

No. 707,547.

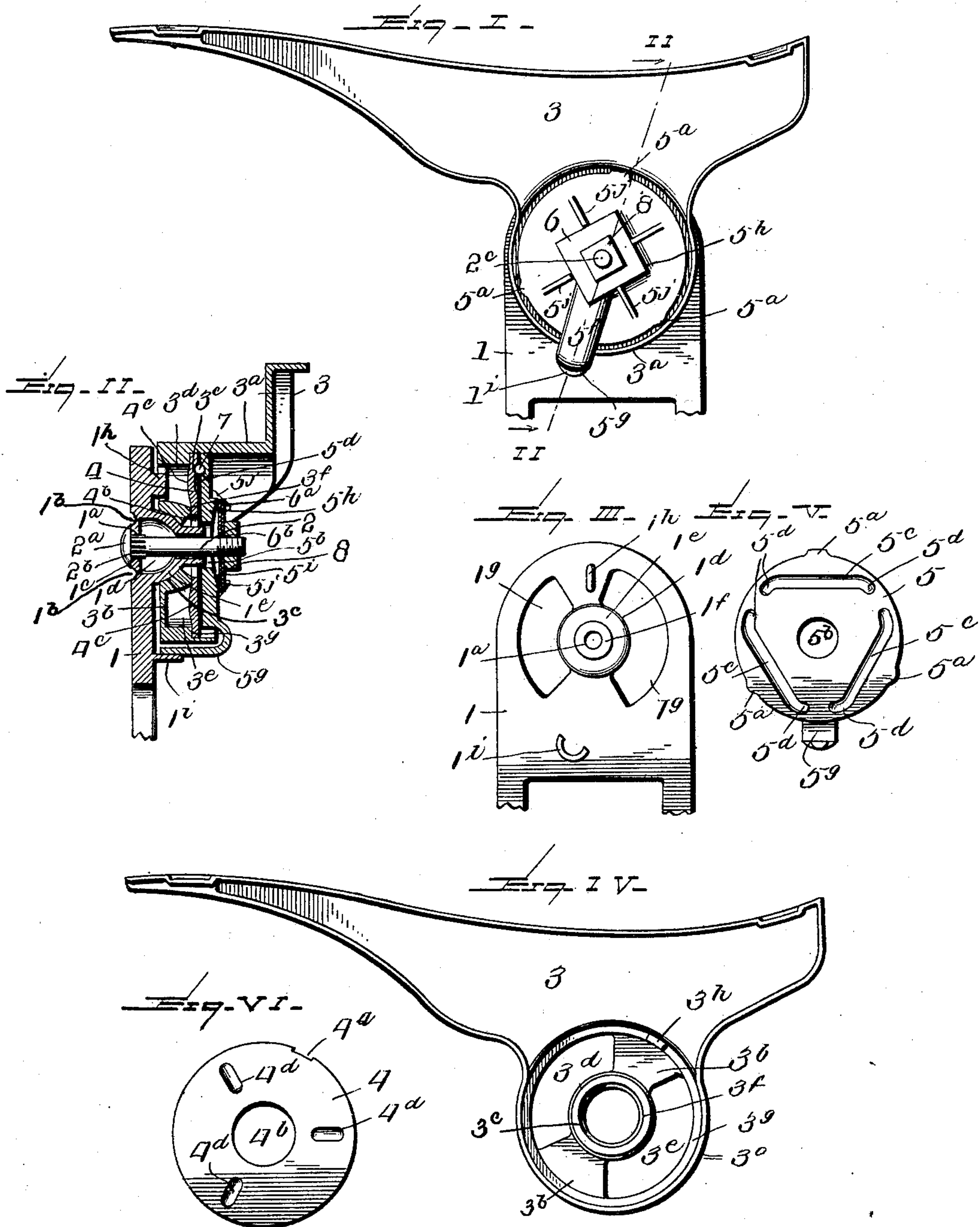
Patented Aug. 26, 1902.

