Jan. 1, 1935. H. J. LOVENSTON 1,986,586

COTTER PIN

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fig. 2

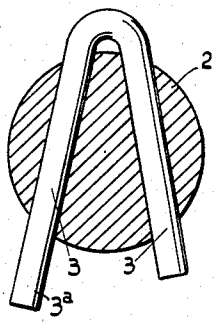


fig. 1

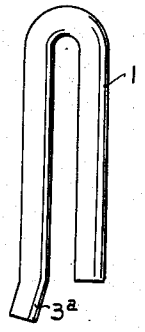


fig. 4

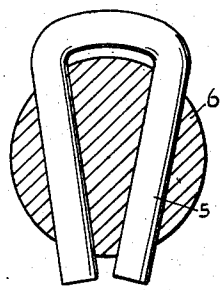


fig 3

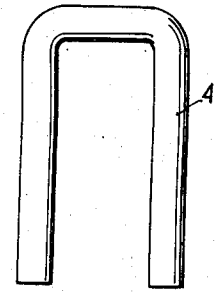


fig. 5

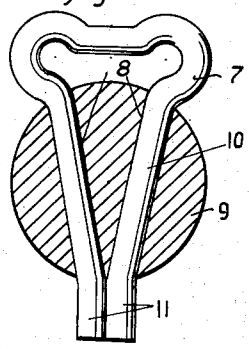


fig. 6

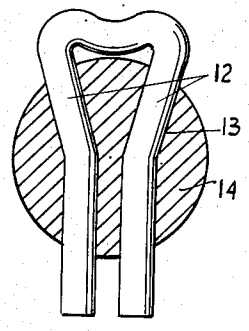
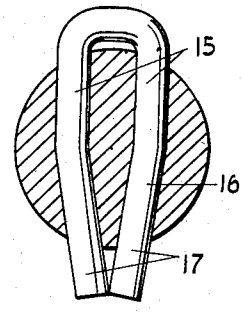


fig. 7



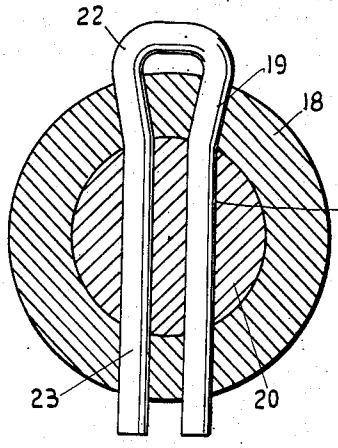
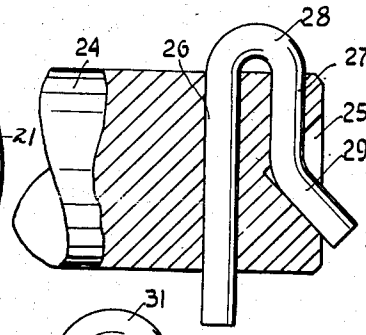


fig. 8

fig. 9



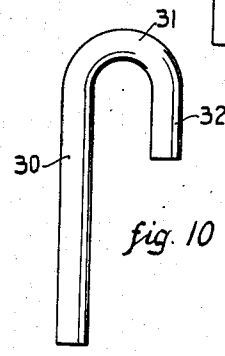
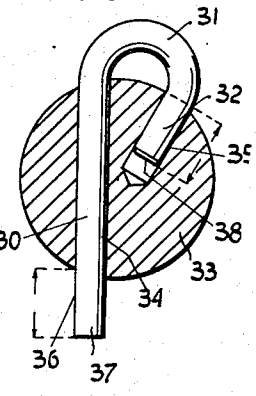


