(No Model.) 2 Sheets—Sheet 1.

P. H. JACKSON.

CONSTRUCTION OF ARTIFICIAL STONE OR CONCRETE PAVEMENTS.

No. 375,999. Patented Jan. 3, 1888.

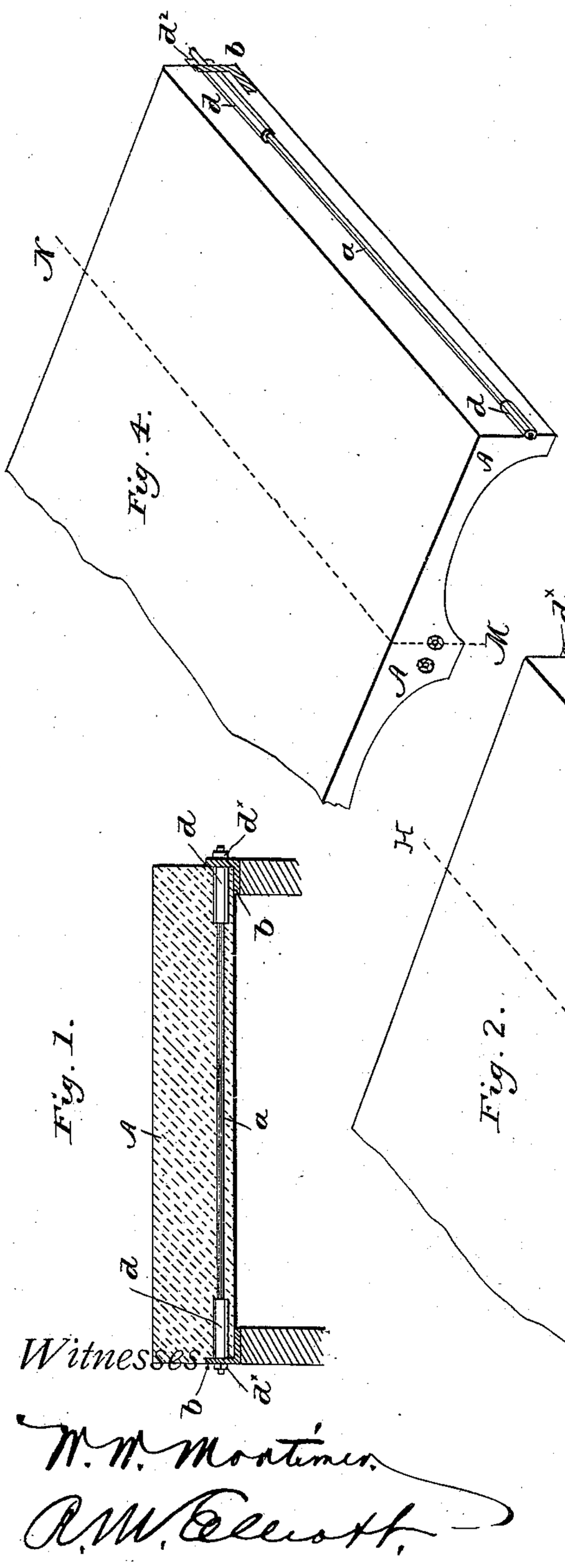

Fig. 4.

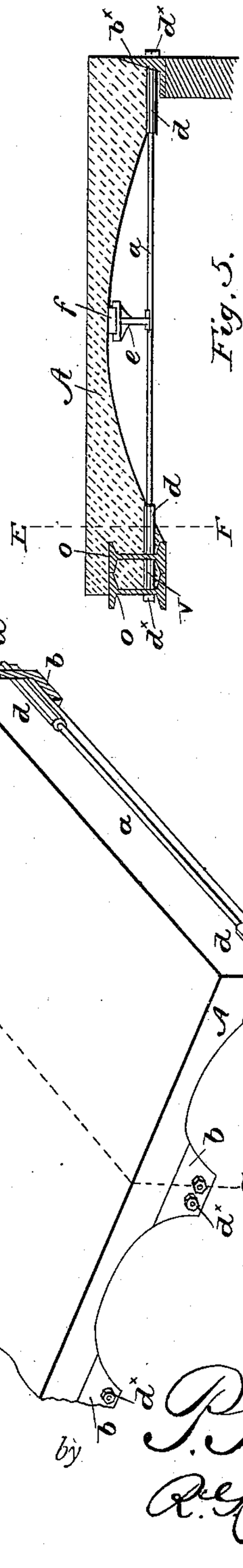

Fig. 5.

Fig. 2.

