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C. E. FETHEROLF.

LIMIT GAGE.

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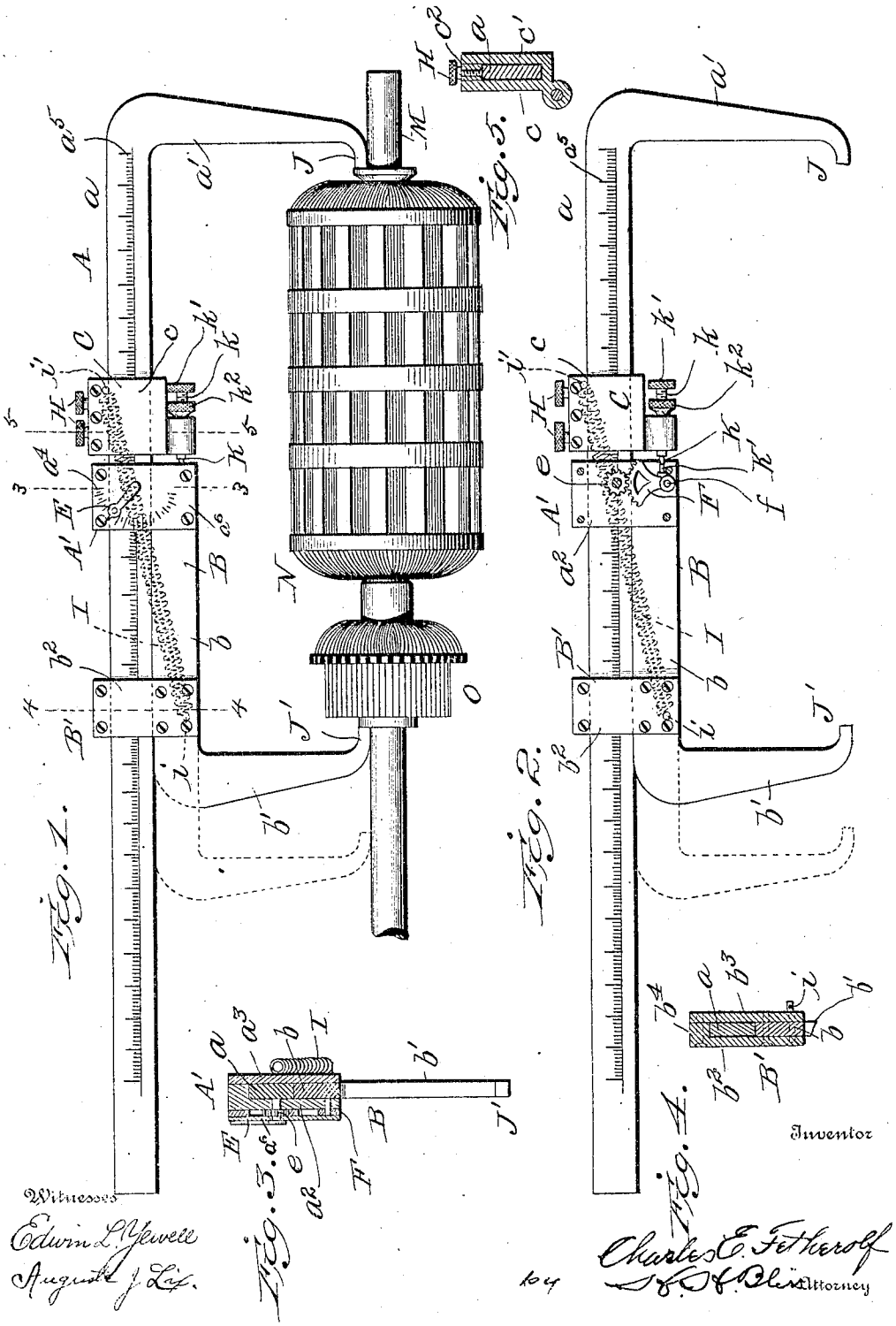

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LIMIT-GAGE.

No. 851,507. Specification of Letters Patent. Patented April 23, 1907.

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To all whom it may concern:

Be it known that I, CHARLES ELMER FETHEROLF, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Limit-Gages, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in instruments for measuring relatively minute distances, it pertaining particularly to an improved instrument for measuring or indicating the distance to which a body, such as the commutator of a dynamo or motor, is moved while it is caused to advance along the shaft toward and in relation to the armature.

