PATENT SPECIFICATION 739,001

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Index at Acceptance :—**Class 106(2)**, H3C2.

COMPLETE SPECIFICATION.

Improvements relating to Differential Fluid Pressure Gauges.

We, PAYNE AND GRIFFITHS LIMITED, of Tudor Works, Windmill Lane, Smethwick, in the City of Birmingham, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention has for its object to provide an improved differential pressure gauge of the Bourdon type, the fluid pressures being either positive or negative.

The invention comprises the combination of a pair of oppositely directed and spirally coiled Bourdon tubes the inner ends of which are anchored, a pair of substantially parallel rods secured respectively to the outer ends of the Bourdon tubes, a rigid link interconnecting the opposite ends of the rods, and mechanism operable through the medium of the link for actuating an index finger.

In the accompanying drawings:—

Figure 1 is a sectional front elevation; and

Figure 2 a sectional side elevation of a gauge embodying the invention;

Figures 3 and 4 and Figures 5 and 6 are respectively similar views to Figures 1 and 2, illustrating alternative embodiments of the invention.

Referring to Figures 1 and 2, there is provided a cylindrical metal or other casing *a*, and in this casing are mounted in spaced relationship a pair of similar Bourdon tubes *b* each having the form of a spiral coil provided with four, or any other convenient number, of convolutions, the two coils being arranged with their convolutions extending in opposite directions, and with their outer ends facing each other.

The inner ends of the spirally coiled Bourdon tubes are secured to, and communicate with, fixed hollow mountings *c*, the latter being surrounded by the tubes, and being secured to the rear wall of the casing. These hollow mountings are connected by pipes *d* to the inner ends of hollow connections *e* which are secured to and extend through one side of the peripheral wall of the casing, and to which fluid under pressure can be admitted. The fluid may be liquid, such as oil, or may be air or other gas.

To the outer ends of the Bourdon tubes are respectively secured a pair of parallel rods *f* which are rigidly inter-connected by a link *g*. The latter may be composed of a pair of parts adjustably connected by a coupling *h* so that the length of the link can be varied within predetermined limits. Also the link may be connected to one of the rods by a pivot pin *i*, and to the other rod by a clamp *j* which is slidably adjustable on the last mentioned rod.

Adjustably secured to the link at a central or other position is a depending plate *k* which at its lower end is formed with a slot *m*. Engaging this slot is a pin *n* on an intermediate part of a lever *o* which at one end is supported on a fixed pivot axis, and which at its other end is adapted to impart motion through any convenient means including a segmental rack *p* engaging a pinion *q* to a spindle *r* carrying an index finger *s*. This spindle passes through a plate *t* which encloses the front of the mechanism, and on which is formed or secured a graduated dial, the index finger being movable over this dial.

When the gauge above described is in use, the Bourdon tubes are deformed by the pressures of the fluids admitted thereto through the hollow connections, and thereby caused to exert opposing tractive efforts on the inter-connecting link. If the fluid

[*Price* 3*s.* 0*d.*]

pressures in the two Bourdon tubes are equal, the tubes are deformed to a corresponding extent, and the opposing tractive efforts exerted by the tubes on the inter-connecting link are equal. In this condition no movement is imparted to the inter-connecting link, with the result that the index finger remains stationary. If, however, the fluid pressures in the two Bourdon tubes tubes are unequal, the tubes are deformed to different extents, and the opposing tractive efforts exerted by the tubes on the inter-connecting link are unequal. In this condition the inter-connecting link is moved by the predominating tractive effort, the direction and extent of this movement depending on which tube exerts the predominating effort, and on the amount by which this effort exceeds that exerted by the other tube.

Due to manufacturing tolerances the amounts by which the two Bourdon tubes are deformed by the same fluid pressure may vary slightly, and to compensate this the length of the link *g* and the position in which it is secured by the clamp *j* to one of the rods may be initially adjusted so that no movement is imparted to the link when equal fluid pressures exist in the two tubes.

To limit the extent of the movements that can be imparted to the link by differential deformation of the tubes, any convenient adjustable stops *u* may be provided.

A gauge as above described is particularly suitable for measuring small differences between high fluid pressures.

