

Aúg. 23, 1927.

1,639,930

L. DAVIDSON  
ARCH OR TRUSS SHOE  
Filed Feb. 9, 1924

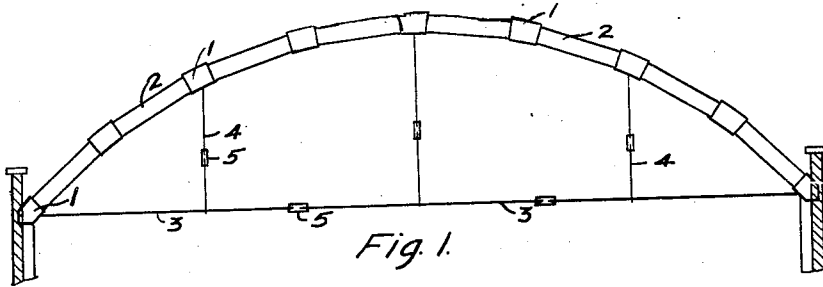


Fig. 1.

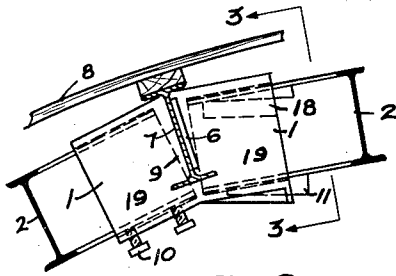


Fig. 2.

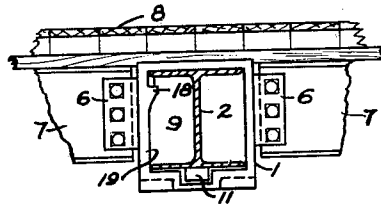


Fig. 3.

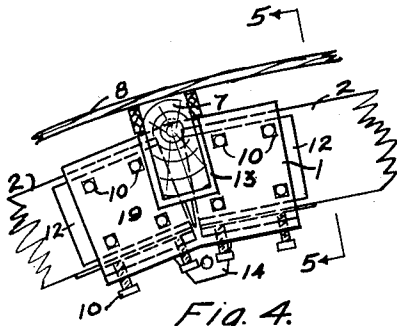


Fig. 4.

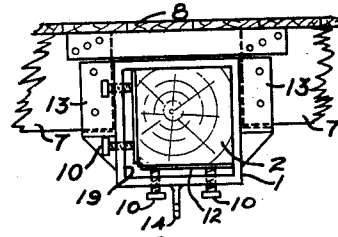


Fig. 5.

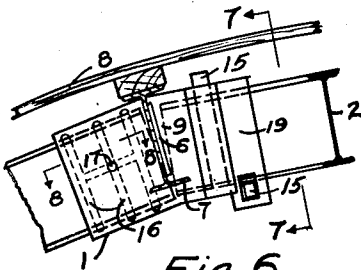


Fig. 6.

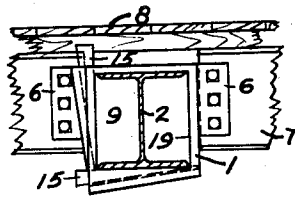


Fig. 7.

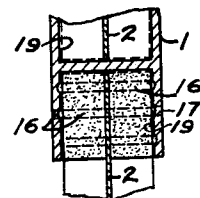


Fig. 8.

INVENTOR.  
*Louis Davidson*

# UNITED STATES PATENT OFFICE.

LOUIS DAVIDSON, OF NEW YORK, N. Y.

ARCH OR TRUSS SHOE.

Application filed February 9, 1924. Serial No. 691,586.

My invention relates to improvements in the shoes used in arch and truss construction, as disclosed in my patent dated January 15, 1924, No. 1,480,882, and its object is to take up the slack between the shoe and segment when the arch is assembled so as to prevent distortion to the arch, avoid secondary stresses during erection, and to insure that the arch will have the precise designed curvature when erected.

The slack is caused by the shoes being made large enough to receive the segments without any alteration.

The embodiments of the invention are illustrated in the accompanying drawing in which—

Fig. 1 is an elevation of a roof arch, and does not show the roof sheathing;

Fig. 2 is an elevation of shoe 1 shown in Fig. 1 and drawn to a larger scale, and shows the roof sheathing;

Fig. 3 is a transverse section of Fig. 2 on line 3—3;

Fig. 4 is an elevation of shoe 1 shown in Fig. 1 and drawn to larger scale, for a timber segment arch and timber purlins, and shows the roofing;

Fig. 5 is a transverse section of Fig. 4 on line 5—5.

Fig. 6 is an elevation of shoe 1 shown in Fig. 1, exhibiting the sheathing and slack taking up details differing from Fig. 2 and Fig. 4;

Fig. 7 is a transverse section of Fig. 6 on line 7—7;

Fig. 8 is a horizontal section of Fig. 6 on line 8—8.

Similar numerals refer to similar parts throughout the several views.

