Railway Signaling in North Africa

Left-hand signals, disappearing targets, wire-line compensators, and other mechanical devices, are of interest to Americans in overseas duty with the Military Railway Service

AMERICAN railroad men are now serving in North Africa with the United States Army, Military Railway Service, Transportation Corps., under the command of Brigadier General Carl K. Gray, Jr. The following information, concerning the signaling with which these Americans are working on railways in North Africa, was abstracted from an extended explanation which was released by the Bureau of Public Relations of the War Department of the United States.

The technical matters pertaining to the signaling and communications on American military and military-operated railways in North Africa are under the jurisdiction of the signal engineer of the Military Railway Service, Captain F. J. Murphy, formerly with the signal department of the Great Northern with headquarters at Seattle, Wash. Sergeant Maurice Peacock, Jr., the assistant to signal engineer, Military Railway Service, was formerly associate editor of *Railway Signaling,* and previously was employed on the Norfolk & Western and the Pennsylvania. Other men in railway signal work with the Military Railway Service in North Africa whose names are mentioned in the information released by the War Department, include:

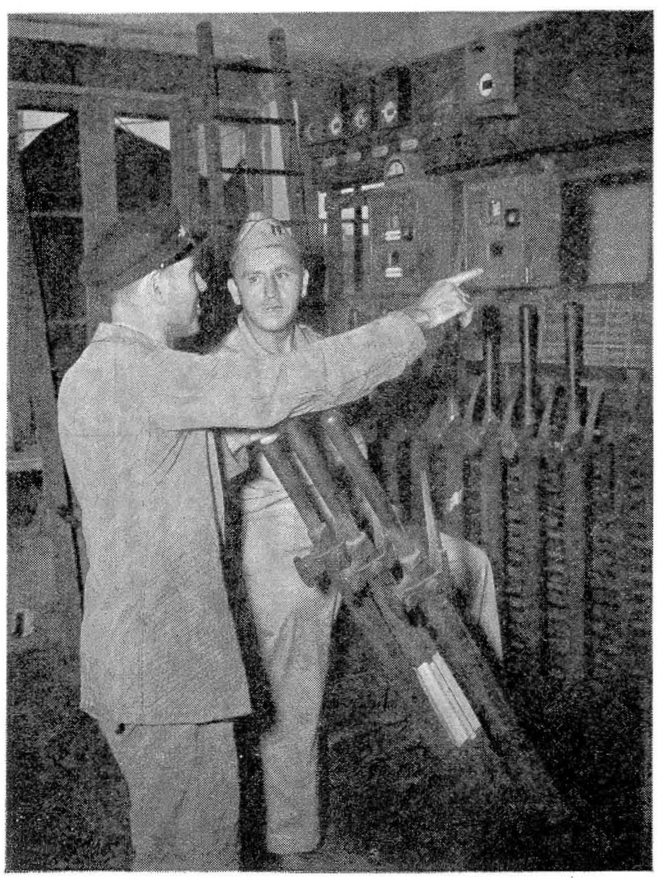
Sergeant Joseph A. Chesmar, who has been overseas since April 1942, was previously a maintainer on the electric division of the New York Central at Harmon, N. Y.

Corporal B. L. Ellis was a signalman in a construction crew on the Great Northern, with headquarters at Spokane, Wash.

Private Maurice B. Krauth was a signalman on the Iowa division of the Chicago & North Western with headquarters at Council Bluffs, Iowa.

Sergeant John W. Stephens was a signalman in a system signal construction crew on the Chicago, Burlington & Quincy, with headquarters at Aurora, Ill.

Technical Sergeant Stanley G. Pittorf, who is the assistant signal supervisor of a Railway Grand division, was formerly in the signal forces of the Great Northern at Seattle, Wash.



Capt. F. J. Murphy, of Seattle, Wash., Signal Engineer of the Military Railway Service, receiving a demonstration and description from the towerman regarding the operation of a Saxby & Farmer mechanical interlocking somewhere in North Africa

Left-Hand Running and Signals

The railway construction and operating practices including signaling, as used in North Africa, are based on French principles and practices. On double-track lines, trains are operated on the left-hand track, and, furthermore, the signals are located at the left of the track over which they govern. As discussed by Captain F. J. Murphy, "one of the greatest problems to American railroad men serving in North Africa has been to become accustomed to left-hand operation, and to the various signal aspects and indications." He further commented that "the signal system is well constructed and maintained."

No Track Circuits On Account of Steel Ties

On a large percentage of the main lines in North Africa, the ties are made of pressed sheet-steel. These ties shunt the two rails, a fact which prohibits the use of track circuits and thus prevent the use of automatic block signaling.

