

Stone Ballast on the Erie Is Cleaned With Moles at Intervals of Four to Six Years.

# Ballast Gets Special Attention on the Erie\*

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EVERYONE will agree that the increased axle loads and speeds of traffic have made necessary higher standards of maintenance. Heavier wheel loads have shown the necessity for using

stone ballast, and the economy resulting from the maintenance of a clean ballast bed has also become recognized. In fact, the cleaning of ballast has become so important that it is one of the last of our activities to be curtailed when a reduction in expenses becomes necessary. We know that ballast which has become fouled must be cleaned in order to function as intended. Track having clean ballast will go through the winter in much better condition than if the ballast is foul, and less attention will be required to take care of surface deflections or heaved locations. When cleaning ballast, it should be cribbed and then cleaned on the shoulder and in the intertrack space to a depth about level with the sub-grade.

One of the principal requirements of good maintenance is adequate drainage. Also, the roadbed should be of sufficient width to support the track and to provide full-width ditches in cuts. We have frequently found it necessary to strengthen the roadbed by widening it, and to provide drain-

age ditches or to install sub-drainage systems for lowering the water table and drainage of water pockets. Adequate roadbed drainage, combined with clean ballast, helps to produce smoother-riding track, and reduces the frequency with which the track must be lined and surfaced.

On this road great emphasis is placed on the desirability of keeping stone ballast clean and of maintaining the proper ballast section. In his paper, Mr. Weccheider gives the reasoning behind this policy and then describes the methods, gang organization and equipment that are employed in putting it into practice. Also he explains how the ballasting and resurfacing operations are coordinated with other maintenance work to produce track that will require a minimum of attention and maintenance expense for years to come

## Need for Periodic Cleaning

In any stone-ballasted track carrying heavy, fast traffic, a compact and unyielding ballast condition will develop in four to six years after it has been given an out-of-face ballast raise. This kind of track will then lose its spring or resilience and in time will become centerbound. It will tend to acquire "choppy" riding qualities, regardless of the kind of stone ballast that is present under the ties. Periodic spot tamping will not alone produce good-riding track; it is necessary periodically to program certain locations to receive out-of-face ballasting or resurfacing raises. Only in this way can we bring back the uniform

conditions which will afford strong, smooth-riding track. In connection with this work, the ballast should be cleaned.

Each year on the Erie we have large programs of work involving our stone ballast. One of the programs consists of what is called reballasting, which is divided into 3-in. and 5-in. raises. The 3-in. reballasting raise is used under ordinary conditions, while the 5-in. raise is made where the ballast is exceptionally muddy, or where one track is lower than the other. In connection with the 5-in. reballasting programs, profiles are run, ballast stakes are set and any existing sags are raised out. The track is reballasted at all locations where new rail is laid. At the majority of these locations, we are replacing 110-lb. rail having a two-tie joint, with 131-lb. rail having a three-tie supported joint. This requires the respacing of all of the ties because of the difference in the joint spacing and also because our main-line track is provided with 24 ties per 39-ft. rail length when it is worked

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over. In this connection we do not renew the rail in any more track in a given month than can be reballasted immediately.

Another of the programs consists of the resurfacing of the track. This work entails a light out-of-face raise and is carried out under old rail where it is not necessary to respace the ties, and where, because of general ballast or tie conditions, a light ballast raise is sufficient. In such locations the ballast is also cleaned.

Our reballasting and resurfacing programs are applied to any given stretch of track at intervals of from four to six years. On all work of this kind the track is cribbed and the ballast is cleaned with "moles." Occasionally, we may lay new rail in track that has had a resurfacing or reballasting raise and the ballast cleaned one to two years previously, in which event the track is raised and tied without cleaning the ballast. However, as a rule, all of our reballasting and resurfacing jobs involve the cribbing and cleaning of the old ballast in advance.

