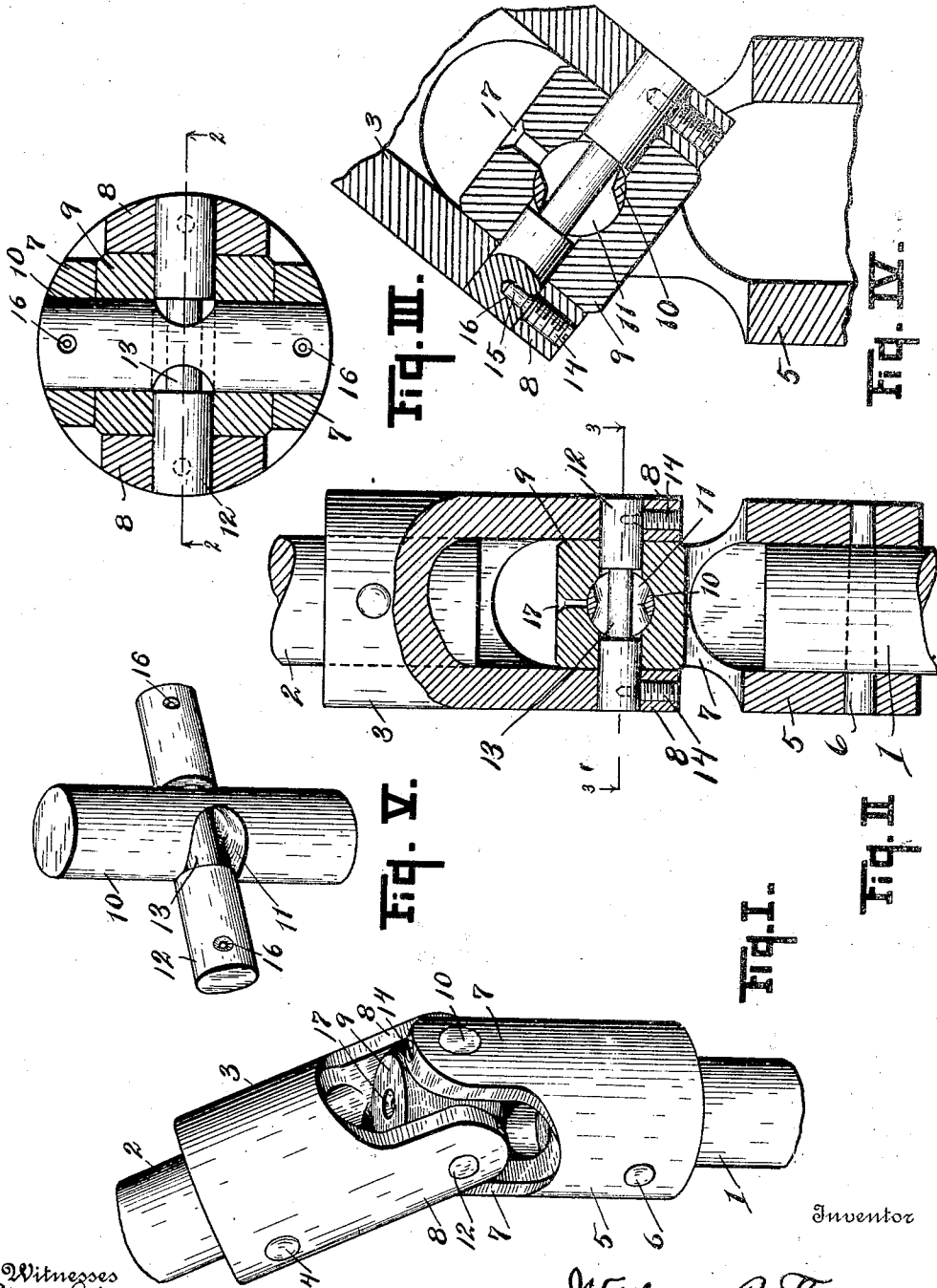


1,096,235.

Patented May 12, 1914.



Witnesses  
 M. L. Glasgow.  
 M. P. Woodruff.

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Inventor  
 William R. Fox  
 Chappell & Carl  
 Attorneys

# UNITED STATES PATENT OFFICE.

WILLIAM R. FOX, OF GRAND RAPIDS, MICHIGAN.

## UNIVERSAL JOINT.

1,096,235.

Specification of Letters Patent.

Patented May 12, 1914.

Application filed March 26, 1912. Serial No. 636,310.

