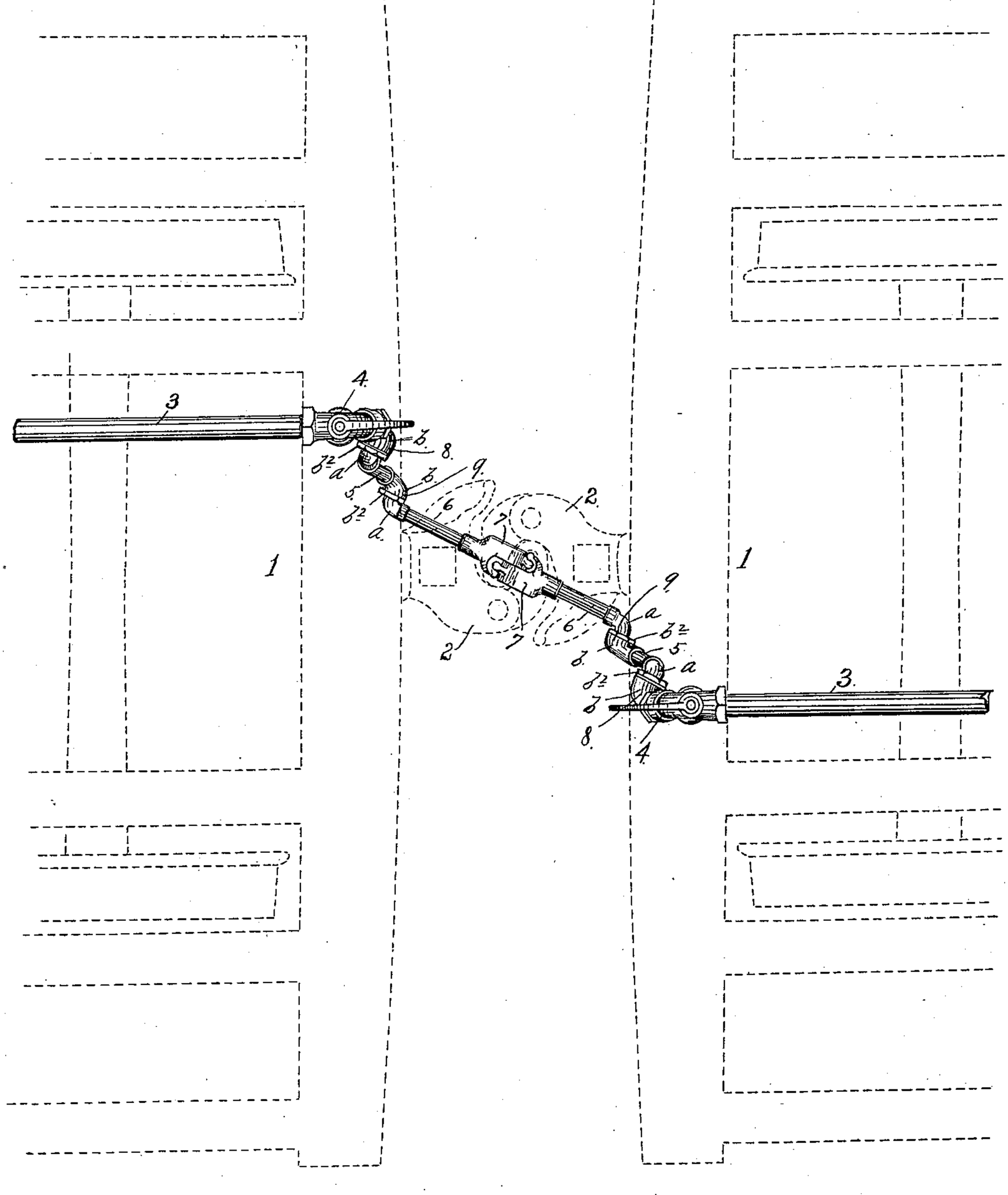
(No Model.) 3 Sheets—Sheet 1.

H. H. VAUGHAN & J. O. PATTEE.

BALL JOINT FOR BRAKE COUPLINGS OR OTHER USES.

