(No Model.)

2 Sheets—Sheet 1.

A. GEISEL.

CONCRETE BRIDGE.

No. 571,225. Patented Nov. 10, 1896.

Fig. 1.

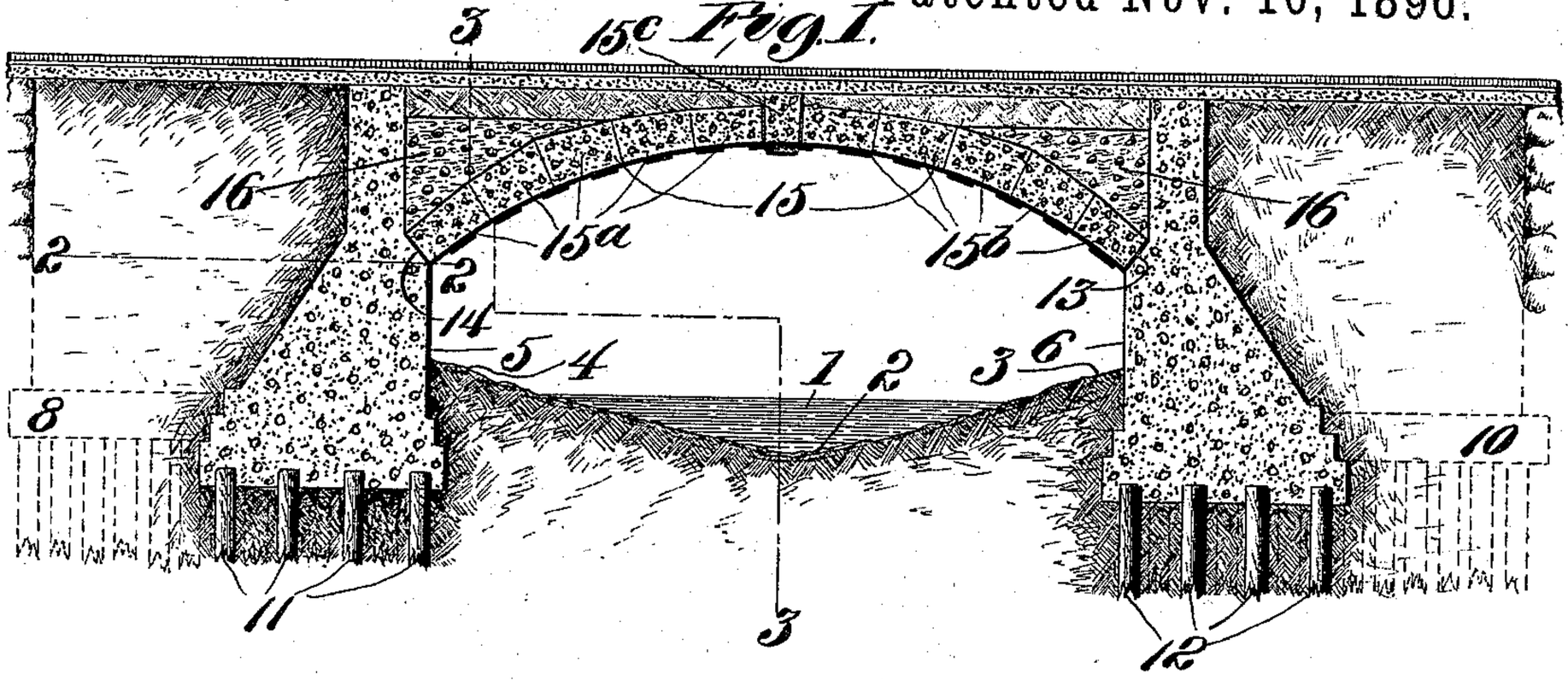


Fig. 2.

