This invention relates to track interlocking devices and more particularly to an improved safety interlocking mechanism for coupling an end of a movable track with an aligned end of a stationary track.

In material handling equipment, overhead tracks are commonly employed to support movable trolleys which carry a load suspended therefrom. Frequently, in factory installations, cranes are provided with a section of track extending transversely of the direction of movement of the crane and, as the crane moves along its path of travel, the crane track comes into alignment with one or more stationary tracks which lead to other parts of the shop. Various devices have been proposed for locking a movable or crane track to a stationary track when the two are in aligned position. Furthermore, it has been proposed to use safety stops which extend across the ends of both the movable and stationary tracks in a position to prevent a trolley from running off of the tracks when the ends are out of alignment, but which stop may be moved out of track blocking position when the movable and stationary tracks are in alignment so that free travel of the trolley from movable to stationary track, and vice versa, will not be interfered with.

With previous apparatus of this general type a serious situation has existed when the trolley happened to be stopped closely adjacent to the end of either the movable or stationary track, when these ends were in alignment and the safety stop retracted, and a portion of the trolley interfered with the safety stop in such a manner that it prevented the stop from moving into track blocking position. When this situation arose, with the prior mechanisms, the crane operator could still release the interlocking pin or other means which held the two tracks in alignment and could then move the crane so that the movable track was out of alignment with the stationary track. Accidents have occurred under these circumstances because the trolley could drop off of the end of the track inasmuch as the safety stop was held in its retracted or non-stopping position by a portion of the trolley. Personal injury and damage to equipment has resulted from such accidents, and it is among the objects of our present invention to provide a track interlock and safety stop whereby the interlock cannot be released until the safety stops are actually in track blocking position.

Other objects of our invention include: the provision of a track interlock of the type described whereby movement of the interlock pin and withdrawing of the safety stops is positively prevented until the connecting rails or tracks are substantially exactly in alignment; the provision of an automatic interlock and safety stop which may be preset as the movable track approaches the connecting track so that when the two tracks come into alignment the interlock will automatically function and the safety stops on both tracks be withdrawn or retracted; the provision of a track interlock and safety stop whereby movement of the track interlocking mechanism actuates the safety stops on both tracks and whereby the track interlock cannot be withdrawn to disconnect the two tracks unless the safety stop on each track is at the same time moved into track blocking position; the provision of a track interlock and safety stop mechanism in which a sliding pin or bolt is employed as an interlock and connections are maintained between the bolt and the track blocking stops whereby the bolt cannot be withdrawn from interlocking position when a trolley is in position to block either of the safety stops, or a stop is stuck or jammed; the provision of a completely automatic and entirely fool-proof track interlock and safety stop which positively prevents movement of one track away from the other unless the track stops are in track blocking position; and the provision of apparatus of the type described which is simple in form, rugged, and economical to manufacture.

The above and other objects of our invention will appear from the following description of several embodiments thereof, reference being had to the accompanying drawings, in which:

Figure 1 is a plan view of one embodiment of our improved track interlock and safety stop mechanism, the parts being in the positions they assume immediately prior to interlocking movement of the bolt, the bolt latch being released and the tracks being aligned.

Figure 2 is a vertical cross-sectional view taken on line 2—2 of Figure 1.

Figure 3 is a fragmentary side elevational view taken substantially on line 3—3 of Figure 1.

Figure 4 is a horizontal cross-sectional view taken on line 4—4 of Figure 2 showing the track safety stop or butterfly in track blocking position.

Figure 5 is a transverse vertical cross-sectional view taken on line 5—5 of Figure 2.

Figure 6 is a plan view, generally similar to Figure 1, but showing the parts in the positions they assume immediately after the interlocking bolt or plunger has moved into locking position.
Figure 7 is a vertical cross-sectional view taken on line 1—7 of Figure 6.

Figure 8 is a horizontal cross-sectional view taken on line 8—8 of Figure 7 showing the track stop or butterfly in non-blocking position.

Figure 9 is a vertical cross-sectional view taken on line 9—9 of Figure 7.

Figure 10 is a side elevation of a modified form of interlocking apparatus for accomplishing the objects of our invention, the tracks being illustrated in disaligned position.

Figure 11 is an illustrative plan view, on a reduced scale, showing the positions of the stationary and movable tracks of the apparatus illustrated in Figure 10.

Figure 12 is a vertical cross-sectional view taken on line 12—12 of Figure 10.

Figure 13 is a vertical cross-sectional view taken on line 13—13 of Figure 10.

Figure 14 is a view generally similar to Figure 10 but illustrating the fixed and movable tracks in aligned position with the locking bolt engaged and the tracks stops lifted out of track blocking position.

Figure 15 is a diagrammatic plan view generally similar to Figure 11 but illustrating the tracks in aligned position.

Figure 16 is a fragmentary end elevation of the movable track structure taken substantially on line 16—16 of Figure 14.

Figure 17 is a fragmentary horizontal cross-sectional view taken on line 17—17 of Figures 14 and 18.

Figure 18 is a side elevational view of the locking bolt sleeve on the stationary track and its associated parts.

