

INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT NO. 3714

CHICAGO, ROCK ISLAND AND PACIFIC
RAILROAD COMPANY

IN RE ACCIDENT

AT DURANT, IOWA, ON

AUGUST 21, 1956

- 2 -

SUMMARY

Date: August 21, 1956

Railroad: Chicago, Rock Island and Pacific

Location: Durant, Iowa

Kind of accident: Derailment and collision

Trains involved: Passenger : Passenger

Train numbers: 8 : 1

Locomotive numbers: Diesel-electric : Diesel-electric
units 656, 750, unit 406
and 651

Consists: 15 cars : 5 cars

Speeds: 68 m. p. h. : 47 m. p. h.

Operation: Signal indications

Tracks: Double; 1° curve; 0.44 percent
descending grade eastward

Weather: Clear

Time: 5:30 a. m.

Casualties: 2 injured

Cause: A false flange on a slid-flat driving
wheel, resulting from a seized
traction-motor pinion bearing on a
Diesel-electric locomotive unit, and
derailed cars obstructing an adjacent
main track immediately in front of an
approaching train

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3714

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS
UNDER THE LOCOMOTIVE INSPECTION ACT OF FEBRUARY 17,
1911, AS AMENDED, AND THE ACCIDENT REPORTS ACT OF
MAY 6, 1910.

CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD COMPANY

December 5, 1956

Accident at Durant, Iowa, on August 21, 1956, caused by a false flange on a slid-flat driving wheel, resulting from a seized traction-motor pinion bearing on a Diesel-electric locomotive unit, and derailed cars obstructing an adjacent main track immediately in front of an approaching train.

REPORT OF THE COMMISSION¹

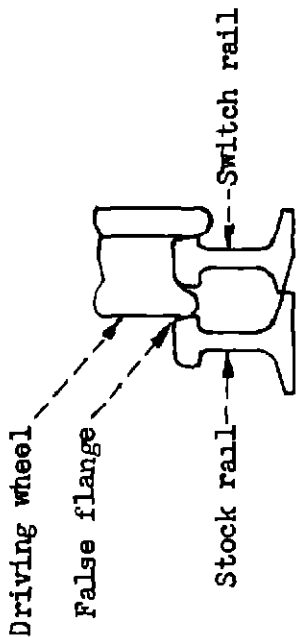
CLARKE, Commissioner:

On August 21, 1956, at 5:30 a. m., at Durant, Iowa, a false flange on a slid-flat driving wheel, caused by a seized traction-motor pinion bearing on Chicago, Rock Island and Pacific Railroad Diesel-electric locomotive unit 656, resulted in the derailment of the rear truck of the unit, both trucks of the middle and rear units, the first 10 cars, and the front truck of the eleventh car of a passenger train. Derailed equipment of this train was struck by another passenger train moving on an adjacent main track. One railway express messenger on each train was injured.