F. S. BROOKE.  
HINGE JOINT FOR SEATING.

(Application filed May 5, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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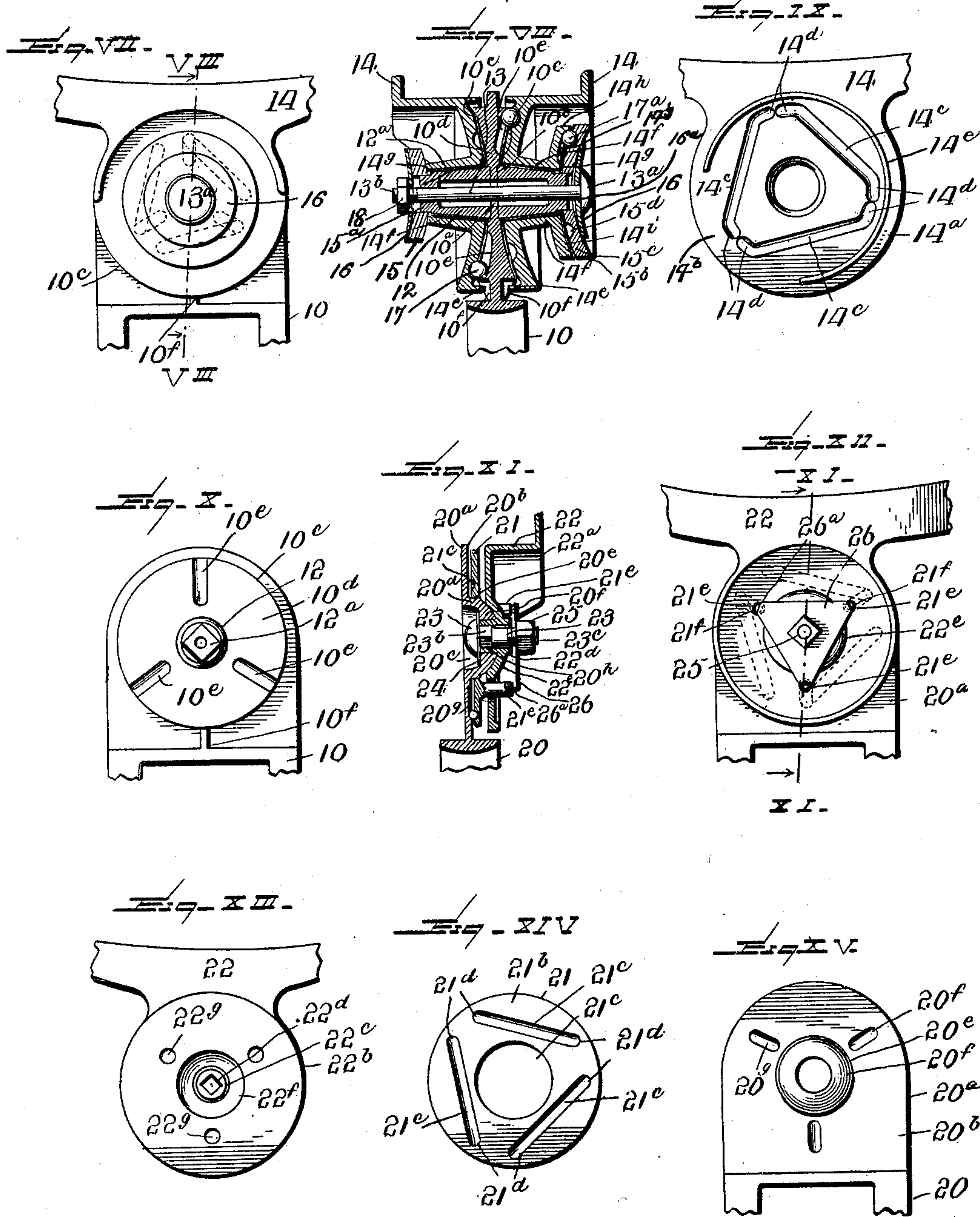
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# UNITED STATES PATENT OFFICE.

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## HINGE-JOINT FOR SEATING.

SPECIFICATION forming part of Letters Patent No. 707,547, dated August 26, 1902.

Application filed May 5, 1902. Serial No. 105,950. (No model.)

*To all whom it may concern:*

Be it known that I, FINLEY S. BROOKE, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Hinge-Joints for Seating, of which the following is a specification.

