

# THE ERIE TRACK INSPECTION CAR.

Apparatus Designed to Detect Inequalities in Line and Surface of Track and to Make Record on Paper and on the Track.

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In order to ascertain the condition of the track with reference to the gage on tangents and curves, the elevation of the outer rail on curves, low joints and other irregularities in rail or road bed which in any way endanger the safety of high speed trains, and to make comparisons with established track standards, an inspection car containing track testing and registering apparatus has been designed and is now being operated by the Erie.

The track inspection car is built on the general plan of a business car, a passenger car being reconstructed in the company

The car is lighted throughout with 32 volt Tungsten car lights, operated by a standard, axle driven, belted, car lighting generator in connection with a battery of 16 storage cells. The electric lights are supplemented with standard Pintsch gas fixtures.

## RECORDING APPARATUS.

The apparatus for the detection of track irregularities is designed to automatically indicate to the track man by the ejection

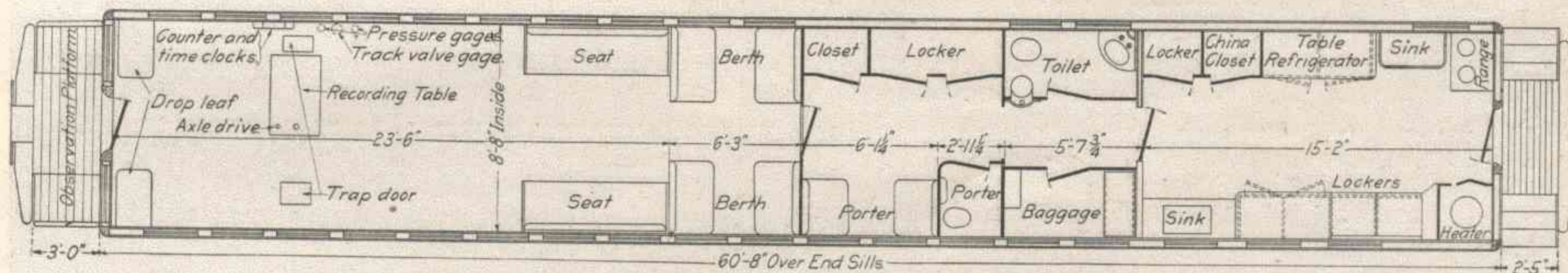


Fig. 1—Erie Track Inspection Car, Floor Plan.

car shops for this purpose. The length of the car is 66 ft. 1 in. It is provided with a 3 ft. rear observation platform and a 2 ft. 5 in. front platform. The observation room in the rear is 23 ft. 6 in. long and 8 ft. 8 in. wide, and is provided with the largest window space available in the rear so that an extensive view of the track is obtained. In front of each rear observation window is a drop leaf table 18 in. x 30 in. The recording table is placed nearly 7 ft. from the rear door on the left side of the car. On the right of the recording table is a trap door 12 in. x 16 in., while on the left is another one 9 in. x 16 in. which permit taking care of the machinery and keeping it oiled. To the

of colored liquids upon the road bed, imperfections of track alinement and to make autographic records for office use and for reference of irregularities of track surface, variation in gage, cross level and car swings, lurches, speed and distance traveled and time in five-second intervals.

The fluctuations in track condition are recorded upon a strip of moving paper, by means of stylographic pens. These pens are arranged in two sets, one of which being stationary, establishes a series of horizontal datum lines, while the other pens have a motion at right angles to the datum, this motion being controlled by the various track imperfection detecting mechanisms