Figure 19 is an end elevation taken on line 19—19 of Figure 18.

Figure 20 is a view similar to Figure 17 but showing the locking bolt and pawl in disengaged position.

Figure 21 is a diagrammatic plan view of the pre-setting and operating mechanism for the interlock and safety stop apparatus shown in Figures 1 to 9 inclusive, the bolt operating spring being released.

Figure 22 is a side elevation of the apparatus shown in Figure 21.

Figure 23 is a view similar to Figure 21 but showing the bolt operating spring in pre-set or compressed position.

Referring to Figures 1 and 2, the movable or crane track is indicated at 1 and the stationary or connecting track at 2. It will be understood that these tracks may be of any suitable form, a standard monorail track being illustrated, and that the crane track will be supported on suitable wheeled carriages for movement into and out of alignment with the connecting track 2.

As shown in Figures 1 and 2, the tracks 1 and 2 have just come into alignment and the views are taken just as the interlock latch member 3 has released the operating interlock bolt 4 but before the bolt 4 has moved. Secured to the ends of the tracks 1 and 2 are the interlock mechanism housings 5 and 6. The housing 5 is carried by the movable track 1 and is formed with a slot 7 in which are disposed the operating bolt 4 and the co-acting sliding plunger 8. Disc 9 is carried on a shaft 10 which has a suitable bearing in the housing 5 and supports at its lower end the track stop or butterfly 11. Diametrically opposed pins 12 and 13 extend downwardly from the disc 9, the end of the pin 12 fitting into a transverse slot 14 in the operating bolt 4 and the pin 13 similarly disposed in a transverse slot 15 in the co-acting plunger 8. A portion of the inner side of bolt 4 is cut away at 16 and a portion of the plunger 8 similarly cut away at 17 to permit limited sliding movement of the bolt 4 and plunger 8 in the slot 17 of the housing 5.

In order to exert a force tending to advance the plunger 8 and retract the operating bolt 4 we provide a compression spring 18 which engages the housing 5 at one end and has its opposite end disposed in a hole in the plunger 8. This spring tends to move the plunger 8 to the right into the position shown in Figure 1 and this movement is transmitted through the pins 13 and 12, and the disc 9, to tend to move the operating bolt 4 to the left into the retracted position as shown in Figures 1 and 2. The main function of this spring 18 is to prevent undesired movement of the parts into track locking position due to jarring or vibration.

The locking end of the bolt 4 is tapered as seen in Figure 1 and is notched at 19, as seen in Figure 2. This notch 19 is engaged by the corner 20 of the latch 3 which comprises a generally U-shaped member having a latching portion indicated at 3 and arms 20 and 21 extending along the sides of the housing 5. Trunnions 22 and 23 are formed on the ends of the arms 20 and 21 and are disposed in slots 24 and 25, respectively, in the top of the housing 5. A latch lifting dog 26, of generally V shape, extends into overlapping relation with the stationary track 2 and is adapted to engage and be lifted by the inclined cam surfaces on the stationary housing 6.

In Figures 2, 1 and 3, the latch 3 is shown in elevated or interlocked position with the dog 26 riding on the high point of the inclined surfaces 27 and with the bottom corner 28 of the latch lifted clear of the top edge of the notch 19 of the operating bolt 4. As will appear more fully later, this position of the parts under some circumstances will obtain only instantaneously when the lifting dog 26 reaches its high point and the corner 28 just clears the notch 19 as, immediately upon release of the bolt 4 of the latch 3, the spring 29, provided it has been pre-compressed by suitable means such as shown in Figures 21, 22 and 23, will move the bolt 4 to the right into track interlocking position. If, however, the spring 29 has not been pre-compressed, the spring 29, and the pre-setting mechanism to be described later, will maintain the plunger 8 and bolt 4 in the positions shown in Figures 1 and 2 and no interlocking of the tracks will take place, thus permitting the movable track to pass by the stationary track without interference.

The means for selectively applying compression to the spring 29 or leaving the spring 29 uncompressed, are shown in Figures 21, 22 and 23 and will be described later.

The housing 6 supports parts which are generally similar to those carried by the housing 5. A plunger 29 is generally similar in form to the plunger 8 but is disposed opposite to the operating bolt 4 when the tracks are in alignment, as shown in Figure 5. A spring loaded plunger 29 is slotted at 30 to accommodate the pin 31 carried by the disc 32. Opposite pin 31 on the disc 32 is a second pin 33 which is disposed in a transverse slot 34 in the bolt 35. A compression spring 36 ensures the housing 6 at one end and the plunger 29 at the other end and functions in the same manner as the spring 18 described above. The track safety stop for the fixed track 2 takes the form of a rotatable plate or butterfly 37 secured
to the shaft 38 which is rotatably supported in the housing 6 and carries the disc 32 at its upper end. Movement of the plunger 29 and bolt 35 is restricted by slots 39 and 40 which are formed in the inner side faces of the plunger 29 and bolt 35, respectively, and which are adapted to engage the shaft 38 to limit movement of the bolt 35 and plunger 29.