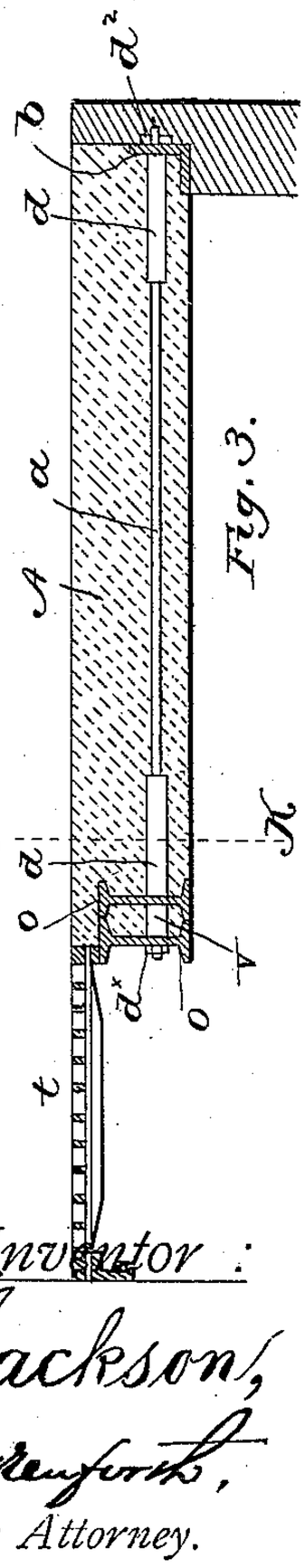

Fig. 3.

Fig. 1.

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Inventor:

P. H. Jackson,

by R. Dyrenforth,

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(No Model.) 2 Sheets—Sheet 2.

P. H. JACKSON.

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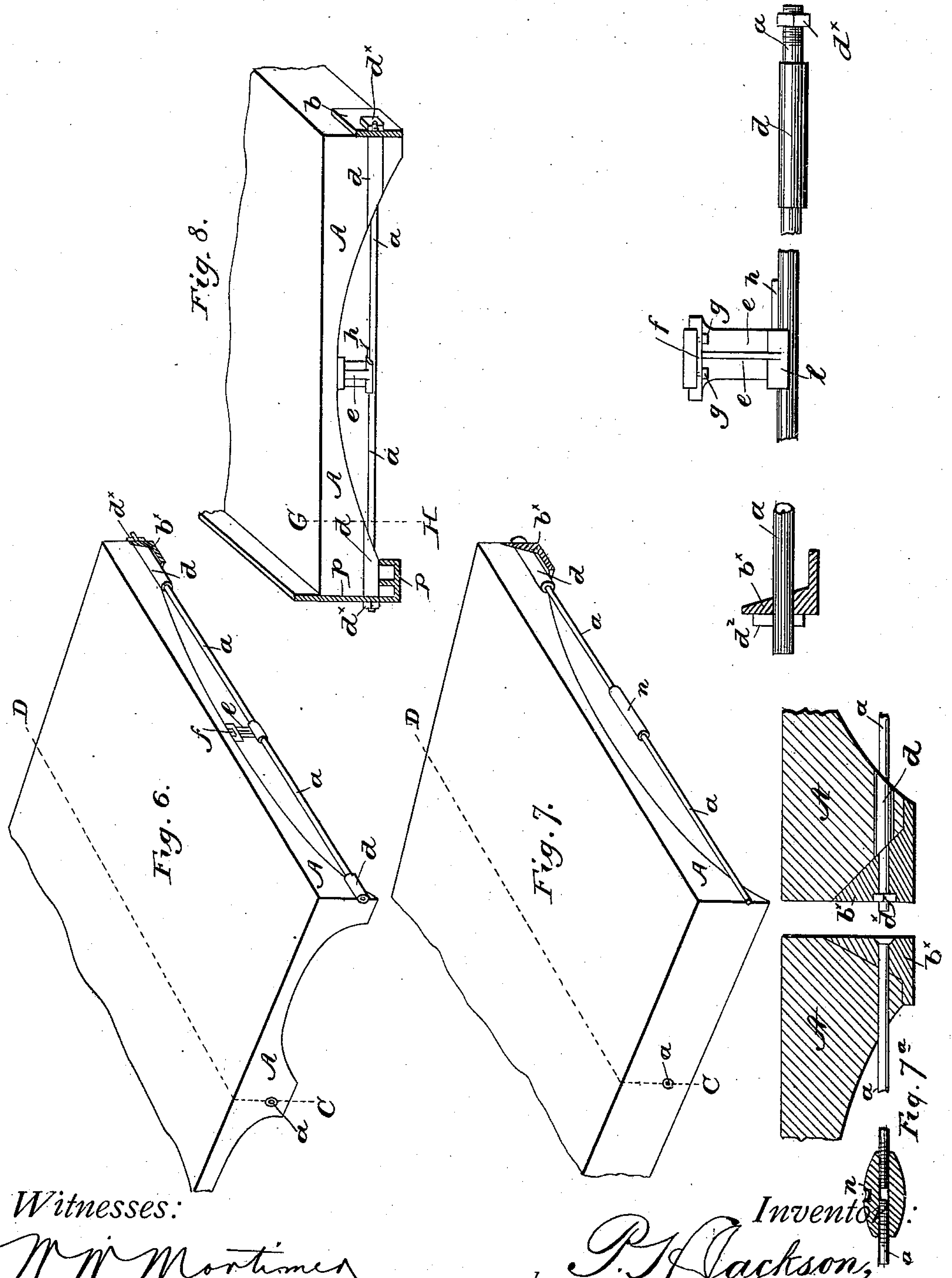

