

(No Model.)

2 Sheets—Sheet 1.

F. MILLIKEN.

CONSTRUCTION OF ARCHES, PARTITIONS, &c.

No. 545,301.

Patented Aug. 27, 1895.

Fig 1

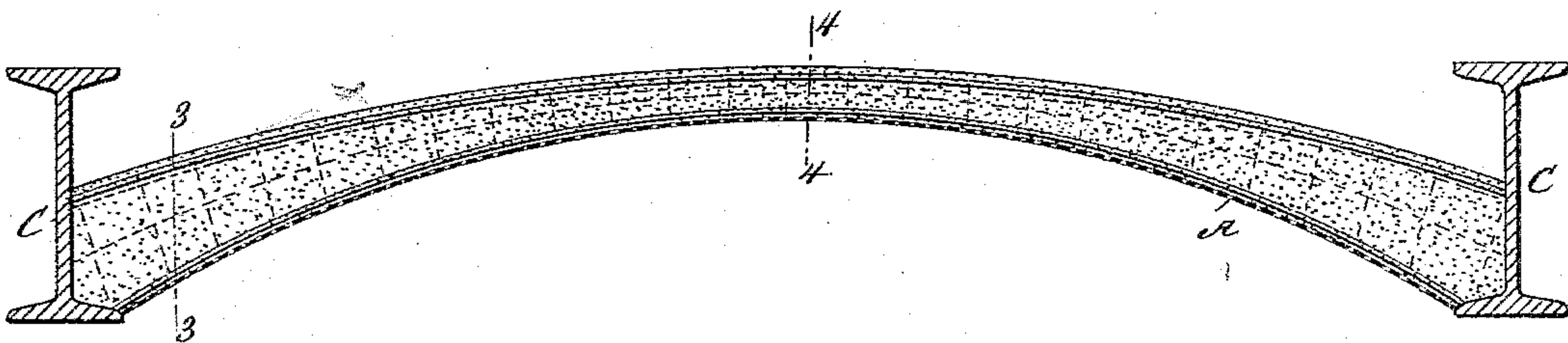


Fig 2

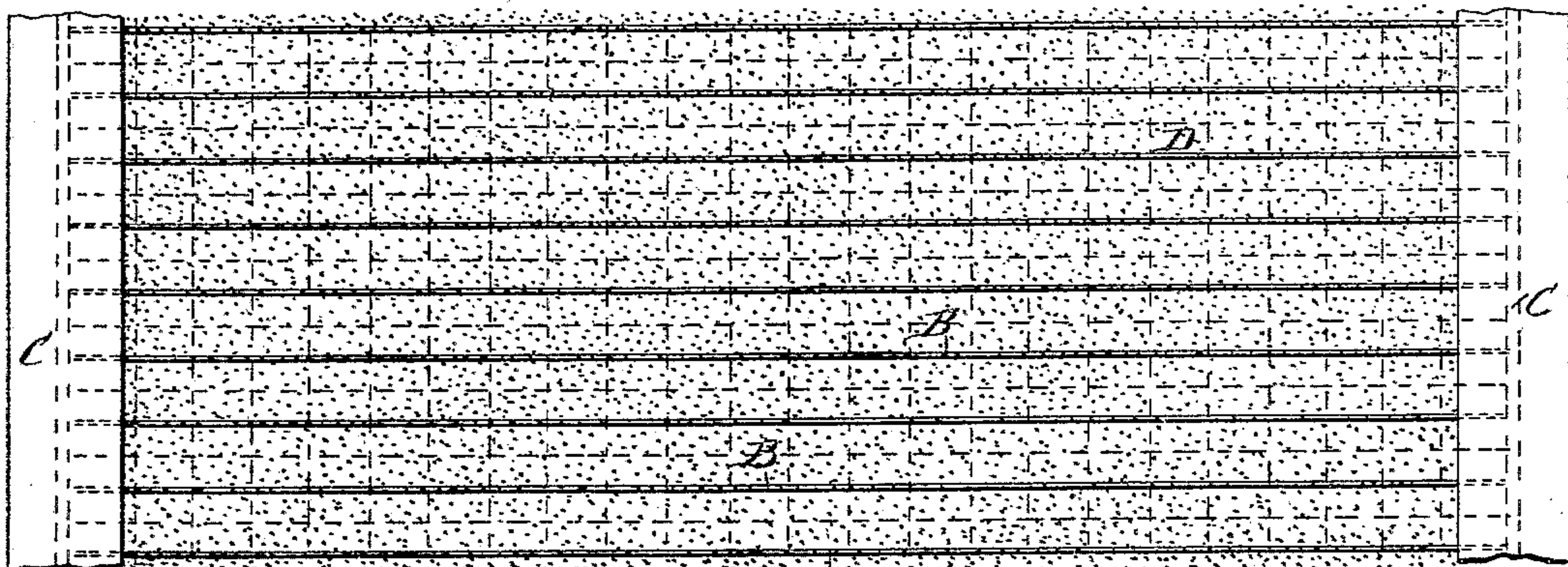
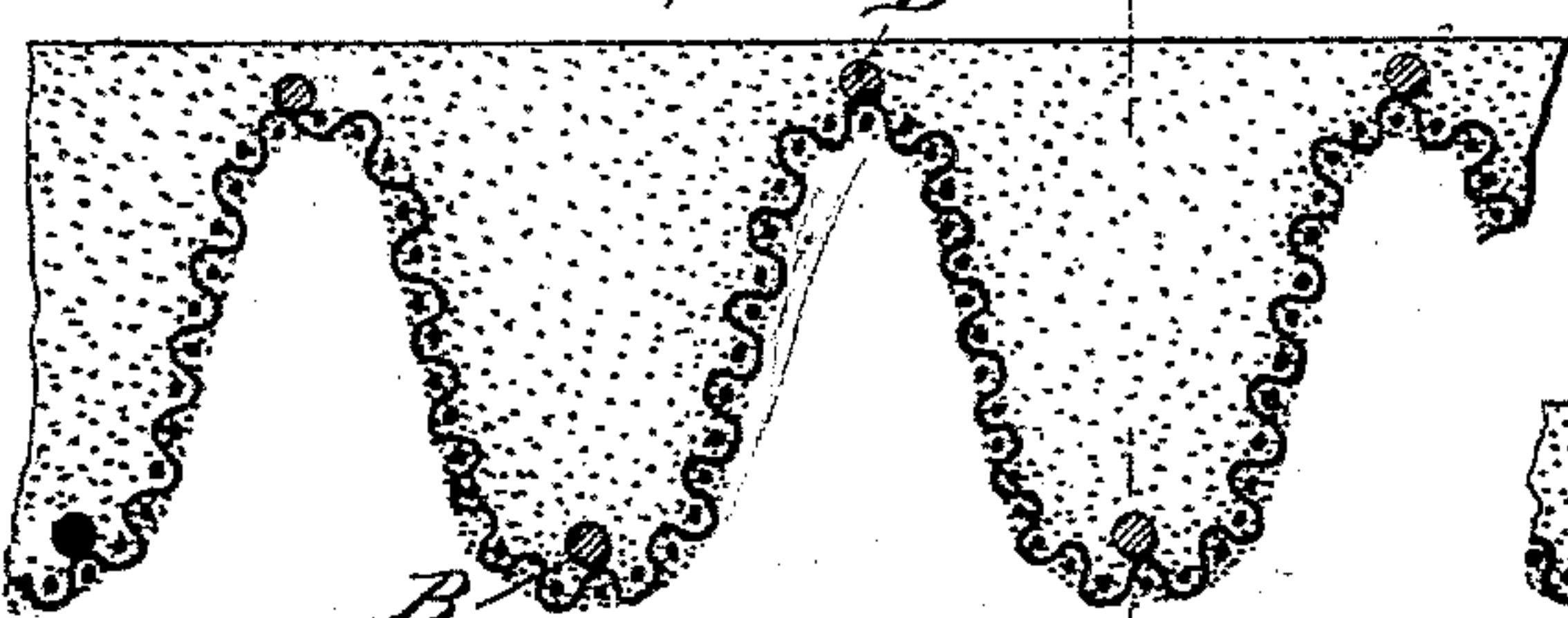


