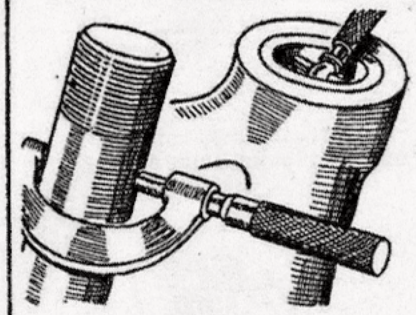
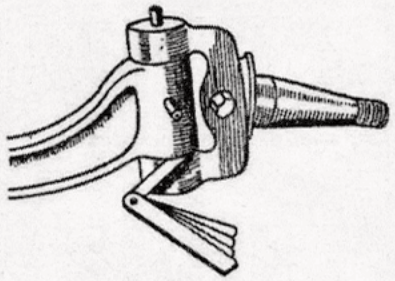
CLEARANCE STANDARDS FOR CHECKING PARTS

These tolerances are for general use *only* when the specific instructions of the manufacturer are not available.
Measurements are in inches unless otherwise specified.



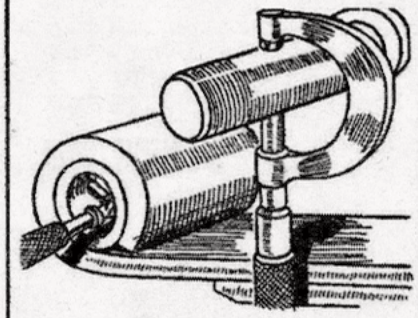
Measure king pin clearance in bushing with micrometer calipers and telescoping gage.

Desirable	.001-.002
Serviceable	.005
Repair or replace	.007



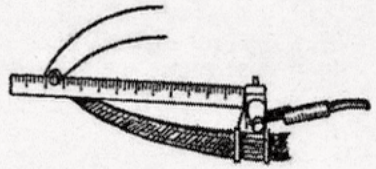
Measure end clearance of spindle thrust bearings with feeler gage.

Desirable	.010
Serviceable	.015-.025
Repair or replace	.030



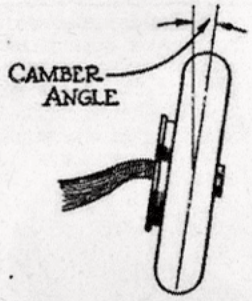
Measure clearance between spring eye bolt and bushing with micrometer calipers and telescoping gage.

Desirable	.001-.002
Serviceable	.010
Repair or replace	.015



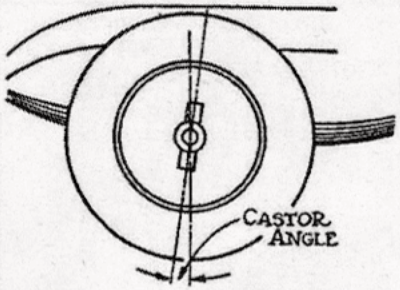
Measure variation in distance between spring eye bolt and axle on each side with steel scale.

Desirable	1/64
Serviceable	1/32
Repair	1/16



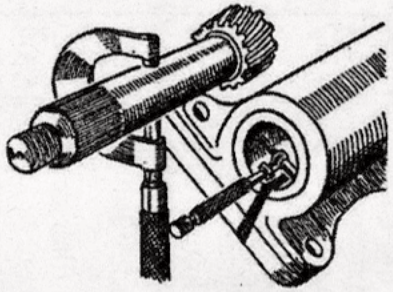
Measure variation in camber of front wheels on each side with camber gage.

	DEGREES	INCHES
Desirable	0	1/32
Serviceable	¼	1/16
Repair	½	1/8



Measure caster of front axle with caster gage, (variation from specifications).

	DEGREES
Desirable	0
Serviceable	¼
Repair	½

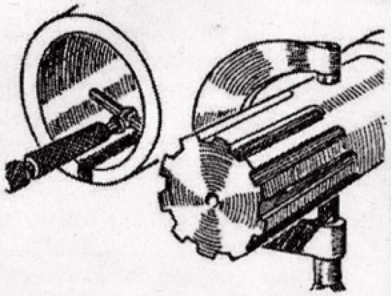


Measure clearance between pitman arm shaft and bushing with micrometer calipers and telescoping gage.

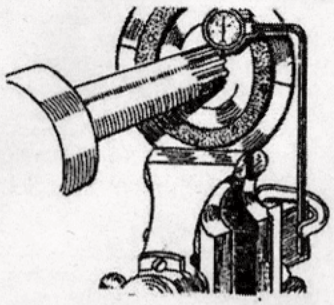
Desirable	.001-.002
Serviceable	.004
Repair or replace	.006

Measure looseness of steering gear at rim of wheel with pointer and steel scale.