No. 605,939. Patented June 21, 1898.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

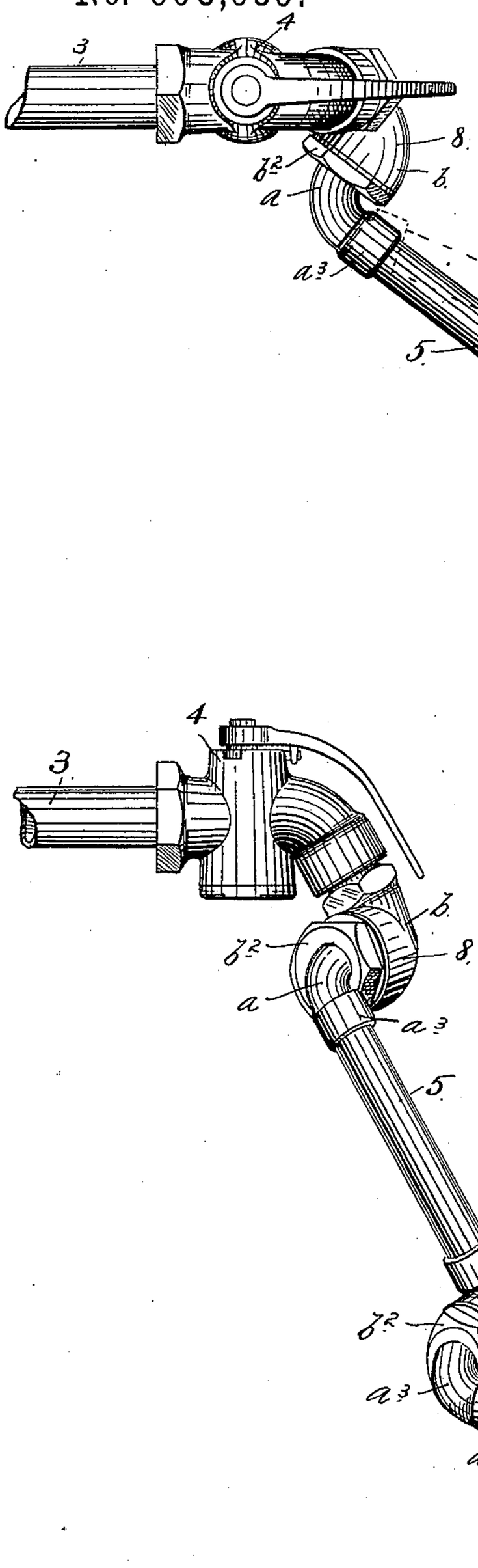

Fig. 3.

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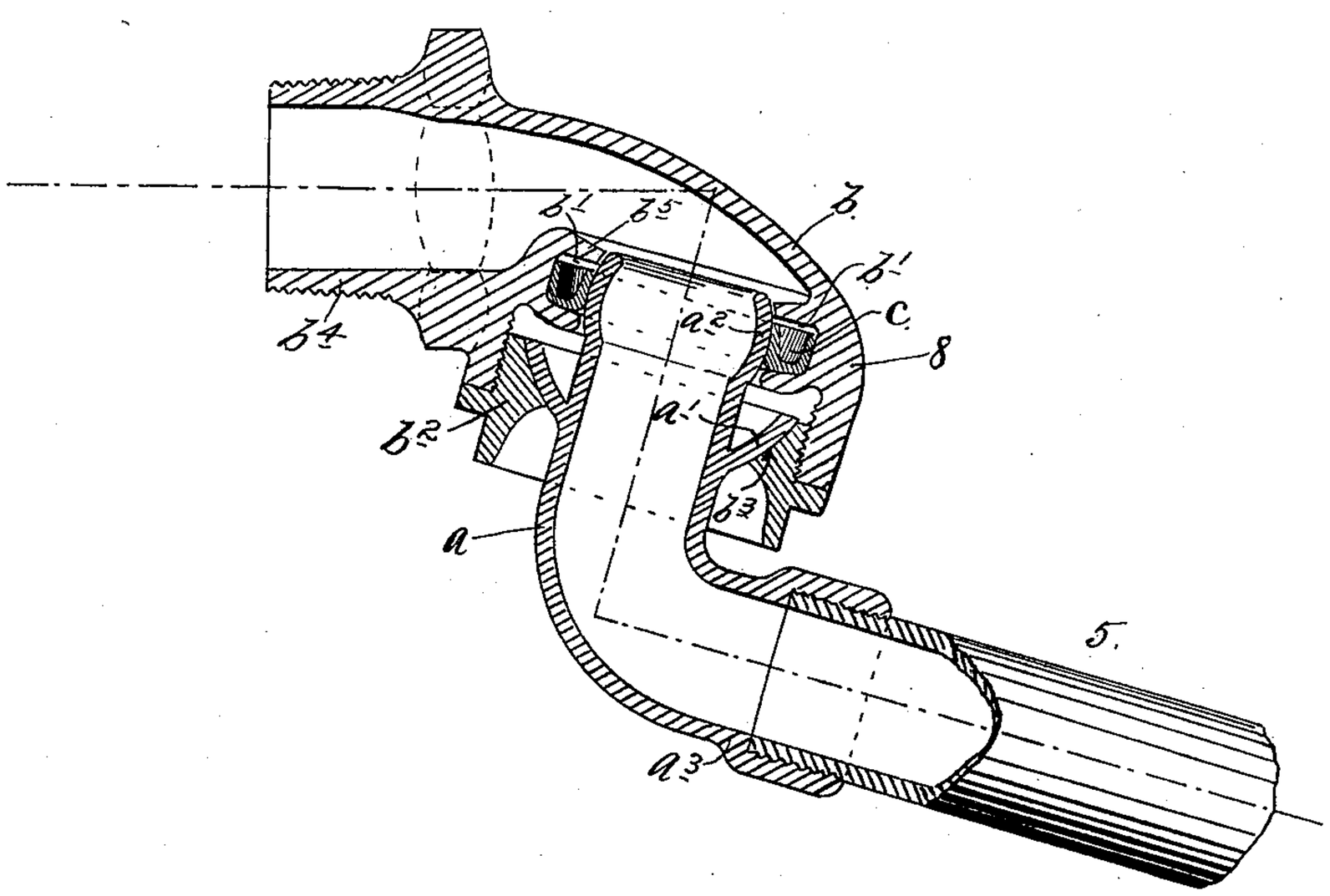
Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY H. VAUGHAN AND JOSEPH O. PATTEE, OF ST. PAUL, MINNESOTA.

