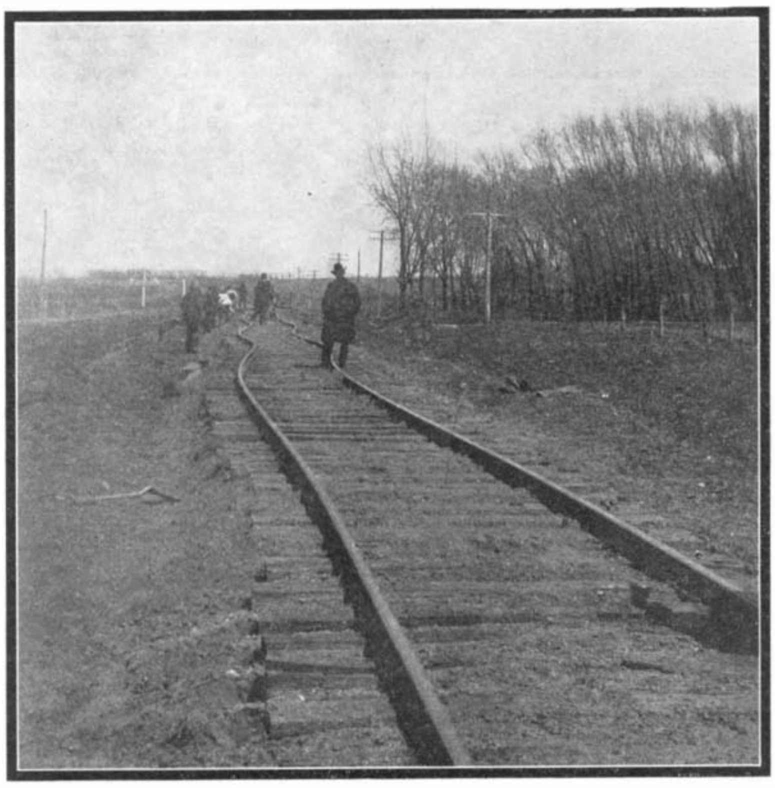
A BAD CASE OF WARPED RAILROAD TRACK.

The most extreme case of distortion of railroad track, due to changes of temperature, that ever came to our notice, is that which is shown in the accompanying illustration. It occurred on April 27, shortly after noon, at a point about three miles northeast of Waterloo, Iowa, on the Chicago & Great Western Railway, and it required no small amount of work on the part of the section gang to get the track back into such shape that the noon passenger train, which was stopped by the accident, was able to proceed.

The track, which was laid about two years ago, is at this point practically level, and the ties are laid in gravel and sand. Apparently there had been no very sudden change in temperature, the government readings giving 62 as the maximum temperature at Dubuque, Davenport, and Des Moines. The probable explanation is that there may have been a creeping of the track during the recent very cold weather, which caused a local closing up of the joints until the rail ends were in close contact; and that with the return of warm weather, the expansion of the rails caused the track to give way laterally at the spot where the resistance was least. It will probably be found that the resistance of the ballast to lateral displacement was considerably less on the stretch of track where the distortion took place, than for a considerable distance on either side of it. Railroad men are accustomed to distortions of the track due to temperature changes; but we think that the most experienced veteran will look upon this picture with no small amount of wonderment.



BAD CASE OF WARPED RAILROAD TRACK.

THE CYCLOGRAPH.

BY EMILE GUARINI.

The apparatus called a cyclograph, recently devised by Mr. Ferguson, is designed for the same purpose as the pedograph of the same inventor, that is to say, for automatically making a topographical record of the ground traversed during a journey. The new apparatus differs from its predecessor in that it is designed for the bicyclist, while the pedograph was designed for the pedestrian. It consists essentially of a flat box arranged horizontally upon the handle bar of the bicycle and containing a sheet of drawing paper, which, owing to the meridians that are traced upon it, may be kept constantly in position in the direction of the road according to the indications of a compass mounted upon the top of the box. As a result of the motion of the bicycle, the paper always moves backward in the direction of the longitudinal axis of the bicycle, and a small inked wheel rubbing over the paper inscribes a line upon it. If the bicyclist makes an angle upon the ground, he turns the paper (guiding himself by the indications of the compass) at an equal angle in the opposite direction. This is always done around a point situated beneath the marking wheel as a center. The paper immediately continues its motion backward as before. As a result there is marked upon the paper a line which exactly indicates the trip made. The motive power for actuating the cyclograph is obtained from a very simple eccentric arrangement fixed to the front wheel. A disk of thin steel, with an interior eccentric circle, is placed in the vicinity of the spokes of the wheel in such a way that it can revolve freely with the wheel without striking the fork. Upon the periphery of this disk slides a shoe forming part of a lever which is secured, in such a way that it can oscillate, to a small bracket projecting forward from the axis of the wheel outside of the fork. This arrangement may be seen in Fig. 1. When the apparatus is not in operation, the lever may be dropped out of contact with the disk. The apparatus may be easily started again by raising the lever until the shoe touches the edge of the disk.