A wheel of a work supporting trolley is indicated at 41 and it will be observed that when the stops 11 and 37 are in their crosswise positions, as shown in Figures 1 and 2, the trolley wheels cannot pass by the stops and thus the trolley cannot be moved by a trolley. It will also be understood that when the tracks 1 and 2 are out of alignment the parts will assume the positions shown in Figures 1 and 2 with the exception that the latch 3 will be dropped into engagement with the notch 19 of the operating bolt 4. This latching action occurs automatically due to the weight of the member 3 when the bolt 4 is retracted by pulling on the connecting rod 42 which extends to the operating means shown in Figure 21.

Figures 6 and 7 illustrate the parts in track interlocking position with the safety stops 11 and 37 in non-blocking position in which, as is clearly seen in Figure 8, they extend parallel to the tracks 1 and 2 and offer no obstruction to free passage of the wheels 41 of the trolley 33. Assuming that the tracks 1 and 2 are out of alignment, the latch 3 in retracted position, the latch 3 engaging the notch 19 in the bolt 4 and holding the bolt in retracted position, and the spring 28 compressed: when the tracks 1 and 2 approach aligned position the dog 26 rides up on the adjacent inclined cam surface 27 on the housing and, just as the tracks 1 and 2 are substantially in alignment, the latch 3 is lifted sufficiently to release the bolt 4. Figure 2 illustrates the parts just as such release occurs. The bolt 4 may then be pushed forward by the compression spring 26 into the position shown in Figure 7. This forward movement of the bolt 4 causes its end to engage the end of the plunger 29 pushing it inwardly into the position shown in Figure 7.

As the plunger 29 is connected to the disc 32 through the pin 33 this movement of plunger 29 will turn the disc 32 causing the pin 31 to advance the bolt 35 into the position shown in Figure 6. As the bolt 35 advances the plunger 8 retracts. During the forward movement of the bolt 4 and the rearward movement of the plunger 29 the discs 8 and 32 are each rotated in counterclockwise direction as seen in Figure 6. This rotation is substantially 90° in extent and turns the stop members 11 and 37 from their transverse or track blocking positions shown in Figures 2 and 4 into their non-blocking positions shown in Figures 7 and 8. The tracks 1 and 2 are now definitely locked in alignment and the stops 11 and 37 are withdrawn to permit free passage of the trolley past the track joint.

When the operator desires to move the crane or movable track 1 he pulls on the operating rod 42 moving the bolt 4 and the bolt 35. The bolt movement turns the disc 8 through the connecting pin 13 and advances the plunger 8 into the position shown in Figure 1. This advancing movement of the plunger 8 pushes the bolt 35 into its retracted position as shown in Figure 1 and locks the trolley into the position shown in the drawing by the disc 32 and pins 31 and 33 to the plunger 28 causing it to resume its unlocked position, as seen in Figures 1 and 2. During this movement of the bolts and plungers the stops 11 and 31 will be turned 90° into their track blocking positions and the trolleys will be prevented from running off of the open ends of the tracks.

An important advantage of our invention will appear if it is assumed that a trolley happens to stop with its wheels or other part of the carrier interfering with either the stop 11 or the stop 31. Under such circumstances the wheels will prevent turning movement of the engaged stop. Regardless of whether the stop 11 or the stop 31 is blocked by a trolley, with or without any obstacles in the way of one of the stops 11 or 31. He then moves the trolley back on the track away from the open end until it clears the engaged stop whereupon he can withdraw the bolt 4 and release the trolley between the two tracks, he immediately knows that there is an obstacle in the way of one of the stops 11 or 37. When the operator attempts to withdraw the bolt 4 and it will not move sufficiently to disengage the interlock between the two tracks, he immediately knows that there is an obstacle in the way of one of the stops 11 or 37.

In Figures 21, 22 and 23 we have rather diagrammatically illustrated an arrangement for pre-setting the spring 28 which encompasses the operating rod 42 and is adapted to force the bolt 4 into interlocking position. In Figures 21 and 22 the bolt 4 is retracted and is held in retracted position by the latch 3. The rod 42 extends freely through the end 54 of a yoke member 55 and is provided with adjustable abutment nuts 66 disposed in the slot 51 of the yoke 55. A bell crank lever having a long arm 58 and a short arm 99 is pivotally supported at 100 on the track structure. In order to maintain the bell crank either in position to release the spring 28 or compress spring 28 we provide a snap-over spring 101 which is attached at one end to the outer end of the bell crank arm 98 and at its opposite end to a fixed pin 102 mounted on the track structure or any other suitable location.

The spring 101 is always maintained under tension and in the position shown in Figure 21 it tends to swing the bell crank arm 98 in clockwise direction. This in turn tends to retract the bolt 4 due to the engagement of the slot 97 with the end of the slot 97 in the yoke 55. When in this position the spring 28 is completely released and if the latch 3 is lifted to unhook the bolt 4 there will be no tendency for the bolt 4 to move out of interlocking position. The bolt operating unit is set as shown in Figures 21 and 22 when it is desired to permit the crane to pass by one or more connecting tracks without interlocking.

