PATENT SPECIFICATION

Convention Date (Australia): Dec. 11, 1937. **505,417**

Application Date (in United Kingdom): Nov. 21, 1938. No. 33765/38.

Complete Specification Accepted: May 10, 1939.

COMPLETE SPECIFICATION

Improvements in and relating to Locking Means for Bucket Pins

We, ALLUVIAL MINING EQUIPMENT LIMITED, a Company organized under the laws of the State of New South Wales, and carrying on business at 26, Jamieson Street, Sydney, in the State of New South Wales, Commonwealth of Australia, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to pin coupled buckets for bucket dredgers (or conveyors) in which a close connected bucket band is employed. As the invention is particularly applicable to dredgers it is hereinafter described and referred to in that connection only.

In a close connected bucket band adjacent buckets are pivotally connected by a pin which passes through the spaced front eyes of one bucket and the aligned back eye of the preceding bucket. The back bucket eye is bushed and oscillates on the pin, and the pin is locked against rotation in the un-bushed front eyes to confine wear to the pin.

Many devices have been proposed and used for the purpose of locking the bucket pin in the front eyes of the bucket, but all of such devices which have been successful have also been relatively complicated and expensive to instal and maintain, in that a head is formed on the pin itself, with which a locking device co-operates to prevent rotation of the pin. The most conventional form incorporates a relatively large "L" or "T" head on one end of the pin.

The bucket pins are particularly expensive, for they are formed of costly alloy, such as nickel chrome steel, and considerable forging and machining is necessary to produce the head thereon. The cost of the metal in the head, and the forging and machining of the hard metal to finish the head, represents the greater part of the cost of the pin.

It has also been proposed to design the "L" or "T" headed pin and the front bucket eyes in such manner that the pin can be rotated or reversed to throw the major wear on the opposite side of the pin, and so extend the life of the pin.

The object of this invention is to provide a locking means for the bucket pin which will be particularly compact, and efficient in use, and which will moveover permit of a major saving in the cost of the pins themselves, in that the head on the conventional pin is entirely eliminated, along with the cost involved in the production of the head.

A further object is to provide such pin locking means in which the feature of reversibility of the pin, to throw wear on the opposite side of the pin, is achieved in a simpler and cheaper manner than hitherto possible, and without weakening the front bucket eyes.

The invention consists in locking means for bucket pins comprising a headless pin mounted at its ends in spaced eyes in the bucket, a slot formed in one of said eyes, and a recess in the pin which co-operates with the slot in the eye, and a wedge block disposed in said slot and recess and seating on one side in the recess in the pin and on the opposite side in the slot in the eye to lock the pin against rotation in the eye.

In order to fully describe the invention, reference is made to the accompanying drawings which depict a preferred form thereof, and modifications, and in which:—

Fig. 1 is a perspective view of a typical bucket with one form of the invention applied to the bucket pin,

Fig. 2 is an elevation of the front eyes and pin of Fig. 1, with one eye in cross-section,

Fig. 3 is a side elevation of a front eye and the pin locking device of Fig. 1,

Fig. 4 is a side elevation of a front eye and a modified form of the pin locking device,

Fig. 5 is a perspective view of the front eyes and pin of the bucket with a modified form of locking device,

Fig. 6 is a cross-sectional elevation, taken on plane 6—6 of Fig. 5,

Fig. 7 is a cross-sectional elevation, taken on line 7—7 of Fig. 6,

Fig. 8 is a side elevation of a further modified form of locking device, and

[Price 1/-]

Figs. 9 and 10 are cross-sectional views taken on lines 9—9 and 10—10 respectively of Fig. 8.

The bucket 5 has a back eye 6, and two similar front eyes 7, 7 in which are mounted the ends of a plain pin 8 by means of which the bucket is pivotally connected to the adjacent bucket. The ends of the pin 8 finish flush with the outer surface of the eyes 7. 7 and no head is formed on the pin.

In the constructon shown in Figs. 1, 2 and 3 each eye 7 is formed on its outer side with a longitudinally tapered slot 9 extending across the lower edge of the bore 10 of the eye. Each end of pin 8 is formed with an " L " recess 11 adapted to register longitudinally with the slot 9, but with the upper edge of the recess projecting slightly below the upper edge of slot 9, as seen in Fig. 3 and for a purpose hereinafter stated. The lower surface of slot 9 is inwardly inclined (undercut), as seen in Fig. 2.

