(No Model.)

2 Sheets—Sheet 1.

O. N. EATON.

UNIVERSAL JOINT.

No. 381,348. Patented Apr. 17, 1888.

Fig. 3.

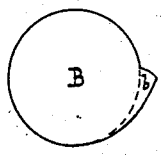


Fig. 1.

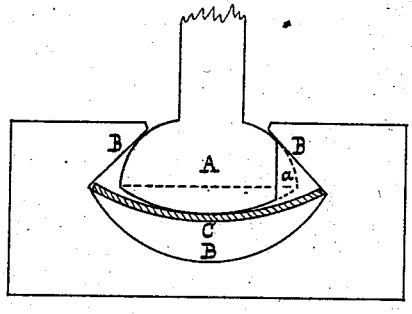
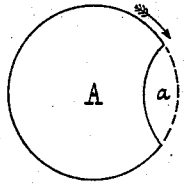


Fig. 2.



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N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

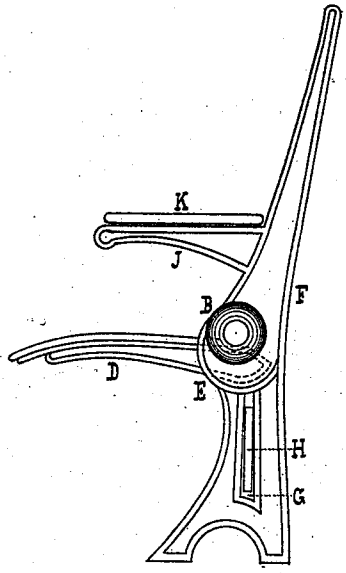


Fig. 5.

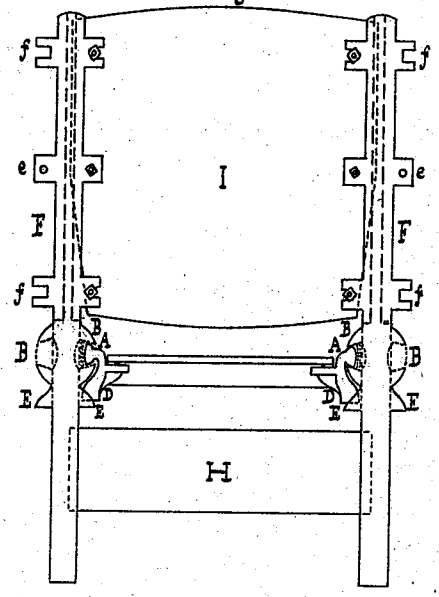


Fig. 7.

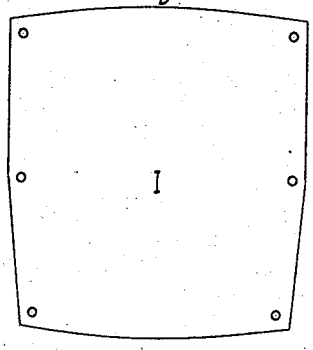


Fig. 6.

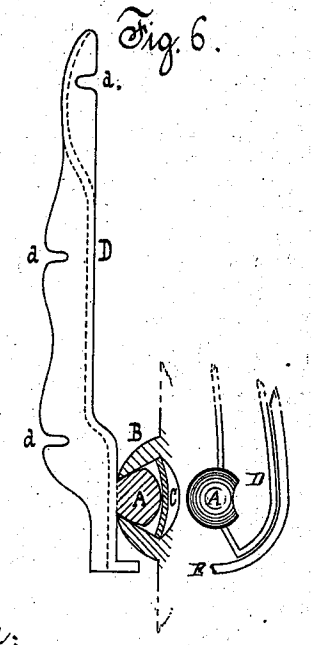


Fig. 8.

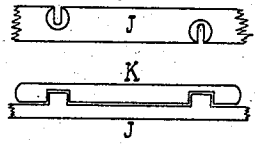
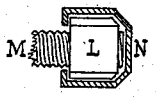


Fig. 9.



