(No Model.) 2 Sheets—Sheet 1.

J. C. GOODRIDGE, Jr.

METHOD OF CONSTRUCTING JETTIES.

No. 331,127. Patented Nov. 24, 1885.

Fig. 1

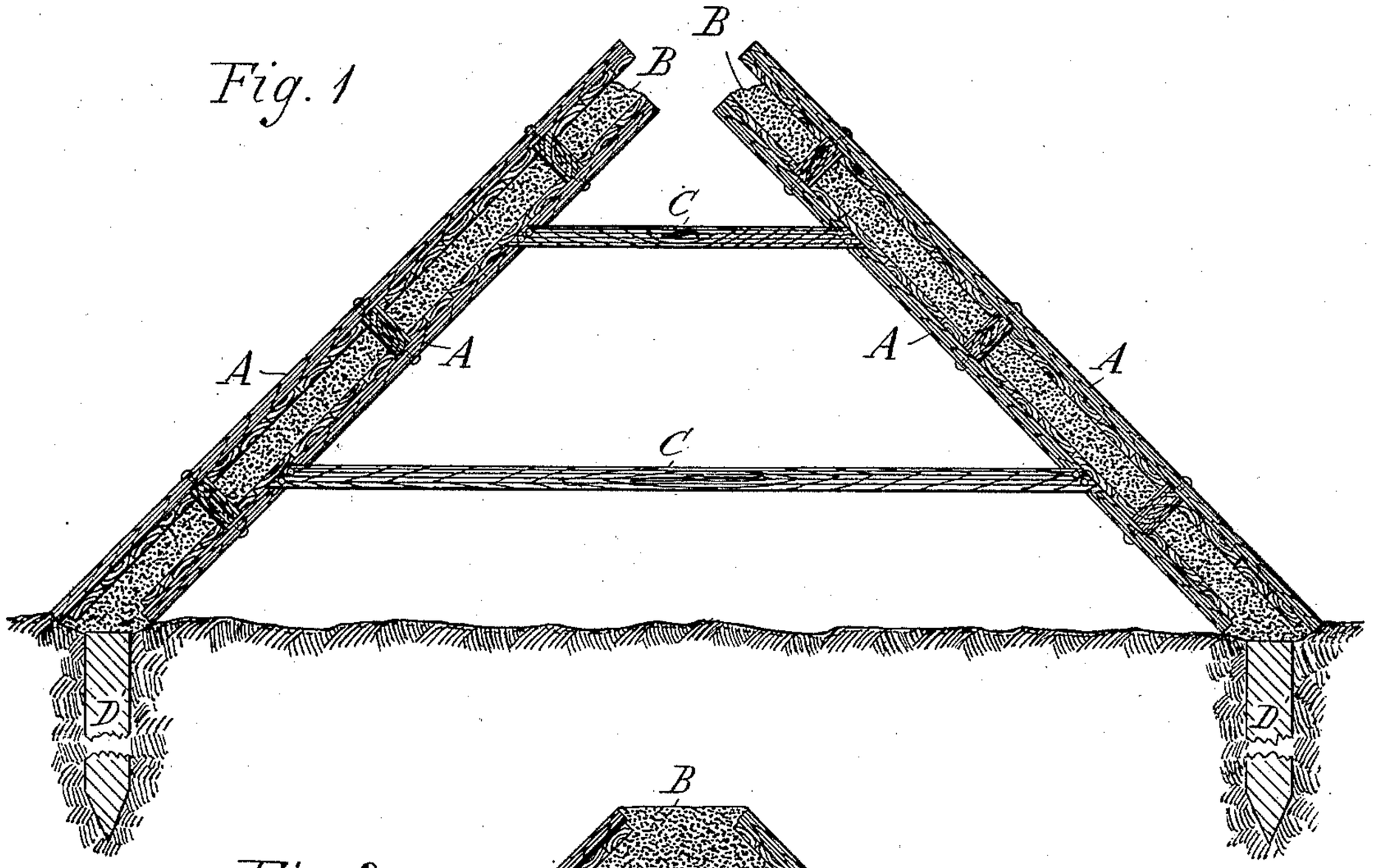
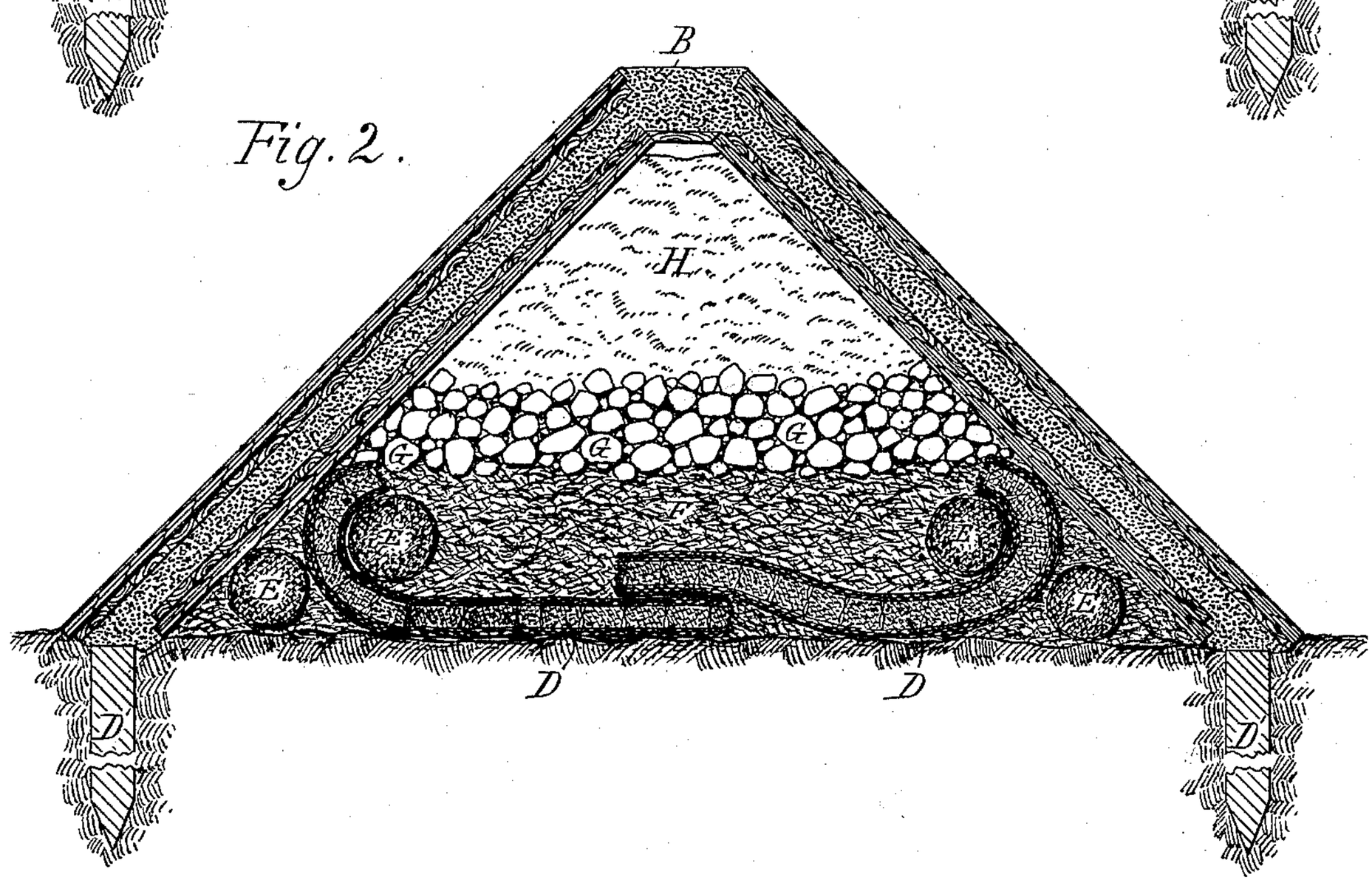


Fig. 2.



