



U.S. Department  
of Transportation

**Federal Railroad  
Administration**

# Memorandum

Date: MAY 6 1996 Reply to Attn of: T-96-03

Subject Security of Component Attachment Beneath Switch Stands  
Original Issue Number and Date: TB-91-04, 9/23/91

From:   
Edward R. English  
Director, Office of Safety  
Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators,  
Supervisory Railroad Safety Specialists (Track), and  
Federal and State Track Inspectors

**Background:** The following discussion is intended primarily for the guidance of Track Inspectors and Signal and Train Control Inspectors, who, respectively, have the responsibility, on a day-to-day basis, to inspect those elements of main track switches that fall within the scope of their particular disciplines. It should be of interest to all other personnel who may be among the investigators arriving early at the scene of an accident for which the following conditions appear evident:

1. Seems to have originated within the confines of a turnout or crossover, particularly as a facing point move.
2. Floating main track switch points may figure, even remotely, according to initial observations.

If these conditions are operative, it is important that the switch stand, regardless of its type and its immediate vicinity, not be disturbed until examined by a qualified specialist.

**Discussion:** For hand-operated switch stands of virtually all types, rotary motion imparted to the vertical spindle within the rod of the stand by the person operating the hand lever is translated into (practically) linear movement of the connecting rod by the right angle combination of the end of the spindle beneath the stand and its attached crank. Unless cranks are cast integral with the spindle at manufacture, they are separate pieces that must be joined. Cranks are attached to spindles in one of two ways: (1) they may be turned into a threaded opening in the side of the spindle or (2) the crank may be fabricated to have a square or rectangular, smooth opening at one end which can be moved from below up onto a

spindle having a similar cross section to a position where it can be secured in place by a horizontally inserted cross pin that simultaneously engages the crank with the spindle. For ease of reference in this discussion, the first case will be referred to as Type A and the second case as Type B. (See the following illustrative material for an indication of how a typical Type B arrangement might be assembled paying especial attention to the items singularized by an asterisk, \*). An undesired decoupling of the connecting rod and the switch stand can occur in the first case (Type A) if the bolt attaching a connecting rod to a threaded crank comes out and, in the second case (Type B), separation of the crank and the spindle can occur in the absence of the cross pin.<sup>1</sup> The highly probable result, in either instance, is floating switch points unless some other device is in place to physically restrain the points.

In 1991, there was a facing point, main track derailment at a crossover, the investigation of which revealed that the switch was of the Type B category. As is the case sometimes, there was a plate-like arrangement of sheet metal suspended from the headblock timbers beneath the switch stand. (This device, generally of a shallow "U" shape, commonly referred to as a "safety plate," is shown in two versions on Figure 4.) The function of the plate, if present, is twofold: (1) to restrict the downward movement of the crank on the spindle, should the cross pin be absent, so the crank does not completely separate from the spindle, and (2) to keep a vertically unrestrained crank from sliding down the spindle far enough to permit the connecting rod enough space below the bottom of the switch stand to move up off the lug of the crank. During the investigation, the cross pin, fractured at some time before the accident, was discovered under the plate. The plate, itself, was found to have been deformed in some way, also earlier, so that the downward displacement of the crank was sufficient to enable the connecting rod to clear the crank lug without contacting the base of the stand leading to decoupling of the switch stand and the connecting rod.

The purpose of this Technical Bulletin is to remind Track Inspectors, primarily, and Signal and Train Control Inspectors, secondarily, of some of the critical ways in which hand-throw switch stands may not function as intended by the supplier and the railroad. The reason for including Signal and Train Control people in the discussion is that their work often brings them in proximity to switches and it would be helpful for them to remain aware of the factors discussed above so that they will continue to recognize questionable conditions and alert appropriate colleagues or railroad staff to situations that may need further investigation.

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<sup>1</sup> There is a special situation, related to the Type B case, where the crank that is held on the spindle by a pin does not have a vertical lug on the end of the crank that receives the connecting rod. Instead, there is a circular opening through which bolt is introduced to engage the connecting rod. This bolt normally will be inserted upright from below and the nut is secured with a cotter pin. Since the nut cannot be torqued too much or it will interfere with the operation of the switch stand, the presence of the cotter pin is absolutely essential to prevent the nut from backing off. A crank of this sort is identified in the illustrations as a Reversible Screw Eye Crank. When this component is encountered, the result, according to switch stand classification scheme outlined above, is a hybrid Type A/Type B embodying some characteristics of both.

