Feb. 8, 1927. 1,617,005

W. AMES

OUTSIDE CYLINDER GAUGE

Filed Sept. 10, 1923

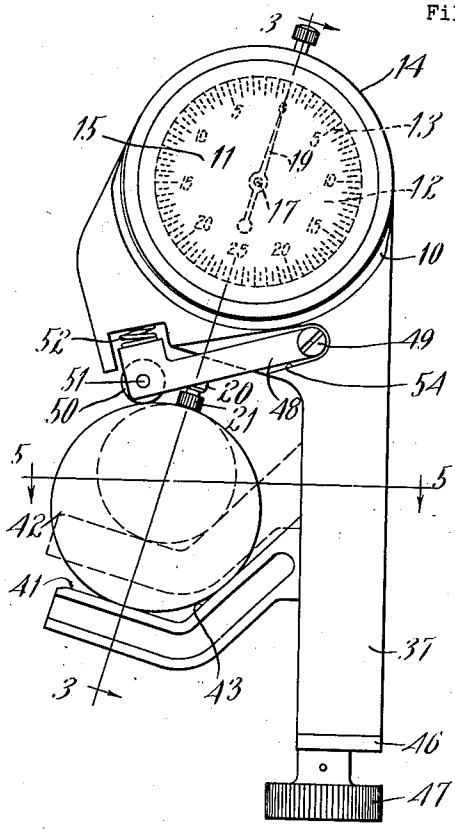


Fig. 1.

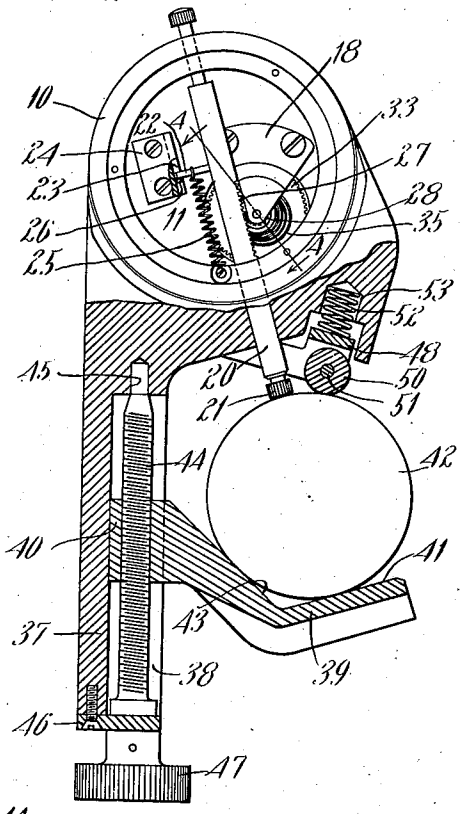


Fig. 2.

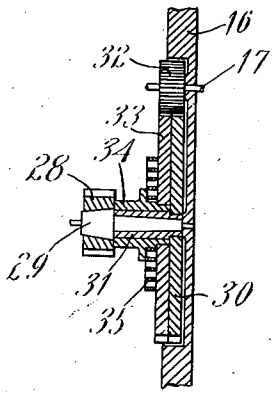


Fig. 4.

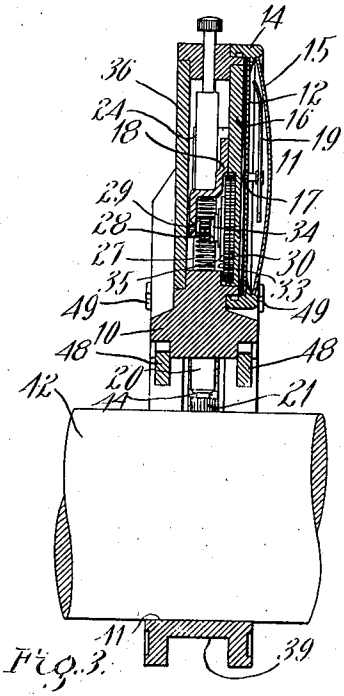


Fig. 3.

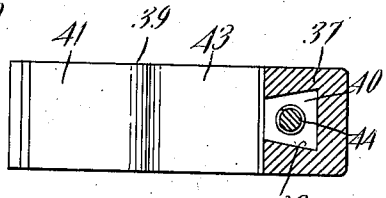


Fig. 5.

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UNITED STATES PATENT OFFICE.

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OUTSIDE CYLINDER GAUGE.

Application filed September 10, 1923. Serial No. 661,807.

My invention relates to outside gauges for cylindrical surfaces and particularly but not exclusively to one for use in connection with crank pins of automobile engine crank shafts or similar articles where the gauge cannot be applied endwise of the shaft.

