The present invention relates to tail sections, sometimes called foot sections of mine chain conveyers. While such sections are normally used to receive the material, such as coal, to be conveyed, and hence may be said to be at the receiving ends of the conveyers, it has been found desirable to also use the conveyers to deliver materials to workmen at such sections by reversing the direction of travel of the chain conveyers, whereupon the tail sections become the delivery ends of the conveyers. The materials thus delivered to workmen may be timbers, powder, bits, drills, cap boards, etc. Many accidents have resulted at the tail sections from this secondary use of the conveyers. These have been due to the character of mechanism and sometimes to the covers forming parts of tail sections in common use which ordinarily require the workmen to snatch the material from the conveyer before it reaches the tail piece in an attempt to avoid accidents. It is one of the objects of the present invention to provide tail sections conducive to safety when they constitute the delivery ends of the conveyers.

Such tail sections must often be carried or shoved to and from workings in mines where the passageways are small, sometimes no more than two feet in height. Since they must be sturdily built, and often weigh considerable, much labor is required to move them about. It is another object of the invention to provide tail sections which are easier to move about. This is in part accomplished by reducing the over-all height and length, and the weight of the sections, as compared with those in common use, without sacrificing durability. The reduction in height of the tail sections has other advantages among which may be mentioned the ability to use them where coal seams are shallow and are used with face conveyers which have delivery ends above the tail sections, thus often avoiding the necessity of "shooting" holes in the roofs of the mine cavities to accommodate the delivery ends of the face conveyers.

Another object of the invention is to provide tail sections which may be located closer to the faces of the mine workings than those in common use, and thus permit the "face" conveyers, which may be loading into the tail sections, to be located closer to the workings than has been the practice in the past.

Due to the character of material moved by chain conveyers, the flights of the chains often become bent and have been a source of trouble in the past. Attempts have been made to avoid such difficulties, by allowing considerable clearance for the flights, so that any which may be bent may travel with little or no obstruction. In so doing the over-all height of the tail sections have been increased thereby rendering the tail sections cumbersome, and entailing more work to locate them in shallow workings. Another object of the invention is to so construct and arrange the parts of the tail sections that desirable clearance for bent flights is maintained, but without needlessly resorting to an increase in over-all dimensions.

To some extent many of these objects and advantages of the present invention are accomplished by using a smaller end sprocket wheel for the usual chain of the conveyer, than those previously used to bring about the return run of chain, and to avoid the use of the so called "hold down" or guide sprockets, or roller working above the chain adjacent the end sprocket so as to maintain the conveyer chain and flights in traveling contact with the bottoms of the conveyer pans adjacent the tail section. As an example we may use a sprocket wheel having a pitch diameter of 4.61 having 6 teeth, instead of one of 5.32 pitch diameter and having 7 teeth commonly used for the usual size conveyer chain which is practically standard in present day use. By the use of the smaller sprocket, and by dispensing with the guide sprocket or roller, the weight and cost of the unit is reduced, the overall height of the section is reduced and the upper run of the chain may travel in about the same plane as it travels in the pan sections. There is no abrupt change in the path of the conveyer chain as it leaves or approaches the end sprocket. This latter arrangement is particularly advantageous when the conveyer is used to transport supplies to the workmen, since there is little if any likelihood of such material catching between the chain and sprocket wheel when it reaches the tail piece. Thus the material may be permitted to drop off the end of the tail piece, and workmen are not required to be alert and snatch the supplies from the conveyer before they reach the tail piece.

It is common practice to provide tail sections with means whereby the chain conveyer may be adjusted lengthwise for proper operation and yet permit it to be slackened so that it may be "broken" near the tail section for inserting another pan section as well as an appropriate chain conveyer section, as work progresses in the mine. It is another object of the invention to permit use of such adjusting means in a shorter tail sec-
tion, without reducing the amplitude of adjustment, and yet permit of ready assembly and dismemberment of the tall piece during manufacture and for repair purposes.

Other objects and advantages of the invention will be apparent from the following detailed description of our invention, taken in connection with the accompanying drawings, forming a part of this specification, and in which drawings:

Fig. 1 is a perspective view of the tail section, a portion of a conveyor chain with one of its flights, and a portion of a conveyor pan coupled to the tail section.