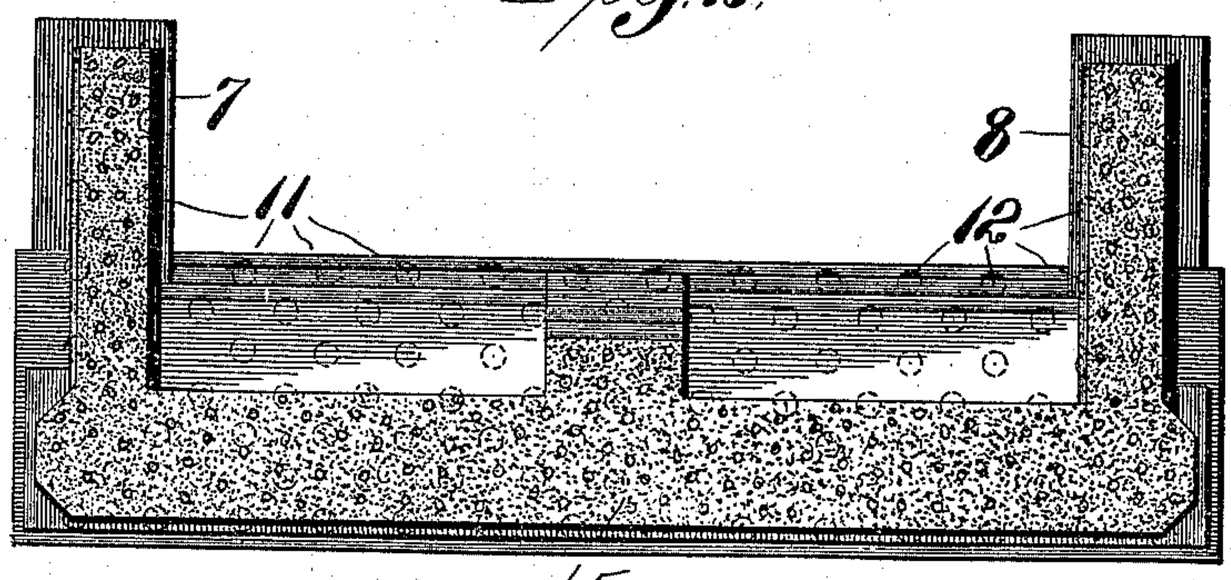
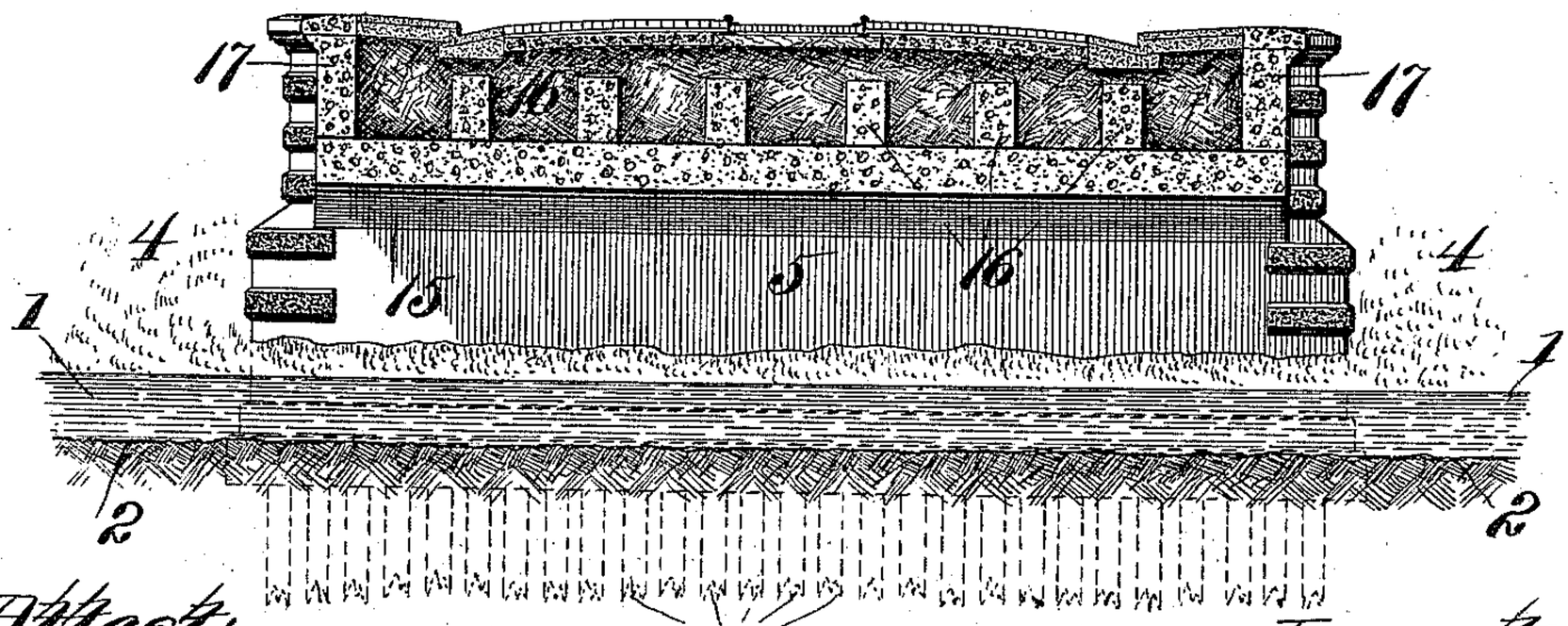


