T. ONO.

JOURNAL BOX.

APPLICATION FILED NOV. 10, 1909.

1,012,218. Patented Dec. 19, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

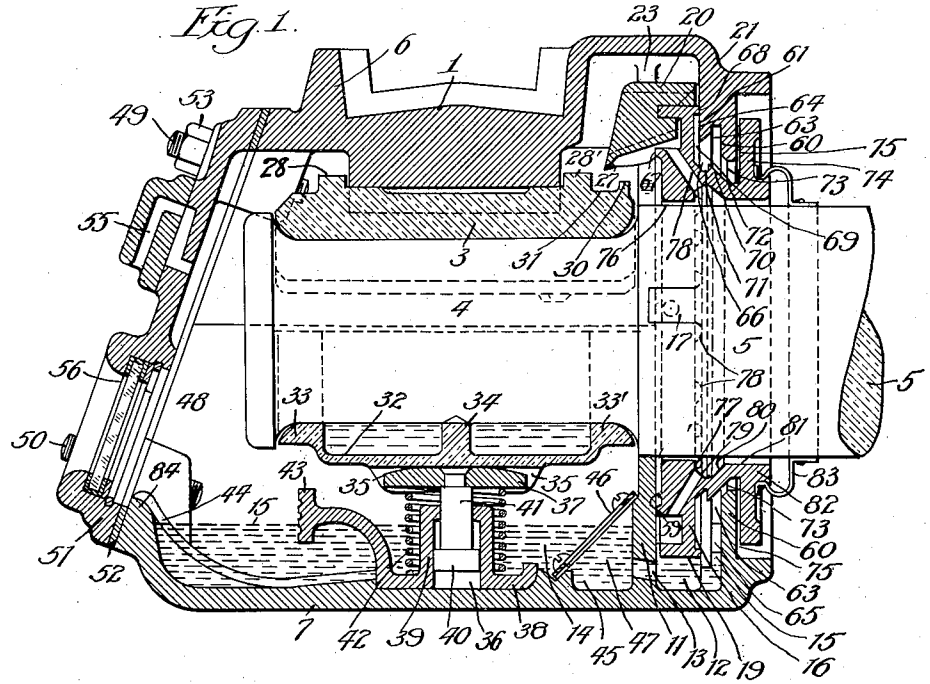
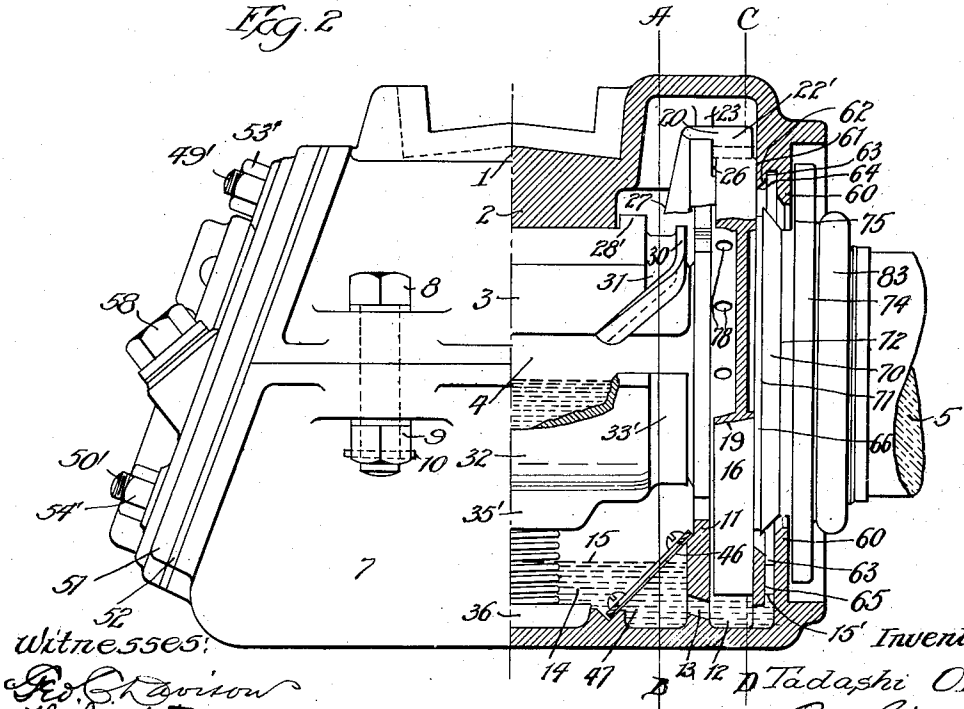


Fig. 2.