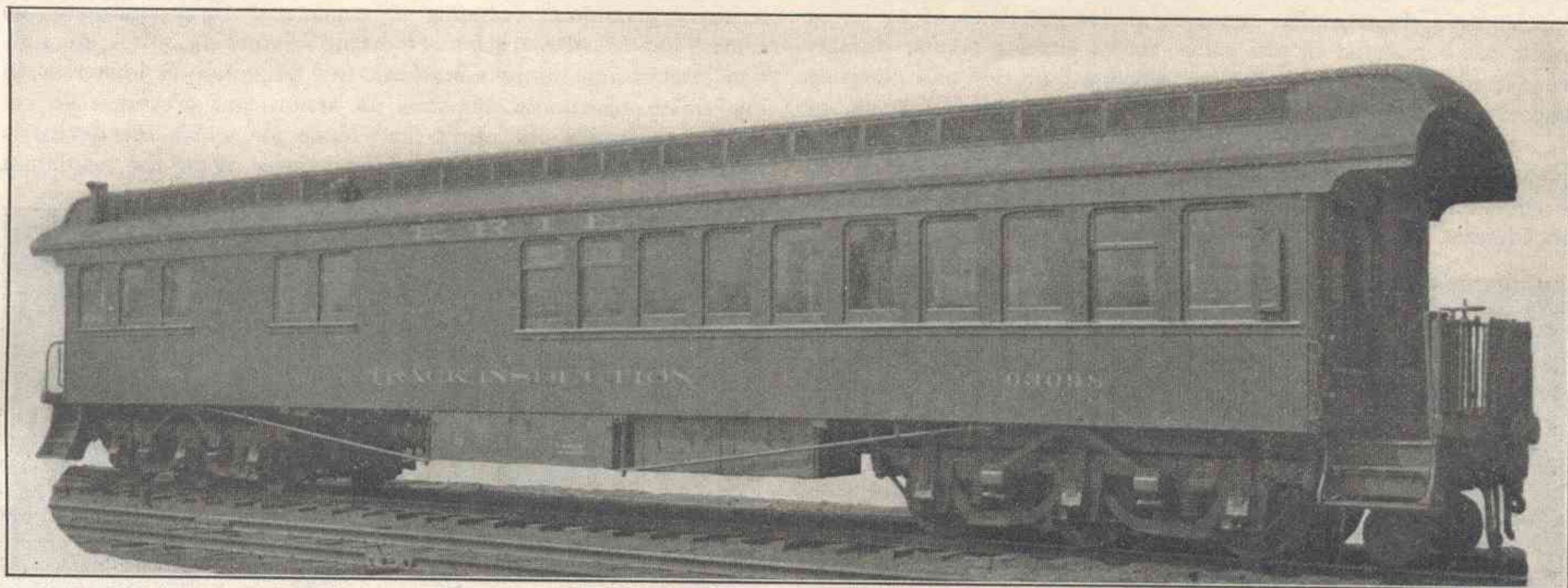


Fig. 2.

left of the recording table, where they can be conveniently seen by the operator, are five counter clocks in a glass case, as shown in Fig. 6. The operator sits at the recording table facing the rear of the car. At his right hand is the three way air valve for raising and lowering the track gauge. Near the counter clock case is a pressure gage showing the air pressure available. Toward the front of the observation room are lounge seats on each side of the car with lockers below. In front of the observation room there are berths for sleeping purposes, lavatories, kitchen, etc.

and being limited by the extent of these imperfections. As the paper moves under the pens at a rate directly proportional to the car speed, the indications of track irregularities appear in their true relation and can be located at any time as may be necessary.

## THE TRACK SURFACE DEVICE.

The purpose of this apparatus is to provide means for the detection of low joints and unsatisfactory conditions of track surface. Vertical movements of the central axle of a six wheel

truck relative to the outer axles, are utilized to indicate the existence and extent of imperfect surface alinement. The mechanism consists of 6-in. I beams mounted over the side sills of the truck and supported at the ends by stanchions, which are fastened to the front and back journal boxes, as shown in Fig. 3. Two plates are bolted on the middle journal box outside and inside of the pedestal. These plates are free to move vertically in yokes attached to the I beam, and their movement in a vertical direction relative to the beam is transmitted to the recording apparatus, by means of a suitable phosphor-bronze wire carried

THE GAGE VARIATION DETECTOR.

The rear six-wheel truck has a two-wheel trailer attached, with its wheels arranged to slide on the axle, as shown in Fig. 4. A system of springs compel the wheels to follow all gage fluctuations, and by means of a phosphor bronze wire these variations are transmitted to the stylographic pen, through suitable brass sheaves and levers.

In order to prevent unnecessary operation, the trailer is flexibly connected and may be raised to clear the track, when so desired. While being raised a spiral clutch automatically grips the wheels

