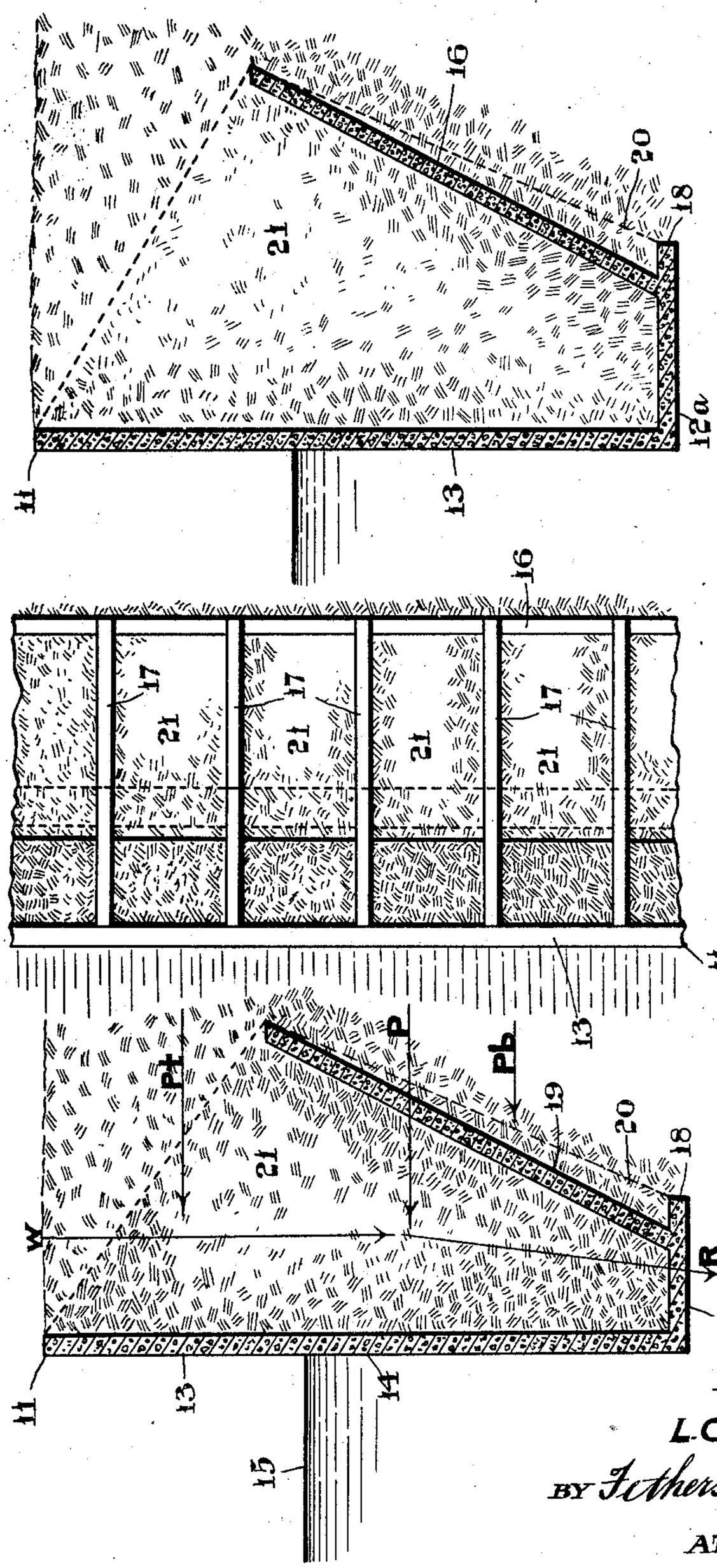

FIG. 3

FIG. 2

FIG. 1

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QUAY WALL.

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This invention relates to new and useful improvements in quay walls, canal walls, retaining walls and the like, and the object of the invention is to provide a wall of simple construction which will be stable under all conditions.

Another object is to provide a wall of the class stated in which the horizontal force exerted by the material retained by the wall, will be greatly reduced when compared with the ordinary gravity retaining wall so much in use at the present time.

A further object is to provide a quay wall which will be light and economical in construction and in which ordinary filling material, such as rock, sand, earth or the like may be used to stabilize or counterbalance the horizontal thrust exerted by the material retained behind the wall.

A still further object is to provide a wall of the class stated in which the vertical pressure exerted by the filler and wall when combined with the horizontal stress exerted by the earth filler or bank behind the wall, will result in a vertically inclined force passing through the centre of the base, so that the load resulting from said force will be evenly distributed across said base.

In my invention, I provide a unitary wall of substantially truncated V formation, the lowermost portion of which is flattened out to form a base of sufficient area to support the weight of the wall plus the weight of the filling in such a manner that a vertical line passing through the centre of gravity of the wall and the filling will pass through the middle third of the base, thereby distributing the load evenly across said base. One leg of the V is approximately vertically disposed to form the face or water side of the wall, while the other leg which is preferably made slightly shorter than the face slopes backwardly to reduce the pressure exerted by the filling material behind it. Suitable bracing members are formed between the legs and suitable ballasting, or stabilizing material may be filled in between the legs, to form a counterbalancing means against the stress of the material held in place by the shorter or sloping leg.

In the drawings which illustrate certain embodiments of my invention,

Figure 1 is a sectional elevation of a quay wall built according to my invention.

Figure 2 is a partial plan of the wall shown in Figure 1.