My invention has for its object improved means for lessening the friction between the bearing-faces of the members of a hinge-joint for seating and also to provide means for the cushioning of the seat-bracket at the end of its movement in either direction in raising and dropping the seat; and it relates particularly to those hinge-joints for seating of all kinds in which antifriction ball-bearings are employed.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects are attained, as hereinafter described and claimed.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure I is a side elevation of my improved hinge-joint for seating applied to an end standard. Fig. II is an axial section thereof, taken on the line II II, Fig. 1, looking in the direction of the arrows. Fig. III is a side elevation of the upper end of the seat-standard. Fig. IV is a side elevation of the seat-bracket. Fig. V is a view of the outer fixed member of the hinge-joint looking at the inner side thereof. Fig. VI is a view of the inner movable member of the hinge-joint looking at the outer side thereof. Fig. VII is a side elevation of hinge-joint applied to an intermediate seat-standard, showing a modification. Fig. VIII is a vertical section thereof, taken on the line VIII VIII, Fig. VII, looking in the direction of the arrows. Fig. IX is a view of the seat-bracket looking at the inner side thereof, showing the outer movable member of the hinge-joint formed thereon. Fig. X is a side elevation of the upper end of the intermediate seat-standard, showing the inner fixed member of the hinge-joint formed thereon. Fig. XI is a vertical

section of a hinge-joint applied to an end standard, taken on the line XI XI, Fig. XII, looking in the direction of the arrows and showing another modification. Fig. XII is a side elevation thereof. Fig. XIII is a view of the seat-bracket looking at the inner side thereof. Fig. XIV is a view of the outer movable member of the hinge-joint looking at the inner side thereof. Fig. XV is a side elevation of the upper end of the seat-standard, showing the inner fixed member of the hinge-joint formed thereon.

Referring to Figs. I to VI, inclusive, 1 represents the upper end of an end seat standard or support formed integral with a serrated bolt hole or opening  $1^a$  and an annular groove  $1^b$  surrounding the bolt-hole on the outer side of the seat-standard, providing an annular seat  $1^c$  for the head  $2^a$  of a securing-bolt 2, having a serrated neck  $2^b$  fitting in the serrated bolt-hole  $1^a$ , and thus locking the bolt to prevent it rotating. The inner side of the standard 1 has formed integral therewith a hollow boss  $1^d$ , surrounding the bolt-hole  $1^a$  and having an inner convex part  $1^e$  and a cylindrical outer part  $1^f$ .  $1^g$  represents segmental openings on opposite sides of the hollow boss, whereby access may be gained to the hinge-joint for the purpose of lubricating it. On the seat-standard, above the hollow boss, is formed a stop-lug  $1^h$ , and on the standard, beneath the hollow boss, is formed a recessed lug  $1^i$ . 3 is a seat-bracket constructed with a circular housing  $3^a$ , having a web  $3^b$ . This web is formed on its inner side with a concave socket  $3^c$ , receiving and fitting the inner convex part  $1^e$  of the hollow boss  $1^d$ , and with segmental openings  $3^d$   $3^e$  on opposite sides of the socket  $3^c$ , the stop-lug  $1^h$  projecting into the segmental opening  $3^d$  for restricting the movement of the seat-bracket. The outer side of the web of the housing is formed with a thimble  $3^f$  and an annular shoulder or seat  $3^g$ , having a retaining-lug  $3^h$ . 4 is the movable inner member of the hinge-joint in the form of a circular disk or plate located within the housing and which is seated against the thimble  $3^f$  and the annular shoulder  $3^g$  of the housing. The inner member 4 is formed with a peripheral recess  $4^a$ , in which the retaining-lug  $3^h$  projects to lock the inner member to the housing, so that it will turn with the seat-