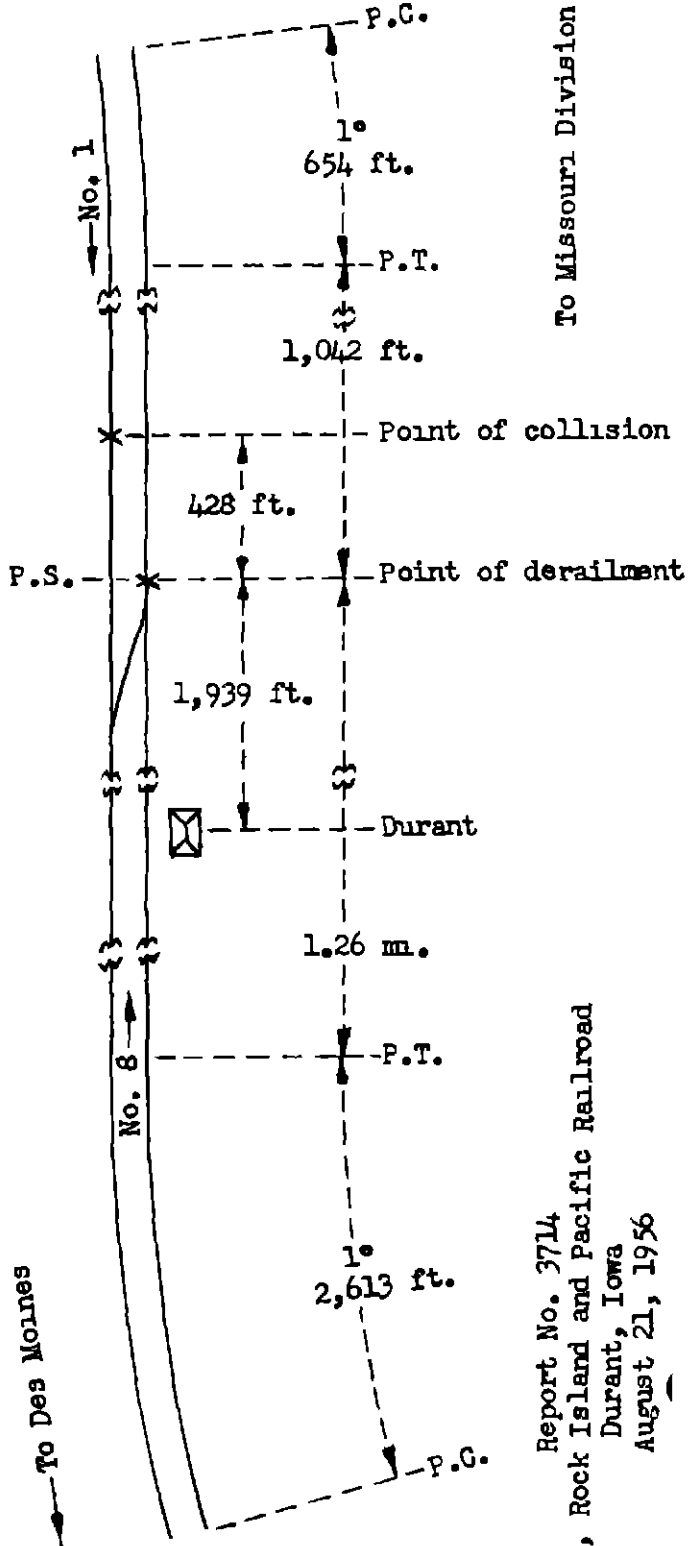
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Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Clarke for consideration and disposition.

○	Missouri Division Jct.	
	Davenport, Iowa	18.3 mi.
X	Durant	(Point of derailment)
		19.3 mi.
○	West Liberty	15.5 mi.
○	Iowa City	14.7 mi.
○	Oxford	15.8 mi.
○	Marengo	6.6 mi.
○	Ladora	13.8 mi.
○	Brooklyn	6.0 mi.
○	Malcom	53.2 mi.
○	Altoona	10.9 mi.
○	Des Moines, Iowa	



Cross section of switch rail and stock rail
12 feet from point-of-switch



Report No. 3714
Chicago, Rock Island and Pacific Railroad
Durant, Iowa
August 21, 1956

Location of Accident and Method of Operation

This accident occurred on that part of the Rock Island Division extending between Des Moines, Iowa, and Missouri Division Jct., Davenport, Iowa, 174.1 miles. Between Altoona, 10.9 miles east of Des Moines, and Iowa City, 121.0 miles east of Des Moines, this is a single-track line. Between Iowa City and Missouri Division Jct. it is a double-track line, over which trains moving with the current of traffic are operated by signal indications. At Durant, 155.8 miles east of Des Moines, a trailing-point crossover connects the two main tracks. The east crossover-switch is 1,939 feet east of the station. The derailment occurred on the eastward main track immediately east of the east crossover-switch, and the collision occurred 428 feet east of the switch. From the west there is a 1° curve to the right 2,613 feet in length and a tangent 1.26 miles to the point of derailment and 1,042 feet eastward. From the east there is a 1° curve to the right 654 feet in length and the tangent on which the accidents occurred. The grade is 0.44 percent descending eastward at the points of accidents.

In the vicinity of the east crossover-switch at Durant the track structure consists of 112-pound rail, 39 feet in length, laid new in 1941 on an average of 22 ties to the rail length. It is fully tieplated with double-shoulder tie plates, single spiked, and is provided with 4-hole 24-inch joint bars and an average of six rail anchors per rail. It is ballasted with 5 inches of slag on 10 inches of gravel. The main tracks are spaced 13 feet 5 inches between centers.