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Inventor:

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N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

OLIVER N. EATON, OF NEW YORK, N. Y.

UNIVERSAL JOINT.

SPECIFICATION forming part of Letters Patent No. 381,348, dated April 17, 1888.

Application filed July 11, 1887. Serial No. 244,035. (No model.)

To all whom it may concern:

Be it known that I, OLIVER N. EATON, a citizen of the United States, and a resident of the city, county, and State of New York, have invented an Improved Ball-and-Socket Joint adapted to Folding Chairs, Desks, &c., of which the following is a description in such full, clear, and exact terms as to enable any one skilled in the art to make and use the same, reference being had to the accompanying two sheets of drawings, wherein like letters indicate corresponding parts throughout the several views.

Sheet 1 of the drawings illustrates my improved ball-and-socket joint; and Sheet 2 shows its adaptation to a chair with a folding seat, and analogous adaptations to similar uses in folding settees, desks, carriage-tops, and elsewhere are easily within ordinary mechanical skill.

Considering Sheet 1, Figure 1 shows a central vertical section of a universal joint consisting of ball A and socket B, of my improved construction; and Fig. 2 shows a horizontal section of the ball A at its greatest diameter, as indicated by dotted lines in Fig. 1. The two chief peculiarities of construction are the substitution of a substantially double-convex ball or button moving in a double concave socket of corresponding shape, instead of the ordinary corresponding spherical shapes, and the removal of a suitable section, *a*, from one side of such double-convex ball A, to allow introduction to the socket B and removal therefrom at will. The socket B has the shape shown in section, depending, of course, upon the convexities of the ball desirable or necessary for the particular use; but generally the bottom of the socket should be more concave than the bottom of the ball is convex, in order to facilitate insertion and removal. The ball A is shaped substantially like a double-convex lens, with a portion of one edge, *a*, cut off straight or with a little inward curve, as shown by the horizontal section in Fig. 2. The same purpose will be served and object accomplished by a suitable notch, *b*, in the rim of the socket B, as shown in plan by Fig. 3. Between the ball and socket is an elastic plate or disk, C, which fits across the greatest diameter of the socket, and has such relation to the ball when seated in the socket that constant pressure results to keep the ball against the edges of the socket. This plate or disk may be omitted where weight may be used instead, as when something is suspended by the joint, or in equivalent instances. The method of inserting the ball into the socket is to introduce one of the corners formed by the cut on the edge of the ball—for example, the upper corner into the socket—pushing back the spring-disk, then turn or twist the ball, as indicated by the arrow in Fig. 2, around into the socket, the remainder being easily pushed into proper place, whereupon the elastic disk springs back, forcing the ball and socket into juxtaposition and firmly keeping it, while allowing freedom of movement within the limits of each particular construction. The motion is reversed in removal. It is obvious that the shape of such a ball or button may vary from nearly flat to nearly spherical and the shape of the socket be modified correspondingly, according to the range of movement desired in a particular location. For instance, the upper sides of the socket may be straight, converging from the middle to the top at the edges of the socket, as shown, or suitably curved, and the ball may be made quite flat where the movement is in parallel planes and wear is considerable. Such modifications are contemplated in my invention and included in the terms used in the claims. The size and shape of the section to be cut from the side or edge of the ball or button also depend upon the size and shape of the ball and the socket, or the section may be taken from the rim of the socket, as suggested. These details, however, are only in special constructions and are already sufficiently pointed out.

Sheet 2 of the drawings shows the joint adapted to the folding seat of an opera-chair of improved construction. Figs. 4 and 5 respectively show side and back views sectional in part. Fig. 6 shows enlarged plan of seat-support jointed to the chair-frame, also partly sectional. Fig. 7 shows shape of the chair-back, and Fig. 8 the construction of the chair-arm and wooden cushion thereon. Fig. 9 shows metallic covering for exposed nuts.