bracket. The inner member is also formed with a central opening  $4^b$ , into which the cylindrical part  $1^f$  of the hollow boss  $1^d$  projects, and a circular convex rib  $4^c$ , fitting in the annular space between the thimble  $3^f$  and the annular shoulder  $3^g$ . On the outer side bearing-face of the inner member are formed three radial ball grooves or races  $4^d$  at equal distances apart. These ball-grooves are located between the central opening and the periphery of the inner member. 5 is the fixed outer member of the hinge-joint in the form of a circular disk or plate located within the housing. This outer member has peripheral spacing-lugs  $5^a$ , impinging against the wall  $3^a$  of the housing, and a central opening  $5^b$ , into which the cylindrical part  $1^f$  of the hollow boss  $1^d$  extends. The spacing-lugs  $5^a$  are provided for the purpose of preventing the wall of the housing from coming in contact with the whole periphery or edge of the outer member. The inner side or bearing-face of the outer member is formed with three transverse ball grooves or races  $5^c$ , arranged at equal distances apart to form an approximately triangular figure and having their ends  $5^d$  turned inward and inclined so as to lead to the face of the bearing. These ends  $5^d$  meet and overlap the outer ends of the radial ball-grooves and provide inclined planes for the balls to run on, so as to avoid a sudden stop or concussion, thus obviating the noise incident in quickly moving or throwing the seat in raising or lowering it, and at the same time the inclines serve as a force to throw the seat back and assist in making it automatic in operation. The friction between the bearing-faces of the members is lessened in my improved construction, so that in some instances the inclines may be omitted; but their presence is an advantage, as stated. The transverse ball-grooves  $5^c$ , formed with inward turned ends  $5^d$  and arranged as shown, provide extended raceways, while the said transverse ball-grooves and radial ball-grooves overlapping, as shown, the antifriction-balls are always retained at an equal distance apart and their whole bearing-surface utilized, so that there is no liability of the balls flattening by working back and forth in a single path, as by my construction the balls are moved radially as well as circumferentially. The radial ball-grooves extend across the transverse ball-grooves at such an angle that when the seat-bracket is turned the radial ball-grooves move obliquely to the transverse ball-grooves from end to end of the latter. The outer side of the outer member of the hinge-joint is formed with a radial arm  $5^f$ , having a projecting hook  $5^g$  overlapping the wall  $3^a$  of the housing and directed inwardly, so as to engage the recessed lug  $1^i$  on the seat-standard to prevent the outer member of the hinge-joint from turning. The outer side of the outer member is also formed with a central square projection  $5^h$ , having a concave spring-recess  $5^i$ , surrounding the central open-

ing  $5^b$ , and radial lugs  $5^j$ , located at the sides of the projection and extending beyond the same. Seating between these radial lugs  $5^j$  is a plate-spring 6, which may consist of one or more plates  $6^a$ , each having a central bolt-hole  $6^b$ , through which the screw-threaded end  $2^c$  of the bolt 2 extends. 7 represents three antifriction-balls located at the crossings of the ball-grooves and adapted to interlock and travel from end to end of the ball-grooves as the hinge-joint is operated. 8 is a nut located on the bolt, which besides providing means in connection with the bolt for securing the parts of the hinge-joint together also seats on the plate-spring 6 and furnishes the means for regulating the pressure of the plate-spring on the hinge members, whereby the working of the hinge-joint is controlled. In operation the balls traveling from end to end of the grooves will run up the inclined ends of the transverse grooves without leaving the abrupt ends of the radial grooves, and will consequently spread the bearing-faces of the hinge members apart and compress the plate-spring, so that when the seat is raised or dropped, or vice versa, a cushioning effect is produced and the usual noise and jarring on the movement of the seat from one position to another is avoided.

Referring to Figs. VII to X, inclusive, I show a modified form of hinge-joint for seating, with which I combine my improved antifriction ball-bearing. 10 is the upper end of an intermediate seat-standard formed with a bolt hole or opening  $10^a$ , annular recesses  $10^b$ , surrounding the bolt-hole, and the inner members  $10^c$  of the hinge-joint having circular concave bearing-faces  $10^d$ , each provided with radial ball grooves or races  $10^e$ , arranged at equal distances apart and having open ends at the periphery of the inner member.  $10^f$  represents stop-lugs located on the seat-standard beneath the inner members of the hinge-joint. 12 represents outwardly-tapering hollow bosses having reduced non-circular outer ends  $12^a$ , seating in the annular recesses  $10^b$  of the seat-standard and supported in horizontal position by a securing-bolt 13, extending therethrough and through the seat-standard. 14 represents seat-brackets having formed therewith outer members  $14^a$  of the hinge-joint, each having a circular convex inner bearing-face  $14^b$ , conforming to the concave faces of the inner members of the hinge-joint and provided with three transverse ball grooves or races  $14^c$ , arranged at equal distances apart, forming an approximately triangular figure, and having their ends  $14^d$  turned inwardly and inclined so as to lead to the face of the bearing. Partly surrounding the ball-grooves  $14^c$  of each seat-bracket is a segmental flange  $14^e$ , having its ends located at opposite sides of a stop-lug  $10^f$ , so that each seat-bracket is restricted in its movement by the ends of the flange impinging against the stop-lug. From the outer side of each outer member extends a tapering