fig. 10

fig. 11



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fig. 12

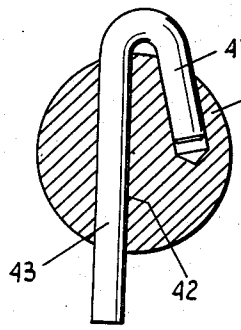


fig. 13

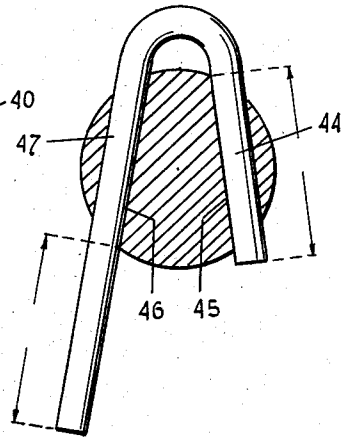


fig. 14

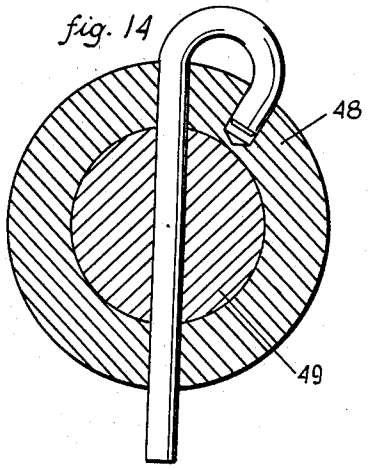


fig. 15

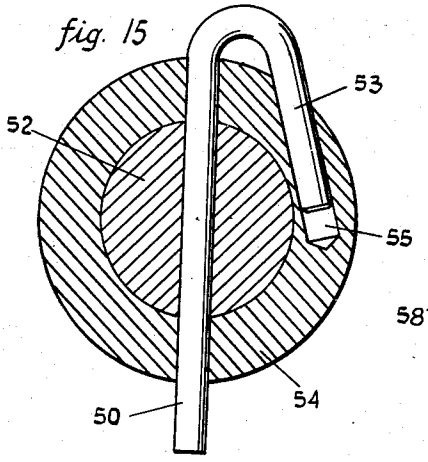


fig. 16

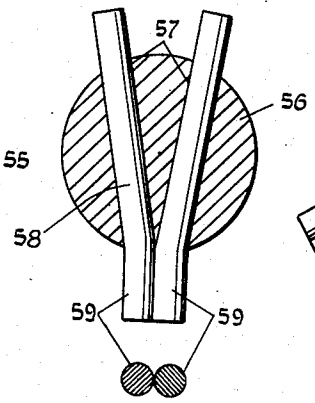
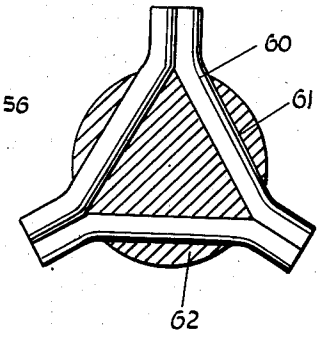


fig. 17



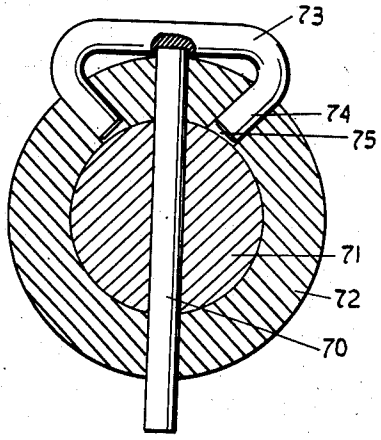


fig. 18

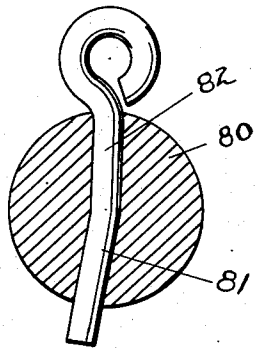


fig. 19

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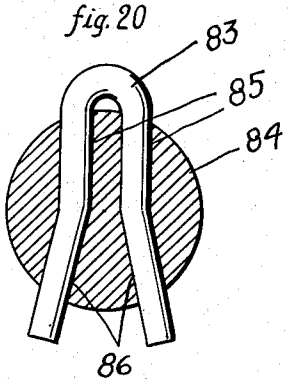
ATTORNEY.

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COTTER PIN

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fig. 20



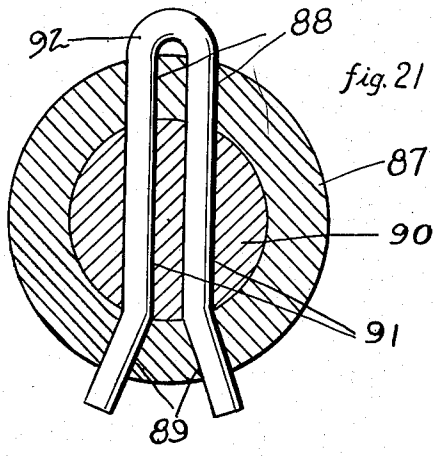
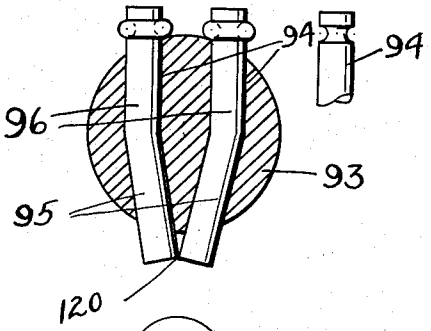