Figure 3 is a sectional elevation of a wall similar to that shown in Figure 1 but with a slightly larger base.

Referring more particularly to the drawings, 11 designates a quay wall of substantially truncated V formation, having its lower portion flattened out to form a base 12. One leg 13 of the wall is approximately vertically disposed to form the face or water front 14 of the quay and extends a short distance above the water level, indicated by the line 15. The other leg 16, which is made somewhat shorter than the leg 13, slopes upwardly from the base 12 and away from the leg 13. The slope of the leg 16 is preferably about 60°. Bracing members 17 are formed between the legs and may be spaced or pitched an even distance from one another along the entire length of the wall. The base 12 may have a portion 18 extending beyond the innermost surface 19 of the wall and ribs 20, may be formed between the extension and the upper edge of the leg 16. In the pockets 21 formed between the legs, earth, rock or such like ballast may be placed to form a counterbalance weight for the purpose hereinafter described.

In Figure 3 the wall shown is of somewhat similar construction, but the base 12^a is made larger, so that the resultant pressure per square foot of base may be considerably reduced. This increase in base is made to accommodate the allowable bearing pressure of the material upon which the wall is built. In the drawings I have shown the wall built of concrete, but it will be readily understood that other materials may be used, such as wood or steel protected by non-corrosive material, or in fact, any material which will not be materially affected by the action of water and the earth filler. Modifications may be made in the construction of the wall, without departing from the spirit of the invention.

To explain the advantages gained in using a wall of this description. when compared with the ordinary inverted V wall of solid construction, the action of which is well known to persons familiar with this art, I will resort to a diagrammatic illustration of the action of the stresses acting on and through my improved wall. P*b* illustrates the centre and direction of pressure of the material retained behind the sloping wall, and P*t* the centre and direction of pressure of the material or filler acting above the up-

per edge of the sloping leg. By combining the forces P*b* and P*t*, a resultant horizontal pressure P is obtained. If the leg 16 is made longer than that shown, that is, the nearer it approaches the level of the uppermost edge of the leg 13 or surface S of the ground, the smaller the pressure P*t* becomes and consequently the pressure P will also diminish in proportion to the sum of the forces P*b* plus P*t*. The weight of the wall plus the filling or ballasting material results in a vertically disposed force W, acting through the centre of gravity of the wall. By resolving the forces, a resultant R is obtained which passes approximately through the centre of the base. In the illustration shown, the base was made 12 feet, the height of the face of the wall 50 feet, and the height of the sloping leg 33 feet, which resulted in P being equal to 15500 pounds and W equal to 117800 pounds, resulting in a pressure of 9800 pounds per square foot evenly distributed across the base. The amount of concrete used per lineal foot in this construction is approximately 8 cubic yards. Now to build a gravity retaining wall of the usual solid construction and of the substantially inverted V type to resist the thrust of the 50 feet of earth retained by my improved wall, approximately 32 cubic yards of concrete would be required and the resulting pressure would then only fall within the middle third of the base, i. e. there would be twice the average pressure at the front of the wall and no pressure at the rear of the wall, the maximum pressure at the front of the wall amounting to 13000 pounds per square foot. This inverted V type of wall has not been shown, but the height of same was made 50 feet, while the base was made 30 feet, tapering upwardly to 5 feet at the top of the wall.

A wall built in the manner herein described is very easily and economically erected as it may be floated into position and then filled. This is accomplished by partially filling the pocket formed within the legs of the wall with ballasting material and floating same into position and sinking same by admitting water into the pocket and subsequently filling in with material, such as earth, rock, ballast, sand or the like. This feature could not be accomplished in a wall of solid construction without the use of expensive apparatus to keep the wall afloat. It will be seen from the above comparisons that a wall built of the truncated V type herein described is economically, easily and stably constructed and gives results that could not be obtained in building a solid wall of the inverted V type. It will be seen that the sloping leg greatly reduces the horizontal pressure P, when compared with the horizontal force or stress exerted by the filling material in a wall of the inverted V type.

By forming the sloping leg of the wall to coincide with the angle of repose of the material behind the wall and by carrying said leg to the surface S of the ground, the thrust P from the said material may be entirely eliminated.

Having thus described my invention, what I claim is:—

1. A quay wall of substantially truncated V formation with a flat base formed at the vertex of the angle enclosed by the legs of the V.

2. A quay wall of substantially truncated V formation with a base formed at the vertex of the wall and one of the legs of the truncated V approximately at right angles to the base.

3. A hollow quay wall of substantially truncated V formation with a flat base formed at the vertex of the wall and with one of the legs of the truncated V approximately at right angles to the wall and the other leg sloping upwardly and away from the vertical leg.

4. A quay wall of substantially truncated V formation with a flat base formed at the bottom of the truncated V, one leg of the wall being positioned at approximately right angles to the base, while the other leg slopes upwardly from the base and at an acute angle to the vertical and a plurality of spaced bracing members between the legs of the V forming the wall.

5. A quay wall according to claim 4, having the base extending beyond the outer face of the sloping leg and re-inforcing ribs between the wall and said extension.

6. A unitary quay wall of substantially truncated V formation with a flat base formed at the bottom of the V, one leg of the wall being formed at approximately right angles to the base and the other leg, which may be slightly shorter, slopes upwardly from the base and away from the vertical wall.

In witness whereof, I have hereunto set my hand.

LIONEL COKE-HILL.