A. GOTTLIEB.

Bridge and Bridge Iron.

No. 230,185. Patented July 20, 1880.

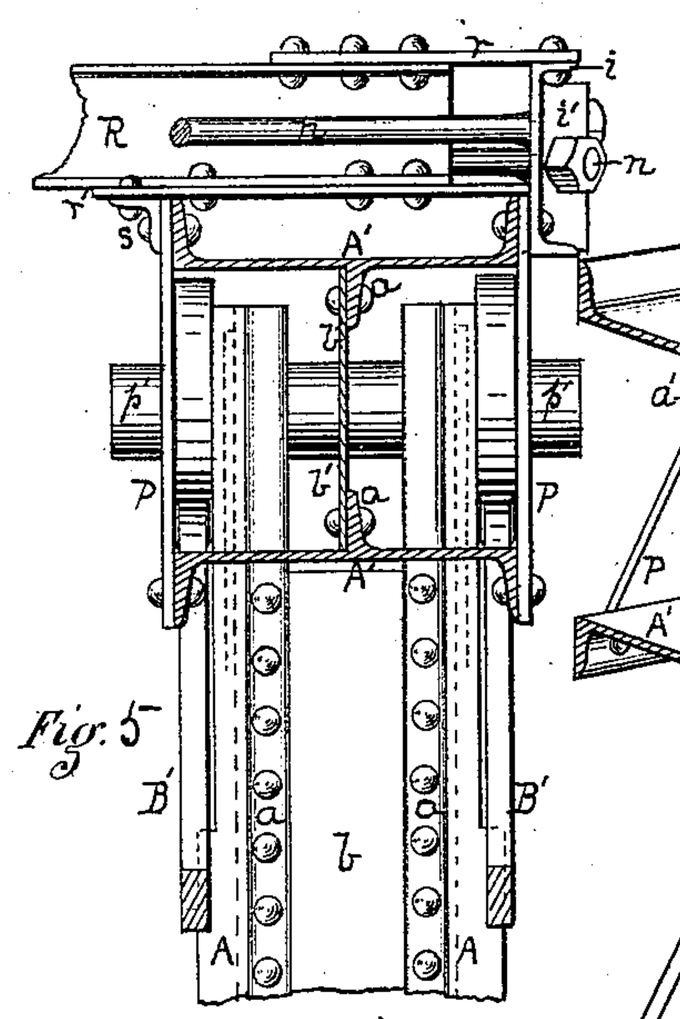

Fig. 5

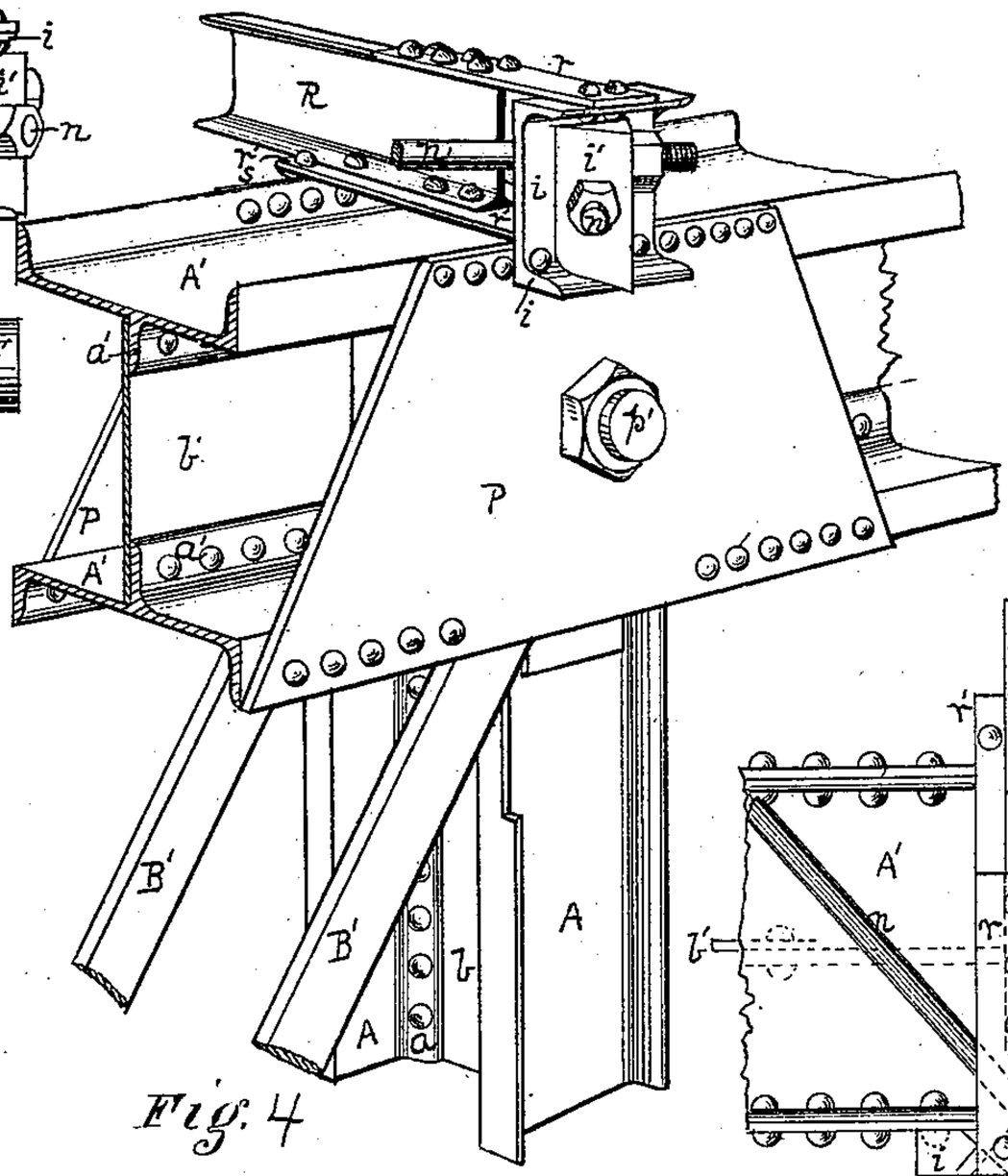

Fig. 4

Fig. 6

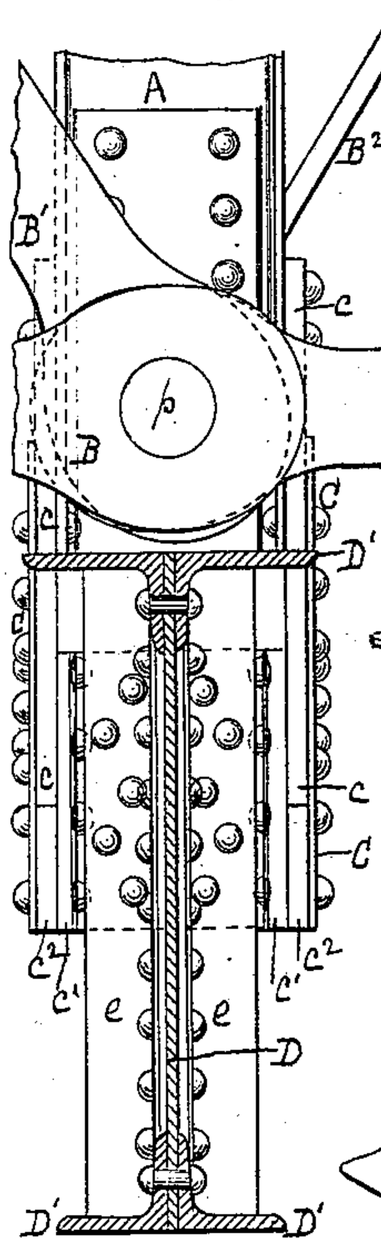

Fig. 2

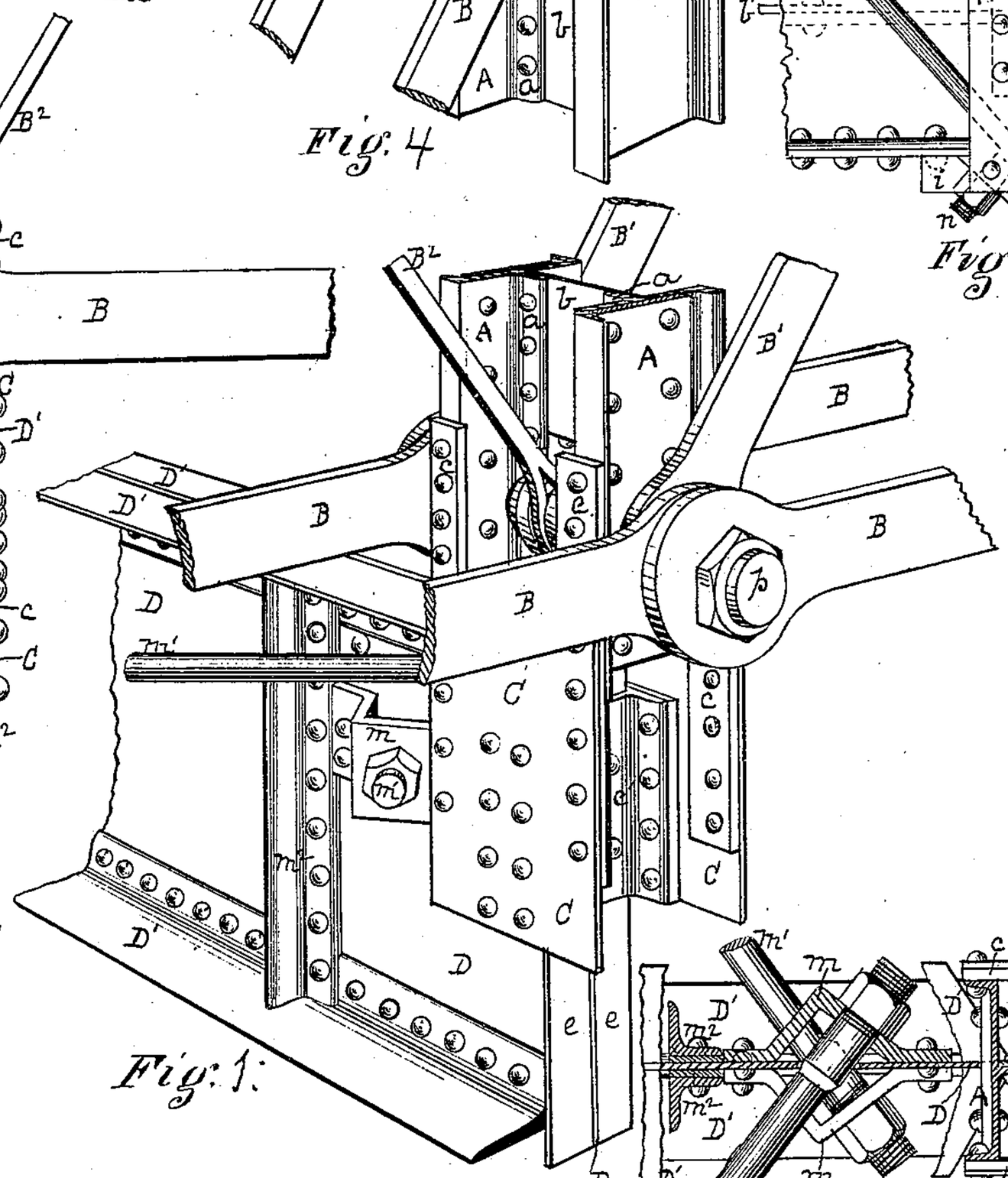

Fig. 1.

Fig. 3.

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BRIDGE AND BRIDGE-IRON.

SPECIFICATION forming part of Letters Patent No. 230,185, dated July 20, 1880.

Application filed January 24, 1880.

To all whom it may concern:

Be it known that I, ABRAHAM GOTTLIEB, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Bridges and Bridge-Irons; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a detached view, in perspective, of so much of the parts of a bridge-post, floor-beam, lower chord, and other connection for a panel-joint of a through-bridge as are necessary to illustrate one form of my invention. Fig. 2 is a vertical sectional view through the floor-beams, and transverse thereto, and showing from the inside the panel-post and connections in elevation. Fig. 3 is a transverse horizontal sectional plan view through the web of the floor-beam at the left-hand end and through the post above the level of the floor-beam at the right-hand end. Fig. 4 is a detached view, in perspective, showing portions of the upper end of the panel-post, the upper chord, and other panel-post connections. Fig. 5 is a sectional elevation of the same as formed by a plane passing in a direction transverse to the length of the bridge a little to one side of the post, and Fig. 6 is a top or plan view of the same.

My invention relates to an improved construction of bridge and bridge-iron, and may be applied either to a through-bridge—that is, one in which the the roadway is down at or near the level of the lower chord, or to a deck-bridge—that is, one in which the roadway is up at or near the level of the upper chord.