Fig. 2 is a side elevation of the tail section, portions being broken away and shown in vertical section to disclose preferred details.

Fig. 3 is a vertical sectional view of the same, parallel to the axis of the conveyor, taken directly in front of the sprocket wheel hub.

Fig. 4 is a horizontal sectional view, on a reduced scale, on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a view partly in plan and partly in horizontal section of an adjustable portion of the tail section.

Fig. 7 is a sectional view on the line 1—1 of Fig. 6.

Fig. 8 is a detail view partly in elevation and partly in section of a portion of adjusting means for tightening and loosening the conveyor chain.

Fig. 9 is a perspective view of an adjustable bearing block.

In the drawings A designates the tail section of the conveyor; B a pan section coupled thereto, generally termed an intermediate section of the conveyor, several of which are used between the tail section and a head section, not shown in the drawings; C a coupling device between the sections A and B, and which may be of the character generally disclosed in our copending application for United States patent filed November 19, 1942, Serial No. 468,124, and D a conveyor chain, of any suitable type, including flights, one of which is shown at E.

The intermediate pan section B, as shown in Fig. 1, includes a trough portion 10 in which the upper run of the conveyor chain D and its flights E travel, as usual, a horizontal plate 11 having side walls 12 diverging upwardly therefrom, as is quite common in the art. The base portion 13 of the pan section beneath the trough accommodates the lower run of the conveyor chain in the usual manner. The end of the pan section is provided with outstanding end flanges 14 for coupling relation with similarly located outstanding end flanges 15 of the tail section.

The pan section may be provided with a transversely extending shoe or runner 16 which may be of the character shown in copending application for United States patent of the present applicant Armistead R. Long, filed January 5, 1945, Serial No. 571,428.

Referring now to the tail section A, it comprises a base or main body portion 17, a trough portion 18, a tail shaft 19 with end sprocket wheels 20 for cooperation with the conveyor chain D, bearings 21 for the end portions of the tail shaft, means 22 for adjusting the position of the bearings longitudinally on the conveyor, devices 23 for applying lubricant to the bearings, an adjustable slide plate 24 and means 25 for supporting the slide plate by the bearings 21.

In the example shown, the base 17 is preferably made mainly of fabricated plate material and rolled metal sections, welded together to render the unit comparatively light in weight, sturdy and susceptible of easy repair. With this in view, it comprises a combined skid and flight guide bottom 26, guides or housings 27 for the bearings 21 adjacent the normal receiving end of the tail section and which may aid in supporting the trough portion 10, side walls 28 secured to the bottom to mainly support the trough portion 10, a ground support 29 at the other end portion of the foot section opposite the guides or housings 27, and a cross brace 30 connecting the side walls 28 for bracing and assistance in supporting the trough portion 10.

The bottom 26 is preferably of substantially H-shape in plan as may be observed from Fig. 4 comprising a central portion 31 extending transversely of the tail section, a first pair of arms 32 to one side of portion 31, serving as guides for the flight E and a second pair of arms 33 upon which the guides or housings 27 are mounted. A relatively large opening 34 is thereby provided between the arms 33 so that flights of the conveyor chain may extend as they travel beneath the shaft 10. In this respect the bottom 26 differs from so-called "skid pans" of tail sections in common use. The free ends of the arms 33 may be bent upwardly to form nosings 35 like the forward ends of skid runners to assist workmen in pushing or drawing the tail section over rough surfaces.

It is preferred to curve and elevate the arms 32 above the plane of the arms 33 as shown in Fig. 3 so that their free ends will align with the usual inwardly turned flanges, not shown in the drawings, of conventional intermediate conveyor sections which are provided as guides for the conveyor flights. With this in view, and to afford a ready means for connecting the tail section to ordinary intermediate pan sections, such as 10, the ground support 29 is provided, including the flanges 36, which may be the legs of upright angle sections 37, the other legs 38 of which are welded as at 39 or otherwise secured to the side walls 28 and also welded as at 39 to the trough section 10; and a transversely extending shoe or runner 40 welded as at 41 or otherwise secured to the ends of arms 32, and welded as at 42 or otherwise secured to the upper end nosings 35.

