

Maintenance and Inspection of Turnouts

Report of Committee

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In order to assure safety of train operation and to provide smooth-riding qualities in the track, it is essential that turnouts be properly maintained. This is particularly true under the highly competitive conditions surrounding railroad transportation today, which require that the traffic offered be moved with speed and dispatch. In order that the necessary maintenance work may be performed when needed, a frequent and thorough inspection of all main-line turnouts is required.

The subject is divided into the two general subdivisions of maintenance and inspection. However, as a prior consideration to both maintenance and inspection, it is necessary to discuss briefly the proper installation of turnouts. It is not within the scope of this report to discuss design of turnouts and turnout materials. It is, however, important that railroads have standard plans to cover the various types and sizes of turnouts commonly used on the property and that the standards include joint spacing through the turnout, tie spacing, proper placing of guard rails, proper location of slide plates and braces, standard frog plates, proper curvature through the leads, and other pertinent information. These standards should be given as wide distribution as may be practicable certainly to include the roadmaster responsible for the work and, if possible, to include the gang foremen in charge of installing turnouts.

Those responsible for the installation of turnouts must see that the standard plans are followed in minute detail, for if improper work is permitted during installation, expensive and excessive maintenance will result in future years, creating conditions which are likely to last for the entire life of the turnout and which no amount of repairs short of reconstruction can overcome. The advantages to be obtained through proper installation include such benefits as longer life for materials, free movement of switch points, snug fit switch points against the stock rails, better riding conditions by reason of proper spacing of joints and ties, and uniform wear in switch points, frogs and guard rails. In addition to strict adherence to standards, careful consideration should be given, particularly in the case of main-track turnouts, to adequate anchorage in order to prevent creepage, and to drainage in the turnout area. Neglect of these important considerations will result in poor riding qualities, increased wear of material due to distortion of line and surface, and, in the case of single track.- delays to trains due to running of the rail resulting in restrictive signal indications.

Inspection

Periodic inspection is essential to good maintenance and, in order to be effective, must be done on a scheduled basis. The frequency of inspections will vary with the class of service and the traffic density. On high-traffic density high-speed main tracks, detailed inspections may be necessary as frequently as every other day, whereas on lines of lesser traffic density weekly detailed inspections may be sufficient. It is thought that a detailed inspection of each turnout in the main track should be made not less than once a week even on low-speed branch-line tracks, since on such tracks the standard of maintenance and the class of materials used are generally not so high as on more important lines. This situation in itself justifies a weekly inspection. The inspections must be scheduled with such frequency as to eliminate the probability that unsafe conditions will develop without warning.

In order to be effective, inspections must be thorough and must cover each component part of the turnout. The inspector should watch closely for variations in the line and surface, signs of improper anchorage, consider carefully the drainage in the turnout area, and be particularly careful to observe any sign of unusual wear developing on the switch points, in the frog, particularly at the frog point, and in the guard rail. The inspector

should also observe all bolted elements in the turnout area to see that the bolts are tight and functioning properly and that cotter keys, if required, are in place. Particular attention should be given to rivets and to parts of frogs applied by welding to see if there is any sign of a failure. Each element of the turnout should be checked to see that it is to proper gage, particular attention being paid to the guard gage.

Organization of Inspection

The personnel to be used for the inspection of turnouts will vary depending on the maintenance organization in use on a particular road or territory. Railroads which use the section gang as the basic maintenance organization generally depend upon the section foreman to perform the detailed inspection of mainline turnouts. In some cases an additional employee, working under the section foreman and responsible to him, makes the inspection of main-line turnouts. Those railroads using other than section gangs as the basic maintenance force may find it desirable to assign employees to cover assigned territories and perform inspections. In some instances this employee reports to the district gang foreman and in other cases he reports directly to the roadmaster. When the inspector reports directly to the district gang foreman and when the district gang foreman is held responsible for the condition of turnouts, it is considered essential that he cover his territory not less than once a month as a check on the work of the inspector. In instances where the inspecting employee reports directly to the roadmaster, the organization is generally such that the employee performing the inspection has the authority to direct the local foreman as to the nature and amount of work found necessary during inspections.