This carrier's operating rules read in part as follows:

110. Running Inspection of Trains on Road.--All employees must, as far as practicable, observe passing trains for defects.

Trainmen of freight and passenger trains, yardmen and operators must observe passing trains for defects.

Operators at intermediate stations, unless excused by train dispatcher, will stand on station platform when trains are passing.

Defects to be looked for include* * * wheels sliding * * * or any other condition which will endanger movement of train.

- 6 -

Employees noting such defects will give stop signals, and when communication with train dispatcher is possible, notify him of such defects.

If nothing irregular is noted, employes observing trains for defects will give proceed signals to the rear of the passing train.

When passing other trains * * * open train order offices * * * train and engine crews must be on lookout for signals, and, when practicable, exchange signals.

111. Road Inspection for Defects.--When leaving stations, and at every opportunity on the road, conductors must carefully inspect and require their trainmen to carefully inspect the train for defects.

* * *

Engineers, firemen and forward trainmen must frequently look back and rear trainmen must frequently look ahead, especially when moving around curves, and approaching and passing stations, to observe signals and to note condition of train.

* * *

The maximum authorized speeds were 79 miles per hour for the east-bound train and 70 miles per hour for the west-bound train.

Description of Accident

No. 8, an east-bound first-class passenger train, consisted of Diesel-electric units 656, 750, and 651, coupled in multiple-unit control, one mail car, two baggage cars, one sleeping car, two coaches, one dormitory-club-dining car, two coaches, one dining car, four sleeping cars, and one observation parlor car, in the order named. The second and the fourth cars were of conventional all-steel construction, and the other cars were of lightweight construction. All units of the train were equipped with tightlock couplers except the first car, the front end of the second Diesel-electric unit, and the rear end of the rear car. The first car was equipped with controlled slack couplers. This train departed from Des Moines at 2:38 a. m., 8 minutes late, and passed West Liberty, 19.3 miles west of Durant and the last open office, at 5:12 a. m., 30 minutes late. While it was moving at a speed of 68 miles per hour, as indicated by the tape of the speed-recording device, a false flange resulting

- 7 -

from the sliding of the front wheels of the rear truck of the first Diesel-electric unit engaged the inside surface of the head of the north stock rail at the east crossover-switch at Durant. When this occurred the wheels were forced to the south, and the left wheel dropped inside the north rail. The rear truck of the first Diesel-electric unit, all trucks of the second and third units and the first to the tenth cars, inclusive, and the front truck of the eleventh car were derailed immediately east of the switch.

No. 1, a west-bound first-class passenger train, consisted of Diesel-electric unit 406, three baggage cars, one coach, and one baggage car, in the order named. All cars were of all-steel construction. This train passed Missouri Division Jct., the last open office, at 5:12 a. m., 2 minutes late. While it was moving at a speed of approximately 47 miles per hour it struck the rear end of the seventh car of No. 8, and the locomotive and the first car were derailed.

No. 8 stopped with the front end of the locomotive 1,180 feet east of the east crossover-switch. A separation occurred between the fifth and sixth cars. The sixth car stopped with the front end 10 feet west of the rear end of the fifth car. There were no other separations between the units of the train. With the exception of the seventh and eighth cars the derailed units of the train stopped approximately in line, on the track structure of the eastward main track or south of the track. The rear end of the seventh car and the front end of the eighth car fouled the westward main track, and these cars were struck by No. 1. The Diesel-electric units were somewhat damaged. The northwest corner of the seventh car and the northeast corner of the eighth car were crushed as a result of the collision with No. 1. The trucks and appurtenances below the floor level of the second to the tenth cars, inclusive, were considerably damaged. The first and the eleventh cars were slightly damaged.

No. 1 stopped with the front of the locomotive 116 feet west of the point of collision. The locomotive stopped approximately 12 feet north of the westward main track and parallel to it. It leaned to the north at an angle of about 45 degrees. There were no separations between the units of the train. The front end of the locomotive was considerably damaged, and the first car was badly damaged.

The locomotive of train No. 8 was equipped with a red oscillating signal light at the front end which was automatically actuated and displayed a red aspect when the brakes of the train were applied in emergency.

The weather was clear and it was daylight at the time of the accident, which occurred about 5:30 a. m.

