

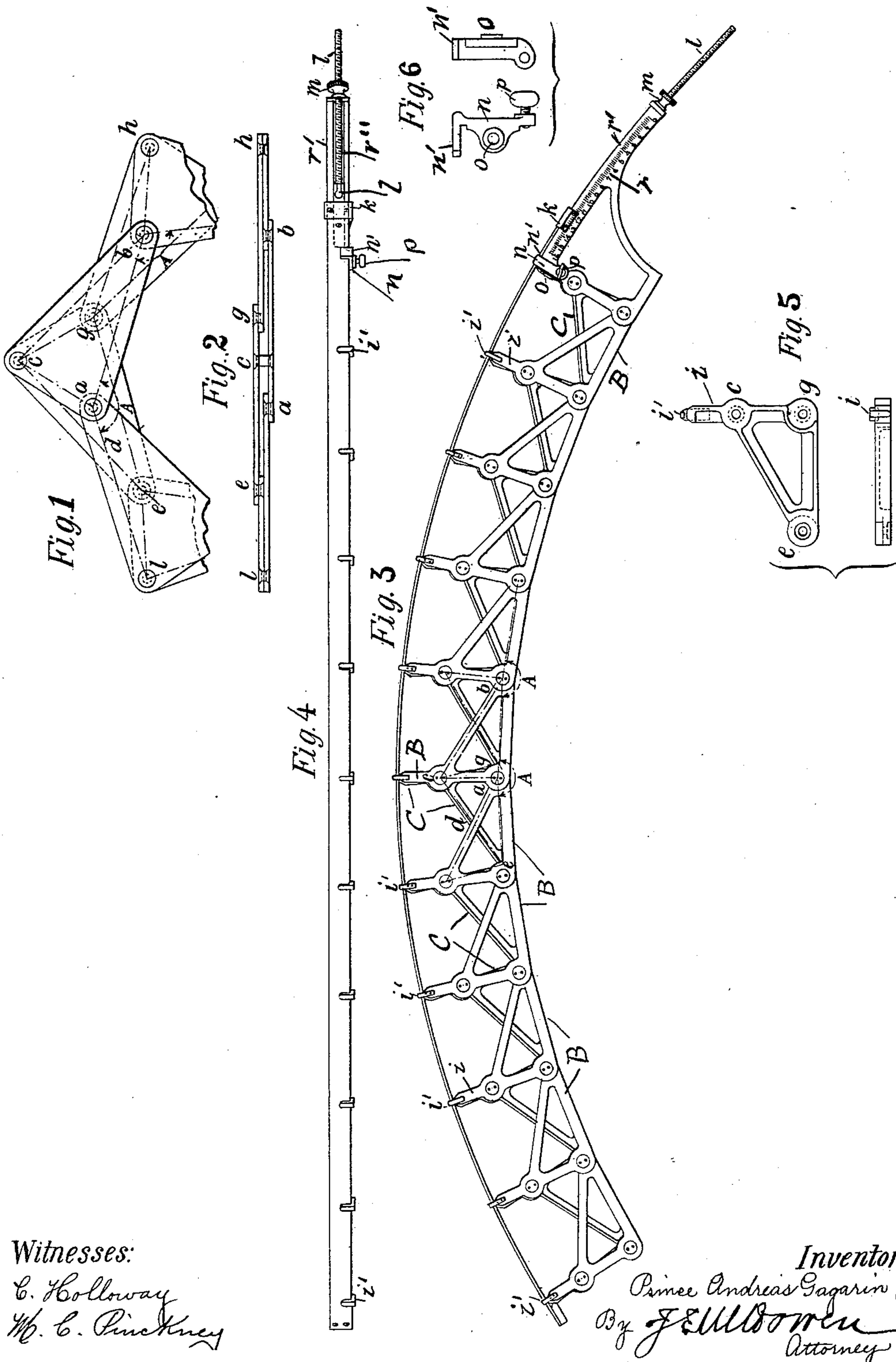
No. 677,349.

Patented July 2, 1901.

P. A. GAGARIN.
ADJUSTABLE CURVED RULER.

(Application filed Apr. 6, 1900.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

PRINCE ANDREAS GAGARIN, OF ST. PETERSBURG, RUSSIA.

ADJUSTABLE CURVED RULER.

SPECIFICATION forming part of Letters Patent No. 677,349, dated July 2, 1901.

Application filed April 6, 1900. Serial No. 11,824. (No model.)

To all whom it may concern:

Be it known that I, PRINCE ANDREAS GAGARIN, a subject of the Emperor of Russia, and a resident of St. Petersburg, Russia, have invented certain new and useful Improvements in Adjustable Curved Rulers or Protractors, of which the following is a specification.

The main objects of the invention are to provide an improved ruler, protractor, or the like adjustable to different curves and to provide such device with means for indicating or determining the radius of the curve in any adjustment of the device out of a straight line.

In the drawings, Figure 1 is a side view, and Fig. 2 a plan, of a short section of an articulated construction of levers, illustrating in part the principle of my invention. Fig. 3 is an elevation, and Fig. 4 a plan, of the ruler. Fig. 5 shows one of the levers of the ruler in side view and in plan view, and Fig. 6 shows a lever of special form in elevation and in edge view.