In addition to the detailed inspection made by the section foreman or other employee designated to inspect turnouts, it is desirable that the roadmaster inspect each main-track turnout at least once a month to see that no abnormal condition is developing which may have escaped the attention of the foreman or other inspector responsible. This inspection by the roadmaster should be in detail and is not to be confused with the running inspections made by the roadmaster on his trips over the road either by train or motor car.

It is a general practice to require that a report be made by the roadmaster to his superior officer of detailed turnout inspections. Some roads require that this report be made monthly, others quarterly, and in some cases the report is made semi-annually. It is felt that the report is important and should be made on main-track turnouts. However, the matter of the frequency of the report can best be determined by the local conditions to be found on the individual road.

The inspection of yard and terminal turnouts presents a different problem than that of main-track inspection because of the large number of turnouts involved, the heavy use to which they are subjected, and the relatively slower speeds encountered. Turnouts on busy ladder and other frequently used tracks should be inspected at least every other day by an experienced employee who will report the conditions found to the yard foreman. The yard foreman should personally arrange to inspect the switches under his supervision at least once a month, and in some instances a more frequent inspection will be found desirable. The roadmaster responsible should check the turnouts not less than once during each three-month period and even more frequently if at all practicable.

The orderly and proper maintenance of turnouts should receive the same care and attention necessary in planning inspections. It will be found that many small items requiring attention will be, and properly should be, taken care of at the time the inspection is made, This applies particularly to conditions regarding drainage, adequate anchorage, and maintenance of proper line, surface and gage through the turnout. Small items of defective material, such as bolts, cotter keys, etc., should be replaced at the time that the inspection is made. Major repairs to or replacements of frogs, switch points, guard rails and ties should be done on a scheduled basis following inspection, unless an emergency condition is observed. A report should be made when defects found are corrected.

Organization of Maintenance

As is the case with inspections, the organization of forces for the maintenance of turnouts will vary depending on the type of maintenance gangs employed on the road or territory. Those roads using the section gangs as a basic maintenance unit perform their turnout maintenance with these gangs. Those roads which use no section gangs in the usually accepted sense of the term, but use larger district floating or semi-floating gangs, perform the turnout maintenance with a portion of the larger gang, usually under the supervision of an assistant foreman. These gangs make the corrections in line, surface and gage that are found necessary during inspection and also replace metal parts as may be required. They also take care of the drainage and replace timber where necessary.

Repair and Renewal of Turnouts

The repair and renewal of various elements of turnouts are discussed separately for the reason that conditions surrounding their replacement vary widely. It is a general practice to renew all turnouts at the time that rail is replaced on a line, and this practice is consistent with good maintenance requirements. Replacements of defective and worn parts are then made piecemeal as may be required during the service life of the rail.

Line, Surface and Gage

Line surface and gage should be restored when general track, rehabilitation work is being done through the turnout area. At that time timber requiring it should be replaced. Sound timber is essential to a satisfactory riding condition in the turnout, and particular attention should be given to the ties under the frogs and at the switch points. Without sound timber neither gage, surface or alignment can be maintained. It is the general practice to replace switch timber in units or pieces rather than by whole sets when the track is worked in the general rehabilitation, and, if this practice is followed with care, it is not generally necessary to make timber replacements between general rehabilitations unless an unusual condition develops.

At the time of general rehabilitation, careful attention should be given to the condition of the ballast and to drainage conditions. If the ballast has become foul, it should be thoroughly cleaned, or renewed. Adequate drainage should be installed where required. While the track is being worked, careful attention should be given to the anchorage and to the spacing of ties and any correction necessary in these two important items should be made. Particular attention should be given to the tamping around the frog and switch points. In many instances it is difficult to secure a proper job of tamping in these areas and unless the foreman gives close attention, an unsatisfactory job may result. When the work of tamping is being done by one of the several types of machine tampers, it will be remembered that these machines do not tamp through the turnout area and, when such a machine is being used, it is important that the roadmaster give particular attention to see to it that proper tools and equipment are provided for tamping the turnout and that the work is well done in such a manner so as to match the machine work on each side of the turnout.