### Organization Standardized

In both the reballasting and the resurfacing work, we use a standardized organization. We have found that a balanced organization lowers costs and improves the quality of the work. At the present time, we crib the track on practically all of our jobs with a power cribbing machine and, because of the economy of cribbing by this method, we work the cribbing machines two tricks. For supervising the work of each of our standard reballasting gangs, we have one extra-gang foreman, who has general supervision over the entire operation and who is in direct charge of the work of making the final raise; one assistant foreman, who is in charge of the cribbing machine or the hand-cribbing gang, as the case may be; and one assistant foreman, who has supervision over the tie gang. There is also an assistant foreman in charge of each "mole."

A total of 44 trackmen are used in this organization, which is composed of separate gangs for cribbing the track, cleaning the ballast, renewing and spacing the ties and reballasting and raising the track. The cribbing gang is started first and remains some distance ahead of the tie gang in order not to interfere with that organization. Similarly the other gangs in the organization are so spaced relative to each other that there is no interference between them. The organization thus started is a balanced one and the work progresses smoothly, with

all gangs evenly spaced. To keep this balanced organization working smoothly, it is necessary for the supervisor to see that such material as ties, spikes and ballast is distributed properly so that no time is lost by the extra gang because of the necessity of stopping its regular functions to redistribute needed material.

### Cribbing

Where cribbing is done by hand the gang organization for performing this work consists of the assistant foreman and 13 men. As mentioned above, however, practically all of our cribbing work is done with a power cribbing machine, in which event the cribbing gang is reduced to one assistant foreman, one cribbing-machine operator, two trackmen and one flagman.

Incidentally, the use of the cribbing machine results in a considerable reduction in the cost of the work. While this machine is apparently of recent introduction, it has proved very satisfactory on the Erie. It weighs approximately thirteen tons and is self-propelled in both directions, operating at a cruising speed of 18 miles per hour. The machine is equipped with power-operated transverse set-off wheels, and can be removed from or returned to the track in approximately four minutes by the standard organization. It is also equipped with four hydraulic jacks for lifting it, which are operated from the top of the rail.

The fouled ballast that has been cribbed to the shoulder and the inter-track space is then cleaned with two "moles," one working in the intertrack space and the other on the shoulder.

