

No. 776,799.

PATENTED DEC. 6, 1904.

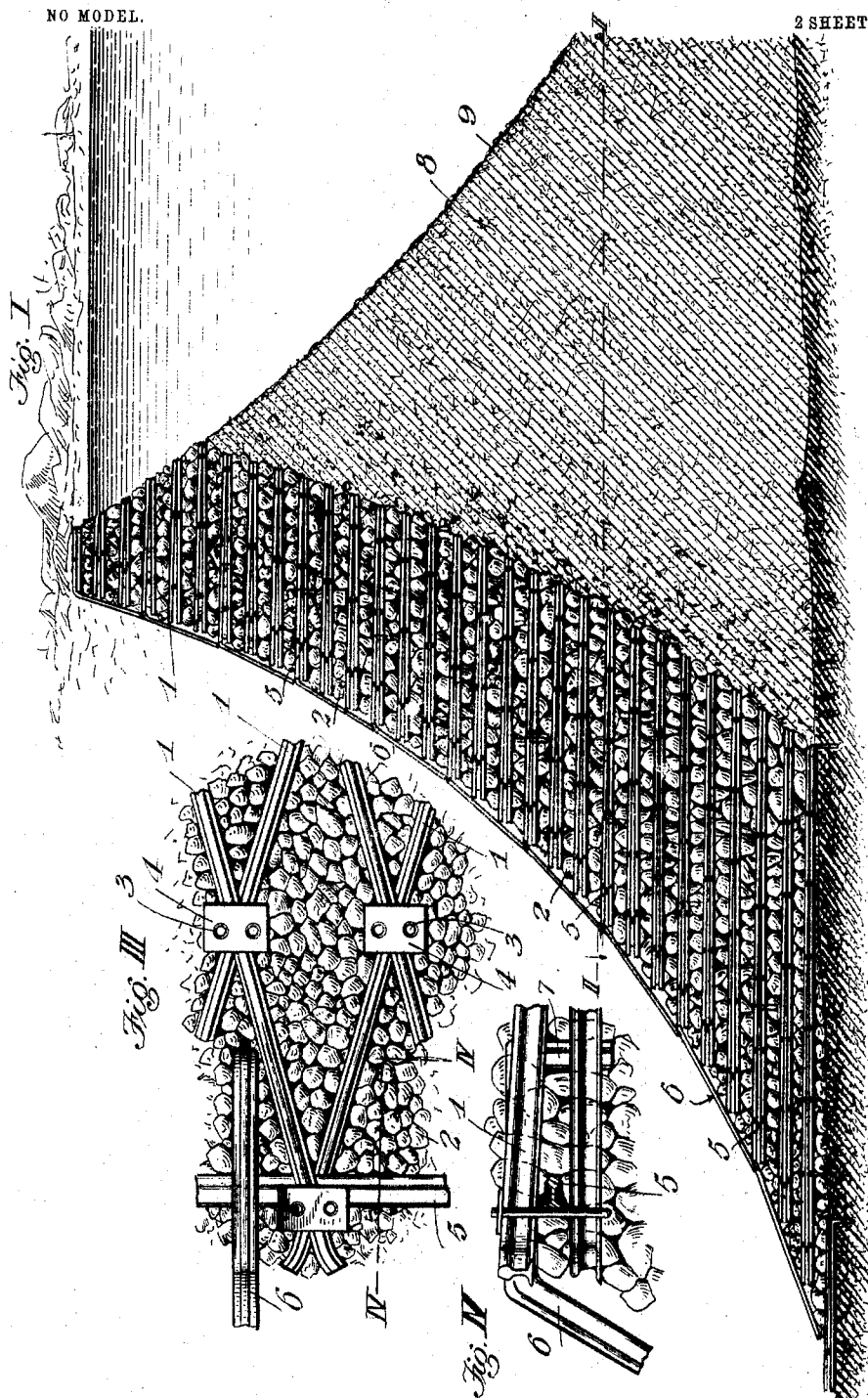
F. H. REED.

DAM.