WITNESSES

Wm. A. Lowe

Henry R. Wills

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John C. Goodridge Jr.

(No Model.)

2 Sheets—Sheet 2.

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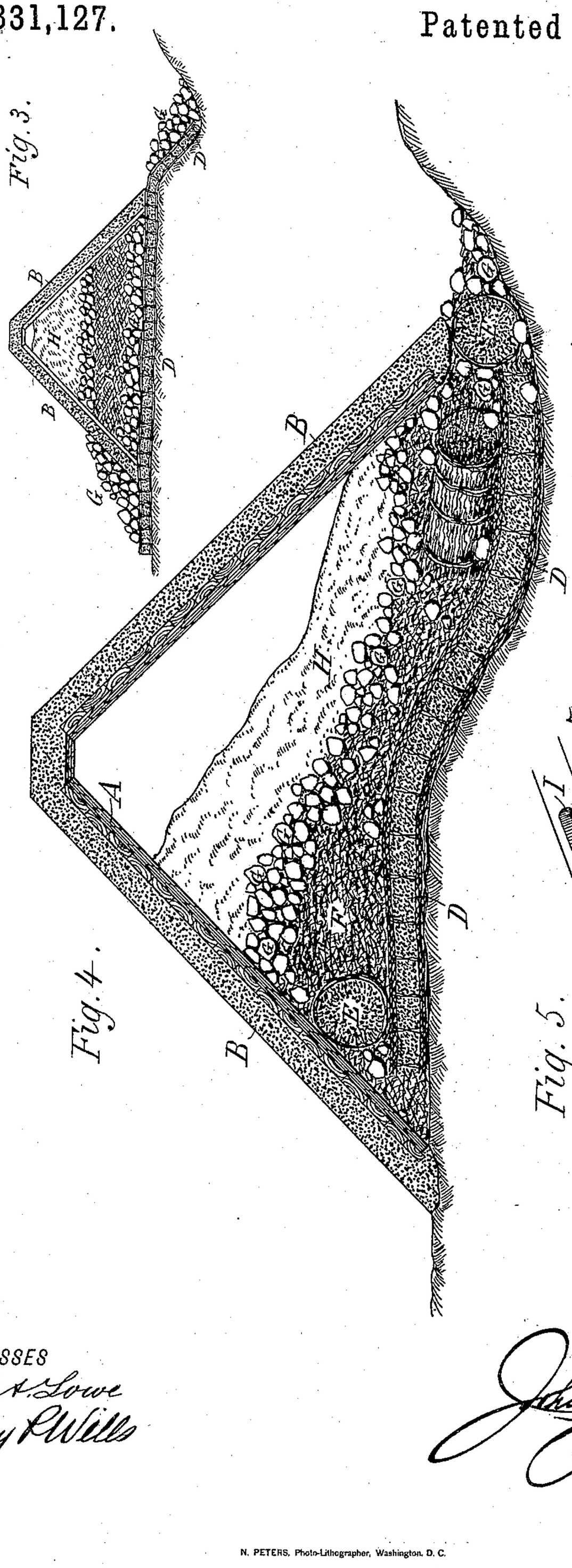

Fig. 3.