Track Inspectors must constantly bear in mind those aspects of switch stand performance that are crucial to functional safety. The present discussion is not all-inclusive. For example, equally important though it may be, the integrity of the connecting rod/switch rod fastening is not addressed here because it is not an immediate part of the switch stand assembly. What this treatment does is concentrate on that region of the mechanical linkage between the switch points and the switch stand that, while vital to functional safety, is difficult to observe adequately in the course of an on-foot inspection of a turnout.

There are several different types of Type B switch stands that are in use on main tracks and yards in the railroad industry. These models differ in minor ways. Nevertheless, they all share reliance on the cross pin restraint of the spindle/crank subassembly and they all share vulnerability to an unwanted, but communal mode of switch stand/connecting rod disengagement. Part of an acceptable turnout inspection inescapably includes examination of these partly concealed parts even if such an action has to be carried out manually and with some physical exertion.

The discussion above is meant to provide the Track Inspectors with information to reinforce inspection instructions already advanced in the Track Enforcement Manual under Sections 213.133, Turnouts and Track Crossings, Generally and 213.135, Switches. The information described above includes cross pin position; in-place cross pin retaining rings or cotter pins; deformation of safety plates, if present; and, for Type A stands, the integrity of the bolted connection between the crank and the connecting rod.

In the interest of uniform classification of defects, please note the following:

- The absence of a safety plate or the presence of a nonfunctional safety plate cannot be considered as a defect.
- Section 213.135(e) is the regulation that covers missing or defective cross pins and pin restraints (ring locks or cotter pins) only. Defects noted under this regulation are to be coded as 135.08, Insecure Connecting Rod.

**ILLUSTRATIVE MATERIAL**

■ **Components of a Typical Type B Switch Stand**

Figure 1 ... Overall Assembly

Figure 2 ... Parts List (1st page)

Figure 3 ... Parts List (2nd page)

Figure 4 ... View of Typical Safety Plate

■ **Example of a Type A Switch Stand**

Figure 5 ... Illustration emphasizes the importance of the cotter pin in crank/connecting rod security.