A wedge block 12 is tapered longitudinally along its lower edge which is also inclined (undercut) in conformity with slot 9, and is disposed within slot 9 in engagement therewith and with the recess 11 in pin 8.

On being forced into locked position, wedge block 12 bears on the back and lower edge of slot 9, and on both surfaces of " L " recess 11 in pin 8, and so locks the pin against rotation in the eye 7. As the upper edge of recess 11 in pin 8 is slightly lower than the upper edge of slot 9, the wedge block 12 does not bear on such upper surface of the slot, and consequently the wedge block cannot jamb in the slot, but always locks on the pin 8.

The engaging complementary inclinations (undercuts) of the lower surface of each slot 9 and each wedge block 12 resist any axial movement of the pin. Each wedge block 12 is formed with a stem 13 which extends through an aperture 14 in a shoulder abutment 15 formed on the bucket. The outer end of stem 13 is threaded, and on the rear side of shoulder 15 is fitted with a nut 16 by which the wedge block is drawn into locked position. A lock nut 17 is also threaded on the stem.

In use each wedge block 12 is engaged in slot 9 and recess 11 of pin 8, and is drawn tight by nut 16 to securely lock the pin 8 in relation to the eye 7 at each end, both with regard to rotational and axial movement in the eyes.

As shown in Fig. 4, the wedge block 12 may extend diametrically across the center of pin 8. In this case slot 9^1 is on a diameter of the eye, and the side recess in the pin is replaced by a substantially diametral recess 18. Whilst they are parallel, recess 18 is slightly offset in relation to slot 9^1, as shown in Fig. 4, for the purpose of preventing jambing of the wedge block 12 in slot 9^1, and with the result that the wedge block bears on the upper surface of recess 18 and the lower surface of slot 9^1, and so locks the pin 8 in the eye 7. The wedge block 12 is undercut and is fitted with a stem 13 and nuts 16 and 17, and its operation is as above described.

The construction shown in Figs. 5, 6 and 7 embodies a slot 9^2 of substantially oval cross-section, formed through each eye 7 intermediate the sides of the eye. The pin 8 is formed near each end with a semi-oval recess 19 which registers with slot 9^2.

The wedge block 12^1 in this construction is longitudinally tapered and of oval cross-section, and it seats along one side on the slot 9^2 and along the opposite side in recess 19 in the pin. The wedge block is formed with the stem 13, which passes through a detachable abutment plate 20 disposed over the rear end of slot 9^2, with which it and nut 16 co-operate to draw the wedge block into locked position.

This form of the invention has the advantage that the slots in the eyes have closed sides, and hence do not weaken the eyes to the same extent as open-sided slots. Moreover, but one wedge block is necessary to lock the pin against axial movement.

In the construction shown in Figs. 8, 9 and 10, the slot 21 in the outer side of each eye extends at an angle from the rear face of the eye, but terminates short of the front of the eye. The pin 8 is formed at each end with the " L " recess 11, and the wedge block 12 is longitudinally tapered and inclined (undercut) along one side, in a similar manner to Fig. 2.

In this construction the stem 13 extends into a cut-back aperture 14^1 in an inclined abutment 15^1, and the nut 16 is fitted on the stem on the forward side of the abutment, with which it co-operates to push the wedge block 12 forwardly.

To insert the wedge block, nut 16 is threaded forwardly on stem 13, which is inserted at an angle through aperture 14^1, as shown in dotted lines in Fig. 10. The wedge block, in this retracted position, is then swung sideways into the wider part of slot 21, and nut 16 is screwed rearwardly on the stem to push the wedge block forwardly into locked position.

This construction has the advantage that the slots in the eyes do not extend to

Figs. 9 and 10 are cross-sectional views taken on lines 9—9 and 10—10 respectively of Fig. 8.

