

Do not bank earth or rocks around the bottom of the pole. This practice is of no advantage in giving security and only retains enough moisture to provide a breeding place for destructive fungi and animal life. A desirable practice is to remove sod and weeds from about the butt of the pole for from two to three feet, packing the earth with only enough slope to allow drainage. This, if done after the growing season, is a protection against fire.

In signal work the maintenance of cross arms is a serious problem, due to the frequent dead ends and unequal strains incidental to the use of a variety of gages of wire; where practicable heavy gage wires should be strung

near the center of the arm and the lighter gages toward the ends. The advantage of this practice is obvious. It puts the strain where it is most easily borne. Use care in pulling up slack and figure your sag to allow for contraction due to low temperatures. This, if properly done, will return twofold benefits of great value, wire breaks will be reduced and the life of the arms will be increased.

In conclusion, get your poles directly under the center of their load and do not let minor defects accumulate. Maintain the safety factor and you will eliminate, to a great extent, trouble for the coming winter and make maintenance easier for the winters to follow.

## Preparation for Winter on a Busy Terminal

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FROM the standpoint of maintenance, winter work differs from summer conditions only because the weather is different. The same routine work is necessary in both seasons. Summer has its extra or replacement work, winter has its emergency work, but routine maintenance is found in all seasons. The difference between trouble shooting and true maintenance lies mostly in the amount of work that is made routine. True maintenance is 50 per cent inspection and anticipation, the balance

lies in correction. Nearly all maintenance work is necessarily outside work. In summer when the weather is pleasant the maximum of maintenance work is easily accomplished, while in winter when the weather is disagreeable the routine work at least must be kept up. The period between summer and winter should be spent in planning and preparing; reflecting upon and reconsidering the amount and quality of work done in the past season; preparing and planning for winter.

### ADVANCE PREPARATIONS

The work on season's repairs is practically completed. That means that last year's "wear outs" are mended, last year's mistakes rectified and last year's deficiencies overcome. Every plant location has been carefully inspected, defective or rotted timbers replaced, lost motion eliminated, loose rivets reset and the smallest as well as the largest defects have been or will have been rectified ere snow flies. We believe we can foresee everything except breakage. Each signal location has been carefully inspected, poor trunking renewed and sealed up as tight as nails and paint can seal, and wire replacements have been made as authorized. Relays and instruments have been carefully inspected and replacements made for the smallest defect. Pole lines have been inspected, insulators replaced where broken, poles out of alignment were straightened and broken or rusted guywires were replaced. Aerial cable has been tested wire by wire, replacements made where necessary and all repainted with weather-proof paint. Lead-covered underground cable has been thoroughly tested, wire by wire, with a "megger" and suspicious weak spots have been carefully overhauled.

Manholes and junction boxes have been cleaned, dried out and repainted. Those that were too low or had defects in drainage were raised. Battery vaults have been remarked where necessary to keep out frost. Wiring has been inspected and batteries renewed.

Bonding has been carefully inspected and thousands of replacements made because of damaged or broken wires. Buildings and shops have been looked over and repaired as found necessary. New conveniences have been installed for the comfort of men where practical or necessary. Stoves are being set up and fuel laid in the bins. Power lines, high tension electric or air, have been or are being carefully and thoroughly checked for possible defects. Light circuits have recently been tested for grounds, etc. Storage batteries have been inspected, replacements made where necessary and all housings put in first-class condition. Detail upon detail could be piled up, for all has been done that could possibly be done with a system of double checked inspections.

### METHODS OF HANDLING THE WORK

Light, regular and ordinary maintenance is performed by regular maintenance men. Heavy and unusual work is done by an extra gang of moderate size of from five to eight men. This gang is not composed of inexperienced men, as is usual, but by experienced ones who have passed out of the helper or repairmen stage. Inspections are made as a check upon regular maintenance men by other repairmen who are on the waiting list for foremen's positions. Light repairs or important replacements are made by these inspectors at the time they are noted. Next to safety in maintenance we rank cleanliness and find that the constant care necessary to keep all things clean brings to attention those things essential to proper operation. All inspections and work is subject to check and recheck by a foreman and the supervisor or his assistant.

### IMMEDIATE PREPARATION FOR WINTER

Fall work is yet to be done. All signals and other receptacles are to be thoroughly inspected and known to be snow-proof. The signals are to be thoroughly cleaned and reoiled. At the first indication of cold weather all drainage must be completed and such systems, whether underground or mere surface ditching, must be inspected and approved. Each and every detector bar on plant switches must be removed and thoroughly scraped and cleaned of all grease and gumbo accumulations. Likewise all cranks, rocker shafts, etc., must be thoroughly cleaned and then thoroughly but carefully

oiled with a mixture of 90 per cent kerosene and 10 per cent lubricating oil. Each and every wire on an electric or electro-pneumatic plant must be "megger" tested and any indication of a breakdown must be located to prevent future trouble.

