tion the movements of preceding trains and, finally, locating the actual circuit by checking the relays.

Once the defective circuit has been located it is only necessary, commencing at either end of the circuit, to take rail-to-rail voltage readings at regular intervals until a point is reached where there is a decided variation in the registered voltage. It is then apparent that the defect lies between this point and the point where the previous reading was obtained. Retracing one's steps and taking further readings at short intervals within these limits it will take but a short time to arrive at the defective bond or fractured rail.

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Disposition of Mechanical Interlocking Equipment

"What disposition should be made of serviceable mechanical interlocking equipment that has been removed from service as a result of abandonments or replacements by more modern equipment?"

Many Mechanical Plants in Service

E. T. Ambach

Assistant Signal Engineer, Baltimore & Ohio
Cincinnati, Ohio

The proper disposition of serviceable mechanical interlocking equipment that has been removed from service as a result of an abandonment, resulting from a change in the traffic load, or replacement by more modern equipment, depends, among other things, upon the age and serviceable condition of the salvaged material.

The question can be divided into two cases: First, mechanical-interlocking abandonment resulting from obsolescence; second, mechanical interlocking abandonment resulting from increased traffic or changed traffic conditions.

In the first case a careful field inspection should be made to determine how much, if any, material can be salvaged and rehabilitated. In many locations where mechanical plants are abandoned on account of obsolescence, about 90 per cent of the material recovered should be scrapped. The geographical location may also enter as a factor in determining the amount and kind of materials serviceable and the cost of rehabilitation. A recent survey seems to indicate that many railways are salvaging material at greater expense than that occasioned by the purchase of new material.

In the second case, it is assumed that the materials are of later design, and the articles are standard and in use on some other part of the railroad. A careful inspection should be made and the materials removed with the minimum amount of damage, and if the articles are within the tolerances of specifications for new materials, they should be packed and shipped direct to a storeroom for reissue. The other material should be further checked and tagged for shipment to the signal repair shop where it can be rehabilitated at minimum expense and returned to the storeroom for re-issue. The balance should be scrapped.

While the mechanical interlocking may be listed as a passing standard about 70 per cent of the total number of levers in service are in mechanical plants, and no doubt these will remain in service for some time to come.

Prospect of Re-Use Determines

P. M. Gault

Signal Engineer, Missouri Pacific
St. Louis, Mo.

It would be impossible to make any rule applicable to all roads to cover the disposition of serviceable mechanical interlocking material which has been relieved as a result of abandonment or replacement by more modern equipment. The answer to this question would depend on the prospect of using this material either as repair or replacement parts in existing installations or in the construction of new interlocking plants where a more expensive type of protection is not justified.

On the Missouri Pacific we have replaced so many mechanical plants with automatic protection that we have accumulated a surplus of mechanical interlocking material far beyond our expected needs. It is our practice to turn interlocking pipe over to other departments where it can be used for water or air lines, after the ends have been cut off and rethreaded. Cranks and compensators in first-class condition are taken into stock and issued for maintenance purposes. Concrete pipe-carrier foundations are used for retaining walls or riprap, and most of the remaining material is scrapped. Where there is a prospect of immediate use we salvage everything usable but these cases are few.

In case of jointly-owned plants, it has been our practice to divide the material between the owners and thus avoid any exchange of credits or money other than for scrap. This seems to be fair to all concerned and relieves the maintaining company of paying for something for which it has no use.

Expectancy of Service Governs

Robert B. Elsworth

Assistant Signal Engineer, New York Central
Albany, N.Y.

Only such mechanical interlocking material that has a reasonable expectancy of being returned to service should be classed as serviceable and taken into stock at a storeroom. Occasionally it is advisable to take into stock, material having a reasonable possibility of being sold. Other material for which there will never be a demand may properly be classed as unserviceable and scrapped.

It is just as wasteful and uneconomic to take large amounts of obsolete material into the storehouse and stock accounts, which will never be required for service, as it is to occasionally scrap material for which there might possibly be a demand within 5 or 10 years.

The answer to this question is that only such material as will be required for service or sale should be taken into stock.

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"Chattering" Slot-Arms

"What methods can be used to overcome the humming or "chattering" of slot-arms on a-c. semaphore signals?"

Several Factors to Be Considered

W. F. Follett

Assistant Signal Engineer
New York, New Haven & Hartford
New Haven, Conn.

In considering the question of slot-arm vibration, a distinction should be made between humming and chattering. Almost any magnet will hum

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when energized by alternating current, but those magnets that chatter may be considered fit subjects for study, with a view of improving the operation.

A chattering magnet used on a slot-arm for an a-c. signal is objectionable, primarily because of the excessive wear that results in the movable parts. A properly designed a-c. slot-arm magnet may hum slightly but will not chatter if it is energized at the proper rated voltage and frequency.