Now, if the operator desires automatically to interlock the crane track with the next connecting track he swings the bell crank arm 98, through any suitable operating connection such as chains or ropes, from the position shown in Figure 21 into that shown in Figure 23. During this movement the latch 3 prevents movement of the bolt 4 and rod 42 but the yoke 55 is moved forward by the bell crank arm 98, compressing the spring 28 as shown in Figure 23. During this compression...
of spring 28 the yoke 55 merely slips over the rod 42. When the tension spring 101 passes over the center line between pivot point 100 and pin 102 it snaps over into the position shown in Figure 23 and, as the spring 28, it will hold spring 26 compressed.

The above described position of the operating unit may be termed the "pre-set" position as, when the spring 28 is so pre-compressed, the bolt 4 will automatically snap into interlocking position with a connecting track as soon as the latch 3 is lifted by the cam 27 to release its engagement with the rod 42 as adapted to rest upon the flange 103 of the track supporting structure and the bell crank arm 59 is disposed below the flange 103 so that the connecting pin 104, between the yoke 25 and bell crank arm 58, is disposed substantially in the plane of movement of the bolt 4.

With this pre-setting apparatus the operator can leave the spring 28 released until he aligns the movable track with the stationary track and can then swing the arm 99 over its center position to cause the spring 28 to be compressed and the bolt 4 advanced into interlocking position. As an alternative, the operator may pre-set the apparatus by moving the bell crank arm 99 into spring compressed position, as shown in Figure 23, before the moving track reaches alignment with the stationary track and, with the spring 28 so pre-set, the interlock will automatically engage and the safety stops be retracted as soon as the two tracks are aligned and the latch 3 lifted by the cam 27 to release the bolt 4 and permit it to snap into interlocking engagement with the mechanism on the other track.

Another embodiment of our improved apparatus is illustrated in Figures 10 to 19. This form of our invention is particularly adapted for heavy crane structures.

The movable track 44 is carried by a crane or the like which is indicated at 45 in Figure 11 and which includes a suitable end carriage 46 mounted on wheels 47 which are supported on a track 48. A stationary track 49, as illustrated in Figures 10 and 11 is disposed out of alignment with the movable track 44, but is illustrated in aligned position in Figure 14.

The track interlocking bolt 50 is mounted for sliding movement in a sleeve 51 secured to the end of the movable track 44. Movement of the bolt 50 in and out through the sleeve is effected by the connecting rod 52 which has a pivotal connection at 53 with the end of the bolt 50 and which is connected at its outer end to a crank 54. Oscillation of the crank 54 is effected by suitable connections, either power or manual but not shown, to an operating wheel 55 and results in in-and-out movement of the bolt 50.

A bell crank 56 has a lug 57 at its upper end disposed in a longitudinally extending groove or slot 58 in the bolt 50. The lower end of the bell crank 56 engages a socket 59 in the lever arm 60 and it will be seen that movement of the bell crank 56 about its pivot point 61 will lift or lower the lever 60. A stop 62 is adapted for vertical movement into and out of track blocking position in a guide 63 and is pivotally and slidably connected to the outer end of the lever 60 at 64. An elbow 60 is formed in the lever 60 and is adapted to rest upon the bottom flange of the track 44 thus limiting the downward movement of the stop 62.

In the bolt retracted position seen in Figure 10 the left hand end of the slot of the groove 58 engages the left hand side of the lug 57. When the wheel 55 is turned to move the connecting rod 52 and advance the bolt 50 into track interlocking position, the initial movement of the bolt 50 will merely take up the lost motion between the ends of the slot and the lug 57. No lifting movement of the stop 62 will occur until the right hand surface of the slot 58 engages the right hand surface of the lug 57 (Figure 10), whereupon further movement of the bolt 50 in track interlocking direction will swing the bell crank 56 counterclockwise and lift the stop 62 into a position to permit free passage of a trolley or carrier structure.

An automatic latch 65 consists of a transverse bolt locking member and supporting side arms 66 and 67 which are pivotally supported at 68 and 69 (see Figure 19) on the crane structure. Cam roller 70 projects from the front face of the latch 65 beyond the intersection line of the adjoining tracks 44 and 49. In Figures 10 and 13 the latch is shown in bolt locking position and it will be observed that the face of the transverse bar of the latch is tapered end 60 of the bolt 50 and prevents outward movement of the bolt into interlocking position.

An inclined or V-shaped cam 71 is mounted on the top of the stationary track 49 and is disposed in the path of the cam roller 70. As the movable track 44 advances toward aligned position with a stationary track 49 the cam roller 70 will ride up upon the adjacent inclined cam surface 71 thus lifting the latch 65 until the lower edge thereof clears the point of the bolt 50. This clearance of the point of the bolt occurs only when the two tracks are substantially in alignment and the operator can then turn the wheel 55, which can be either power or manually operated, to advance the bolt 50 into locking position as shown in Figure 14.