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**Attachments**

cc. D. Hollingsworth, Louisville  
S. Fender, Denver

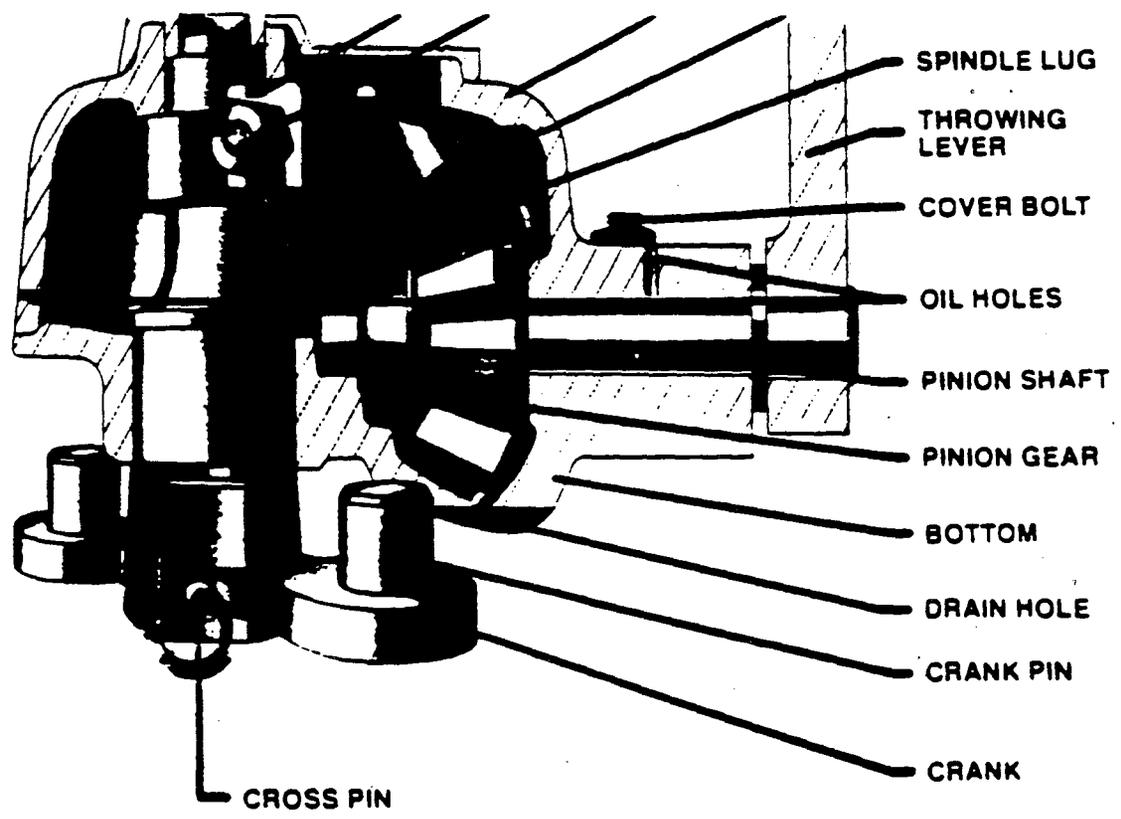
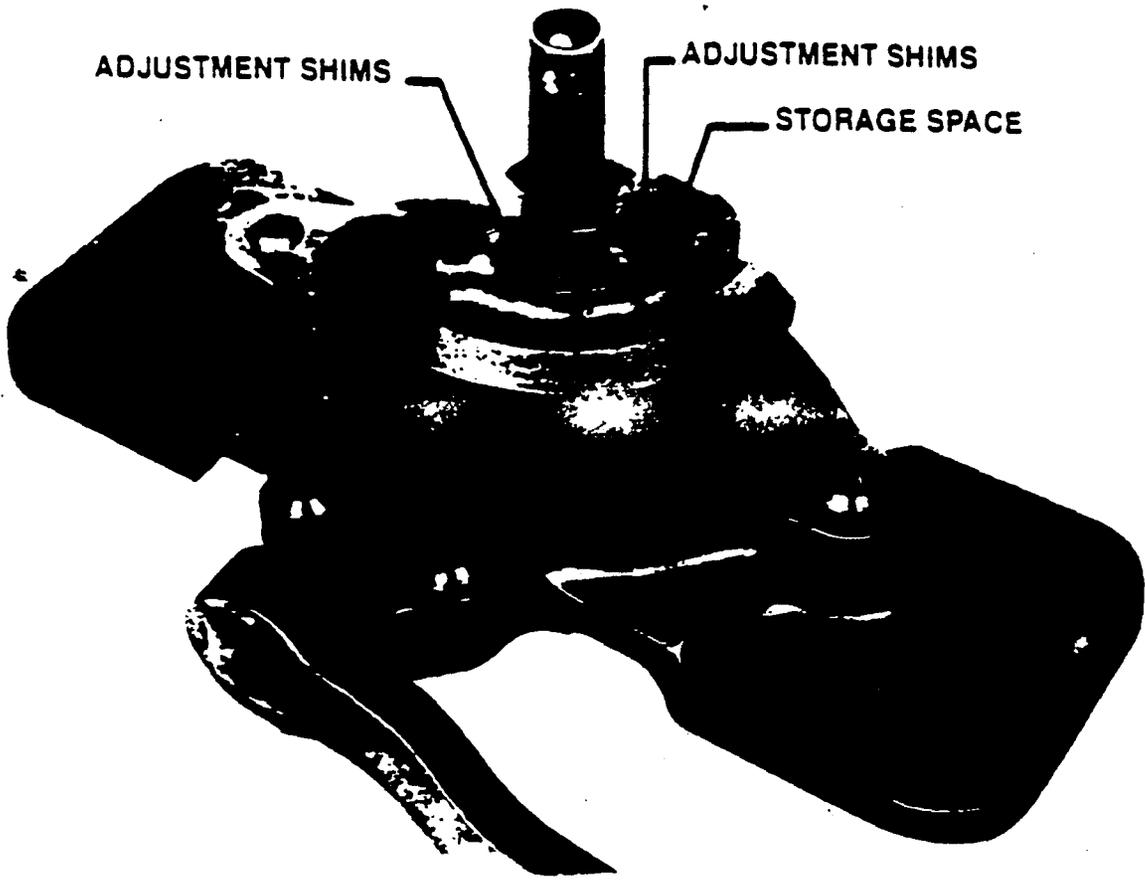


FIGURE 1



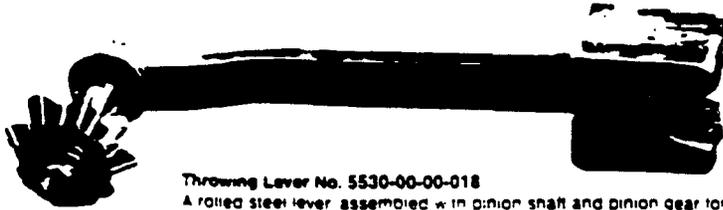
Top No. 5420-00-00-041  
For use on Model 51-A (Low-Type) Made of cast iron