thimble or sleeve 14<sup>f</sup>, surrounding a hollow boss 12 and having a concave end 14<sup>g</sup>. 15 represents saucer-shaped washers each having a convex inner side seating against the concave end of a thimble and having a non-circular opening 15<sup>a</sup>, which fits on the non-circular end 12<sup>a</sup> of a hollow boss 12. 16 represents plate-springs each having a central bolt-hole 16<sup>a</sup>, through which the securing-bolt 13 extends, the head 13<sup>a</sup> bearing on one plate-spring, while the threaded end 13<sup>b</sup> of the bolt extends through the other plate-spring and receives a nut 18, which bears on the latter, so that by turning the nut in the proper direction the tension of the plate-springs can be regulated and the hinge members tightened to take up the wear of the parts, which are held together by the bolt yieldingly. 17 represents the antifriction-balls located in the ball-grooves. The operation of the hinge in this modification is the same as in the principal form of the invention first described.

As an auxiliary antifriction-bearing on the outer side of a seat-bracket I may also employ my arrangement of radial and transverse ball grooves or races, as shown at the right-hand side of Fig. VIII, in which the outer end of the thimble 14<sup>f</sup> is formed with an inner member 14<sup>h</sup> of a hinge-joint having a concave face 14<sup>i</sup>, provided with radial ball grooves or races 14<sup>j</sup>, and the saucer-shaped washer 15 is formed with an outer member 15<sup>b</sup> of a hinge-joint having a convex face 15<sup>c</sup>, provided with transverse ball grooves or races 15<sup>d</sup>, 17<sup>a</sup> being the antifriction-balls working in the ball-grooves.

Referring to Figs. XI to XV, inclusive, I show another modified form of hinge-joint for seating with which I combine my improved antifriction ball-bearing. 20 is the upper end of an end seat-standard formed with the inner member 20<sup>a</sup> of a hinge-joint having a bearing-face 20<sup>b</sup>, a cylindrical central recess 20<sup>c</sup> on its outer side, a central hollow boss 20<sup>d</sup> on its inner side having a cylindrical inner part 20<sup>e</sup> and a convex outer part 20<sup>f</sup> and radial ball grooves or races 20<sup>g</sup> in its bearing-face 20<sup>b</sup>, located between the hollow boss 20<sup>d</sup> and the outer edge of the inner member. The outer member of the hinge-joint is in the form of an intermediate disk 21, having a central opening 21<sup>a</sup>, fitting on the cylindrical inner part 20<sup>e</sup> of the central boss 20<sup>d</sup>, an inner bearing-face 21<sup>b</sup>, having three transverse ball grooves or races 21<sup>c</sup>, gradually inclined toward the face at their ends 21<sup>d</sup>. 21<sup>e</sup> represents three pillars or posts extending horizontally from the outer side of the outer member of the hinge-joint and formed with cup-shaped recesses 21<sup>f</sup> at their ends. 22 is the seat-bracket, formed with a housing 22<sup>a</sup> and a web 22<sup>b</sup>, having a cylindrical sleeve 22<sup>c</sup>, provided with a non-circular bolt-hole 22<sup>d</sup> and extending across the web and fitting at its inner end in the cylindrical opening 20<sup>h</sup> of the hollow boss 20<sup>d</sup>. Surrounding the

sleeve 22<sup>c</sup> is convex projection 22<sup>e</sup>, having a concave annular recess 22<sup>f</sup>, fitting the convex outer part 20<sup>f</sup> of the hollow boss 20<sup>c</sup>, and located in the web around the convex projection 22<sup>e</sup> are holes 22<sup>g</sup>, through which the pillars or posts 21<sup>e</sup> project. 23 is a securing-bolt having a head 23<sup>a</sup> located in the central recess of the inner member of the hinge-joint and seating against a washer 24 in the hollow boss 20<sup>a</sup>. The bolt has a non-circular neck 23<sup>b</sup>, fitting in the non-circular bolt-hole 22<sup>d</sup> of the sleeve, and has its screw-threaded end 23<sup>c</sup> projecting beyond the sleeve to receive a nut 25. For the purpose of connecting the parts together yieldingly I provide a triangular plate-spring 26, through which the threaded end of the bolt extends and on which the nut 25 is adapted to bear. The corners of the plate-spring are intumed to provide lips 26<sup>a</sup>, which seat in the cup-shaped recesses 21<sup>f</sup> of the pillars or posts, so that the tension of plate-spring can be regulated by adjusting the nut, and thus tighten or loosen the hinge-joint.

