F. S. TAINTER.

DAM.

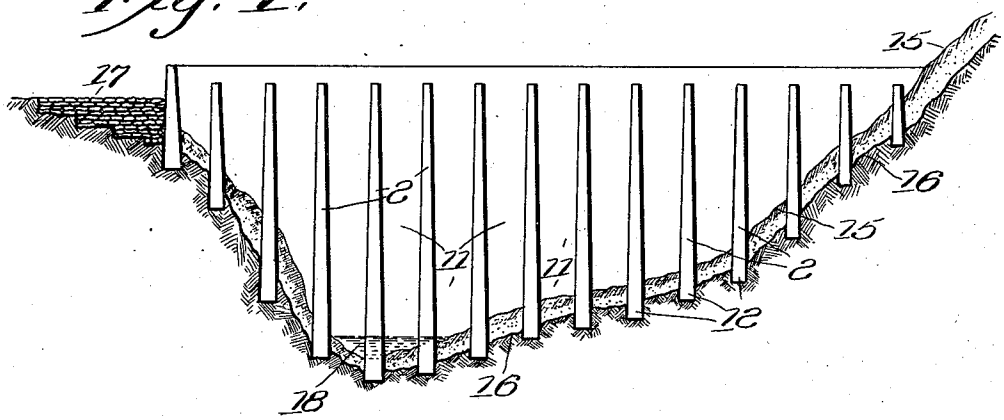
APPLICATION FILED APR. 27, 1910.

1,012,750.