Mounted on the stationary track 49 is a sleeve member 72 which guides and supports a plunger 73. Pivotally supported on the track structure at 74 is a bell crank lever, the upper arm 75 of which has a lug 76 disposed in a slot 77 in the plunger 72. The lower arm 76 is connected to the track safety stop bar 78 and oscillation of the bell crank 74 will lift or lower the stop 78. A suitable bracket 80 guides the up and down movement of the stop 79.

Secured to and extending from the plunger 73 is a rod 81 having a sliding fit in a fixed supporting bracket 82. This rod 81 carries a spring 83 which acts against the end of the plunger 73 and the bracket 82 exerting a force tending to move the plunger 73 to the right (Figure 14).

As is clearly seen in Figures 17, 18 and 19, the end 90 of the bolt 50 is tapered and is provided with a hole 84 extending a short distance into the tapered portion 80. The end 90 of the plunger 73 is slotted at 85 to accommodate a swinging latch or pawl 86, pivotally supported on a pin 87 which extends across the slot 85. This pawl 86 has a hooked inner end 88 and a follower lug portion 89 (see Figure 19) disposed generally opposite the slot bar 82 is supported for vertical movement into and out of track blocking position in a guide 90 and is pivotally and slidably connected to the side thereof. This cam surface 90 has a deep portion 90 and a relatively shallow portion 92.

After the tracks 44 and 49 have been aligned and the latch or keeper 65 has been raised to clear the point of the bolt 50 the bolt may be
moved into locking position, i.e., to the left from the position shown in Figure 10 into the position shown in Figure 14. During this movement the end of the bolt 50 engages the end of the plunger 73 and pushes it inwardly against the spring 83. As the bolt 50 moves into the sleeve 72 the hook 83 on the pawl 86 is swung up into the hole 84 in the end of the bolt 50 as the follower lug member 29 moves from the deep portion 90 of the cam surface 50 to the shallow portion 90'. When the parts are in the position shown in Figure 17, the bolt 50 is at the limit of its locking movement and the hooked end 85 of the pawl 86 is in and up the bolt 50 as shown in Figure 18. When the sleeve 72 is moved inwardly the bell crank arm 76-78 is moved counter-clockwise, lifting the stationary track stop bar 79 into non-blocking position as shown in Figure 14.

Thus, as illustrated in Figure 14, the bolt 50 is in track interlock position and both track stops 62 and 79 have been retracted to permit free passage of a trolley or carrier frame thereby. When the operator desires to release the track interlock he retracts the bolt 50 by turning the wheel 55. This retracting movement of the bolt 50 causes the follower lug 29 to move away from the plunger 73 under the influence of the spring 83. While the pawl follower lug 89 is engaged in the hole 84 the bolt 50 cannot be pulled free from its connection to the plunger 73 and this connection is maintained until the follower 89 reaches the deep portion 90' of the cam surface 50. When this point is reached additional movement of the bolt 50 causes the edge of the hole 84 to engage the edge of the hooked end 85 and swing the pawl 86 so that follower lug 89 drops into the deep part 90' of the cam 80. Now the bolt 50 is completely released from its connection to the plunger 73 and it may be entirely withdrawn from interlocking engagement with the stationary track sleeve 72. During this withdrawing movement of the bolt 50 the track stop 62 is moved downwardly into blocking position and similarly, as the plunger 73 advances, the track stop 79 is moved downwardly into blocking position.

If any obstacle is offered to downward movement of either the stop 62 or stop 79 the operator will be unable completely to withdraw the bolt 50 because the interengagement of the pawl hook 86 and the bolt 50 prevents complete withdrawal of the bolt 50. Thus, if a trolley or carrier frame is disposed beneath either of the stops 62 or 79 these stops cannot be moved down into their blocking positions and, even though they may move part way, the pawl 69 will not be released unless the stops are down sufficiently far to properly protect the track ends. The degree of downward movement of the stops 62 and 79 which must be completed before the bolt 50 can be completely released is determined by the length of the shallow portion 90' of the cam surface 50.

In Figure 13 a form of carrier structure is illustrated having wheels 92 supported on the track 84 and a frame 93 carried by the wheels. If this frame 93, or any part thereof, is disposed in the path of the stops 62 or 73 it will not permit sufficient movement of the bolt 50 to the right (from the position shown in Figure 17) to permit the follower lug 89 to drop into the deep portion 90' of the cam. The spring 83 is employed largely to cause the plunger 73 to follow up the bolt 50 as it withdraws. When the follower lug 29 moves up the inner corner of the hooked end 86 of the pawl 86 which would occur if the bolt 50 had to pull the pawl 86 and plunger 73 along with it during each retracting movement.

From the above description of the embodiment of our invention shown in Figures 10 to 19, it will be seen that the operator is positively prevented from releasing the interlock bolt unless both track stops are in track blocking position.

Both forms of our invention, through the bolt blocking latch, prevent an operator from carelessly throwing the bolt out and withdrawing the safety stops at any time except when the rail or track which carries the latching device is in registry with another track. Each track end eliminates the danger which arises with apparatus in which the locking bolt can be thrown when the tracks are not in alignment due to the bolt projecting and striking the ends of connecting tracks with resulting damage to equipment and possible injury to said bolt, and to say nothing of the possible danger of running a trolley and load off the track when the stops are in non-blocking position.

