(No Model.) 2 Sheets—Sheet 1.

C. M. FERGUSON.

RAILWAY TRACK GAGE, LEVEL, AND GRADIENT.

No. 329,895. Patented Nov. 10, 1885.

Fig. 1

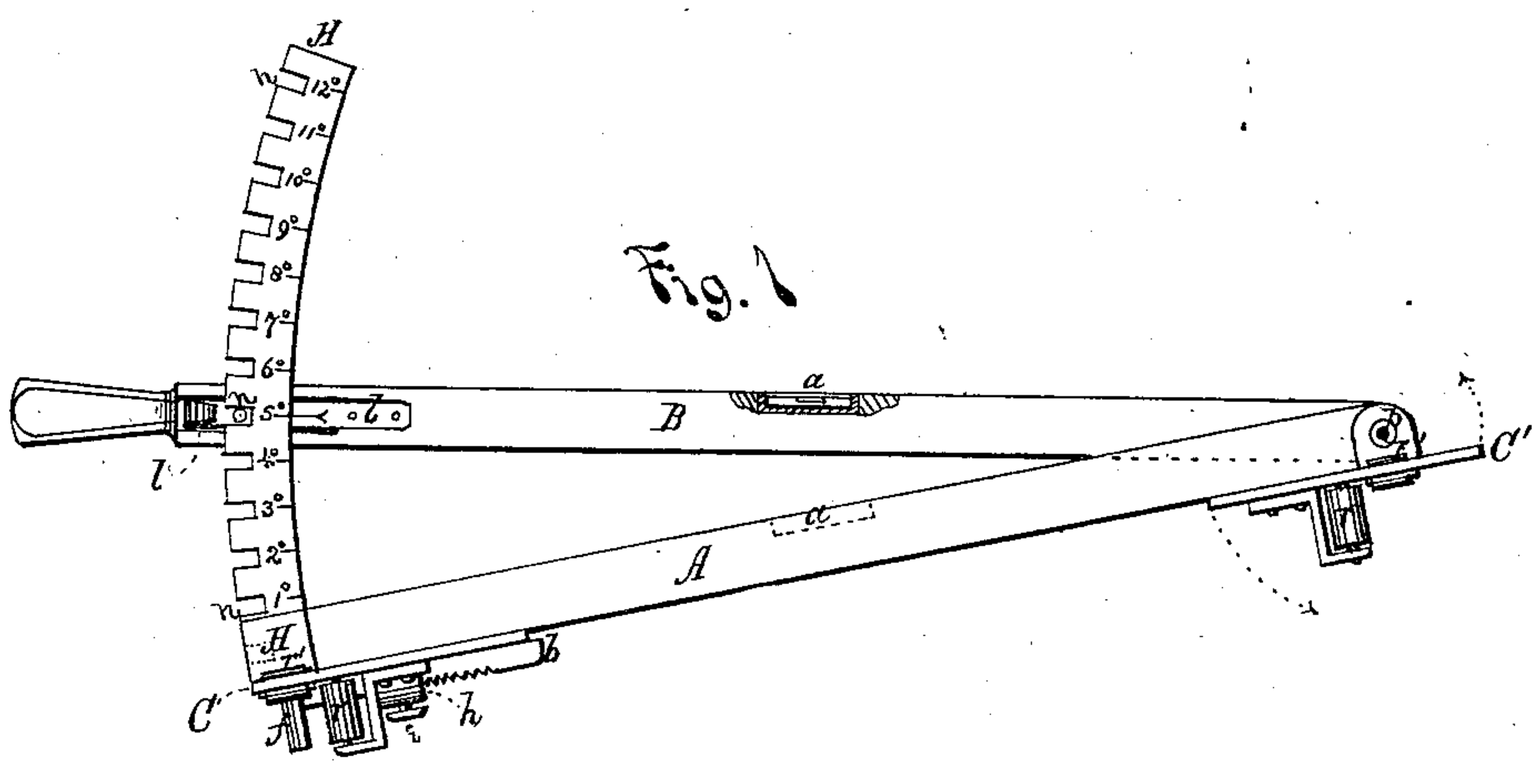


Fig. 2

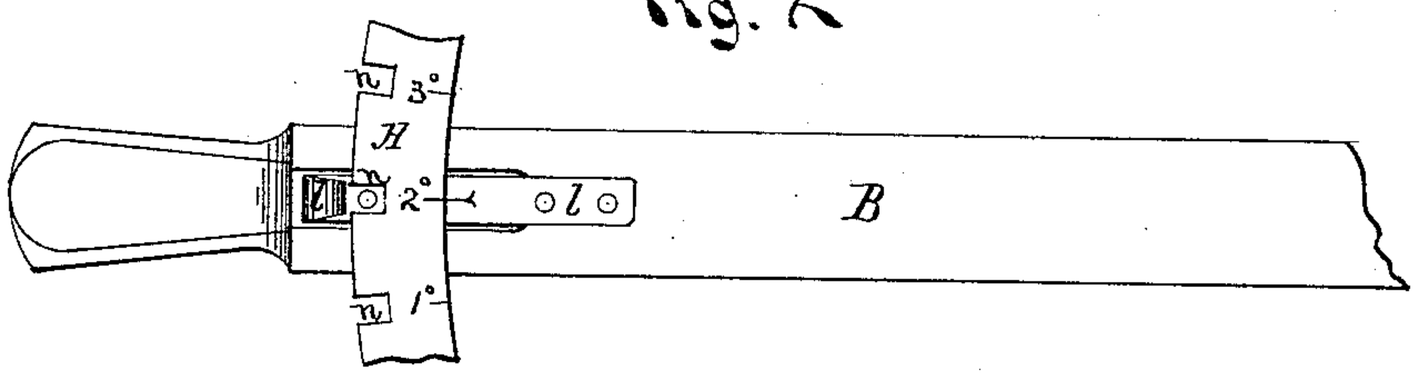


Fig. 3

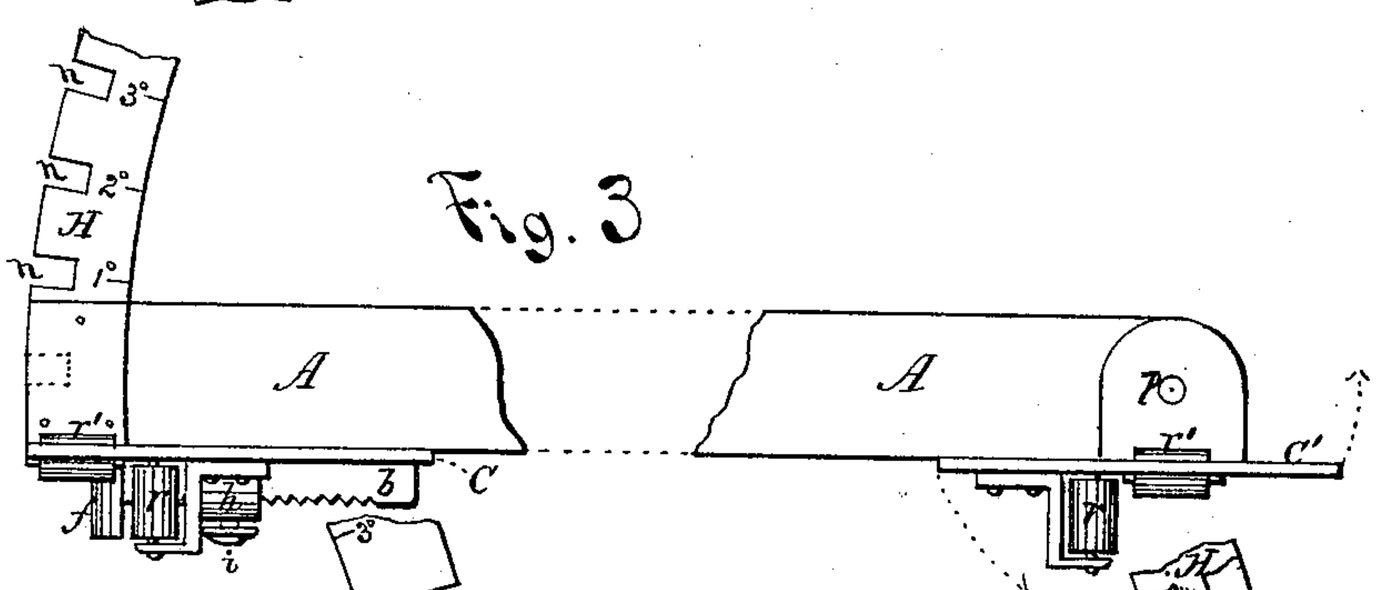