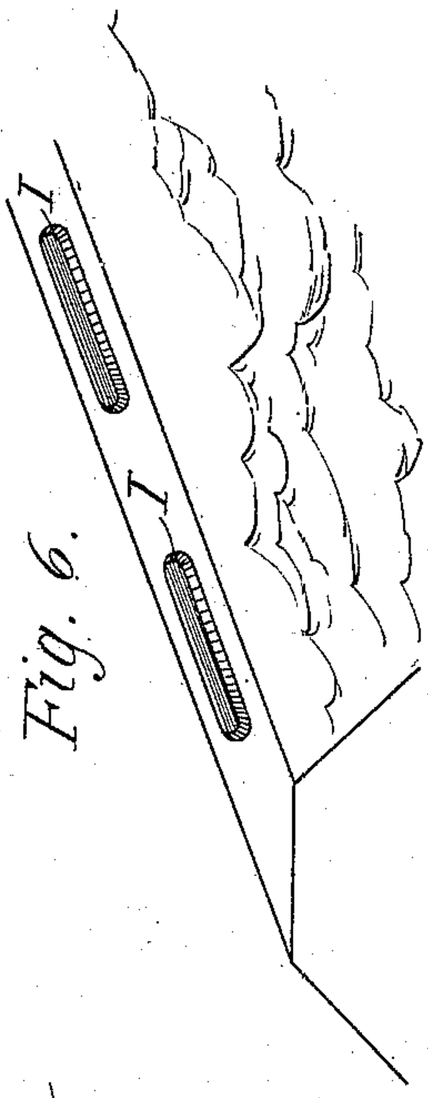

Fig. 6.

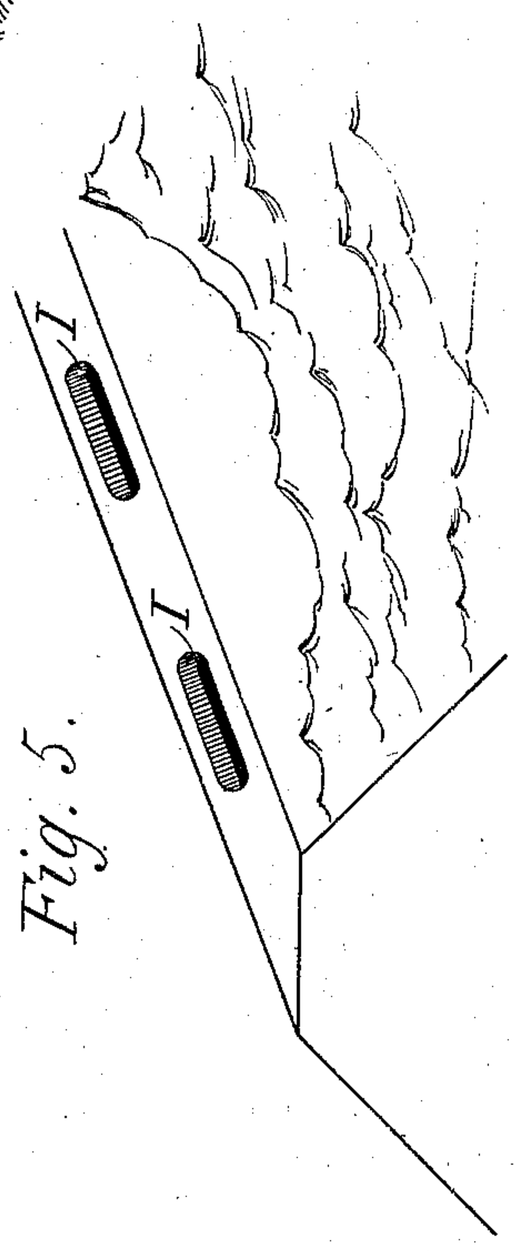

Fig. 5.

Fig. 4.

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JOHN C. GOODRIDGE, JR., OF NEW YORK, N. Y.

METHOD OF CONSTRUCTING JETTIES.

SPECIFICATION forming part of Letters Patent No. 331,127, dated November 24, 1885.

Application filed May 2, 1885. Serial No. 164,218. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. GOODRIDGE, Jr., of the city of New York, in the county of New York and State of New York, have invented a new and useful Improvement in the Method of Constructing Jetties, of which the following is a specification, reference being had to the accompanying drawings.

My invention consists of an improved method of constructing jetties or breakwaters to be used in hydraulic engineering. Hitherto jetties or breakwaters have been made by throwing stones into the water at the desired locality, or of piling, cribs filled with stone, or masses of concrete or stone retained in place by mattresses, fascines, gabions, or similar devices. The use of large masses of stone or concrete thrown into the water at random for this purpose is open to serious objection. To the expense of the material must be added the cost of transportation often from long distances, together with the cost of handling large masses of inconvenient shape and size, while much of the material during the process of laying it finds ultimate lodgment away from instead of upon the work, and thus becomes either wholly or partially lost to use. When wood is used, either wholly or in combination, it is in many localities speedily destroyed by the teredo. The jetty then disintegrates, and its repair becomes difficult. Again, when exposed to the attack of water in motion, the tendency is to undermine these jetties and destroy them by washing away the foundation upon which they rest, and this is the usual process of their destruction.