BALL-JOINT FOR BRAKE-COUPLINGS OR OTHER USES.

SPECIFICATION forming part of Letters Patent No. 605,939, dated June 21, 1898.

Application filed October 29, 1896. Serial No. 610,493. (No model.)

To all whom it may concern:

Be it known that we, HENRY H. VAUGHAN and JOSEPH O. PATTEE, citizens of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Ball-Joints for Brake-Couplings or other Uses; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to ball-joints and coupling connections for brake-pipes and other uses, and has for its object to improve the same with a view of increased efficiency.

To this end our invention consists of the novel features hereinafter described, and defined in the claims.

The invention is illustrated in the drawings as applied to brake-pipes, wherein, like notations referring to like parts throughout the several views—

Figure 1 is a plan view, partly in diagram lines only, showing our improved coupling connections for brake-pipes as they would appear related when in their coupled or working position on the cars. Fig. 2 is a plan view of the left-hand set of connections shown in Fig. 1 detached. Fig. 3 is a view of the same, chiefly in side elevation, but partly in perspective, or as the same would appear when looking from the side of the car; and Fig. 4 is a detail, partly in section and partly in elevation, showing the preferred form of our improved joint and the peculiar nipple or fitting which is used on one member of the joint which connects the primary section of the coupling-pipes to the angle-cock or fixed pipe-section on the car.

Referring to Fig. 1, the numeral 1 represents the facing ends of the two cars, and the numeral 2 the car-couplers in dotted lines, as the said parts will appear when the cars are coupled together.

The numeral 3 represents the brake-pipe sections, which occupy a fixed position on the car, and 4 are the so-called "angle-cocks" at the outer ends of the pipe 3. Except when otherwise noted in the further discussion, the angle-cocks 4 will be regarded as parts of the pipe-sections carried in a fixed position on the cars. It is well known, of course, that the said fixed pipe-sections carried on the car are disposed lengthwise thereof and are located on opposite sides of the center line of the car, at the opposite ends of the same, so that the facing ends of any two sets of the said pipes on a pair of coupled cars will be on opposite sides of the car-couplings or center line of the two cars. The brake-pipe couplings therefore take an angular position in respect to the center line through the two cars, and, as is well known, the said coupling connections when made up of metallic pipe-sections must be mounted with freedom for oscillation in the horizontal plane to provide for the lateral motion of the cars, &c., and must be of such construction as to be extensible and contractible to provide for the spreading motion between the two cars and for the coupling and uncoupling action and the up-and-down motion of one car in respect to the other. To meet this latter function, the coupling connections are made up of pipe-sections connected by proper joints, which will permit the said sections to swivel and coöperate like toggle-levers in the vertical plane.