On some sections of railroad, the train movements are authorized by the electric train staff system using line wire circuits between two staff machines, one at each end of a given block section. The system is controlled so that only one staff can be removed at any one time, and no train is allowed to enter the given track section without carrying such a staff.

On numerous other sections of the railroads in North Africa, the train movements from station-to-station are authorized by a form of manual block signaling which is under the direct control of the station masters. The manual block is operated by means of a station-to-station telephone, called the "omnibus circuit", no signals being provided. When a train arrives at a station, the conductor reports to the station master, who then has charge of the train. If any switching is required, this is done under the station master's directions. On completion of this work, the station master calls the station master at the next station on the "omnibus telephone" to secure permission for the train to advance to the next station.

Mechanical Interlockings

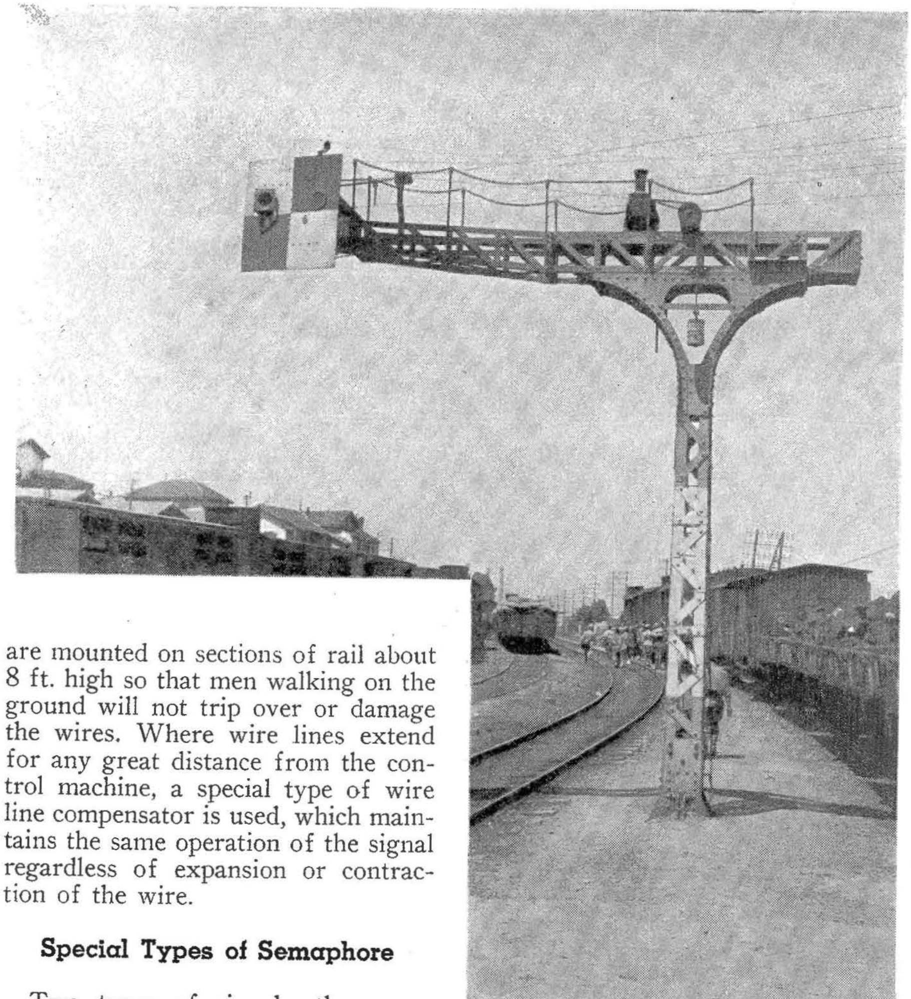
The interlockings are of the mechanical type using Saxby & Farmer type of machines, an unusual feature being that the locking bed is in a vertical plane and mounted over the machine as shown in one of the accompanying illustrations.

The switches are operated by pipe or rather "rod" connections, from the levers to the switches, in the usual manner. No locking is provided on trailing-point switches. Locking is usually provided on facing-point switches, the switch being operated by one lever and the facing point lock by another lever, a point of interest being that a switch is ordinarily locked in only one position; for example, in the normal but perhaps not in the reverse position.

As previously explained, track circuits cannot be used because the ties are made of steel. Therefore, no detector locking or route locking can be provided in these interlocking plants. Electrical circuits are provided to control signal repeater indicators and a few electric locks. Ground return is used for one side of all these indication and lock circuits, a practice which is used by only a very few roads in America.