The guides or housings 27 are each preferably made of major vertical end plates 43 and 44, minor intermediate vertical plates 45 and 46, horizontal upper plate 47, horizontal lower channel section or plate 48 and vertical side plate 49, with guide rib 50 on the under side of plate 47 and guide rib 51 on the upper side of plate 48. The plates 43 serve also to brace side walls 52, which preferably have upper outstanding flanges 53, of the trough portion 10. Walls 48 and 54 are also primarily braces for the side walls 52 and flanges 53, but the wall 45 also functions as an abutment for the end wall 44 which is removable in order to place and remove the bearings 21 and parts carried thereby. The horizontal lower channel section 48 has its downwardly extending flanges 54 welded, as at 55, to the top of its respective arm 33 of the frame bottom 26. The end plate 43 has its lower margin welded, as at 56, to the same arm 33, its inner side margin welded, as at 57, to the end of side wall 28, and welded as at 58 to the side wall 52 of the trough portion 10, and its outer margin as at 59 to the flange 53. The horizontal upper plate 47, has its end margin at plate 43 welded thereto, as at 60, and its inner longitudinal margin welded, as at 62, to the trough wall 52, as shown.
in Figs. 1 and 5. The minor intermediate plates 45 and 46 have their lower margins welded at 55 and S5, respectively, to the top of plate 47, and their inner margins, welded at 96 and 96, respectively, to the trough side wall 92. Finally, the side plate 45 has its lower margin welded as at 97 to arm 33, its top margin welded, as at 98 to the underside of plate 47, and its end margin at plate 43 welded as at 99, thereto. The removable end plate 44 has a perforation 76 aligning with a perforation 71 in wall 48 for the shank of a bolt 72 coating with a nut 73 used to detachably secure the plate 44 against the ends of plates 45 and 48. The plate 45 is held against displacement by its lower margin resting upon arm 39 and caught behind nose 94. In order that access may be had to lubricating devices 23, without removing plate 44, the latter is provided with a relatively large perforation 76 to accommodate a part of the means 22, as shown in Fig. 4.

It will be noted from Figs. 1 and 3 that the trough portion 19, while having upwardly diverging side walls 52 and outstanding top flanges 53 extending through the length of the foot section, and the trough bottom 78 terminating as at 77 at the end of the foot section adapted for coupling relation with the pan section 33, the trough bottom has its other or inner end 78 near the transverse center of the foot section leaving a zone 79, indicated in Fig. 3, where the trough, per se, is bottomless. It is in this zone 79 that the sprocket wheel 26 and upper part of shaft 18 may be adjusted to tension the conveyor chain and permit the chain to be "broken" as when adding more pan sections and conveyor chain, or dismembering the conveyor. Thus the shaft 18 is in spaced relation to the end 78 of the trough bottom 78, with the plane of the latter intersecting the shaft 18. The bottom 78 is placed as low as possible, so as to allow ample capacity for the trough and yet sufficient room beneath the trough 76 and the arms 22 for the lower run of the conveyor chain and its flights.

The side walls 23 have their lower portions welded, as at 90 to the outer longitudinal margins of the arms 32, and welded, as at 91 to the bottom of trough 78. They are also welded as previously described, to the end plates 43, shown in Fig. 4.

We prefer to make the cross brace 30 of rolled angle metal, and locate it with the juncture 92 of its legs 93 and 94 lowermost, as shown in Fig. 3. The ends of the cross brace are welded as at 95 to the side walls 26, and the edges of the legs 93 and 94 are welded, as at 96, to the trough bottom 78. Thus the outer faces of the legs 93 and 94 converge downwardly serving as guides for any bent flights which may engage them, and present no obstruction to operation of the chain conveyor. This cross brace 30 avoids the necessity of any cross braces above the trough 18 and aids in providing a sturdy structure.