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UNITED STATES PATENT OFFICE.

PETER H. JACKSON, OF SAN FRANCISCO, CALIFORNIA.

CONSTRUCTION OF ARTIFICIAL-STONE OR CONCRETE PAVEMENTS.

SPECIFICATION forming part of Letters Patent No. 375,999, dated January 3, 1888.

Application filed October 27, 1886. Serial No. 217,372. (No model.)

To all whom it may concern:

Be it known that I, PETER H. JACKSON, of San Francisco, State of California, have invented certain new and useful Improvements in the Construction of Artificial-Stone or Concrete Sidewalks, Floors, Roofs, &c.; and I declare the following to be a full, clear, and exact description thereof, sufficient to enable any person skilled in the art to which my invention belongs to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

The invention relates to artificial-stone or concrete sidewalks, floors, or roofs.

The object of the invention is to strengthen and render more durable sidewalks, floors, roofs, and similar bodies constructed of artificial stone, concrete, or like material.

The invention consists in the combination of a sidewalk, floor, roof, or similar body constructed of artificial stone, concrete, or like material, with a series of arches, the footings of the arches being connected by ties provided with sleeves and skewbacks at their ends, and means whereby the skewbacks are forced against the material, the span of the arch decreased, and the structure strengthened; furthermore, in a sidewalk, floor, roof, or like body constructed of artificial stone, concrete, or like material, with a series of arches, the footings of the arches being connected by ties provided with sleeves and skewbacks at their ends, and intermediate of their ends with adjusting devices; furthermore, of a sidewalk, floor, roof, or like body constructed of artificial stone, concrete, or like material, with a series of arches, and having embedded in the footings of the arches ties provided with sleeves and skewbacks at their ends, the ends of the ties being screw-threaded and provided with keys, whereby the skewbacks may be thrust against the material; and, finally, in various novel details of construction whereby the effectiveness of the structure is insured and the object of the invention is attained.

To resist the tensile strain, one or more metallic ties are built in at or near the bottom of the arch and along its length, with their ends projecting through. The ties are united to the inclosing material by hydraulic or other strong cement, or are held by the plastic material of which the arch is composed. That part of the tie which projects through the ends of the arch is provided with screw-threads and nuts or keys, wedges, or similar well-known means, and pass through a plate or skewback at each end, the end of the arch fitting against the plate or skewback, and when the nut, key, or wedge is tightened on the outside of the abutting plate or skewback it presses the plate against the end of the arch, making it an abutment to resist the horizontal thrust; also, to prevent the material surrounding the tie along its length from slipping or sliding over it. By this arrangement for ordinary use plain bar, rod, plate, or band iron, or other shaped metal made at rolling-mills may be used as tie metal at or near the bottom of the arch without the usual expensive preparation of corrugating, roughening, indenting, or forming raised portions or irregular surfaces on the metal, or by cross-stops or by pins or any other preparation of the tie to make it hold over its length to the inclosing material when cemented to it.

Plain bar, rod, plate, or band iron or steel ties, without the preparation described for holding, and without the arrangement of the end abutting plates or skewbacks, but only cemented along the bottom of the arch, will not hold from sliding through the inclosing material when subjected to severe tensile strain.

A metallic tie at the bottom of an arch and extending along its length to be subjected to transverse strain must of necessity be cemented to the inclosing material practically over its length and more securely held at the center of its length, which is the place subjected to the greatest transverse strain, to prevent its breaking away in its connection to the top when the arch is undergoing deflection.