My invention is intended to provide a cheap and easy method of constructing such jetties or breakwaters, which at the same time provides wholly or in great part against their destruction from any of the causes above set forth, and which facilitates repair, should it be at any time required.

In the drawings forming part of this specification, Figure 1 shows a transverse sectional elevation of the outer part or shell of my jetty; Fig. 2, a like view showing the jetty filled and complete. Fig. 3 shows a similar view of the jetty, filled in a somewhat modified manner, though embodying the same principle; Fig. 4, a like view to illustrate the action of the contents of the jetty when its foundation is impaired, and its tendency automatically to repair the defect and prevent its increase; Fig. 5, the upper surface of my jetty when provided with openings to facilitate repair, and Fig. 6 the same with said openings closed after the repairs are complete.

My method is first to construct an outer shell of béton or concrete, using therefor a mold properly stayed and supported, all in the manner ordinarily followed in such constructions, and as shown in Fig. 1, in which A is the mold, B the béton shell formed within it, and C some of the braces or supports to said mold. Having completely filled said mold, and the shell of béton or concrete so formed having set, the outer portion of the mold may be removed or not, as is preferred; but the inner portion of the mold is allowed to remain, or if removed to be used elsewhere. Some substitute support should be provided to sustain the béton walls until the jetty is complete. The thickness of the béton shell will of course depend upon circumstances, due consideration being given both to economy of expenditure, the size of the jetty, and the destructive action to which it is to be exposed. Ordinarily for a jetty twenty feet high a thickness of wall of two feet will be sufficient.

Should the local conditions cause apprehension lest the stratum upon which either edge of the jetty-shell rests should be carried away bodily for long intervals, thus dropping the jetty-shell bodily over to that side, I place piles D′ at intervals for it to rest upon. These need not be numerous, only enough to sustain the weight of the shell being required; but under ordinary circumstances piling will not be necessary, since the shell will retain its position if supported at a comparatively few points, as long as these are not too widely separated from one another. I then place upon the bottom and within the jetty flexible mattresses D D, preferably in two parts overlapping in the middle, the outer ends of which are bent upward where they are in contact with the shell, as shown at Fig. 2. Instead of a brush-wood mattress, one or more thicknesses of heavy canvas or other similar material may be used where the jetty is not exposed to a heavy sea. Indeed, anything of the kind which will bend upward to a considerable height within the jetty, and thus

partially inclose the filling employed, and at the same time interpose a close barrier between the action of the water and the filling, will answer the purpose more or less perfectly, according to its durability. I then place within the jetty-shell and upon the mattress or its substitute fascines of brush-wood, as shown at E in Fig. 2, locating them particularly upon the mattress where it bends upward against the inner wall of the béton shell. I then fill in a layer of brush-wood, hay, straw, or any similar material which may be locally attainable, as shown at F, Fig. 2, upon which I pile stones, as shown at G of that figure, and, lastly, fill the rest of the shell with sand, H, or earth, or other weighty and cheap material; or the modification shown in Fig. 3 may be adopted, in which a mattress wider than the jetty-shell is first laid down. The jetty-shell B is then built upon it. Stones G G are then placed upon the protruding parts of the mattress, as shown, and the shell filled as before. The openings at the top of the jetty may then be closed altogether, or openings may be left at intervals, as shown at I, Fig. 4; or said openings may be temporarily closed with béton, or otherwise, as shown at Fig. 5.