In the case of a chattering magnet, it is suggested that attention be given first to the voltage and the frequency. Usually the frequency is accurate, especially if the current is purchased from a public utility company. The voltage, however, may be too high or even too low. If the chatter can not be remedied by proper adjustment of the voltage, it is suggested that attention be given to the shading coil. It sometimes happens that a shading coil, consisting of a copper band around a part of the laminated core, becomes broken or cracked, so that the electrical circuit of the shading coil is either open or of very high resistance. This condition will cause excessive chattering.

The next factor to be considered is the air-gap between the armature and the poles of the magnet, which should be as small as possible and yet sufficient so that there is no possibility of the iron of the armature coming in contact with the iron of the magnet poles. The writer has in some cases improved the operation of a slot-arm by connecting a capacitor in multiple with the magnet.

If, after the above factors have been properly cared for, the magnet continues to chatter, it is suggested that it be replaced by a new one, as it is probably inherently of improper construction.

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Avoiding Frost on Commutators

"How do you keep the commutators on signal and switch machine motors clean and how do you prevent frost trouble on such commutators?"

Special Device Satisfactory

R. A. Sheets
Signal Engineer, C. & N. W.
Chicago

Standard practice on the Chicago & North Western is to clean and polish the commutators on signal and switch motors periodically with chamois skin. Sometimes a cleaner, like carbon-tetrachloride, is used where signal motors have been closed up for several months and where there is any evidence of an accumulation of gummy dirt.

Recently, however, we have tried, with favorable results, a device manufactured in Chicago known as the OK cleaner and defroster. This is a specially designed felt pad, supported by springs in such a manner that it partly encircles the commutator; the springs, attached to the brush holders, keep this felt pad under a slight tension. These units have the effect of a wick in picking up excessive oil as well as moisture from the commutator. This device also saves labor in cleaning and keeping the commutators clean. The felts are washed in gasoline from time to time and are reapplied.

This device has been applied to the commutators of switch and signal motors at electric interlocking plants but has not as yet been used on straight automatic signals. The first of these applied in February, 1934, have proved to be satisfactory. We have not had a commutator failure to date on any so equipped, but have had some failures this winter on those not equipped with this cleaner and defroster. The extra current needed in the operation of the motors equipped with the cleaners is negligible.

Although we have had these pad units in service only a few months, I feel safe in recommending the extension of their use as a labor saver, as well as a preventative of switch motor failures.

Defroster and Cleaner Successful

G. E. Beck
Supervisor of Signals, New York Central
Toledo, Ohio

For G.R.S. Models-2, 5 and 5A and Union Style-M2 switch machines, we use defrosters and cleaners, which are made of felt and insulating blocks to fit each type of motor. During the past winter, these devices gave excellent service, and, although we had very bad frost conditions, we had no cases of failure due to frosted or dirty commutators. Occasionally the maintainer wipes the commutators clean and dry, using a piece of chamois skin moistened with a very small quantity of alcohol, gasoline or kerosene.

For signals also, we use a piece of chamois skin slightly moistened with alcohol, gasoline or kerosene and wipe the commutators clean and dry. During the past winter, we only had one signal failure caused by a frosted commutator.

Provide Proper Ventilation

Carl T. Smith
Assistant Signal Supervisor, Boston & Maine
Concord, N.H.

In some parts of the country it is not unusual, especially in the New England states, to have a temperature change of 40 deg. within 48 hours. Such drastic changes are bound to cause trouble with batteries, contacts, motor commutators, etc. Frost usually forms when the air circulation is poor in cabinets and cases, owing to the lack of proper ventilation. In other words, frost is caused from condensation brought about by radical temperature reductions in dead air spaces.

On the older types of Union signals, the commutator is protected by a glass covering. As glass is a well-known accumulator of frost, I remove this covering and place a small piece of felt inside, saturated with kerosene oil. A small cloth bag, that just fits over the glass covering, is then secured in its place by an elastic band. A piece cut off of an old stocking will do, or a special protector can be made. After these cloth protectors are in place, pour on a small amount of kerosene oil. Metal shields are worth while and should be used whenever possible, in addition to the cloth protectors.

Felt Wipers Helpful

R. D. Ashley
Signal Supervisor, Illinois Central
Chicago

Commutators of switch-machine and signal motors can be kept clean by means of a wiper of medium-hard wool felt. The felts may be applied to the commutator in several ways, depending upon the motor design. Sometimes the felt is wrapped completely around the commutator, holes being provided for the brushes; in other cases the wiper contacts the commutator in only one or two places. Either method is effective in keeping the commutator clean and in preventing frost trouble. The felt wipes off and absorbs any moisture

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