APPLICATION FILED DEC. 11, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES

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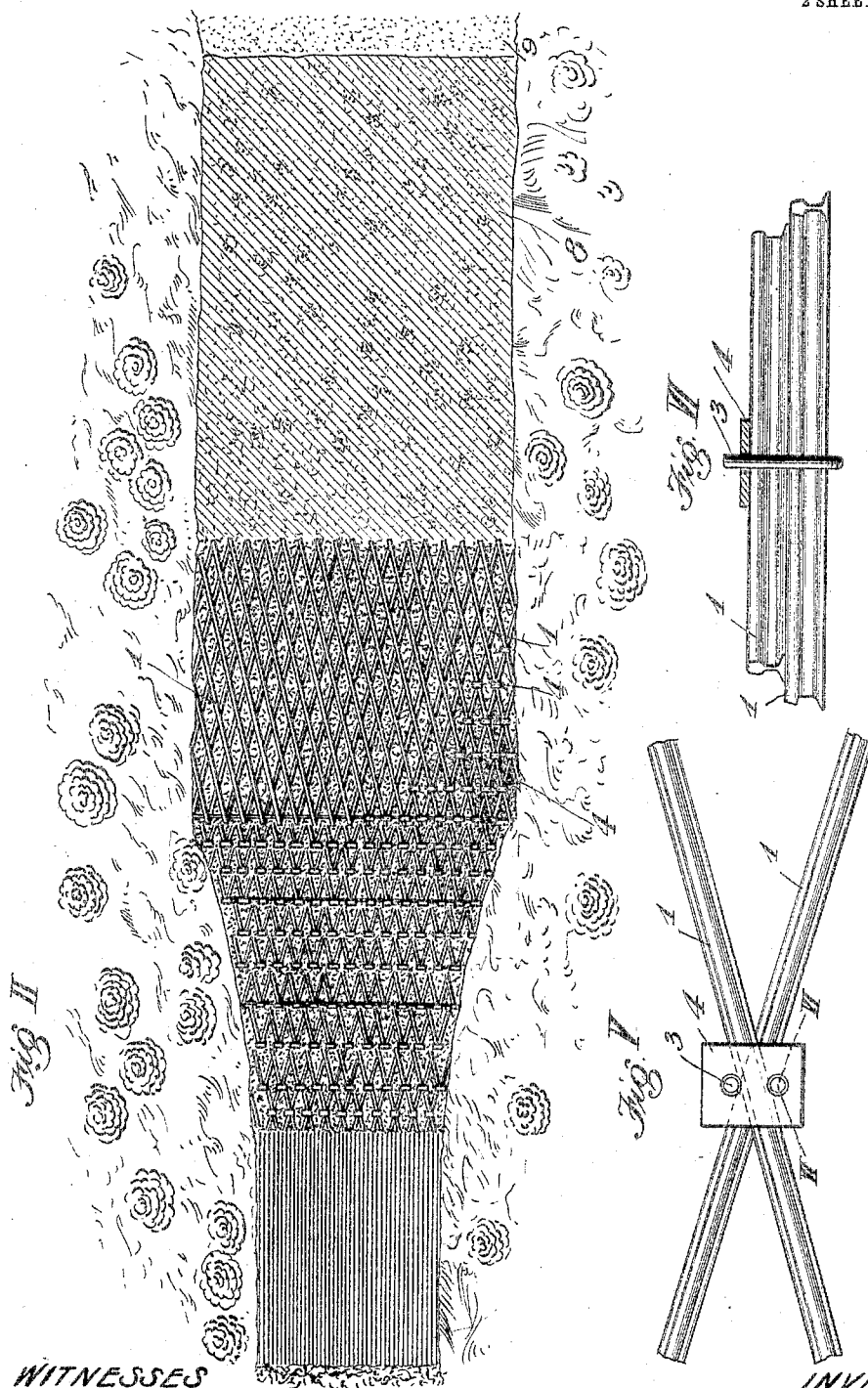
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2 SHEETS—SHEET 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

FREDERICK H. REED, OF CLAREMONT, CALIFORNIA.