Fig 3

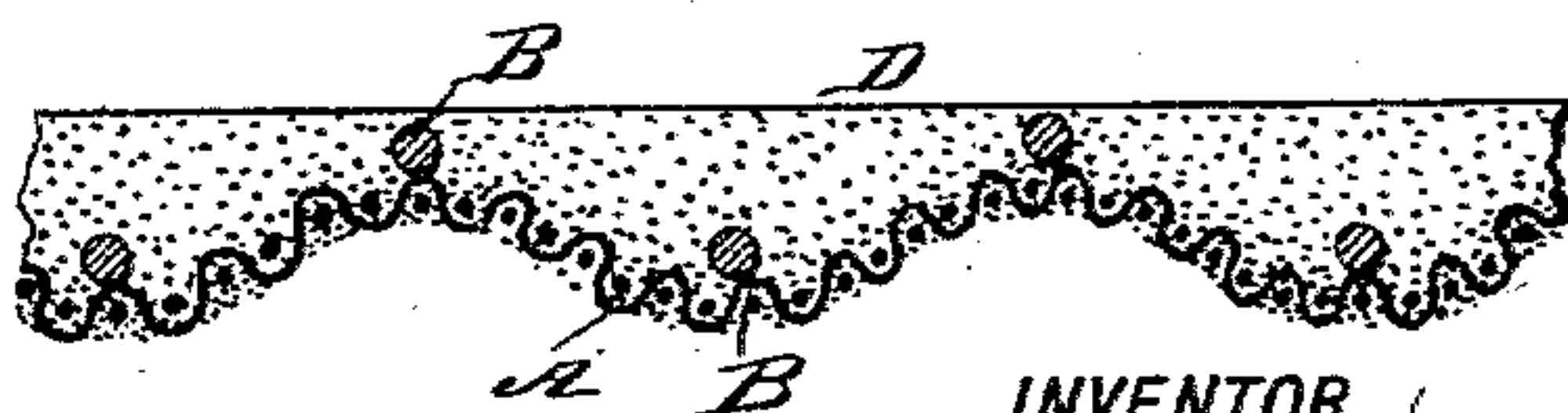


WITNESSES:

H. Walker

J. Acker

Fig 4



INVENTOR

F. Milliken

BY

Munn & Co

ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

F. MILLIKEN.

CONSTRUCTION OF ARCHES, PARTITIONS, &c.

No. 545,301.

Patented Aug. 27, 1895.