The bucket 5 has a back eye 6, and two similar front eyes 7, 7 in which are mounted the ends of a plain pin 8 by means of which the bucket is pivotally connected to the adjacent bucket. The ends of the pin 8 finish flush with the outer surface of the eyes 7. 7 and no head is formed on the pin.

In the constructon shown in Figs. 1, 2 and 3 each eye 7 is formed on its outer side with a longitudinally tapered slot 9 extending across the lower edge of the bore 10 of the eye. Each end of pin 8 is formed with an " L " recess 11 adapted to register longitudinally with the slot 9, but with the upper edge of the recess projecting slightly below the upper edge of slot 9, as seen in Fig. 3 and for a purpose hereinafter stated. The lower surface of slot 9 is inwardly inclined (undercut), as seen in Fig. 2.

A wedge block 12 is tapered longitudinally along its lower edge which is also inclined (undercut) in conformity with slot 9, and is disposed within slot 9 in engagement therewith and with the recess 11 in pin 8.

On being forced into locked position, wedge block 12 bears on the back and lower edge of slot 9, and on both surfaces of " L " recess 11 in pin 8, and so locks the pin against rotation in the eye 7. As the upper edge of recess 11 in pin 8 is slightly lower than the upper edge of slot 9, the wedge block 12 does not bear on such upper surface of the slot, and consequently the wedge block cannot jamb in the slot, but always locks on the pin 8.

The engaging complementary inclinations (undercuts) of the lower surface of each slot 9 and each wedge block 12 resist any axial movement of the pin. Each wedge block 12 is formed with a stem 13 which extends through an aperture 14 in a shoulder abutment 15 formed on the bucket. The outer end of stem 13 is threaded, and on the rear side of shoulder 15 is fitted with a nut 16 by which the wedge block is drawn into locked position. A lock nut 17 is also threaded on the stem.

In use each wedge block 12 is engaged in slot 9 and recess 11 of pin 8, and is drawn tight by nut 16 to securely lock the pin 8 in relation to the eye 7 at each end, both with regard to rotational and axial movement in the eyes.

As shown in Fig. 4, the wedge block 12 may extend diametrically across the center of pin 8. In this case slot 9^1 is on a diameter of the eye, and the side recess in the pin is replaced by a substantially diametral recess 18. Whilst they are parallel, recess 18 is slightly offset in relation to slot 9^1, as shown in Fig. 4, for the purpose of preventing jambing of the wedge block 12 in slot 9^1, and with the result that the wedge block bears on the upper surface of recess 18 and the lower surface of slot 9^1, and so locks the pin 8 in the eye 7. The wedge block 12 is undercut and is fitted with a stem 13 and nuts 16 and 17, and its operation is as above described.

The construction shown in Figs. 5, 6 and 7 embodies a slot 9^2 of substantially oval cross-section, formed through each eye 7 intermediate the sides of the eye. The pin 8 is formed near each end with a semi-oval recess 19 which registers with slot 9^2.

The wedge block 12^1 in this construction is longitudinally tapered and of oval cross-section, and it seats along one side on the slot 9^2 and along the opposite side in recess 19 in the pin. The wedge block is formed with the stem 13, which passes through a detachable abutment plate 20 disposed over the rear end of slot 9^2, with which it and nut 16 co-operate to draw the wedge block into locked position.

This form of the invention has the advantage that the slots in the eyes have closed sides, and hence do not weaken the eyes to the same extent as open-sided slots. Moreover, but one wedge block is necessary to lock the pin against axial movement.

In the construction shown in Figs. 8, 9 and 10, the slot 21 in the outer side of each eye extends at an angle from the rear face of the eye, but terminates short of the front of the eye. The pin 8 is formed at each end with the " L " recess 11, and the wedge block 12 is longitudinally tapered and inclined (undercut) along one side, in a similar manner to Fig. 2.

In this construction the stem 13 extends into a cut-back aperture 14^1 in an inclined abutment 15^1, and the nut 16 is fitted on the stem on the forward side of the abutment, with which it co-operates to push the wedge block 12 forwardly.

To insert the wedge block, nut 16 is threaded forwardly on stem 13, which is inserted at an angle through aperture 14^1, as shown in dotted lines in Fig. 10. The wedge block, in this retracted position, is then swung sideways into the wider part of slot 21, and nut 16 is screwed rearwardly on the stem to push the wedge block forwardly into locked position.

