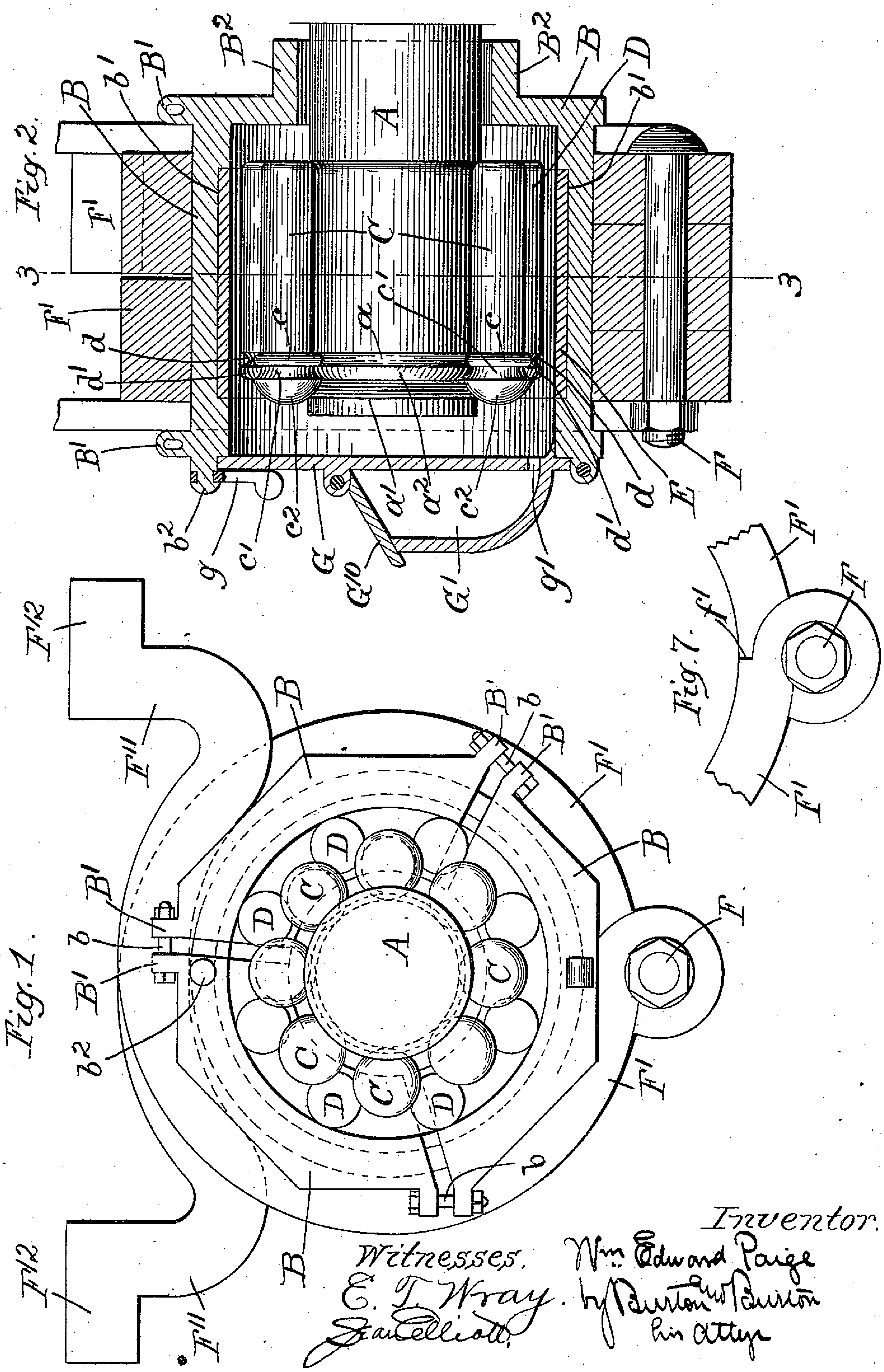
(No Model.) 2 Sheets—Sheet 1.