Fig 5

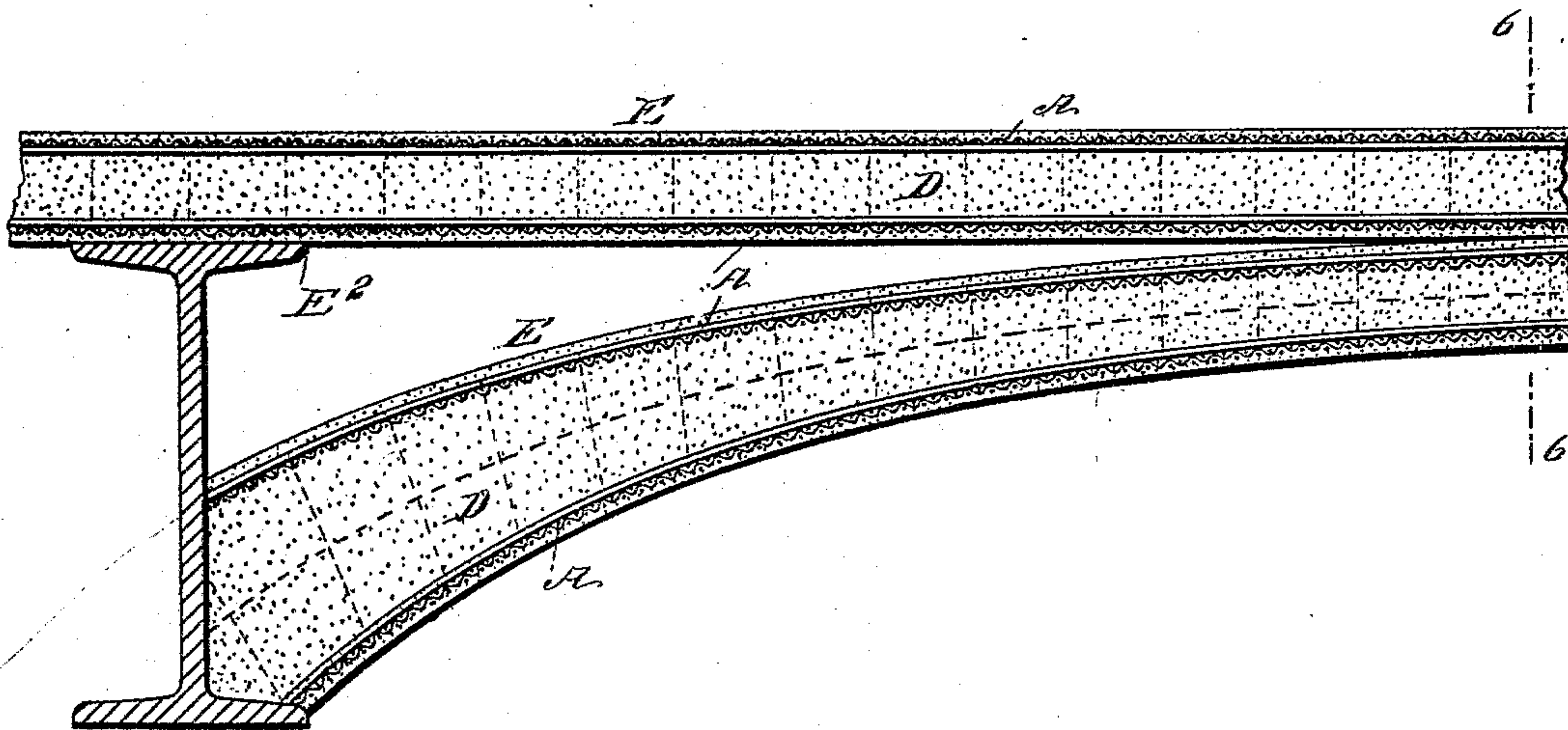


Fig 6

