2 Sheets—Sheet 1.

L. C. SCHNELL.

Clinometer.

No. 199,319. Patented Jan. 15, 1878.

Fig. 1.

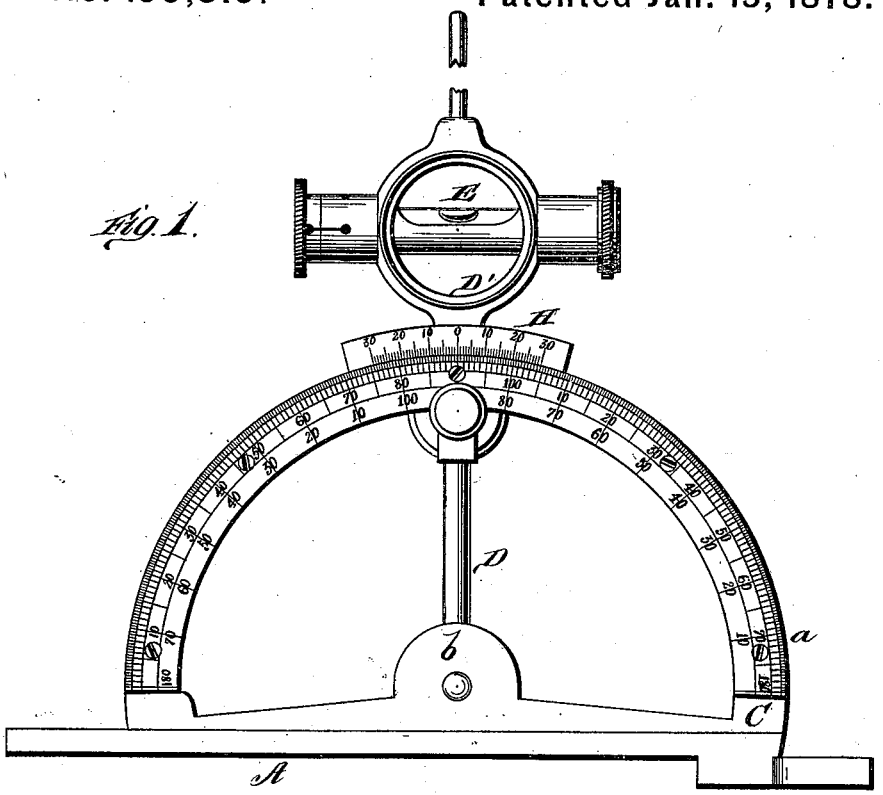

Fig. 2.

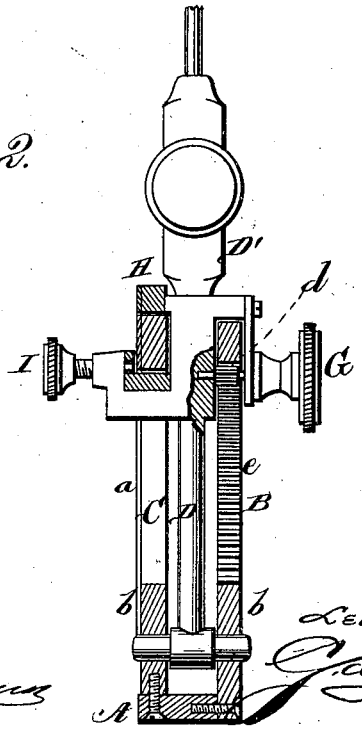

Fig. 3.

WITNESSES

Robt. Ewalt

George E. Upham

INVENTOR.

Lewis C. Schnell.

C. Clarence Smith & Co.

ATTORNEYS.