Fig. 3 shows the manner in which the motive power thus produced is utilized in the apparatus. The horizontal lever, *A*, is capable of oscillating around the vertical shaft of the driving wheel, *B*, and striking alternately the posts, *C* and **D**. Of these latter, the first is stationary, and the second movable upon a graduated scale to which it may be secured by means of a thumb screw, *E*. In an inoperative position, the lever is held against *C* by the spring, *F*, which has sufficient strength to keep taut the wire, *W*, that runs to the eccentric. If a pull be given the wire, the lever will be moved until it strikes the post, *D*. The excess of power still exerted by the eccentric at this moment is absorbed by the spring, *G*. In this way, the lever is always limited to the amplitude of oscillation allowed by the adjustable post, and which ranges from zero to maximum, according to where the post is set. Upon each side of its fulcrum point the lever is provided with vertical flanges, *H*, which leave between them and the rim of the wheel, *B*, two oblique spaces in which the disks, *K*, are inserted in such a manner that they have a slight play. If the lever, *A*, moves toward *C*, the disks will slide with an imperceptible friction along the rim of *B*, in such a way that the rubbing spring, *L*, can only just maintain the wheel, *B*, in position. When the lever moves in the opposite direction, the small disks, *K*, become jammed between flanges, *H*, and the wheel, and thus turn it. The reason for this is that when the lever moves in one direction the disks, by rubbing against the wheel, are pushed into the widest space between the flange, *H*, and the wheel's periphery, while when the lever moves in the opposite direction they become jammed in the narrowing space between *H* and the wheel rim, thus moving the latter, as stated above. The result is that the various positions in which the post, *D*, is placed, will determine the amount of movement given the wheel at every revolution of the bicycle wheel, since each turn of this wheel produces an oscillation of the lever. The wheel, *B*, has a double-threaded worm, *M*, upon the upper end of its shaft, and this drives the small gear, *N*. The teeth of this gear project above the cover plate, **O**, through a slot in the latter. The paper is placed upon the plate, **O**, between the gear, *N*, and the inking wheel, *P*.

If, as a consequence of the oscillations of the lever, *A*, the gear wheel, *N*, begins to move, it will carry the paper along with it. The inking wheel will revolve and draw a line upon the upper surface of the paper, while the teeth of the gear wheel will leave their marks upon the lower surface. These marks will be spaced one millimeter apart. As every oscillation of the lever corresponds to one revolution of the wheel of the bicycle, and consequently to about 2.15 meters (7 feet) of the road, one millimeter upon the paper therefore represents as many times 2.15 meters upon the road as it has required oscillations of the lever, *A*, to cause the wheel, *B*, and the worm, *M*, to make only a revolution. The latter is double-threaded and moves gear, *N*, one tooth for every half revolution that it makes. The scale may therefore be established at will for any value from one ten-millionth up to $1/\infty$.