With metallic ties that have been prepared over their length to hold to the inclosing material of the arch at the bottom, as described, and with the assistance of the skewbacks or abutting plates and the means for forcing them against the ends of the arch, the holding of the tie to the inclosing material is largely increased and is adapted to places of severe trial, as that of arches of slight rise and long span.

In front of buildings area-spaces have to be provided between them and the sidewalk. In floors openings are left for stairways, and for

pavements and platforms over excavations the ends of the arches have to be supported, and for this purpose girders are used either at one or both ends. Where one end of the arch is supported by a girder and the other end by a wall or other support, the end without the girder-support requires skewbacks, &c., as described, the other end of the arches abutting against the side of the girder, the girder resisting the thrust of the arch and supporting their ends, the side of the girder taking the place of the abutting plates or skewbacks, the ends of the ties passing through the girder, with the nuts, keys, or wedges tightened on the outside, thus firmly holding the girder to the arches, and should the girder be of two or more metal beams it firmly holds them together, being held in place by the ties, which pass through them, and by filling in the space between the beams with artificial stone, concrete, or other plastic material, when hardened, any number of beams forming the girder become as one in support of the load and prevent leakage from the top between the beams forming the girder.

When the metallic ties are cemented to the inclosing material along their length, they are incorporated with the mass as long as they hold to it, and any pulling force applied at the end of the tie and compressively resisted by the abutting end of the arch, which is the fulcrum, is not tensilely felt by the tie in the inclosing material while held to it. Should the tie not be straight or bent, any amount of pulling force on the end of the tie would fail to change it as long as the inclosing material held it in its bond. In order to produce tensile strain on the tie at a suitable distance from the ends, I use tubes or sleeves that will fit closely on the tie, one being slipped over each end of the tie with the outer end against the abutting plate, skewback, or side of girder, the tie passing through them, the inclosing material at the end of the arch being cemented to the sleeves and the tie being free to slide on the inside. After the concrete or other material of the arch has become hard and strong and the tie tensilely strained inside of the sleeves, that part of the bottom of the arch between the inside ends of the sleeves is compressed and the arch strengthened. These sleeves or coverings of the tie may be of any shape to conform to the shape of the tie, and are preferred to be of metal, or may be of any other material that will separate the tie from the material of the arch and permit it to slip through it, such as thick cloth, paper, blacklead, clay, &c.

Figures 1 to 4, inclusive, represent arches extending in a cross direction, and in the bottoms between and at their ends along their length are metallic ties embedded and cemented to the inclosing material with skewbacks, sleeves, &c.

Fig. 1 is a longitudinal section of an arch, A, on the line G H, Fig. 2.

a is a metallic tie built in the material at the bottom between the arches and along the length, extending through the sleeves *d d* at the ends, and through abutting plates *b b*, and having screw-threads on its ends, with the nuts $d^{\times}$ $d^{\times}$, when screwed up, pressed against the abutting plates and ends of the arch.

Fig. 2 is a perspective view, of which Fig. 1 is the longitudinal section, showing the ends of the arches A with the ties, sleeves, and abutting plates as described for Fig. 1.

Fig. 3 is a longitudinal section of an arch from J K, being on the line M N of Fig. 4. At one end is shown a girder composed of two metallic beams, *o o*, which may be of one, two, three, or more beams, as required for strength, or may be of any other form or kind of girder. This girder supports the ends of the arches A, which abut against it, the metallic tie *a* passing through the webs of both beams *o o*, and when the nut on the outside is screwed up after the arches are formed and become hard and strong it presses the girder against the end of the arches, making an abutment and taking the place of abutting plates or skewbacks. *d d* are the sleeves or coverings of the ties. Upon the other end of the arch is an abutting plate, *b*, with the wedge or tapering key d^{2} forced into the slot in the tie and pressing against the abutting plate *b*, serving the same purpose as the nut on the other end of the tie. A section of illuminating-tile, *t*, is shown extending out from the front of the building, upon which one end rests, to the sidewalk and over on the girder covering the area-space, the space V between the beams *o o* being filled in with concrete or like plastic material.

Fig. 4 shows a view cut off on the line J K of Fig. 3, in order that the ends of the arches may be seen.

In Figs. 5, 6, 7, and 8 the arches with ties extend the long way instead of crosswise, as in the preceding figures. The metallic ties *a* pass through the sleeves at the ends of the arches, and by screwing up the nuts or forcing the keys against the abutting plates, skewbacks, or girder the arch is cambered and the bottom or intrados of the arch is compressed, increasing the strength of the arch, which could not be done if the sleeves or coverings of the ties were omitted.