Fig. 3.



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S. G. Wells.

Inventor:
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By Higdon & Higdon & Kougan.
Atty's.

(No Model.) 2 Sheets—Sheet 2.

A. GEISEL.

CONCRETE BRIDGE.

No. 571,225. Patented Nov. 10, 1896.

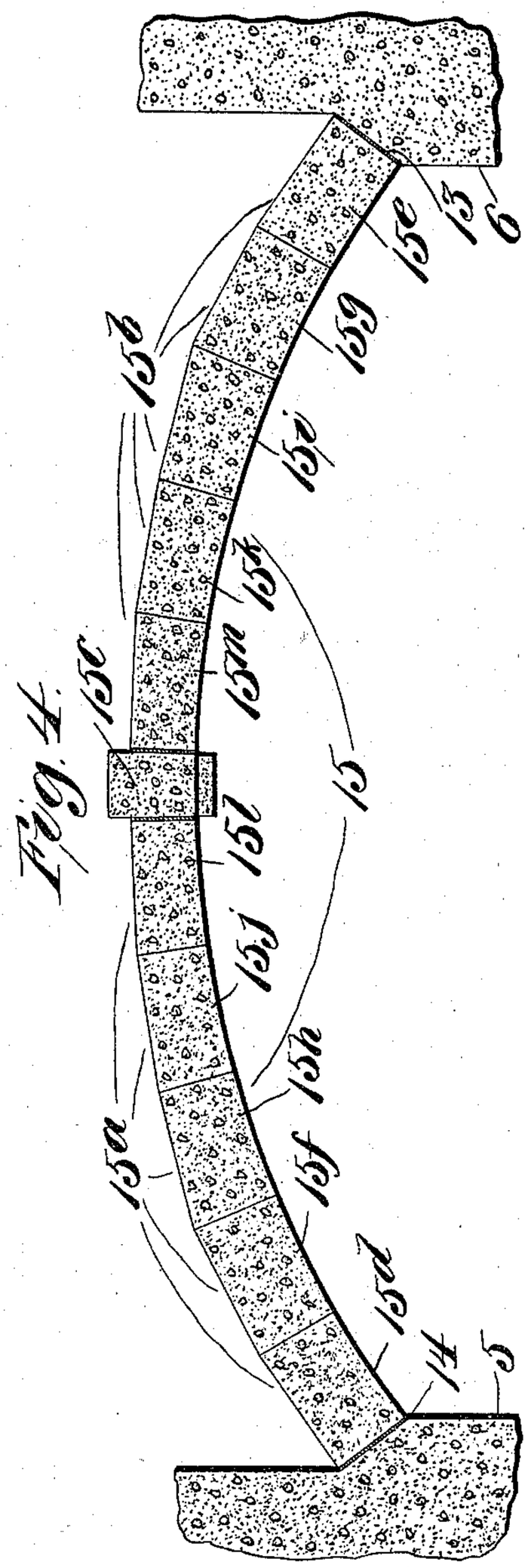

Fig. 4.

