

three-track on the main line between Tyrone, Pa., and Spruce Creek, all other main line portions of the division being four track. Prior to July 21, 1913, the three-track section was operated under manual block rules, the tracks being used as follows: No. 1, track eastward, passenger and freight; No. 2, track westward, freight; No. 3, track westward, passenger. There was a great deal of delay to the eastward freight movement at Tyrone during periods when eastward passenger trains were moving at frequent intervals. While the train dispatcher frequently advanced the freight trains by moving them against the current of traffic on No. 2 track, when conditions would permit, it required too much time to get an eastward train started, by means of a train order, after westward movement was completed. Therefore, in many cases, freight trains were held for passenger trains, because of the fact that there was not sufficient time to make the cross-over movement from the four to the three track, without delaying passenger trains. To make matters worse, eastward freight trains held at this point were obliged to cut public crossings. This congested condition was greatly relieved by the installation of controlled manual block on No. 2 track, which was completed on July 21, 1913.

The installation of automatic signals on the main line portion of the division, which was completed September 1, 1914, has greatly facilitated the movement of trains in general. Automatic signals make it possible to schedule passenger trains closer together, causing less interference to the freight movement. Freight trains, by reason of receiving definite information conveyed by automatic signal indication as to location of train ahead, are enabled to make much better time than was possible under manual block system rules when, on account of following trains ahead under permissive signal, it was necessary to move through entire blocks of five or six miles in length at reduced speed.

Signaling Postponed Heavier Expenditures on N. & W.

By R. H. Smith

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ABSOLUTE permissive automatic block signals have accomplished excellent results for the Norfolk & Western on 108 miles of single track on a 150 mile engine district, the first 42 miles of which is on double track. The traffic consists of five passenger trains each way daily and freight traffic varying with business, but amounting at times to ten trains each way daily, making a total of thirty train movements. The entire district is on a broken mountain grade line with a total rise in one direction of over 2,200 ft. in long grades and in the other direction about 1,940 ft. This rise is exclusive of stretches of grades due to short dips, there being corresponding long descending grades in each direction.

Following the installation of signals, the use of the "31" order has been discontinued, thereby eliminating train stops for train orders and attendant delays, thus reducing the wear and tear on equipment. The signals have reduced the long delays to freight trains when clearing for passenger trains on absolute block, especially at night when some telegraph offices are closed. Necessity for maintaining many open telegraph offices, particularly at night, is now eliminated and the closing of these offices has resulted in material operating economies.

We are using heavier but slower motive power with greater train tonnage and double heading has been practi-

cally eliminated coincident with the increase of average train speed and reduction of overtime hours.

On this 150 mile mountain grade engine district, a tie-up of a train for rest between terminals, in accordance with the Hours of Service Law, is now a rare occurrence. The signals have also effected an absolute check against the possibility of a man failure in handling train orders or in observing the rights of superior trains, which possibility always exists on even the best regulated manual block single track lines. In brief there has been a material increase in the capacity of the line with a correspondent postponement of heavy expenditures for double track.

The Cash Saving Accomplished By Signals on the B. & O.

By J. C. Hoffman

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THE installation of automatic signals on 11.9 miles of double-track between Warwick, O., and Sterling on the Akron division of the Baltimore & Ohio has resulted in a saving of approximately \$333,000 since 1917. Warwick, at the east end of this section, is the junction of the double-track main line between New York and Chicago, with the double-track C. L. & W. line running south to the Ohio and West Virginia coal fields. As Warwick is about midway in the division, 80 per cent of the tonnage trains passing through take coal and water. Sterling, on the west end of the section, is the junction between the double-track main line and the upper C. L. & W. district, which is double track from Sterling north to Seville. At Sterling there is a water station, and an interlocked grade crossing with the double-track line of the Erie. Therefore the double track between Warwick and Sterling handles the traffic of two double-track lines at each end of this sector, and serves somewhat in the nature of a gauntlet. Although the grade is very light in either direction, the eastward and westward tracks are separated about one-half mile diverging at the west end of Warwick yard, and at the east end of the eastward passing siding at Sterling. The distance between these tracks prevented the use of crossovers at Easton, which is midway between Sterling and Warwick. This limitation reduced the flexibility of operation, and required two, three-trick telegraph offices at Sterling, one on the westward track and the other on the eastward track.

The traffic during the summer season on the C. L. & W. district consists mainly of coal from the Ohio and West Virginia fields for the lake ports of Lorain and Cleveland, and the empties in the return movement to the mines. This traffic, added to the dense main line traffic formerly congested this territory very badly. Nine passenger trains and one express train were handled over this section daily in each direction, in addition to an average of 45 tonnage freight trains during the peak of the summer business. Serious delays were caused by reason of the superior trains.

In 1917, automatic block signals were installed between Warwick and Sterling. Following this the two, three-trick telegraph offices at Easton were dispensed with, and there has resulted an average saving of 20 min. on each freight train handled over this territory. At least 75 per cent of the time saved is overtime, and a conservative estimate of the saving in wages alone during the peak business is \$7,500 per month. The saving since the installation of these signals is approximately \$60,000 per year in wages and overtime, without considering the saving in equipment, fuel, supplies, turning of power, etc.