Fig. 4

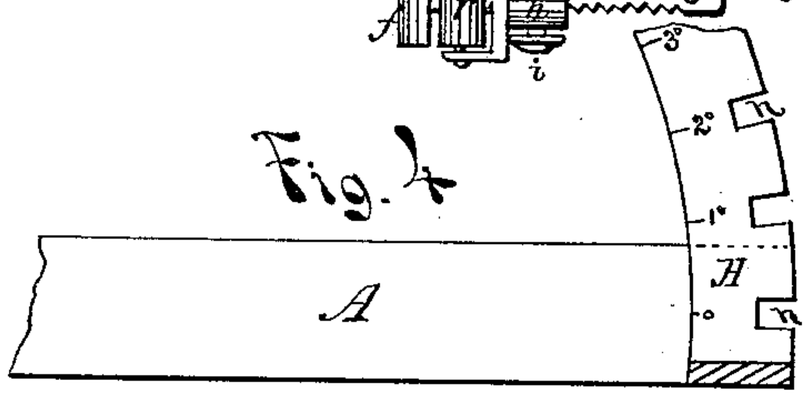
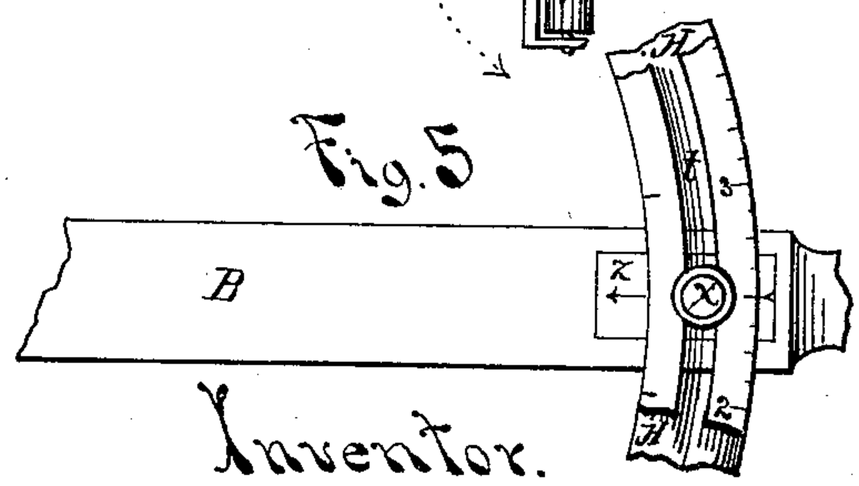


Fig. 5



Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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RAILWAY TRACK GAGE, LEVEL, AND GRADIENT.

No. 329,895. Patented Nov. 10, 1885.