The frame F is provided on each side with socket B to hold ball A attached to seat-sup-

port D, and with a flange or stop, E, to limit the folding of the seat and hold it horizontal. The seat-support D has a flange with slots *d d d* for affixing the seat with bolts and allowing for variations in alignment, and any necessary strengthening-rib may take the course indicated by the dotted lines in Fig. 6. The ball-and-socket joint is constructed and operated as before described. Each frame F is also provided on each side with three flanges, the central one, *e*, bored, and the outside ones, *f f*, slotted, as shown distinctly in Fig. 5, whereby the chair-back may be hung between the frames by bolts through the holes in the central flanges, *e e*, and adjusted in any position by bolts in the slotted flanges *f f*.

The chair-back I is of the shape outlined in Fig. 7, with straight parallel sides above the middle and converging below sufficient to allow for variations necessary when chairs are arranged in circular rows. It is obvious that chairs of such patterns may be set in either straight or curved rows and accommodate themselves to varying lines necessary in each case.

The floor itself upon which circular rows of chairs are placed is often raised rearward, and sometimes in the center also, causing additional variations of the juncture of the backs and frames. Straight square backs cannot then be used without more or less manual modifications or shaping to each situation, involving additional labor and consequent cost. Where the floor is raised centrally and there are straight rows of chairs across, the frames are necessarily farther apart at the top than at the bottom proportionately to the rise, and where the floor slopes downward toward the front and the chairs are in circular rows across there is the same result and remedy required. These remarks apply also to the juncture of the seat-supports with the chair-frames with reference to the various planes of movement in turning the seat up and down required in the varying situations. A joint or hinge admitting only of action or movements in parallel planes and straight lines obviously is only adapted to chairs placed in straight rows on a level floor. So with straight square backs and rigid frames. It is obvious, therefore, that the improved construction and combination described will obviate these objections and result in almost automatic adaptability to any situation. It is also obvious that as a result of the construction of the back so shaped and set in the side frames, together with the universal joints and seat-frames, as described, combined as specified, all parts mutually and reciprocally adjust themselves to the different angles and conditions required by situations varying from straight lines to circles, which is an impossibility with square backs, rigid frames, and joints acting always in the same planes, so that the specified construction becomes adaptable to any situation, and special constructions for each different situation are not necessary.

The chair-frame is provided below the seat with a slot or aperture, G, smaller at top than bottom, to receive a board, H, and retain it when raised up and thereby wedged into position. The ends of such boards or so-called "hat-protectors" would be adjacent in a row of chairs, as indicated by the dotted lines in Fig. 5. The top of the arm J has slotted pins or studs on each side, as shown plainly in Fig. 8, which fit into corresponding holes in the bottom of the wooden cushion commonly attached, so that it may be easily affixed by screws.

As shown in Fig. 9, the nuts L of the bolts M, holding the chair-back in place or elsewhere exposed, are covered with a metal cap, N, which may be made ornamental.

What I claim as novel, useful, and my invention is—

1. A universal joint consisting of a double-convex ball or button with a suitable segment removed from its side, in combination with a corresponding double-concave socket, substantially as specified.

2. A universal joint consisting of a double-convex ball or button with a suitable section removed from its side, in combination with a corresponding double-concave socket containing an elastic disk or plate, in the manner and for the purpose substantially as specified.

3. A universal joint adapted to chairs with folding seat, consisting of seat-supports provided with double-convex ball or button, in combination with frames provided with double-concave sockets containing elastic disk or plate and provided with suitable stop, in the manner and for the purpose substantially as specified.

4. As combined by universal joints, a chair-frame and folding seat, said frame provided on each side with a perforated flange in the middle and slotted flange above and below, in combination with a chair-back having sides converging below the middle, in the manner and for the purpose substantially as specified.

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Witnesses:
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GEO. WHITFIELD BROWN, Jr.