Witnesses:
R. G. Davison
R. Frankstein

Inventor
Tadashi Ono
By J. J. Singer
Atty.

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3 SHEETS—SHEET 2.

Fig. 3.

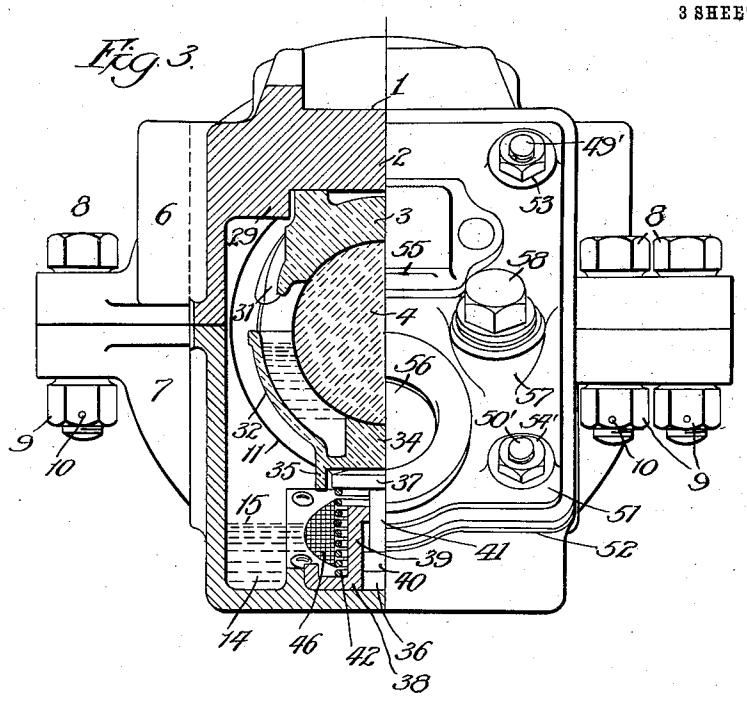
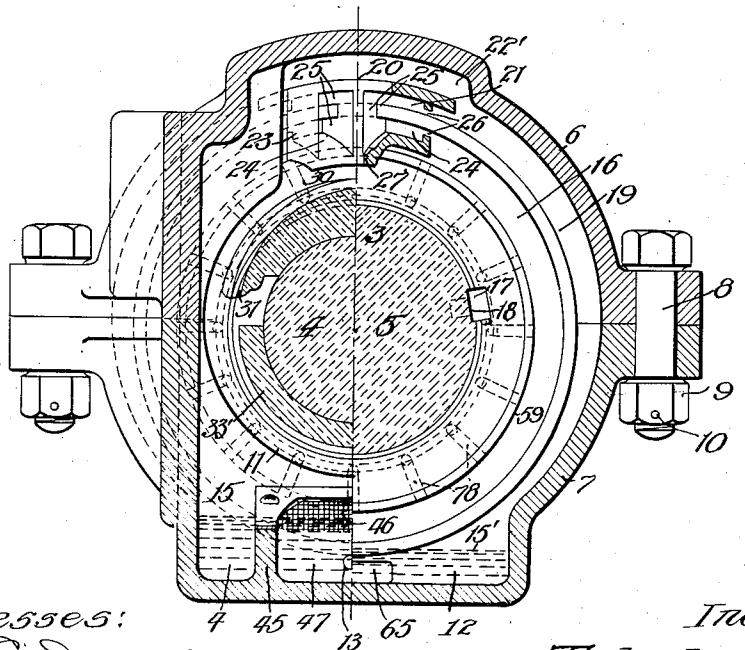


Fig. 4.



Witnesses:
Geo. C. Dawson
R. Isaacstein

Inventor:
Tadashi Ono
By B. Singer
Atty.