The connecting shoe is marked 1, and is preferably a casting into which arch segments 2 are placed. The shoes 1 are formed with relatively deep sockets 19, and the ends of the segments 2 are adapted to be inserted into said sockets. 3 is the tie rod to resist the horizontal thrust of the arch. 4 is a rod hanger and is used for the purpose of preventing sag in the horizontal tie rod. 5 are conventional turnbuckles. 6 is a lug on shoe 1 for the purpose of connecting the shoe to beam 7. 7 are beams to support the roof between the arches and deliver the loads to them. 8 is the roof sheathing and roofing supports. 9 is the diaphragm or partition in shoe 1 against which arch segments 2

bear. 10 are machine screws that are screwed through the shoe wall and firmly bear against the segments to take up the slack and prevent movement during erection and resist eccentric live load distortion. 11 are wedges that are used for the purpose of taking up the play between the shoe and the segment and prevent movement during erection. 12 are steel bearing plates against which machine screws 10 bear and are used to prevent the screws from biting into the wooden segment. 13 are seat supports for beam 7. 14 are lugs on the shoes for the purpose of connecting hangers 4 or other web members. 15 are wedges to take up the slack between the shoe and the segment and are inserted into the shoe at right angle to the length of the arch. 16 are grooves on the inside face of the shoe to permit of a liquefied substance circulating freely inside and around the segments for the purpose of preventing movement in the shoe when the liquid has solidified. 17 are holes in the shoe walls through which a liquefied filler is poured. 18 are shelve like projections in the shoes to engage wedging used to prevent movement of the segments inside the shoes. 19 are the sockets of shoes 1.

The segments used in arch construction whether steel I or H sections, or of timber, cannot for practical reasons be made to precisely the same size cross section every time. The steel as it is manufactured is permitted to come within a predetermined variation of the size of the theoretical cross section; and if it were practical to cut the timbers each time with mathematical precision they would not so remain because of seasoning resulting in the cross-section shrinking materially.

This invention is a practical means for overcoming difficulties the variations in cross section of segments introduce in an economical and expeditious manner, and assure a snug and tight fit at all times under all kinds of variations of cross section of the segments.

The shoes are always made slightly larger in cross section than is theoretically required, but to the true curvature of the arch, and the excess space is taken up by wedging or by screws being tightened up until they engage the segments in the shoe by contact, and the segments have taken the curvature of the shoe.

Where timber segments are used it is

advisable to insert a light steel plate between the ends of the screws and the segments to prevent the screws from biting into the segments. The object is to have the screws hold the segments firmly without digging into the segment so that when the segment takes its compression load in the arch it will be free to move and engage partition 9 if before erection in its final position it has not already done so.

Fig. 8 shows another method of taking up the slack. This method consists of temporarily closing the ends of the shoes with the segments inserted in place and filling the voids in the shoe with a liquefied substance like molten metal or cement and then permitting it to solidify. This method can be used alone, or in combination with the screw and wedging methods.

It will be observed that there are two wedging systems. One is where the wedging is driven in the direction of the length of the truss. The other the wedges are driven at right angle or substantially at right angle to the length of the truss. In the latter system the wedges are driven through perforations in the walls of the shoe sockets. The advantage in driving wedges at right angle to the length of the truss is that in assembling the truss a better contact fit of the segment against partition 9 is obtained with much less expenditure of energy; and also the danger of the wedges dropping after the arch is erected is eliminated.

Where wedging is used on timber segments a bearing plate similar to that shown for use with screws may be used.

In designing the details of the shoes extra metal is placed around the hole or the entire socket is made thicker to compensate for the reduction in strength due to the perforations.

It may be necessary to use a combination of these tightening methods, especially on long span arches, though combinations are not shown; but are plainly evident.

It is evident from the several figures shown that many modifications can be made, and I do not intend to be understood as limiting myself to the outlines and shapes shown in the drawing. The essential principles of my invention as illustrated in the accompanying drawing may be varied within the limits of the appended claims.

I claim as my invention:—

1. An arch or truss shoe having sockets therein into which the ends of segments may fit, means in the shoe which permit of the compression strains being transmitted from an end face of one segment to the end face of another without stressing the outer walls of the shoe, said sockets having connected walls for sustaining the vertical and horizontal strains which may be transmitted thereto by the ends of said segments, and means for taking up transverse play between the ends of said segments and said socket walls and resist bending and torsional strains on the arch.

2. An arch or truss shoe having sockets therein into which the ends of segments may fit, means in the shoe which permit of the compression strains being transmitted from an end face of one segment to the end face of another without stressing the outer walls of the shoe, said sockets having connected walls for sustaining the vertical and horizontal strains which may be transmitted thereto by the ends of said segments, and means for taking up transverse play between the ends of said segments and said socket walls and resist bending and torsional strains on the arch, said means comprising means projecting inwardly from the walls of said socket against said segments and bearing plates in the shoe against which the projecting means bear.

3. An arch or truss shoe having sockets therein into which the ends of segments may fit, means in the shoe which permit of the compression strains being transmitted from an end face of one segment to the end face of another without stressing the outer walls of the shoe, said sockets having connected walls for sustaining the vertical and horizontal strains which may be transmitted thereto by the ends of said segments, for receiving screws or wedges and means for taking up transverse play between the ends of said segments and said socket walls and resist bending and torsional strains on the arch, said sockets having openings adapted to receive screws or the like for engagement with the segments.

February 8, 1924.

LOUIS DAVIDSON.

**CERTIFICATE OF CORRECTION.**

Patent No. 1,639,930.

Granted August 23, 1927, to

**LOUIS DAVIDSON.**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, lines 96 and 97, claim 3, strike out the words "for receiving screws or wedges"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D. 1927.

Seal.

**M. J. Moore,**  
Acting Commissioner of Patents.