Top No. 5410-00-00-052  
For use on Models 50-B & 51-B (Intermediate-Type) Made of cast iron



Gear Segment No. 5500-00-00-092  
For use on Model 50-A Made of malleable iron



Throwing Lever No. 5530-00-00-018  
A rolled steel lever assembled with pinion shaft and pinion gear for Models 50 and 51 30-lb cast iron weighted handle

Throwing Lever No. 5530-00-00-090  
This rolled steel lever with a 35-lb cast iron weighted handle is also available for Models 50 and 51 Specify the weight handle desired



Gear Segment No. 5500-00-01-607  
For use on Model 50-B Non-adjustable full motion



Bottom No. 5300-00-00-043  
For use on all New Century Switch Stands Wide heavy base of cast iron



Ring No. 6990-00-01-611  
This ring serves as a lock for cross pin No. 6990-00-02-228



Cross Pin No. 6990-00-02-228  
Spec a shear-resistant steel



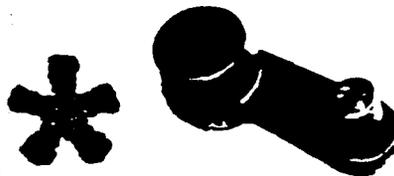
Adjustment Bolt No. 6990-00-00-054  
For use on Models 51-A and 51-B



Adjustable Gear Segment No. 5500-00-00-049  
For use on Model 51-A Made of malleable iron



Double Crank (See Table)  
For use on New Century Switch Stands Made of malleable iron Breakable for yard use



Single Crank (See Table)  
For use on New Century Switch Stands Made of forged steel for main line use



Adjustable Gear Segment No. 5500-00-00-050  
For use on Model 51-B Made of malleable iron



**Top No. 5400-00-00-002**  
For use on Model 50-A (Low-Type) Made  
of cast iron

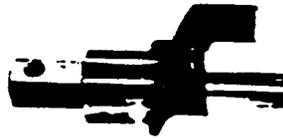
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**Adjustable Shim Set No. 6020-00-01-824**  
For use on Models 51-A and 51-B



**Cover No. 6010-00-00-039**  
For use on Models 51-A and 51-B Made of  
malleable iron

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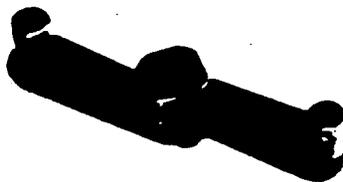
**Spindle No. 5510-00-00-063**  
For use on New Century Switch Stand  
Made of forged steel