Examination of Track

Examination of the track structure after the accident occurred disclosed that between Ladora, 71.9 miles west of Durant, and Durant the rails and frogs at turnouts had been marked outside each rail of the main track. These marks were light in the vicinity of Ladora and became progressively heavier as they continued eastward. At Oxford, 49.5 miles west of Durant, and east of Oxford the marks had become considerably heavier, and shavings of metal had been sheared from the rails and frogs. Eastward from a point approximately 27 miles west of Durant the tops of the welds on the bond wires on the outside of each rail of the eastward main track had been marked, and eastward from a point approximately 10 miles west of Durant the tops of all inside joint bars had been marked. The tops of the bonds and the tops of the joint bars are, respectively, 1/2 inch and 1-3/4 inches below the tops of the rails. These marks also became progressively heavier as they continued eastward, and in the vicinity of Durant the marks on the tops of the joint bars were extremely heavy. A joint bar 11 feet east of the east crossover-switch at Durant bore indications that a wheel had become derailed inside the north rail. East of the portion of track which was torn up as a result of the derailment there were no marks similar to those found on the track west of the point of derailment.

Description of Locomotive Unit Involved

Unit 656, the lead unit in the locomotive, was built in June, 1940, at La Grange, Illinois, by the Electro-Motive Division of General Motors Corporation and originally carried road number 627. In June, 1953, the unit was involved in an accident and badly damaged by fire. It was rebuilt as locomotive model E8A in September, 1953, by the Electro-Motive Division at La Grange, Illinois, and renumbered 656 when returned to service by the carrier. At the time of the accident it was equipped with 2 E.M.D. model 12-567-B Diesel engines, each of which was direct connected to an E.M.D. model D-15B-D16 generator. Each engine was a 12-cylinder, 2-cycle, V-type, rated at 1,125 horsepower at 800 R.P.M. Construction and control design permitted use as either a leading or trailing unit. The multiple-wear wrought-steel wheels with which it was equipped had specified new diameter of 36 inches. Total weight on driving wheels was 229,320 pounds, and tractive effort was 55,060 pounds. The unit was equipped with 24 RL and electro-pneumatic brakes and carried a Vapor-

Heating Corporation heating boiler having capacity of 4,500 pounds of steam per hour.

No. 3 traction motor in which bearing seizure occurred was type D-27 and was equipped with permanently lubricated type Hyatt roller bearings. It had been originally installed in unit 406 and was removed in December, 1952, after 395,746 miles of service because of grounded armature. After rebuilding it was installed in unit 628 in April, 1953, and removed because of "running hot" after 70,554 miles. The motor was subsequently used in units 630, 635, 625 and 634 and removed from each of these units for reasons other than traction motor condition. It was installed in unit 656 in June, 1956, after having been used for 373,979 miles since rebuilt in 1953. While installed under unit 656, mileage run was 32,285. The motor had thus been used for 406,264 miles between date of rebuilding and its removal from unit 656 following the accident.

The two trucks of unit 656 were of swing-bolster type with wheelbase of 14 feet 1 inch. Each truck had 3 pairs of wheels; the front and rear axles were motor driven and the idle middle or intermediate axles were load carrying only. Each traction motor was carried by axle support bearings on one side and a spring-cushioned nose support on the opposite side. The wheels on the locked axle were manufactured in February, 1956.

Unit 656 was equipped with through-cable wheel-slip relays designed to function at low speeds by differential in impressed motor voltages and at high speed by current differential of the related motors. Operation of a wheel-slip relay operated a flashing alarm light in the cab and opened the field circuit of the main generator thus removing power from the traction motor circuit until the speed differential of related wheels had been eliminated. When motors in the wheel-slip relay circuit were isolated or electrically disconnected no wheel-slip indication appeared in the cab.

Examination of Parts Involved

As a result of the sliding of the front wheels of the rear truck of unit 656, the left wheel, which was adjacent to the seized pinion gear, had a slid-flat spot $\frac{3}{4}$ inch deep, 3 inches wide, and 10 inches long, and a false flange approximately $\frac{3}{4}$ inch in height had been formed between the slid-flat spot and the outer edge of the tread. The companion wheel had an almost identical slid-flat spot and false flange.

- 10 -

Flange heights were 1-1/32 inches and rim thickness was 2-1/2 inches where undamaged.

