

R. GUASTAVINO.
MASONRY STRUCTURE.
APPLICATION FILED JUNE 24, 1910.

1,052,142.

Patented Feb. 4, 1913.

Fig. 1

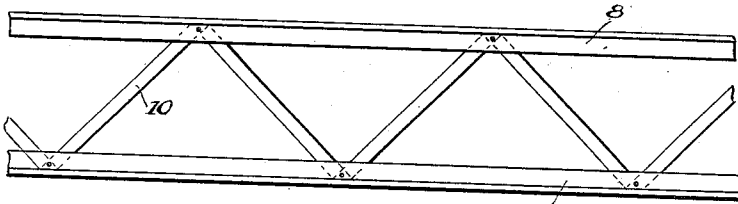
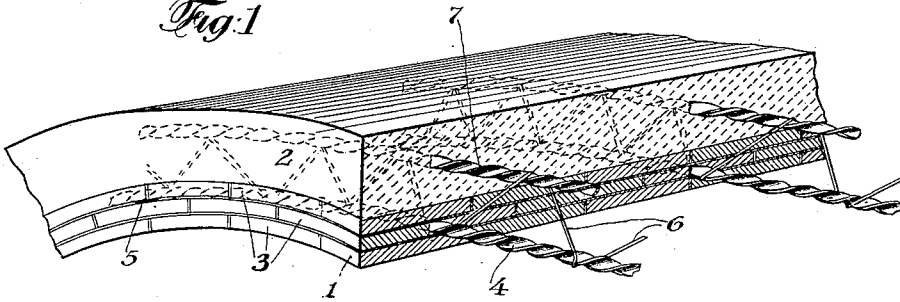


Fig. 3

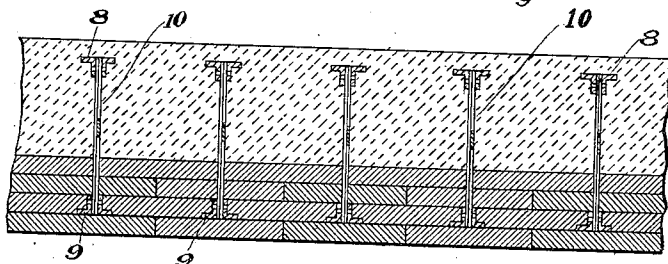


Fig. 2

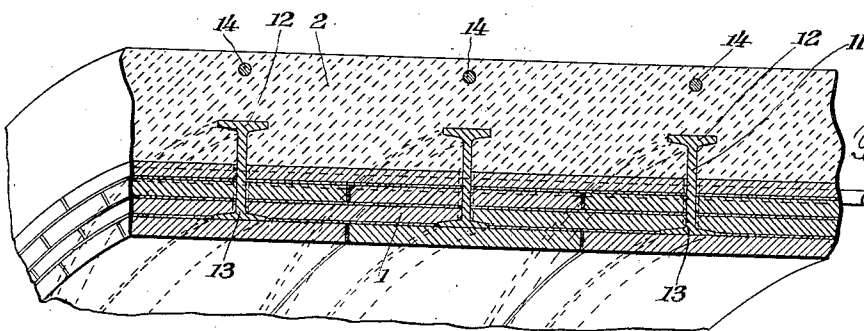


Fig. 4

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MASONRY STRUCTURE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RAFAEL GUASTAVINO, a citizen of the United States, residing at No. 537 Greene avenue, borough of Brooklyn, city of New York, county of Kings, and State of New York, have invented certain new and useful Improvements in Masonry Structures, of which the following is a specification.

10 This invention relates to masonry structures, and more particularly to the construction of bridges, arches, domes, and the like requiring a maximum of strength and a minimum of thickness.

15 To this end the invention has in view certain novel and practical improvements which carry forward the invention disclosed and covered in my former Patent No. 947,177, dated January 18, 1910.

20 The invention primarily contemplates a composite reinforced masonry arch embodying in its organization a lower section of thin tile slabs and an upper section or part of concrete material superimposed upon said tile slab section and united therewith by means of metallic reinforcement, thus providing a reinforced structure well adapted for many uses where great strength is required, as well as comparative thinness, and also admitting of great facility and economy in building up.

25 The composite reinforced structure above referred to is particularly available for arch work in the building of bridges or long spans.

30 With these and many other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

35 The distinctive thought of the invention, namely, the superimposed sections respectively of tile slabs and concrete material, and connecting reinforcement in said sections is necessarily susceptible to embodiment in a variety of forms without departing from the invention, but for illustrative purposes certain preferred forms are illustrated in the accompanying drawing, in which—

40 Figure 1 is a sectional perspective view of an arch constructed in accordance with the present invention and illustrating one form of reinforcement. Fig. 2 is a sec-

tional view of the same kind of arch, but illustrating a different form of reinforcement. Fig. 3 is an elevational view of the lattice-type of reinforcement shown in Fig. 2. Fig. 4 is a view similar to Fig. 2 but illustrating another kind of reinforcement that may be utilized to connect or tie the tile slab and concrete sections.