I do not consider it essential that the walls of said jetty should be of béton or concrete, though I prefer that material, since it is both cheap and becomes monolithic in hardening, and is proof against the teredo and the like as well; nor do I confine myself to the precise material or order of material herein described in filling said shell. It has been and is the practice of hydraulic engineers to utilize for works of this character the materials most conveniently to be had in the neighborhood, and it is a part of their technical skill and education when one material cannot be had, except at a distance and inconvenience, to search out some substitute to be found near at hand. The degree of exposure to which the jetty is to be subject would also modify this somewhat, more stone being used in a jetty open to the attack of a North Atlantic storm than in one merely intended to direct the current of a minor river. So, too, in some sterile localities sacks of clay or sand might be used instead of the fascines, as well as other changes which would suggest themselves at once to the experienced engineer when acquainted with the locality where the jetty was to be placed. Where the jetty will be subjected to extreme exposure, the jetty-shell may be built upon a mattress, as in Fig. 3, and then filled, as shown in Fig. 2.

The purpose of my invention is not only to furnish a method of building substantial jetties wherein local and cheap material may be utilized to a degree hitherto unknown, but also to provide a jetty which will for a very considerable period automatically repair any injuries it may sustain, and which, with a very little attention and with comparatively very cheap additions involving little technical skill, will remain permanently efficient. The greatest danger to which a structure of this kind is exposed is shown in Figs. 3 and 4, where the exposed side of a jetty is figured as undermined by wave action or the attack of running water. When this action of destruction once begins on the jetty of ordinary construction, it proceeds with constantly acceleratory rapidity. The jetty then gradually falls over toward the undermined side, disintegrates, and is at last swept away.

My jetty meets this contingency as follows, (see Fig. 4:) The contents of the jetty rest upon and are enveloped by a flexible bed, which bed exceeds the width of the jetty, and is folded upward and against the inner sides of the jetty-walls. It is clear that when one side of the jetty is locally undermined the contents of the jetty must there fall, since they are deprived of support from below, while the jetty-shell will retain its position, since it is supported by its adjacent parts, which rest where the foundation is unimpaired, or upon piles; but when the filling falls it must carry the flexible bed D before it, thus at once filling the cavity with a solid and resisting mass, since the flexible bed D prevents the water from attacking the contents of the jetty in detail, and thus sweeping them gradually away. Every breach is thus closed at the instant of its formation, and in a manner offering the greatest possible resistance to a recurrence of the evil. Should the work of destruction repeatedly continue during a time of freshet or storm, the flexible bed D may be carried downward until that portion which was folded upward against the inner wall of the jetty is withdrawn from contact therewith. Then the fascines E are crowded into the gap with like effect.

The modification shown in Fig. 3 operates on exactly the same principle. The moment undermining begins that end of the flexible mattress drops into and closes the gap and opposes recurrence thereof. Thus the process of undermining (which must necessarily be slow, since it is resisted at every step in the most efficient manner) and automatic repair may go on without outside attention until from the fall of the jetty-filling its stability may become endangered from loss of specific gravity. Then the empty space within the jetty may be readily refilled with sand or like material at the openings I.

Where the local conditions are such that the jetty is little or not at all exposed to undermining action, a shell may be constructed as hereinbefore described, and then filled with any heavy material which may be at hand—such as earth, sand, stone, and either with or without a bed of brush-wood, straw, or hay, or similar material, as the greater or less degree of exposure may render advisable.

Having thus described my invention, what I claim as new and desire to patent is—

1. In a jetty, the combination, with a hol-

low shell and the loose filling placed therein, of a flexible mattress interposed between said filling and the bed of the stream.

2. The combination, with the hollow shell and the loose filling, of a flexible mattress, upon which said filling rests, the mattress being upturned at its edges, so as to partially envelop the filling, substantially as set forth.

3. The combination, with the hollow shell and the loose filling, of a flexible mattress formed in overlapping sections, interposed between said filling and the bed of the stream, substantially as set forth.

4. The combination, with the hollow shell, the filling of hay, straw, brush-wood, stones, dirt, sand, or other material, and the flexible mattress upon which said filling rests, of the fascines resting upon said mattress, substantially in the position and for the purpose set forth.

In testimony that I claim the foregoing improvement in the method of constructing jetties, as above described, I have hereunto set my hand.

JOHN C. GOODRIDGE, JR.

Witnesses:

M. A. GOODRIDGE,

HENRY H. HALL.