DAM.

SPECIFICATION forming part of Letters Patent No. 776,799, dated December 6, 1904.

Application filed December 11, 1903. Serial No. 184,781. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. REED, a citizen of the United States, residing at Claremont, in the county of Los Angeles and State of California, have invented a new and useful Dam, of which the following is a specification.

The object of this invention is to provide a simple construction which combines iron or steel with a loose rock embankment to form a dam structure to restrain or impound water for power, irrigation, or other useful purpose.

The accompanying drawings illustrate the invention, and referring to the same, Figure I is a vertical cross-section through the dam. Fig. II is a horizontal section through the dam, taken on line II II, Fig. I. Fig. III is a detail view in plan showing the manner of tying the terminal bars at crossings and at their ends near the downstream face of the dam. Fig. IV is a vertical section through Fig. III on line IV IV. Fig. V is a plan view in detail showing the method of tying the bars at their crossings. Fig. VI is a section through Fig. V on line VI VI.

The invention comprises tiers of crossed iron or steel bars placed in a generally horizontal position, which are embedded in a filling or body of pieces of rock or other material in such manner that the filling sustains the weight of the bars.

The invention also comprises further details of construction for tying the bars where they cross and for attaching the bars which form the apron and for tying the ends of the bars which terminate near the apron.

A very important and valuable feature of the invention is that the materials required for its construction may be obtained at relatively low cost. In view of the fact that ordinary iron or steel railroad-rails and rock form the greater part of the dam it will be seen that the dam may be built without the elaborate preparation required for other dams and at a much lower cost. Further, the construction may be performed by unskilled labor, and the direction of the work does not necessarily require the services of a skilled engineer.

1 designates bars which may be of any desired pattern of cross-section, railway-rails

answering well for the purpose, which are preferably laid to form tiers of network, the bars desirably lying laterally at an angle of about fifteen degrees with the longitudinal axis of the dam. Some of the bars terminate at the downstream face and others abut on the banks, as shown. 2 designates a loose rock filling. The bars may be preferably tied at their intersection by U-shaped irons 3, which are held from spreading by plates 4.

In building the dam a tier of the crossed bars may be temporarily supported at the desired elevation by pieces of rock, so that as further rock is deposited the filling will be confined by the bars and project into and bond with the course previously deposited. Similarly other tiers of crossed bars and rock filling are added until the dam is built to the required height, each tier being separated from the tier below by intervening filling, so that the weight of the tier rests on such filling and not directly on the next tier below. At the downstream termination of the tiers of bars a cross-bar 5 is laid to confine the filling along the face of the dam. The ends of the bars which terminate along the cross-bar may be spread apart to receive the cross-bar, as shown in Figs. III and IV, and a U-shaped iron 3 serves the double purpose of locking the ends of the bars 1 and of holding the cross-bar 5 in place, the ends of the rails 1 being bent outwardly, as shown, to hold the U-iron in place.

To provide a spillway over the face of the dam during construction, a series of iron bars 6 are placed parallel with each other on the downstream face, and their upper ends are bent so that they lie within the filling. For further security the extreme end may be bent down to form a hook 7. The bars 6 constitute a permanent apron to deflect and carry the overflow-water in event of no other spillway being provided, each set of bars being held in place by the superimposed filling.

The filling is of reasonably large and tough rock to give the desired mass and weight, and the filling, together with the tiers of bars, may sustain movement or settlement due to pressures, its own weight, or earthquakes without impairing its usefulness or safety,

and it will not be injured by sudden overflows and attendant vibrations at any time during construction and will thus be practically a complete dam during any stage of construction, so that, if desired, the structure can be made available at any height attained and its completion, if necessary, be indefinitely deferred.

The upstream portion of the dam may be made with gravel or earth and a further seal against leakage made with other material, such as cement concrete or wood or iron plates.