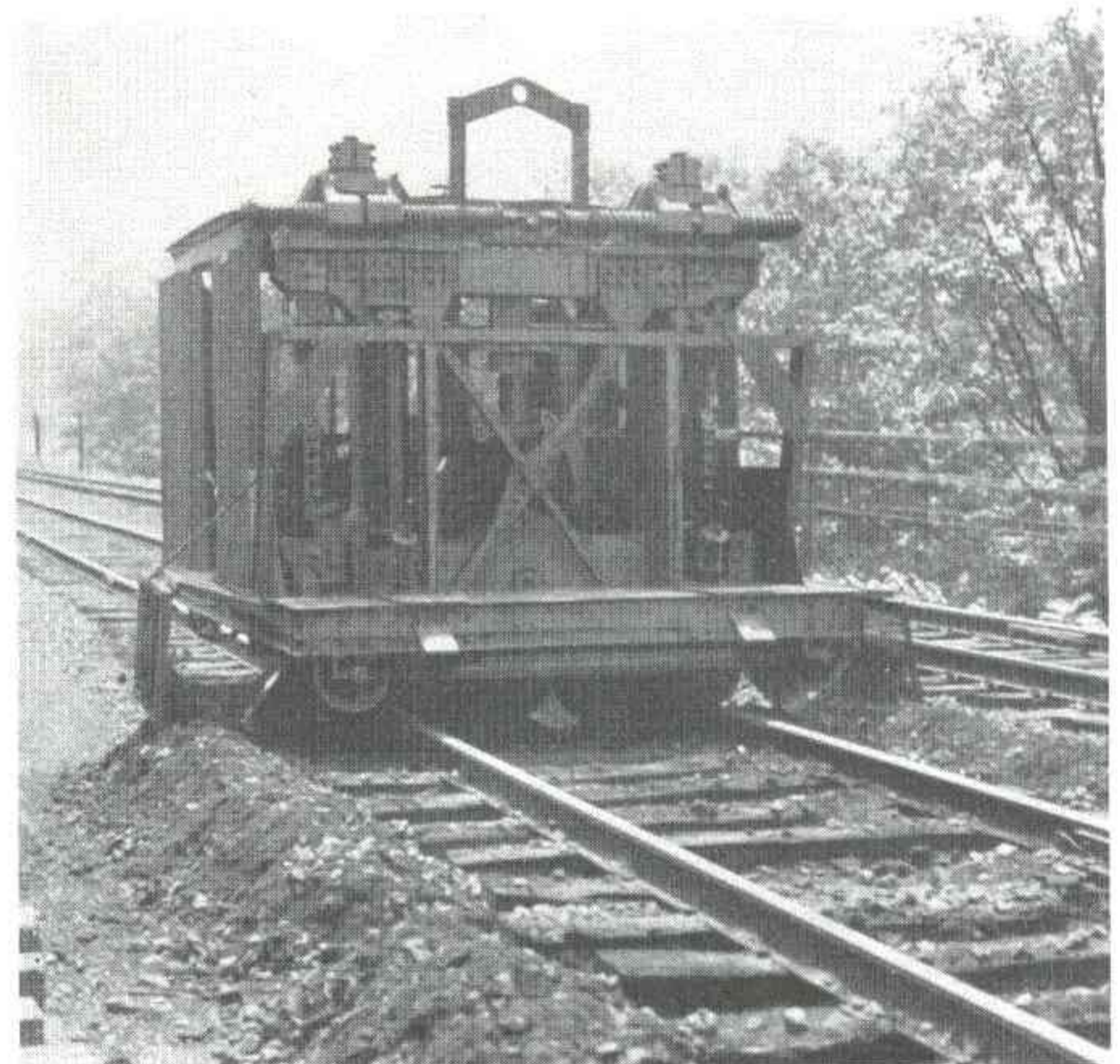
Each "mole" has a separate organization, consisting of one assistant foreman, one operator, and four trackmen when working in the intertrack space or three trackmen when cleaning the shoulder ballast. The "moles" are transported from one location to another on special push cars and a demountable derrick is used for loading and unloading them, one of which accompanies each "mole." This derrick fastens to the head of the rail and is equipped with a six-ton hoist. The use of push cars for transporting the "moles" eliminates the need for work-train service for this purpose and thereby helps greatly to reduce the cost of cleaning ballast.

### Other Operations

After the "moles" comes the gang that spaces and renews the ties, which consists of one assistant foreman and 13 trackmen. In the wake of this gang, the necessary ballast is distributed uniformly from Hart convertible ballast cars, and the track is raised. For the latter operation, the gang comprises the extra gang foreman and 10 trackmen using tamping forks. Six trackmen then perform the final operations of levelling off the sub-grade and dressing the ballast. This organization includes one man carrying water and one flagman when necessary. After a few weeks, the final spotting up of any deflections that have developed is done by a small section gang.

An accurate record, involving weekly reports, is kept of the operations of these gangs, and the progress of each gang is watched closely and compared with that of other similar gangs. By computing the output on a

One of the Power Cribbing Machines That the Erie Uses in Connection With Its Ballast-Cleaning Work.





lineal-foot and man-hour basis, a good check can be kept on the efficiency of the gang operations.

### Tie-Tamper Work

Our yearly maintenance effort also includes what is known as the tie-tamper cribbing program. This work is performed at locations, involving old rail, where out-of-face respacing of the ties is not required and where tie renewals are light. Generally the ballast at these locations is foul and the track requires smoothing up. These jobs are made ready for the tie-tamper operation by first cribbing the track with the power cribbing machine, cleaning the ballast with the "moles" and renewing what ties are necessary.

