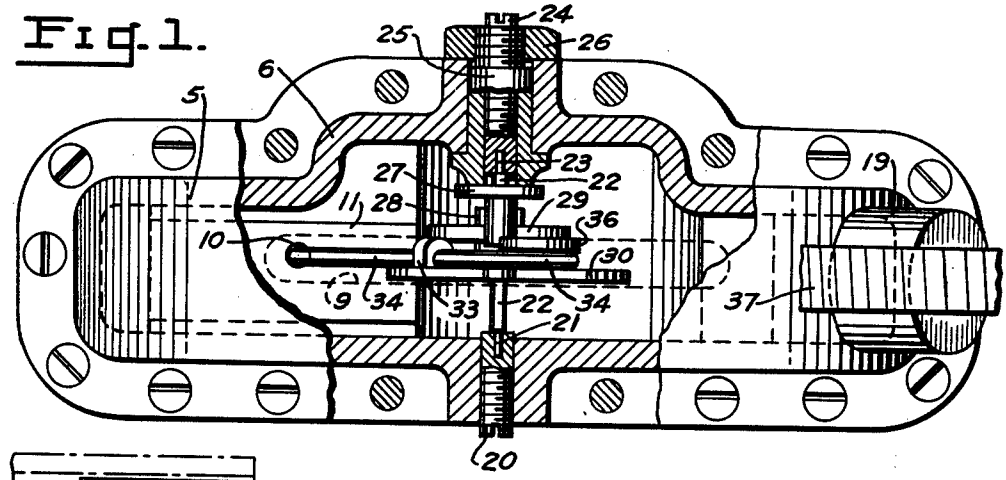
June 9, 1953 G. W. GRISDALE 2,641,130

DIFFERENTIAL AIR GAUGE

Filed April 16, 1947

Fig. 1.



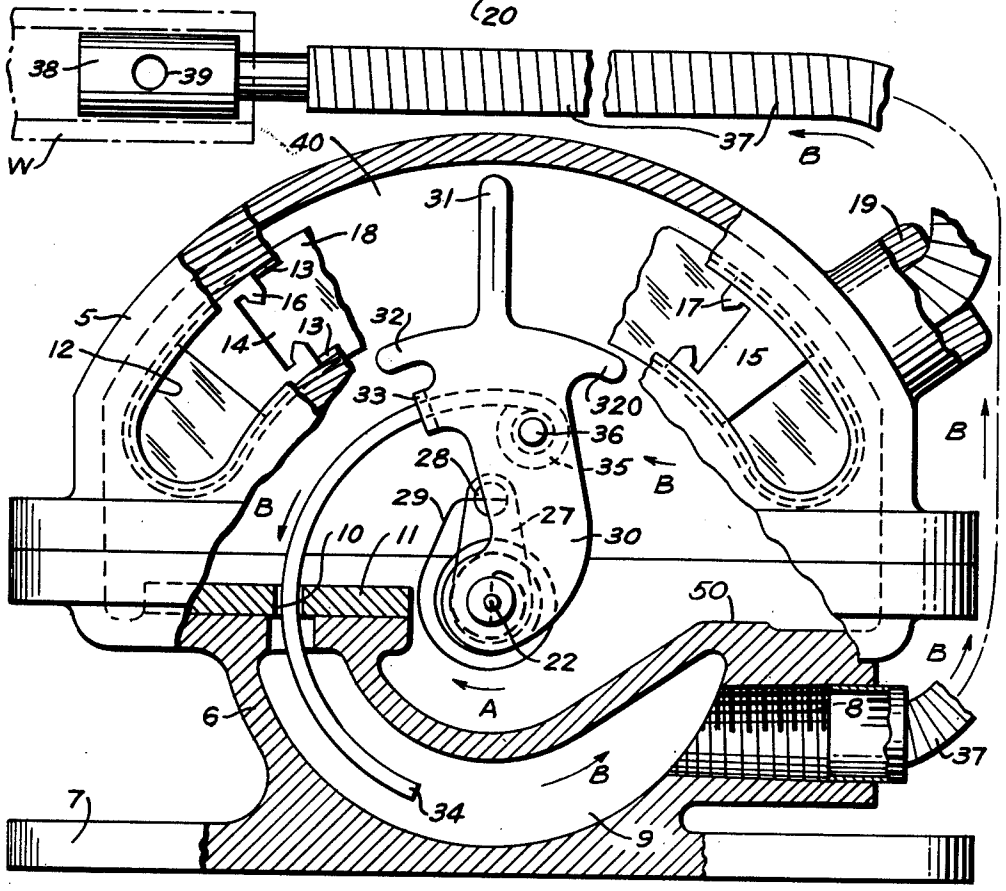


Fig. 2.