W. E. PAIGE.

ROLLER BEARING AND JOURNAL BOX.

No. 548,136. Patented Oct. 15, 1895.



Witnesses.
E. T. Wray.
Jas. Elliott.

Inventor.
Wm Edward Paige
by Burton & Burton
his Attys

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

(No Model.) 2 Sheets—Sheet 2.

W. E. PAIGE.

ROLLER BEARING AND JOURNAL BOX.

No. 548,136. Patented Oct. 15, 1895.

Fig. 5.

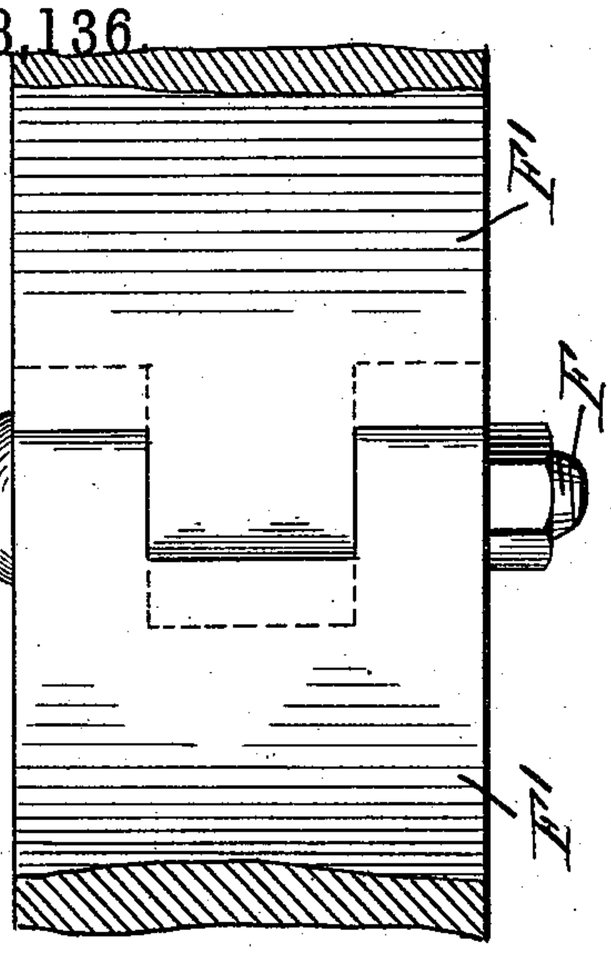


Fig. 6.

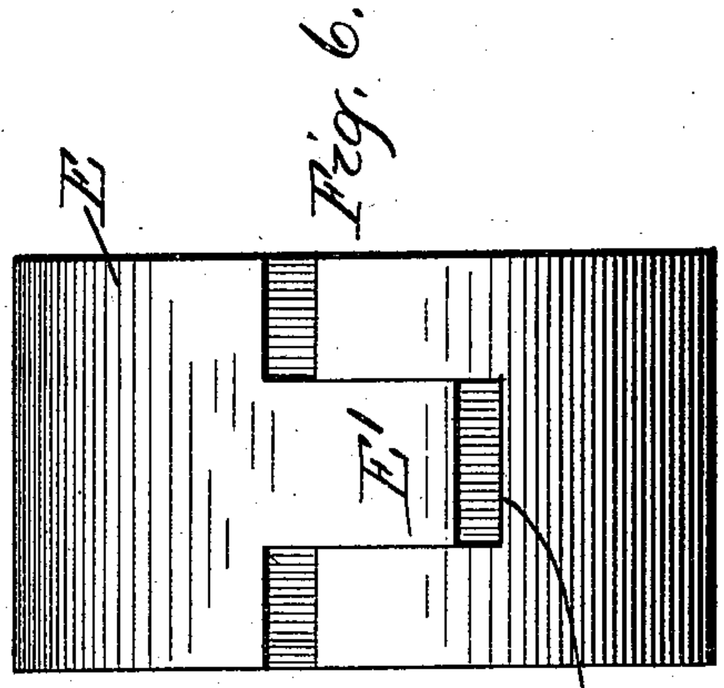


Fig. 4.