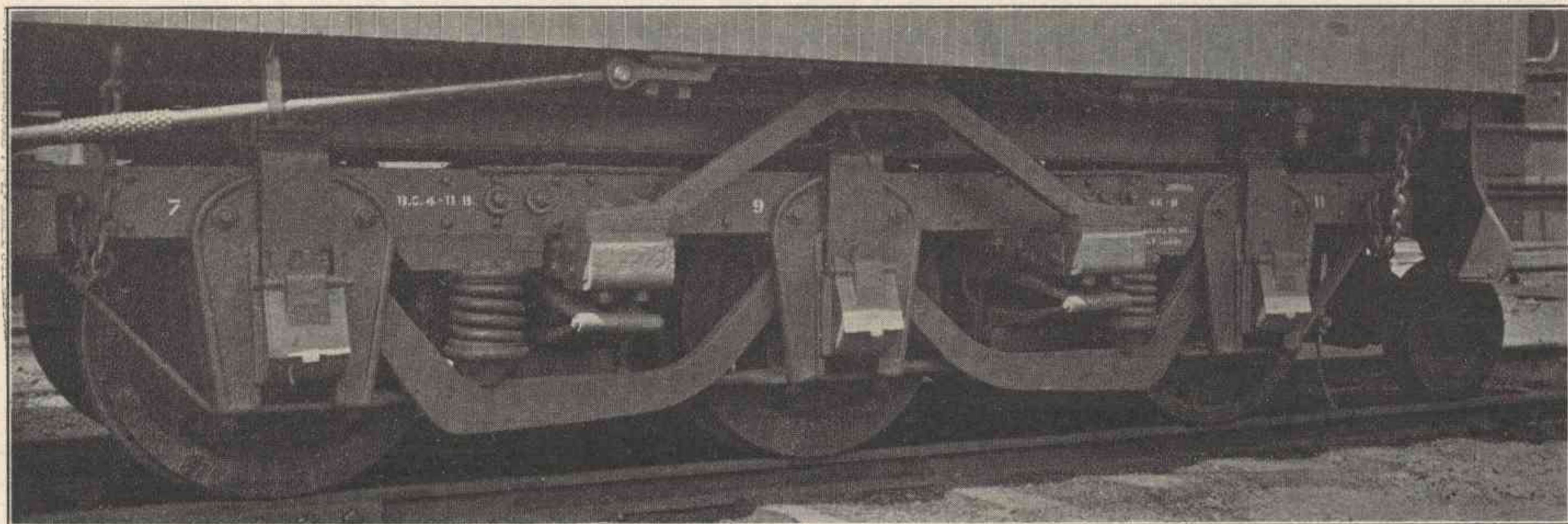


Fig. 3—Arrangement of Apparatus for Detection of Low Joints; Erie Track Inspection Car.

on brass sheaves. This mechanism is applied to each side of the truck and indicates the defects of both rail surfaces simultaneously.

Two sets of adjustable electric contact points are provided on each of the outside plates, fastened to and moving with the middle journal boxes. These points are arranged to make connection with corresponding contacts carried on the I beams. Whenever a variation of track surface amounting to  $\frac{3}{8}$  in. or over is encountered, one set of points makes an electrical contact and the condition is automatically registered by means of a counting mechanism. In a similar manner, all irregularities of  $\frac{5}{8}$  in. or more are registered by the other set of contact points, suitably connected in series with the car storage batteries and counting apparatus. It is further provided that when either a  $\frac{3}{8}$  in. or  $\frac{5}{8}$  in. variation in surface alinement is registered, an electro pneumatic spotting valve simultaneously opens and ejects a colored liquid upon the road bed, thereby marking the location of the defects.

and draws them inward until they register 4 ft. 8 in. in gage, so that when lowered the trailer wheels will fall correctly inside a 4 ft. 8½ in. standard gage track. The raising and lowering operations are pneumatically performed, and are controlled by means of a three-way air valve, conveniently located in the car observation room.

THE CROSS LEVEL INDICATOR.

Objectionable car swings owing to imperfect cross level conditions are indicated, and their extent recorded by the motions of a heavy pendulum, swinging in a plane at right angles to the center line of the track. To avoid disturbing effect of sudden lurches and minor vibrations, this pendulum is immersed in oil, which effectually dampens its action and prevents the recording of conditions other than those for which the device is intended. The action of centrifugal force upon the pendulum