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Patented June 9, 1953

2,641,130

UNITED STATES PATENT OFFICE

2,641,130

DIFFERENTIAL AIR GAUGE

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Application April 16, 1947, Serial No. 741,831

3 Claims. (Cl. 73—388)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to gages which operate by the differential pressure of air passing through them. Such gages are particularly adapted for measuring in response to the variations in the gap between the outlet member of the gage and a work piece, such as the interior of a gun barrel. However, such gages may be employed for indicating any differential fluid pressure.

One object of the present invention is to provide a gage having an orifice of fixed size across which orifice pressure differential is measured and at the same time having part of the indicating element of the gage passing through the orifice.

Another object of the invention is to improve the quality and character of gages.

Further objects of this invention are to provide a simple and accurate fluid pressure operated gage which can be easily and economically manufactured and which is efficient and exact in use since it is easily read.

The invention also comprises the improvements to be presently described and finally claimed.

In the following description reference will be made to the accompanying drawing forming part hereof and in which:

Fig. 1 is a top or plan view with parts broken away in horizontal cross section.

Fig. 2 is a front elevation with parts broken away in vertical cross section to reveal the internal structure.

In the drawings, the gage of this invention will be seen to consist of a housing or casing made in two parts of which the upper is designated by the reference character 5 and the lower by the reference character 6. This housing or casing is supported on a base 7. The upper part 5 of the housing has in inlet 19 communicating with a high pressure chamber 40 whose opposite or outlet end communicates with an orifice 10 passing through a slab or plate 11. Slab or plate 11 may be readily removed from the housing and replaced with another having an orifice of different size through it. The upper part 5 of the housing is generally arcuate in vertical cross section and has a correspondingly shaped window or opening 12. The upper and lower arcuate edges of window 12 are channeled or grooved to receive the edges of a maximum clearance indicator 14 and a minimum clearance indicator 15 whereby these indicators are mounted for manual adjustment in a manner obvious from inspection of the drawing. These

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indicators are in the form of sheets or plates cut away at one side to provide indexes 16 and 17 respectively. The rear or inner face of window 12 is closed and sealed by a transparent pane 18. The lower housing part 6 forms a generally arcuate low pressure chamber 9 having an exhaust or outlet connection 8.

Bearing members 20 and 24 are mounted in aligned relation in the upper central portion of the walls of lower housing 6 and have axially aligned bores in their confronting ends to receive the reduced ends or spindles 21 and 23 respectively, of shaft 22 to provide an anti-friction pivotal mounting for the same. Member 20 is threaded into a tapped hole in one wall of the housing, while member 24 is threaded into a sleeve 25 having a smooth fit within an enlarged bore in the other wall of the housing. This sleeve has an inner flange which is drawn against a shoulder in the inner face of said other wall by means of a nut 26 upon a reduced threaded exterior portion, whereby the sleeve is rigidly secured to the housing. The inner end of sleeve 25 is reduced and an upstanding support 27 has a press fit thereon. This support bears an inwardly projecting pin 28 on its distal end to which is affixed the outer end of a coil spring 29. The other end of spring 29 is secured to shaft or spindle 22.

Also mounted on spindle 22 is an indicator 30 in the form of a flat plate having a pointer 31 visible through pane 18, and oppositely extending stops 32 and 320 formed in its upper portion. A rearwardly extending flange 33 is turned back out of its plane and has a perforation through which passes a portion of a piston 34.

Piston 34 is in the form of a length of stiff wire in arcuate form and fixed to pointer 31 coaxially of shaft 22 by loop formed on one end of the wire in cooperation with a rivet 36 and also by the aforesaid flange 33.

Communicating with outlet orifice 8 is a flexible tube 37 on the opposite end of which is mounted a measuring piston 38 having one or more orifices 39 in its side walls and in communication with the contiguous end of tube 37. The measuring piston 38 is adapted for insertion into the work piece to be measured such as the gun barrel W indicated in dotted lines in Fig. 2.

