put will have to be considered in determining the title as well as the strictly technical terms which may be more properly applicable. Many outlying crossings have not been interlocked because the expense of a complete interlocking, with towermen on service 24 hours, has not been justified. At many such points the so-called automatic interlocking is adaptable and will permit the elimination of train stops to such an extent that a decided saving can be made. In view of the substantial economies that may be effected it would seem that the Signal Section should reconsider the nomenclature applied to such layouts and apply the term "automatic interlocking," thereby removing an obstacle that is in many cases at present hindering the railways from securing approval for such installations.

Unit Basis for Maintenance of Signal Equipment

DIVIDING up an installation of signals into maintainers' territories of equal mileage does not necessarily give each man the same amount of work. In recognition of this fact several roads assign definite unit values for the maintenance of each signal, switch box, track circuit, and other functions of signal and interlocking equipment, in an effort to secure uniform results. This system of units is, however, only a start, for consideration must also be given to many other local factors in order to reach a fair average. Curves, grades, tunnels and heavy winds affect the time required to get over the road. Winter weather may be especially severe on one section, thus limiting the actual field maintenance work to 9 or 10 months, while on other parts of the road, the winters may be comparatively "open." Such conditions can be compensated for by varying the number of total units to be assigned to territories on different divisions or districts. On the Northern Pacific a committee of signal supervisors not only worked out a system of units but also agreed on the number of units to be assigned to each maintainer's territory on each division. This system of equating the amount of work has been followed for several years to the satisfaction of all concerned. On many other roads the introduction of a unit basis for maintenance will be the means of eliminating controversies and uneven division of work, which may be the cause of some of the signal failures at present.

How Long Is a Track Circuit

TRACK circuits are all of the same width but they vary in length according to local conditions and the maximum length for standard practical operation varies from 2,500 ft. to 10,000 ft. on different roads. The successful operation of track circuits depends on the bonding, ballast, drainage, amount of salt brine drippings, and the climate.

After years of experience, the majority of roads have decided that long track circuits are not practicable because of frequent failures in wet weather. Some roads fix 3,500 ft. as a maximum, others even less. As explained in an article elsewhere in this issue the New York Central recently completed an extensive signal installation on the West Shore line, in which the blocks are about a mile long and each block is divided into two center-fed track circuits with storage battery using a relay on each end of each track circuit so that each track circuit feed is about 1,200 ft. to 1,500 ft.

On the Erie the automatic signals are about a mile apart and the three indications are secured by polarized track relays fed the length of the block by primary battery. The New York, New Haven & Hartford has an installation of automatics with the signals about a mile apart in which polarized track relays are fed the length of the block from storage batteries. The Southern has for years successfully operated two-mile polarized a-c. track circuits for the control of automatic signals. On the recently completed signal and train stop installations on the Pennsylvania, three-position a-c. track relays, fed the length of the blocks in most cases, are used to secure the three indications of the signals, the blocks being about 1.5 miles long.

Center-fed track circuits with short length feeds, such as are used on the West Shore, afford economical and reliable operation under all weather conditions without constant attention or adjustment, the effect of foreign current is to a great extent eliminated, and broken rail protection is increased. In contrast the polarized track circuit, extending the length of the block, eliminates line control circuits with attendant first cost, maintenance and a certain number of failures due to line breaks, lightning, etc. With the rapidly increasing mileage of stone ballast, heavier rail, better bonding and good drainage, it may be practicable to use longer track circuits successfully on new installations or to eliminate cut-sections of signaling in service. However, reliability of operation of signaling is becoming more important every day, so that such a change in standards should be preceded by a study of local conditions in each case.

Letters to the Editor

Non-Interlocked Interlocking Machines

TO THE EDITOR:

With the machines of but a few years ago, before lever locks, route locking, detector locking, "SS" circuits, "KR" circuits (or what have you?) were in common use, mechanical locking between levers was quite essential. With any of the modern mechanical or electro-mechanical plants it would be possible to remove all of the mechanical locking between levers and it would still be impossible to set up a route incorrectly and get the signal for it. Mechanical locking is only preliminary and it is expensive. If we are electrically-locking our machines it would appear that a part, of not all, of the mechanical locking is superfluous.

The writer has installed and has had in service for some time an S. & F. machine handling switches and derails and table lever controllers handling the signals. No mechanical locking is used between the mechanical and table levers and no mechanical locking between table levers. The machine is as nearly foolproof as any completely mechanically-locked machine.

There seems to be no good reason why electrical locking cannot be entirely substituted for mechanical locking in many instances, thereby reducing costs and saving tower space. Why not?

SIGNAL ENGINEER.