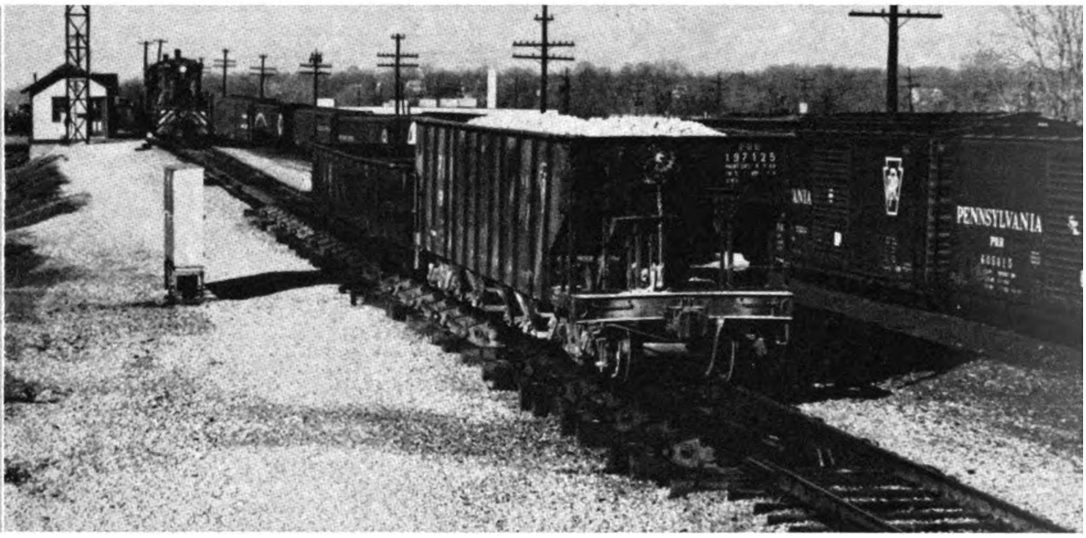
Railway
Signaling &
Communications



PRR Upgrades Yard, Improves Service

Pennsylvania, like many other railroads, is always searching for ways to improve operations at smaller classification yards. The problem is to cut operating costs, reduce time of cars in the yard, and yet not be required to make a considerable capital expenditure for retarders and their attendant controls for a yard which may handle about 500 cars daily. PRR found a solution to this problem by installing simplified retarders and controls made by American Brake Shoe Co.

At Grandview yard in Columbus, Ohio, the railroad installed Racor weight-responsive retarders with speed sensing elements and hydraulic switch machines that are controlled by the retarder operator. A master retarder and three group retarders are used to control speeds of cars being classified into any of nine tracks. Total investment for the railroad is $167,000 for the Grandview improvements. Improved efficiency and other operating economies will produce a minimum of 25% return on this investment.

The immediate advantage of this installation, notes David E. Smucker, PRR's vice-president operations, "is a notable improvement in PRR freight service to and through Columbus, and to industries served by the Grandview yard. We now can classify cars on a 24-hour basis, as contrasted to the previous 8-hr operation each day, and are handling many more cars per hour. Deliveries to local industry are faster, in some instances by as much as 16 hours."

Grandview, one of several PRR yards serving the Columbus area, was a rider hump yard. It was operated one trick per day, five days per week. The yard crew consisted of a conductor and nine brakemen. A brakeman would ride each cut down the hump and apply the brakes to stop the cars on the class tracks. Following the installation of retarders and remotely controlled switches, the yard is operated on a 24-hour basis. A yard crew now consists of a conductor, two brakemen and a car retarder operator for each trick.

To take advantage of the improved operating conditions at Grandview, including its three-trick operation, part of the traffic handled at two other yards has been diverted to Grandview. Since Grandview has become a 3-trick operation, six to seven trains are now handled daily through the yard. Also, several trains originate at Grandview that were formerly made up at other yards. Not only has classifying at Grandview reduced work at other yards in the Columbus area for the PRR, but overtime has been practically eliminated at Grandview. Engine crews from other yards were brought to Grandview to staff second and third tricks.

Grandview is the first of several small classification yards that the PRR intends to upgrade using weight-responsive retarders, remote controlled switches and simplified speed controls. Grandview is somewhat of a test installation in that experience gained here will be applied at other small yards to be similarly upgraded. As one PRR spokesman pointed out: "We really picked out one of our worst locations. By that I mean a yard which had relatively few class tracks—nine—and they only hold about 35 cars each. Thus we can't really get maximum efficiency out of our retarder installation. But Grandview had a big advantage working for us. If necessary, we could take the yard out of service for a period of time while adjustments or other work is done on the new control equipment. Thus, it made an ideal test installation."