Switch Stands

Maintenance work done in the field on a switch stand is usually done at the time the inspection is made and consists of making the necessary adjustments and corrections in order to secure the proper throw in both directions and seeing to it that the switch stand is in proper adjustment. When the switch stand is worn to the extent that it can no longer be adjusted in the field, it is the practice on many roads to send the switch stand to the shop for a complete overhaul. On some roads the repaired switch stand is used only on branch lines and on other roads they are used wherever required. It does not appear that there is any reason why a repaired switch

stand will not give good service on main track provided the shop doing the work is properly equipped with the necessary tools and has adequately trained personnel.

On several types of switch stands it is important that safety plates or other devices be maintained in good condition at the bottom of the switch stand in order to prevent a vertical movement of the staff, which will result in the throw rod becoming disengaged. This feature must be carefully checked and such safety devices be promptly provided if not in place. The switch stand must be kept well lubricated as required, and the lubrication should be checked at the time of the weekly inspection. Periodical inspection should be made of the bolts connecting the switch stand to the throw rod and tie rod by removing them to see that they are in good condition, that no unusual wear has taken place, and that no fracture is evident. The frequency of such inspections will depend upon operating conditions.

Switches

In order to prevent unusual wear on switch points, it is necessary that the gage immediately in front of the switches and through the turnouts be maintained to a close margin of accuracy. It is also necessary that a good line be maintained through the turnout. Variations in gage and line should be immediately corrected when found in order to prevent wear of the switch points. On many roads it is the practice, when the switch points become chipped or excessively worn, to repair them by welding in the track. This practice has been found, by those roads following it, to be entirely satisfactory, provided the work is done with competent well-qualified personnel. When switch points are repaired by welding, all welding work should be finished with a grinding machine to restore the running surface to a smooth, true shape.

When switches are used employing points in excess of 16-1/2 ft. in length, it has been found desirable by many roads to recess the switch point on the maintrack side into the stock rail in order to prevent excessive wear and chipping. When installing new turnouts, recessed stock rails may be purchased from the frog and switch manufacturer. If this is not done, the work may be done satisfactorily in the field by using a grinding machine equipped with a jig designed to properly recess the rail. It is important that switch points be fitted closely and accurately to the stock rail and that this close fit be maintained throughout the life of the switch point. Under traffic it is to be expected that excess metal will be rolled onto the gage side of the stock rail. This metal must be periodically removed by grinding if satisfactory switch-point maintenance is to be had. It is important that the switch point be maintained at the proper height with relation to the stock rail and, if too great a variation in height is found, then the worn part must be replaced.

A decision as to the proper time for changing out switch points, and stock rails is a matter of good judgment depending on the speed, location and other service conditions, and no hard and fast rule can be established to cover this important feature of switch maintenance. It is important, however, to point out that a change should be made before the outer edge of a cupped wheel will hit the stock rail. This is a particularly dangerous condition when a trailing movement is being made through the turnout for the cupped wheel will tend to force the stock rail out of position. Reinforcing straps and rivets must be kept tight in order to furnish proper strength to the thinner section at the point,

Switch-point protectors of an approved design may be used at locations where excessive wear is experienced in yard and terminal areas or at other locations where only slow speeds or switching speeds are attained. Switch plates and switch braces as called for on the standard drawings must be maintained throughout the turnout. Particular care should be taken to see that the switch braces are kept properly adjusted in order to furnish adequate lateral support to the running rail and the stock rail.

If during the inspection the switch is found difficult to throw or, in those cases where a switch machine is used, to be causing difficulty to the switch machine, the line, surface and gage should first be checked, then a check should be made of the slide plates. If these conditions are found to be satisfactory, then the heel assembly should be checked to see to it that the shoulder bolt, thimble and bent angle-bar assembly are properly applied. On switches not using a heel block, the rail seats on both the stock rail and closure rail should be checked to see that the rail is correctly seated and that the proper spread is maintained.