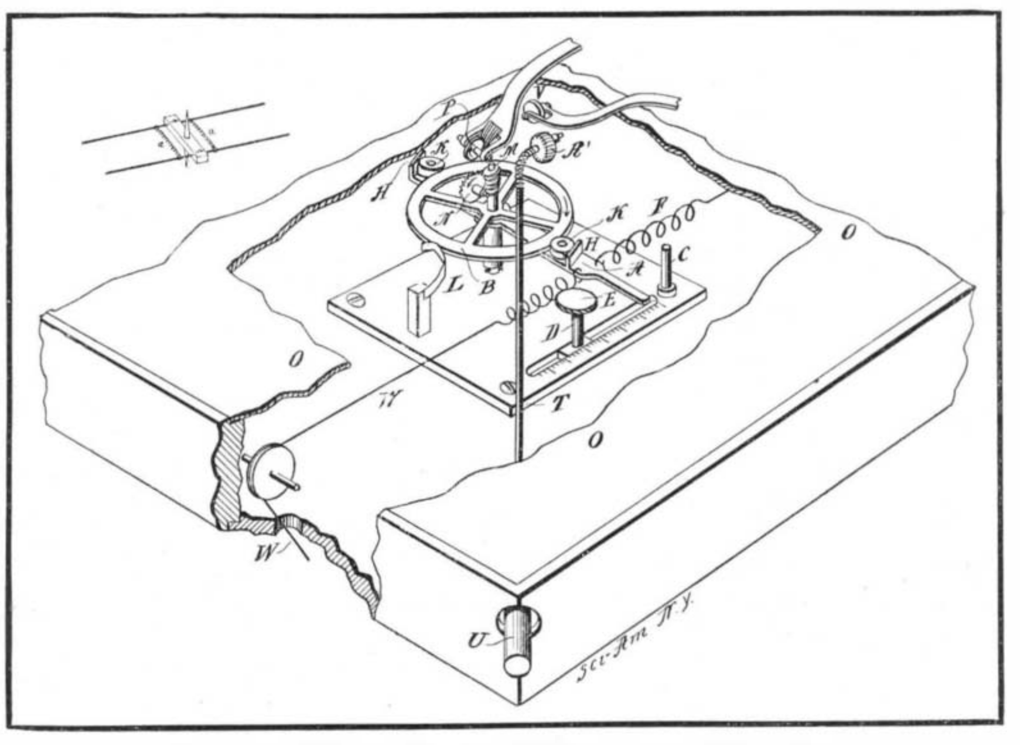


Fig. 3.—DETAILS OF THE MECHANISM OF THE CYCLOGRAPH.

In order to prevent displacement of the paper, the apparatus is completed by the arrangement *U T A′ V*, which serves at the same time to turn the paper at a certain angle. *U* is a rod provided with a grip, by means of which the arrangement is actuated; *T* is the prolongation of the rod; *A′* a milled wheel mounted upon a spring that plays the part of a flexible shaft; and *V* is another roller, which presses the paper against *A′* which projects through a slot in the plate **O**. If the route is north-south, the paper will be moved regularly backward; but if the road turns, the bicyclist turns the paper at the same angle by means of the arrangement just described and as indicated by his compass.

In order to do away with the inconveniences inherent in

Fig. 1.—THE CYCLOGRAPH ON A BICYCLE.

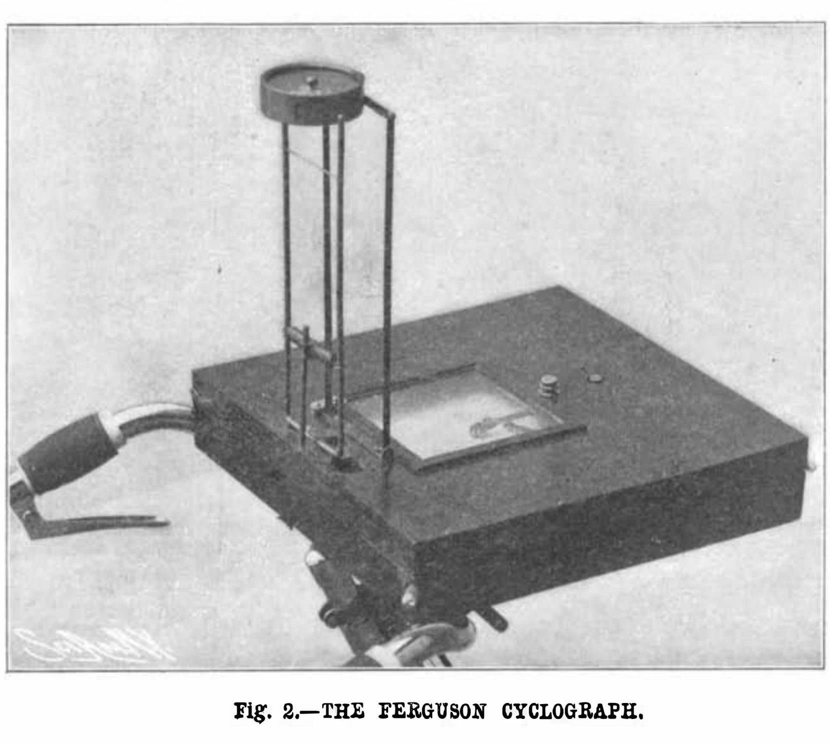


Fig. 2.—THE FERGUSON CYCLOGRAPH.