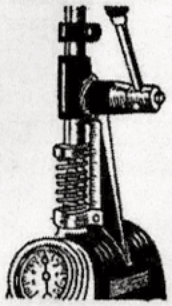
Desirable	½-1 in.
Serviceable	2 in.
Repair	3 in.



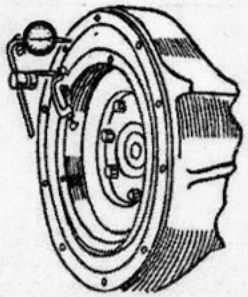
Measure clearance between sliding sleeve and clutch shaft with micrometer calipers and telescoping gage.
Desirable ..... .001-.002
Serviceable ..... .005
Repair or replace ..... .007



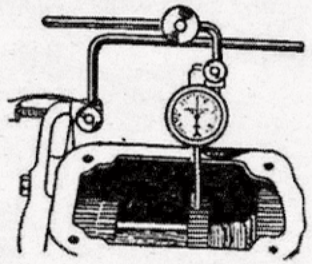
Measure clearance beween clutch hub and clutch shaft splines with dial gage.
Desirable ..... .002-.003
Serviceable ..... .006
Repair or replace ..... .010



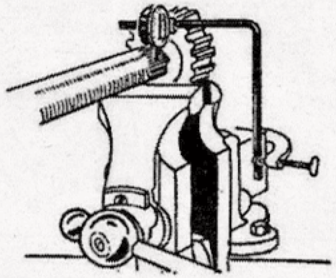
Measure difference in pressure between clutch springs with spring pressure testing gage.
Desirable ..... 1-2 lb.
Serviceable ..... 3 lb.
Replace ..... 5 lb.



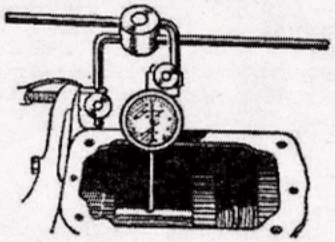
Measure alignment of clutch bell housing with flywheel face, using dial gage.
Desirable ..... .002-.003
Serviceable ..... .005
Repair or replace ..... .010



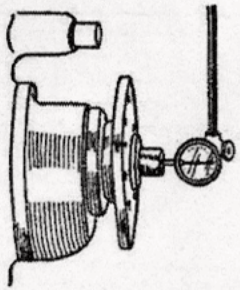
Measure clearance between transmission gear teeth with dial gage.
Desirable ..... .003-.005
Serviceable ..... .012
Repair or replace ..... .015



Measure clearance between gear hub and splines of shaft with dial gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .005



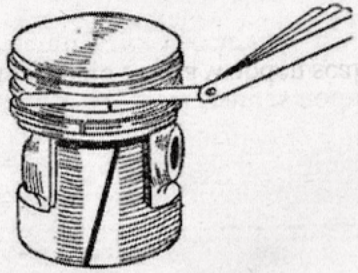
Measure diametral clearance of transmission bearings with dial gage.
Desirable ..... .0005-.001
Serviceable ..... .004
Repair or replace .... .005



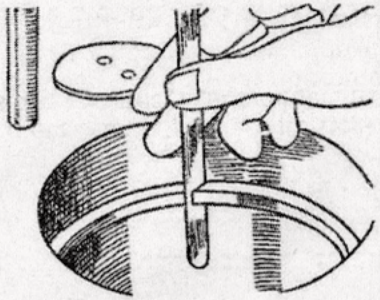
Measure end clearance of transmission bearings with dial gage.
Desirable ..... .001-.003
Serviceable ..... .005
Repair or replace ..... .010

Editor's Note: This article (from 1931) suggests the use of certain tools to measure the various components of a vehicle. Many of these tools are often found in a reasonably well-equipped shop, while others are less common, and they can be found in a specialized repair shop. The definitions which follow are intended to identify the various tools and their uses.

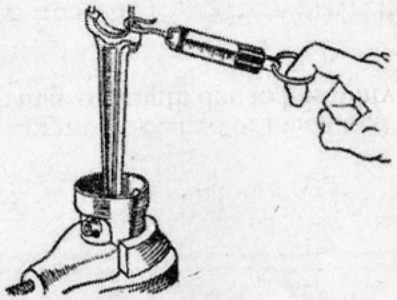
Micrometer (sometimes called a micrometer caliper) – A micrometer is a precise measuring tool consisting of a rigid frame and a fixed anvil. A telescoping rod, which is designed to measure the outside diameter of an item, is controlled by a knurled knob. A scale is engraved onto the barrel of the tool making very precise measurements possible. See *Skinned Knuckles*, February 2015 for more details.