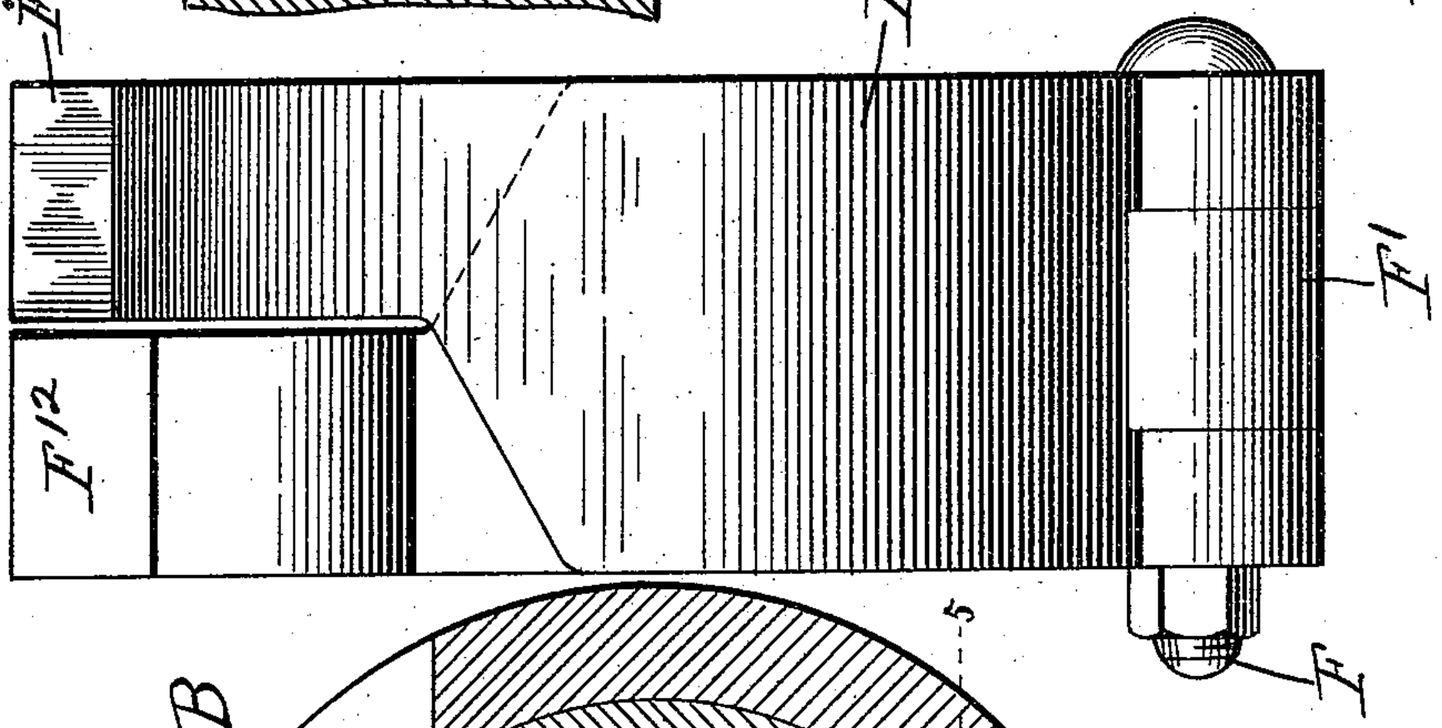