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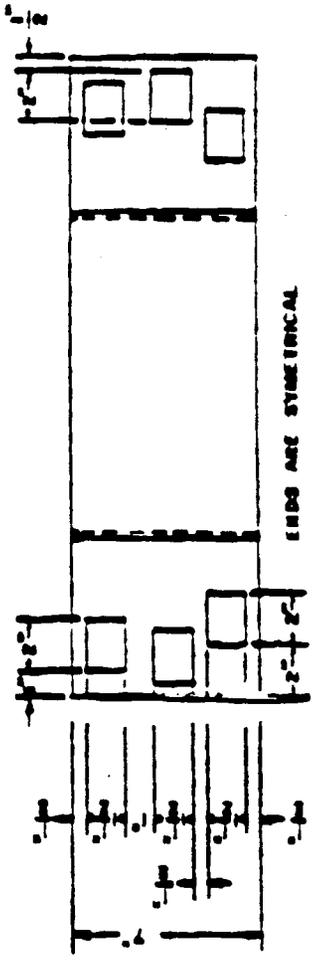
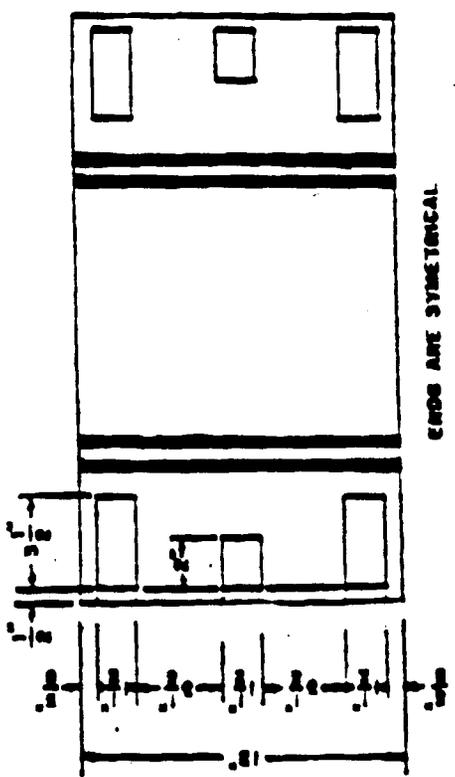
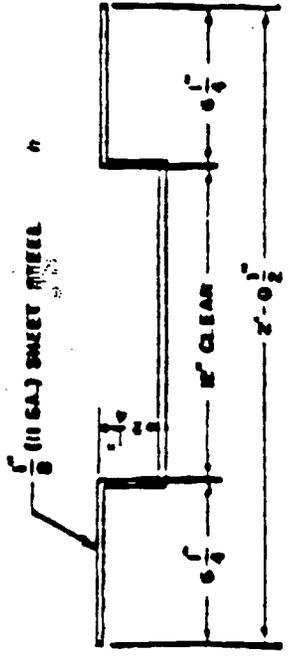
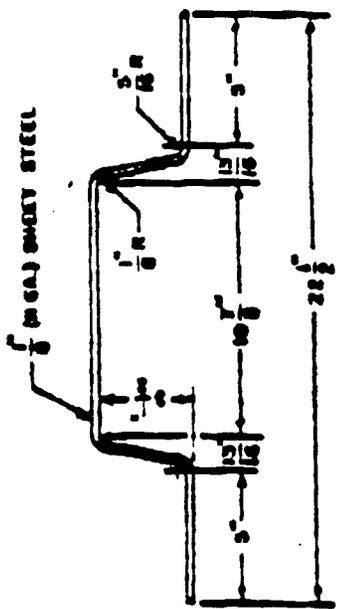
**Reversible Screw Eye Crank  
No. 5720-00-01-511**  
For use on Models 50 and 51 Made of  
malleable iron. Switch-point adjustments  
from 3 1/2 to 5 in

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**Double Crank (See Table)**  
For use on New Century Switch Stands  
Made of forged steel for main line use

**FIGURE 3**

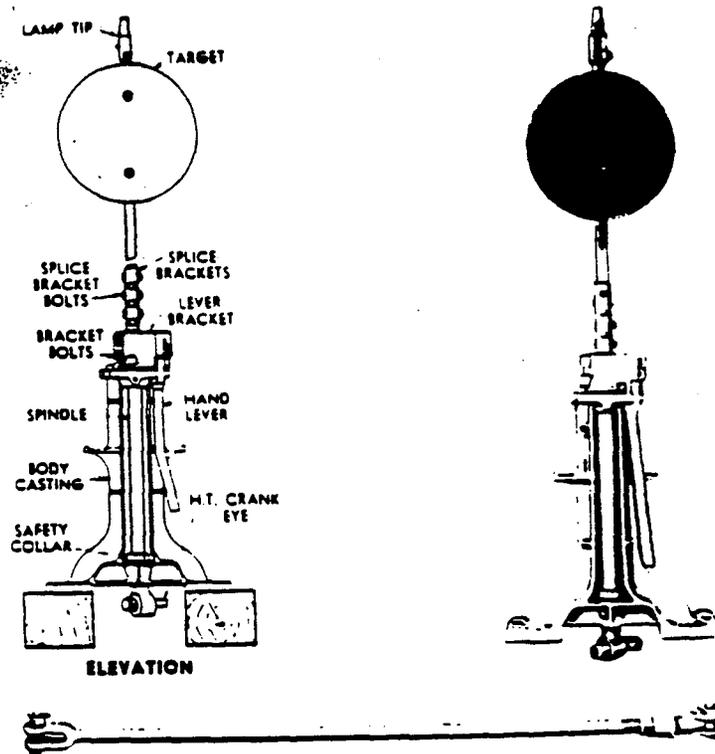


ENDS ARE SYMMETRICAL  
FOR WEIR NO. 10 HIGH SWITCH STANDS

ENDS ARE SYMMETRICAL  
FOR LOW M.C. SWITCH STANDS MODEL 50-A

SAFETY PLATE

FIGURE 4



TYPE A SWITCH STAND

FIGURE 5

Note that the two bolts at the ends of the connecting rod are inserted from the bottom up with a cotter pin securing each nut. In the absence of a cotter pin there is nothing to prevent the nut from backing off when it is subject to the vibration associated with normal train traffic.