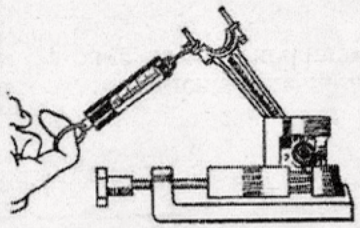
Measure clearance of piston rings in grooves with feeler gage.
Desirable ..... .001-.0015
Serviceable ..... .0025
Repair or replace.... .004



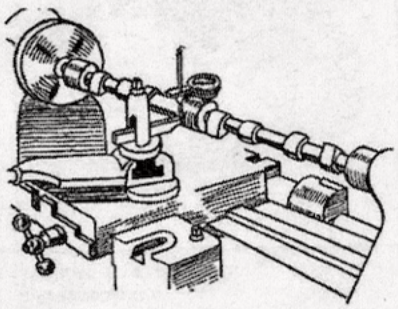
Measure clearance between ends of rings In cylinders (clearance per inch of piston diameter).
Desirable ..... .003
Serviceable ..... .004
Repair or replace ..... .006



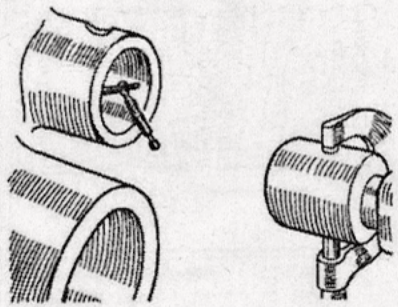
Measure fit of floating pin in alloy piston with spring scale.
Desirable..5-7 lb. pull when cold
Serviceable when worn .... .001
Repair or replace when worn .002



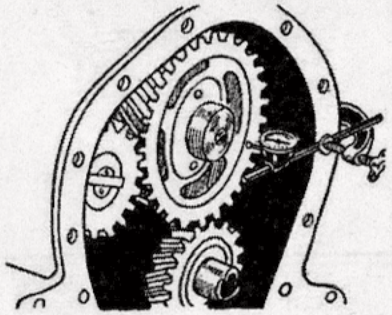
Measure fit of pin using bronze bushings with spring scale.
Desirable..3-5 lb. pull when cold
Serviceable when worn .... .001
Repair or replace when worn .002



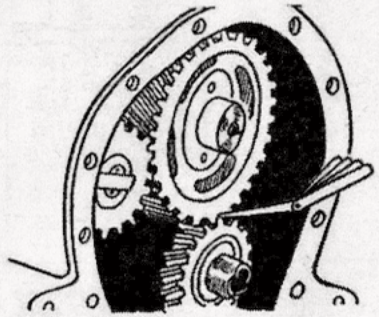
Measure straightness of camshaft with dial gage.
Desirable ..... .0005-.001
Serviceable ..... .002
Repair or replace .... .004



Measure camshaft bearing to journal clearance with micrometer calipers and telescoping gage.
Desirable ..... .001-.002
Serviceable ..... .003
Repair or replace ..... .005



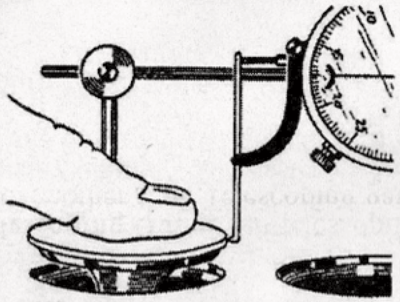
Measure lateral trueness of camshaft timing gear with dial gage.
Desirable ..... .001-.002
Serviceable ..... .003
Repair or replace .... .005



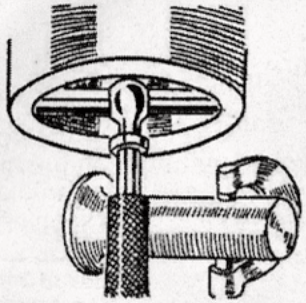
Measure clearance between teeth on camshaft and crankshaft timing gears with feeler gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .006

Telescoping Gauge – A telescoping gauge does not, by itself, measure. It merely expands into a space, locks and then can be measured with another tool. Telescoping gauges generally are available in sets of five or six gauges, ranging in sizes from about ½" to 3". Each gauge fits a range of sizes. An example would be the smallest gauge fits ½" to ¾", the next ¾" to 1¾" etc.