Patented Dec. 26, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



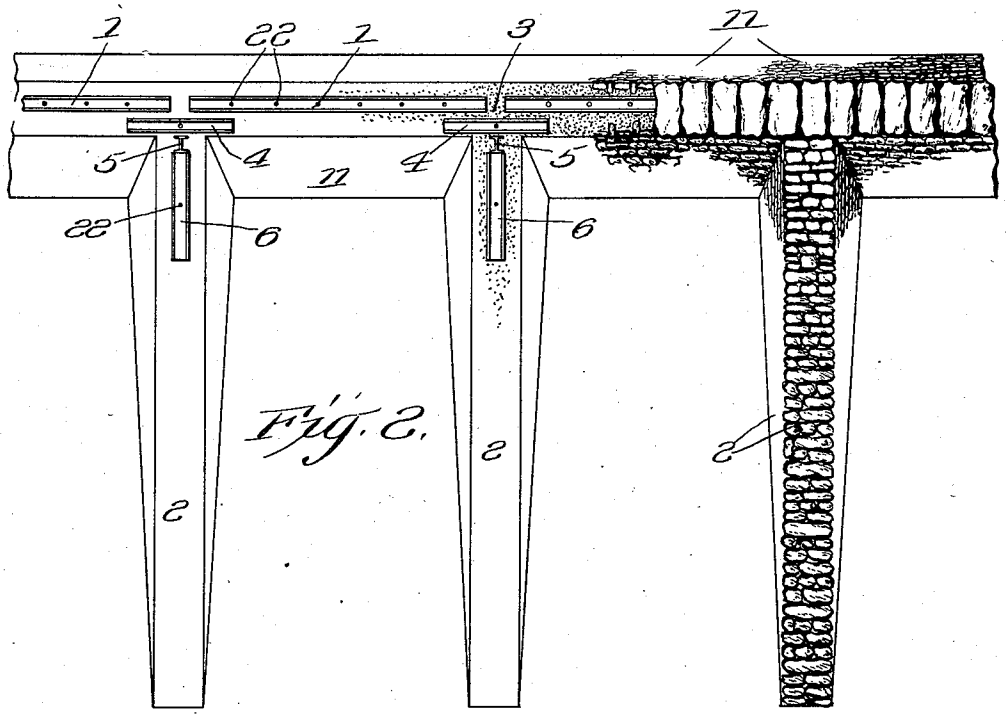


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

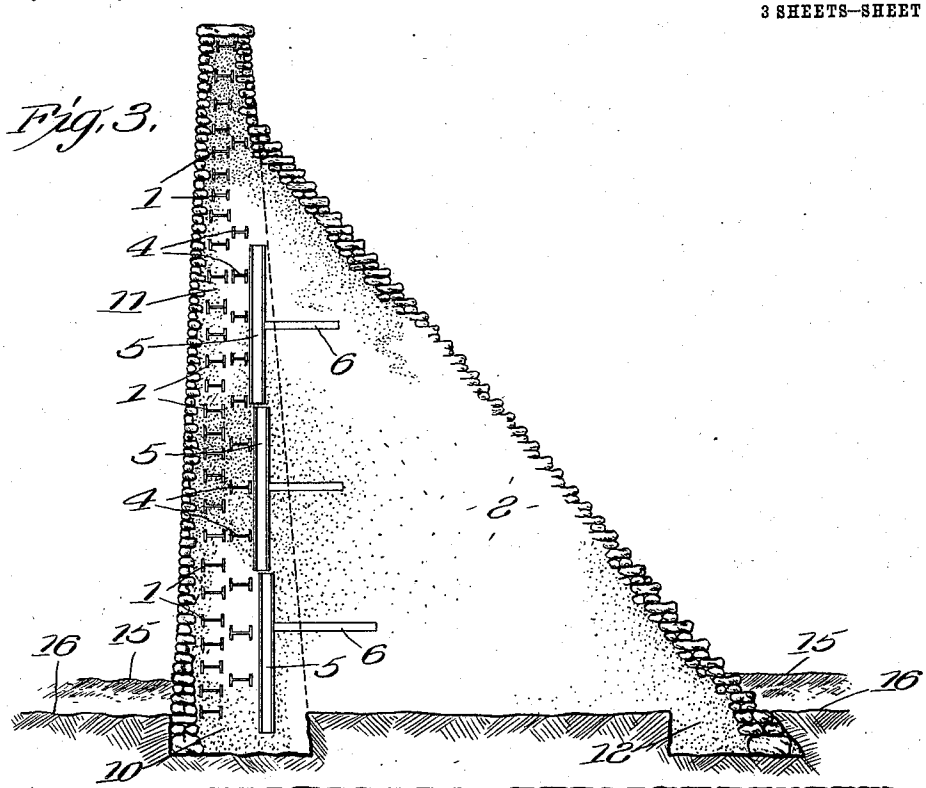
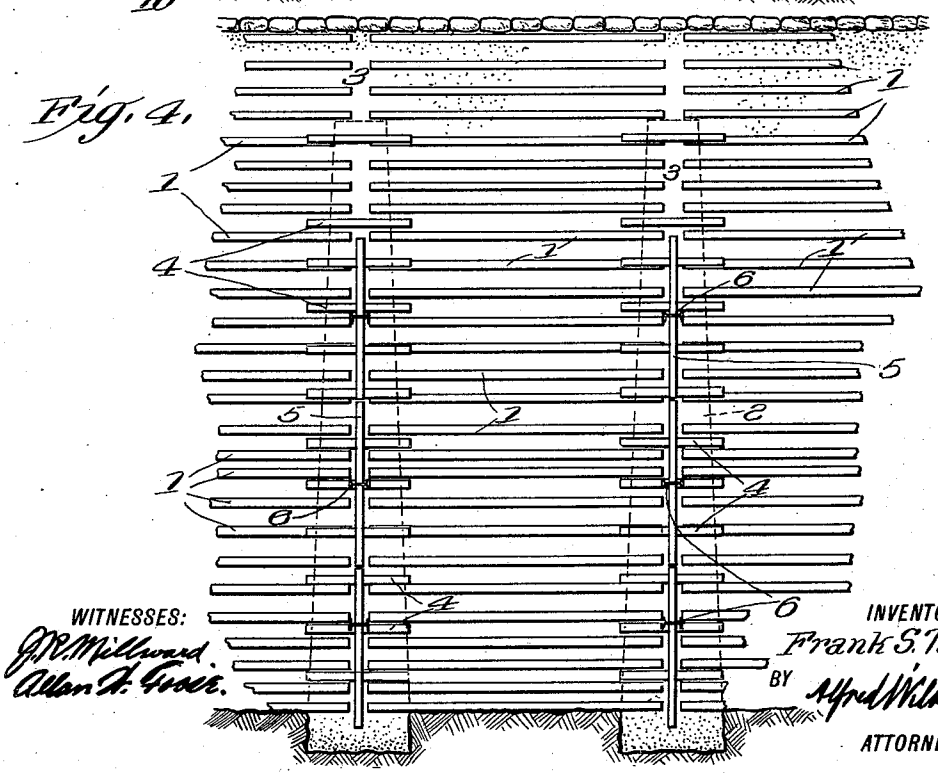


