(No Model.) 2 Sheets—Sheet 1.

J. C. GOODRIDGE, Jr.

METHOD OF REPAIRING WITH BETON OR CONCRETE.

No. 317,337. Patented May 5, 1885.

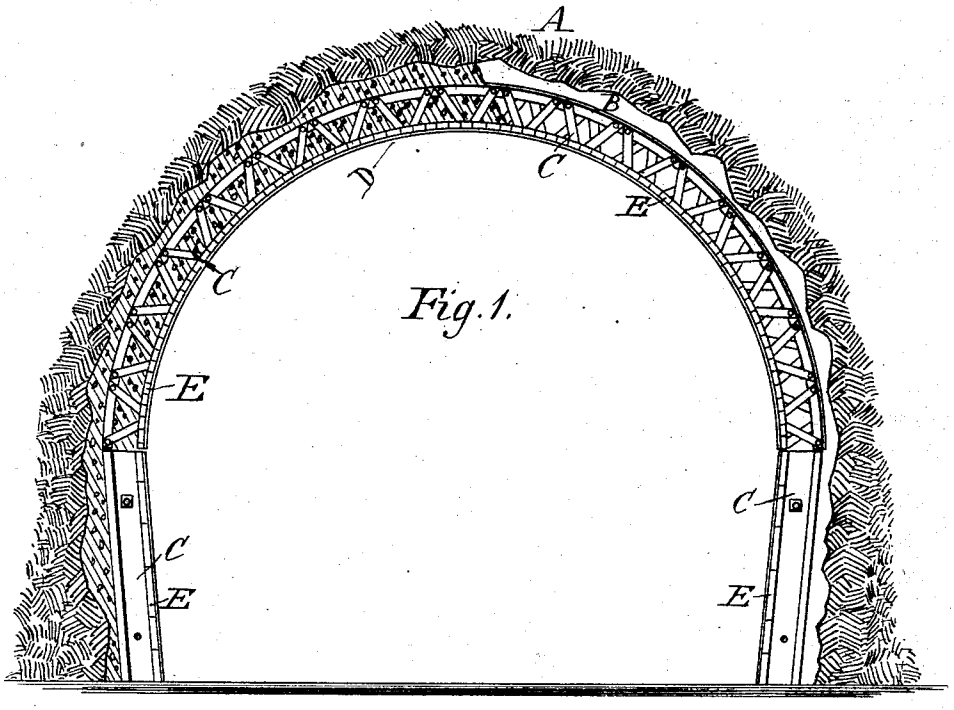


Fig. 1.

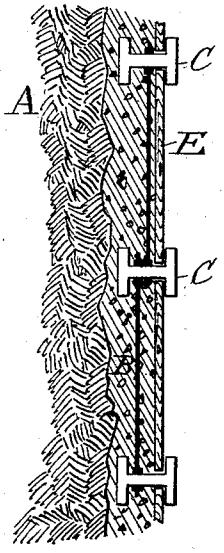


Fig. 2.

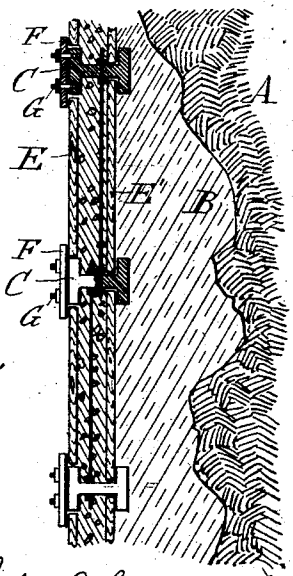


Fig. 3.

WITNESSES:

Henry P. Wells

Wm. A. Lowe

John C. Goodridge Jr.
INVENTOR

BY Henry P. Wells his
ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. C. GOODRIDGE, Jr.

METHOD OF REPAIRING WITH BETON OR CONCRETE.

No. 317,337. Patented May 5, 1885.

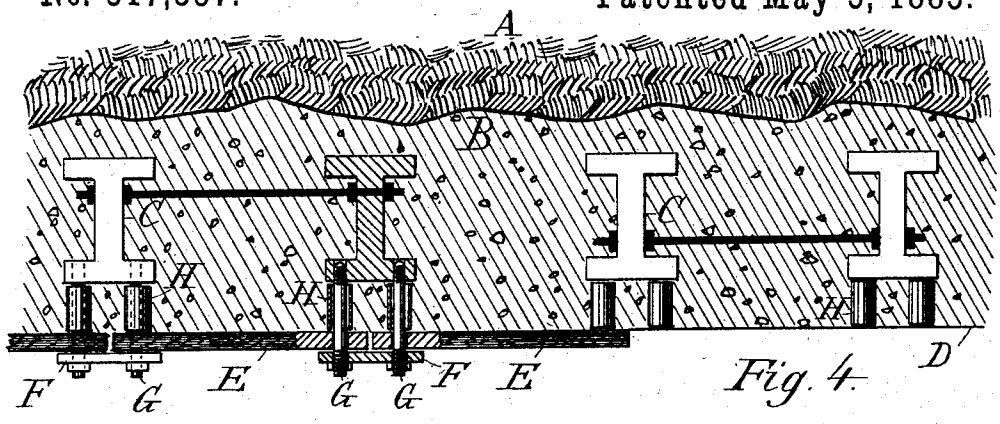


Fig. 4.