Signals Operated by Wire Lines

For the most part, the signals in North Africa are operated mechanically by means of wire pull lines extending from the levers to the signals. These wires are ordinarily No. 8 bare iron and are run on rollers which



Red and white square-target signal

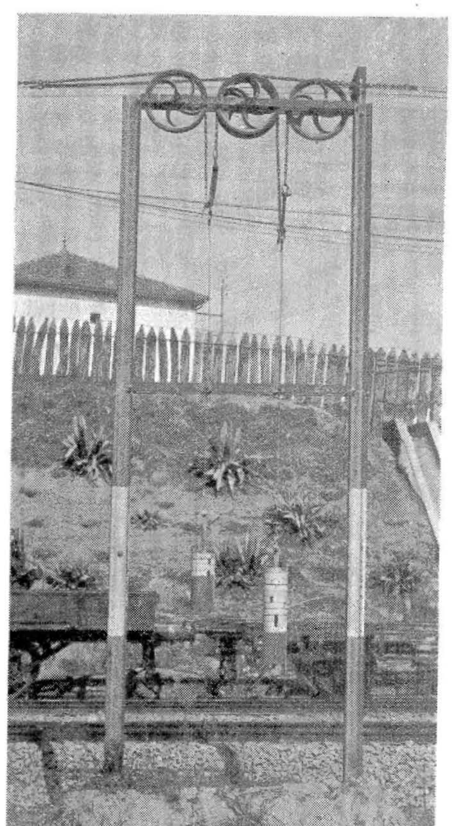
are mounted on sections of rail about 8 ft. high so that men walking on the ground will not trip over or damage the wires. Where wire lines extend for any great distance from the control machine, a special type of wire line compensator is used, which maintains the same operation of the signal regardless of expansion or contraction of the wire.

Special Types of Semaphore

Two types of signals, the semaphore and the rotating target, are used on the railroads in North Africa. The semaphore blades are square end, and are painted red on the face and white on the back. As viewed from an approaching locomotive, a semaphore arm is mounted to the left of its mast and moves in the lower left-hand quadrant. The Clear aspect is with the arm in the vertical position parallel with the mast and at night with a lunar-white light. The Stop aspect is with the arm horizontal and at night with a green and a red light. The green is on the left and the red on the right. As shown in one of the illustrations, a portion of the blade, when in the horizontal position, extends to the right of the center line of the mast. As explained by Captain Murphy, switch targets and lamp are used on some interlocked switches in Africa as an extra precaution in addition to the interlocking signals.

Rotating Target Signals

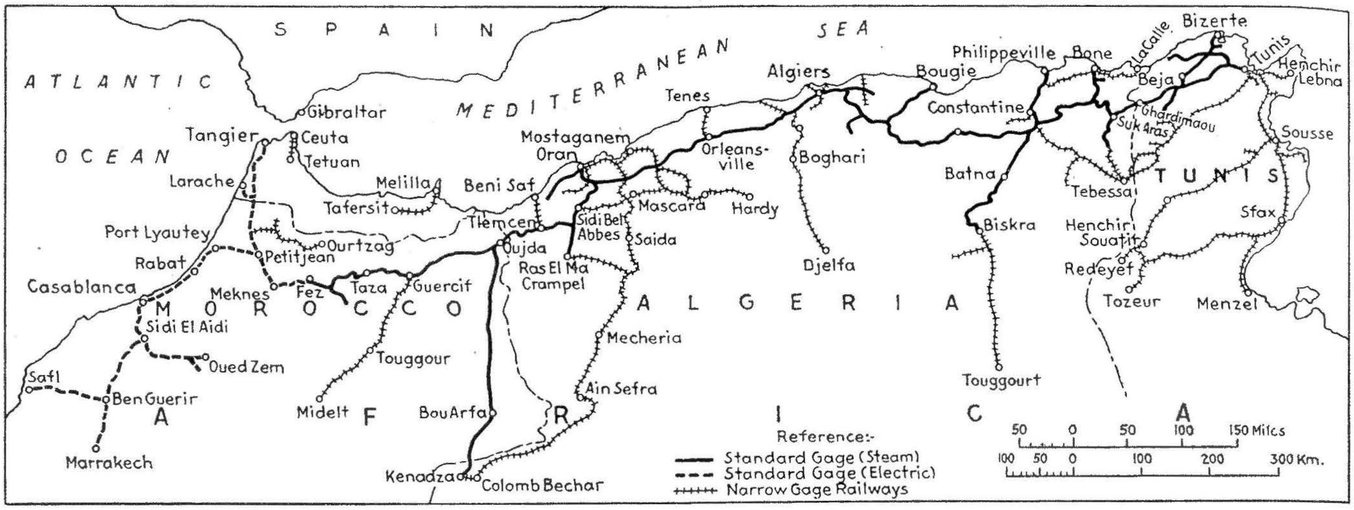
A second type of signal in service in North Africa is the target type, which is mounted on a vertical shaft at the center and operated by wire pull lines. When in the clear position, the target is turned on its vertical shaft so that the edge of the target is viewed by an engineman of an ap-