All signal lamps must be thoroughly inspected and put in first-class condition in regards to door slides, glasses, etc., and the foreman must by engine riding assure himself that each lamp is properly aligned. In addition preparations are under way which includes the overhauling of all tools that are in poor condition, the inspection and testing of snow melters, the making and distributing of snow and ice scrapers, securing of brooms, laying in supplies of waste and poor grade kerosene to be used in snow and ice melting and getting on hand a sufficient supply of gunny sacks for covering the switch adjustments. In other words, everything that can possibly look beneficial and important is given attention before snow flies.

#### OPERATION AND ORGANIZATION

By going into the winter with everything done that should be done beforehand, winter maintenance becomes a mere matter of close inspection and routine work except in emergencies and is mostly a matter of organization. Organization simply means having sufficient men on the various assignments to properly care for the regular work, and seeing that the work is done. In emergencies such an organization will of necessity need to be stretched either to cover more time or do more work. In the case of a terminal where 24-hour maintenance is in force, with the men working in three shifts, it is, of course, a simple matter of overtime to get a larger force for short periods. Organization requirements should be simple, concise and reasonable and may be listed under six different headings:

(1) Each man is to be equipped with ample and proper clothing to be able to stay out and work in some comfort, regardless of the weather, and these clothes are to be kept where they are always available. (Each man is furnished a locker at his headquarters.)

(2) The men are to stay out in the weather to do the work that is necessary. We do not believe in the idea that the results count. (Poor maintenance and good luck may combine to be misleading.) The routine work must be known to have been done each day, because the men are actually seen doing it. Our men do not object, because this requirement includes the foremen and the supervisor as well.

(3) The men are expected to live up to their reputations as maintainers, not "trouble shooters," and do any work that is necessary to keep trains moving. This means that no one is above using a broom to clean switches or a shovel to dig ditches in emergencies.

(4) All inspections and routine work shall be made regularly daily, weekly or monthly as required unless the weather absolutely prohibits.

(5) In emergencies we expect the men to give all that they can in time and experience, and all overtime made will be cheerfully paid for.

(6) It is our endeavor to keep enough men on any work to properly care for it, even should it mean the payment of overtime.

From the foregoing it can be seen in brief how, through hard work, some foresight, simple regulations, careful inspections and routine maintenance, the business is handled in a terminal moving 559 regular scheduled passenger moves and hundreds of scheduled and unscheduled freight moves with a minimum of delays laid to the signal department.

## WINTER MAINTENANCE OF LAMPS, MOTOR CARS AND TOOLS

BY CALEB DRAKE, GENERAL SIGNAL INSPECTOR, CHICAGO & NORTHWESTERN, CHICAGO, ILL.



AS winter approaches this year, it is of more than usual importance that preparations be made to insure the best maintenance possible under adverse conditions. There will probably be a larger number of maintainers, helpers and lampmen of limited experience on the railroads this winter than ever before. On the larger roads these men receive thorough instruction, but in a majority of cases they will obtain their education in signal work through their own experience or by the experience of others through some medium such as the *Railway Signal Engineer*.

### SIGNAL LAMPS

It is safe to say that there is no part of the automatic signal maintainer's duties which requires more constant attention than the proper care of the signal lamps. If one stops to consider that the lamp finally transmits the indication at a time when it is most needed, for which all the construction and maintenance has been expended, a better appreciation of the part the lamps play in signal work will prevail. It is a good plan in winter to take care of lamps on good days, even if these do not fall on the regular lamp schedule. This often saves the necessity of looking after them in bad weather when it is almost impossible to give them the proper attention. Where the maintainers do not take care of the lamps, they should arrange to assist their lampmen in cases of emergency.

#### THE CARE OF STORAGE TANKS AND FOUNTS

Storage tanks and filling cans should be kept clean to insure clean oil. Storage tanks should be emptied and washed out with clean kerosene at least every two months. Filling cans and lamp founts should be emptied and rinsed every 30 days. When metal barrels or tank cars are not used in shipping kerosene, special care must be exercised to see that the oil is in good condition before using it. A good method of testing oil is to take a fountful out of each shipment and try it with a long-time burner. The appearance of the flame and the wick after three days' burning will indicate if the oil is of good quality.

To obtain good lights it is necessary to have the inside of lamps clean as well as the lens itself. The lens and all other glasses through which light is transmitted should be cleaned each time the lamp is filled. Particular care must be taken to keep the corrugations on the inside of the lens clean. Fine mineral wool is very good for this purpose, as is wood alcohol. Snow and sleet should be removed from lenses and roundels.

The height of the flame, with the kerosene in use on a great many railroads, is affected by a rise or fall of temperature when used with long time burners. This is more noticeable when the days are warm and the nights cold. The variation is about  $\frac{1}{8}$  in. in height of flame for a variation of 40 deg. A lampman cannot be expected to make this allowance, but it is a good thing for the