This construction has the advantage that the slots in the eyes do not extend to

the front face of the eyes and hence do not present open mouths into which material may be forced during operation of the bucket chain.

The invention provides a particularly compact and efficient lock for the bucket pin. These pins are of expensive alloy metal and have to be replaced frequently. Moreover, the pins 8 in accordance with the invention can be readily withdrawn and reversed end for end, thereby presenting the opposite side for wear, and virtually doubling the life of the pin.

In the construction shown in Figs. 5, 6 and 7, this feature of reversibility may be maintained even when but one eye is provided with locking means, by forming a recess 19 at either end of the pin.

The saving in the cost of the pins which is made possible by the invention is of major importance over a period of operation in a bucket chain equipped with a large number of such pins.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. Locking means for bucket pins comprising a headless pin mounted at its ends in spaced eyes in the bucket, a slot formed in one of said eyes, and a recess in the pin which co-operates with the slot in the eye, and a wedge block disposed in said slot and recess and seating on one side in the recess in the pin and on the opposite side in the slot in the eye to lock the pin against rotation in the eye.

2. Locking means according to Claim 1, and including screw means for forcing said wedge into locked position.

3. Locking means according to Claim 2, in which the screw means comprise a threaded stem on the wedge block and a nut thereon co-operating with an abutment on the bucket.

4. Locking means according to any of the preceding claims, and including means for preventing axial movement of the pin in the eye.

5. Locking means according to any of the preceding claims, in which the wedge block is longitudinally tapered.

6. Locking means according to Claim 5, in which the slot in the eye is longitudinally tapered.

7. Locking means according to any of the preceding claims, in which the slot in the eye is disposed intermediate the sides of the eye.

8. Locking means according to any of Claims 1 to 6 inclusive, in which the slot is formed in the outer side of the eye and the recess is formed across the outer end of the pin.

9. Locking means according to Claim 8, in which the recess is of "L" shape, running out at the side of the pin.

10. Locking means according to Claim 8, in which the recess extends diametrically across the outer end of the pin.

11. Locking means according to any of Claims 7, 8 or 9, in which the slot in the eye terminates short of the front face of the eye.

12. Locking means according to any of the preceding claims, in which the wedge block and the eye are formed with complementarily inclined engaging faces which prevent lateral movement of the wedge block in the eye.

13. Locking means for bucket pins comprising a headless pin mounted at its ends in spaced eyes in the bucket, a slot formed in the outerside of each of said eyes and a co-operating recess formed in the adjacent end of the pin, a longitudinally tapered wedge block in each eye seating along one side on the slot in the eye and along the opposite side on the recess in the pin, and a screwed stem on said wedge block co-operating with an abutment on the bucket for drawing the wedge block into locked position.

14. Locking means for bucket pins comprising a headless pin mounted at its ends in spaced eyes in the bucket, a closed-sided slot formed through one of said eyes intermediate the sides of the eye, a recess in the pin registering respectively with the slot in the eye, a longitudinally tapered wedge block disposed in said slot and seating along one side in the slot in the eye and along the opposite side in the recess in the pin, and a screwed stem on the wedge block co-operating with an abutment on the bucket for forcing the wedge block into locked position.

15. Locking means for bucket pins comprising a headless pin mounted at its ends in spaced eyes in the bucket, a slot formed in the outer side of each of said eyes and terminating short of the front face of the eye, recesses in the ends of the pin registering respectively with the slots in the eyes, a longitudinally tapered wedge block disposed in each slot and seating along one side on the slot in the eye and along the other side on the recess in the pin, and a screwed stem on each wedge block co-operating with an abutment on the bucket to push the wedge block into locked position.

16. Locking means for bucket pins substantially as herein described and illustrated in Figs. 1 to 3, or Fig. 4, or Figs. 5 to 7, or Figs. 8 to 10.

Dated this 21st day of November, 1938.

CRUIKSHANK & FAIRWEATHER,
65—66, Chancery Lane, London, W.C.2,
and 86, St. Vincent Street, Glasgow,
Agents for the Applicants.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1939.