Switches equipped with non-heat-treated heel blocks require particular attention due to the heat-treated bolt bearing against the softer metal in the heel casting, which results in the shoulder bolt wearing into the casting. When the switch is infrequently used, the wear is usually excessive on the closed point. As the shoulder bolt wears into the casting, the bolt is constantly being tightened which results in the point becoming rigid, making the switch difficult to throw. This condition places severe stresses on the switch point and should be corrected, in order to prevent damage, by renewing the shoulder bolts and heel assemblies when excessive wear is evident.

Frogs

The frog is a most important part of the turnout and requires frequent adjustment and attention if proper service life is to be attained. This is particularly true of spring rail frogs. It is of prime importance that the surface, line and gage be properly maintained through the frog, Failure to maintain the surface will result in excessive wear to the frog parts, thus greatly reducing the life of the material. Variations in line and gage will cause excessive wear on the contact surfaces and, if not corrected, will result in serious difficulty. It is important that frogs be carefully watched for the development of any unusual wear which indicates improper line, surface or gage, and when indications of such wear are seen the cause should be determined at once and the condition corrected.

In case of spring rail frogs, it is important to see that the tension bolt and spring are properly adjusted and that all rivets are tight and in place. This is particularly important through the reinforcing bar. Special attention should be paid to the hold-down horns and housings to see that the horns are not broken, that no excessive wear has taken place, and that the housings are securely fastened to the frog plates. In checking the wear on the hold-down housing and horn, it is important to see that the vertical movement of the spring rail is limited to the tolerance permitted by the standard. If vertical movement in excess of tolerance is found, immediate correction should be made, This condition may be corrected by welding, shimming, or replacement of the defective parts. When excessive wear is found in the holddown horns, it is well to check the timber under the frog to see that it is sound and well tamped.

When rail-bound manganese frogs are used, it will be found that the manganese casting, in work-hardening under traffic, has a tendency to flow into the flangeway area from the top of the casting. This metal should be ground out periodically in order to prevent failure starting in the flowed metal. The throat and point batter on manganese frogs should be checked frequently and should not be allowed to develop to a depth that would reduce the flangeway depth to less than 1-3/4 in. In maintaining manganese frogs, it has been found that the best practice requires rebuilding the throat and point areas when the wear is less than that indicated above and before the base metal begins to break down. If this practice is followed, it will be found that the overall cost of maintaining manganese frogs will be greatly reduced.

In the case of plain rail frogs, it is important that the flangeways be kept ground in the same manner as noted above for manganese frogs and that they be rebuilt by welding when wear on the point reaches the stage where damage is likely to result to the knuckle rails in the throat area. The location at which frog repair work is done is dependent on local condition on a particular road. In some instances all work of this nature can best be done at a central shop. Under other circumstances, it may be found desirable to do the work either in the track or in the field, and it is not felt that a hard and fast rule can be established to cover this phase of frog maintenance.

Guard Rails

Proper maintenance of guard rails is essential to safety of movement through the turnout. Both the running rail and the guard rail must be well spiked to sound ties. If the guard rail is of the bolted type, all bolts must be checked regularly and kept to the proper tension. If the guard rail is of a type requiring use of a clamp, particular attention must be given to see that the clamp is properly applied and that the wedges are driven tight and locked in place. Frequent checks must be made of the guard face gage, the guard check gage, and the flangeway to see that they are to the proper dimensions, and any adjustment found necessary must be promptly made. Attention should be given to observe any movement in the guard rail area and, if noted, steps taken to correct the condition. The proper location of the guard rail should be shown on the standard drawing and its location should be checked at each inspection. If the guard rail is found to be out of place, then it should be relocated in accordance with the standard.

Lubrication and Metal Preservation

If a turnout is to function properly, it must receive adequate lubrication of an approved type. The switch slide plates must be thoroughly cleaned before the lubricant is applied. In many instances, particularly in CTC territory, it has been found that a graphite-base lubricant, cut with an aromatic oil or with turpentine, serves the purpose. In other locations it will be found that a medium-weight oil will best serve the needs, particularly in slow-speed territory. Care must be used to see that the spring rail assembly on spring-rail frogs is properly lubricated and free of obstruction so there will be an unhampered movement of the spring rail when movement takes place through the turnout side of the frog. In general, the same type of lubricant used on the switch plates will prove satisfactory for lubricating the slide area of the frog plate, and a medium-weight oil should be used in the bolt and spring area in order to assure proper life of the materials, a good grade of metal preservative should be applied to the rail braces and to the exposed parts of spring rail frogs. Metal preservative should also be applied to the switch throw rod, the tie rods, the bolts in the turnout area, and other parts which may be adversely affected by corrosion.