Fig. 6

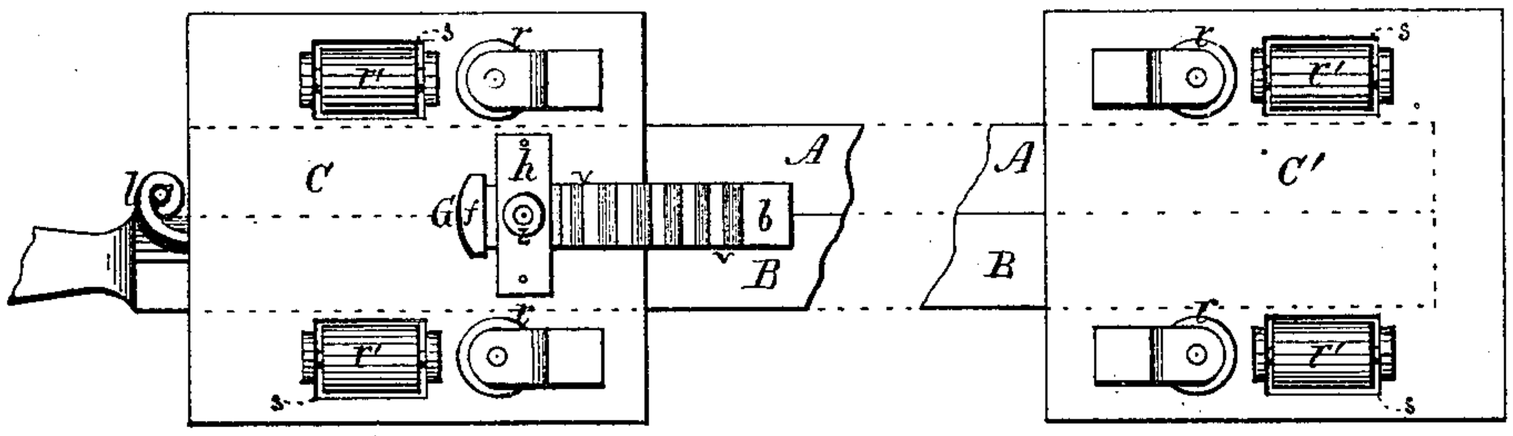

Fig. 7

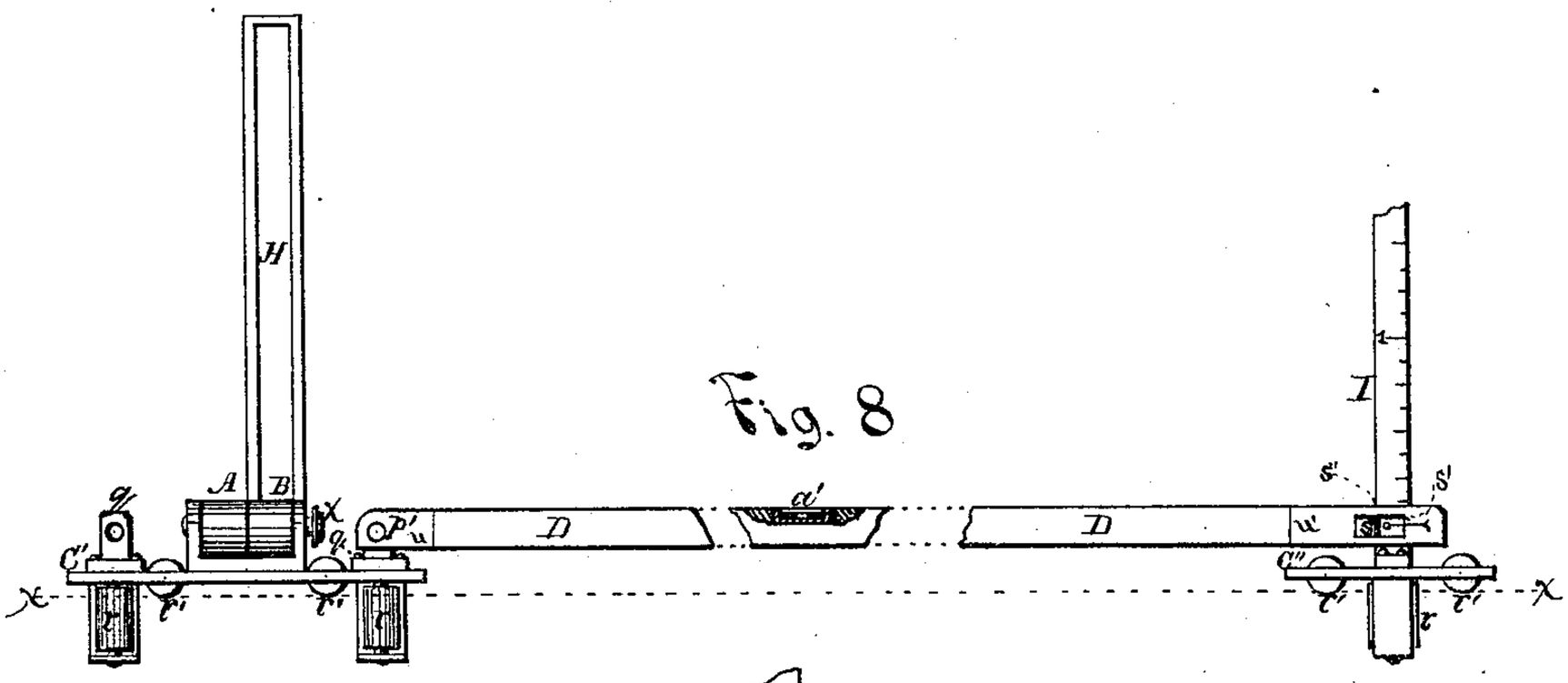

Fig. 8

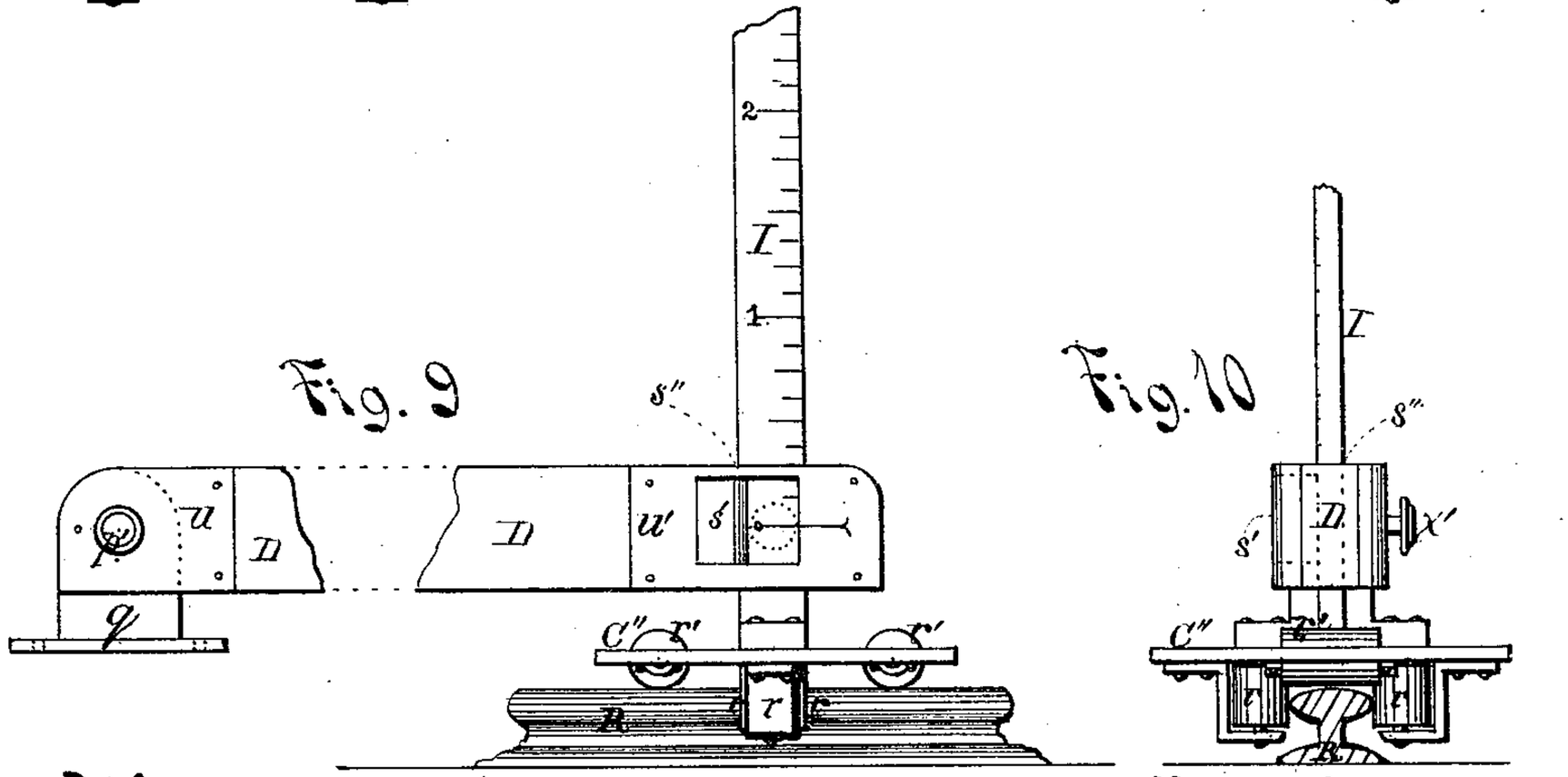

Fig. 9

Fig. 10

Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES M. FERGUSON, OF CHARLES CITY, IOWA.

RAILWAY-TRACK GAGE, LEVEL, AND GRADIENT.

SPECIFICATION forming part of Letters Patent No. 329,895, dated November 10, 1885.

Application filed September 8, 1884. Serial No. 142,508. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. FERGUSON, a citizen of the United States of America, residing at Charles City, in the county of Floyd and State of Iowa, have invented certain new and useful Improvements in the Railway-Track Gage, Level, and Gradient, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention is a railway-track gage, level, and gradient combining and embracing the following novel features: two square bars horizontally pivoted together at one end and having each a spirit-level tube fitted into the middle of its top plane; also, underneath the ends of said bars, counter gage-plates, one of the pair easily swinging by its cheek-lugs to the same pin which pivots the bars, and the other rigidly fastened to the swinging end of one of the bars, said plates being furnished each with a pair of vertical rollers or gages and a pair of horizontal rollers or travelers; also, suitably attached underneath said rigid gage-plate, an intermediary curve-gage consisting of a sliding bar having regulative indents made in its outer surface, and a horizontally plano-convex flange-face upon one end thereof, and furnished with an attaching hanger-yoke and a set-screw; also, fixed upon the