Compensators in wire lines

proaching train. When presenting a restrictive or stop aspect, the target is turned to a position at right angles to the track, thus presenting the entire surface of the face of the target to be viewed by the engineman. Different shapes and painting of targets for The Stop indication is with the target turned right angles to the track, and at night two red lights in a horizontal row to the front, and a white "back" light to the rear.

A circular disk target signal is painted on the face in red, with a trains with air brakes, at 16 m.p.h., and by trains without air brakes at a speed no greater than a man can walk. On curves, this signal is preceded by from one to three marker boards 164 yd. apart. These boards have three, two and one diagonal



Map Adapted from Railway Gazette (London)

The railways of northwest Africa

daytime aspects, and different colored lamps for night aspects are used as signals for different purposes.

As An Absolute Signal

For use as an absolute Stop signal, the target is square, and the face is divided into two red and two white squares, as shown in one of the illustrations. The Clear aspect by day is with the target turned parallel with the track to present an edge to the view of enginemen, and the Clear aspect at night is a single lunar-white light as viewed by an approaching engineman. Concurrently with the display of a lunar-white to the front, a blue light is displayed to the opposite direction as a so-called "back" light.

Capt. F. J. Murphy, observing the towerman operating the railroad telephone communication equipment in a signal tower somewhere in North Africa

black and white outer border, and on the back in white. The disk parallel to the track, and out of sight by day, and a lunar-white light by night, indicates Clear. The disk at right angles to the track by day and a single red light at night, indicates to the engineman to be prepared to stop at the next signal or switch. The back-light indication of the signal is white for both positions. This signal corresponds to the distant signal used in the United States, outside of automatic block territory, displaying yellow for Caution or green for Clear, and is usually distinguished from all other signals by a fish-tail arm and a vertical yellow marker light.

The red disk-target signal at Stop can be passed by light engines and stripes, respectively. In such an instance, in the United States, another successive approach signal would be used if required.

With Purple Target

The purple square-target signal is used in yards, and is painted purple on the face and white on the back. The target parallel to the track and out of sight by day, and a white light at night, indicates Clear. The target at right angles to the track by day, and a purple light by night, indicates Stop. The back-light indication is white for Stop and blue for Clear. These signals are used similarly to dwarf signals in American railroad yards, and, at other places, used as slow-speed signals and also to distinguish them from other signals. The Clear aspect of the purple square-target signal corresponds with the Slow-Clear (Clear-Slow) aspect of green or the Restricting (Caution-Slow-Speed) aspect of yellow of American dwarf signals. The Stop aspect of this signal corresponds with the American aspect of purple or red.

The blue disk-target signal is used in stations for reverse movements, and corresponds to the American dwarf-signal governing such train movements. The disk is painted blue on both sides. At night, it is capable of showing either a white or blue light in both directions. The disk parallel to the track and out of sight by day, and a white light by night, prohibits a reverse movement, or switching. The disk at right angles to the track by day, and a blue light by night, authorizes a reverse movement or switching. These aspects appear contrary to the practice of a target parallel to the track and out of sight, authorizing a train movement, and a target at right angles to the track prohibiting a movement. This signal corresponds to the American dwarf signal displaying green for Slow-Clear (Clear-Slow), yellow for Restricting (Caution-Slow-Speed) and purple or red for Stop.