In Figs. 1 and 2 there is shown a short section of a device composed of a front series and a rear series of bell-crank levers, here shown as triangular plates acb , gce , &c., in the front and the rear series, respectively. The plates forming the levers are of uniform shape and size. The levers or plates in one series have the long sides extending from the short sides oppositely from the levers or plates of the other series. In each series the acute angle of each plate is pivotally connected to one of the angles of the succeeding plate or lever, as at ab in the front series and at e g in the rear series. These pivots are connected to the levers of but one series. The other angles of the levers in the first series are connected to corresponding angles in the rear series, as at lch . It is characteristic of this combination of triangles that when deflected from a straight line in the manner shown and to a greater or less extent the figures formed by the inner edges of the levers of the two series are parts of regular and equal polygons overlapping each other and remain equal and regular whatever the adjustment of the levers out of a straight line—that is, out of a position in which the pivots of angles $eagb$ are in a common straight

plane. Further, the angles at which the series are connected (lch) maintain such relation under all adjustments from the straight line that a regular curve passing through them will be an arc of a circle, and the radius of the arc will vary with the amount of deflection of the levers.

My ruler or device contains a front series B and an oppositely-arranged rear series C of bell-crank levers, here shown as open triangles having ninety, sixty, and thirty degree angles. The ninety-degree and the thirty-degree angles of the levers in each series of bell-crank levers are connected together by pivots and are not connected to the other series; but the sixty-degree angles of the two series are connected by pivots c , which pivots c remain in a common plane which is an arc of a circle or cylinder of greater or less radius, according to the adjustment of the levers from the straight position.

The levers have equal arms i , extending upward beyond the sixty-degree angles and having therein recesses to receive a flexible strip, preferably of steel. These recesses are preferably formed by L-shaped pieces i' , secured to arms i and extending over the strip. Fig. 4 shows pieces i' on the front levers only; but in practice the rear levers have such pieces also. The recesses are of uniform distances from the pivots at the sixty-degree angles, and will maintain the same relative positions as the pivots. Hence said strip held in the recesses will either be straight or in an arc of a circle of greater or less radius, according to the adjustment. So far as the operation is concerned it is not necessary that the strip be held at a distance from the connected sixty-degree angles; but it is more convenient to support the strip on equal arms i , as set forth. The strip is secured at one end to the first arm i at the left, is free to slide in the recesses in the following arms i , and at the other end has a terminal block k , limited in its movement toward the right by a screw-threaded rod l , having a set-nut m and capable of being fixed in the required position when it has been adjusted by means of a lever n , having at one end a clamping right-angle arm n' and at the other end a locking thumb-screw p and pivoted at o to one edge of the last lever at the right. The

lever at the right in Fig. 3 is provided with and rigidly supports the tubular arm r' , having a slot r'' in its upper side in which the inner end of screw l stands in such position as to be struck by and to arrest block k , secured to the strip, thus fixing the radius of the curve. r is a graduated scale on part r' , and the displacement of the stop-screw l can thus be accurately gaged, giving the radius of the arc—that is, of the bend—of the strip. When it is desired to change the arc, screw p is loosened and screw l advanced or retracted to the required extent as measured by the scale, and then screw p is again screwed up, clamping the strip to the first arm i . Evidently the sides of the triangles connecting the sixty and thirty degree angles have no function except to increase the strength and rigidity of the device and need not be used.

In practice the levers are preferably cut from sheet-steel, the pivot-lugs stamped up, and the pivot-holes accurately bored.

The described device is especially useful in laying out, drawing, or measuring arcs of large radius, (or the radii of large arcs.)

I do not limit myself to the uses named nor to the exact details of construction described, as these may be varied somewhat without departing from my invention.

I claim—

1. A ruler or the like having in combination front and rear series of bell-crank levers, the levers of each series being pivoted together, and the levers of the different series being connected together by different pivots, the bell-crank levers being extended equal distances beyond the last-mentioned pivots, a flexible strip on the ends of said extended arms, one end of the strip being fixed, and means for limiting the movement at the opposite end of the strip consisting of a screw l , and a gage or scale for indicating the adjustment of the screw.

2. The combination of several bell-crank levers in series, said levers having right-angle arms, the right angle of one lever being pivoted to the outer end of one of the arms

of the next lever in the series and so on for following levers, a second series of like but reversed bell-crank levers beside the first series, the free arm of each lever of the first series being pivoted to the adjacent like arm of the second series, whereby the pivots connecting the different series remain in line with each other in a straight line or in an arc of a circle the radius of which varies with the adjustment given to the levers.

3. The combination in an adjustable flexible device, of a plurality of series of bell-crank levers with arms at right angles, the long arm of one lever being pivoted to the right angle of the next lever in each series, the short arm of the adjacent levers in the different series being pivoted together, the levers of one series being reverse to that of the adjoining series, and a flexible strip supported at a uniform distance from the pivots connecting the levers of the different series.

4. An adjustable device having in combination a plurality of series of bell-crank levers side by side, the levers of one series being reversed with respect to those of the other series, pivots connecting the levers of each series, other pivots connecting together the levers of the different series, a flexible strip adapted to assume arc shape of different radii, means for limiting the bend, and a scale or gage therefor.

5. An adjustable device having in combination a plurality of series of bell-crank levers side by side, the levers of one series being reversed with respect to those of the other series, pivots connecting the levers of each series, other pivots connecting together the levers of the different series, a flexible strip adapted to assume arc shapes of different radii, and means for fastening the strip in its adjusted position.

In witness whereof I have hereunto set my hand in presence of two witnesses.

PRINCE ANDREAS GAGARIN.

Witnesses:

M. BREITFUSS,

N. TSCHEAALOFF.