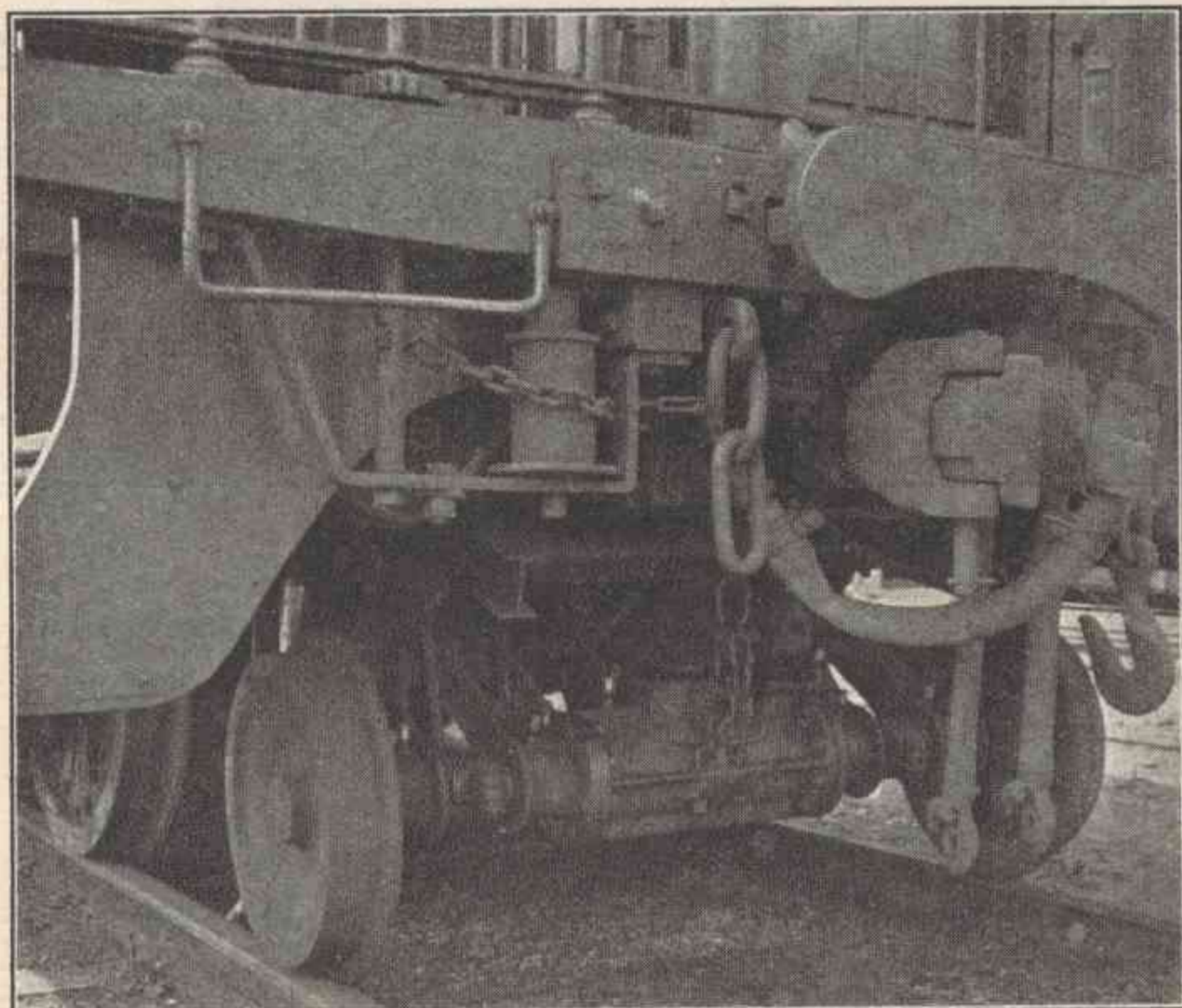


Fig. 4—Apparatus for Detection of Variations in Track Gage.