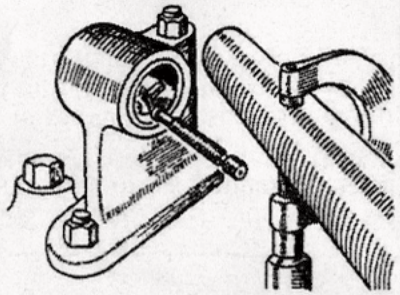
The telescoping gauge is shaped like a 'T' with the cross piece able to move or telescope in and out. The handle has a lock at the end which holds the cross piece at a certain size. The cross piece is fitted into the space to be measured and then locked to the correct fit. It is then removed, and the length of the cross piece is measured with a micrometer. Three or four measurements are recommended to assure accuracy.



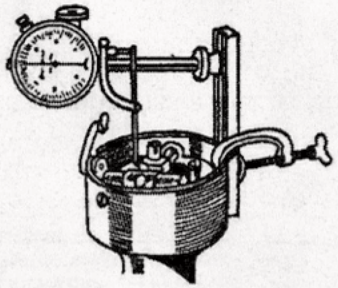
Measure clearance between valve stem and valve guide with dial gage.
Desirable ..... .002-.004
Serviceable ..... .005
Repair or replace ..... .006



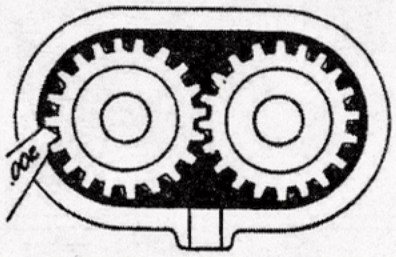
Measure clearance between valve lifter and lifter guide with micrometer calipers and telescoping gage.
Desirable ..... .001-.002
Serviceable ..... .003
Repair or replace ..... .005



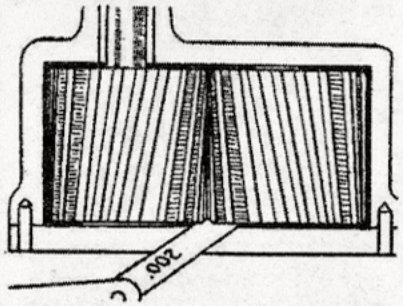
Measure clearance between rocker arm shaft and bushings with micrometer calipers and telescoping gage.
Desirable ..... .001-.002
Serviceable ..... .003
Repair or replace ..... .005



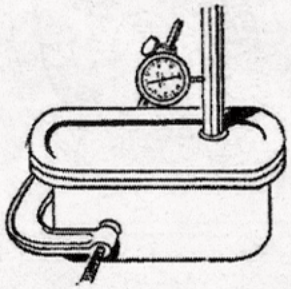
Measure sidewise movement of ignition distributor cam with dial gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .006



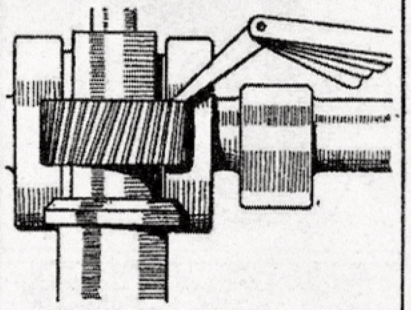
Measure clearance between oil pump gear teeth and housing with feeler gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .006



Measure clearance between oil pump housing cover and face of gears with feeler gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .006



Measure clearance between oil pump shaft and bushings with dial gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair or replace ..... .006

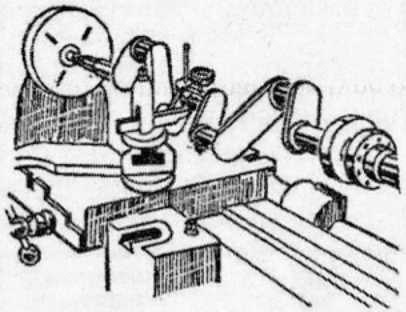


Measure clearance between oil pump drive gear and camshaft gear teeth with feeler gage.
Desirable ..... .003-.005
Serviceable ..... .007
Repair or replace ..... .010

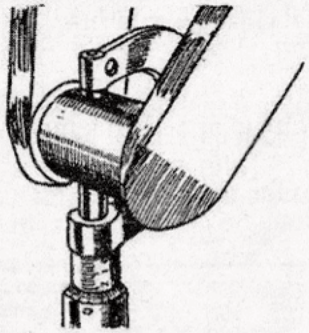
Feeler Gauge – A feeler gauge is used to measure gaps. The gauge consists of separate precisely machined thicknesses of metal, each marked with its thickness. Thicknesses generally range from approximately 0.001" up to 0.025".