The action of the impounded water as a thrust cannot overturn nor slide the dam on account of the weight and mass of the dam, and the result of movement or settlement of any portion simply tends to a firmer bond of the materials. The angular disposition of the iron bars secures the entire structure as a flexible monolith, so to speak, which accommodates itself to any change of forces, while the downstream portion being of open rubble or loose rock fill any water percolating through the dam from beneath or from overflow will find immediate exit, causing no loss of weight and no internal pressure in the structure, as would occur in a tight masonry structure when a leak started. Such a structure can be safely built to any height thus far employed for the purpose and the backing in many cases carried up simultaneously by the hydraulic process with great economy.

As distinguished from prior constructions wherein a wooden cribwork is filled with rubble, &c., my invention presents the following characteristics: The series of tiers of binding-network do not rest upon one another, but are embedded in the rubble in such manner that each tier is separated from the tier below by rubble material, and its full weight is therefore brought on such material. In ordinary crib structures the weight of the cribbing is sustained wholly by the cribbing itself, and said cribbing is substantially rigid and takes no part in the settlement or subsidence of the filling material. In my construction each tier of network rests upon the subjacent filling and follows it down as it subsides. Inasmuch as the subsidence will not be exactly the same over all of the area of the dam, the network must have a certain amount of flexibility to enable it to follow down in accordance with the settling of the different parts of the dam. This flexibility is secured, first, by the nature of the material itself—namely, iron, steel, or similar metal—and, second, by the fact that its members are connected only at intervals, allowing more or less slip and bend.

A further distinguishing feature of the invention is the fact that the networks of tiers are of a material of greater specific gravity than the filling, so that the downward pressure of such network on the filling is an important factor in retaining the latter in place

and also in causing the network to subside to follow any subsidence of the filling.

It will be understood that the bars will be formed of either iron or steel or, in fact, of any other suitable metal of sufficient strength, weight, flexibility, and cheapness.

What I claim is—

1. A dam comprising rubble interlaced with metal bars of greater specific gravity than the rubble, embedded in and resting on the rubble.

2. A dam comprising rubble interlaced with metal bars of greater specific gravity than the rubble, embedded in and resting on the rubble, said bars arranged substantially horizontal, but at angles with respect to one another.

3. A dam comprising rubble with tiers of bars of flexible material of greater specific gravity than the rubble, and arranged to form networks, each network tier supporting upon the rubble below it.

4. A dam comprising rubble with cross-bars tied at their intersections and arranged in tiers, said bars being of flexible material of greater specific gravity than the rubble and each tier of bars resting upon the rubble below and separated from the tier of bars next below.

5. A dam comprising rubble interlaced with bars, and an apron comprising substantially parallel bars.

6. A dam comprising a loose rock filling interlaced with bars, and an apron comprising substantially parallel bars, the upper ends of the bars being bent and extending into the filling.

7. A dam comprising a loose rock filling interlaced with bars, and an apron comprising a series of bars having their upper ends bent and extending into the filling, the extreme ends being bent down to form hooks.

8. A dam comprising a loose rock filling, and a plurality of tiers arranged substantially horizontally through the filling, a tier comprising crossed bars of flexible material of greater specific gravity than the said filling, each tier supported by the filling between it and the next lower tier.

9. A dam comprising a loose rock filling, a plurality of tiers arranged substantially longitudinally through the filling, a tier comprising crossed bars, the ends of adjacent bars being spread apart vertically, cross-bars between the spread ends, the ends of adjacent tier-bars being tied outside the cross-bars.

10. A dam comprising a loose rock filling, a plurality of tiers arranged substantially longitudinally through the filling, a tier comprising crossed bars, the ends of adjacent bars being spread apart vertically, the ends of the adjacent tier-bars being bent outwardly, cross-bars between the spread ends, U-shaped irons for tying the ends of adjacent tier-bars, and plates receiving the ends of the U-shaped irons.

11. A dam comprising rubble with interlaced metallic bars resting on the rubble.

12. A dam comprising open rubble with interlaced metal bars of greater specific gravity than the rubble, and a backing of sealing material.

5 In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, in the

county of Los Angeles and State of California, this 28th day of November, 1903.

FREDERICK H. REED.

Witnesses:

GEORGE T. HACKLEY,
JULIA TOWNSEND.