T. ONO.

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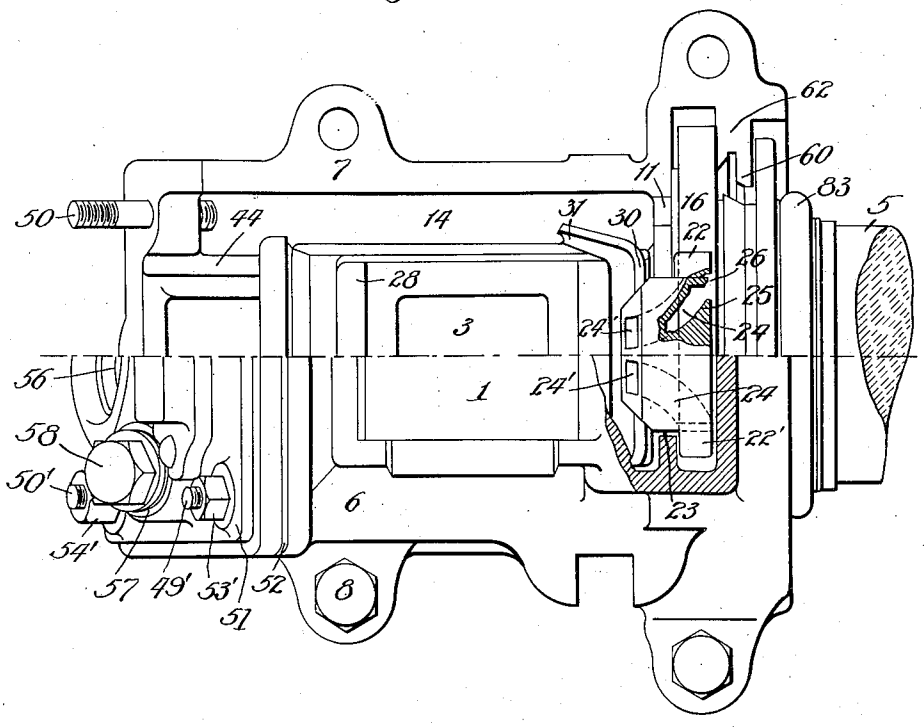
3 SHEETS—SHEET 3.

Fig. 5



Witnesses:
Geo. C. Davison
R. Isenstein

Inventor
Tadashi Ono
By J. J. Singer
Atty.

UNITED STATES PATENT OFFICE.

TADASHI ONO, OF TOKYO, JAPAN.

JOURNAL-BOX.

1,012,218. Specification of Letters Patent. Patented Dec. 19, 1911.

Application filed November 10, 1909. Serial No. 527,323.

To all whom it may concern:

Be it known that I, TADASHI ONO, a subject of the Emperor of Japan, residing at No. 33, Fujimicho, Azabuku, in the city of Tokyo, Empire of Japan, have invented a new and useful Improvement in Journal-Boxes, of which the following is a specification.

This invention relates to improvements in bearings and journals for shafts, especially for axles of cars and other horizontally disposed shafts.

An object of the invention is to provide a bearing in which the rotary shaft is lubricated automatically in that part in which it is supported.

Another object of the invention is to provide a bearing in which the lubricating oil is conveyed by means of the rotary shaft from a feeding chamber to that part of the shaft which must be lubricated and from there back to a storing chamber.

Another object of the invention is to prevent leakage of the oil from the box along the rotary shaft.

Another object of the invention is to prevent the entrance of impure oil into the feeding chamber from said main chamber.

Other objects of the invention will be more clearly understood by reference to the following specification and accompanying drawings and they will be more clearly pointed out in and by the appended claims.

One preferred embodiment of this invention is shown in the accompanying drawings in which—

Figure 1 is a longitudinal section through a journal box, the section being taken vertically through the center line of the shaft. Fig. 2 is partly a side elevation and partly a section of the box. Fig. 3 is partly a front elevation and partly a vertical transverse section of the box. Fig. 4 is a sectional view, the left half of said figure showing a section taken on line A—B of Fig. 2 and the right half of Fig. 4 showing a section on line C—D of Fig. 2. Fig. 5 is a top plan view, showing one half the bearing with the upper part thereof removed.

Similar reference characters indicate similar parts throughout the drawings.