The Reduce-Speed signal is a yellow triangular target with the point of the triangle up. It has a vertical black stripe and a black and white outside border. The target parallel to the

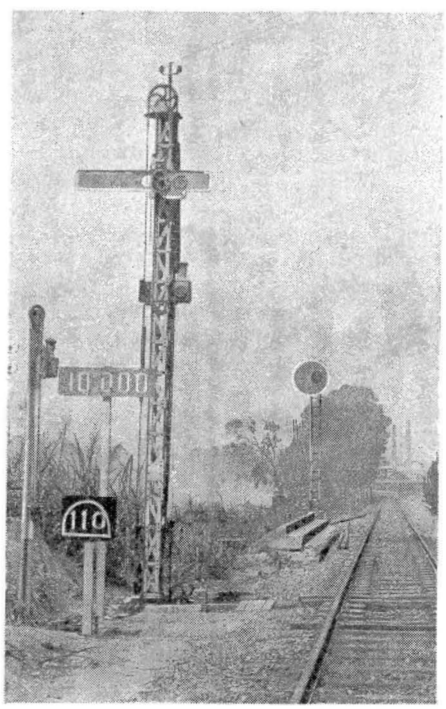
Capt. F. J. Murphy, of Seattle, Wash., Signal Engineer of the Military Railway Service, checking indication and locking circuits with his assistant, Sgt. Maurice Peacock, Jr., of Philadelphia, in a signal tower somewhere in North Africa

track by day, and a lunar-white light by night, indicates Clear. The triangle at right angles to the track by day, and two horizontal yellow lights by night, indicates reduce speed to not exceeding 19 miles per hour. The two yellow lights correspond with the distinctive permissive signal used in the United States.

Up until a few years ago, green and white square-target and green disk-target signals were also in service in North Africa. These were permissive signals and have since been replaced with yellow triangular signals, in accordance with the present signal code which was revised to eliminate more than one target of the same shape with different meanings, thus obviating misunderstanding and confusion of signal aspects and indications. However, it is believed that a few green and white square and green disk-target signals may still exist in remote locations which have not yet been replaced. Just as is the same case with semaphore signals in the United States at dusk and dawn, neither the lights nor the shapes and positions of the targets in North Africa can be seen by enginemen as readily as during the hours of broad daylight or complete darkness. Prior to the revision of the signal code, there was confusion and misunderstanding, for this reason, between the green and white and red and white square-target signals, and between the green disk and red disk-target signals, especially at dusk and dawn, when neither the lights nor shapes of these signals were clearly visible, which is the reason they were replaced. Furthermore, the revision was made to eliminate green from the signal code on account of an estimated one per cent of the natives of the North African area being "Daltonians," that is, with the inability to distinguish between blue and green.

Signal Lamps and Lighting

The majority of signals in North Africa are lighted at night by oil lamps, with a few exceptions at certain interlockings and distant signals



Semaphore and red disk target signals

which are lighted by a low-voltage lamp with an optical lens. Power, in the majority of cases for this type of lighting, is provided by caustic soda primary battery, or dry cells, located at the signal in an insulated precast-concrete battery box elevated off the ground about two feet.

Synthetic Insulation

(Continued from page 533)

vibration at low temperatures was determined by the Underwriter's Laboratories in 1939. In this test, a coil of Flamenol wire was brought down to a temperature of -30 deg. F. and, kept at that temperature, was then placed in a wooden box with dry ice to maintain this temperature, and vibrated for two hours, supporting a 20-lb. weight. The test was repeated with a 50-lb. weight. At the end of these tests, the insulation on each sample did not show any visible deterioration due to the vibration.

Corrosion Resistance

Flamenol insulation is well known for its resistance to action of such agents as oils, acids, and alkali. It may be exposed to hydrochloric acid or sodium hydroxide in concentrations up to ½ N, and sulphuric acid in concentrations up to 10 N. Because of its excellent resistance to acids and alkali, Flamenol is ideal for battery connections, burial in cinders fill, and in other locations where corrosive conditions exist. The standard oil-resistance test for Flamenol requires that the physical values be at least 85 per cent of the original, and that there be no increase in diameter of the sample after four hours' submersion in SAE-20 oil at 70 C. The oil resistance of Flamenol is an advantage in switch controllers and other locations where oil may be encountered.

Examination of the samples show that Flamenol is highly resistant to sunlight and weathering, without the benfit of a braid. Thus, since there is no braid to dry out and require painting, this item of maintenance can be eliminated.

For inside wiring of relay houses and interlocking towers, and for use in made-up aerial cables, line drop cables, and other installations in the open, Flamenol without any outer covering is suggested. For multi-conductor aerial cables made up in the factory, a Flamenol jacketed cable will present a neat appearance and eliminate the need for painting.

For underground track and control circuits, a Flamenol cable with conductors insulated with regular thickness of plasticized polyvinyl chloride, a jacket of this material over the grouped conductors, and jute or tape and braid finish overall will afford better mechanical protection and increased moisture resistance. However, for lower cost, a multiconductor cable with increased insulation on each conductor and a jute finish, omitting the jacket, is also suitable.