swinging end of the same bar which holds the rigid gage-plate, a vertically-erected measuring-standard consisting of a pair of ruled cheek-plates evenly united top and bottom, so as to fitly embrace the handled end of the other leveling or index bar, having their edges shaped into dual arcs concentric at said pivot-pin with said swinging bars, and also having the front edge of one cheek cut in notches graduated to conveniently-marked degrees, while the other cheek has a concentrically-arched slot suitably cut through it, and also graduated to and conveniently marked in inches; also, the end of the handled bar which is embraced by said standard provided on one side with a spring-catch latching into said degree-notches, and on the other side with a slide or bearing plate and a set-screw, the shank of the latter sliding and screwing within said arched slot and into said slide-plate; also, an additional or gradient bar made attachable to the pivoted gage-plate on either side of said leveling-bars, and advancing or following at an exact rectangle to their side planes; also, said gradient bar furnished with a centrally-fixed spirit-level tube and a roller-plate, the latter provided with dual pairs of horizontal and vertical rollers similar to those of the gage-bar, and, finally, said gradient bar also furnished with a vertical slot, suitably cut through the outer end thereof, in which to fittingly adjust a graduated tenon-standard, the foot of which is suitably fixed to the center of said roller-plate, and its shaft adjustably secured within said bar-slot by a suitable jam and set screw, all of which and their purposes are hereinafter more fully described, and illustrated by the accompanying drawings, in which like letters designate identical parts of my invention in the different figures respectively.

Figure 1 is a side elevation of my device, showing the handled or index bar on level, and the other or gage bar depressed to the five-degree declination, as marked on the scale-standard, the notch for that degree being latched at a point on a level with the concentric pivot-pin of the two bars; also showing the position of the pair of counter-placed spirit-level tubes, one being shown in longitudinal section and the other by dotted lines. Fig. 2 is a sectional side view of the index-bar, showing the spring-latch engaging within one of the degree-notches of the graduated standard. Fig. 3 is a side view of the end portions of the gage-bar, showing a section of the measuring-standard and the counter gage-plates, the latter supplied with said counter-facing gage-rollers, travelers, and said adjustable curve-gage. Fig. 4 is another side view of a portion of the gage-bar, showing the obverse side of of the same, together with the inner side of the notched cheek of the standard in section. Fig. 5 is a view of the obverse side of the index-bar, showing its bearing-plate and set-screw clinching the edges of arched slot of the standard marked with inches and their proportional parts. Fig. 6 is an under view of the rigid gage-plate, showing the relative positions of the said travelers, the gage-rollers, and the intermediary curve-gage, together with the vibrating end of the springing notch-latch. Fig. 7 is also an under view of the pivoted gage-plate, showing its travelers and gage-rollers.