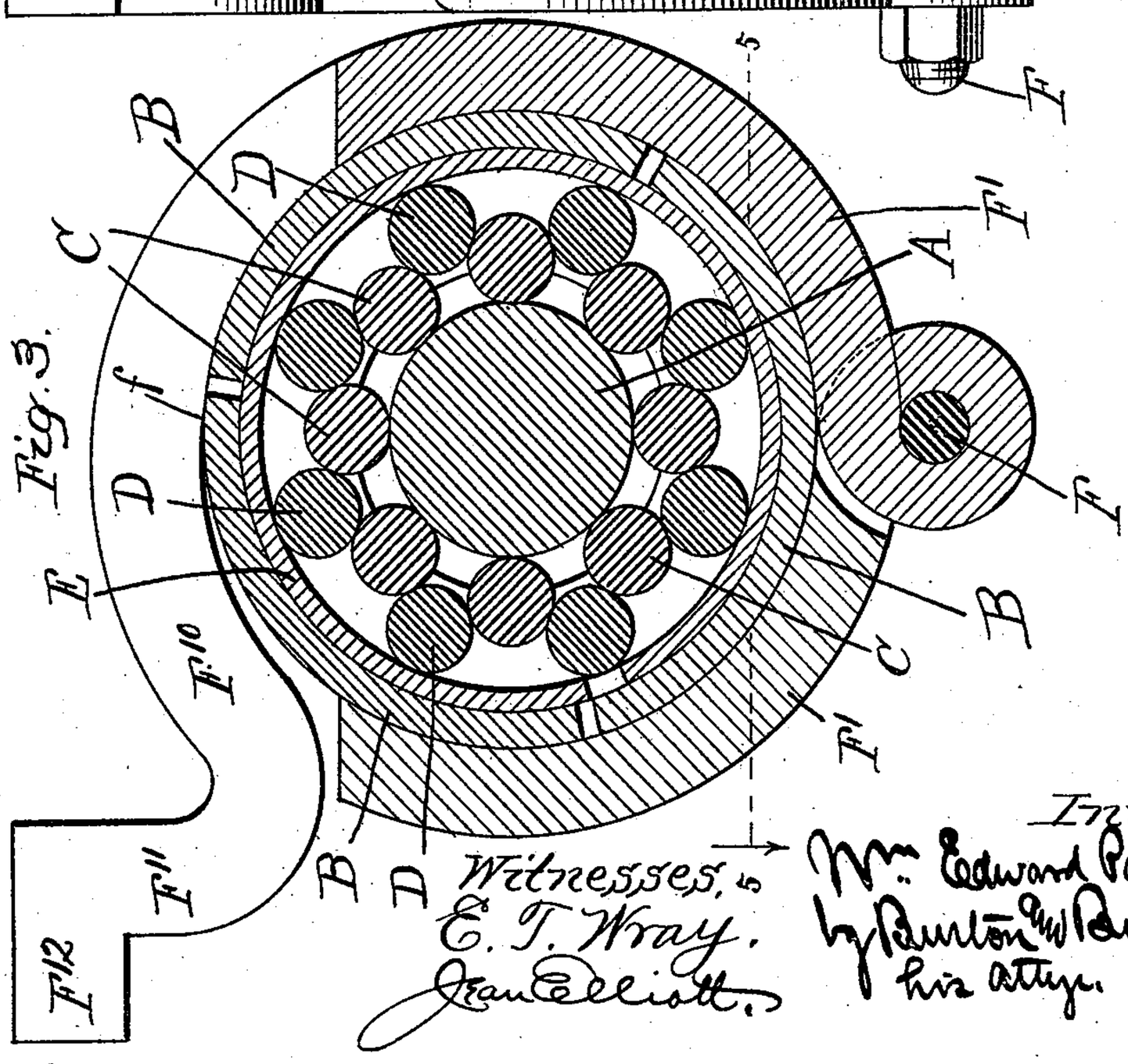