My invention will be best understood from the following description when read in light of the accompanying drawing showing one specific embodiment of my invention selected for illustrative purposes, while the scope of my invention will be more particularly pointed out in the appended claims.

Referring to the drawings:—

Figure 1 represents a front elevation of an outside cylinder gauge embodying my invention.

Fig. 2 is a rear elevation of the gauge, the back plate which covers the indicating mechanism being removed and a portion of the gauge being broken away and illustrated in section.

Fig. 3 is a section as taken on the line 3—3, Figure 1.

Fig. 4 is a detail section as taken on the line 4—4, Fig. 2.

Fig. 5 is a horizontal section as taken on the line 5—5, Figure 1.

Referring to the drawings, I have shown a casing 10 in which an indicating mechanism 11 is mounted. The indicating mechanism 11 may be of any suitable construction but preferably includes a dial 12 provided with graduations 13 preferably representing one thousandth of an inch and fraction thereof, a bezel 14 and crystal 15. Secured in any suitable manner in the casing 10 adjacent to the rear of the dial 12 is a front plate 16 at the center of which is a center staff 17. The center staff 17 is mounted to rotate in the front plate 16 and also in a bearing member 18 fast to the rear of said front plate, and fast to said staff at the forward end thereof and located adjacent to the front face of the dial 12 is an indicating hand 19.

Slidably mounted in the casing 10 is a yielding work engaging member 20 at one end of which a contact point 21 is detachably secured. The yielding work engaging member 20 is prevented from rotating in the casing 10 by a pin 22 which is fast to said member and projects into a groove 23 provided in a guide member 24 fast to the front plate 16. A spring 25 extends between the pin 22 and the casing 10 and always acts to force the yielding work engaging member 20 downwardly until the pin 22 contacts with a stop pin 26 located within the guide member 24 and extending across the groove thereof, at which time said yielding work engaging member is located in its normal position and as illustrated in Fig. 2.

The motion of the yielding work engaging member 20 is transmitted to the center staff 17 carrying the indicating hand 19 by mechanism as follows:—Provided upon the member 20 and preferably formed integral therewith are a series of rack teeth 27 which mesh with and drive a pinion 28 fast to a staff 29, the latter being rotatably mounted at one end thereof in the bearing member 18 and at its other end in the front plate 16. A gear 30, preferably having a collet 31 rigidly fastened thereto and constituting a hub therefor, is rigidly fastened to the staff 29 in any desired manner and said gear 30 meshes with and drives a center pinion 32 which is rigidly fastened to the center staff 7. Another gear 33 constituting a take-up gear and preferably having a collet 34 rigidly fastened thereto and constituting a hub therefor is loosely mounted upon the hub of the gear 30 and also meshes with the center pinion 32. A spiral spring 35 surrounds the hub of the take-up gear 33, one extremity of said spring being secured to said hub and the other extremity being secured to the bearing member 18, said spring being arranged constantly to act to force the teeth of the take-up gear 33 against those sides of the teeth of the center pinion 32 which are opposite the sides to which power is applied to said teeth by the gear 30 when the yielding work engaging member 20 is being forced upwardly. This action of the take-up gear 33 results among other things in eliminating any backlash which may occur between the gear 30 and center pinion 32. A back plate 36 is fast to the casing 10 and entirely closes said casing at the rear thereof.

I have illustrated as formed integral with the casing 10 and projecting laterally from the periphery thereof a channel-shaped extension 37 having a dove-tailed shaped groove 30 formed therein. A rigid work engaging member 39 is shown slidably mounted upon the channel-shaped extension 37 of the casing 10, said member being provided with a dove-tailed shaped tongue 40

which fits the dove-tailed shaped groove 38. The rigid work engaging member 39 as illustrated is V-shaped and is provided with a surface 41 upon which a shaft 42 or other cylindrical forms of work may rest, and while resting upon said surface 41 the periphery of said work will contact with another surface 43 also provided upon said rigid work engaging member. It will be observed that the member 39 affords means for positioning the axis of the contact member 20 diametrically of the work and also means which engages the work at points along spaced parallel lines on the surface of the work.

The rigid work engaging member 39 is herein adjusted to move the surface 41 thereof toward or away from the contact point 21 of the yielding work engaging member 20 through the medium of an adjusting screw 44, the upper end of which is mounted to rotate in a bearing 45 provided in the casing 10, while the lower end thereof is mounted in a plate 46 fast to said casing and said screw 44 extends through and has screw-threaded engagement with the member 39. The screw 44 is rotated through the medium of a suitably knurled knob 47 which is fastened to the lower end thereof.