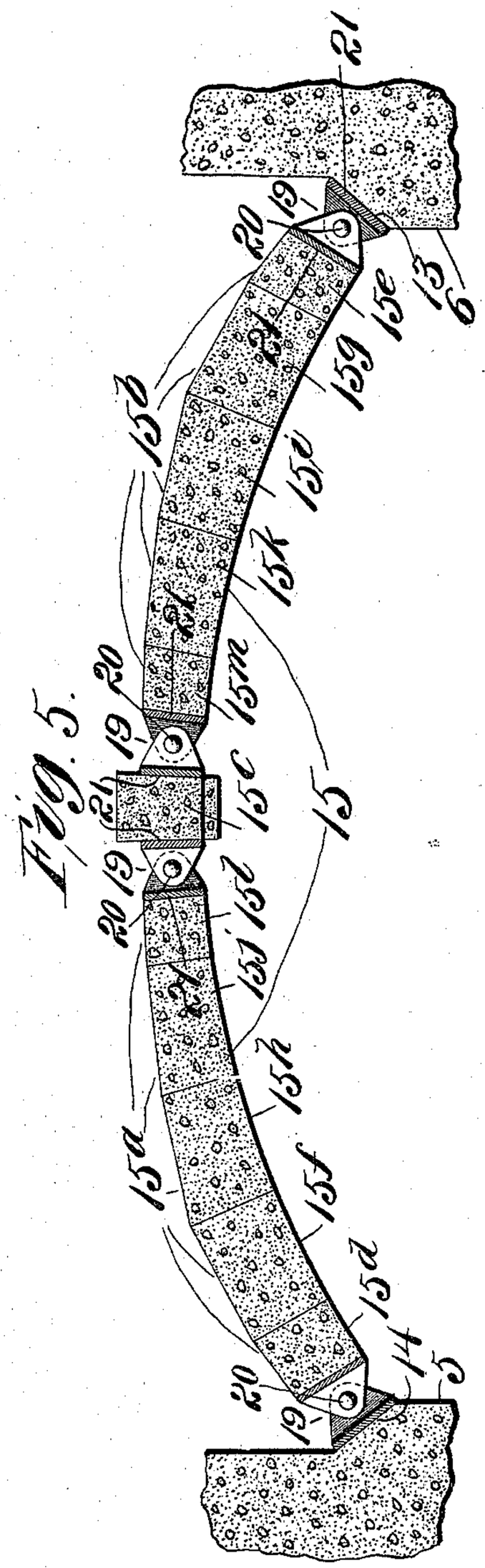

Fig. 5.

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UNITED STATES PATENT OFFICE.

ADAM GEISEL, OF ST. LOUIS, MISSOURI.

CONCRETE BRIDGE.

SPECIFICATION forming part of Letters Patent No. 571,225, dated November 10, 1896.

Application filed March 23, 1896. Serial No. 584,440. (No model.)

To all whom it may concern:

Be it known that I, ADAM GEISEL, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Concrete Bridges, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved concrete arch bridge; and it consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

This application is supplementary to and should be read in connection with my application filed concurrently herewith and serially numbered 584,439.

In the drawings, Figure 1 is a longitudinal sectional view of a bridge constructed in accordance with my invention. Fig. 2 is a horizontal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a vertical transverse sectional view on the line 3 3 of Fig. 1. Fig. 4 is an enlarged longitudinal sectional detail of the arch used in constructing the bridge shown in Fig. 1 and illustrates the form of arch which I use for short spans. Fig. 5 is an enlarged longitudinal setional detail of a modified form of the arch shown in Fig. 1 and illustrates an arch constructed in accordance with my invention where a very long span is required.