This report has dealt only with the switch parts for which track forces are generally responsible. In signaled and traffic-control territory, it is necessary that the track forces and signal forces work together closely, for while there are other fields of joint responsibility between track and signal forces, switches in signaled territory are a most important joint responsibility of the two departments. If there is major work to be done on a turnout in signaled territory, it is usually necessary that a qualified signal employee be present when the work is done, and if the work is such that it can in any way affect the signal circuit, then the work should not be undertaken unless a qualified signal employee is available, except in cases of emergency.

Track maintenance forces should recognize that worn and defective switch parts will adversely affect the track circuit and cause delay to train operations. It is particularly important in territory where electrical switch machines are used to see to it that the headblock ties have a firm bearing throughout their entire length. If these ties are not well supported, serious damage will be done to the delicate mechanism in the switch machine. Broken or improperly fitted heel blocks will also adversely affect the signal system as will badly running rail and improper conditions of surface and line. It is important that the track-maintenance forces recognize their joint responsibility with the signal forces in this extent in providing well-maintained matters and cooperate to the fullest turnouts in signaled territory.

DISCUSSION

Chairman Hutcheson: I would like to thank the members of my committee for the way in which they responded in preparing this report. I was pleasantly surprised. I don't know why I was surprised, but I was, to receive replies from nearly every member of the committee. I not only appreciated their support at that time but also here now on the platform.

Vice-President Gilkey: I think Mr. Hutcheson and his committee have certainly put a lot of work on this report. They have gone into this in detail, to the Nth degree. There should be considerable discussion of how it is being carried out on particular railroads.

There is one particular feature of the inspection that is of interest to me and that is an inspection made by men who know what to look for. Of particular interest is getting a man who knows what he is going to look for when he inspects a turnout and what is meant by good judgment. Some fellows have one kind of judgment and some another. Whether this particular man is best fitted for inspection is very important. I would like to hear from some of the members.

Holding Down Frog Housings

A. B. Chaney (M.P.): Mr. Gilkey, I would like to ask Mr. Hutcheson and his committee if they decided that there is a superior way to fasten the hold down housing on spring frogs? Some railroads use a bolt, some a rivet and others use a recessed weld. We have used a bolt and a cotter key to hold this housing down but the A.R.E.A. recommends a bolt, as I remember. And I would like to hear from any member of the committee or others present if they have had any trouble with the recessed weld in fastening these hold-down housings?

Chairman Hutcheson: Mr. Chaney, there was a great deal said by many of the committee members in replying to the questionnaire about hold-down housings. That same difficulty apparently has been noted with every method used. There is a recessed weld, as you mentioned the bolted type, and then there is the type of construction in which the side of the hold-down housing is placed under the frog plate and bolted up. The frog plate is upset to accommodate those wings. That method of hold-down housing was receiving some acceptance and there was not any particular difficulty with it except that it was expensive.

If anybody else has any other idea about it, I would be glad to hear it. We are using all types on the Seaboard and we are having some trouble, just as everybody else is.

Mr. Chaney: I think this is a very excellent report. It is more closely related to safety on our railroads than possibly any other subject we have handled here. Some of the southwestern lines are attempting to get together on a uniform standard frog and switch, and in our discussions on this matter, we are about to get together on a uniform standard. But a question has arisen as to this hold-down housing. So far we more or less favor the recessed welding.

Switch-Point Locks

There is one other item I would like to ask or hear discussed and that is, how many roads make a practice, or do any roads make a practice of using a switch point lock on their main line turnouts on other than power switches? Seems to me this adds a good deal of safety, a large safety factor due to failures in the No. 1 rod. And if there are any members of the committee or others here whose lines make regular use or standard use of switch point locks. I would appreciate hearing it.