fig. 21

fig. 22



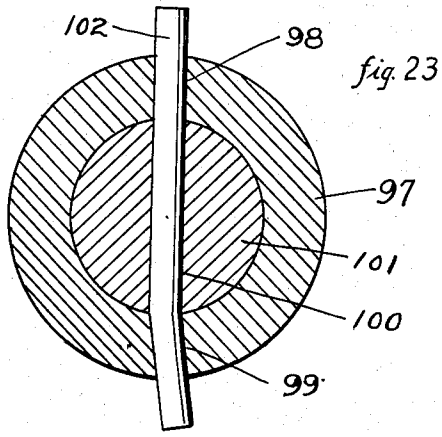


fig. 23

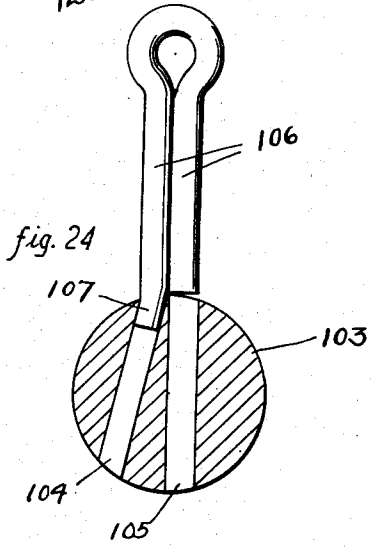


fig. 24

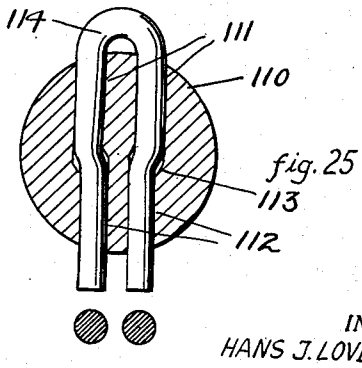


fig. 25

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Patented Jan. 1, 1935

1,986,586

UNITED STATES PATENT OFFICE

1,986,586

COTTER PIN

Hans J. Lovenston, Detroit, Mich.

Application August 19, 1931, Serial No. 558,109

2 Claims. (Cl. 85—7)

This invention relates to a cotter pin and more particularly that type of cotter pin which is adapted to lock wheels, collars, and the like upon bars, shafts, axles, and the like.

It is an object of this invention to produce a cotter pin that will have a positive interlocking fit with the member upon which it is mounted, which is easily assembled and disassembled to the said member and which will not readily bend under strain.

In the drawings:

Fig. 1 is an elevation and section of the cotter pin shown in Fig. 2 prior to assembly.

Fig. 2 is a cross section through a bar showing the cotter pin in locked position.

Figs. 3 and 4 are views of another type of cotter pin before and after assembly.

Fig. 5 shows another type of cotter pin the ends of which meet to form a double lock.

Figs. 6 and 7 are variations of the type of pin shown in Fig. 5.

Fig. 8 shows a cotter pin similar to that shown in Fig. 6, used for interlocking a shaft and a collar.

Fig. 9 shows a cotter pin in combination with a shaft with an opening having a surface inclined relative to the cotter pin hole.

Figs. 10 and 11 show another type of cotter pin before and after assembly to a shaft.

Figs. 12, 13, 14, and 15 are variations of the cotter pin shown in Fig. 10.

Fig. 16 shows a two-pin type of cotter pin assembly wherein the ends of the cotter pin abut to give a double locking effect.

Fig. 17 shows a modified form of the cotter pin assembly shown in Fig. 16.

Fig. 18 shows a modified form of the cotter pin shown in Fig. 10.

Fig. 19 shows still another form of cotter pin.

Figs. 20 and 21 show cotter pins in which the pins are inserted reversely to those shown in Figs. 6 and 8 respectively.

Fig. 22 shows a modified form of the pin shown in Fig. 7.