Steel Scale – A steel scale is nothing more than a 'ruler'. The steel is engraved, etched or machined to show increments. The advantages of a steel scale over a wooden scale is that the steel is not subject to change of length due to humidity or warpage. The marked increments are generally more accurate.

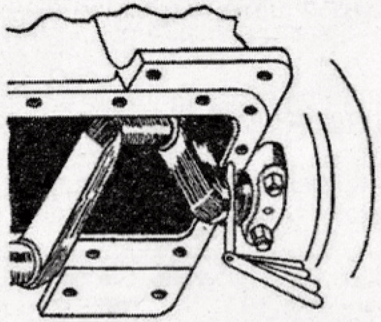
Camber Gauge – A tool used to measure the 'tilt' of a wheel (viewed from the front) from perfectly vertical, either inward or outward. If the top of the wheel is tilted in toward the centerline of the car, it is known as negative camber. Tilted outward is positive camber.



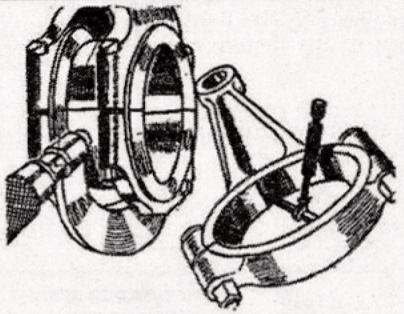
Measure straightness of crankshaft with dial gage.
Desirable ..... .0005-.001
Serviceable ..... .002
Repair or replace .... .004



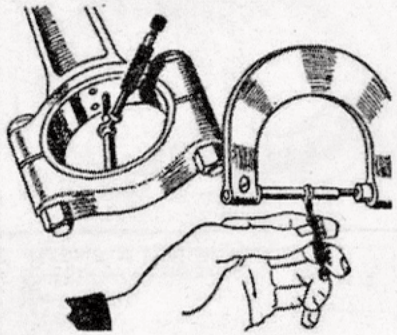
Measure crankpin for taper and roundness with micrometer calipers.
Desirable ..... .0005-.001
Serviceable ..... .002
Repair or replace .... .003



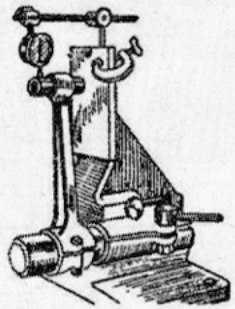
Measure end clearance of crankshaft with feeler gage.
Desirable ..... .006-.008
Serviceable ..... .012
Repair or replace ..... .018



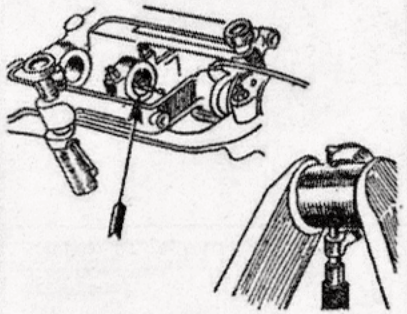
Measure clearance of forked-type outside bearing with micrometer calipers and telescoping gage.
Desirable ..... .004-.005
Serviceable ..... .006
Replace under.. .004 or over .007



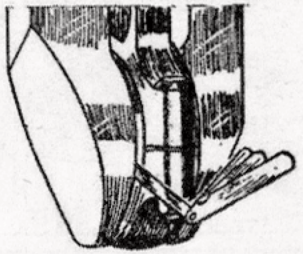
Measure roundness of bearings with micrometer calipers and telescoping gage.
Desirable ..... .0005-.001
Serviceable ..... .002
Repair or replace .... .003



Measure connecting rod bearing for parallelism with piston pin, using aligning fixture and dial gage.
Desirable ..... .0005
Serviceable ..... .001
Repair or replace ..... .002



Measure bearing to shaft clearance with micrometer calipers and telescoping gage.
Desirable ..... .0015-.0025
Serviceable ..... .003-.004
Repair or replace ... .005

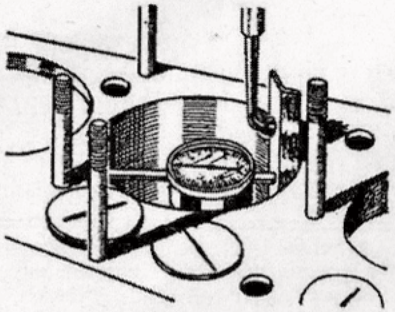


Measure end clearance of connecting rod bearing with feeler gage.
Desirable ..... .005-.007
Serviceable ..... .010
Repair or replace ..... .015

Castor Gauge - The caster gauge measures the forward or backward slope of a line drawn through the upper and lower steering pivot points when viewed directly from the side of the vehicle.