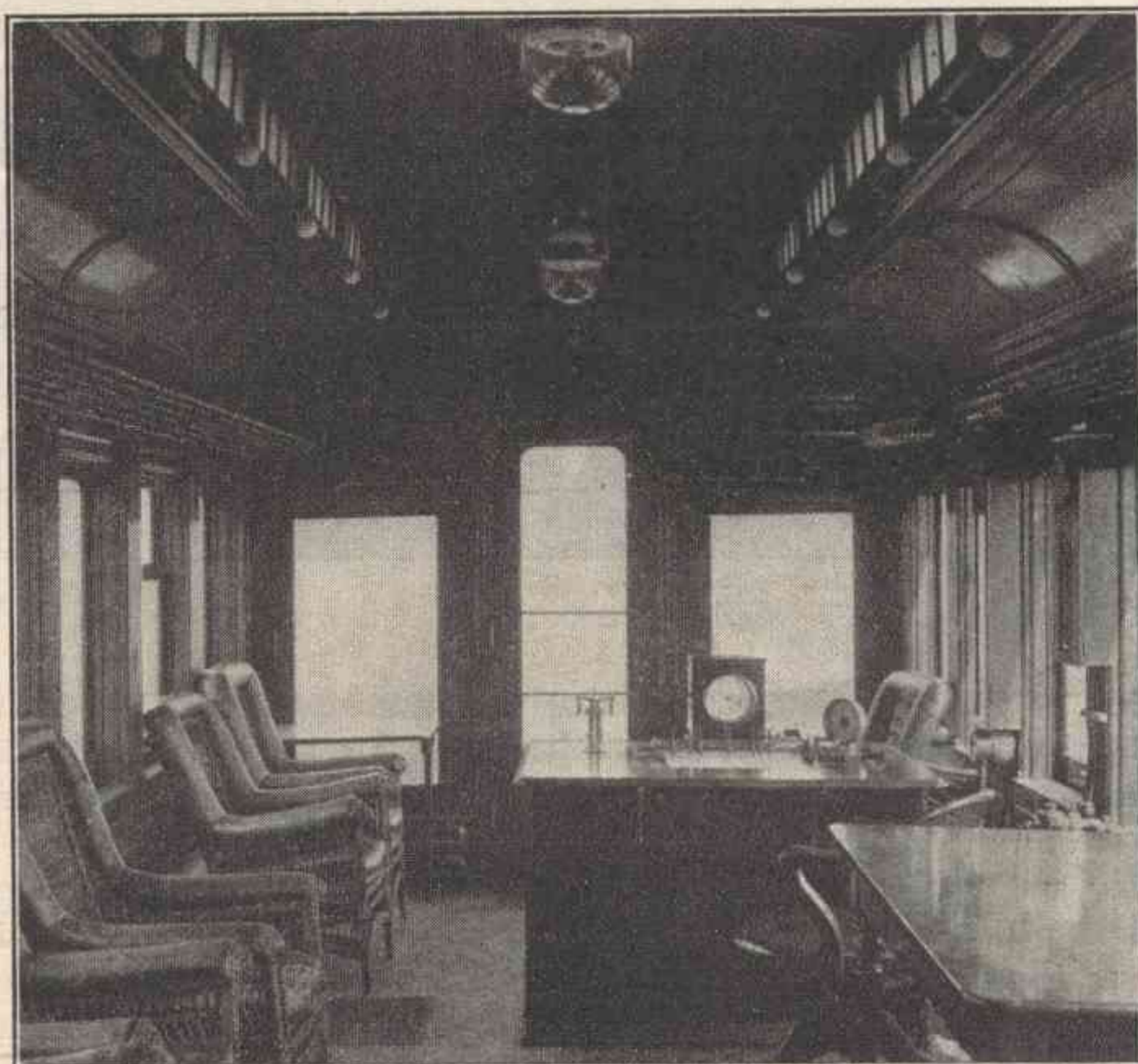


Fig. 5—Interior of Car, Looking Towards the Rear.

when rounding curves is compensated for by an adjustment in the recording arm connection. The effect at various speeds is thus controlled so that a true record of cross level conditions is registered by the stylographic pen.