Fig. 8 is a side elevation of said track-gradient, showing its attachment to a gage-plate on one side of the pivoted ends of the leveling-bars, and said vertically-adjustable standard supplied with its roller-plate and inch-scale, the top level of the line of rail-track being shown by the dotted line *x x*. Fig. 9 is an enlarged view of said gradient, showing the normally-relative positions of the standard end of the same with the sectional portion of a level track-rail; and Fig. 10 is an elevation of the outer end of said gradient bar, showing the travelers of its roller-plate resting upon the top flange of an H-rail in transverse section, said vertical rollers counter-clasping the sides of said rail-flange and the set-screw which adjustably clamps the gradient scale-shaft.

The letter A represents the one of said leveling-bars, called the "gage-bar," and B the one called the "index-bar." Both bars are made, preferably, of suitable wood, cut square and with smooth and even faces, of such length as to suitably extend over the standard "broad" gage of railway-tracks, and are horizontally pivoted together by a suitable pin, *p*, so that they may be worked at any vertical angle each to the other's top plane. Each bar is furnished with a boxed spirit-level tube, *a*, let into its top plane, the centers of which are exactly in a line across the bars with the precise middle point between the said pivot-pin and the swinging end of the gage-bar, for mutually leveling purposes herein described and shown. Underneath said gage-bar are placed the pair of gage-plates C and C′, the former of which is rigidly and suitably fixed in place underneath the swinging end of the bar, and the latter plate is hung, as shown, by the cheek-lugs to the bar-pivoting pin *p*, in order to allow the plate to mutually oscillate with the rise and depression of the other end of the bar.

Each gage-plate has secured underneath it, as shown, a double pair of interchangeable spindle-rollers, *r* and *r′*, the former of which are attached by suitable angle-lugs in a vertical position, each pair, respectively, facing or bearing outwardly toward the bar ends and adjusted about six inches apart, one roller from the other in a right line exactly across the plate, while the rollers *r′* are suitably secured upon their spindles within the dual slots *s*, cut through each plate, as shown, in a horizontal position lengthwise the plate. Each plate is also adjusted, together with the length of the gage-bar, so as to bring the outwardly facing or bearing surfaces of its pair of vertical rollers to the fitting distance of either fifty-six and a half inches or thirty-six inches from the similar pair of rollers under the other plate, these distances being the respective standards between the opposite rails of a broad or a narrow gage railway-track, so that when the horizontal rollers *r′*, being situated just outside of the vertical rollers *r*, are placed upon the opposite rails of the track under construction or repair, they serve as wheels upon which to smoothly trundle the bars A and B along the tops of said pair of rails, while the vertical rollers *r* are simultaneously and automatically setting the gage of said track by pressing against or being pressed by the opposing rail-flanges; hence the horizontal rollers are termed "travelers" and the vertical rollers "gagers," respectively and relatively. Again, said counter-facing rollers *r* being placed at said respective distances apart singly each from the other in said transversal line of each plate and in pairs upon the two plates, and, besides, each pair of the same being at a right angle to the parallel lines of direction of the two bars A and B, said bars will always be in a line perpendicular to the line of the track or coradial to its curves while being trundled upon their travelers *r′* over the unset rails.

The intermediary gage, G, is also attached underneath the plate C, to act as a curve-spreading gage, and consists of a suitably-sized metallic bar, *b*, to fittingly slide between the gage-plate and the correspondingly-bent hanger-yoke *h*, by which said sliding bar is secured against the bottom of said plate. It is also provided with graduated indents *v*, cut transversely into its convex side or bottom and graduated to eighths of an inch, into which a suitable thumb or set screw, *i*, turns to jam and accurately adjust the bar, and supplied with a vertical and plano-convex flange, *f*, upon its front or outer end, and normally set against the outer or front edge of the hanger *h*, when the median line of its front or horizontally-convex face will be exactly in range or even with the vertical fronts of the pair of adjacent gaging-rollers, as shown in Fig. 6, so that when it is desired to spread the track-curve the sliding bar *b* is set at the required distance beyond the line-front of said gaging-rollers, and while the dual pairs of gaging-rollers are regulating the track-gage the said intermediary gage is similarly regulating the proper spread of the track-curve by pushing the rails beyond the regulative line-front of said gaging-rollers.