Fig. 4.



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3 SHEETS—SHEET 3.

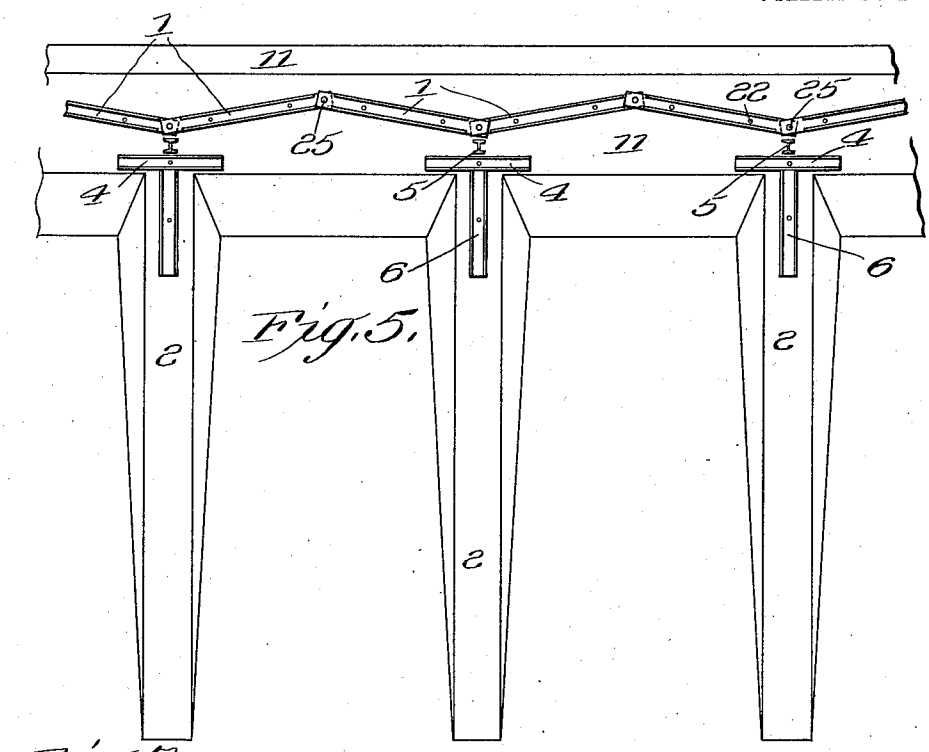


Fig. 5.

Fig. 7.

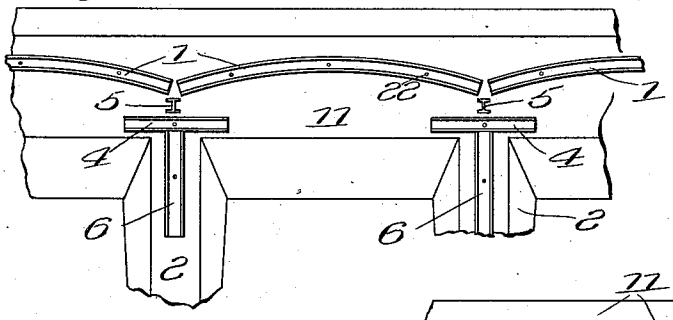
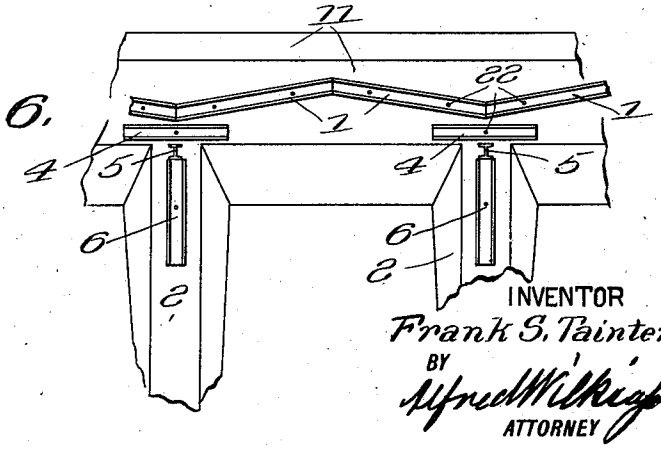