Fig. 23 shows a simple form of the round cotter pin connecting a shaft and collar.

Fig. 24 shows another type of cotter pin having a projecting end which serves as a pilot.

Fig. 25 shows another type of pin and shaft having two pairs of offset openings for interlocking the pin in the shaft.

Referring more particularly to the drawings, there is shown in Fig. 1 a cotter pin 1 which is U-shaped and circular in cross section. This cotter pin is adapted to be mounted upon any suitable member such as the shaft 2, which has drilled therein the openings 3. It will be noted that the longitudinal axes of the openings 3 intersect at an imaginary point exterior of the periphery of the shaft 2 leaving a space between the openings on the periphery of the shaft. The cotter pin is provided with the angular projection portion 3*a* which serves as a pilot. The pilot portion 3*a* of the cotter pin is bent outwardly to conform to the angular position of the opening into which it is received. In assembly the pilot portion 3*a* is inserted in the opening which properly positions the cotter pin and retains it in this position so that the workman may remove his hand and drive the pin with any suitable instrument such as a hammer into the diverging openings 3 causing the legs of the cotter pin to bend and thus lock the same into the shaft 2. It will be noted that initially the legs are parallel to each other. Hence, upon entering the openings 3 each leg is bent continuously after it is driven into the opening 3. This is brought out in Fig. 2 which shows the pilot portion 3*a* in longitudinal alignment with the remainder of the leg portion 1 after it has been driven through the opening 3. In other words, when the cotter pin of this construction is driven into the locking opening 3 the legs will bend at the extreme ends upon the first blow of the hammer and each successive blow of the hammer will create a bend until the pin is driven home as shown in Fig. 2. To disassemble the cotter pin from the shaft 2, the pilot end 3*a* is struck with a hammer. When the outer end of the pilot 3*a* reaches the outer surface of the shaft 2, the outer end of the other leg 1 will be positioned within the hole 3 and inwardly of the periphery of the shaft 2. This leaves an opening between the end of the non-piloting leg and the surface of the shaft which serves as a pilot for a drift or other instrument which may be used for driving the cotter pin out of the opening 3 in the shaft 2.

Figs. 3 and 4 show a cotter pin 4 which is initially U-shaped and adapted to be received in the openings 5 of the shaft 6. This modified form is a reversal of that shown in Figs. 1 and 2 in that the cotter pin is adapted to be projected into the openings 5 at their divergent ends.

In Fig. 5 the cotter pin 7 is initially U-shaped and adapted to be received in the converging openings 8 of the shaft 9. The legs 10 of the cotter pin 7 are driven completely through the openings 8 and somewhat beyond the periphery of the shaft 9 thus causing the ends 11 of the legs 10 to bend relative to the leg portion 10 and

tightly interlock. Hence, with this type of cotter pin the converging legs 10 in conjunction with the converging openings 8 not only prevent withdrawal of the cotter pin 7 but the interengagement of the ends 11 likewise prevent removal of the pin 7 from the shaft 9.

In Fig. 6 the cotter pin is provided with the leg portions 12 which are adapted to be received in the angular openings 13 of the shaft 14. The legs 12 are initially straight but upon being driven through the angular openings 13 are bent to the form shown and thus prevent withdrawal of the cotter pin from the openings in the shaft 14.

In Fig. 7 the cotter pin is provided with the legs 15 which are initially straight but upon being driven through the angular openings 16 take the form indicated, the lower portion 17 of the legs 15 converge and meet at a point outside of the circumference of the shaft.

In Fig. 8 there is shown a collar 18 having a pair of openings 19. Collar 18 is mounted on the shaft 20 having a pair of parallel openings 21. The openings 21 of the shaft 20 meet the non-parallel openings 19 at an angle, thus when the initially U-shaped cotter pin 22 is driven through the openings 19 and 21, the legs 23 are distorted in the shape of the angle indicated thereby interlocking the cotter pin the shaft and the collar 18.

In Fig. 9 there is shown a shaft 24 having a conical opening 25 and a transverse bore 26 and a shorter transverse bore 27 which opens into the opening 25. The opening 25 has a surface inclined relative to the transverse bore 27. The cotter pin 28 is initially U-shaped but upon being driven into the openings 26 and 27 the outer or locking leg 29 engages the surface of the counterbore 25 and is thereby bent outwardly as indicated locking the pin to the shaft.