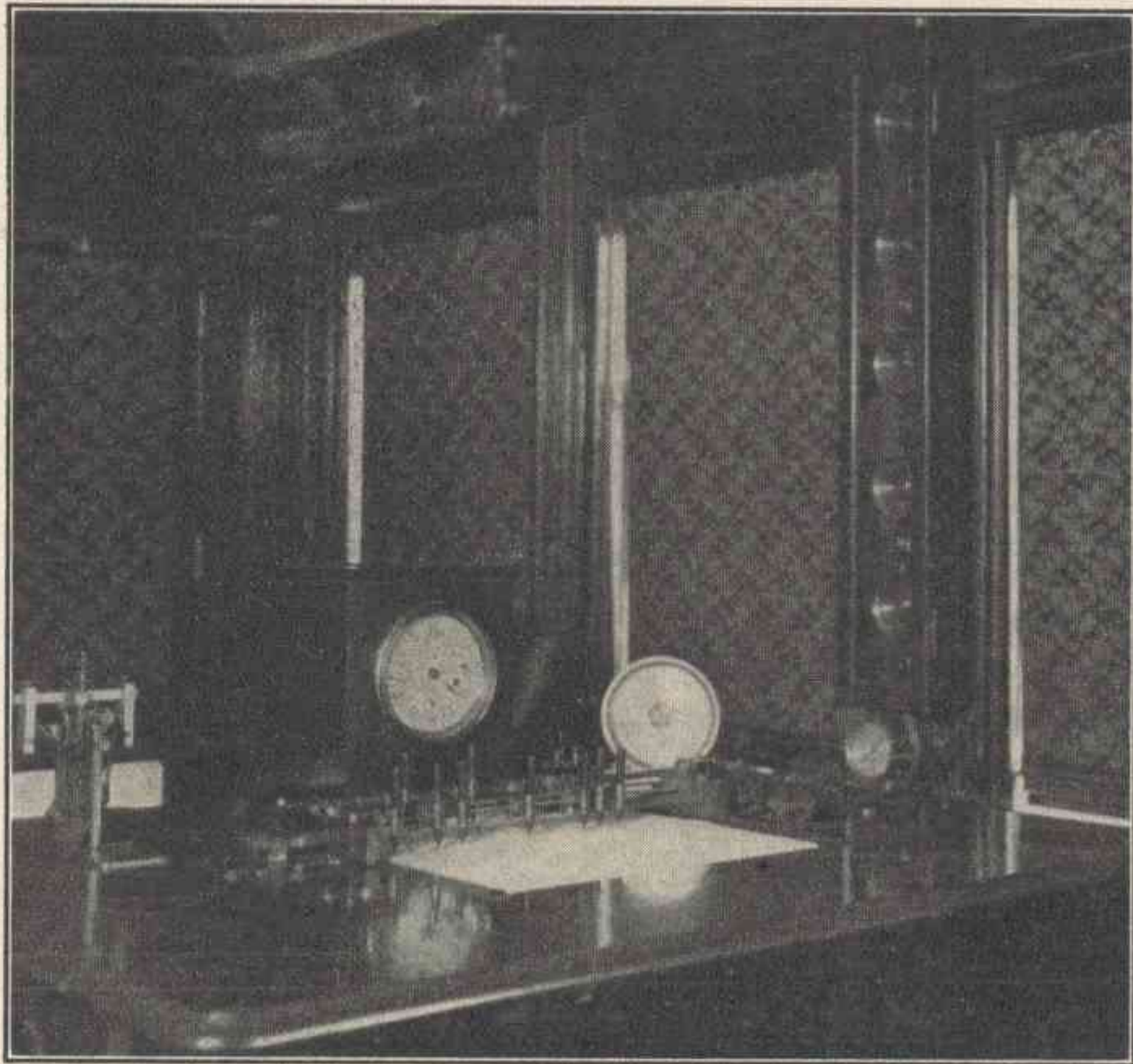


Fig. 6—Operator's Table, Recording Apparatus and Counter Clocks; Erie Track Inspection Car.

THE LURCH RECORDING DEVICE.

This apparatus is a more sensitive mechanism than the previously described cross level indicator. Its purpose is the detection of minor vibrations and sudden car lurches caused by various imperfect track conditions. The device consists of a pendulum which swings in a plane at right angles to the center line of the track and carries two copper balls, each secured to the end of a light band steel spring, which in turn is fastened at one end to the pendulum blade by an adjustable screw clamp. The copper balls are thus free to vibrate at the end of steel springs held in a vertical position and parallel with the pendulum. A sudden car lurch produces a corresponding motion of the pendulum. This motion, transmitted to the copper balls through the flexible steel springs, causes one of them to fly out and make electrical connection with suitable contacts. The pen registering car lurches is electro-magnetically operated, and when the copper ball makes a contact the otherwise continuous car lurch line is notched, which notch constitutes a record of an objectionable track condition causing the lurch.

An electric counting mechanism and electro-pneumatic spotting valves are also wired in series with the above recording apparatus; thereby each individual defect is automatically counted and the track simultaneously marked with a colored liquid.

SPEED, TIME AND DISTANCE INDICATORS.

An electric contact time clock is connected in circuit with the datum line pens and arranged so that each five-second interval is registered by a notch. As the movement of the record paper is proportional to the distance traveled, these notches in the datum line serve as a means to determine the train speed. The location of mile-posts, stations, bridges, etc., are also recorded

