**How 9 RRs Beat the Hot Box Menace**
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# How 9 RRs Beat the Hot Box Menace

What is the present status of automatic hot box detection? How accurate is it? Is it economically justified? How does it benefit train operations, and what is its future?

To answer these questions Railway Age went to the nine U. S. railroads now using automatic hot box detectors. The following report is based on their experiences, plus field trips to detector installations.

Working with the Servo Corporation of America, the Chesapeake & Ohio installed the first hot box detector, on a railroad, at Norge, Va., in November 1956. Since then, detectors have been installed on the Norfolk & Western; Reading; Boston & Maine; New York Central; Southern; Delaware, Lackawanna & Western; Baltimore & Ohio and the Pennsylvania.

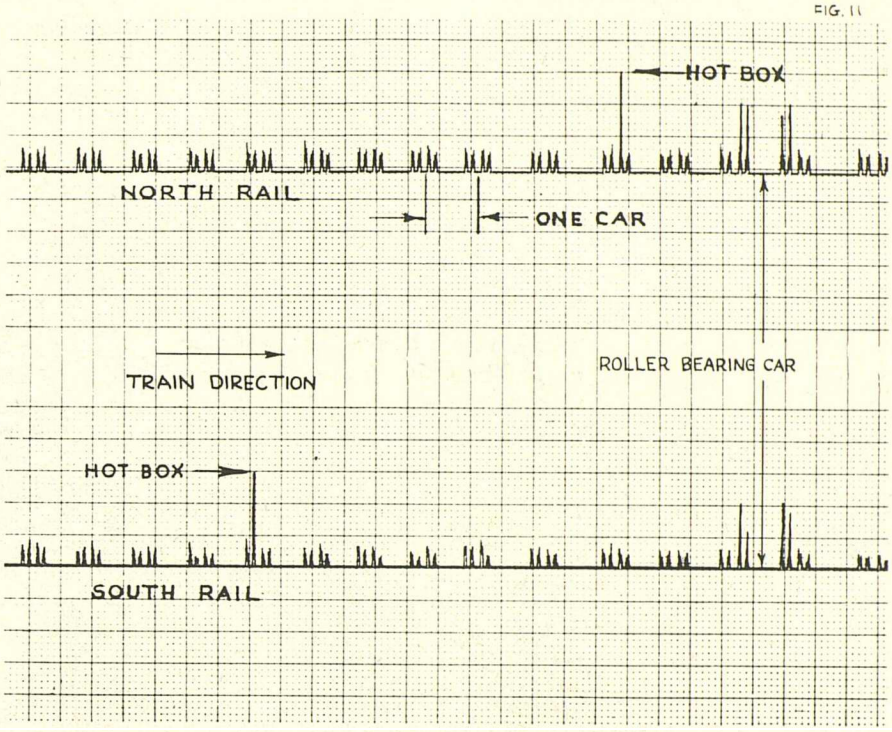
Many solutions to the hot box problem have been proposed. Some are effective, but the problem remains. Freight cars do run with hot journals at one time or another, resulting in delays to trains and, sometimes, expensive wrecks. Automatic and accurate detection of hot boxes is one economical method of reducing such delays and preventing the wrecks.

The Servo hot box detector is mounted along the track to view passing journals of moving freight trains. A pen-graph recorder, actuated by the detector, records a pattern showing each journal on the train. The pen's deflection is proportional to the heat radiated by each passing journal. An abnormally hot journal shows a relatively large deflection or "pip" compared with a normal box. Roller bearing cars and locomotives are easily identified because their pips are slightly taller than those of a solid bearing journal, but appreciably shorter than a pip indicating a hot box.

As the accompanying chart shows, a pip is recorded for each journal. The height of the pip is proportional to the heat radiated by the journal. It is a simple matter of counting pips from the front end of the train to locate accurately the abnormally hot journal. The consensus of railroads using detectors appears to be that a 12- or 15-mm deflection indicates an abnormally hot journal. A car with a journal causing such a deflection should be stopped and inspected. As the chart indicates, the hot box having a 15-mm deflection is readily observed.

Identification of roller bearing cars has not been difficult because a roller bearing car will show four large pips per side, that is, eight all together The symmetry of the pattern of four tall pips in a row is easy to spot. Also, the operator may check these pips with those of the engine, which he knows has roller bearings. While it is true that all high pips on one car could indicate hot boxes, chances are mathematically remote that such an instance would arise. It has never happened on any of the nine roads.

**Composite chart shows typical hot box indications**




**ROLLER BEARING** car is easily identified by four tall pips on each side of car.

Here's another proof of the accuracy of the detectors. Several roads reported that train crews, after being told they had a hot box after stopping their train, walked back to the specified box, felt it, and were unable to decide whether it was abnormally hot. One crew, disbelieving that the detector equipment had pin-pointed a hot box, opened the box and was surprised to see the waste burst into flame when the journal lid was lifted.