The bearings 21 are of block like formation and provided with upper and lower guides 87 and 88 for slidable engagement with the guide ribs 50 and 51, respectively. The bore 90 of each block is provided, in the example shown, with a bushing 90 of wear resisting material such as brass and is relatively shorter than the bore 90, as shown in Figs. 4 and 5, so as to leave end portions of the bore uncovered. A disc 91 inserted in the bore 90 closes one end of the bushing, at the outer side of the bearing and since it is desired to render the bearings interchangeable, end to end on the tail shaft 16, the end faces 92 are each provided with a recess 93 for a part of the means 22 for adjusting the portion of the bearing longitudinally of the conveyor. Also since it is desired to provide means for efficient lubrication of the bearing, a lubricant way 94 is provided, leading from the bottom of each recess 92 to a companion lubricant way 95 in the bushing 90. Either way 94 may receive the stem of device 23 for applying lubricant to the bearing, according to the position of the block of material on the inside or housing 21, that is, so the device 23 will be nearest the access opening 74 in wall 48. If the bushing 90 of each bearing becomes worn on the inside, where greatest pressure comes upon it, the bearing may be changed, end for end, and the device 23 placed in the opposite ways 94, thus presenting unused wear surfaces to the tail shaft ends.

We also prefer to provide the tail shaft with lubricant reservoirs 88 in its ends, a circumferential external groove 97 around the tail shaft and a radial way 99 leading from each groove 97 to its respective reservoir. Thus a large quantity of grease may be forced into the reservoir, thru the device 23, the ways 94, and 95, the groove 97 and way 99, in readiness for use if the block of material on the perimeter of the shaft becomes dry and the shaft starts to heat.

The adjustable slide plate 24 spans the distance between the shaft 18 and the bottom 76 of trough 18 through the amplitude of adjustment of the shaft and its sprocket 20 in zone 78. The means 25 for supporting this plate by the bearings 21 may comprise sleeves 89, welded, as at 100 to rearwardly extending lips 101 extending from the main body of the plate 24. The lips 101 are spaced apart a distance sufficient to receive a hub 102 of sprocket wheel 26, and a notch 103 is formed in the plate thru which the teeth of wheel 26 travel during operation of the conveyor. The outer end portions of the sleeves are preferably reduced in diameter, as at 104 so as to be accommodated in the bores of their respective bearings 21 and so that their outer ends may bear against the bushings 90 in dust proof manner. By making the sleeves with an internal diameter noticeably greater than the diameter of shaft 18, the sleeves 89 are supported by the bearings 21 with a clear of the shaft 18 thus reducing wear and friction to a minimum.

It is preferred to dispose the plate 24 slightly higher at its end above the shaft 18 than at its forward end 105 which rests upon the trough bottom 78, as shown in Fig. 3 so as to insure intimate contact between the two thrurout operation and adjustment of the conveyor. We also prefer to bevel or "round" the forward edge of the plate as at 106 and to "round" the plate, as at 107 between its forward edge and side edges, in the plane of the plate structure. Where the conveyor is used to deliver supplies to the tail section end of the conveyor, by reversing the direction of travel of the conveyor chain, the material will be guided up the beveled edge 105. Also any bent flights will be elevated above the surface of the plate 24, before they reach the plate at its full width, by the chain and the center of the flights bearing upon the central top surface of the plate adjacent the beveled edge 105. In other words, by relieving the forward portion of plate 24 of angular corners, any bent flights will not en-
counter abrupt edges and hence may travel with the chain, without obstruction. The means 22 for adjusting the position of the bearings 21 longitudinally of the conveyor is preferably similar to such means in common use with several notable exceptions. It is old in the art to provide a threaded screw and stationery nut for this purpose and in the example shown the means 22 comprises a thrust screw 108, having a thrust end formation 109 at one end of its threaded shank 110 for reception in the recess 88, and a head 111 at the other end of its threaded shank to facilitate rotating the screw, and a nut 112 having a threaded bore 113 for shank 110. Also the shank 110 must be of sufficient length so as to permit a wide range of adjustment of the bearing 21 along its guide way. It is desirable to normally dispose the sprocket 20 as near the rear end of the base 17 as possible and thereby get the receiving end of the conveyor as near the face of the mine working as possible, yet to permit sufficient slack in the chain to "break" it as when inserting an additional length of chain and an additional pan section, it must be possible to move the bearings 21 a considerable distance toward the forward end of the base 17. Herefore it has been the practice to make the thrust screw sufficiently long that the screw 108 could be entirely unscrewed from the nut, without obstruction, when dismembering the tail section. We have provided an arrangement whereby we reduce the overall length of the tail section and still enable dismembering the screw 108, less the thickness of the nut 12 as shown by dotted lines in Fig. 4. Then we provide this abutment 114 with a slot 116 open as at 117, laterally of the tail section whereby the screw and nut may be bodily placed and removed, with the shank 110 accommodated in the slot 116, provided the screw is first fed inwardly, or outwardly with respect to the nut until its thrust end is substantially with the threaded bore of the nut as shown in Fig. 8. After assembly the screw and nut as thus shown and described, the nut may be accommodated between the abutment 114 and end wall 43 of the guide or housing 21, and the shank of the screw disposed in slot 116, whereupon the screw may be rotated to extend thru opening 75 in wall 43 and engage the bearing 21 in the usual way.