For insuring that the surfaces 41 and 43 of the rigid work engaging member 39 will engage the work, I herein provide a bifurcated member 48 pivotally mounted upon screws 49 located upon the opposite sides of the casing 10, said member 48 having a roller 50 mounted to rotate upon a pin 51 fast in said member. The member 48 is forced toward the work through the medium of a spring 52 which is located within a recess 53 provided in the casing 10, the lower end of said spring bearing upon the member 48 and acting to hold the roller 50 in yielding engagement with the work. The outward movement of the member 48 is limited by a suitable stop 54 provided upon the casing 10. It will be observed that the member 48 and associated parts when the device is in operation thus act to effect urging of the work engaging member 39 yieldingly toward the work, while the spring 25 yieldingly urges the contact member 20 toward the work.

In order that the reading of the gauge will correspond to the exact diameter of the work substantially independently of the magnitude of the diameter or out-of-roundness of the work I so correlate the angle between the surfaces 41 and 43 and the angles between these surfaces and the line of movement of the work engaging member 39 that for all diameters of work the contact member 21 and point of tangency of the surface 41 with the work will lie on the diameter of the work, and preferably but not necessarily I form the surface 41 at right angles to the line of movement of the contact member.

The operation of a gauge constructed according to my invention when used in connection with worn crank pins is as follows: Assuming that a worn crank pin is to be trued to make it accurately round and cylindrical I first set the gauge to enable me to compare the diameters of the crank pin with a known distance, which I do by placing the contacts of an outside micrometer, set gauge or the like between the contact feeler 21 and surface 41, and by turning the knob 47 adjust the rigid work engaging member to such position as will bring the pointer over the zero mark, or if desired secure this same result by rotating the dial relatively to the casing. The micrometer is then laid aside and the gauge slipped over the crank pin and rotated relatively thereto and moved longitudinally thereof while noting the deflection of the pointer in a plus or minus direction from the zero mark on the dial, by which means the minimum diameter of the pin and its out-of-roundness can be quickly and accurately measured. For example if the known distance corresponding to the zero reading of the gauge is three inches and the maximum deflection of the pointer in a minus direction indicates five thousandths of an inch then the minimum diameter of the crank pin is two and ninety-five thousandths of an inch.

If the crank shaft to be measured is assembled in the crank shaft bearings, or if mounted between the centers of a lathe or grinding machine, the gauge conveniently will be rotated relatively to the crank pin by positively and slowly rotating the crank shaft while holding the gauge stationary.

After the minimum diameter of the crank pin is determined and it is subjected to a turning or grinding operation for truing it the gauge may be used by the operator from time to time for determining the progress of the operation. When the gauge in all positions of its application to the crank pin reads the minimum diameter previously determined the crank pin is then a true cylinder.

It will be noted that a gauge constructed according to my invention may be used to compare diameters with a known distance as distinguished from being limited to comparing them with a cylinder of known diameter, with the result that a common inside micrometer which is adjustable to an infinite number of distances may be used for securing an infinite number of standards, where if a known cylinder must be used as a standard an infinite number of cylinders must be available for securing an infinite number of standards. Further a gauge constructed according to my invention will substantially accurately measure the diameter

even if the work is out-of-round as distinguished from prior gauges where the gauge will only indicate the presence of out-of-roundness without measuring the diameter.

Although I have described for purposes of illustration one specific embodiment of my invention it is to be understood that I am not limited thereby to its particular mechanical details, but that within the scope of my invention wide deviations may be made therefrom without departing from the spirit of my invention.

I claim:—

1. A device of the character described comprising, in combination, a casing, an indicating device mounted upon said casing, an elongated yielding work engaging member axially movable toward the work, means operatively connecting said work engaging member to said indicating device, and a second work engaging member rigidly mounted upon said casing and having surfaces at an angle to each other adapted stably to position cylindrical work relatively to said yielding work engaging member, one of said surfaces being substantially normal to the axis of said yielding work engaging member.

2. A device of the character described having, in combination, a casing, an indicating device mounted upon said casing, an elongated yielding work engaging member, means operatively connecting said member to said indicating device for actuation thereof, and a rigid work engaging member slidably mounted upon said casing for movement toward said indicating device, said last named work engaging member having means adapted to engage cylindrical work at transversely spaced points upon the surface of said work for stably positioning such work relative to said yielding work engaging member with the diameter of said work axially of said yielding work engaging member independently of the size of the diameter of said work.

3. In combination, a gauge embodying therein a casing, having a yielding work engaging member mounted thereon, a second work engaging member rigidly mounted upon said casing and having means adapted for contacting cylindrical work at points spaced transversely of the work, said means adapted stably to position cylindrical work relatively to said yielding work engaging member, means to move said second work engaging member toward and away from said yielding work engaging member, and means adapted for yieldingly engaging the work to clamp said work against said second work engaging member.