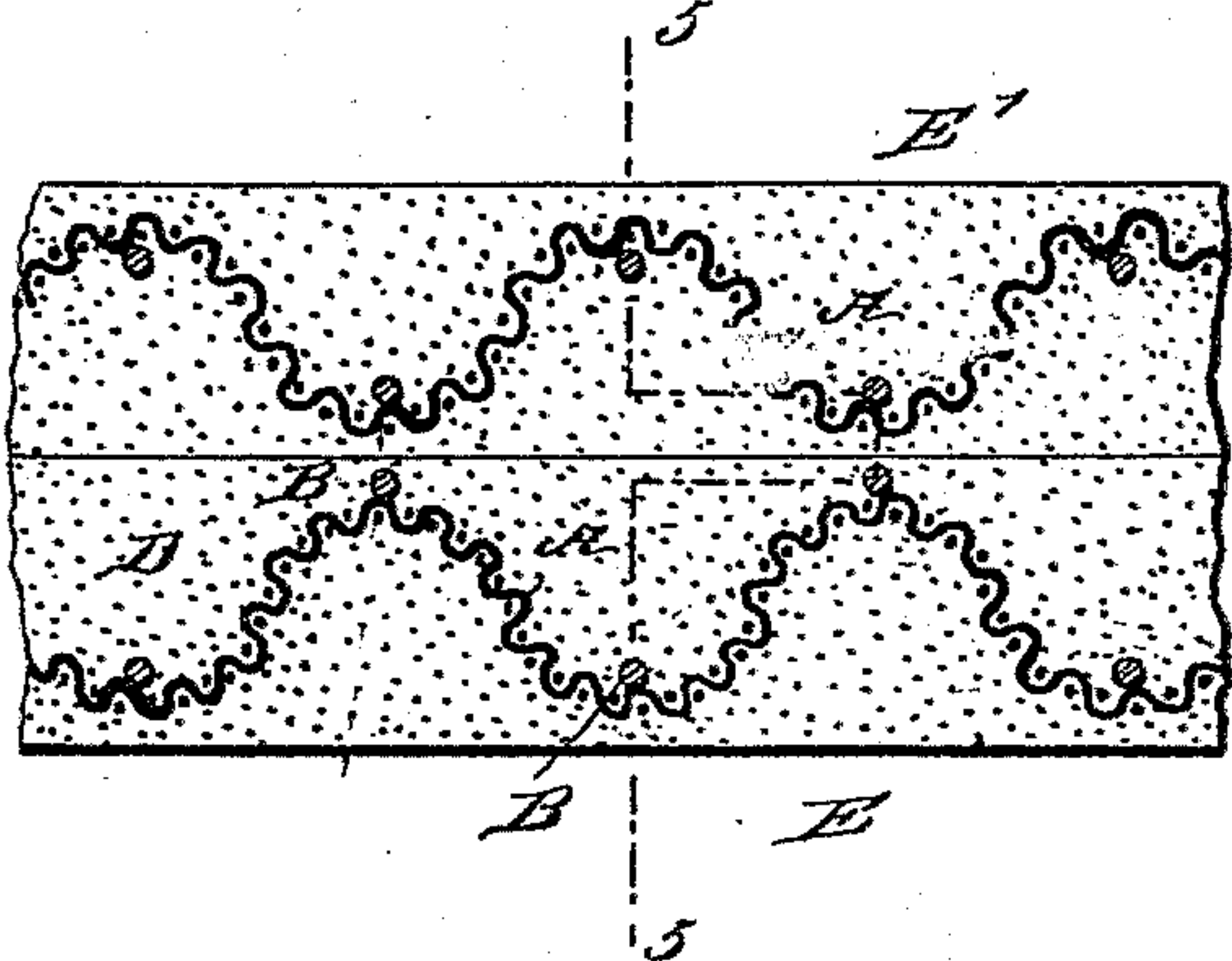


Fig 7