The traction motor was dismantled at Silvis, Ill., shop on August 27, 1956, for examination.

The surface of the commutator was marked by contact with brush holders for approximately 7 inches of its 42-inch circumference.

The surface of armature laminations was deeply abraded from contact with pole pieces in the motor frame, the abraded area extending 16 inches around the 58-inch circumference of the armature at the commutator end and 31 inches around the circumference of the armature of the pinion gear end. The abraded area included approximately one third of the total external surface area of the armature laminations.

The field-coil pole pieces in the motor frame had been abraded by contact with the armature. Each of the four field-coil pole pieces had been abraded its entire length. The abraded area included approximately one fifth of the total interior surface area of the field-coil pole pieces.

The banding wire on the pinion gear end of the armature was loose, broken and twisted.

Motor field-coil connections on pinion gear end had been cut and frayed by banding wire.

The roller-bearing cage was broken, discolored and distorted. The bearing rollers were dark blue in color and embedded in the surface of the bore of the inner bearing race. Flat spots having maximum width of 1/2 inch extended the entire length of each roller. Some rollers were slightly elongated at the flattened area.

The inside diameter of the inner bearing race was approximately one half inch larger than the diameter of the armature shaft at the end of the bearing adjacent to the pinion gear fit. The bearing could not be removed from the shaft by the tools ordinarily used. Each bearing race was cut into two pieces to permit removal from the shaft. The inner bearing race was found fused to the inner oil thrower and the inner oil thrower was fused to the bearing cap and the armature shaft, thus locking the bearing to the motor frame through the bearing housing.

- 11 -

The pinion gear end of the armature shaft was twisted in a clockwise direction and distorted in size, shape, and length. The shaft was approximately one half inch out of alignment at a point three inches from the armature within the bearing fit on the shaft. The appearance of the surface of the shaft within the bearing indicated that the shaft had turned within the inner bearing race. Overheating had embedded the rollers in the race and had twisted and distorted the armature shaft.

The wheel-slip relay and ground relay systems were tested after installation of a replacement truck in No. 2 position and found to function as intended.

Photographs showing damaged traction motor pinion bearing and slid-flat spots on the locked pair of wheels appear as appendix to this report.

Inspection and Repair Reports

Locomotive unit 656 received monthly inspection and repairs at Chicago, Ill., on August 4, 1956.

Daily inspection and repair reports from July 1, 1956, to date of accident from maintenance points and from division terminals through which unit 656 had been operating in extended service were examined and the following pertinent items were found reported.

Council Bluffs, Iowa, 12:20 a. m., date missing, by operator: "No. 1 eng. blocked acct. B.O. aux. gen. bearing."

Fairbury, Nebr., August 20, 1956, time missing, by operator; "No. 1 engine off the line and isolated into Pburg. acct of bearing out on aux generator."

Phillipsburg, Kans., August 20, 1956, time missing, by operator: "#1 eng dead & blocked on account of bad bearing on rear end of aux gen."

Denver, Colo., August 20, 1956, 10:00 a. m., by a Rocket maintainer: "Number one engine shut down and reverser blocked at Denver account aux. generator bearing bad."

Denver, Colo., to Goodland, Kans., dated August 20, 1956, at 2:40 -m by operator: "#1 eng down acct aux generator bearing out." Repairs were not made.

Summary of Evidence

Train No. 8 arrived at Des Moines, Iowa, at 2:18 a. m. where locomotive units were serviced and engine crews changed. No defective locomotive conditions were reported by the incoming crew except No. 1 engine of unit 656 which was shut down and tagged. The train departed at 2:38 a. m., 8 minutes late.

The engineer stated that the locomotive operated satisfactorily until the train passed Malcom, Iowa, 64.1 miles from Des Moines, when the ground relay alarm bell sounded on unit 656. He stated that there was no wheel-slip relay light indication at the time. The fireman investigated the cause of the alarm and reported No. 2 engine ground relay switch open; that the re-set ground relay switch was again opened when he attempted to return No. 2 engine to service; that he then isolated the engine and returned to the cab where he reported conditions found and that there was smoke and odor of burned insulation in the engine compartment.