The box which forms the embodiment of my invention comprises a bottom part 7 and a top part 6. The latter is provided with a strong cover 1, having a depending portion 2 in engagement with the brass 3, which rests on the end 4 of shaft 5. The parts 6 and 7 are connected by means of bolts 8, having nuts 9. For the purpose of locking the nuts in position on the bolts locking pins 10 are provided which extend through bolts 8 and nuts 9, as shown in Fig. 2.

The interior of the box is divided into a main chamber 14 and a feeding chamber 12, the two chambers being separated from each other by means of a partition wall 11. An aperture 13, provided in the lower part of the partition wall 11, serves for communication between the feeding chamber and the main chamber. An annular lubricating member 16 is fastened to the shaft 5 within the feeding chamber 12 and rotates synchronously with said shaft. A key 17 loosely disposed within the key way 18 on said shaft, may serve as a fastening means for the ring 16. As the key 17 is loosely disposed within the key way 18, the shaft may play in longitudinal direction within the bearing and as the ring 16 does not fit closely on the shaft, the shaft therefore has also some lateral play. It is obvious from the foregoing description that in the common rotation of shaft and ring oil from the feeding chamber is conveyed upwardly through the rotation of the ring and downwardly again.

For the purpose of conveying oil from the lubricating member 16 to that part of the shaft which rests within the brass, a wiper 20, (Figs. 1 and 4) is provided in the upper part of the box, a lateral projecting rim 19 of the ring 16 continuously engaging a groove 21 formed in said wiper. The wiper 20 is held in position in the upper part of the box by means of lateral wings 22, 22′, which are disposed horizontally between the front and rear wall of the feeding chamber. The partition wall 11 is not continuous in its upper part, a gap portion 23 being provided therein, the front parts of the wings 22, 22′ projecting into said gap and being thereby prevented from following the ring 16 in its rotary motion. In the embodiment shown in the drawings, two passages 24 are provided within the wiper 20, these passages leading from the rear part of the wiper to the front thereof and being adapted to convey the oil which is taken along by the ring from said ring to the journal box 3. The lower part of the passages 24, 24′ is slanting forwardly and prevents thereby a

return flow of the oil to the feeding chamber through said wiper and groove 21. The rim 19 of the lubricating ring 16 passes through the recesses 26, provided in the lateral walls of the passages 24, 24'. These recesses 26 are broad enough to permit the passage of the rim 19 without wiping the oil adhering to said rim, so that the oil is not removed therefrom before the rim approaches the apertures leading into the passages 24, 24'. The lower part of said passages is bent downwardly and in the front part of the opening of said passages a small nose 27 is provided which serves for leading the oil to the rear portion of the upper brass 3. The slanting direction of the passages also serves for preventing a return flow of the oil through the recesses 26; this return flow would be possible when the shaft would rotate at a very low speed.

As may be clearly seen from Fig. 5, the wiper 20 consists of two symmetrical halves, so that in the rotation of the axle 4 in one direction one-half of the wiper serves for the conveyance of the oil to the brass and in the rotation in opposite direction the other half of the wiper serves the same purpose. The brass 3 is prevented from displacement in longitudinal direction by means of front and rear flanges 28, 28', which project upwardly, engaging thereby the portion 2 of the cover 1. Movement of the brass in lateral direction is prevented by means of two flanges 29, which project downwardly from the bearing cover 2 as clearly shown in Fig. 3. A small ledge 30 leading from the rear part of the brass 3 downwardly and forwardly serves as a wall for a groove 31 provided on the rear part of said brass, as indicated in Figs. 1 and 2. The oil discharged through passages 24, 24' of the wiper is conveyed into the groove 31 which leads the oil into the lower journal box.

The lower brass comprises a lubricating well, the rear and front walls of said well extending upwardly and being provided with circumferential ledges 33, 33'. By this means the end 4 of the axle 5 is continuously in engagement with the lubricating oil stored in said well 32, the front and rear ledges 33, 33' being in engagement with said axle. As an additional support a lug 34 is provided within the well 32, which lug also is in engagement with the end 4 of the axle and supports the same. This lug also serves as a reinforcing means for the wall of the well 32. A support 36 centrally disposed with respect to the well 32 serves for pressing the same into engagement with the end 4 of the axle. This support 36 comprises a cap 37 in engagement with the lower face of the well and is prevented from lateral movement by means of flanges 35 depending therefrom. The cap 37 is fastened to a rod 41, which in its lower part carries a piston 40 slidably disposed within a cylinder 39. The base of the support comprises a plate 38, preferably integral with the cylinder 39. A spiral spring 42, interposed between the base of the support and the cap presses the same into engagement with the lower face of the lubricating well. The spring 42 must be selected of such resiliency that in jars and vibrations of the entire structure the well 32 does not separate from the end 4 of the axle. The spring also serves to maintain a suitable frictional engagement between the lubricating well and the shaft, even after one or both of these parts on account of wear have undergone any change in their frictional surface.