For convenience of illustration I have shown the improvements embodied in my invention as applied more particularly to a through-bridge, but will so far explain its other application as to enable skilled mechanics to construct the same.

The particular object I have in view is to provide an improved means of suspending or supporting the weight of the load which the bridge must carry at or from a point midway, or practically midway, between the diagonal main ties, so that such weight will be equally, or nearly equally, distributed thereon; and in so far as relates to the improved bridge-iron herein described, while I have shown the same as incorporated into the structure of a chord and a post, it may also be applied with useful result in any or all of the compression members of truss-bridges, and, in fact, in architectural structures generally.

Referring, first, to Figs. 1, 3, the panel-post represented has in its structure two channel-bars, A, each of a form which I believe to be new. In addition to the usual edge-flanges, which constitute them channel-bars proper, they have each a flange or rib, *a*, which extends lengthwise of the bar on its back or rear side, and at or about midway between its edges, and of such form (by preference) as to admit of the riveting thereto of a plate, *b*, or other suitable desired connection. This flange, which I shall term herein a "back" flange, is made in the rolling of the bar at the same time with the other two or front flanges and by substantially like means, with such modifications as are known to those skilled in the art. In this case the plate *b* terminates at such point at its lower end as to make provision for the insertion of the usual chord-pin *p*.

The bars A, through which the chord-pin passes, extend far enough below the same to give the desired strength at that point and upward to the desired height for connection with the upper chords, as shown in Fig. 4, and they may be strengthened by plates riveted in the channel. The usual lower chords, B, are connected with the chord-pin in the usual way. The usual main diagonals or ties B′ are also made from the chord-pins outside the posts to the upper chord-pins, as illustrated in Fig. 4; and the additional diagonal or counter-tie B^2, running in a reverse direction from at or near the middle of the chord-pin, may be added, if so desired.

In order, now, to provide means for suspending the ends of the floor-beams so that the strain of the weight or load shall come in a plane at or about midway between the main ties B′ B′, which are on opposite sides of the post, I make the connection of the floor-beam with the post substantially as follows: To each front flange of the bars A, I rivet a bar, *c*, of about the width of the flange, and extend

the same down far enough for the giving of a good and strong means of support to the plates C, which, in turn, extend down far enough for giving in secure form the connections presently to be described. These two plates C, at or toward their lower ends, I connect together by means of an I-beam, c', which is riveted to the plates C, as shown in Figs. 1 and 2; but as it is more convenient to manufacture such I-beams of the same width as the channel-bars A, I find it better to do so, and insert filling pieces or strips c^2 between the heads of the I-beam and the plates C. The I-beam c', it should be stated, is thus secured to the plates C in a plane at or nearly midway between the vertical channel-bars A, and as this I-beam gives the means of connection from the post with the floor-beam, the suspension-point of the latter is thereby brought midway between the main ties B′; and to make such connection I rivet two angle-irons, e e, to the inside face of the web of the I-beam c', and with their projecting flanges at such distance apart as properly to receive and be riveted to the end of the web D of the floor-beam, the latter being made up of the web D and top and bottom angle-irons, D′, of the desired size, form, and strength, with such additional elements as may be desired. The angle-irons e e are, by preference, as long as the web D is wide, so as to give a strong and secure connection, and the line or plane of suspension, support, and strain being in the plane of the middle of the chord-pin, or practically so, the same will be equally divided, or nearly so, between the inner and outer main ties, B′, and the same facts will be also true of the upper chord-pin and post, as will presently appear in connection with the description of Figs. 4, 5, and 6.

It is an important element of utility in the connection of the floor-beams with the posts, as thus described, that the permanence or perfection of none of them is dependent on the use of nuts or other detachable fastenings.

The facility with which nuts work loose and the ease with which they can be loosened by malicious persons, and the danger thus resulting from carelessness or malice are so great to both life and property as to enhance materially the value of a construction from which such elements of danger are wholly eliminated.

Wrought-iron lateral angle-blocks m, and lateral tie-rods m', with or without other known appliances, may be added, if desired, as also vertical angle-iron stiffening-bars m^2.

In making the connection described, I do not limit myself to exact identity of form in every case, but include herein as elements of such connection known forms which will give a like result—as, for example, angle-irons and channel-bars of the ordinary form may take the place of the filling-bars c and plates C.