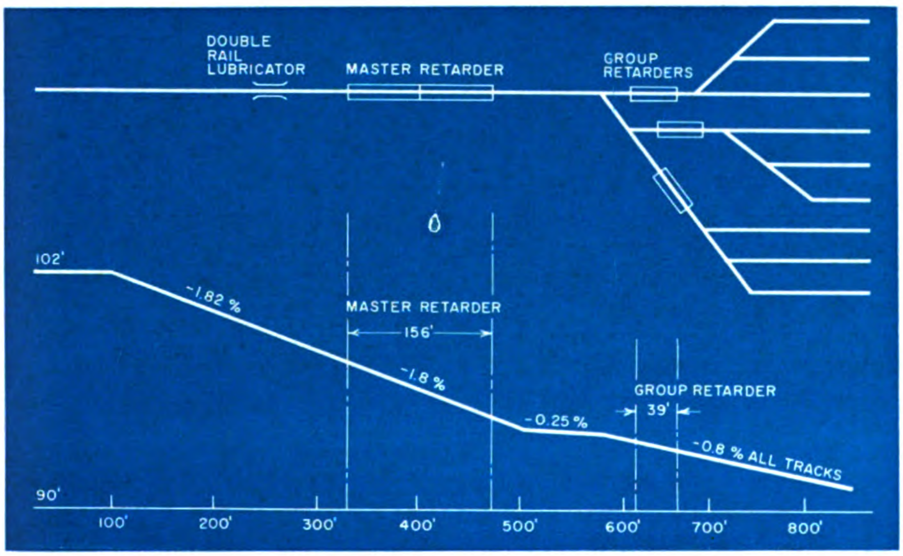
Operation has been very satisfactory, reports Clarence Frew, assistant superintendent. The yard is classifying about 500 cars daily. During one trick 200 cars were humped.

A test indicated a humping rate of three cars per minute. The maximum number of cars in a cut is held to four. This has not presented any problems, because an analysis of switch lists revealed that the majority of cuts would be four cars or less.

To prepare Grandview for semi-automatic operation, some reconstruction was necessary. Grades on the hump and class tracks were revised. Ladder tracks and a running track were relocated. Some of the nine class tracks were realined to reduce curvature. New 115 lb rail was laid over the hump and down to the clearance point on each of the nine class tracks.

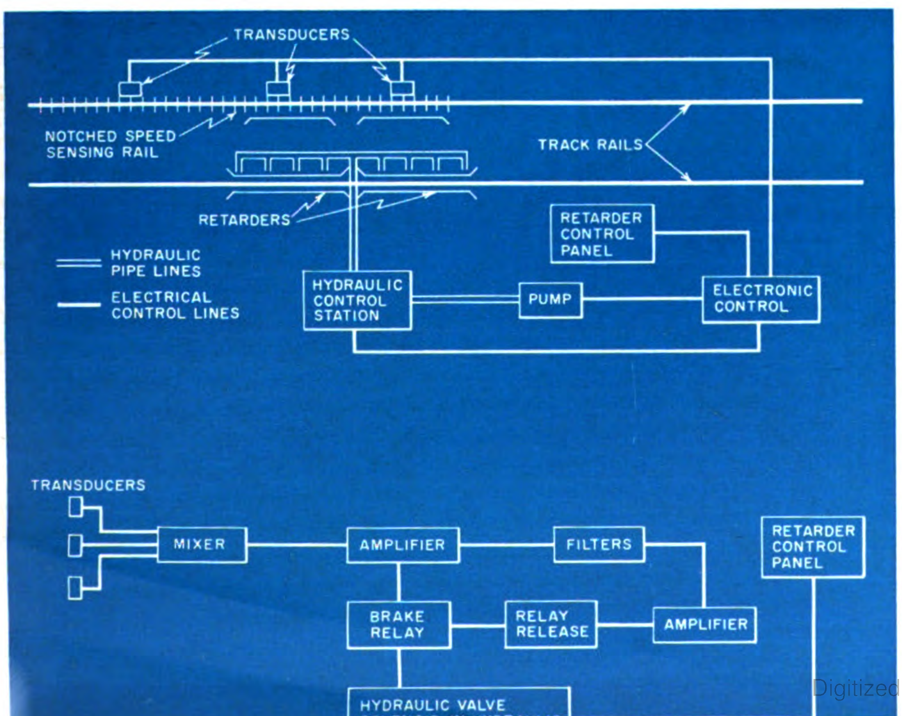
PRR installed one master and three group retarders. These are Racor R-11 weight compensating units with speed sensing elements. Four 39-ft retarders are installed 300 ft below the crest of the hump on a grade of −1.8%. Each retarder section consists of hydraulically controlled retarder rails that press against the wheels on one side of a car. The rail opposite the retarder acts as the speed sensing element. Notches cut in the top of the rail are ¼" deep, ½" wide and spaced on about 2" centers. The notched rail runs the entire length of the retarders (master and groups) and also extends one rail length (39 ft) ahead of the master and group retarders. The master retarder is controlled in two sections, that is, the first two retarders act as a unit and the last two sections act as a unit. Each group retarder consists of a 39-ft retarder (retarding rails are about 32 ft long) and two lengths of notched speed sensing rail. The group retarders are on a −0.8% grade. One group retarder is about 675 ft from the crest of the hump, while the other two groups are located about 750 ft from the crest.