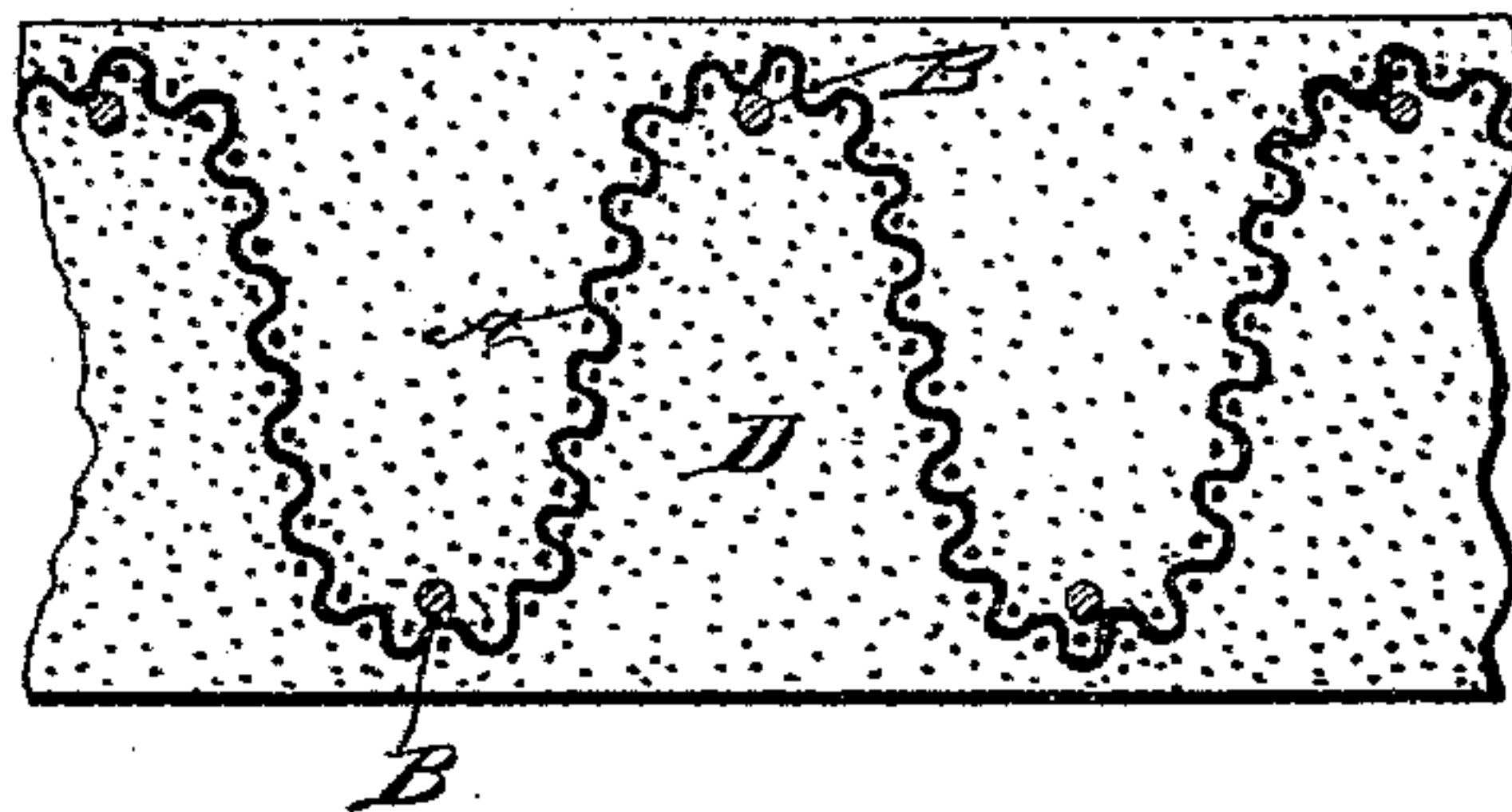
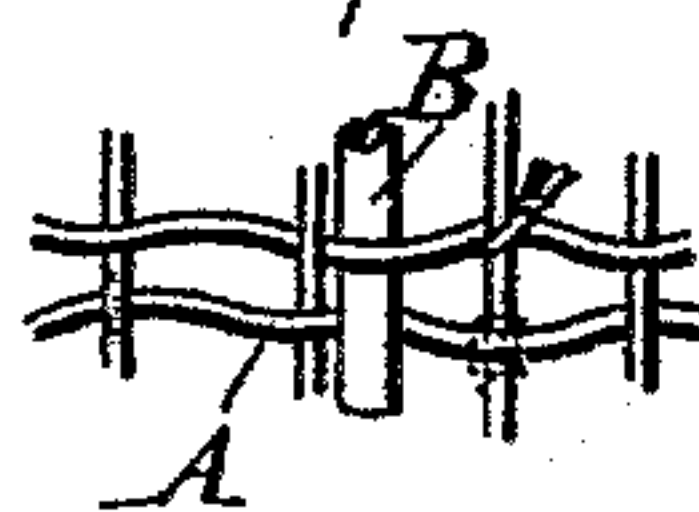