Our improved track interlock and safety mechanism prevents disengagement of the interlock if a trolley or carrier frame moves away from the movement of the safety stop into blocking position. It further prevents disengagement of the interlock if the safety stops would stick or become jammed or if any part of the operating linkage or lever system should jam. Thus, we have provided a completely fool-proof interlock and safety stop for apparatus of the type described and, although we have described the illustrated embodiments of our invention in considerable detail it will be understood by those skilled in the art that numerous variations and modifications may be made in the specific arrangement of parts and form of elements employed and we do not, therefore, wish to be limited to the particular form of our safety interlock herein shown and described, but claim as our invention all embodiments thereof coming within the scope of the appended claims.

We claim:

1. In track blocking and interlocking apparatus, tracks adapted to be moved relatively into and out of end to end alignment, bolt interlocking means, means for moving said bolt across the ends of said tracks when aligned to interlock same, a safety stop adjacent the end of said bolt, said stop operatively connecting said bolt and said stops for preventing complete withdrawal of said bolt from interlocking position except when each of said stops is free to move into effective track blocking position.

2. In track blocking and interlocking apparatus of the type described, track members disposed for relative movement into and out of end to end alignment, an interlocking bolt supported adjacent the end of said tracks, a safety stop adjacent the end of said one of said tracks, means for moving said bolt from interlocking position, connections between said bolt and stop whereby movement of said bolt into interlocking position moves said stop into non-blocking position relative to said track and movement of said bolt out of interlocking position moves said stop into track blocking position, a plunger supported adjacent the end of the other of said tracks, a second safety stop adjacent the end of said other of
said tracks, connections between said plunger and second stop whereby movement of said plunger away from said other track end moves said second stop into non-blocking position and movement of said plunger toward said other track end moves said second stop into track blocking position, and means carried by said bolt carrying track for maintaining said bolt in interlocking position when either of said safety stops are held in non-blocking position.

3. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved relatively into and out of end to end alignment, a movable interlocking bolt mounted adjacent the end of one of said tracks, a plunger mounted adjacent the end of the other of said tracks and disposed opposite said bolt and in the line of movement thereof when said track ends are aligned, safety stops carried by said tracks and adapted to be moved into and out of blocking position, operating connections between said bolt and one of said stops, operating connections between said plunger and the other of said stops, a latch member positioned to retain said bolt in withdrawn position, and latch actuating means automatically operable and movable to move said bolt into alignment for releasing said latch to permit said bolt to be moved into interlocking position.

4. In track interlocking mechanism, a pair of tracks adapted to be moved relatively into and out of end to end alignment, a bolt carried by one track, a receptacle for said bolt on the other track, means for moving said bolt into and withdrawing said bolt from said receptacle when said track ends are aligned, a latch means pivotally carried by said bolt carrying rail for retaining said bolt in withdrawn position at all times except when said stops are engaged.

5. In track interlocking mechanism, a pair of tracks mounted for movement relatively into and out of end-to-end alignment, a bolt carried by one track, a receptacle for said bolt on the other track, means for moving said bolt into and out of said receptacle when said track ends are aligned, latch means pivotally carried by said bolt carrying rail for retaining said bolt in withdrawn position at all times except when the rail ends are aligned, a safety stop adjacent each track end, means operable upon movement of said bolt into said track blocking position and to return said stops to track blocking position upon withdrawal of said bolt from said receptacle, and means operatively connecting said bolt and said stops for preventing complete withdrawal of said bolt from said receptacle except when each of said stops is free to move into effective track blocking position.

6. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved relatively into and out of end to end alignment, a movable interlock bolt mounted adjacent the end of one of said tracks, a plunger member mounted adjacent the end of the other of said tracks and disposed opposite said bolt and in the line of movement thereof when said track ends are aligned, safety stops carried by said tracks and adapted to be moved into and out of track blocking position, operating connections between said bolt and one of said stops, operating connections between said plunger and the other of said stops, and means operatively connected to said bolt and to said plunger respectively for preventing substantial separation of said bolt and plunger during movement thereof toward the track on which said bolt is carried until said safety stops are moved into track blocking position.

7. Track blocking and interlocking mechanism including tracks adapted to be moved relatively into and out of end to end alignment, housing means supported one on each of said tracks, one of said tracks being fixed and the other movable, a track interlocking bolt slidably supported in the movable track housing, a plunger disposed adjacent to said bolt and also slidably supported in said movable track housing, means for interconnecting said bolt and plunger whereby movement of said bolt in one direction will be accompanied by movement of said plunger in said opposite direction, a track safety stop operable by said bolt and plunger interconnecting means, said safety stop being disposed in track blocking position when said bolt is withdrawn or retracted into said housing and moving into non-blocking position when said bolt is advanced into interlocking position, a second plunger slidably carried by said housing on said stationary track and adapted to be disposed opposite said bolt when said tracks are substantially in alignment, a second bolt disposed in said stationary track housing adjacent said second plunger, said second bolt being disposed in alignment with said first named plunger when said tracks are in alignment, means for interconnecting said second plunger and said second bolt whereby movement of said second plunger away from the stationary track end will advance said second bolt into interlocking position when said second bolt is retracted and moving into non-blocking position when said second bolt is advanced, and means for advancing and retracting one of said bolts to and from track interlocking position.