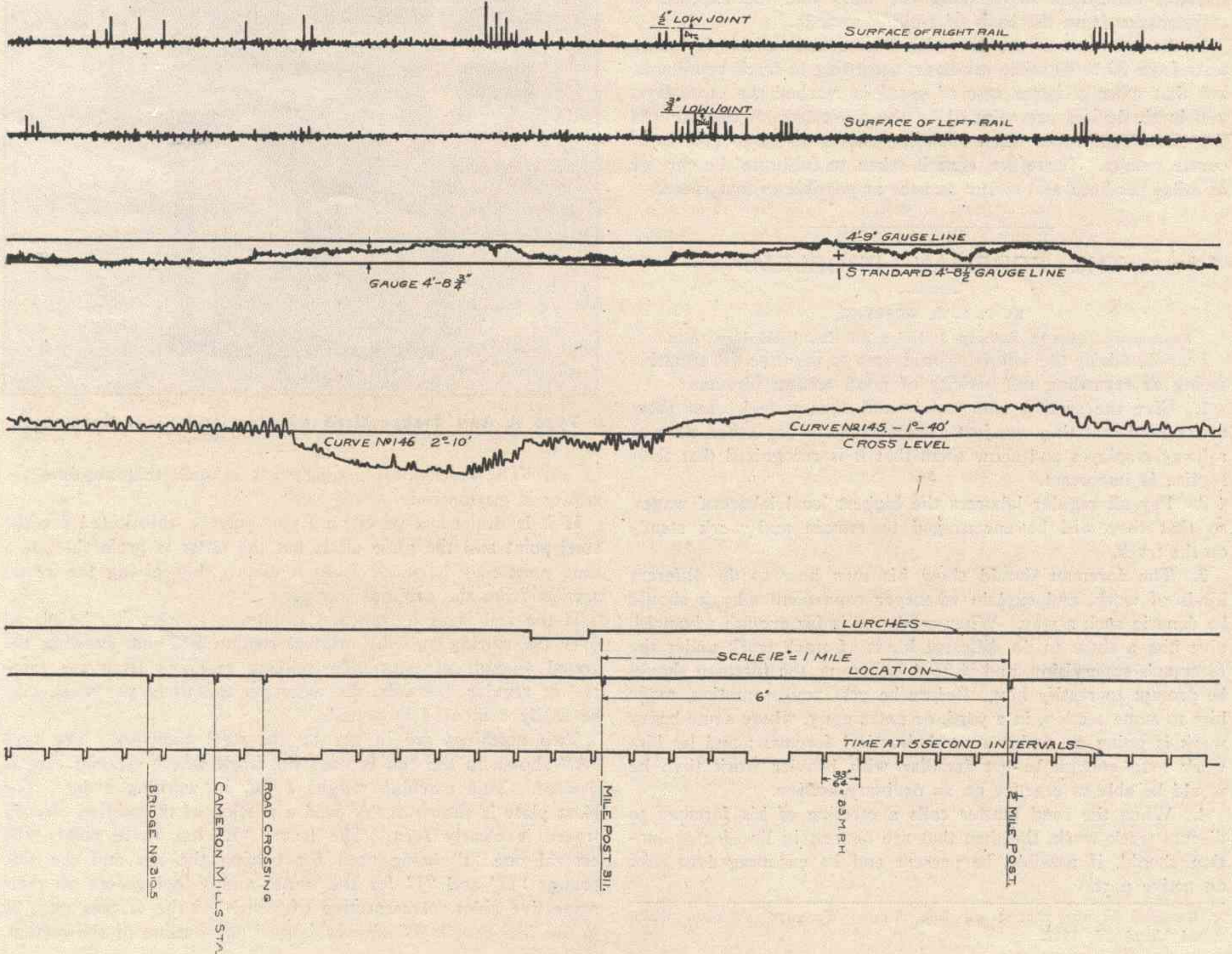


Fig. 7—Part of a Record Diagram.

electrically by an observer, who presses a key as the car passes such points. These indications constitute an accurate method whereby the position of track imperfections can be located, and provide a check upon the operation of the track-spotting device.

Before placing this car in service, the various detecting and recording mechanisms were carefully calibrated, upon a section of specially prepared track. As all the devices are provided, where necessary, with suitable adjustment facilities, it is anticipated that future track inspection work can be performed and accurate records obtained covering a wide range of conditions.

The car and apparatus were completed and put into service in July, 1911, and immediately following that date a complete test of all track on the system was made. A similar inspection was again made in the fall of the year.

In making tests the car is run on the rear of a special train at a regular rate of 35 miles per hour. On the usual run about 350 miles of track is tested in a day. The charts made by the car are blueprinted and copies of their respective sections furnished to the track foreman. Prints are also furnished to the division engineers, and a complete set to the chief engineer of maintenance of way. At the same time reports showing the total and average number of  $\frac{3}{8}$  in. and  $\frac{5}{8}$  in. or over low joints and carswings per mile for each section and division are made up.

The maintenance of way officials are present on these tests and inspect the general conditions of the track, the division engineers, superintendents and supervisors accompanying them over their respective territories. Following the fall inspection and test, reports are made up and the charts and records are compared with those taken in July.

A system of prizes for the best sections has been established. The track charts, the records of spring and fall inspections, the physical conditions surrounding the work and the expense of maintenance from the basis of making awards.

In the operation of the car it has been found reliable in taking tests from 30 to 40 miles per hour, according to track conditions, but that when a faster rate of speed is reached the cross level and lurch devices are affected by the movement of the car and the centrifugal force when rounding curves so as to give inaccurate results. Therefore, care is taken to calibrate the car for 35 miles per hour and to run as near as possible to that speed.

## THE FOREMAN PROBLEM.\*

BY P. J. M. WOSLYNG,

Roadmaster, Alberta Railway & Irrigation Co., Lethbridge, Alta.

I would advise the following measures to improve the situation facing us regarding the scarcity of good section foremen:

1. Give the section men a fair and square deal. Let them understand that they are just as important as any other class of railway employes and show them that it is recognized that their service is important.

2. Pay all regular laborers the highest local laborers' wages, so that they will be encouraged to remain and work steady on the track.

3. The foreman should show his men how to do different kinds of work, and explain whenever convenient why it should be done in such a way. When a laborer is far enough advanced, give him a show to do different kinds of track work under the foreman's supervision, and if he does wrong, the foreman should be prompt to rectify him. Before he gets any promotion, move him to some section, in a yard, or extra gang, where some heavy work is going on under a good practical foreman; and let him work long enough to get familiar with heavier work than he would be able to practice on an ordinary section.

4. When the road master calls a meeting of his foremen to discuss track work, the men that are nearest in line for promotion should, if possible, be present and be encouraged to take an active part.