Fig. 6.



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DAM.

1,012,750. Specification of Letters Patent. **Patented Dec. 26, 1911.**

Application filed April 27, 1910. Serial No. 557,897.

To all whom it may concern:

Be it known that I, FRANK S. TAINTER, a citizen of the United States, residing at Far Hills, in the county of Somerset and State of New Jersey, have invented new and useful Improvements in Dams, of which the following is a specification.

My invention relates to a dam or retaining-wall of new form and construction, and designed on a new principle.

The characteristic feature is a steel frame adapted to carry in compression all the loads imposed on the structure. This frame consists essentially of a series of substantially horizontal beams which are embedded in concrete or other desirable masonry material, whereby the beams are supported, and the dam made water-tight. The frame thus forms a series of horizontal arches or arched ribs; so proportioned in length, size and weight, as to be always well inside of any deflective movement. These arches should be supported at each end by buttresses, abutments or struts on the downstream side, so that the entire thrust or reaction is safely and evenly distributed and taken up, and any tendency of the main wall to overturn, on account of its otherwise light section, is resisted. To that end the toes of the struts should be located far enough down stream. These struts may be of steel but I prefer to make them of masonry in the form of buttresses. As here shown they are of masonry reinforced to some extent by steel beams. The masonry of the main wall not only provides a permanent foundation and support for the rows of steel beams, but protects the steel frame against erosion and corrosion. A Portland cement masonry envelop is desirable as this cement is a preservative of steel.

In the figures is shown a desirable embodiment of my invention.

Figure 1 is an elevation of the dam on the down-stream side. Fig. 2 is an enlarged top plan with the upper masonry courses partially removed to show the steel. Fig. 3 is a vertical cross section. Fig. 4 is a partial vertical longitudinal section. Figs. 5, 6 and 7 are partial plans showing modifications in the arrangement of the beams.

Referring first to Figs. 1 to 4, 1 indicates the beams of the main series which form the arches spanning the spaces between the struts or buttresses 2. Across the spaces 3, between the ends of the beams, are preferably arranged supplementary horizontal beams 4 to receive the direct thrust and to equalize and distribute it to the buttresses. For a similar reason the vertical beams 5, substantially in alinement with said spaces and with the axes of the buttresses may be added also. As shown, the buttresses, or abutments, are composed for the most part of masonry, but they are desirably reinforced at intervals by the strut beams 6 6, which also assist in distributing the thrust.

As shown in Figs. 1 and 3 the base 10 of the masonry of the curtain wall 11 is carried down into the rock to give a strong foundation, and, for a similar purpose, the toes 12 of the buttresses are carried down. Merely for purposes of illustration, I have indicated the line of the earth at 15, the line of the rock at 16, the spillway at 17 and the river below the dam at 18, but it will be remembered that each dam varies according to local conditions.

The beams may be of iron, steel or any suitable metal, but steel beams of standard structural shapes, such as I beams, are desirable. Lighter beams may be used toward the top of the wall. The beams should be formed with the air holes 22 to insure against air pockets in bedding. The core of the curtain wall and of the buttresses will preferably be concrete with a face and coping of stone as shown.