In one instance on the C & O, the crew was unable to decide from inspection of the journal whether the car should be set out. After further consultation with the man who reported the defective journal had produced a 15-mm deflection, the crew set the car out. When the carmen jacked up the car, they found the babbitt had run down to the brass.

The old theory that a journal will smoke when it gets hot seems to have gone into the discard recently with the use of journal lubricators. However, the hot box detector has pointed out abnormally hot journals which are equipped with journal lubricators. In one of these cases, the lubricator pad was not working properly, so the oil was not being evenly distributed around the journal. The detector indicated a hot running journal. Visual inspection by the crew had not revealed anything out of order. However, when carmen inspected the journal they found the true situation.

### What Is 'Critical'?

Some roads claim they have stopped trains when the detector's pen showed deflection above normal, but that no hot box was found. The general opinion appears to be that, with proper adjustment of the recorder (4 to 5-mm deflection for a normal running journal), trains should be stopped which show journals with 12- or 15-mm deflection. Servo Corp. recommends that the critical deflection for a hot box should be a differential deflection of 8mm or more. That is, the difference in the deflections indicated by the journals at each end of the same axle.

One railroad uses the detector as follows. Any time a train causes a detector to show at least a 12-mm deflection, the

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train is stopped. A crew member is instructed to inspect the indicated journal and report back by telephone to the operator. As one man put it, "It's remarkable how many times the crew walked back, said, 'We don't think there's a hot box, but we'll look anyway,' then lifted the lid to find that the car had to be set out."

Most everyone agrees that hot box detection is economically justified. The Reading estimates that because the detector reveals an overheated journal before it becomes a hot box, there are savings of approximtaely $300 per axle, when no wheel change is required. In addition, the Reading points out, the system detects overheated journals early, thereby minimizing journal and axle cuts and preventing possible derailments.

The B&M reports considerable time savings in car set-offs since installation of detectors at Ayer, Mass. The Reading reports that because the detector system is able to reveal an overheated journal prior to a journal cut—in which case the cars are set out and repairs made in the field—they save at least three days when the car does not have to be sent to the shop. One railroad has sharply reduced the number of daily set-outs formerly experienced on a 330-mile length of its main line. For six months before the hot box detector was installed, as many as 25 daily set-outs were required because of hot boxes. For the six months after the detector was placed in service, the number of daily set-outs averaged two. Setouts were reduced because the detector often picks up journals in their early heating. Thus, the crew is able to make the minor repair or repack the journal without setting out the car.

### Cuts Inspection Time

The fact that the detector accurately locates a hot box materially reduces the time a train is held up on the main line while the crew inspects the car and decides whether to set it off or repack the journal. Some roads have reduced materially the time required to inspect trains in yards, particularly if they have detectors which check the trains as they approach the yards. One road makes it standard practice now, where incoming trains are checked by hot box detectors, for inspectors to give attenion only to those indicated abnormally hot by the detector.

What are the basic requirements for detector location? They must be placed so that once a train with a hot box has passed the installation, an employee can control a signal on the wayside to indicate to the train crew that the train should be stopped. A telephone should be at the stop point so the train crew can call in to the interlocking operator or CTC dispatcher. The latter will by then have read the pen-graph recording of the indications and can tell the crew which journal is overheated.

B&O has an installation at Hancock, W. Va., with the detectors 500 ft from the tower in which the recorder is located. This detector location is 8.7 miles in approach to Miller's interlocking, where the train can be stopped by the operator for inspection by the crew. Thus, the Hancock interlocking operator, seeing a hot box indication on the recorder, telephones the Miller's interlocking operator to stop the train for inspection.

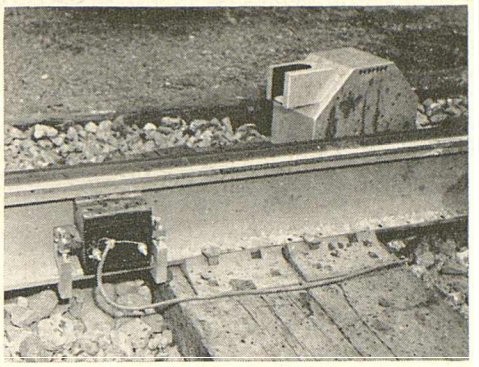
At the B&M Ayer installation, the detectors are two miles in approach to an interlocking. The recorders are in the interlocking tower, where the operator, noting that a hot box is indicated, can set signals to stop the train. The NYC has similar installations of detectors at Angola, N.Y., and Dock Junction, Pa., with recorders in the dispatcher's office in Erie. The information is telemetered into Erie, 64 miles from Angola and 6 miles from Dock Junction. The dispatcher at Toledo, Ohio, receives journal readings from hot box detectors at Wauseon, Ohio, 32 miles distant, and Brimfield, Ind., 97 miles away. In these installations the trains are operating in CTC territory and the dispatcher can, if necessary, put the train into work sidings after it has passed the detector. Or he can route trains into nearby yards where car inspectors are located. The Reading also has its hot box detectors at interlockings, and the operator is able to control signals six miles away to stop trains. In all these instances, the trains are stopped by direct or remote controlled signals.