As indicated in Fig. 1, an oil gage 43 is in integral connection with the base 38, said oil gage being also adapted to serve as a handle for said support. Webs 44, projecting from the bottom of the lower half 7 of the box, may serve as a means for sliding the support and oil gage into place.

Two triangular walls 45, projecting from the partition wall 11 and the bottom part 7 of the box serve as a supporting means for a screen 46, formed by wire netting or some similar structure. This netting prevents the entrance of impure oil through hole 13 into the feeding chamber 12. An aperture 48 of preferably rectangular area in the front wall of the entire structure may be closed by means of a cover 51, which is fastened to the two parts 6 and 7 by means of bolts 49, 49', 50, 50' and the nuts 53, 53', 54 54'. A packing 52 may be inserted between the cover 51 and the box.

For the purpose of preventing a sudden change of pressure of air contained in the bearing, which change could eventually be caused by the play of the axle in longitudinal direction and which would result in conveying an over large amount of oil from the main chamber into the feeding chamber, a communication between the outer air and the air in the journal box is provided. For this purpose a passage 55 is provided within the cover 51 and it is advisable to prevent leakage of oil through said passage by giving said passage a bent form as clearly shown in Fig. 1.

For the purpose of facilitating inspection of the bearing and mainly for the purpose of observing the amount of oil a window 56 is provided in the cover. A bolt 58 serves as a closing means for an oil inlet 57 through which the journal box may be filled with oil.

The oil entering the feeding chamber 12 through the aperture 13 is circulated within said feeding chamber by means of the ring 16. The amount of oil which is conveyed upwardly by means of the lubricating ring 16 is then wiped off said ring by means of the member 20 and is larger, even at a slow

rotation of the shaft, than that amount of oil which is conveyed inwardly through the aperture 13. The level 15′ of the oil in the feeding chamber is therefore lower than the level of the oil 15 in the main chamber. The level of the oil within the feeding chamber depends upon the speed with which the shaft rotates, the vibration of the entire bearing, and upon the amount of the oil which is returned from the axle into said chamber when the axle is at rest. But in the movement of the axle it cannot be prevented that oil is thrown against the interior walls of the feeding chamber 12 and that it adheres to said walls. The surface opposite the partition wall 11 is indicated with 61 and the oil thrown against the surface 61 during the rotation of the axle would naturally tend to flow through the aperture, which is provided in the journal box for the axle. For the purpose of preventing this leakage an annular groove 63 is provided within the wall 62. The oil coming from the rear face 61 of the feeding chamber will flow down in the groove 63. In the lower part of said groove 63 the oil may then follow the surface 61 and return into the feeding chamber flowing down this surface or in being conveyed through the groove 63 it will be returned into the feeding chamber through the hole 65 provided in the lower part of said groove. The rear wall 62 of the bearing is not provided with a cylindrical passage, but the diameter of the aperture in the inner surface of said wall 62 is larger than the diameter of the aperture provided in the outer surface thereof. By this means the oil dripping from the front surface 64 of the groove 63 is conveyed into the annular channel 66 of the lubricating ring. This annular channel is formed by means of a conical wall continued by a cylindrical surface 71, another conical wall 70 forming the outer retaining wall of said channel 66. It is advisable to make those annular ledges 67 and 68 by means of which the lubricating ring 16 is in engagement with the partition wall 11 and rear wall 62 respectively as small as possible for the purpose of decreasing the frictional resistance of the ring and the resistance resulting from the cohesive force of the oil.