The speed control function is accomplished as follows: As a car rolls down the hump it rolls over a 39-ft section of notched running rail in approach to the master retarder. As the car wheels pass over these notches, they set up vibrations in a magnet moving in a coil in a transducer attached to the notched rail 15 ft beyond the begin-



Above: Diagram showing plan and profile of Grandview classification yard.

Below: Block diagrams showing interconnections of hydraulic and electronic controls.



Retarders are weight-responsive in that car pressing downward increases retarding force due to mechanical linkage.

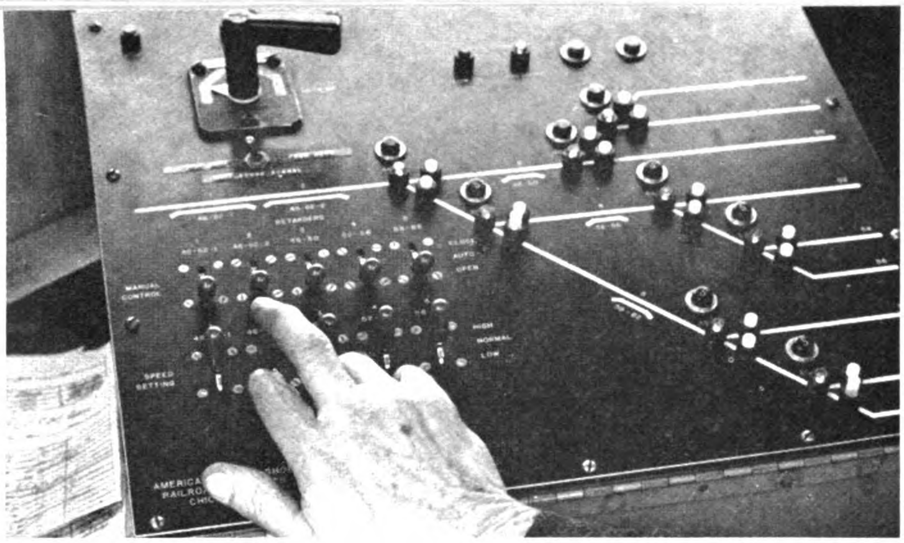
ning of the notches. Since the vibration of the track is proportional to the speed of the moving car, the vibration of the moving magnet in the transducer is similarly proportional to the speed. An electrical signal generated from this moving magnet is proportional to frequency. This electrical signal is then fed to the model 600 retarder speed control equipment where controls are actuated to set the retarder rails at the proper position to brake the car to the leaving speed selected by the retarder operator. Rapidity of the speed sensing and resultant control action is such that the retarder is "cocked" ready for the car or cut after it has traveled about 12 ft along the notched sensing rail.

At the master retarder, the approaching car speed is sensed and the first two sections are positioned. As the car slows down in these sections, it is running over the notched rail. Again its speed is determined, and the second section of the master retarder is properly positioned to retard the car for the selected leaving speed.

After leaving the master retarder, a car rolls down a 0.25% grade to a group retarder. Again, it passes over a 39-ft section of notched rail prior to entry into the retarder. To improve the rollability of cars, a Racor double-rail flange lubricator was installed ahead of the master retarder.

At Grandview, the retarder operator is located in a control building between the group and master retarders, giving him a view of both the hump and the class tracks. His control panel contains a track model diagram of the yard, plus toggle switches for setting retarder leaving speeds and pushbuttons for power switch operation. In addition, the panel contains indication lamps for switch position and detector track circuit vacancy. For the master and each group retarder, the operator can select three leaving speeds. For the master retarder they are: low-6 mph, medium-7 mph, and high-

Car wheels traveling over notches in rail set up vibrations for speed sensing.