In Fig. 10 there is shown a cotter pin consisting of the main stem portion 30, the arcuate portion 31, and the locking leg portion 32. In this instance the shaft 33 is provided with an opening 34 which is adapted to receive the stem portion 30 of the cotter pin. The stem portion 30 in this instance serves the main function of a cotter pin, namely, that of retaining a hub or collar or the like upon a shaft, and the short leg portion 32 serves the auxiliary function of locking the cotter pin to the shaft. To this end the shaft 33 is provided with an opening 35 positioned at an angle to the opening 34. Hence, when the cotter pin, as shown in Fig. 10 is driven into the shaft as indicated in Fig. 11, the leg 32 is bent inwardly and locks the cotter pin to the shaft. It will be noted that the opening 35 does not connect with the opening 34 which consequently assists the workman to insert the main stem portion 30 of the cotter pin in the proper opening during assembly because if the workman inserts the cotter pin in the shorter opening 35, upon the shaft reaching the bottom of opening 35 the workman will know that he has positioned the main stem 30 of the cotter pin in the wrong opening.

Much difficulty has been encountered in the removal of cotter pins from the openings in which they are fitted. To facilitate and simplify the removal of the cotter pin from the member upon which it is mounted, the cotter pin shown in Fig. 11 is so designed that the locking leg portion 32, as indicated by the arrows and the dotted lines, is no greater in length than the projection 36 of the stem portion 30 beyond the circumference of the shaft 33 as indicated by the dotted lines and the arrows. Hence, the cotter pin is very easily removed by striking the end 36 with a hammer and upon the extreme outer end 37 reaching the circumferences of the shaft 33, the outer end 38 of the locking leg 32 will be positioned at or beyond the circumference of the shaft 33, i. e., out of locking engagement with the shaft 33, thus permitting the cotter pin to be easily lifted from the hole 34.

The cotter pin shown in Fig. 12 is a variation of that shown in Fig. 11. In this variation the opening 40 for locking leg 41 diverges from the opening 42 for the main stem portion 43 and does not extend through the shaft.

The cotter pin shown in Fig. 13 is a variation of that shown in Fig. 11. The locking leg portion 44 is adapted to project entirely through an opening 45 in the shaft positioned at an angle to the opening 46 for the main stem portion 47 of the cotter pin. In this instance the locking leg 44 serves both the function of the locking leg and that of a cotter pin as indicated by the arrows and the dotted lines. The projection of the main stem portion 47 beyond the circumference of the shaft is equal to and preferably somewhat greater than the length of the locking leg 44, thus permitting easy withdrawal of the cotter pin from the shaft as explained in regard to the pin shown in Fig. 11.

In Fig. 14 the cotter pin is identical with that shown in Fig. 11, but here the pin is used to assemble the collar 48 to the shaft 49. In this instance, the shorter opening does not extend through the collar 48 and thus prevents the insertion of the main stem of the cotter pin into the wrong opening.

Fig. 15 shows a cotter pin which is a variant of that shown in Fig. 13. In this instance the main stem portion 50 extends through aligned openings in the collar 51 and the shaft 52 whereas the locking leg portion 53 engages only in an opening 55 in the collar 54 which opening is at an angle to the aligned openings receiving the main stem portion 50.

In Fig. 16 the shaft 56 is provided with the converging openings 57. Each of the openings 57 is adapted to receive a cotter pin 58. The cotter pins 58 are initially straight. The converging openings 57 meet at the circumference of the shaft 56. Upon being driven through the openings 57 the lower ends 59 of the pins 58 meet at the circumference of the shaft and each is bent into angular relation with the remainder of the pin. The ends 59 are driven tightly together and thus cooperate to lock the pins 57 to the shaft 56.

Fig. 17 shows a modification of the cotter pin arrangement shown in Fig. 16, in that three cotter pins 60 are arranged to be driven through the openings 61 in the shaft 62. The openings 61 are positioned at an angle of 60° to each other. Thus three cotter pins 60 form a triangular arrangement with three pairs of interengaging locking ends.

In Fig. 18 the cotter pin 70 is adapted to be projected through aligned openings in the shaft and collar 71 and 72 respectively. The cotter pin 70 has fixed thereto, in any suitable manner such as by spot welding, an initially U-shaped member 73. The U-shaped member 73 has the locking legs 74 which engage in the angular openings 75 to lock the cotter pin 70 to the shaft and collar in a manner similar to that of the cotter pin shown in Fig. 11.