In each form of hinge-joint illustrated it will be seen that I employ in connection therewith a series of radial ball grooves or races on one member and a series of transverse ball grooves or races on the other member, the ball grooves or races being so arranged with relation to each other that in dropping or raising the seat one series of ball-grooves crosses the other series of ball-grooves obliquely or shearwise, so that the antifriction-balls move back and forth in the radial grooves while traveling the length of the transverse grooves, and when they reach the end inclines of the transverse grooves they pass partly out of the latter and force the members of the hinge-joint apart slightly, thus compressing the plate-spring, which results in producing a cushioning effect in raising and lowering the seat.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinge member having radial ball-grooves, the other hinge member having transverse ball-grooves, antifriction-balls located at the crossing of the ball-grooves and limiting the movement of the seat-bracket, and adapted to interlock, and travel in the ball-grooves of both hinge members to provide an antifriction-bearing between the meeting faces thereof, and means for securing the parts of the hinge-joint together.

2. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinge member having radial ball-grooves, the other hinge member having transverse ball-grooves, with their ends turned inward toward the outer ends of the radial grooves, antifriction-balls located at the crossing of the ball-grooves and limiting the movement of the seat-bracket, and adapt-



ed to interlock, and travel in the ball-grooves of both hinge members to provide an anti-friction-bearing between the meeting faces thereof, and means for securing the parts of the hinge-joint together.

3. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinge member having radial ball-grooves, the other hinge member having transverse ball-grooves, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves, and adapted to interlock, and travel in, the ball-grooves of both hinge members, and yielding means for securing the parts of the hinge-joint together.

4. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members having radial and transverse ball-grooves respectively, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves and adapted to interlock, and travel in, the ball-grooves of both hinge members and yielding means for securing the parts of the hinge-joint together.

5. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinged member having radial ball-grooves, the other hinge member having transverse ball-grooves, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves and adapted to interlock, and travel in, the ball-grooves of both hinge members and means for securing the parts of the hinge-joint yieldingly together.

6. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinge member having radial ball-grooves, the other hinge member having transverse ball-grooves provided with inclines leading to the bearing-face at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves and adapted to interlock, and travel in, the ball-grooves of both hinge members and means for securing the parts of the hinge-joint yieldingly together.

7. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members, one hinge member having radial ball-grooves, the other hinge member having transverse ball-grooves provided with inclined ends, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves and adapted to interlock, and travel in, the ball-grooves of both hinge members and yielding means for securing the parts of the hinge-joint together.

8. A hinge-joint for seating comprising a support, a seat-bracket, inner and outer hinge members one hinge member having three radial ball-grooves, the other hinge member having three transverse ball-grooves arranged in approximately triangular form, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves, and adapted to interlock, and travel in, the ball-grooves of both hinge members, and yielding means for securing the parts of the hinge-joint together.

9. A hinge-joint for seating comprising a support having a boss, a seat-bracket having a housing provided with a web formed with a thimble fitting around the boss, a member of the hinge-joint, having radial ball-grooves and located within the housing, the other member of the hinge-joint having transverse ball-grooves and located within the housing, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves, and yielding means for securing the parts of the hinge-joint together.

10. A hinge-joint for seating, comprising a support having a stop-lug a recessed lug, and a boss, a seat-bracket having a web provided with a segmental opening receiving the stop-lug, and a thimble fitting around the boss, a member of the hinge-joint having radial ball-grooves and secured to the seat-bracket, the other member of the hinge-joint having transverse ball-grooves and a radial arm provided with a hook engaging with the recessed lug, inclines leading to the bearing-faces at the ends of the ball-grooves, antifriction-balls located at the crossing of the ball-grooves, and yielding means for securing the parts of the hinge-joint together.

11. A hinge-joint for seating comprising a support having a boss, and a recessed lug, a seat-bracket having a housing formed with an annular shoulder having a retaining-lug, and a web formed with a thimble fitting around the boss, a movable member of the hinge-joint having a peripheral recess receiving the retaining-lug, and radial ball-grooves, the other fixed member of the hinge-joint having transverse ball-grooves, inclines leading to the bearing-faces at the ends of the ball-grooves, and a radial arm provided with a hook engaging the recessed lug, antifriction-balls located at the crossing of the ball-grooves, and means for securing the parts yieldingly together.

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Witnesses:

J. GERTRUDE WOODS,  
J. C. BROOKE.