Fig. 3.



Witnesses:
E. T. Wray.
Jean Elliott.

Inventor:
Wm Edward Paige
by Burton & Burton
his attys.

UNITED STATES PATENT OFFICE.

WILLIAM EDWARD PAIGE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE INTERNATIONAL PATENT PROMOTION AND MANUFACTURING COMPANY, OF SAME PLACE.

ROLLER-BEARING AND JOURNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 548,136, dated October 15, 1895.

Application filed June 20, 1895. Serial No. 553,457. (No model.) Patented in Mexico March 23, 1895, No. 677,

To all whom it may concern:

Be it known that I, WILLIAM EDWARD PAIGE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Roller-Bearings and Journal-Boxes, (for which I have received a patent in Mexico, dated March 23, 1895, No. 677,) which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved form of roller-bearing and journal-box for the same free from the defects which exist in the more familiar forms of roller-bearings and journal-boxes and especially adapted to be adjusted to compensate for wear.

I have shown this invention in a form especially adapted for application to car-axles and car-axle boxes, but it is not limited to this specific use.

It consists of the features of construction specified in the claims.

In the drawings, Figure 1 is an end elevation of a car-axle journal-box having my improvements, the lid or door being removed to disclose the structure. Fig. 2 is a vertical axial section of the same, the lid being in place. Fig. 3 is a section at the line 3 3 on Fig. 2. Fig. 4 is an edge or side elevation of a device which I term a "pressure converter or equalizer," the function of which is to convert the pressure of the load into radial pressure on the axle and distribute such pressure equally about the same. Fig. 5 is a detail plan showing a hinge-joint between two members of the device shown in Fig. 4. Fig. 6 is an edge elevation of a ring which incloses the antifriction-rollers. Fig. 7 is a detail showing a modification of the hinge-joint in the equalizer, whereby it is provided with a stop-shoulder to limit the folding movement.

A is the shaft or axle which is to be provided with my improved roller-bearing. In the drawings it is represented as a car-axle. For this axle I form a three-part box B B B, each of the parts B forming a segment of the entire inclosing chamber or box, said parts being secured together by bolts *b b b*, which take through lugs B′ B′, &c., which have elongated slots for such bolts at the proximate corners of the segmental parts B B B, as seen in Figs. 1 and 2. The chamber formed by these three parts B B B is cylindrical and is coaxially provided with a reduced or hub-like portion B^2 at the inner side, said reduced portion being large enough to admit the axle freely and with ample play. The principal or larger portion of the box is enough larger than the axle to accommodate two series of antifriction-rollers, the inner rollers C C C, &c., forming the immediate seat of the axle and the outer series D D D, &c., forming the seats for the inner series and being seated in the box, but not immediately on the inner surface thereof, for I interpose a ring E, made, preferably, of a steel band whose ends are not united, but interlocked, as seen in Fig. 6, one end being provided with a tooth E′ and the other with a corresponding recess E^2, adapted to receive the tooth. This ring is provided with a seat formed by recessing the inner cylindrical surface of the three-part box, as seen at *b′* in Fig. 2, and as the three-part box is adapted to be closed up or expanded more or less by drawing the ends of the parts B B B more or less closely together by the bolts *b* and by other means, hereinafter described, so the ring E is adapted to be contracted more or less, the tooth E′ entering more or less deeply into the recess E^2 as the ring is thus contracted.

It will be evident upon inspection of the structure thus far described that the axle obtains a true rolling bearing in the box, all rubbing friction being eliminated so far as rotary motion is concerned, and that all wear due to even the rolling friction which may occur between the axle and the rollers and the box may be compensated by tightening the bolts *b b b*, whereby the three parts B B B of the box are drawn together and contract the ring E upon the rollers, which will distribute themselves about the axle accurately when acted upon by the encircling ring thus contracted. In order to automatically take up any lost motion due to such wear between the axle, rollers, and box, not relying upon the expedient of tightening the bolts *b*, I have provided a spring-clamp device adapted to