Vice-President Gilkey: Has anyone here had any experience with a switch point protector and guard that fastens the switch point securely in case the stand is damaged,

N. W. Kopp (I.C.) : Mr. Chairman, the practice on our road is to use switch locks, that is, an additional rod at locations where the switch stand is subject to being struck by a train on a crossing where some object might hit it and knock it down. Judgement would be used as to the speed of the trains and the location of the switch point crossing. It is not adopted as a general practice in all turnouts. Where you have a definite hazard, such as near road crossings, the lock is used.

Chairman Hutcheson: Several of the roads mentioned using those switch point locks, Mr. Chaney. I can't recall the names of them. I know it is the general practice on the Seaboard to use them in the manner which Mr. Kopp stated, on highway crossings. I would say it is general practice. It is done on the recommendation of the local operating officers.

E. E. Crowley (D.& H.) : Where we have high-speed trains on double track, we make a practice of putting safety locks on all points on switches.

A. G. Reese (C.B.& Q.): Mr. Gilkey, that is the established practice on the Burlington, applying switch point locks on all facing point switches, particularly in territories where we operate high-speed trains, and in all other locations where there is some hazard of vehicles on the highway being struck by a train. Those locations depend more or less on local operating conditions. But that applies both in single track and multiple track territory.

H. W. Kellogg (C.&O.): Mr. Gilkey, as Mr. Reese stated, we have had that practice on the Pere Marquette, District in our territory with automatic signals of placing locks in locations where they are apt to be disturbed with automobiles. In fact, in a few instances that I know of, I think it has saved serious derailments. On our C.T.C. territory we have a lock on every switch regardless of the location. Then it is impossible to open the switch by hand without releasing the electric lock. This, I think, has been very valuable on C.T.C. territory. It is a safety factor that could be extended to other types of switches.

Flame-Hardened Stock Rails

C. E. Neal (S.P.): Mr. Chairman, I would like to hear somebody discuss if they have had any experience in hardening stock rails to prevent them from flowing, battering, and chipping? We have conducted some tests for at least two years. Stock rails ordinarily wear out in six months. Their life has been extended - we don't know just how long by hardening. They look to be about as good now as when they were installed.

Also, coming out, I noticed on the U. P., and I know they do it in Colorado, that they are planing the turnout stock rail to provide a pathway for the outside tread of the wheel to pass over. And realizing that it costs something to do this, I am wondering if the benefits have been derived that they expected from this practice. Maybe somebody here from the Ajax people or the U. P. could explain it. Maybe some of these other gentlemen from these other roads might be able to answer that.

Vice-President Gilkey: Is there anyone present who could give Mr. Neal some information on that?

Member: I might say that I have some plain rail and some heat-treated rail in very heavy curves with very heavy traffic conditions, and these rails adjoin each other. We also have some chromium rail. But we have heat-treated and plain hardened-end rails on a heavy-duty curve at one particular location that I can cite to you where new rail lasted less than a year. We have now had it in for three years and the wear is hardly noticeable. It is almost as good as the day it was put in, and the curve wear is very, very slight. Our curve wear previously

had been very excessive and the low rail was wearing out very fast. This is the New York Central I am talking about. It is my belief that it certainly is very good.

While we are talking about heat-treating, I had a question I was going to ask the committee, if they have made any study or if anybody is familiar with the heat-treating of switch points in stock rails? We have had some heat-treated switch points in track for several years and I am just curious if the committee has had any experience with heat-treated stock rails for switch points and what it is,

Chairman Hutcheson: I personally have had no experience with heat-treated stock rails. I don't know if any member of the committee has. There was some mention made of heat-treated stock rails in some of the replies. However, we considered that to be a design feature and didn't touch on it because we didn't have anything that indicated the life that could be expected. Several of the roads are using heat treated frogs and switch parts regularly. Maybe some of the gentlemen would be glad to talk about it. Don't you use it on the Coast Line,

Member: Yes, we use them quite extensively now. We have one particular case that we have been watching closely, a 39-foot switch point in a No. 20 turnout on double track. It has been in use for three years and there has been very little wear on it so far.

Chairman Hutcheson: Maybe somebody else has had some experience.