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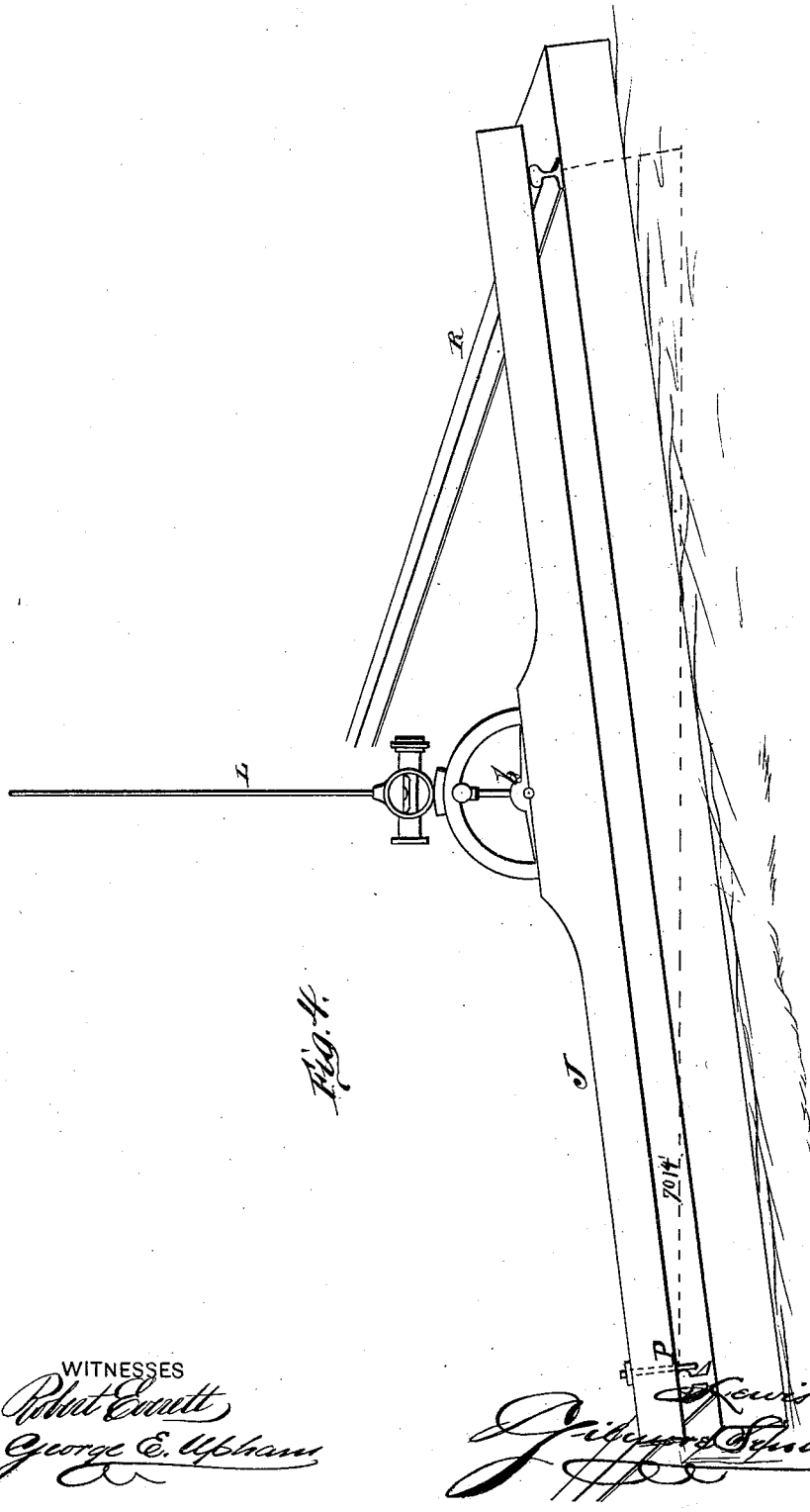

Fig. 4.

WITNESSES

Robt Ewett

George E. Upham

INVENTOR.

Lewis C. Schnell.

Gibson & Spinks

ATTORNEYS

UNITED STATES PATENT OFFICE.

LEWIS C. SCHNELL, OF AKRON, OHIO.

IMPROVEMENT IN CLINOMETERS.