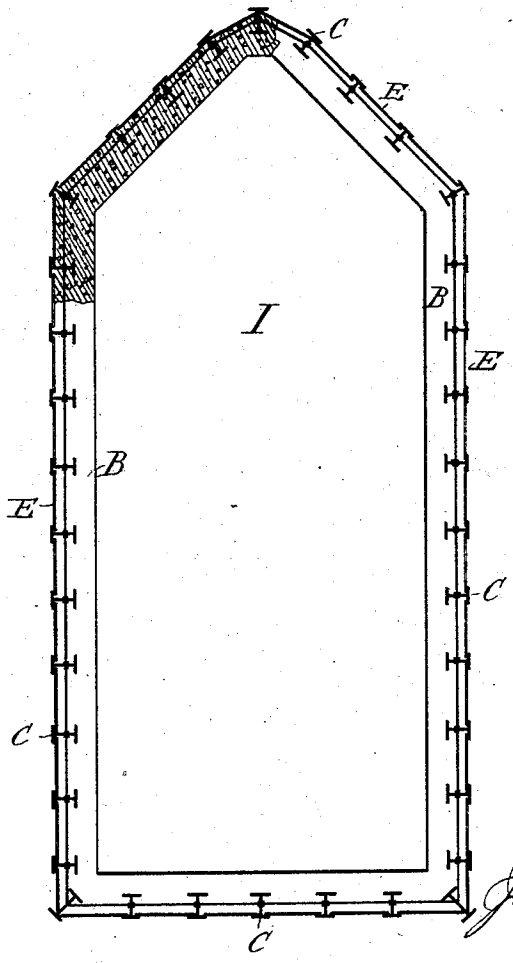


Fig. 5.

WITNESSES:
Henry P. Wells
Wm. A. Lowe

John C. Goodridge Jr.
INVENTOR

BY Henry P. Wells & Co
ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

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

METHOD OF REPAIRING WITH BETON OR CONCRETE.

SPECIFICATION forming part of Letters Patent No. 317,337, dated May 5, 1885.

Application filed August 27, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. GOODRIDGE, Jr., 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 Repairing and Building with Beton or Concrete, of which the following is a specification, reference being had to the accompanying drawings.

It has been the custom heretofore in construction or repair with beton or concrete first to prepare a mold of timbers and afterward to fill the beton or concrete within the mold, allowing the latter to remain until its contents have hardened, and then to remove the mold. This method is open to this objection: In railroad work—such as lining tunnels, &c.—large and heavy centers and timbers placed within the tunnel so reduce its area as to impede the use of the track altogether. It might further be observed that in all such cases the mold adds nothing to the ultimate strength of the work, while it is an expense.

My invention consists in combining the mold with the work itself in such a manner that the ordinarily useless portions of the mold form an integral portion of the completed work, and add the strength of the material of which they are composed to the strength of the beton or concrete; or, in other words, it has been the practice to support the lagging, which gives the desired form to the beton or concrete, upon centers or other heavy timbering placed without the space to be occupied by the completed work, while my method is to erect the supports for the lagging or centering within the space to be filled with the completed work, and hanging the lagging upon them, so to speak, thus diminishing the working-room required, cheapening the cost of the structure, increasing its strength, and simplifying and expediting it.

Figures 1, 2, and 3 represent my method as applied to the lining of railway tunnels or arches. Fig. 4 represents a detail in the same construction. Fig. 5 represents my method as applied to a bridge-pier or any mass of masonry or of earth or natural rock which it is necessary to strengthen.

I line a tunnel by my method as follows: I provide a sufficient number of iron beams, bent to conform to the required arch, and erect them at proper distances from one another—say from three to six feet apart—according to the load they are to sustain. These I brace and tie together in the usual manner, thus forming a center within the arch, as shown in Fig. 1, in which A is the natural rock; B, the space to be filled; C, one of the iron beams; D, the contour of the completed lining, and E the lagging.