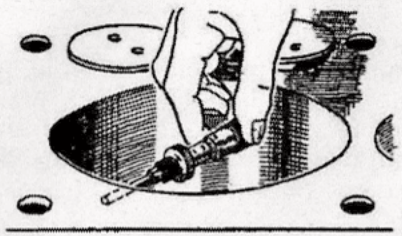
Pointer – A pointer is merely a fixed reference point that can be measured. It may be clamped, or affixed with a magnet or other method to keep it accurate.

Dial Gauge – An indicator gauge which may be used in a variety of ways. Some are activated by a rod which is moved up and down;



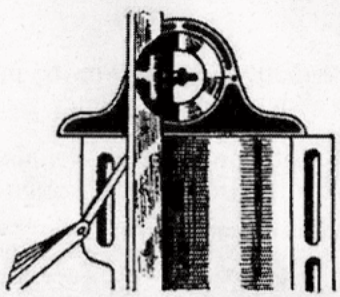
Measure roundness of cylinder bore with dial gage.

Desirable	.0005-.001
Serviceable	.002-.003
Repair or replace	.004



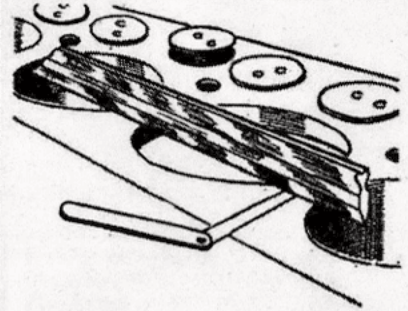
Measure cylinder bore for taper with inside micrometer.

Desirable	.001-.002
Serviceable	.003
Repair or replace	.005



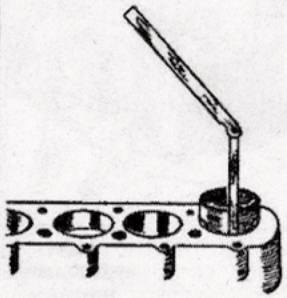
Measure squareness of bore with top of block, using Vee edge protractor and feeler gage.

Desirable	.001-.002
Serviceable	.004
Repair or replace	.006



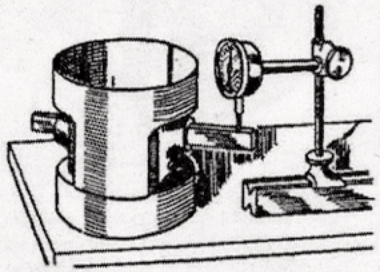
Measure flatness of top of block with steel straightedge and feeler gage.

Desirable	.003-.005
Serviceable	.007
Repair or replace	.010



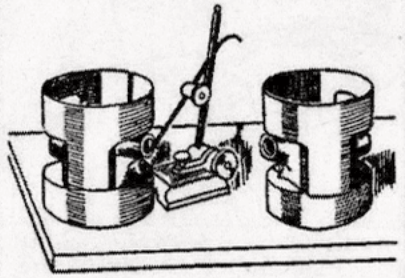
Measure clearance of piston in cylinder with feeler gage (clearance per inch of piston diameter).

	IRON	ALUMINUM
Desirable	.001	.001-.0015
Serviceable	.0015	.0015-.002
Replace	.0025	.003



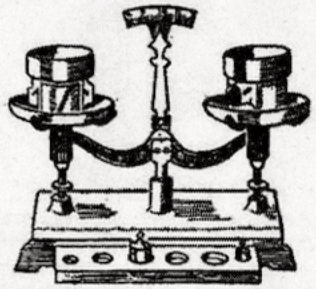
Measure piston pin boss bore for parallelism with head, using surface plate and dial gage.

Desirable	.001
Serviceable	.002
Repair or replace	.003



Measure variation in compression height with surface plate and dial gage.

Desirable	.003-.005
Serviceable	.010
Repair or replace	.020



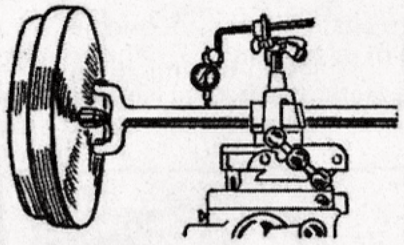
Measure difference in weight between pistons with balance scale.