The train was stopped at Brooklyn, Iowa, 70.0 miles from Des Moines and 85.7 miles from Durant, where examination of No. 3 traction motor by the engineer and fireman disclosed considerable odor and smoke but the motor did not feel hot when touched. The train was stopped again at Marengo, Iowa, 90.5 miles from Des Moines and 65.3 miles from Durant, where examination was made. The traction motor was not hot to the hand and no longer smoked. At Iowa City, 121.0 miles from Des Moines and 34.8 miles from Durant, the engineer inspected the right side of the traction motor and saw no unusual conditions. The fireman found the left side of the traction motor was not hot and after a rolling inspection reported all wheels turning.

The members of the train crew said that they inspected the equipment as the train moved on each curve en route, and that they saw no sparks or other indications of sliding wheels or defective equipment.

As the train approached the point of derailment the engineer noticed unusual lateral movement of unit No. 656 and immediately applied the brakes in emergency. At this time train No. 1 was approaching. The fireman lit and threw off a fusee as the locomotive of No. 1 passed. The engineer stated he inspected the rear truck of unit 656 immediately following the accident and found no evidence of overheating.

The engineer of train No. 1 stated that he first saw the headlight of train No. 8 as his train passed the station sign one mile east of Durant; that when he was approximately 300 feet from train No. 8 he saw the headlight of the locomotive of that train flash to red light and he immediately applied brakes in emergency. The engineer said the train speed was then 47 miles per hour. He further stated he saw hand stop signals given by the engine crew of train No. 8 and saw a car of that train obstructing the westward main track. The brakes of this train had been tested and functioned properly when used en route.

The equipment of No. 8 was inspected from the station platforms by the operators at Marengo and West Liberty, 65.3 and 19.3 miles, respectively, from Durant. Neither operator detected a defective condition. The operator at West Liberty said that the brakes of No. 8 were applied as the train passed the station and sparks were flying from the wheels and the brake shoes. He was not certain that he could detect a sliding wheel under these conditions.

Discussion

Evidence developed during the investigation disclosed that when the train departed from Denver the No. 1 engine in unit 656, the first unit of the locomotive, was inoperative because of defective auxiliary generator bearing. The unit was used with No. 2 engine in operation until ground relay action occurred at a point between Malcom and Brooklyn, Iowa, 91.7 and 85.7 miles, respectively, from point of derailment. Because of repeated ground relay action the engine was isolated and the unit continued with both engines stopped. Under this condition of operation wheel-slip relays were inoperative on unit 656 and the train continued without protection of wheel-slip indication until the accident occurred.

Cause

This accident was caused by a false flange on a slid-flat driving wheel, resulting from a seized traction-motor pinion bearing on a Diesel-electric locomotive unit, and derailed cars obstructing an adjacent main track immediately in front of an approaching train.

- 14 -

Dated at Washington, D. C., this fifth
day of December, 1956.

By the Commission, Commissioner Clarke.

(SEAL)

HAROLD D. McCOY,
Secretary.



PLATE I: Inner bearing race on pinion end of armature shaft of seized traction motor on locomotive unit 856. Radial enlargement of race and indentations where rollers were embedded in the race are shown.