For important work beams of the cross-section shown in Fig. 4 and of a depth proportional to the load to be borne are preferred, while for minor work old railway-rails will answer every purpose; but the best sectional dimensions for and the intervals between these beams will of course vary with the peculiarities of each individual case, and can readily be calculated by any engineer familiar therewith. When the center is complete, as aforesaid, the lagging is then placed upon the flanges of the beams by pushing them into place, as shown in Fig. 2, which is a plan view of the work, and in which A indicates the natural rock; B, the space to be filled; C, the iron beams aforesaid; E, the lagging, which may be either of boards, as is usual, or iron plates. The space B between the lagging and the natural rock is then filled in the usual manner with beton or concrete. The beams and their tie-rods and braces thus become solidly embedded in and an integral part of the work, and lend their strength thereto, while they are completely protected by the substance by which they are incased from deterioration. Often large void spaces intervene between the lagging and the natural rock where the latter has fallen down. These it has been the custom to fill in with the same material as the lining itself at, of course, a like expense per cubic foot. In such cases I proceed as shown in Fig. 3, wherein A is the natural rock; B, the space to be filled; C, iron beams, and E E′ two separated layers of lagging, secured as shown. I then fill in the space between the two layers of lagging with the material with which the tunnel is to be lined; but the space B between the lagging E′ and the natural rock I fill with broken stone, sand, or other cheap material, which will answer every purpose.

Where it is not desired to remove the lagging, no special provision need be made for

that purpose; but where it is desired I arrange it as shown in Fig. 4. In that figure F, are iron plates secured to the inner flanges of the beams by screw-bolts and nuts, as shown. E is the lagging resting on said iron plates F. G are the screw bolts screwed into the iron beams and passing through the plates F, and there provided with nuts. These bolts G are surrounded by thimbles H. The beton or concrete is then packed in and around them in the usual manner, and when it has set, by unscrewing the nuts the plates F and the lagging E may be removed. Then by unscrewing the bolts G from the beams only the thimbles remain to be filled. Thus the beams C are completely embedded in the beton, and a smooth inner surface to the tunnel is obtained. Still the thimble may be dispensed with and the iron bolts allowed to project, or they may be cut off after the lagging is removed, if preferred. It is obvious that this method is equally applicable to the construction of a shaft by conforming the beams to the required shape of the work.

It is often desirable to incase a bridge-pier or other structure or a mass of earth or rock. This has been done by building a mold without the structure, supported by timbers sufficiently heavy for the purpose, and filling in between the molds and the structure to be reenforced with beton or concrete; but in addition to the objections already stated there are others which manifest themselves, particularly in incasing a bridge-pier. Then it is exceedingly difficult and troublesome properly to adjust and retain in place the timbers to sustain the mold against their buoyancy. My method is shown in Fig. 5, in which it is applied to a bridge-pier, and in which I is a masonry pier to be incased.

C C are iron beams erected perpendicularly at such distances from one another as the nature of the strain they are to endure requires—say, from three to six feet apart—and surrounding the work. These are clamped together by tie-rods and braces in the usual manner, thus forming a skeleton frame-work surrounding the pier.

E is the lagging, placed as hereinbefore described, and B the space to be filled. The lagging is placed in position piece by piece as the work progresses, so as to have as little as possible thereof unfilled to be supported against the current of the water. When the beton has set, the beams and their connections are firmly embedded in the beton and become an integral part of the structure, as in the case hereinbefore described. Substantially the same method is used to incase a mass of earth or rock or any structure like a column or chimney, or it may be built within the structure, as in a well, or lining a monument or statue. In all these cases the lagging may, if necessary, be temporarily braced in position until the filling renders this unnecessary.

I am aware that floors and walls have been constructed of concrete strengthened by iron and wooden girders embedded in said concrete, but do not consider such as equivalents of my invention.

I do not claim in this application the herein-described "process" of lining and repairing with beton and concrete, for the reason that I have made the said process the subject of a separate application for Letters Patent, which was filed on or about the 4th of February, 1883, Serial No. 154,948.

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

1. The within-described lining or casing for tunnels, shafts, piers, and abutments, which consists of the frame of the required shape placed a suitable distance from the structure to be strengthened, and the concrete or beton so applied as to embed the said frame therein, substantially as set forth.

2. The herein-described lining or casing for tunnels, shafts, piers, abutments, &c., which consists of a frame of the required shape placed a suitable distance from the structure to be incased, beton or concrete so applied as to embed said frame therein, and sand, broken stone, or other cheap material filled in between the beton or concrete and the surface incased thereby, substantially as set forth.

3. In a lining or casing substantially as herein described, the combination, with the frame forming an integral part thereof, of screw-bolts projecting from said frame and provided with thimbles, bearing-plates, and screw-nuts, the whole so arranged as to removably secure molding-boards to said frame and at the required distance therefrom, as and for the purpose set forth.

In testimony that I claim the foregoing improvement in the method of repairing or building with beton or concrete, as above described, I have hereunto set my hand this 21st day of August, 1884.

JOHN C. GOODRIDGE, JR.

Witnesses:
M. A. GOODRIDGE,
C. L. ROLLINS.