Desirable	1/16 oz.
Serviceable	1/8 oz.
Repair or replace	1/4 oz.

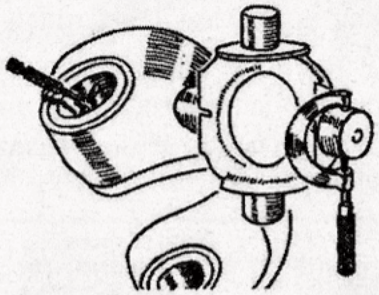
others may be activated by a sideways movement. Each movement of the activating mechanism is shown on the face of the dial gauge. Some readings can be extremely precise, ranging from 0.0001" of movement.

The dial gauge may be affixed to a surface with a magnetic clamp, bolts, or a stand. A variety of 'feelers' are often available to allow the gauge to do more than one type of measurement.

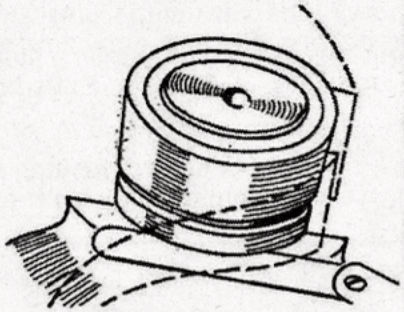
Spring Pressure Tension Gauge – A spring pressure tension gauge is little more than a specially designed scale. It measures the amount of pressure (in ounces or pounds) of a spring at various points of compression. Often valve springs are specified to have a certain pressure



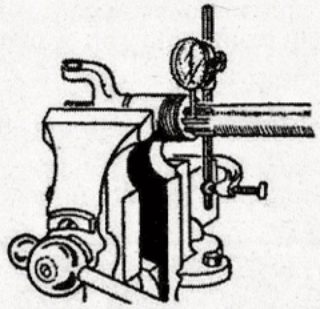
Measure straightness of propeller shaft with dial gage.
Desirable ..... .002-.004
Serviceable ..... .006
Repair ..... .010



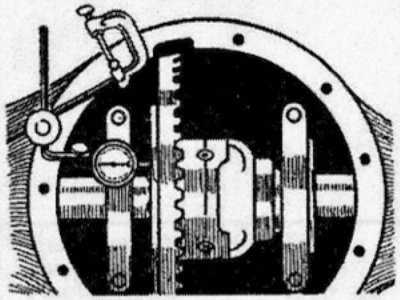
Measure clearance between universal joint pins and bushings with micrometer calipers and telescoping gage.
Desirable ..... .001-.002
Serviceable ..... .005 if quiet
Replace ..... .007 if noisy



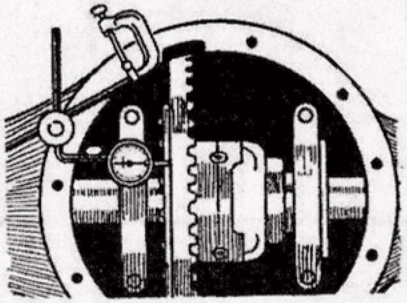
Measure end clearance of universal joint pins in bushings with feeler gage.
Desirable ..... .001-.002
Serviceable ..... .005
Repair or replace ..... .010



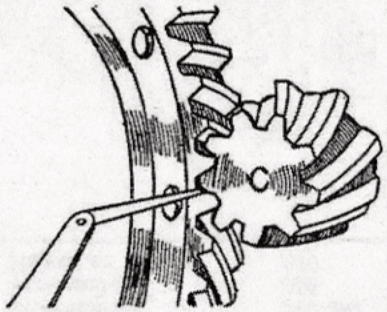
Measure fit of propeller shaft splines in universal joint yoke with dial gage.
Desirable ..... .002-.004
Serviceable ..... .005
Repair or replace ..... .010



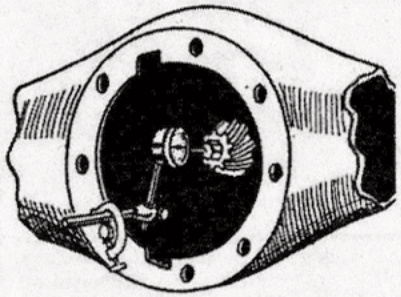
Measure lateral trueness of differential case flange with dial gage before installing ring gear.
Desirable ... .001-.002 variation
Serviceable ..... .003 variation
Repair or replace. .004 variation



Measure lateral trueness of assembled ring gear with dial gage.
Desirable ... .002-.003 variation
Serviceable ..... .006 variation
Replace ..... .010 variation