4. In combination, a gauge embodying therein a casing, having a yielding work engaging member mounted thereon, a V-shaped work engaging member rigidly mounted upon said casing and adapted to position cylindrical work relatively to said yielding work engaging member, means to move said last named work engaging member toward and away from said yielding work engaging member, and means yieldingly to engage the work positioned on said V-shaped work engaging member to clamp said work against the opposed surfaces of said member.

5. In combination, a gauge embodying therein a casing provided with a laterally projecting extension and having an elongated yielding work engaging member mounted thereon at the side of said extension for axial movement, a rigid work engaging member slidably mounted upon said extension for straight line movement in a plane including the axis of said elongated member, said rigid work engaging member formed for stably positioning cylindrical work with the diameters of such work axially of said yielding work engaging member, and means to move said rigid work engaging member toward and away from the contact surface of said yielding work engaging member.

6. In combination, a gauge embodying therein a casing provided with a laterally projecting extension and having an elongated yielding work engaging member mounted thereon for axial movement, a rigid work engaging member slidably mounted upon said extension for straight line movement, said rigid work engaging member formed for stably positioning cylindrical work with the diameters of such work axially of said yielding work engaging member, and a screw mounted upon said extension and engaging said last named work engaging member and adapted to move the same toward and away from the contact surface of said yielding work engaging member.

7. In combination, a gauge embodying therein a casing provided with a laterally projecting extension and having an elongated yielding work engaging member mounted thereon, a rigid work engaging member slidably mounted upon said extension, a screw mounted upon said extension and engaging said last named work engaging member and adapted to move the same toward and away from said yielding work engaging member, and means yieldingly to engage the surface of cylindrical work positioned on said rigid work engaging member to clamp said surface against said member.

8. In combination, a gauge embodying therein a casing provided with a laterally projecting extension and having an elongated yielding work engaging member mounted thereon, a rigid work engaging member slidably mounted upon said extension, a screw mounted upon said extension and engaging said last-named work engag-

ing member and adapted to move the same toward and away from said yielding work engaging member, a member pivotally mounted upon said casing, a roller mounted upon said last-named member and a spring engaging said pivoted member and adapted to force said roller into engagement with work mounted upon said rigid work engaging member.

9. In combination, a gauge embodying therein a casing provided with a laterally projecting extension and having an elongated yielding work engaging member mounted thereon, the longitudinal median line of said yielding work engaging member being disposed at an angle relatively to said extension, a rigid work engaging member mounted upon said extension, and means to move said last-named member to position the diameter of cylindrical work mounted thereon into alignment with the longitudinal median line of said yielding work engaging member.

10. A device for gauging outside cylindrical surfaces comprising in combination, an indicating device having a casing and a contact member movable relatively to said casing, means responsive to relative movement of said casing and contact member for actuating said indicating device, a second contact member having two contact portions the points of contact of which with the work in a plane transverse to the work are on tangent lines at an angle to each other, and means for adjusting said second contact member and casing relatively to each other along a line at such angle to said tangent lines that for all diameters of work the point of tangency of said first mentioned contact member and point of tangency of one of said lines with the work will lie at the ends of the diameter of the work.

11. A device for gauging outside cylindrical surfaces comprising in combination, an indicating device having a casing and a contact member movable relatively to said casing, means responsive to relative movement of said casing and contact member for actuating said indicating device, a second contact member having two contact surfaces at an angle to each other adapted to be tangent to the work when presented thereto and to contact the same at points along spaced parallel lines, and means for adjusting said second contact member and casing relatively to each other along a line at such angle to said surfaces that for all diameters of work a point of tangency of said first mentioned contact member and of one of said surfaces with the work will lie at the ends of a diameter of the work.

12. A device for gauging outside cylindrical surfaces comprising in combination, an indicating device having a casing and a contact member movable relatively to said casing, means responsive to relative movement of said casing and contact member for actuating said indicating device, a second contact member adapted to have contact with the work at points along parallel lines, and means for adjusting the casing and second contact member relatively to each other along a line at such angle to the axis of the first mentioned contact member that for all diameters of work said axis and one of said parallel lines will lie in the same plane.

13. A device for gauging outside cylindrical surfaces comprising in combination, an indicating device having a casing and a contact member movable relatively to said casing, means responsive to relative movement of said casing and contact member for actuating said indicating device, a second contact member having two plane contact surfaces at an angle to each other, one of said surfaces being substantially normal to the axis of said first contact member, and means for adjusting said casing and said second contact member relatively to each other along a line at such angle to said contact surfaces that for all sizes of work the axis of said first contact member and line of contact of the work with said surface normal to said axis will lie in the same plane.

In testimony whereof I have hereunto set my hand.

WARREN AMES.