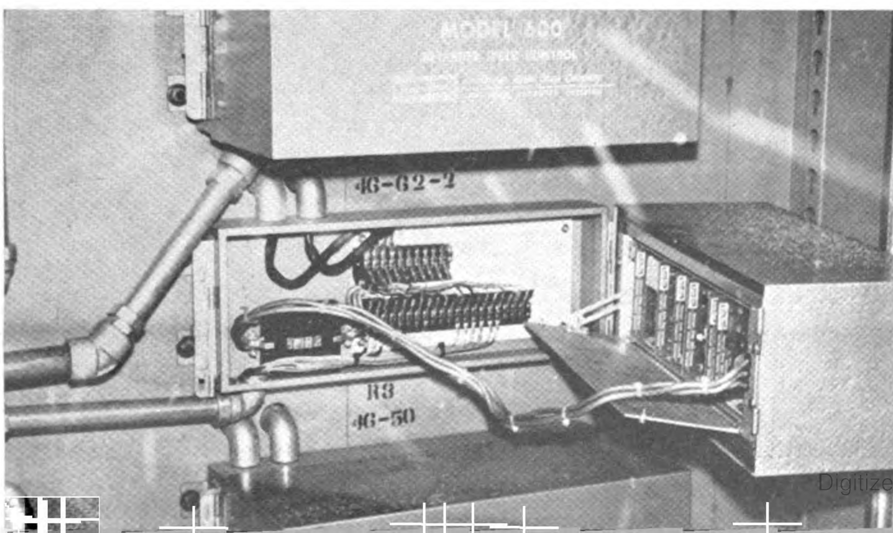
Retarder operator can set leaving speeds from retarders and position switches.

8 mph. For the group retarders, the corresponding leaving speeds are: low-4 mph, medium-5 mph, and high-6 mph. Also, the operator has a manual take-over of the retarders, whereby he can open or close them.

The eight class track switches are remotely controlled by the retarder operator. They are model HM-1 hydraulic switch machines. These are Racor model 22 hand-throw stands equipped with a hydraulic unit for positioning. They are also trailable. Because the operator must align switches, detector track circuits were installed to prevent him from throwing a switch under a car or cut. When a light on the track diagram panel at the switch is lighted, the operator can move the switch. With the detector track circuit occupied, this light is out, and an electrical interlock prevents the operator from throwing the switch. These detector track circuits are 65 ft long. They are type C in which AC is applied to the track at one end of the circuit and a rectifier is located at the far end. They have good shunting characteristics, report PRR engineers. The circuit extends 19 ft back of the switch points so that as a car or cut approaches the switch, the operator cannot throw the switch and have the car arrive at the points before they are completely over. A limit switch installed on these switches operates in conjunction with the hand-throw lever. If a man on the ground raises this lever 2", the limit switch cuts the electrical circuit to the retarder operator's controls so he cannot operate the switch.

As mentioned earlier, the retarders are the weight-responsive, hydraulic-type. The regarding force, proportional to the weight of the car, is exerted by a mechanical linkage. The hydraulic system, using oil at 600 psi, releases the retarding rails as called for by the speed sensing system. Denison Engineering division of American Brake Shoe Co., provided normal and standby pumping facilities. From this location the oil is pumped to accumulator tanks, one set at the master retarder and another set at the group retarder sites.

Electronic equipment acts upon speed sensing vibrations to properly set retarders.



Pennsylvania industrial engineers made extensive speed checks at Grandview. In addition, stop watch checks were made to determine times it took cars or cuts to roll through various track or retarder sections. For example, the following times were obtained: when man pulled the pin on a car or cut; time cut entered the master retarder, time in master retarder, time to travel from master to group retarder, time in group retarder, and overall elapsed time from pin pulling to clearance point.

For speed checks a two-trip, battery-operated timer was used. Two wheel trips are clamped to the rail 11 ft apart. The timer is started when the first trip is depressed by a car wheel and it stops when the wheel depresses the second trip. The dial reads miles per hour. In the Grandview checks, the dial reading had to be divided by 8 because the timer is normally used in line-of-road territory where speeds are considerably greater and the trips are spaced 88 ft apart.

The speed checks indicated that the retarder leaving speeds were within ±1 mph or less of the speed set by the retarder operator. These checks were made on all types of cars and lading: ranging from empties to 90 tons gross weight. Lading varied from merchandise and perishables to scrap steel, and limestone. For leaving speed checks, the trips were placed out of the master retarder a sufficient distance so that the rear wheels of a car would be free of the retarder. Although speed checks were made last October after the yard had been placed in service, PRR industrial engineers are going back in cold winter weather to make further checks.

In addition to recording data concerning speeds and times of car movements, the following information was obtained: type of car, lading, gross weight, lightweight if empty, type of wheel, type of journal and weather. Multiple wear wheels have more surface contact with the rubbing retarder rail than do single-wear wheels. Although results of the checks taken at Grandview provide no definitive information regarding relative performance of multiple-wear vs single wear wheels, PRR's industrial engineers are not overlooking any factors that may be significant. RS&C