Specification forming part of Letters Patent No. **199,319**, dated January 15, 1878; application filed November 24, 1877.

To all whom it may concern:

Be it known that I, LEWIS C. SCHNELL, of Akron, in the county of Summit and State of Ohio, have invented a new and valuable Improvement in Clinometers; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a front view of my clinometer. Fig. 2 is a transverse vertical sectional view. Fig. 3 is a detail view, and Fig. 4 is a view of my clinometer as applied.

The nature of my invention relates to the construction of a clinometer, or an instrument designed for the purpose of measuring the elevation of the outer rails on railway-curves, as will be hereinafter more fully set forth, and pointed out in the claims.

The annexed drawings, to which reference is made, fully illustrate my invention.

A represents the bed or bed-plate of the instrument, upon which are secured two upright semicircles or limbs, B and C, of the same radius. Upon the face of the semicircle C is attached or formed a graduated arc, *a*, reading to half-degrees, as shown.

To or between ears *b b* in the center of the bed A is pivoted an arm, D, which passes up between the semicircles B C, and on the upper end thereof is secured or formed a ring, D′, in which is arranged a spirit-level, E.

The arm D is operated by means of a pinion, *d*, secured on a shaft, having a suitable thumb-piece, G, for turning the same. The pinion *d* meshes with a semicircular rack, *e*, formed on or attached to the inner edge of the semicircle B. To the arm D is attached a vernier, H, sliding over the graduated semicircle C, said vernier being adjusted by means of the thumb-piece G, pinion *d*, and rack *e*. I is a clamp-screw, by which the movable bar or arm D and level E are made firm when adjusted.

This instrument may be attached to a bar, J, of any length; but such bar should be of sufficient length to reach from rail to rail, as shown in diagram, Fig. 4.

It is evident that there is a limited height to which the outer rail must be raised, so that it may counteract the centrifugal force, and keep the flange of the wheel from wearing the rails to an extreme extent, and also to reduce the amount of friction and diminish the strain upon the axle.

I have calculated a table showing the elevation of the outer rail according to the diameter or radius of the curve and the speed at which the trains are intended to pass around the curve.

Referring to diagram, Fig. 4—take, for example, a 4° 20′ curve—it is found by calculation that the elevation of the outer rail in 4.8½-foot gage is equal to .590, or nearly six-tenths, of a foot. This distance or elevation subtends an angle at P on the inner rail equal to 7° 14′, with a velocity of fifty miles per hour. Now, if this angle be deflected upon the clinometer, and the arm D clamped, it will only be necessary to level the instrument and raise the outer rail to the level of the bar J, and so on with every degree of curvature from one degree to thirteen degrees and intermediate minutes. This is applicable to serve all velocities from twenty to fifty miles per hour.

To the top of the level ring D′ is attached a rod, L, for the purpose of measuring switch or frog angles in cases of turn-outs and switches. This is done in the following manner: Lay the plane of the leveling-bar upon the iron, with the center point *b* at R on the rail; then set the vernier so that it will measure the required angle, and, by comparing with the rod L, any number of stakes may be located on a line.

I claim as new and desire to secure by Letters Patent—

1. In a clinometer, the combination, with the bed A, having ears *b b*, of the arm D, pivoted to ears *b* of the bed, and passing upward between the semicircles B C, and having on the upper end thereof a ring, D′, in which is arranged a spirit-level, substantially as and for the purpose set forth.

2. In a clinometer, the pivoted arm D, carrying a spirit-level, operated by means of a pinion, *d*, attached to a shaft, having a thumb-

piece, G, for turning the same, in combination with the semicircular rack *e* of the semicircle B, substantially as described.

3. The herein-described instrument called "clinometer," consisting of the bed A, graduated semicircle C, cogged semicircle B, centrally-pivoted bar D, with level E and vernier H, adjusting device G *b*, and clamping-screw I, all substantially as and for the purposes herein set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

L. C. SCHNELL.

Witnesses:
THOS. O'BRIEN,
CHAS. L. CHASE.