Referring, now, to Figs. 4, 6, A represents the upper end of the same channel-bars of the same post as represented in Fig. 1 by the same letter, and with the same back flanges, a. The upper chord-pin is shown at p', and B′ B′ are the upper ends of diagonal ties, similar to those already referred to, but leading to the next post. The intermediate plate, b, which connects the post channel-bars, also extends up, but ends a little below the chord-pin p'. In these figures I have intended to illustrate the use of the improved channel-bar with back flange, as already described, in the manufacture of bridge-chords. Such a bar, forming part of a bridge-chord, is here lettered A′, and the back flange is marked a'. The two are connected by a longitudinal web, b', as already described in connection with the post, but which may terminate a little short of the chord-pin, or may extend continuously along, with a hole through the same for the chord-pin; and, as the upper end of the post extends up into the upper chord, it is obvious that in such case the lower channel-bar, A′, must end at the post. To make up for the decrease of strength thus occasioned in the upper chord, I rivet to each side of it the re-enforcing or splice plate P, and also, by means of the latter, provide bearings for the upper chord-pin. The upper channel-bar, A′, of this chord may be spliced or made continuous, as may be preferred or found necessary or desirable. The chords thus constructed extend from post to post through the bridge. Diagonal ties are added in any desired number or order from one chord to the other, and the usual cross-diagonals n n are also provided. In order to provide end supports to the latter, as well as for a cross-strut, R, I rivet to the upper edge of the outer side of the chord a short channel-piece, i, and support on it the gib-block i', through which the cross-diagonals n n pass.

The lateral or cross strut R consists of an I-beam secured at its ends to the top of the chord by plates r r', the upper plate, r, being riveted at one end to the upper flanges of the I-beam R and at its other end to the upper flange of the short channel-piece i. The lower plate, r', is riveted to the lower flanges of the I-beam R, abuts at one end against the back face of the channel-piece i, and at its other end is riveted to the lower flanges of the I-beam R, abuts at one end against the back face of the channel-piece i, and at its other end is riveted to one flange of a short angle-piece, s, Fig. 5, the other flange of which is riveted to the inside upper edge of the upper chord.

In deck-bridges thus constructed the floor-beams would take the place of the cross-struts R, but without the riveted connections described; and such floor-beams, in order that the downward strain may come equally on both ends of the chord-pins and be properly distributed, as already described, should be supported on blocks which rest on the upper channel-bar of the chord, midway between its opposite edges, or in a plane midway between the bearings of the chord-pin, or so near that point as to give practically the result indicated.

With the explanation thus given mechanics skilled in the art of bridge-building will have

no difficulty in utilizing the improved channel-bar described in the making of compression or supporting members of such structures generally, whether vertical, inclined, or horizontal, and whether known by the name of posts, columns, struts, girders, &c., and, in so far as such channel-bars provided with a back flange are useful for architectural or structural purposes generally, they are included herein as within the scope of my invention.

The improved bridge-iron described, consisting of a bar or plate having a flange on each edge of one side and a back flange or rib on the opposite or back side, about midway between the edges, and made solid therewith, while presenting, as is believed, novelty of form and construction, has the advantages of giving a double line of connections on one side and a single intermediate line of connection on the other side, without either the work or weakening effect of punching and riveting for attaching a back flange or rib.

The particular features of construction by which the combinations described are or may be applied in the construction of deck-bridges are not claimed herein, but are reserved for the subject-matter of a further application.

I claim herein as my invention—

1. A floor-beam connected with the web system of trusses by a rigid riveted connection in or near a plane midway between the bearing-points of the main diagonal ties, substantially as set forth.

2. In a floor-beam and post connection of bridges, the combination of bars *c c*, plates C, I-beam *c'*, and angle-irons *e e*, substantially as set forth, with reference to bringing the suspension-point of the floor-beams in a plane midway, or practically so, between the main diagonal ties.

3. The combination of upper lateral strut, R, and upper chord by means of plates *r r'*, channel-piece *i*, and angle-piece *s*, substantially as set forth.

4. As an improved element for bridge and other structures, the channel-bar A, having back flange, *a*, made as a part thereof and at or about midway between the edges of the back face, substantially as set forth.

5. In the structure of compression members of bridges and other structures, channel-bars A or A', having each a back flange, *a* or *a'*, made as a part thereof, in combination with plate *b* or *b'* riveted thereto, substantially as set forth.

6. In a bridge-chord, the combination of channel-bars A', having each a back flange, *a'*, plate *b'*, and re-enforce or splice plate P, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ABRAHAM GOTTLIEB.

Witnesses:
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C. L. PARKER.