If desired, the abutment 114 may also be used to brace the structure by being cut to substantially the pattern of the end walls 43 and 44, and securely welded, in spaced relation to wall 43. For instance its inside edge may be welded, as at 118, to side wall 28, and, as at 119, to the side wall 52 of trough 18; its top margin welded, as at 120 to the trough flange 53 and its lower margin welded, as at 121, to the bottom 26. We may also provide short transverse plates 122 and 123 above and below the nut 112 as shown in Figs. 1 and 2, welded as at 124 and 125 to the wall 43 and abutment 114, respectively, which also serve to brace the structure and prevent the nut from rotating as the screw is turned for adjusting purposes.

Another advantage of this means 22 is that if becomes upset or damaged, so that it is difficult to unscrew or separate it from the nut, the screw may be turned until the thrust end formation 109 is in or near the nut, and the two removed from the tail section, where appropriate tools may be conveniently used to remedy the defect. This is not possible in constructions where the nut is welded or otherwise affixed to the section base, or where the screw must be entirely disconnected from the nut, before the latter may be removed.

It is believed the operation of the conveyor equipped with a tail section constructed according to this invention will be understood from the foregoing description. However, it may be noted from Figs. 1 and 3 that a smooth traveling surface is provided for the flights, and coal is prevented from entering from between the sprocket plate 24 and the trough bottom 18; that the effective conveying portion of the tail section may be disposed very close to the face of the mine working by avoiding any cover above the tail shaft and end sprocket; and that the conveyor may be used to deliver coal to the workman with comparative safety by avoiding any cross bracing and any "hold down" or guide sprocket, or roller working above the chain.
said base for supporting said shaft crosswise of the conveyor and in spaced relation to the end of the bottom of said trough; means for adjusting said bearings longitudinally of the conveyor; a bottom slide plate, upon which said chain and flights slide, said plate spanning the distance between said shaft and the end of the trough, and slidably engaging the upper surface of the bottom of said trough, the bottom plate at its junctions between its cross margin with its side margins, above the bottom of the trough, being rounded in the plane of the plate to accommodate bent flights; and means for supporting said plate by said bearings.

4. In an endless chain conveyor the combination of a base; a trough for the upper run of the conveyor chain; a foot shaft carrying an end sprocket wheel for the conveyor chain; bearings movably carried by said base for supporting said shaft and said sprocket wheel, said bearings and Said sprocket wheel, surrounding said foot shaft, secured to said bottom shaft and having its end portion pivotally supported by the adjacent shaft bearing.

5. In a tail section for chain conveyors, the combination of a base including laterally spaced apart bearing guides adjacent one end thereof and laterally spaced apart leg members adjacent the other end thereof; bearings carried by said guides, movable toward and from said leg members; a tail shaft carried by said bearings and extending between said guides; and means at each side of said base for adjusting the position of said bearings, each of said means comprising a relatively long adjusting screw having a thrust end rotatably engaging its respective bearing and extending longitudinally of its respective side of said base, a nut for said screw and an abutment for said nut, carried by said base, intermediate said bearing guide and leg member, the nut engaging the face of said abutment being spaced from said leg member, a distance substantially equal to the over-all length of said screw, less the thickness of said nut whereby the screw and nut may be bodily removed laterally from the base when the thrust end of the screw is at least partially in the nut.