While the dam is desirably constructed with flat arches, yet, where convenient, the frame may be somewhat strengthened by slightly modifying the form and arrangement of the beams. In Fig. 5 the beams are arranged two to each arch or span, and inclined as shown to carry the thrust back to the buttresses on each side. The ends of the beams may be hinged or pinned together by pins 25, with the flanges cut away, or otherwise suitably connected. The same result substantially may be produced as shown in Fig. 6 by beveling the ends of the beams and setting them in contact. The beams may also be bent as shown in Fig. 7, but such modifications in shape of the individual beams would increase the cost and would not be generally desirable.

As for the general arrangement of the beams, that may be much varied without departing from the spirit of my invention. The beams of each row may, or may not,

be connected as suggested. But the various rows are preferably connected and supported only by the masonry envelop.

I have thus produced a dam consisting of a steel skeleton frame, suitably supported in a masonry curtain, said frame being of such strength as to be capable by itself of withstanding with ample margin of safety all possible strains, whereby I have greatly diminished the bulk and amount of material necessary, and the labor and time of excavation and construction, and consequently have reduced the cost. Furthermore as all the materials are entirely in compression, careful work and special forms for bonding are unnecessary for the bond, which is necessary between the steel and masonry work in structures involving tensile strength, may be disregarded.

Having described my invention what I claim is,—

1. In a structure of the character described, the combination with a steel frame arranged to carry the loads in compression, of a masonry curtain wall for said frame, said wall inclosing, protecting and supporting the elements of said frame.

2. In a retaining wall or dam, a curtain wall of masonry and rows or courses of metal beams arranged substantially horizontally and embedded in said wall, said beams being arranged to form arches to carry the load in compression.

3. In a dam a curtain wall of masonry and a series of steel beams embedded in the wall, said beams being arranged to form arches to carry the load in compression, and buttresses arranged at the ends of the arches on the side of the dam opposite to the load.

4. In a dam, a curtain wall of masonry and a frame work of metal beams embedded therein, said beams being arranged in a series of horizontal rows, forming arches to carry the load in compression, and each row being connected to the other rows only by the masonry.

5. In a dam, a curtain wall of masonry, and a plurality of rows of substantially horizontal steel beams embedded in the masonry, each row of beams forming a series of arches, the arches of the various rows being correspondingly arranged one above the other, supplementary horizontal beams arranged to overlap the joints between the adjacent arches and buttresses or struts arranged opposite said joints on the down-stream side of the dam.

6. In a dam, the combination with a curtain wall of masonry of a plurality of rows of substantially horizontal steel beams, arranged one above the other and embedded in the masonry, each row of beams forming a series of arches, to carry the load in compression, the arches of the various rows being correspondingly arranged one above the other, supplementary horizontal beams arranged to overlap the joints between the adjacent arches, supplementary vertical beams arranged substantially opposite the joints and buttresses arranged opposite said joints on the downstream side of the dam.

7. In a dam, the combination with a curtain wall of masonry, of a plurality of rows of substantially horizontal steel beams embedded in the masonry, each row of beams forming a series of arches the arches of the various rows being correspondingly arranged one above the other, supplementary horizontal beams arranged to overlap the joints between the adjacent arches and buttresses arranged opposite said joints on the downstream side of the dam, said buttresses consisting of masonry and of reinforcing strut beams, embedded in the masonry of the buttresses and arranged horizontally and substantially at a right angle to the curtain wall, substantially as described and shown.

8. In a dam, a curtain wall of Portland cement masonry, having a concrete core and faces and coping of stone, and in combination therewith rows of substantially horizontal steel beams, the rows being arranged one above the other and embedded in the masonry, each row of beams forming a series of arches, the arches of the various rows being correspondingly arranged so that the joints between the arches come one above the other, supplementary horizontal beams arranged to overlap the joints between the adjacent arches and buttresses arranged opposite said joints on the down-stream side of the dam.

9. A dam composed essentially of a steel frame arranged to carry all the loads and to carry the same in compression, said steel frame being embedded in a wall of concrete to afford a foundation and protection for the steel.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK STONE TAINTER.

Witnesses:
ALLAN W. FOOSE,
J. R. MILLWARD.