An annular recess 59 in the front face of the ring 16 and a more shallow recess 69 in the rear face of the ring serve for conveying the oil which has been taken along in upward direction on the walls 11 and 61 backward into the feeding chamber. The diameter of the ring 16 is gradually decreased in the rear of the channel 66, said ring forming a conical surface as described, and the oil on said conical surface following the centrifugal force will run upwardly and collect within the channel 66 from which it will enter the annular recess 69 and return to the feeding chamber 12. The conical part of the lubricating ring 16 is adjacent a short cylinder 72, this cylinder having a smaller diameter than any other portion of the ring. This portion of the ring is in opposition to a similarly shaped hole 73 of the journal box. Adjacent said portion is an annular shield 74, preferably integral with the cylindrical portion just described and with the rest of the ring, said annular shield 74 being separated by a small distance 75 only from the rear face of the wall 60 of the bearing. It is obvious that this distance must not be so small that in the reciprocating longitudinal play of the axle the shield will strike against the bearing. The only parts therefore of the ring 16 which are in frictional engagement with stationary members of the bearing are the annular ledges 67 and 68. In the rotation of the shield air is drawn in by suction through the small gap 75.

In the common rotation of the shaft and ring oil will be conveyed upwardly within the annular space between shaft and ring and by a suitable groove or channel formed in the inner face of said ring the oil will be conveyed toward the bottom part of the groove. The walls of the groove 79 are formed by the inwardly extending shoulders 77 and 80. Following the centrifugal force the oil will therefore be conveyed through a plurality of holes extending from said channel 79 to the recess 59 and from there back to the feeding chamber or to the upper part of the brass 3. The inner surface 81 of the ring adjacent the groove 79 is cylindrical, an annular interspace being provided between the axle 5 and the ring, this interspace being somewhat larger than the interspace between the surface 76 and the axle. By making this annular interspace larger at the right hand end of the ring the ring 16 will continuously be held in engagement with the partition wall 11 and rear wall 61, even when the axial adjustment of the end 4 has been changed on account of the tear and wear of the same. Adjacent the shield 74 is a substantially cylindrical ring portion 82 to which a dust shield 83 is fastened, said shield having the shape of a hollow pliable cylinder. This dust shield 83 covers the outer end of the lubricating ring 16 and is fastened to the axle 5. The dust shield 83 is adapted to follow the reciprocating motion of the axle on account of the pliability of the material used therefor.

A preferable way of assembling the bearing is the following:—The lubricating ring 16 and the wiper 20 are adjusted with respect to each other and the two halves of the journal box 6 and 7 are loosely connected by means of the bolts 8 and nuts 9. After having fastened the dust shield 83 to the axle the key 17 is inserted into its key

way 18. By lifting the front end of the journal box the upper brass 3 may be put in place through the opening 48 and finally the lower lubricating well 32 and the support therefor are introduced through the aperture 48. The cover 51 may be then placed onto the journal box.

The quantity of oil contained in the main chamber 14 must be large enough so that the level thereof is higher than the lowest portion of the lubricating ring 16. It is also possible to maintain said level at the same height as the lowest point of the aperture 73 provided in the rear wall of the feeding chamber; said lowest point of the aperture has about the same height as the portion 84 adjacent the aperture 48, so that no oil will be discharged from the bearing when the cover 51 it removed.

It is a well-known fact that by continuous immersion of the journal in oil the frictional resistance is considerably decreased. In addition to this, sudden changes in this frictional resistance are prevented by this feature.

The lubricating well 32 in the embodiment described is not under strain and only serves the function of providing continuously the journal with oil thereby avoiding the rise of the temperature of the bearing.

It is to be understood that the invention is not limited to the single embodiment described and that changes regarding the shape of the bearing may be made within the scope of this invention in accordance with the purpose for which the bearing may be used.

I claim:—

1. In a device of the class described, the combination with an axle, of a box having chambers, a lubricating ring in one of said chambers mounted on the axle, a wiping member engaging two opposing surfaces of said ring in said chamber, said ring being provided with an extension projecting through and beyond the wall of the box.

2. In a device of the class described, the combination with an axle, of a box having chambers, a lubricating ring in one of said chambers mounted on the axle, a wiping member in engagement with said ring in said chamber, said ring being provided with an extension projecting through and beyond the wall of the box, and an annular shield on said extension in opposition to said wall.

In testimony whereof I affix my signature in presence of two witnesses.

TADASHI ONO.

Witnesses:
T. UCHIMURA,
GENJI KURIBARA.