Like references designate corresponding parts in the several figures of the drawing.

Referring to the embodiment of the invention illustrated in Fig. 1 of the drawings, it will be observed that the masonry arc shown therein consists of a lower tile slab section 1 and an upper concrete or cement section 2, superimposed directly upon the said tile slab section 1. The tile slab section 1 is constructed along similar lines to the tile slab arch disclosed in my former patent aforesaid that is to say, the said tile slab section 1 is composed of a plurality of superimposed courses of thin tile slabs 3, the slabs in each course being flushly laid edgewise with their thin edges arranged edge to edge, and also so disposed as to break joints crosswise of the structure, in combination with binding material between the tile slabs in the separate courses, and also between the edges of adjoining tile slabs. According to the present invention metallic reinforcing elements 4 are arranged at suitable points in the joints between the edges of the tile slabs, and other metallic reinforcing elements 5, running across the plane of the reinforcing elements 4 are preferably laid in the joints between the separate courses of the tile. As shown the reinforcement 4 in the tile slab section is connected by means of metallic reinforcing ties 6 with metallic reinforcing elements 7 embedded in and following the curve of the concrete section 2. Under normal conditions both of the rods 4 and 7, which follow the curve of the arch, work under compression, and the connecting ties 6 are so disposed as to take up the shearing stresses to which the material of the arch is subjected under heavy loads. The center of the reinforcing elements or rods 7 will work in compression when the arch has a heavy load at the crown and the center of the elements or rods 4 will work in tension when the arch has been so far overloaded as to cause it to be somewhat deformed in shape. When this occurs the reinforcement or rod 7 near each foot of the arch will work in

tension if the deformation of the arch is sufficient, and at the same time the reinforcement or rod 4 near the foot of the arch will work in compression due to the deformation of the arch.

Another form of the connecting reinforcement which may be employed is shown in Figs. 2 and 3, wherein the upper reinforcing element 8, within the concrete section, as well as the lower reinforcing element 9 within the tile slab section consists of a pair of angle bars between which are clamped the ends of the metallic connecting ties 10 arranged diagonally or otherwise. The arrangement, however, as shown in Fig. 3 provides a lattice-type of reinforcement. Again, as suggested in Fig. 4, the connecting reinforcement may consist of I-beams 11, the upper flanges 12 of which are embedded in the concrete section 2 and the lower flanges 13 of which are bonded into the lower tile slab section 1. This reinforcement works normally at compression, but the lower portion thereof may be caused to work under tension if a sufficient load is placed on the structure to cause it to be sufficiently deflected from its true form. This structure may be further reinforced if desired or required by compression rods 14 in the concrete section 2, and at this point it will be observed that the longitudinal reinforcement, designated by the numeral 5, is preferably arranged to extend through the structure between the reinforcements 4 and 7 respectively of the tile-base and of the concrete body.

A feature of special practical importance resides in the plurality of courses of thin tile slabs which constitute what may be termed a tile-base. In constructing an arch, embodying this invention, it is only necessary to employ a very light centering, for the reason that the courses of thin tile slabs are first laid upon such centering and are then allowed to become quite thoroughly set, so that the same act as a part of the centering support for the superimposed body of concrete which may be of any predeter-

mined thickness. Accordingly, the tile-base, of thin tile slabs not only acts as a part of the centering, but also forms a part of the finished arch, thus providing in combination with the body of concrete and the reinforcement, a composite monolithic masonry arch which is particularly adapted for arch work in the building of bridges of long span or in other places where great strength is required, while at the same time admitting of great facility and economy in the building of centering supports or false work.

I claim,—

1. A composite monolithic masonry arch consisting of a tile-base composed of a plurality of superposed courses of thin tile slabs laid edgewise, the tile in each course being arranged to break joints with all adjacent tile in the adjoining course or courses, a superimposed body of concrete upon said tile-base, reinforcing elements extending through the courses of tile and through the body of concrete, and metal ties connecting the reinforcing elements in the tile with the reinforcing elements in the concrete.

2. A composite monolithic masonry arch consisting of a tile-base composed of a plurality of superposed courses of thin tile slabs laid edgewise, the tile in each course being arranged to break joints with all adjacent tile in the adjoining course or courses, a superimposed body of concrete upon said tile-base, reinforcing elements extending through the courses of tile and through the body of concrete, metal ties connecting the reinforcing elements in the tile with the reinforcing elements in the concrete, and other reinforcing elements extending through the structure between the said reinforcing elements in the tile and in the concrete.

In testimony whereof, I, RAFAEL GUASTAVINO have signed my name to this specification in the presence of two subscribing witnesses, this 17 day of June 1910.

RAFAEL GUASTAVINO.

Witnesses:

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