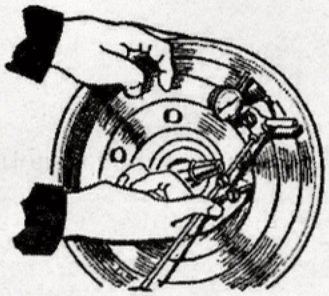
Measure clearance between pinion and ring gear teeth with feeler gage.
Desirable ..... .006-.008
Serviceable ..... .010
Repair or replace ..... .015



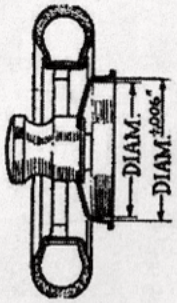
Measure endwise clearance of pinion shaft with dial gage.
Desirable ..... .001-.002
Serviceable ..... .003
Repair or replace ..... .005

at various lengths. *Skinned Knuckles* has in the past advised on how to make a simple spring pressure tension gauge using a drill press and a bathroom scale. We will be repeating this information in a future issue.

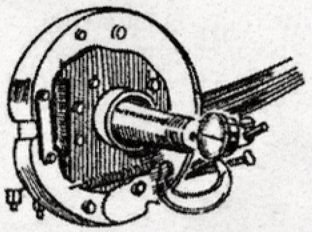
Spring Gauge – A spring gauge provides an identifiable amount of tension. One end of the gauge is coupled to the part to be measured. The amount of pull is marked in fractions of an ounce or pounds. The amount of movement of the part being measured has to be determined with another tool.



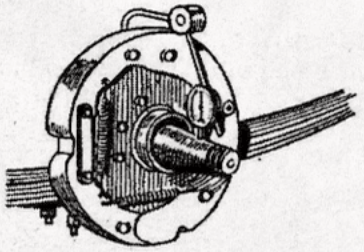
Measure brake drum for roundness and concentricity with hub, using dial gage mounted in hub.
Desirable ..... .002-.004
Serviceable ..... .008
Repair or replace ..... .010



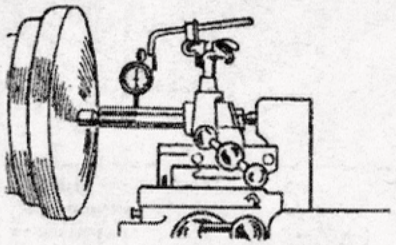
Measure brake drum for taper or bell-mouth with dial gage mounted in hub.
Desirable ..... .001-.002
Serviceable ..... .004
Replace ..... .006



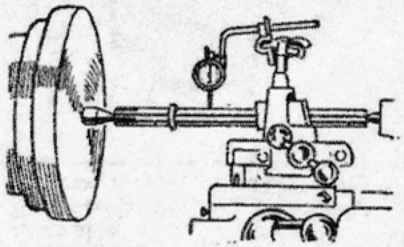
Measure endwise clearance of axle shaft with dial gage.
Desirable ..... .002-.004
Serviceable ..... .005
Repair or replace ..... .010



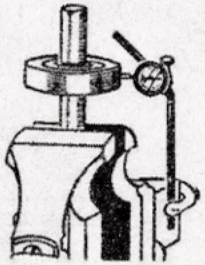
Measure wheel bearing clearance with dial gage.
Desirable ..... .001-.002
Serviceable ..... .005
Repair or replace ..... .008



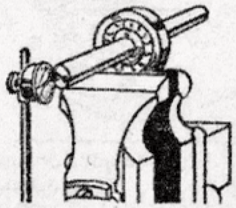
Measure all splined shafts for straightness with dial gage.
Desirable ..... .001-.0015
Serviceable ..... .002
Repair ..... .003



Measure all axle shafts for straightness with dial gage.
Desirable ..... .001-.002
Serviceable ..... .004
Repair ..... .005



Measure all ball bearings for radial or diametral clearance with dial gage, (clearance per inch of diameter).
Desirable ..... .0005-.001
Serviceable ..... .003
Replace ..... .005



Measure all ball bearings for endwise clearance with dial gage, (clearance per inch of diameter).
Desirable ..... .001-.002
Serviceable ..... .004
Replace ..... .006

Inside Micrometer – Often known as an inside tubular micrometer, this device works like the inside telescoping gauges, but is considerably more accurate in the readings. It does not have a handle like the telescoping gauge, and the measurement can be read directly from a scale on the tubular barrel.

Protractor – A tool designed to measure angles. Two (somewhat) perpendicular faces will measure how many degrees (from a perfect right angle - 90°) the two surfaces vary. Often one face is moveable, and a vernier scale indicates the number of degrees of variation.