Inspection of Turnouts

C. A. Shaner (Reading): We use heat-treated frogs. We haven't gone to the switch points as yet, but we do use the facing point locks. There is just one question, in my mind, on the committee's report about the turnouts. I notice they say that the supervisor should inspect every turnout at least once a month and give a report that goes to the higher official. I would like to hear from some of those roads that actually do that.

Member (Santa Fe): I would like to make a comment on that, as far as inspection is concerned. We have the roadmaster and the track supervisor on our road make a daily inspection on a motor car of so many switches. But they have a form to fill out that covers, I think, every part of the switch, frog, yard rail and rivets, bolts, ballast, every condition you can think of, that is filled out quarterly. Some may think it ought to be oftener. However, that is about as often as we expect them to take that much time. They will take one or two switches a day and make out this report.

I would like to say something about the frogs. On our spring rail frogs, I think we have as much trouble as anybody else with bolts, rivets, the housing being worn, and so forth. We originated the practice during the last year of welding all the housings. You have the four bolts coming up and they are welded down. We have a welder and helper on each division. In addition to this work, of course, we weld switch points, frogs, and so forth.

Now on your housing, where there is to be a certain amount of clearance, instead of taking that off when there is too much wear, they simply heat the top of this housing and just bend it down. That seems to do very well. On the switch plates, not the plates that are riveted on one end, but the brass plates that are riveted, those plates are solidly welded to the frog along each side. The rivets in the reinforcing bars are removed and case-hardened. The bolt is put in with a lock washer and tightened and regular maintenance keeps those tight.

We went into this frog business rather thoroughly the last year. Now the welding was done on my territory about two months ago. Since that time I have had about 12 or 14 of those plates break loose, It was due to inexperience with this kind of welding. Another thing is improper tamping or decayed ties under the frog. You

know, if you don't have good ties and tamping I don't care what kind of bolts or welding you use, it is not going to stay. I wanted to mention that.

In head-rod inspection, we have a semi-annual rod inspection with a small portable magnetic tester. Head rods are removed twice a year and thoroughly cleaned and we are using Magniflux and the little tester is run over each one of the head rods for inspection twice a year, and we have found small cracks and they are immediately removed.

Vice-President Gilkey: Gentlemen, this is an interesting and important matter on our railroads. We could probably go on here and talk all afternoon about it. The basic thing is the inspection, the inspection to be made by the competent inspectors and to be made periodically. I think after the trouble is found, we all know how to remedy it. The difficulty comes when we don't find the trouble.

We will excuse this committee with the thanks of the Association.

More on Switch-Point Welding

Member (N.Y.C.): Mr. Chairman, I don't know of anything more important on railroads than the maintenance of turnouts. I do have a couple of short questions I would like to ask this committee, if I may encroach on your time. The committee mentioned welding switch points. I am curious. No mention was made of main tracks or yard tracks. Are they welding in main tracks and if they are welding in main tracks, are they welding, say, where you have high-speed passenger traffic and long turnouts, Are these points being welded?

Chairman Hutcheson: The practice varies with the different railroads. There are some railroads who do not weld in track. There are other railroads who do weld in track. The key to it, in my opinion, is to have competent personnel and have them well trained.

Those railroads that are welding their switch points in track and have been doing it for years are having no difficulty with it. The Seaboard has done it for a number of years, everything from high-speed main track down to industrial tracks, and we haven't had any difficulty with it whatsoever. The key to it is to have competent, well-trained personnel to do the work. It has been done with electric welding and acetylene welding to equally good advantage.

Member (N.Y.C.): On spring rail frogs on our railroad we have gone to the practice on lines east of Buffalo of discontinuing the use of spring rail frogs due to the fact that the wheel base on our diesel locomotives is nine feet. This places one wheel at the toe of the frog and the other wheel at the wing rail of the frog. Now our hold-downs are not holding, as everyone seems to say, which allows the wing rail to rise slightly. If the frog gets worn a little there have been derailments where we have forced open the wing rail of the frog and the wheels have dropped down. For that reason we are discontinuing the use of spring frogs east of Buffalo.