In many cases in the mechanical arts it is desirable to have a visible indication of the distance to which one body is moved in relation to another, without requiring that the tedious and more or less intricate methods, such as calipering, be followed. As above indicated, an instance of this is the pushing or forcing of a commutator upon the shaft of an armature. This body must be advanced a certain distance and at the same time must not be carried to the slightest extent beyond a certain predetermined distance, but these bodies are referred to here merely as types or illustrations and the device to which the invention relates can be applied to many analogous uses.

In the drawings, Figure 1 is a face view of a measuring or gaging instrument embodying my improvements together with an armature, its shaft, and the commutator which is to be connected therewith. Fig. 2 is a view of the instrument detached, the face plate of the indicator having been removed. Fig. 3 is a vertical section on the line 3—3 of Fig. 1. Fig. 4 is a section on the line 4—4, Fig. 1. Fig. 5 is a section on the line 5—5, Fig. 1.

In the drawings the two principal elements of the instrument are indicated by A and B. That at A consists of a bar *a* having an arm a^1 extending therefrom, this arm terminating in a point at J.

The element B is somewhat similar to that at A, it having a bar *b* with an arm b^1 projecting therefrom and terminating in a point J^1, the points J J^1 being turned toward each other.

The element B is arranged to have its bar *b* parallel to the bar *a* of the element A, the two being adapted to slide one upon the other. They are loosely connected and held together by means of guides, indicated as entireties by A^1 and B^1. These may be formed in any suitable way. As shown, that at B^1 consists of plates b^2, b^3, each rigidly secured to the bar *b* together with a cross bar b^4 which may be integral with that at b^2 or that at b^3.

The joining device indicated by A^1 comprises a plate a^2 secured to the bar *b* and lying upon the front side of the bar *a*, and a plate a^3 upon the rear of the latter. The bar *a* carries also an adjustable abutment or gaging device, indicated as a whole at C. This surrounds the bar *a*, it having a plate *c* upon the front side, a plate c^1 upon the rear, and a cross bar c^2 at the top.

H, H, indicate fastening devices, such as milled screws situated in the stopping and engaging part C and adapted to be tightly set against the bar *a*. The part C can be moved to one point or another along the bar *a*, and then set tightly in position, as desired.

The element B of the instrument normally tends to be held against the abutting and gaging device C because of a coiled spring I, which is secured at *i* to the yoke B^1 and bar b^1 and secured at i^1 to the part C.

The adjustable abutment C carries a stop K, which in turn, is adjustable in relation to the part C. Preferably it consists of a pointed rod or pin formed on the end of a screw *k*, having the milled head k^1 and the jam nut or screw k^2.

The sliding plate A^1 carries the index finger E, which at its inner end, is secured to the shaft of a pinion *e*. With this pinion engages a rack segment F, pivoted at *f*. The rack segment is so arranged as to be adapted to impinge upon and press against the point of the adjustable stop at K, the segment preferably having for this purpose a laterally projecting pin K^1. This is situated relatively close to the axis at *f* of the segment, and consequently any motion of the sliding guide A^1 or of its carrying bar *b* along a straight line, will result in a relatively greatly increased motion of the periphery of the segment F and of the pinion *e*. Consequently the index E can be used to indicate to a minute degree

the subdivisions of short distances over which the bar *b* moves along the bar *a*. This instrument is devised for indicating distances as short as one one-hundredth of an inch over which the points J or J^1 move in relation to each other.

Preferably the face plate a^6 is used and placed intermediate of the index E and the segment F and pinion *e*, this plate having a series of graduations a^4 concentric with the pinion *e*.

The bar *a* of the element A of the instrument is provided with a series of graduations a^5 which may be of any predetermined character, such as inches and fractions of an inch, or the divisions of a metric scale, and the graduations at a^4 should be proportional to those at a^5.