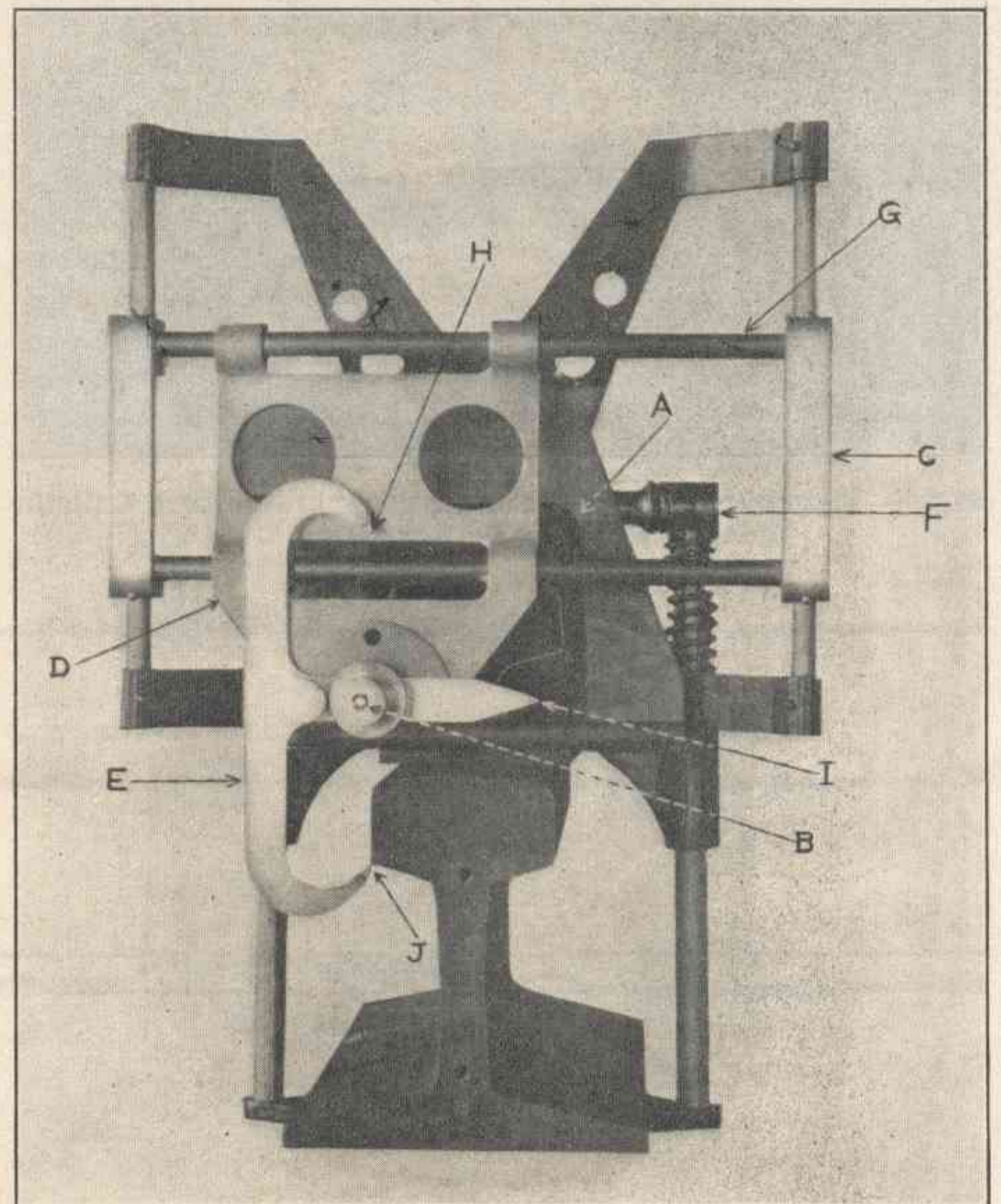
\*Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

## RAIL TRACING MACHINE.

BY J. H. K. SHANNAHAN, JR.

It is of importance to both the railways and the manufacturers to have a quick, accurate method of determining the wear of rails in service, especially on stretches of track where the service is known to be severe. This enables the railway company to make accurate comparisons of the wearing qualities of the rails furnished by the various manufacturers, and it also serves as guide to the manufacturers themselves.

The Maryland Steel Company has had in use for several years a machine which is simple in design, accurate in execution and easily operated. By moving steel tracer points over the surfaces of the head, a facsimile section of the rail is traced simultaneously on a glass plate coated with lampblack ground



Type A Rail Tracer Used by Maryland Steel Company.

in oil. The mechanical arrangement is such that absolute accuracy is guaranteed.

If it is desired, a pencil and pad may be substituted for the steel point and the glass plate, but the latter is preferable, as a blue print may be made from it direct, thus giving the actual section from the original tracing.

If the rail is of a standard section, a templet can be placed over the tracing and the original section laid out, showing the actual amount of wear. By making readings from the same rail at regular intervals, the wear per month or per week may be easily computed in pounds.

Two machines are in use by the steel company. The type "A," shown in the cut, is used for work where especial care is desired. This machine weighs 7 lbs. in working order. The glass plate is shown at "A" and a portion of the section already traced is clearly seen. The tracer "E" has three points, the central one "I" being used for tracing the top and the side prongs "H" and "J" for the under and side furnaces on their respective sides. Irrespective of which of the tracers may be in use, the pencil "B" always follows the outline of the section.