6. In a tail section for conveyors including a chain and a flight, a base including a substantially H-shaped combined skid and flight guide bottom, said bottom being disposed with its central portion extending transversely of the tail section, and its arms to one side of said central portion serving as guides upon which the flight may ride, a tail shaft, bearings for each end portion of said shaft and guides for said bearings mounted upon the other arms of said bottom.

7. In a tail section for conveyors including a chain and a flight, a base including a substantially H-shaped combined skid and flight guide bottom, said bottom being disposed with its central portion extending transversely of the tail section, and its arms to one side of said central portion elevated above the second pair of arms to the other side of said central portion and serving as guides upon which the flight may ride, an end ground support for the free end portions of said first arms, a tail shaft, bearings for the end portions of said shaft, and guides for said bearings mounted upon said second arms of said bottom.

8. In a tail section for conveyors including a chain and a flight, a base including a substantially H-shaped combined skid and flight guide bottom, said bottom being disposed with its central portion extending transversely of the tail section, and a first pair of arms to one side of said central portion elevated above the second pair of arms to the other side of said central portion and serving as guides upon which the flight may ride, an end ground support for the free end portions of said first arms, a tail shaft, bearings for the end portions of said shaft, and guides for said bearings mounted upon said second arms of said bottom.

9. In a tail section for conveyors including a chain and a flight, a trough portion; a tail shaft carrying an end sprocket wheel for the chain; bearings for the end portions of said shaft; and a base for supporting said trough portion and bearings, comprising a combined skid and flight guide bottom including an intermediate transverse portion, a first pair of spaced arms extending to one side of said transverse portion, longitudinally of the conveyor and a second pair of spaced arms extending to the other side of said transverse portion, longitudinally of the conveyor, guides for said bearings mounted upon said first pair of arms, vertical walls carried by and secured to said second pair of arms, and secured to said trough, and a cross brace secured to said walls and bearing against the underside of the bottom of said trough.

10. In a tail section for conveyors including a chain and a flight, a trough portion; a tail shaft carrying an end sprocket wheel for the chain; bearings for the end portion of said shaft; and a base for supporting said trough portion and bearings, comprising a combined skirt and flight guide bottom including an intermediate transverse portion, a first pair of spaced arms extending to one side of said transverse portion, longitudinally of the conveyor, guides for said bearings mounted upon said first pair of arms, and vertical walls carried by and secured to said second pair of arms, extending longitudinally of and secured to said trough.

11. In an end section of a conveyor of the endless chain type, the combination with a cross shaft carrying an end sprocket for the chain, of a bearing for each end of the shaft, a base for adjusting said bearings, and means including a thrust screw and nut for adjusting each of said bearings, the said bearings each being of block-like formation and provided with a bushing for the shaft end, oppositely disposed recesses in its end walls enabling one of which may receive the thrust end of said screw, and guide ways open to its upper and lower faces, and said base provided with longitudinally extending up-
per and lower guides extending into said guide ways, and said base supporting said nut, whereby the cross shaft may be adjusted longitudinally of the conveyer by said screws and the bearings changed end for end to present unworn thrust surfaces to the shaft ends.

12. In an endless chain conveyer, the combination of a base; a trough for the upper run of the conveyer chain, carried by said base, and having its bottom spaced above the bottom of the base sufficient to permit the lower run of the conveyer chain to pass between the bottoms of the base and trough; a foot shaft carrying an end sprocket wheel for the conveyer chain; bearings movably carried by said base for supporting said shaft crosswise of the conveyer, and in spaced relation to the end of the bottom of said trough and with the plane of the bottom of the trough intersecting the shaft; means for adjusting said bearings longitudinally of the conveyer; a bottom slide plate spanning the distance between the upper portion of said shaft and the end of the trough, and slidably engaging the upper portion of the bottom of the trough; and means for pivotally supporting said plate by said bearings.

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CERTIFICATE OF CORRECTION.

ARMISTEAD R. LONG, ET AL.

October 9, 1945.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 28, claim 4, for "shaft" read --plate--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of January, A. D. 1946.

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First Assistant Commissioner of Patents.
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