Ballast is then unloaded lightly and the track is given a uniform 1½-in. to 2-in. raise with a 12-tool (pneumatic) tie-tamper gang, organized as follows: One extra gang foreman, who sights the track and has general supervision over the gang; one assistant foreman who handles the level board and checks the actual tamping and filling in of ballast; one operator in charge of the tie-tamper compressor and who assists in moving pipe when necessary; 12 trackmen operating tie-tamper guns, 8 on the outside of the rails and 4 on the inside; two trackmen operating the jacks, of which 8 to 10 new-style low jacks are employed; two trackmen who keep the cribs properly filled ahead of the tampers, and handle the hose; two trackmen tightening bolts, driving down spikes and adjusting rail anchors; and two trackmen assisting the compressor operator in moving the pipe. To summarize, this gang consists of a foreman, an assistant foreman, an operator and 20 trackmen, and works over approximately 1,050 ft. of track per day.

### Careful Work Required

In this organization, it is necessary that the track be sighted carefully for the raise, and that a close check be kept on the tampers to be sure that a uniform job is performed and that the ties are tamped under the rails. To insure a uniform tamping job, it is important that the ballast be distributed and forked evenly. All track that is reballasted and resurfaced in any year is gone over with the tie tampers the following year, using the organization described above except that it is not necessary to crib the track or clean the ballast.

Our tie-tamper compressors are worked from set-offs by using with each compressor 3,000 ft. of 2-in. pipe equipped with either Fons or

Simmons Flexible pipe couplings so that the pipe can be moved quickly from one location to another by removing the coupling pins on every second length of pipe. The pipe is moved on push cars by two laborers and the compressor operator. For maximum efficiency in tamping MT-3 low-pressure type guns are used.

Weekly reports are submitted covering the operations of the tie-tamper organization. These reports give the number of feet of track tamped during the week, and show the time that the gang was idle, which includes delays occasioned by the passage of trains, bad weather, moving the hose connections, etc. With this data in hand, it is possible to compute the number of feet tamped per tool per hour of actual working time.

### Ditching and Bank Widening

Wherever ditching and bank-widening work are contemplated, they are co-ordinated with the surfacing and reballasting operations, i. e., any cut-widening or bank-widening work that is to be performed within the limits of a track-raising job is carried out during the same year.

Our ditching is done in various ways. Where a cut is heavy the work is performed with a Diesel-powered

dozers which push the material to the ends of the cuts, where it is used to strengthen the adjoining fills.