The C&O and one other railroad use a flashing lunar-white signal aspect to indicate to train crews that they are to stop and telephone to learn which journal box is hot. This special C&O signal is controlled from an interlocking.

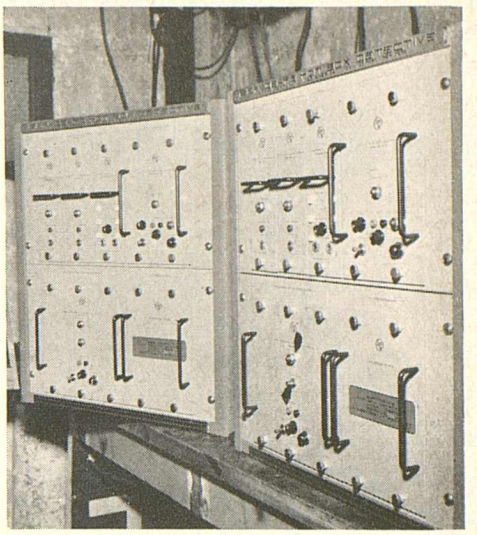
Most roads seem to agree it is desirable to have the detector placed so that when a train is stopped for inspection the car with a hot box is convenient to a siding. Detectors, many railroads believe, should be located approximately 30 miles in approach to a yard where the freight train can be inspected.

Thus, the detector will catch or pinpoint hot boxes for trains inbound to yards, and these can be given attention by car inspectors.

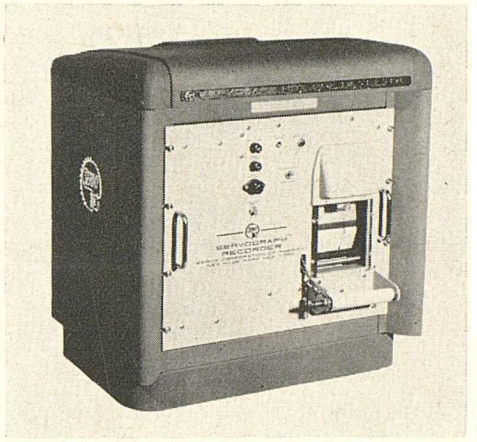
This does not eliminate the need for stopping the train and inspecting any hot journal, because the car might have to be set out. But it can help in the in-



**HOT BOX DETECTOR** head is mounted outside rail. Transducer (black metal box) works with a twin unit to control shutter on detector to view only the passing journal.



**AMPLIFIERS** receive signal from detector head, amplify it and feed it into the pen-graph recorder. Two amplifiers shown serve double-direction hot box detectors.



**NEW RECORDER** developed by Servo Corp. of America features take-up reel for the recording tape. All controls are mounted on the front panel for easy operation.

spection of the train when it arrives at the yard.

One belief is that perhaps the best location for hot box detectors in approach to yards is only 3 to 5 miles out. When a hot box is indicated, the train pulls into the yard where the hot journal is looked at by car inspectors. Thus, the car with the hot journal does not have to be set out along the line. The time saved by having the train checked in the yard, and not setting cars out, is estimated to be considerable.

Detectors should also be installed 30 miles from a yard to check outbound trains. Experience has indicated that, if a journal is going to heat up after standing in a yard, it will do so in the first 30 miles of running. Some feel that an additional installation should be made another 20 miles on, that is 50 miles from the yard. The second detector would catch journals that might be "warming up" but had not reached the critical stage when they passed the detectors 30 miles out.

Does the recorder have to be at the same location as the detector? In the beginning, this was considered to be essential. The belief may have deterred some roads from installing detectors, as they felt they could not justify an installation economically if they had to put someone out by the detector to ready the pen-graph recorder.

The New York Central is telemetering hot box information from the detector heads to recorders in the dispatchers' offices. As indicated earlier, the Toledo, Ohio, dispatcher receives indications from a detector 97 miles west, at Brimfield, Ind. Servo Corp. is now in the testing stage for telemetering hot box indications to the recorder. Thus, it appears, for all practical purposes, that detector heads can be any distance from the recorder that is necessary. NYC experience has been that it is of tremendous advantage to have recorders at the same location as the signal control.

Analysis of the experience of the nine railroads with detectors indicates the future is bright for hot box detection. A large number of hot box detectors are on order or are scheduled to be ordered by several of the roads for future installation.

The New York Central plans to install hot box detectors on all its operating districts. The C&O plans to install a hot box detector near Clifton Forge, Va., which will check every tonnage train approaching the yard. The B&M is contemplating two more installations—one at Wells Beach, Maine, another at North Adams, Mass. Most of the other roads in the survey plan further hot box installations, although the plans are not yet definite. One road has ordered a large number of hot box detectors and is planning to put them in approaches to all its major yards.

The efficiency of the modern signal system and the diesel locomotive has satisfied the demand for higher speeds and longer non-stop runs. Installations for automatically detecting and locating hot boxes appear to be an economic necessity, as part of the modern signal system.