The measuring-standard H consists of a suitably-sized strip of sheet metal embowed at the middle into a pair of check-plates and firmly fixed in a vertical position upon the swinging end of the bar A, so as to fittingly embrace the similarly-swinging bar B. The front and rear edges of said cheeks are formed into concentric curves or arcs centering at the pivot-pin *p*, and the front edge of one of said arcs is graduated by the notches *n*, cut and marked in regular angular degrees, while the corresponding arcs of the counter-cheek are graduated and conveniently marked in inches, as shown.

In order to set the index-bar B in its required angular relations with the coregulating-bar A by the standard H, either in degree or any proportional of inches, there is provided on one side of said index-bar a suitable latch, *l*, vibrating within its furnished recess and

springing its horizontally-projecting catch into any of the degree-notches desired, (the spring being regulated by the projecting curled end of the same,) and on the opposite side of said bar a set-screw, *x*, having its shank vertically sliding within the concentrically-cut arc slot *t*, and its point screwing into the bearing-plate *z*, thereby to jam the cheek between said screw-head and plate at any desired angle of inches indicated by the horizontal median line or pointer marked on said bearing-plate, as shown, becoming coincident with the desired inch-mark upon the cheek-plate.

In order to supply a co-operative provision for showing the angle of rise or depression, respectively, of either the up or down grade of a rail-track in course of construction or repair, in addition to the herein-described elements for gaging, leveling, and curve-spreading said track, the following supplemental gradient device is furnished: This consists of an additional and provect bar, D, of similar material to the other bars and of suitable size and length. Said bar is furnished with a spirit-level tube, *a'*, similar in character and situation to those in the other bars, and at one end with a head-strap, *u*, through which is horizontally pierced a screw-hole for the entrance of the interchangeable pivot-screw *p'*, by which the bar is made securely attachable to either of the vertical standing lugs *q*, suitably fixed upon the gage-plate C', one on each side of said leveling-bars, as shown. Said bar D is also provided upon its outer end with a counter head-strap, *u'*, which has the sight-slot *s'* cut horizontally through one of its cheeks into an intercrossing mortise-slot, *s''*, vertically made through the bar between the cheeks, and also has a screw-hole horizontally pierced through the cheek counter to said sight-slot for the entrance of the set-screw *x'*, all as shown in Figs. 9 and 10 of the drawings.

The sight-slot *s'* serves as a means to conveniently observe and regulate the inch-scale marked into the side or sides of the graduated standard I, vertically sliding and held by said adjusting set-screw *x'* within said fittingly-mortised slot *s''*, and thereby to set the bar D at the indicative angle by which the up or down grade of track is to be made or determined.

The standard I is made of suitable material, size, and length, and with even and smooth sides, so as to be properly and conveniently marked with an inch-scale, as shown, and to snugly fit and slide within the vertical mortise-slot *s''* while being adjusted and before being firmly held in place by the jamming set-screw *x'*. It is also firmly secured in its vertical position, to be readily adjusted, as described, by suitable counter-bracing foot-flanges or angle-irons, as shown, upon the roller-plate C'', which is substantially similar in material, form, and dimensions to the gage-plates C and C', and, alike to them, is furnished with similar vertical rollers, *r*, and horizontal rollers *r'*, although somewhat differently adjusted in and on said plate, in order to suit the appropriate operation of the pivoted gradient bar D, namely: The travelers *r'* are placed to the front and rear of said foot-flanges, exactly transverse to the end of the bar, and carry it, when trundled in advance or in rear of the plate C', smoothly along the top flange of the usual constructive track-rail, R, while the rollers *r*, being placed vertically underneath said plate, each suitably sidewise to said bar, fitly clasp said rail-flange between them, as shown in Fig. 10.

Having described the essential features of my invention, their use and operation is as follows: To gage and level a continuously-straight line of track, the top planes of the two bars A and B are made coincident and put with their travelers *r'* upon that portion of the track already adjusted and "set." Then, when said bars are trundled over and upon the "unset" rails, their gage or width apart will be automatically regulated, as heretofore described, and the correct level simultaneously indicated by the coincidence of the counter spirit-levels *a*. The index-bar B is then raised to any required angle of a scale-inch—say one-quarter—in order to indicate to the follower trackman what the required thickness of the "shim" shall be, which, being "tied," completes this portion of the track adjustment.

To "curve" the track, the spreading-gage G is set, as heretofore stated, to the required distance of "spread" between the constructive curve-rails, and the index-bar B raised from its coincident level with the gage-bar A to the degree-angle of elevation of the outside curve-rail, when, the pivot end of said gage-bar remaining or being placed upon that side which is to be the higher track-curve, the travelers *r'* are trundled upon the curve-rails. Said rails are then "worked" until the index-bar comes to a level, as indicated by its spirit-tube *a'*, when the spread of the curve and its angle of dip will have been simultaneously regulated, and it only remains for the thickness of the shims to be determined, as before stated, to complete the second operation.