Chairman Hutcheson: That is very interesting to me. If anybody else has anything to say on the subject, I would certainly like to hear it. I believe that a great many of us suspect with the advent of the diesel and complete dieselization of railroads, things are happening to our frogs that didn't formerly happen. I would be glad to hear any discussion on that which anyone would care to make.

Member (N.Y.C.): I might mention that the real danger lies in having the ties loose at the toe of the frog which would also help the condition along the spring rail to raise if the hold-downs are a little loose.

Spring Frogs Vs. Rigid Frogs

Member (K.C.S.): Mr. Chairman, we have just experienced moving from the rigid frog to the spring rail frog, with the transposal of our power from steam locomotives to diesels. I think the man could answer his question if he would see that he has good timber under the end of those spring rails to the frogs, well surfaced and tamped.

Chairman Hutcheson: I think there is nothing in the world that will advance switch maintenance more than line, surface and gauge. I mentioned it in the report on every occasion that I could find to put the words in there.

Member: We on the Kansas City Southern would never think to go back to the rigid frog.

J. Pickrel (C.B.&Q.): We have 112-lbs. TR rail, Burlington design, and at Aurora, Nebr., 70 miles west of Lincoln, last winter I had a derailment of a diesel engine. We had a No. 11 turnout spring switch. Our frog was 18 ft. long, and our hold-down pockets are welded on these particular frogs. The steel was laid only about two years prior to this accident. We had a snowstorm with a very light snow. No. 79 stopped at about the heel of the frog. They cut off a few cars and went down in on a long siding. They made this movement over the switch on the main line, back in on the siding, then when they came out and coupled onto the train, the diesel was located right over the frog. When the train started, every driver on the rear diesel unit dropped off. The engineer did stop the diesel before it got into the points, however. He backed up to take another pull to get the stack, and when he did this, all of the wheels but those on the front truck were derailed because they came right back onto where the filler was adjacent to the wing rail.

Of course, they called me and the section men up there, and the engineer didn't even know he was on the ground. He wouldn't have known it but one of the hold-down pockets flew out. He saw it fly. He got out to inspect it and discovered the head-end wheels were off. We re-railed it, took a jack and jacked in the wing rail, spiked it, and let it go. Then we ordered a new frog and changed it out.

The only thing I could figure out was that, they went back in on the siding and when they came out the wing rail remained open. Then when they backed up onto their train the wheels undoubtedly had dropped in. With the snow in there it was compact and causing it to bend the wing rail.

They told me I was absolutely wrong. Mr. McKinney was out there and made a check of it. They figured that, the wheels sitting in the position like this gentleman said caused the wing rail, with a little snow getting under it, to raise just high enough. The diesel wheels, not being as wide as those of the old steam engine, caught the outer side of the wing rail, forcing it open, and as they went ahead, allowed the wheels to drop in just at the point of the frog.

That was a case that actually happened on my territory. After they explained it to me, I can't help but agree with this explanation, gentleman.

Trouble with Hold-Down Pockets

Another thing, I have had a lot of trouble with the hold-down pockets breaking on the welded frogs. Now, the hold-down pocket is electric welded and has four holes in each edge whereby you can spike it. Where we find one that has cracked a little or is getting a little loose, we have jacked up the frog and put in a bolt on each side, holding it down and using the other bolt to spike to the tie. Of course, that TR rail is the Burlington's design and I don't think any of the other roads are using it. But that might help.

Vice-President Gilkey: Well, gentlemen, this subject has been most interesting and I expect we are going to have to have more about it later on, in the years to come. New ideas are coming into effect every day. We are going to have to cut this inspection of turnouts down to probably the inspection of the particular unit in the turnout, because it gets into such a large controversy between the various railroads its to what is the right thing to do.

We will excuse the committee. You have made an excellent report. (Applause)

Our next report is on "Records Necessary for the Efficient Maintenance and Repair of Work Equipment." Now the chairman was Mr. J. S. McCauley, assistant division engineer, Southern Pacific, Bakersfield, California. Mr. McCauley could not be with us, so Mr. S. E. Tracy, superintendent of work equipment of the C.B.& Q. here at Chicago, has taken over the reading of the report. We would like to have Mr. Tracy come to the platform with any members of that committee who are present.

. . . Mr. Tracy read the report . . .