The method or mode of operation of the gage of this invention is as follows: The inlet 19 is connected to a suitable source of constant pressure fluid such as compressed air. The helically coiled spring 29 stresses or biases indicator 30 clockwise in the direction shown by the arrow A in Fig. 2. The right-hand stop 320 is therefore

in contact with the fixed stop 50 (Fig. 2) when the device is at rest. When the compressed air is admitted to the inlet 19 it passes in the direction of the arrows B through high pressure chamber 40, the fixed orifice 10, the back pressure chamber 9, the outlet orifice 8, the tube 37, and out through the orifice or orifices 39. Since the only communication between the chambers in casing parts 5 and 6 is through restricted orifice 10, there is a pressure drop between chambers which acts upon the piston 34 to urge the same and pointer 31 counterclockwise, with a torque proportional to the pressure difference or rate of flow of fluid through the orifice. If the measuring piston 38 is now inserted into the interior of the work piece which is to be gaged, such as the gun barrel W, the escape of air from the measuring orifice 39 is reduced and consequently the pressure drop across and rate of flow of fluid through the orifice decreases so that spring 29 moves indicator 30 as indicated by arrow A in a clockwise direction, or to the right as seen in Fig. 2. The amount of clockwise or right-hand movement of indicator 30 depends upon the clearance between the measuring piston 38 and the work piece W. A maximum setting ring is slipped over measuring piston 38 to enclose orifices 39 and the position of pointer 31 is observed. Maximum clearance indicator 14 is then moved so that its pointed markers 16 coincide with the axis of pointer 31. The maximum setting ring is then slipped off the measuring piston 38 and a minimum setting ring is slipped over the measuring piston 38. Since there is a difference in clearance between the measuring piston 38 and the maximum and minimum setting rings, the pointer 31 occupies a different position when the minimum setting ring is over the measuring piston 38. This position of pointer 31 is observed and the minimum clearance indicator 15 is moved so that its pointed markers 17 coincide with the axis of the pointer. Thus the maximum and minimum clearance indicators are set to provide tolerance or gage points between which the finger 31 should be located when the measuring piston 38 is inserted in the work piece W being gaged, in order to pass as satisfactory each of the work pieces being gaged. If the finger 31 lies beyond the pointed markers 14 or 16 in either direction, the work piece is either too small or too large.

I claim:

1. In a differential pressure gage, a casing comprising upper and lower halves having inlet and outlet connections, respectively, and generally horizontal confronting mating faces secured together to define first and second pressure chambers communicating only through an orifice in the interface of one said half, aligned bearings carried by the opposed side walls of said lower half and defining a pivot axis radially offset from said orifice, a shaft journaled by and between said bearings for rotation about said axis, a pointer fixed with said shaft and viewable through a sealed viewing opening in said upper half, an arcuate piston secured at one end with said pointer and extending loosely through said orifice coaxially of said axis, and a spring yieldingly urging said shaft in one direction of rotation.

2. In a differential pressure gage, a lower casing half having walls defining a closed first pressure chamber, an upper casing half secured to and over said lower half and defining therewith a closed second pressure chamber, the wall of said lower half having an apertured flat surface between said chambers, a flat plate removably secured to and over said surface and having an orifice superposed over the aperture therein, first and second bearings mounted in aligned relation in respective side walls of said lower casing to define an axis radially offset from said orifice, a shaft journaled by and between said bearings, a pointer member radially secured to and upstanding from said shaft and viewable through an arcuate sealed viewing opening in the wall of said upper half, an arcuate piston fixed to said pointer member coaxially of said shaft and extending loosely through said orifice throughout the range of angular movement of said shaft, spring means urging said shaft into one direction of rotation, and inlet and outlet connections in communication with said chambers.

3. In a differential pressure gage, a lower casing half having walls defining a closed first pressure chamber, an upper casing half secured to and over said lower casing half to define therewith a second closed pressure chamber, a plate replaceably secured over an aperture in the wall between said chambers and having an orifice superposed over the aperture, there being aligned bearing openings in respective opposed walls of said lower casing half defining an axis radially offset from the orifice, a first bearing threaded into one said opening, a sleeve secured in and fitting the other said opening, a second bearing threadedly engaging said sleeve, a shaft journaled by and between said bearings for rotation on said axis, a pointer member secured to said shaft and viewable through a sealed opening in said upper casing half, an arcuate piston fixed to said pointer member coaxially of said shaft and extending loosely through said orifice, a support fixed to the inner end of said sleeve and extending radially therefrom within said second chamber, a coil spring having one end secured to said support and the other end to said shaft, and outlet and inlet connections carried by the respective casing halves and in communication with the respective chambers.

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