8. Track blocking and interlocking mechanism including tracks adapted to be moved relatively into and out of end to end alignment, housing means supported one on each of said tracks, one of said tracks being fixed and the other movable, a track interlocking bolt slidably supported in the movable track housing, a plunger disposed adjacent to said bolt and also slidably supported in said movable track housing, means for interconnecting said plunger and the other of said stops disposed in alignment with said first named plunger when said tracks are in alignment, means for advancing and retracting one of said bolts to and from track interlocking position.
position when said second bolt is advanced, means for advancing and retracting one of said bolts to and from track interlocking position, and latch means carried by said movable track housing for retaining said movable track bolt in withdrawn position.

9. Track blocking and interlocking mechanism including means adapted to be moved relatively into and out of end to end alignment, housing members supported on each of said tracks, one of said tracks being fixed and the other movable, a track interlocking bolt slidably supported in the movable track housing, a plunger disposed adjacent the center line and also slidably supported in said movable track housing, means for interconnecting said bolt and plunger whereby movement of said bolt in one direction will be accompanied by movement of the plunger in the opposite direction, a track safety stop operable by said bolt and plunger interconnecting means, said safety stop being disposed in track blocking position when said bolt is withdrawn or retracted into said housing and moving into non-blocking position when said bolt is advanced into interlocking position, a second plunger slidably carried on said stationary track and adapted to be disposed opposite said bolt when said tracks are substantially in alignment, a second bolt disposed in said stationary track housing adjacent said second plunger, said second bolt being disposed in alignment with said first mentioned plunger when said said tracks are in alignment, means for interconnecting said second plunger and said second bolt whereby movement of said second plunger away from the stationary track end will advance said second bolt into interlocking position, a second safety stop operatively connected to said interlocking means for said second bolt and plunger, said second safety stop being disposed in track blocking position when said second bolt is retracted and moving into non-blocking position when said second bolt is advanced, means for advancing and retracting one of said bolts to and from track interlocking position, and latch means carried by said movable track housing for retaining said movable track bolt in withdrawn position, said latch having a portion projecting over the junction line of the said ends, and means on said housing for maintaining said pawl in said bolt aperture during a portion of the movement of said bolt.

10. In track interlocking apparatus, a pair of tracks adapted to be moved relatively into and out of end to end alignment, an interlocking bolt supported adjacent the ends of said tracks, means for receiving said bolt carried adjacent the end of each of said tracks, an operating rod secured to said bolt, latch means for retaining said bolt in withdrawn position, a compression spring encompassing said operating rod and abutting against said bolt at one end, a yoke member through which said rod freely passes, said yoke member engaging the opposite end of said compression spring, a stop member on the end of said rod beyond said yoke, said crank arm when in bolt retracted position and to lie on the other side of said center line when in pre-loaded or bolt operating position, said tension spring being stronger than said compression spring.

11. In track interlocking apparatus, a pair of tracks adapted to be moved relatively into and out of end to end alignment, an interlocking bolt supported adjacent the end of one of said tracks, means for receiving said bolt carried adjacent the end of the other of said tracks, an operating rod secured to said bolt, latch means for retaining said bolt in withdrawn position, a compression spring encompassing said operating rod and abutting against said bolt at one end, a yoke member through which said rod freely passes, said yoke member engaging the opposite end of said compression spring, a stop member on the end of said rod beyond said yoke, said crank arm means having a fixed pivot and having one arm thereof connected to move said yoke toward and away from the end of the track, a tension spring having one end connected to the outer end of the other arm of said bell crank lever and its other end secured to a fixed pivot, said tension spring being adapted to lie on one side of the center line between the fixed support for said tension spring and the fixed pivot of said bell crank arm when in bolt retracted position and to lie on the other side of said center line when in pre-loaded or bolt operating position, said tension spring being stronger than said compression spring, and means at the end of said other track for releasing said bolt retaining latch means when said tracks are substantially in alignment.

12. In track interlocking and safety stop mechanism, a movable track, a stationary track, the ends of said tracks being adapted to be disposed in closely spaced aligned relation, an interconnected bolt and plunger carried by said movable track, a corresponding but oppositely ranged interconnected bolt and plunger carried by said stationary track, the bolt on one track being opposite the plunger on the other track when said track ends are in alignment, track safety stops means adjacent each track end, operating connections between each of said stop means and its respective track end for engaging and moving said latch to release said movable track plunger when said track ends are substantially in alignment.