Fig. 5 is a longitudinal section of the arch A on the line C D of either Fig. 6 or 7, shown with the girder composed of two metallic beams, *o o*, the tie *a* passing through them, and the space V between the beams filled with artificial stone, concrete, or other plastic material, when hardened uniting the beams as one, and by screwing up the nuts $d^{\times}$ $d^{\times}$ it shortens the tie between the nuts and cambers the arch. $b^{\times}$ is a skewback. In many cases access cannot be had to the end nuts or keys to tighten and strain the ties by reason of the ends being covered by masonry or brick-work, and to overcome this over the strut *e*, between it and the under side of the arch, is shown the tapering key or wedge *f*, which, when forced in, increases

the distance between the tie and the under side of the arch, which cambers the arch and strains the tie, thereby increasing the strength of the arch to sustain a load on its top; or, in place of the strut key or wedge, a turn-buckle is used to shorten the tie.

Fig. 6 is a perspective view on the line E F, Fig. 5, showing the sides and ends to be direct and transverse arches, as described in my Patent No. 339,296, but with the improvement for cambering and strengthening the arches by means of the sleeves *d d* on the ties *a*, as well as the key *f* over the strut *e*.

Fig. 7 is a perspective view of a direct arch, or arched only in one direction over its length from the line E F, Fig. 5, and extending to the skewback $b^{\times}$. *n* is a turn-buckle on the tie to shorten it.

Fig. 7^{a} is a longitudinal section of turn-buckle *n* and skewback.

Fig. 7^{b} is a longitudinal section of a recessed skewback, $b^{\times}$, holding an immovable nut, $d^{\times}$. The nuts on opposite ends act on reverse threads. The distance between nuts is shortened by turning the tie *a* in the middle of its length by tongs, thereby cambering the arch, producing compression at the intrados.

Fig. 8 is a longitudinal section representing the same construction as Figs. 6 and 7 on the line C D, and having a girder, *p*, of L shape on one end and an abutting plate, *b*, at the other. The strut *e* has a tapering key, *h*, at the bottom between it and the tie.

Fig. 9 is an enlarged view of the parts. The tie *a* is shown with the nut $d^{\times}$ on one end, and at the other end a tapering key, d^{2}, driven through the tie. The strut *e* shows some of the different methods for increasing the distance between the tie and the crown of the arch. One is shown with the tapering key *f* at the top, and another is shown to be with screws *g g*, passing through the top of the strut and pressing against a plate, which forces up the arch. Another is shown with the key *h* between the tie and the under part of the strut.

The strut may be made in two pieces in height having a tapering screw, key, or wedge between, by which the distance between the tie and arch may be increased, as in the other methods.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a sidewalk, floor, roof, or similar body constructed of artificial stone, concrete, or like material, with a series of arches, the footings of the arches being connected by ties provided with sleeves and skewbacks at their ends, and means, substantially as described, whereby the skewbacks are forced against the material, the span of the arch decreased, and the structure strengthened.

2. A sidewalk, floor, roof, or similar body constructed of artificial stone, concrete, or like material, with a series of arches, the footings of the arches being connected by ties provided with sleeves and skewbacks at their ends, and intermediate of their ends with adjusting devices, substantially as described.

3. A sidewalk, floor, roof, or like body of artificial stone, concrete, or like material, with a series of arches, and having embedded in the footings of the arches ties provided with sleeves and skewbacks at their ends, the ends of the ties being screw-threaded and provided with keys, whereby the skewbacks may be thrust against the material, substantially as described.

4. A sidewalk, floor, or roof constructed with artificial stone or concrete, arches with longitudinal ties to resist the tensile strain, with the ends extending through sleeves or coverings, by which that part of the ties may slide independent of the material which it passes through, in combination with screws, nuts, keys, wedges, turn-buckles, or the like, by which tension on the tie may be increased and the material acted upon compressed, substantially as herein described.

PETER H. JACKSON.

Witnesses:
JAMES B. LANE,
WM. MAYER.

Corrections in Letters Patent No. 375,999.

It is hereby certified that in Letters Patent No. 375,999, granted January 3, 1888, upon the application of Peter H. Jackson, of San Francisco, California, for an improvement in "The Construction of Artificial Stone or Concrete Pavement," errors appear in the printed specification requiring correction as follows: In line 40, page 1, the word "and" should have been printed *or;* and on page 3, line 75, the words *having nuts, or being* should have been inserted before the word "provided;" and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 14th day of February, A. D. 1888.

[SEAL.]

D. L. HAWKINS.

Acting Secretary of the Interior.

Countersigned:

BENTON J. HALL,

Commissioner of Patents.