The manner of using an instrument of this sort will be readily understood from the drawings in the above description. Suppose, for instance, that it is desired to secure to the shaft M of an armature N, the commutator O, which is to be electrically connected to the latter. In practice these commutators are driven to their proper positions by great force and yet it is essential that they should be stopped with great accuracy. If they are advanced toward the commutators even a minute distance too great, there is danger of accident and at the same time it is requisite that they should be advanced far enough to have the shaft and its attachments adapted to properly fit the other parts of the machine. In such case I put the commutator on the end of the shaft and start the press, such as a hydraulic press, to advance it toward the armature and it is forced along the shaft until it is within a short distance, say two inches, from the desired position. Then the gage is set by pulling the elements A and B apart against the force of the spring I to separate the points J, J^1 far enough to have the former placed against the end hub or boss of the armature and the other against the hub or boss of the commutator. Thereafter the spring I will compel the point J^1 to follow the commutator until finally the points at K, K^1 shall come together, and the parts at A^1, C are so set that this shall occur when the commutator is, say, within one sixty-fourth of an inch of its final position. Thereafter any further movement of the commutator will be indicated by the index E moving around on the dial. As soon as the indicator shows that the commutator has moved the necessary one sixty-fourth of an inch, the advancing mechanism is stopped.

It will be observed that in the structure illustrated, the zero point is at the bottom of the scale on the face plate a^6 and therefore the weight of the index E carries said index to the zero position when it is unrestrained. If the normal weight of the index is insufficient to overcome the friction of the parts, the index may be weighted as by pouring lead into a recess formed in the index. Obviously a spring for moving the index to the zero position would be an equivalent of the weight. The agency which tends to return the index to the zero position also serves to maintain the parts K and K′ in contact while they are within engaging distance.

I have found that a practical and accurate dial and indicator can be employed which will convert the travel of the sliding guide A^1 over one sixty-fourth of an inch rectilineally into a travel of four inches of the index point on the dial, and this enables me to control with great accuracy the advancing of the commutator toward the armature.

What I claim is—

1. In a calipering or gaging device of the character described, the combination of two opposed mutually approaching caliper points, the bars carrying said points respectively, a spring normally drawing said points together, a dial carried by one of said bars, a rotary index on said dial, an adjustable pressure point carried by the other bar, and motion-multiplying devices interposed between said pressure point and the rotary index, substantially as set forth.

2. In a calipering or gaging device of the character described, the combination of two opposite mutually approaching caliper points, two bars carrying the said points, a spring normally causing the said points to approach each other, means carried by said bars for multiplying the motion of the said points and adjustable along one of said bars to vary its operative posit on thereon, said means comprising two contacting portions adapted to engage prior to the engagement of the said caliper points, one of said contacting points being mounted upon one of said bars and the other contact point being mounted upon the other of said bars, and an indicator for visibly indicating the increments of multiplied motion, substantially as set forth.

3. In a calipering or gaging device of the class described, the combination of two calipering points, the bars or carriers therefor adapted to carry the points rectilineally toward and from each other, a spring normally tending to draw said points toward each other, the means for securing the said spring to one of the said carrying bars, and the adjustable stop device secured to the other bar and having secured to it the opposite end of the spring, substantially as set forth.

4. In a calipering or gaging instrument of the class described, the combination with the two calipering points, of the bars slidably connected together and each carrying one of the said points, the spring normally tending to slide the said bars and draw said points together, the adjustable stopping device C secured to one of the said bars, the motion-

multiplying device carried by one of said bars, and means carried by the other for transferring to the motion-multiplying devices the longitudinal motion of the bars, substantially as set forth.

5. In a calipering or gaging instrument of the class described, the combination with the calipering points, of the bars respectively carrying the said points and slidable, one upon the other, the rectilineal series of graduations upon one of the said bars, the rotary motion-multiplying devices, and means interposed between the bars and adjustable along one of them for transferring the relative rectilineal motion of the bars to the rotary motion-multiplying devices, substantially as set forth.

6. In a calipering or gaging device of the class described, the combination of two calipering points, the bars or carriers therefor adapted to carry the points rectilinearly toward and from each other, a spring connected to each of said bars and normally tending to draw said points toward each other, and a stop device, adjustable independently of said calipering points, secured to one of said bars and adapted to be engaged by the other.

7. In a calipering or gaging instrument of the class described, the combination with the two calipering points, of two bars slidably connected together and each carrying one of said points, a spring connected to said bars and normally tending to draw the said points together, an adjustable stopping device C secured to one of said bars, and a motion multiplying device comprising mechanism carried by one of said bars, and an adjustable pressure point carried by the other bar for transferring to the said mechanism the relative longitudinal motion of the bars.

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

CHARLES ELMER FETHEROLF.

Witnesses:

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S. ADDA B. WHITING.