13. In track interlocking apparatus, a pair of tracks adapted to be moved relatively into and out of end to end alignment, an interlocking bolt supported adjacent the end of one of said tracks, means for receiving said bolt carried adjacent the end of the other of said tracks, an operating rod secured to said bolt, latch means for retaining said bolt in withdrawn position, a compression spring encompassing said operating rod and abutting against said bolt at one end, a yoke member through which said rod freely passes, said yoke member engaging the opposite end of said compression spring, a stop member on the end of said rod beyond said yoke, said crank arm when in bolt retracted position and to lie on the other side of said center line when in pre-loaded or bolt operating position, said tension spring being stronger than said compression spring, and means at the end of said other track for releasing said bolt retaining latch means when said tracks are substantially in alignment.
and permitting release of said pawl from said bolt at a predetermined point in the withdrawing movement of said bolt, track safety stops associated with each of said tracks, and operating connections between said stops and said plunger and bolt respectively, said predetermined point in the bolt withdrawing movement at which said pawl releases said bolt being reached only when said track stops are in track blocking position.

14. In track interlocking and safety stop mechanisms, a pair of tracks adapted to be moved into and out of end to end alignment, a bolt carried by one track, a bolt receiving sleeve carried by the other track, a plunger movable in said sleeve, and means for connecting said bolt and plunger when said bolt is in said sleeve and permitting release of said bolt from said sleeve at a predetermined point in the withdrawing travel of said bolt.

15. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved into and out of end to end alignment, a bolt carried by one track, a bolt receiving sleeve carried by the other track, a plunger movable in said sleeve, means for connecting said bolt and plunger when said bolt is in said sleeve and permitting release of said bolt from said plunger at a predetermined point in the withdrawing travel of said bolt, and track stops operable by said bolt and plunger respectively.

16. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved into and out of end to end alignment, a bolt carried by one track, a bolt receiving sleeve carried by the other track, a plunger movable in said sleeve, means for connecting said bolt and plunger when said bolt is in said sleeve and permitting release of said bolt from said plunger at a predetermined point in the withdrawing travel of said bolt, track stops operable by said bolt and plunger respectively, latch means for maintaining said bolt in retracted position, and means carried by the sleeve carrying track for releasing said latch when said tracks are substantially in alignment.

17. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved relatively into and out of end to end alignment, a movable interlock bolt mounted adjacent the end of one of said tracks, a plunger member mounted adjacent the end of the other of said tracks and disposed opposite said bolt and in the line of movement thereof when said track ends are aligned, safety stops carried by said tracks and adapted to be moved into and out of track blocking position, operating connections between said bolt and one of said stops, operating connections between said plunger and the other of said stops, means for preventing substantial separation of said bolt and plunger during movement thereof toward the track on which said bolt is carried until said safety stops are moved into track blocking position, spring means for moving said bolt, latch means for holding said bolt in retracted position, and means for pre-setting said spring whereby said bolt will automatically move into locking position when said latch is released.

18. In track interlocking and safety stop mechanism, a pair of tracks adapted to be moved relatively into and out of end to end alignment, a movable interlock bolt mounted adjacent the end of one of said tracks, a plunger member mounted adjacent the end of the other of said tracks and disposed opposite said bolt and in the line of movement thereof when said track ends are aligned, safety stops carried by said tracks and adapted to be moved into and out of track blocking position, operating connections between said bolt and one of said stops, operating connections between said plunger and the other of said stops, means for preventing substantial separation of said bolt and plunger during movement thereof toward the track on which said bolt is carried until said safety stops are moved into track blocking position, spring means for moving said bolt, latch means for holding said bolt in retracted position, and means for pre-setting said spring whereby said bolt will automatically move into locking position when said latch is released.

19. Track blocking and interlocking mechanism including tracks adapted to be moved relatively into and out of end to end alignment, housing members supported one on each of said tracks, one of said tracks being fixed and the other movable, a track interlocking bolt slidably supported in the movable track housing, a plunger disposed adjacent and said bolt and also slidably supported in said movable track housing, means for interconnecting said bolt and plunger whereby movement of said bolt in one direction will be accompanied by movement of the plunger in the opposite direction, a track safety stop operable by said bolt and plunger interconnecting means, said safety stop being disposed in track blocking position when said bolt is withdrawn or retracted into said housing and moving into non-blocking position when said bolt is advanced or interlocking position, a second plunger slidably carried by said housing on said stationary track and adapted to be disposed opposite said bolt when said tracks are in alignment, a second safety stop disposed in alignment with said first named plunger when said tracks are in alignment, means for interconnecting said second plunger and said second bolt whereby movement of said second plunger away from the stationary track end will advance said second bolt into interlocking position, a second safety stop operatively connected to said interlocking means for said second bolt and plunger, said second safety stop being disposed in track blocking position when said second bolt is retracted and moving into non-blocking position when said second bolt is advanced, means for advancing and retracting one of said bolts to and from track interlocking position, latch means carried by said movable track housing for retaining said movable track bolt in withdrawn position, said bolt advancing and retracting means including a spring, and means for pre-setting said spring to exert a bolt advancing force thereagainst when said latch holds said bolt withdrawn.

20. Apparatus according to claim 7 characterized by having independent relatively light spring means tending to urge said plunger and bolts into non-interlocking position whereby movement of said bolts into interlocking position when said tracks are out of alignment is resisted.

FRANK C. HARRIS.
RALPH T. MOORE.