Referring by numerals to the accompanying drawings, the water 1 of the river rests on the bed 2 between the banks 3 and 4. In each of the banks 3 and 4 an excavation is made for the abutments 5 and 6 and the wing walls 7, 8, 9, and 10 of the bridge. Piles 11 and 12 are sunk in these excavations until a solid foundation is reached. The upper ends of these piles are sawed off on a horizontal line about one foot above the bottom of the excavation. The ground plan of the abutments and wing walls is shown in Fig. 3, the piling being shown in dotted lines. After the piles have been driven and sawed off the excavations are cleaned out to the virgin earth. A layer of concrete about one foot in thickness is then placed in the excavation and thoroughly rammed around the heads of the piles. Similar layers of concrete are placed one on top of the other in the excavations until the abutments and wing walls are of the desired height. Each layer is thoroughly sprinkled with water before another is added, in order to form a thorough bond between the layers. When completed, the whole mass of each abutment and its wing walls is a solid body of concrete. When the abutments and wing walls get above the surface of the ground, suitable false work is erected to mold said abutments and wing walls into the desired shape. After the concrete work is finished the false work is left in position about three days or until the concrete has become sufficiently hardened to stand.

On the facing walls of the abutments 5 and 6 are surfaces 13 and 14, forming the skewbacks, upon which the ends of the arch 15 are seated, the lines of said surfaces corresponding to the radial lines of the arch. The arch is in three pieces when the bridge is complete, and consists of the two sides 15^a and 15^b and the keystone 15^c. The surfaces 13 and 14 are covered with tar-paper or other suitable substance to prevent the arch from forming a bond with the abutment. The side pieces 15^a and 15^b are each constructed in five sections 15^d, 15^e, 15^f, 15^g, 15^h, 15^i, 15^j, 15^k, 15^l, and 15^m. In constructing the arch I work from each end toward the center. The end section is cast, and before it has time to set the next section is cast and a bond forms between them, and so on until the pieces 15^a and 15^b are complete. At the boundary-line between the second and third sections from the outer ends of the pieces 15^a and 15^b the arch is between thirty-five and forty per cent. thicker than at the inner ends of said pieces and about ten per cent. thicker than at the outer ends. The inner ends of the pieces 15^a and 15^b are covered with tar-paper or other suitable material to prevent a bond with the keystone. The keystone 15^c is then cast in position. The center of the arch should be elevated slightly above a true center, (about one inch to forty feet,) in order that it may form a true arc of a circle after the bridge is completed and settled.

The false work used in casting the arch should be left in position about twenty days after the arch is closed, or long enough to allow the concrete so set.

I omit the usual haunchings on top of the arch, and in their place I insert concrete walls 16 in the form of right-angled triangles. The

short side of the triangle rests against the vertical face of the abutment and the hypothenuse rests upon the upper surface of the arch, thus bringing the long side of the right angle in a horizontal plane for the purpose of forming ribs to support the superstructure of the bridge. Similar walls 17 join with the wing walls and the edges of the arch.

There is no bond between the walls 16 and 17 and the arch. The space between these walls is filled with clean clay and rammed solid, after which the sidewalks and road-bed are laid in the usual way.

Several coats of plastering are applied to the face of the arch and the wing walls, the finishing coat showing an imitation of alternate smooth and rock face stonework.

The distinguishing feature of my concrete arch bridge is the joints in the arch and the substitution of the walls 16 and 17 for the usual haunchings, thus leaving the pieces of the arch free to expand or contract without cracking or breaking the arch, and will also allow a settlement of the support of the arch without cracking the arch.

Where it is desired to build a bridge using a span or spans of from twenty to fifty feet in length, the form of arch just described and shown in detail in Fig. 4 is sufficient and will prove very strong and durable.

The layer of tar-paper between the ends of the arch and the skewbacks forms a joint between the arch and the abutments which allows of sufficient action caused by expansion or contraction without cramping the parts of the arch and cracking or breaking the arch and abutments. This construction is shown, described, and claimed in my application above referred to, filed concurrently herewith and serially numbered 584,439.

When it is desired to build a span of from one hundred to three hundred feet, I employ the construction shown in detail in Fig. 5. I employ iron shoes 19, having joints 20 in their center and the faces 21 on each end. One end of the shoe rests upon the surface of the skewbacks, and the lower end of the arch rests upon the other surface, thus forming a hinge-joint between the arch and the skewbacks. A similar shoe is inserted between the upper end of the segments of the arch and the keystone. The shoes 19 extend the whole width of the bridge, as do the layers of tar-paper, as heretofore described, and form supports for the arch and allow of its moving by expansion or contraction without injuring the pieces of which the arch is composed and without breaking or cracking any part of the bridge. This construction allows the foundations to settle without showing any cracks.