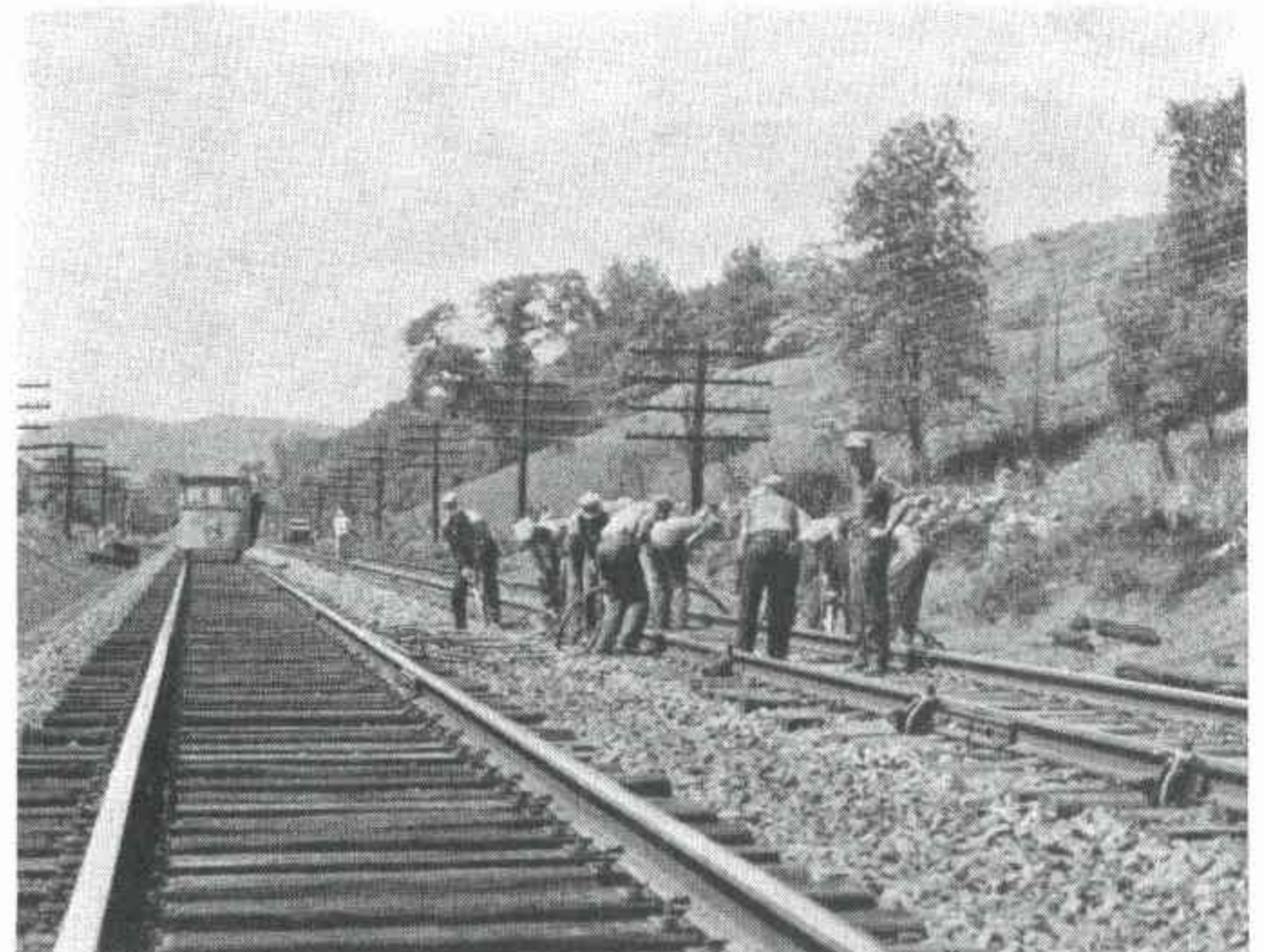
Material that is loaded into dump cars from cuts is used on the bank-widening jobs, but when the ditching operations are too far removed from the bank-widening work to permit this to be done economically, the widening is done with cinders that are hauled in flat-bottom cars in a work train including two locomotive cranes for unloading purposes.

Each year we have a regularly-assigned program in which the spreader car is operated over the entire territory, cleaning out and shaping all ditches where the clearances will permit. This work, which is generally done in the fall, helps to control vegetation and provides clean ditches, placing them in condition to handle the spring flows.

### Ballast-Shaper Car

In connection with the dressing of stone ballast, we operate a specially-designed ballast-shaper car over the entire territory each year. By purely mechanical means, this car straightens the stone line and gives the proper shape to the ballast section. The use of this car has greatly reduced the cost of dressing ballast and, in addition,

One of the Tie-Tamper Gangs That Are Employed in Out-of-Face Surfacing Operations.



ditcher mounted on a flat car, which deposits the excavated material in air-operated dump cars. Bank widening is also handled in this manner. At locations where obstructions interfere with the operation of a ditcher, locomotive cranes are used, also loading the material into air-operated dump cars. If two cranes are used in a work train, the cost of the work is naturally reduced. When wires or other obstructions interfere with the operation of ditchers or cranes in shallow cuts, the ditching work is performed economically by Diesel-operated bull-

allows us to keep all of our stone ballast lines in a neat condition.

All of our maintenance operations are carefully programmed and when a season's program has once been made it is adhered to. Also, the programs for laying rail, reballasting, bank widening, etc., are so co-ordinated that any piece of track that has been worked over comprises a section of standard railroad in every respect. Barring unusual circumstances, no heavy maintenance work will be required by this piece of track until its cycle has expired.