serve as the seat or support of the three-part box and the means for attaching the same to the truck, if the box is applied to a railway-truck, or as the means of attaching such box to any fixed support, if it is used as a shaft-bearing for fixed machinery, and adapted to transmit the weight of the load or the weight and strain on the shaft to the anti-friction rollers and their box, translating all such weight and strain into pressure, which shall operate radially with respect to the axle and distributing such pressure substantially equally about the axle, whereby such pressure tends constantly to contract the box and keep the antifriction-rollers in contact successively around the axle and in contact with the axle and the box. This device, on account of the function above stated, I term a "pressure converter or equalizer." As herein illustrated, it comprises two pieces F′ F′, hinged together and connected by the pintle-bolt F at the lower side of the axle (when applied to a car-axle box.) In the case of a car-axle box these parts F′ F′ are made of steel bar about one inch thick and three inches wide at the portion of each extending from the hinge around about one-third of the circumference of the box. At the end portions of each they are cut away, as seen in Fig. 4, half the width of each being cut away at their proximate sides, the reduced portions lapping past each other as they extend on around the box, completely encompassing it. The reduced end of each, after it has extended halfway around the box—that is, to the point *f* opposite the hinge F—is extended in a curve slightly diverging from the box for a further portion of the circumference, each at this part F^{10} lapping by the other, and each extending thence outward and upward in the portion F^{11} and terminating in horizontal seats F^{12} F^{12}, adapted to seat the truck-equalizer, if applied to a railway-car truck, or to be seated on any fixed support, if employed as a shaft-bearing for fixed machinery. It will be understood upon inspection that the weight of the load resting upon the seats F^{12} F^{12} will tend to close up the clasp or clamp formed by the two parts hinged together at F, (but without regard to its hinged character,) causing them to compress whatever is encompassed by them, and causing them, in the construction above described, to force the three parts B B B of the box together radially until all the rollers constituting the bearing of the shaft are in successive contact with each other and in contact with the shaft, affording the latter a rolling bearing without play.

The necessity or desirability of making the equalizer of two parts hinged together, as described, is only that otherwise it would be exceedingly difficult, if not impossible, to assemble the bearing, because so heavy a band could not be spread to admit the parts of the box within it, and it would be particularly difficult to disconnect the same for repairs or substitution of worn parts. The hinge, however, is not a necessity to nor does not in any degree interfere with the action of the device, because although the two parts F′ F′ may be unclasped from the box freely when the weight is off their seats F^{12}, yet when clasped together about the box the pressure exerted upon their ends F^{12} F^{12} tends to flex each part about the box as if it were a strap drawn around it and to compress the box radially, and although the hinge constitutes, apparently, an extra flexible point in such strap, yet since the strap in any event operates only to draw the three parts B B B toward the common center, and since the hinge is at the middle of one of these parts, the effect is not observably different from what it would be if there were no hinge. The three parts B B B being thus clamped toward the center by the weight resting on the arms of the equalizer, the ring E is contracted by the equally-distributed radial pressure of the parts B B B upon it, and thus translates that pressure so that it is exerted along as many radial lines as there are rollers in contact with said ring. Thus whatever inequality might exist in the pressure of the equalizer-clamp F′ F′ is first partly distributed by the three-part box B B B and then fully distributed to the rollers, respectively, by the ring E.

I desire to prevent all friction, except rolling friction, between the axle and the rollers. The structure described prevents any friction due to rotary motion. For the purpose of preventing rubbing friction due to endwise motion I provide the axle with a circumferential groove *a*, and I provide the rollers C with circumferential beads *c*, which take into the groove *a* on the axle. The outer series of rollers D, I also provide with grooves *d* to receive the same beads *c* of the rollers C. By this means when the rollers are suitably assembled on the axle and retained by the band E longitudinal movement relative to the axle is prevented. The longitudinal movement thus prevented between the rollers and the axle must take place to some extent between the outer rollers D and the seat provided for them—namely, the ring E—and in order that these rollers may not wear an abrupt shoulder on the ring E, which would be liable to arrest too abruptly the lateral movement of the truck, which would cause longitudinal movement of the rollers on their seat, I make the ends of the rollers D rounded or hemispherical, as seen at *d′*. The rollers C may have a seat *c′* shaped to conform to the hemispherical head of the rollers D, and the ends of the rollers C being similarly formed, as seen at c^2, the axle A may have a similar groove *a′* to receive the periphery of said head, which constitutes, virtually, a bead on the roller C. There will thus be provided two grooves *a* and *a′* on the axle, with an intervening bead a^2 and two beads *c* and c^2, the latter being the terminal bead or head on the roller C, with an intervening groove *c′* and a single groove *d* and bead *d′* on the rollers D, whereby double engagement of the rollers