To all whom it may concern:

Be it known that I, WILLIAM R. FOX, a citizen of the United States, residing at the city of Grand Rapids, county of Kent, and State of Michigan, have invented certain new and useful Improvements in Universal Joints, of which the following is a specification.

This invention relates to improvements in universal joints.

The objects of this invention are to provide a universal joint of simple construction which shall be very durable and which can be repaired with great facility.

A further object is to provide a structure in which the wearing parts are all hardened and are so disposed and arranged that they are very readily lubricated.

Further objects that relate to details and economies of operation and construction will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

The invention is clearly defined and pointed out in the claims.

A structure constituting a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this specification, in which:

Figure I is a perspective view of my improved universal joint. Fig. II is a detail vertical longitudinal section taken on a line corresponding to line 2—2 of Fig. III, with the joint disposed in the straight position. Fig. III is a detail transverse sectional view on line 3—3 of Fig. II showing the intersecting cross pivot pins. Fig. IV is an enlarged detail sectional view similar to that of Fig. II with the joint in flexed position. Fig. V is a detail perspective view of the intersecting cross pivot pins showing their relation the one to the other when they are assembled.

In the drawing the sectional views are taken looking in the direction of the little arrows at the ends of the section lines and similar numerals of reference refer to similar parts throughout the several views.

Considering the numbered parts of the drawings, the shaft ends 1 and 2 are suitably joined by my improved universal joint. The forked member 3 is secured to the shaft 2 by the cross pin 4 driven therethrough, and the member 5 is secured to the shaft 1

by the cross pin 6 driven therethrough. These pins are preferably tapered as seen in Fig. II.

The forked member 5 is provided with arms 7—7 and the forked member 3 is provided with arms 8—8 and these embrace the sides of the central pivot block 9, which block is in form substantially a cube. The fork arms 7 are secured thereto by a transverse cross pivot pin 10, the ends of which are engaged by set screws 14, 14 engaging in holes 16—16 therein, as seen in Fig. II. This pin is suitably journaled in the block 9, as seen in Figs. II, III and IV. A transverse opening 11 is formed through the pin 10 by boring a hole therethrough and then reaming out the opposite sides of the hole to give freedom to the reduced portion 13 of the cross pivot pin 12, which is disposed transversely therethrough. This enlargement is quickly accomplished by inserting a reamer in the place of the drill and oscillating the pin 10 the necessary amount in either direction to secure the freedom of oscillation required. Because these pins intersect in this way, their journals are in substantially the same transverse plane and great freedom of movement of the joint is secured.

The cross pivot pin 12 is secured to the forks 8 by set screws 14 in holes 16 in the ends thereof, precisely like the set screws which retain the larger pin 10. These set screws 14 are provided with reduced tenon extension portions 15 engaging in corresponding cross holes 16 in the pins 10 and 12. This is quite necessary, as the pins are hardened and the set screws would not otherwise effectively engage and retain the same.

In the top of the block 9 is an oil hole 17 leading to the central journal bearings of the cross pivot pins and to the recess formed by the transverse opening 11 in the pin 10. This recess constitutes an oil chamber and is opened when the joint is flexed, as seen in Fig. IV, when it can be filled with oil and effectively supplies lubricant to the journal bearings of the cross pivot pins.

I preferably insert the set screws 14 in the ends of the forks, because they are there very accessible, as will be seen from an inspection of Fig. IV. However, the set screws may be inserted from any direction transverse to the cross pivot pins and serve the purpose very well. The set screws, when in-

serted in the manner I have indicated, couple the opposite fork member arms of each fork together and insure their proper engagement with the center block 9 without deformation by the strains to which it is subjected, and as the structure is effectively lubricated from the oil chamber in the center, a very satisfactory, strong and rigid joint is secured. The torsion on the joint cannot separate the arms of the fork members because they are tied together by the cross pivot pins in each instance and the full diameter of the pin is embraced in the journal bearing, securing a well lubricated bearing for the journal parts of the joint. It will be readily seen that, whenever any of these parts become broken or injured or worn by any misuse or chance, they can be very readily replaced by simply withdrawing the set screws that retain them in position. By this means, because the pins are securely locked at both ends to the forks, and as there is no bearing upon the forks sufficient to cause undue wear and displacement, the forks will last indefinitely. It is only necessary to replace the hardened parts, and as these hardened parts are very simple and inexpensive, the joint is a very economical joint, not only to manufacture but to use. Further, the joint is perfectly lubricated and very easy running.