To determine and regulate the "grade"—either level, down, or up—of the constructive track: For the first, attach the gradient bar D upon the advancing side of the gage-plate C', as heretofore stated, and having put the standard end of the bar by its travelers *r'*—which, together with all said spindle-rollers, are interchangeable, upon the top of the evenly-abutting end of one of the constructive rails R next adjacent to the already set track-rails, which will also include the top flange of said rail between the clasping-rollers *r* of the roller-plate C, see that said end of the bar is jammed and set by the set-screw *x'* upon the tops of the bracing-flanges of the standards I, which should bring the naught-mark of the inch-scale, sighted through the slot *s'*, to be coincident with the horizontal level mark or pointer made, as shown, into the margin of said slot, and when the bar D shall have been trundled

upon the farther end of said rail R, and the rail worked until said bar is indicated by its spirit-tube to be on a level, the required grade of this portion of the track will be accomplished, this advance operation being of course next followed by the gaging and leveling coregulative processes, as before described. For the second operation, to determine the downgrade, place the travelers of the roller-plate C″ in the same position as described in the beginning of the level-grade process, then raise the outer end of the bar D until the desired angle of inclination is reached, as heretofore stated, upon the inch-scale I, and, when said roller-plate shall have been trundled upon the lower end of the constructive rail R, and the rail worked until the gradient bar is on level, the downgrading will be completed. The same operation will be performed to determine the upgrade, only that the position of the gradient bar D will first be reversed in its relation to and with the gage-plate C′, in that said bar shall be attached to the other or counter-standing lug *q* upon the opposite side of the bars A and B, so as to follow them instead of being, as heretofore, trundled in advance.

It will be readily observed, especially by those skilled in the art, that the above-described invention affords a very speedy, certain, as well as convenient, combination of co-operative elements for producing the intended results, the gradient device being, for instance, an especially effective adjunct of the other, either following or advancing co-operative devices; for, let the gradient bar be made as described, with a length, say, of twenty-two feet between the pivot and the median line of its inch-scale, then upon setting said bar to one inch of incline by said scale in the aforesaid grading operations a certain grade of twenty feet to the mile, or one in two hundred and sixty-four, is determined almost simultaneously with the co-operations of gaging and leveling the same constructive track. Again, in order to avoid any possible inconvenience which might arise upon reaching a "reverse curve" to be constructed or repaired which might require the transfer or reversal to the opposite side of the track of the respective ends of the leveling-bars and their gaging-plates, an additional arc standard, similar to that herein designated as H, and another similar index-bar, may be attached and pivoted in reverse order to the gage-bar A in any suitable way without essentially changing or limiting the characteristic features of my invention as herein described, and in a similarly supplemental way the standing lugs *q* might be made to swivel, so as to allow said gradient to accommodatingly work, as above described, on an up or down curve grade. Therefore

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

1. In the engineering apparatus herein described, the combination of the gage-bar, the index-bar, and the gradient bar, respectively furnished with the spirit-levels, the hinging pivots, the scale-standards, and the carrier-plates, the last respectively provided with the spindle-rollers, the curve-gage, and the alternative lugs, all made and adjusted substantially as and for the purposes herein specified.

2. The combination of the gage-bar having spirit-level, scale-standard, and carrier-plates, the last respectively provided with hinging pivot, spindle-rollers, and curve-gage, with the index-bar having counter spirit-level, spring-latch, and set-screw, substantially as and for the purposes herein specified.

3. The combination, with the gage-bar, of the spirit-level, the notched and arc slotted scale-standard, and the carrier-plates respectively provided with the spindle-rollers, curve-gage, and hinging pivot, substantially as and for the purposes herein specified.

4. The combination, with the index-bar, of the counter spirit-level, the spring-latch, the set-screw, the pointer-marked bearing-plate, and the hinging pivot, substantially as and for the purposes herein specified.

5. The combination, with the adjunctive gradient bar, of the spirit-level, the head-straps, the sight-slot, the standard-slot, the set-screw, the interchangeable hinging pivot, and the scale-standard, the last rigidly fixed upon the carrier-plate having clasping-rollers and travelers, substantially as and for the purposes herein specified.

6. The carrier-plates herein described, respectively furnished with the interchangeable spindle-rollers, and severally attached to the respective gage, index, and gradient bars, substantially as and for the purposes herein specified.

7. The combination of the intermedial curve-gage having its sliding bar provided with the bearing-flange, the hanger, the set-screw, and the regulative indents with the spindle-rollers of the carrier-plates of the gage and index bars, substantially as and for the purposes herein specified.

8. The interchangeable spindle-rollers, severally counter-adjusted on and in the respective carrier-plates of the regulative gage, index, and gradient bars, substantially as and for the purposes herein specified.

In testimony whereof I affix my signature in presence of two witnesses.

C. M. FERGUSON.

Witnesses:
P. R. GUIRVITS;
C. D. ELLIS.