Fig 8



WITNESSES:

W. Walker
J. Reddick

INVENTOR

F. Milliken

BY

Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FOSTER MILLIKEN, OF NEW YORK, N. Y.

CONSTRUCTION OF ARCHES, PARTITIONS, &c.

SPECIFICATION forming part of Letters Patent No. 545,301, dated August 27, 1895.

Application filed November 9, 1894. Serial No. 528,295. (No model.)

To all whom it may concern:

Be it known that I, FOSTER MILLIKEN, of New York city, in the county and State of New York, have invented a new and useful
5 Improvement in the Construction of Arches, Partitions, Floors, &c., of which the following is a full, clear, and exact description.

This invention relates to the construction of arches, partitions, floors, &c.; and the object
10 of the invention is to provide a combination of cement and concrete with wrought-iron or steel which will develop the full strength of all of the materials.

The invention consists in the novel construction and combination of the several
15 parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification,
20 in which similar letters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal section of an arch constructed in accordance with my invention. Fig. 2 is a plan view thereof. Fig. 3 is a
25 transverse section taken at the buttress of the arch, preferably on the line 3 3 of Fig. 1. Fig. 4 is a similar section taken at the crown of the arch and practically on the line 4 4 of Fig. 1. Fig. 5 is a longitudinal section through
30 a combination of an arch and flooring constructed in accordance with my invention, the said section being taken substantially on the line 5 5 of Fig. 6. Fig. 6 is a transverse section taken on the line 6 6 of Fig. 5. Fig. 7 is
35 a longitudinal section of a partition or floor embodying the features of the invention. Fig. 8 is a detail view, hereinafter referred to.

The invention applies particularly to the construction of arches. Cement or concrete
40 in combination with iron for this purpose is not new; but a satisfactory plan has not yet been devised to make both of these materials act together so as to obtain their full carrying capacity.