Hitherto it has been found difficult to provide a joint for the pipe-sections which would be sufficiently free and nevertheless remain air-tight under the service. Ball-joints were used, but in these joints the packing was applied to parts which were subject to the wear and tear as bearing-surfaces. Hence as the bearing-surfaces would wear away the packing would become imperfect and the joint would leak.

One object of our invention is to provide a ball-joint wherein the bearing-surfaces and the packing-surfaces are entirely independent. Otherwise stated, the packing and the joint-surface packed thereby do not act as bearing-surfaces. The bearing-surfaces are not packed, and the latter do not come into abrading contact with the former. In the preferred form of our joint the construction is such that neither of the two coöperating bearing-surfaces can ever even touch the packing or the packed surface of the joint under the working movements of the parts. In virtue of this improvement the joint may

be free and, nevertheless, be kept tight by the packing for a great length of time under the service.

As another feature of our invention certain of our ball-and-socket joints are of such a special construction as to permit the same to be used at the angle-cocks or fixed pipe-sections on the car, while, nevertheless, permitting the necessary movements of the coupling connection. Otherwise stated, on such of our joints as are to be used at the angle-cocks the member connecting with the angle-cock is provided with a nipple for that purpose which is set at an acute angle to the axis of the joint, and hence complete rotary movement is permitted in the vertical plane, and a limited oscillation is permitted to the couplings in the horizontal plane, and this oscillation is equal on both sides of a vertical plane passing through the two angle-cocks or the normal line of said coupling connections when in working position on the cars. This is an important improvement or simplification in the construction for securing the said results.

The numerals 5 and 6 represent, respectively, the two metallic pipe-sections used as part of the coupling connections. The numeral 7 represents the ball-and-socket joint which connects the section 5 to the angle-cock 4 or fixed pipe-section on the car. The numeral 9 represents the ball-and-socket joint connecting the sections 5 and 6 and differs from the joint 8 only in a certain detail, which will be hereinafter noted. Directing attention to Fig. 4, which illustrates the joint numbered 8 in the other views, the ball member a of the joint is provided with two concentric spherical surfaces a' and a^2, the former of which is shown as in the nature of a flange and the latter of which is shown as formed at the open end of the ball. It will be seen that these two surfaces a' and a^2 are separated or spaced apart from each other. The socket member b of the joint is provided with a groove or seat b', formed in the inner wall of the same and opening toward the other or ball member a of the joint. In the said groove or seat b' is mounted a cup-shaped packing-ring c, of elastic or flexible material, in position to bear against the surface a^2 on the other or ball member of the joint. The socket b is also provided with a nut-section b^2, having a bearing-surface b^3 of concave form, which coöperates with the bearing-surface or flange a' on the ball when the parts are in working position. The socket member b is also provided with a nipple b^4 for connection with the angle-cock 4 or fixed section of pipe on the car. In said Fig. 4 the parts are represented partly in plan, but chiefly in central section through the joint members, when the ball member is turned so that the nipple a^3 thereof is in line with the nipple b^4 of the socket member b or substantially as the said parts would be related when in the position shown in Fig. 3. By inspection of this view, Fig. 4, it will be seen that the ball member is free for a large rotary or swiveling movement in respect to the socket member b in the vertical plane for the toggle action of the coupling connections, while at the same time the said ball member is free for a limited oscillation at right angles to the plane of its said swiveling or rotary movement, as required to permit the oscillation of the coupling connections in the horizontal plane. This oscillating motion is a limited one, for it is obvious that the spherical surface or flange a' on the ball a would strike the lower wall of the groove or ring-seat b' of the socket, so as to thereby limit the said oscillation of the ball-joint in either direction. For brake-coupling connections, however, this range of oscillation only need to be a limited one, and the clearance or freedom for this purpose in the construction shown in Fig. 4 is quite sufficient. It will be seen that the bearing-surface a' on the ball a never comes in contact with the packing-ring c, and what may be called the "packing-surface" a' on the ball never comes in contact with the bearing-surface b^3 of the socket. Hence the elastic packing-ring c has always got a true spherical surface to bear against, and a tight joint may therefore be readily maintained. No difference what the wear and tear may be between the bearing-surfaces a' and b^3 of the ball-and-socket members the packing-ring c and the packed surfaces of the joint will be unaffected thereby. It will also be noted that the packing-ring c and the seat for the same in the socket b are of such construction as to permit the pressure from within the pipes to be available on the said ring for packing the joint. As shown in Fig. 4, the seat b' for the ring c is formed by internal flanges b^5, of such radial extent only that they do not touch the packing-surface a^2 on the ball when all the parts are in proper position and the pressure is on. It will also be noted that inasmuch as the bearing-surface b^3 of the socket member b is formed on the nut-section b^2 of the socket the bearing-surfaces a' and b^3 may be readily adjusted whenever so required, and the joint members may be readily separated by simply removing the nut b^2. It is also obvious that when the joint members are separated the elastic packing-ring c may be readily entered into its seat b'.