In the ordinary universal joint one pin is larger than the other and in order that the pins may intersect at the center of the block, the larger pin has a hole through its center only slightly larger than the diameter of the smaller pin. The smaller pin can be fastened into the fork and journaled on the center block but the larger pin must move with the center block and either have its motion in the fork, or by reducing the ends of the large pin that project outside of the center block, it can be journaled in bushings secured to the fork ends. This construction admits of an angular movement limited only by the contact of the outside of one of the forks coming in contact with the cutaway portion of the other fork.

In my improved joint, the angular movement of the block on the larger pin is equal to the motion made possible by enlarging the hole in the large pin or by reducing the diameter of the small pin for the length equal to the diameter of the large pin. It will be readily seen that if the angular movement of the universal joint exceeds ninety degrees, it will not be possible to use a joint constructed on the principles of my invention, as it will cut away all of the centers of both the large and small pins. In ordinary use, however, the angular movement does not exceed forty degrees. This amount of angular movement can be readily provided for by enlarging or making oblong the hole in the large pin, or by reducing the diameter of the small pin where it passes through the

large pin, or by both enlarging the hole and by reducing the pin, making it unnecessary to have any motion of either pin in the forks.

My improved construction makes possible the building of a universal joint having both pins fastened into the forks. The motion of the joint is entirely between the center block and the pins which are journaled therein. It will be seen from an inspection of this structure, that I have avoided all bushings about the cross pivot pins, because these parts are produced of hardened metal and are rigidly secured to the arms of the fork members.

I have described my structure in its preferred form. I desire to remark that the structure can be greatly varied in details without departing from my invention. I desire to claim the specific form of the invention and also desire to claim it broadly as pointed out in the appended claims.

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

1. In a universal joint, the combination of the opposed joint fork members, a pivot block disposed between the said forks, with an oil hole in the top thereof, cross pivot pins connecting the arms of each fork member together and disposed transversely in said pivot block in suitable journal bearings therein, one pin being of larger diameter than the other and perforated transversely with a reamed out aperture larger than the said smaller pin, and the smaller pin being reduced in diameter at its central part for a distance in excess of the diameter of the larger pin, whereby the said pins move freely over each other and whereby an oil space is formed for lubrication of the same; and set screws transverse of said cross pivot pins for securing the opposite ends thereof to their appropriate fork arms, as specified.

2. In a universal joint, the combination of the opposite fork joint members, a pivot block disposed between the same, and cross pivot pins for the forks, one of larger dimension than the other, the larger of which is perforated by a hole of sufficient diameter to pass the smaller pin, which hole is reamed out and enlarged, and the smaller pin of which is reduced in diameter at the central part for a distance in excess of the diameter of the larger pin, co-acting as specified.

3. In a universal joint, the combination of the opposite fork joint members, a pivot block disposed between the same, and cross pivot pins for the forks, one of larger dimension than the other, the larger of which is perforated by a hole of sufficient diameter to pass the smaller pin, which hole is reamed out and enlarged, coacting as specified.

4. In a universal joint, the combination of the opposite fork joint members, a pivot

block disposed between the same, and cross pivot pins for the forks, one of larger diameter than the other, the larger of which is perforated by a hole of sufficient diameter to pass the smaller pin, and the smaller pin of which is reduced in diameter at the central part for a distance in excess of the diameter of the larger pin, coacting as specified.

5. In a universal joint, the combination of opposite fork joint members, a pivot block disposed between the same, and a cross pivot pin for each fork rigidly secured thereto and pivoted on said block, the said pins intersecting within the said block, the central intersecting portion of at least one of said pins being of reduced cross section to permit free movement.

6. In a universal joint, the combination of opposite fork members, a pivot block disposed between the said forks, and a cross pivot pin for each fork rigidly secured thereto, the said pins intersecting within the

said block, the central intersecting portion of at least one of said pins being of reduced cross section to permit free movement, the holes in each fork and the corresponding hole in the pivot block being of the same diameter.

7. In a universal joint, the combination of the opposite fork joint members, a pivot block disposed between the said forks, and cross pivot pins for said forks rigidly secured to said forks and pivoted in said pivot block, the said pins intersecting within the said block, the central intersecting portion of at least one of said pins being of reduced cross section to permit free movement.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

WILLIAM R. FOX. [L. s.]

Witnesses:

LENA CHURCH,  
MARY M. WURZBURG.