45 The prime object of this invention is to develop the full strength of both of these materials. To this end I employ a wire-netting A or other form of perforated or reticulated metal in connection with stiffening-bars B,
50 which bars may be either round, square, T-shaped, angled in shape, I-shaped, or may be given any other cross-sectional form, and the

said stiffening-bars are either woven in or bound to the wire, as shown in Fig. 8, or to the reticulated or perforated metal-work employed, or they may be joined to such wire
55 by solder or the cement, as shown in Figs. 3, 4, 6, and 7. In the drawings the stiffening-bars are shown round in cross-section. The wire, since wire is preferably used, strengthened by the said bars, is corrugated, as illustrated, the corrugations being preferably V or U shaped; but they may be given other
60 contour, if desired. One of the strengthening-bars is located at the bottom of each descending corrugation, and in many cases another bar is located at the upper portion of each ascending corrugation, as is likewise fully shown. The entire corrugated sheet, formed
65 as above, is then curved or arched, when an arch is to be employed, as shown in Fig. 1, and is made to rest upon suitable beams C, adapted to support the buttresses of the arch. Preferably the corrugations are made deeper at
70 the ends or buttresses of the arch than at the crown, as shown in Figs. 3 and 4, one figure being a transverse section through the arch near the buttress and the other a section at the crown. The whole of this wire-netting and bar-work is then covered with cement or
75 concrete D. The cement covers the wire on top and is made substantially level at that point, while on the bottom it covers the wires and follows the contour thereof, being practically corrugated. However, as shown in Figs.
80 6 and 7, the bottom portions of the wires may likewise be covered, the cement or concrete entering into the ascending as well as into the descending corrugations, in which event a smooth or plain top and bottom surface is
85 given to the work, which is desirable in floorings, for example, and in partition-work.

A corrugated arch of any material, weight for weight, is stronger than a plain arch. Cement or concrete is good in direct compression,
90 but is weak in tension. A bar of iron will develop an enormous supporting capacity when supported so that it cannot deflect sideways. The under side of this arch will present a smooth surface, which will serve in place of
95 plaster, while the cement will protect the iron from fire, and the dead load is reduced to a minimum.

Upon examination of the cross-section of

the arch it will be found, considering it as a beam, that the upper flange will be in compression. It will likewise be noticed that there is an excess of cement on the upper portion, which is exactly as desired, as this portion of the arch must take compression, while the lower flange, which is in tension, is held by the iron, and, further than this, the corrugations tend to make a truss out of this iron. It may also be well to know that by this method it is impossible for the concentrated load not to distribute the concentrated effect, as the wire will cause all of the stiffening-rods to act. Since the stiffening-rods and corrugated wire are employed in the cement, they are practically supported their entire length from deflecting sidewise, and therefore they will develop their full carrying capacity, and the full value of both the cement and the iron is obtained. The cement will accomplish its part in direct compression, and in addition will hold the wire and rods in their proper position so that they can do a maximum amount of work.

In short spans work of the above construction can be used flat, without arching, as a board would be passed from the top of one beam to another; or a combination of an arch E and a flat section E' can be made, as illustrated in Fig. 5 in the drawings, leaving an air-space E², through which pipes for heat can be conducted. The foregoing construction can also be used for roofs, domes, sides of buildings, sidewalks, partitions in a building, pavements, vault-light work or coverings for pipes, and for the protection of piles. It can also be used in the forming of tanks, vats, barrels, &c.

In the event it should be desired to make the wirework especially strong and secure the wires from moving sidewise where they are woven, this may be done in many ways and

will add great strength to the structure. For example, the joints could be wrapped with wire, (see Fig. 8,) or they could be welded by electricity, or the entire wire-netting might be galvanized, and the galvanizing would make a soldered joint.

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

1. In the construction of arches, floorings, partitions, and the like, an apertured supporting material provided with open corrugations extending transversely from one support of the arch or other structure to the other, strengthening bars extending longitudinally of the open corrugations, at the apexes thereof, and a bedding of cement or concrete covering the said apertured material and filling the upwardly open cavities formed by the corrugations, substantially as described.

2. The herein described method of constructing arches, which consists in corrugating wire or like material, reinforcing the said corrugated material at its corrugations, bending the corrugated material to shape, the corrugations being less defined at the crown than at the buttress of the arch, and bedding the reinforcing material and the corrugated material with cement or concrete, as and for the purpose specified.

3. The combination with the beams or other supports, of the supporting material resting thereon and provided with corrugations extending transversely from one support to the other, the corrugations being less defined at the center than adjacent to the supports, and a suitable bedding upon the said material, substantially as described.

FOSTER MILLIKEN.

Witnesses:

E. H. MITCHELL,
W. W. WARD.