In Fig. 19 the shaft 80 is provided with the

angular opening 81. The cotter pin 82 is initially straight but upon being driven through the angular opening 81 is bent to the angle shown, and thus becomes locked against withdrawal in the opening 81.

In Fig. 20 there is shown a cotter pin 83 which is initially U-shaped. In this instance the shaft 84 has a pair of parallel openings 85 which communicate with a pair of converging openings 86. This is similar to the cotter pin and shaft shown in Fig. 6, only in this instance the cotter pin is driven through the openings in the shaft in the opposite direction.

In Fig. 21 the collar 87 is provided with the parallel openings 88 and the converging openings 89 and the shaft 90 is provided with the parallel openings 91. Hence, upon the initially U-shaped cotter pin 92 being driven through the openings 89 and 91 the cotter pin is bent to the position shown and together with the openings is locked securely in position.

In Fig. 22 the shaft 93 is provided with the parallel openings 94 which communicate with the diverging openings 95. In this instance, two initially straight cotter pins 96 are driven into the openings 94 and 95 until the projecting ends meet as at 120.

In Fig. 23 the collar 97 is provided with the disaligned openings 98 and 99 which communicate with the opening 100 in the shaft 101. In this instance the initially straight round cotter pin 102 is driven through the opening and bent to the position shown to form an interlock with the shaft and collar.

In Fig. 24 there is shown the shaft 103 having the converging openings 104 and 105. In this instance the legs 106 of the round cotter pin have a line contact along the outer surface, one of the legs is provided with an end portion 107 which is bent at an angle to the main leg portion 106 which corresponds to the angle between the openings 104 and 105. When the workman desires to assemble the cotter pin to the shaft 103 the pilot 107 is inserted in the openings 104, and the pin is then in a proper position to be driven into interlocking relation with the shaft 103.

In Fig. 25 the shaft 110 is provided with the parallel openings 111 which are offset from the parallel openings 112. The junctions of the openings 111 and 112 are suitably inclined as at 113 so that when the initially U-shaped cotter pin 114 is driven through the openings 111 the legs will be bent and directed through the parallel openings 112 to the position shown in Fig. 25.

As indicated by the cross sections in Figs. 16 and 25, the cotter pins here shown are round or circular in cross section. Further the openings through the shafts and collars which are adapted to receive the round cotter pins are of substantially the same diameter as the cross-sectional diameter of the pins. This is important because it gives the pin a snug fit in the openings in the shaft and likewise is quite essential to the bending action which takes place where the cotter pin is driven home in the opening in the shaft as was specifically described above in regard to the pin shown in Fig. 2. Another important feature of this type of round cotter pin is that such a cotter pin can be used a great number of times before it becomes necessary to discard it. In other words, one or several uses of this type of round cotter pin will not destroy it. For instance, after the cotter pin in Fig. 2 has been disassembled from the shaft 2 it will take the form of the cotter pin shown in Fig. 1 and again be ready for use.

I claim:

1. A cotter pin assembly comprising in combination a bar having an opening extending completely therethrough and a second opening positioned at an angle to the first opening, a metal cotter pin of the type which takes a permanent set when assembled with the said bar having a main stem portion engaging in the first opening and projecting beyond the periphery of the bar and a locking leg portion of a length not greater than the length of the main stem portion which extends beyond the main projection of the bar, said locking leg portion engaging in the second opening in the bar to lock the cotter pin to the bar, and a portion connecting the main stem portion and the locking leg portion whereby the cotter pin may be removed from the bar by driving the projecting portion of the main stem portion back in flush relation with the periphery of the bar whereupon the locking leg portion is completely withdrawn from its opening to permit the pin to be withdrawn.

2. A cotter pin assembly comprising in combination a bar having a pair of openings circular in cross-section positioned at an angle one to the other and the first of which extends completely through the bar, a metal cotter pin of the type taking a permanent set when assembled with the said bar having a main stem portion engaging in the first opening and projecting beyond the periphery of the bar and a locking leg portion engaging in the second opening, and a curved portion connecting the locking leg portion and the main stem portion, a portion of the main stem projecting beyond the periphery of the bar a distance at least substantially equal to the length of the locking leg portion projecting within the second opening in the bar whereby the pin may be disassembled from the bar by driving the projecting portion of the main stem portion back flush with the periphery of the bar whereby the locking leg is removed from locking engagement with its opening to permit the removal of the pin from the bar.

HANS J. LOVENSTON.