The nipple b^4 on the socket member b of the joint shown in detail in Fig. 4 and marked with the numeral 8 in Figs. 1, 2, and 3 does not extend at right angles to the axis of the ball-and-socket joint, but is disposed at any acute angle to the axis of said joint, as clearly shown by the center lines (dotted) in Fig. 4. In virture of this disposition of the nipple b^4, which connects the socket member b of the joint a to the angle-cock 4 or fixed pipe-section on the car, the coupling connections will, when in working position and coupled up, stand as shown in Fig. 1, and the said couplings or coupling connections will be free for oscillation in the horizontal plane to an equal

extent on either side of a vertical plane drawn through the two angle-cocks or normal line of the said couplings. Otherwise stated, the angle of oscillation will be equal on either side of said vertical plane through the angle-cocks when the socket member *b* is applied to the angle-cock, so that the axis of the joint is horizontal, as required for the rotary or swiveling movement of the joint members and the toggle action of the coupling connections in the vertical plane.

It will be understood, of course, that the principle involved in our improved joint is capable of many modifications in the details of the construction.

It should be noted that the modification illustrated in Figs. 5 and 6 is not the full mechanical equivalent of our preferred construction shown in the other views, especially in Fig. 4. The preferred form (best shown in Fig. 4) permits the surface on the ball, which coöperates with the packing in the socket, to be of but slightly larger diameter than the diameter of the pipe for which the joint is suitable, while the bearing-surface of the ball may be formed on a sphere of any desired radius for coöperation with the bearing-surface on the socket without thereby increasing the pressure to be withstood or taken by said bearing-surfaces. The pressure taken on the bearing-surfaces is simply that due to the interior fluid acting on a circular area equal in diameter to the external diameter of the spherical packed surface. Hence as this is independent of the radius of the bearing-surfaces the pressure on the latter may be reduced to any amount per square inch desired by simply varying the radius of the said bearing-surfaces. This statement would not apply to the modification shown in Figs. 5 and 6, and hence the latter is not the full mechanical equivalent of the preferred construction. (Best shown in Fig. 4.) It must be obvious that the construction shown may be reversed in respect to the relation of the bearing-surfaces, the packing-ring, and the packed surface as to the two members of the joint without departing from the principle of the invention.

From the illustrations given it is obvious that we have provided a joint which is particularly well adapted for the purposes had in view, and it will be understood that although the same was especially designed for use in metallic brake-pipe couplings the said joint is capable of general application wherever the corresponding functions are required.

What we claim, and desire to secure by Letters Patent of the United States, is as follows:

1. A ball-and-socket joint constructed for a limited oscillation, one member of which has two concentric spherical surfaces of different radii, which are acted on, respectively, by a packing and a bearing surface carried by the other joint member, with said packing and the joint-surface packed thereby located inward of said bearing-surfaces, substantially as and for the purposes set forth.

2. The ball-and-socket joint comprising the ball member having the two concentric spherical surfaces a' and a^2 separated from each other with the latter inward of the former, the socket member having the ring-seat or groove b', the packing-ring *c* seated in said groove and bearing against said surface a^2 on the ball member, and the nut b^2 forming part of the socket member and provided with the bearing-surface b^3 for coöperation with said surface a' on the ball member, all substantially as described.

3. In metallic brake-pipe coupling connections, a ball-joint uniting the angle-cock or fixed car pipe-section to the primary or adjacent section of the coupling-pipes through a nipple or fitting on one member of said joint set at such an angle to the axis of the joint that, when the pipes are coupled together, in working position, the angle of oscillation of the couplings will be substantially equal on either side of the vertical plane through the two angle-cocks or the normal line of said coupling connections, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY H. VAUGHAN.
JOSEPH O. PATTEE.

Witnesses:
JAS. F. WILLIAMSON,
BESSIE B. NELSON.