with each other and with the shaft, respectively, is provided to prevent longitudinal movement of the one with respect to the other.

To the lower one of the three parts B B B, I hinge the lid or door G, which closes the box at the end, a latch *g*, pivoted on the stud b^2, which projects from one of the other parts B at the upper side of the box, serving to retain the door closed. On the forward side of the door I provide an oil-pocket G′, from the lower end of which an aperture *g′* leads through the door into the lower part of the box, a suitably-hinged lid G^{10} being provided to close the upper end of the pocket G′. This pocket is designed to contain suitable absorbent material to hold oil, which will be yielded slowly through the aperture G′ into the bottom of the box for the sole purpose of lubricating the band E to prevent wear on account of the endwise movement of the rollers, which may occur on account of the end thrust of the shaft.

The wear in this journal-box, it will be seen, is confined to the rollers, the axle, and the ring E. The rollers and axle being subject to directly radial pressure equally distributed by the equalizer the three-part box and the ring E will wear circular, simply being reduced slightly in diameter by the wear, which being due almost wholly to rolling friction will be the least possible. The ring E is also subject chiefly to rolling friction and will be reduced but slightly by wear; but all the wear of all the parts from the axle outward to the ring E accumulates in the necessary contraction of this ring and reduction of the box by closing up of the parts B B B. Before this reduction and contraction has proceeded too far, at any convenient time, the seats F^{12} F^{12} being relieved of the load, the parts F′ F′ may be unclasped from the box to permit it to be spread by slacking the bolts *b b*, if necessary, whereupon the ring E, which tends elastically to close upon the rollers, being by this tendency caused to leave its seat in the parts B B B as the latter are separated, may be readily removed from the box, whereupon, a new ring being substituted, the box may be closed up again, the whole change requiring but little labor.

In case of accidental breakage of the equalizer during travel the weight of the load will be received directly by the box made up of the parts B B B, and it is for such a contingency that the bolts *b b* are provided, since in ordinary use the equalizer clamps the three parts of the box together without regard to or necessity for such bolts.

It should be noticed that by arranging the rollers in two series, the members of one of which touch the axle but do not touch each other, while the members of the other series alternate with and touch the members of the first series and touch the box but do not touch each other, a complete circuit of rollers successively in contact is provided without any rubbing friction between them, such as results when a series of such rollers successively in contact are all in contact with the shaft and all in contact also with the box; also, by this arrangement I avoid the necessity of calculating the diameters of the rollers, so that they shall be adapted to form a complete series in consecutive contact around the shaft and remove the difficulty which would otherwise exist in such a series, that in case of wear such calculation is disturbed and the complete consecutive contact cannot be maintained where the wear upon the shaft and upon the rollers, respectively, is such that the rollers after a given period of wear no longer fill the circle about the shaft reduced by the same period of wear. It may be found desirable in some cases, in order to avoid a pinching strain on the lower of the three parts B of the box, which might be produced by the tendency of the equalizer to fold at the hinge-joint under the pressure of the load, to provide a stop-shoulder at that joint, so that the equalizer, when properly folded about the box to the limit permitted by the stop-shoulder, shall in any subsequent action caused by the load operate as an integral elastic strap or band. Such a modification is shown in Fig. 7, wherein *f′* is such stop-shoulder.