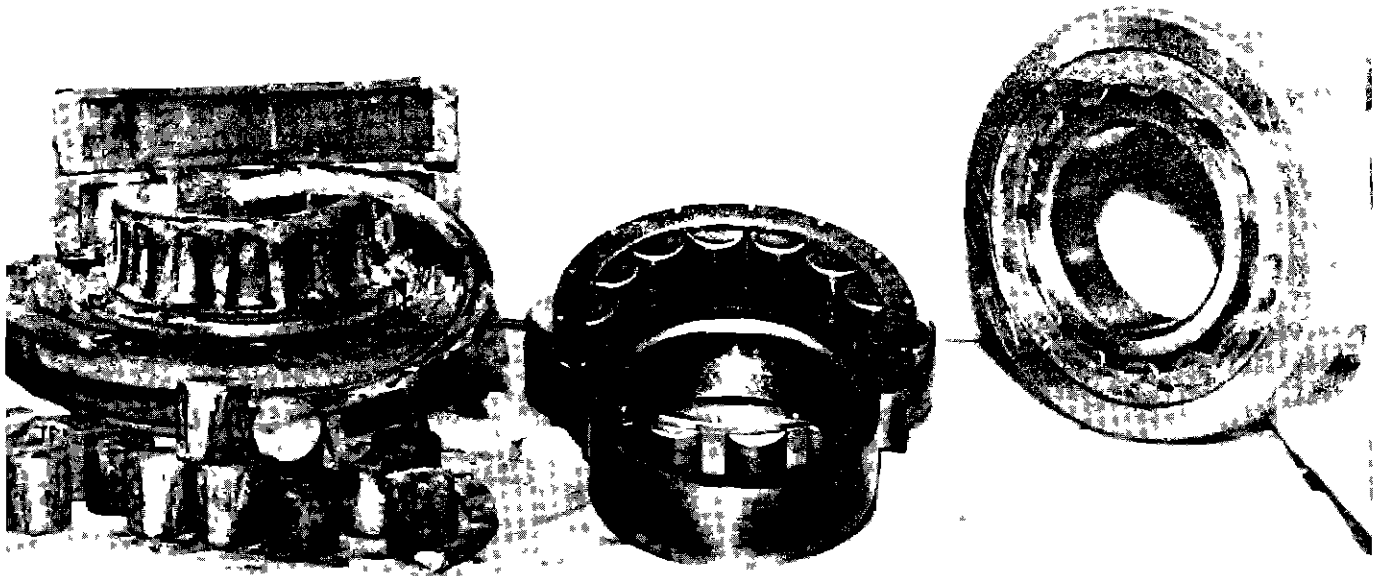


PLATE II: Condition of bearing races, rollers, and cage removed from seized traction motor on locomotive unit 656 as compared with new bearings of the same type.



PLATE III: Slid-flat spot on wheel at commutator end of seized traction motor on locomotive unit 656.

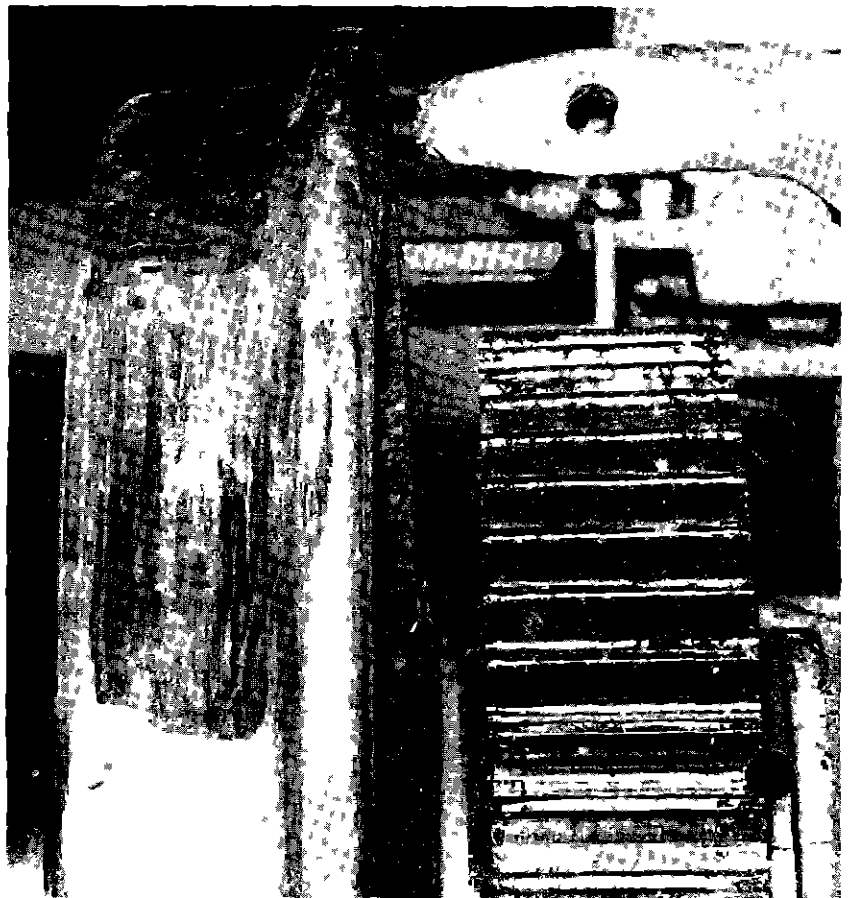


PLATE IV: Slid-flat spot on wheel at pinion end of seized traction motor of locomotive unit 656.