Thus it will be seen that by adopting my invention a concrete arch bridge may be built having spans up to three hundred feet in length, which could not be done by any known old process.

A complete concrete arch constructed in accordance with my invention herein described comprises three pieces and four joints. Each of the three pieces are cast in position as heretofore suggested. In making these castings the section to be constructed is subdivided to suit the exigencies of the case. After work commences on one of these subdivisions that subdivision must be finished before the work is discontinued for the noon hour or for the night, in order that there may be no divisions or cracks in the subdivision caused by the hardening of one part of the concrete before the next part is added. When the subdivision is completed, the templets in which the subdivision has been cast are left in position until the workmen are ready to begin the next subdivision. Then the templets are removed and the exposed surface of the completed subdivision to which it is proposed to join the new subdivision is thoroughly scratched by an iron brush and cleaned off with water, and a thin coat of mortar is spread all over said surface, in order to prepare it for taking a bond with the next-to-be-completed subdivision, and this process is repeated until the entire section is completed.

In constructing the arch as hereinbefore described I use concrete prepared as follows: Take one part of Portland cement, three parts of sand, and five parts of macadam by measurement. Mix the sand and cement thoroughly together while dry, then add a good sprinkling of water, mix again until a stiff mortar is formed, then spread the macadam all over the motar, and turn the whole mass over three or more times and until the spawls are all covered with mortar. Then place the concrete so formed immediately in position and ram the same until the water flushes to the surface, after which the concrete is not to be disturbed. In order not to disturb the newly-made subdivision of the section by expansion of the false work from the moisture or dampness of the fresh concrete which is to form the next adjacent subdivision, the false work is thoroughly soaked for at least two days before the concrete work commences, and then the sheeting of the false work is covered with waterproof paper, so that no additional moisture can come in contact with said false work.

An arch consisting of only three members constructed in accordance with my invention is strong enough to carry almost any weight, and supplemental haunches, which are a matter of necessity for either stone or brick arches, are not required in my bridge. This omission takes a large weight off of the foundations of the bridge, or, in other words, the foundations for an arch of my construction do not need to be near as heavy as for the old-style stone or iron arch.

In the place of the usual supplemental haunches I make the arch thicker at the breaking-point, which is about one-third of the length of the span from the skewbacks, and from the breaking-point the segments of

the arch taper both ways, being the thinnest at the point next the keystone. The walls 16 are not a necessary part of the arch, but may be inserted or left out, as desired. When inserted, these walls form a convenient and effective support for the roadway, sidewalks, or whatever superstructure there may be above the arch.

I claim—

1. In a concrete bridge, metallic shoes jointed together and inserted between the ends of the haunches and the skewbacks and between the opposite ends of the haunches and the keystone, substantially as specified.

2. A concrete bridge consisting of abutments having skewbacks, metallic shoes resting upon said skewbacks, mating metallic shoes jointed to said first-mentioned shoes, haunches comprising voussoirs of concrete bonded together resting in said second-mentioned metallic shoes, metallic shoes at the upper ends of said haunches and metallic shoes jointed to the last-mentioned shoes, and a keystone resting between said last-mentioned shoes, substantially as specified.

3. A concrete bridge consisting of abutments having skewbacks, metallic shoes resting upon said skewbacks, mating metallic shoes jointed to said first-mentioned shoes, haunches comprising voussoirs of concrete bonded together resting in said second-mentioned metallic shoes, metallic shoes at the upper ends of said haunches and metallic shoes jointed to the last-mentioned shoes, a keystone resting between said last-mentioned shoes, and walls on top of said haunches, said walls being unbonded from said haunches and said abutments, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

ADAM GEISEL.

Witnesses:

EDWARD E. LONGAN,

MAUD GRIFFIN.