I claim—

1. In a journal bearing in combination with the shaft, a divided box, anti-friction rollers interposed between the shaft and the box, the box having a continuous lining ring which encompasses the rollers and constitutes the seat thereof on the box, and suitable means for contracting the box by radially closing up its parts, whereby the ring is contracted upon the rollers, substantially as set forth.

2. In a journal bearing in combination with the shaft and a divided box provided with a continuous lining ring, anti-friction rollers interposed between the shaft and the box and encompassed by the lining ring of the latter, said rollers being arranged in two series, the individuals of one series being seated on the shaft and not in contact with each other successively nor with the box, the individuals of the other series alternating with the individuals of the first series and in contact therewith respectively and with the box but not with the shaft, and suitable means for reducing the box by radially closing up its parts, substantially as set forth.

3. In a journal bearing in combination with the shaft, a box composed of a plurality of parts radially divided, anti-friction rollers interposed between the shaft and the box and a support for the box consisting of a band encompassing the same, the end portions of such band being extended past each other and adapted to receive the pressure or load which the axle sustains, substantially as set forth.

4. In a journal bearing in combination with the shaft, anti-friction rollers arranged thereabout in an inner and an outer series, the individuals of the inner series being in contact

with the shaft but not with each other and the individuals of the outer series alternating with the individuals of the inner series and seating thereon respectively but not in contact with the shaft nor with each other, a divided journal box provided interiorily with a suitable seat for the outer series of rollers and adapted to be contracted by having its parts closed up radially, a support for such journal box consisting of a band which encompasses its divided parts, the end portions of said band being extended past each other and adapted to receive the pressure or load which the axle sustains, substantially as set forth.

5. In a journal bearing in combination with the shaft, an inner and an outer series of anti-friction rollers, the individuals of the one series alternating with the individuals of the other series, the inner series only being in contact with the shaft, a divided journal box and a ring which lines the same and which encompasses the rollers and affords seat for the outer series, a support for the divided journal box which consists of a band encompassing its several parts, the end portions of said band being extended past each other and adapted to receive the pressure or load which the axle sustains, substantially as and for the purpose set forth.

6. In a car axle box in combination substantially as set forth, the three-part box B B B, the continuous lining ring E within said box, the axle and two series of anti-friction rollers interposed between the axle and the lining ring, the inner series being seated upon the axle, the outer series alternating therewith and seated upon the individuals of the inner series respectively and upon the lining ring, the equalizer F′ F′ encompassing the three-part box and retaining its parts together, said equalizer having the end portions extended from the point at which they pass and adapted to receive the load on their extended ends.

7. In a car axle box, the equalizer composed of the hinged parts F′ F′ and terminating in the seats F^{12} F^{12} adapted to receive the load, the three-part journal box encompassed and adapted to be clamped by said equalizer, the spring lining plate E for said journal box, the axle and the anti-friction rollers interposed between the same and the lining ring, said journal box being reduced at the inner side to form the hub B^2 and provided at the forward side with the door G, said door having an oil pocket on its forward side, and an aperture at the bottom of the oil pocket leading into the cavity of the lower part B of the three-part box, substantially as set forth.

8. In a car axle box in combination with the divided box and the anti-friction rollers seated therein, the equalizer encompassing the box and retaining its several parts and adapted to receive the load on its extended ends, said equalizer being made of two parts hinged together at the bottom, whereby it is adapted to be clasped upon and unclasped from the box by folding at such hinge, substantially as set forth.

9. In a car axle box in combination with the divided box and the anti-friction rollers seated therein, the equalizer encompassing the box and retaining its several parts and adapted to receive the load on its extended ends, said equalizer being made of two parts hinged together and thereby adapted to be clasped upon and unclasped from the box, said hinge being provided with a stop shoulder to limit the folding of such equalizer and cause it to operate as integral under the weight of the load.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, county of Cook, State of Illinois, this 18th day of June, 1895.

WILLIAM EDWARD PAIGE.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.