In the modification illustrated by Figures 3 and 4, the rods *f* are inter-connected by a link *g* which is pivotally attached at both ends to clamps *j* the latter being slidably adjustable on the rods. On the link *g* is attached a slidably adjustable arm *v* which is pivotally connected by a link *w* to the segmental rack *p*.

The modification shown in Figures 5 and 6, differs from that shown in Figures 4 and 5, in that the arm *v* is connected to the segmental rack *p* through a plurality of links *w* adapted to magnify the motion transmitted from the link *g* to the rack.

The invention is not, however, limited to the examples described, as subordinate constructional details may be varied to suit different requirements. Moreover, the invention is capable of being used for measuring differences between negative fluid pressures, in which case the negative pressures are created in the Bourdon tubes by exhaustion.

What we claim is:—

1. A differential fluid pressure gauge comprising the combination of a pair of oppositely directed and spirally coiled Bourdon tubes the inner ends of which are anchored, a pair of substantially parallel rods secured respectively to the outer ends of the Bourdon tubes, a rigid link inter-connecting the opposite ends of the rods, and mechanism operable through the medium of the link for actuating an index finger.

2. A differential fluid pressure gauge comprising the combination and arrangement of parts substantially as described and as exemplified by Figures 1 and 2, Figures 3 and 4, or Figures 5 and 6 of the accompanying drawings.

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PROVISIONAL SPECIFICATION.

Improvements relating to Differential Fluid Pressure Gauges.

We, PAYNE AND GRIFFITHS LIMITED, of Tudor Works, Windmill Lane, Smethwick, in the City of Birmingham, a British Company do hereby declare this invention to be described in the following statement:—

The invention has for its object to provide an improved differential fluid pressure gauge of the Bourdon type.

The invention comprises in combination a pair if Bourdon tubes each having the form of a spiral coil anchored at one end, means inter-connecting the other ends of the coils, and mechanism operable through the medium of the inter-connecting means for actuating an index finger.

In one manner of carrying the invention into effect, there is employed a cylindrical metal or other casing, and in this casing are mounted in spaced relationship a pair of similar Bourdon tubes each having the form of a spiral coil provided with four, or any other convenient number, of convolutions, the two coils being arranged with their convolutions extending in opposite directions, and with their outer ends facing each other.

The inner ends of the spirally coiled Bourdon tubes are secured to, and communicate with, fixed hollow mountings, the latter being surrounded by the tubes, and being secured to the rear wall of the casing. These hollow mountings are connected by pipes to the inner ends of hollow connections which are secured to and extend through one side of the peripheral wall of the casing, and to which fluid under pressure can be admitted. The fluid may be

liquid, such as oil, or may be air or other gas.

To the outer ends of the Bourdon tubes are respectively secured a pair of parallel rods which are rigidly inter-connected by a link. The latter may be composed of a pair of parts adjustably connected together by a coupling so that the length of the link can be varied within predetermined limits. Also the link may be connected to one of the rods by a pivot pin, and to the other rod by a clamp which is slidably adjustable on the last mentioned rod.

Adjustably secured to the link at a central or other position is a depending plate which at its lower end is formed with a slot. Engaging this slot is a pin on an intermediate part of a lever which at one end is suported on a fixed pivot axis, and which at its other end is adapted to impart motion through any convenient means to a segmental rack, the latter being in engagement with a pinion on a spindle carrying an index finger. This spindle passes through a plate which closes the front of the casing, and on which is formed or secured a graduated dial, the index finger being movable over this dial.

When the gauge above described is in use, the Bourdon tubes are deformed by the pressures of the fluids admitted thereto through the hollow connections, and thereby caused to exert opposing tractive efforts on the inter-connecting link. If the fluid pressures in the two Bourdon tubes are equal, the tubes are deformed to a corresponding extent, and the opposing tractive efforts exerted by the tubes on the inter-connecting link are equal. In this condition no movement is imparted to the inter-connecting link, with the result that the index finger remains stationary. If, however, the fluid pressures in the two Bourdon tubes ar unequal, the tubes are deformed to different extents, and the opposing tractive efforts exerted by the tubes on the inter-conncting link are unequal. In this condition the inter-connecting link is moved by the predominating tractive effort, the direction and extent of this movement depending on which tube exerts the predominating effort, and on the amount by which this effort exceeds that exerted by the other tube.

Due to manufacturing tolerances the amounts by which the two Bourdon tubes are deformed by the same fluid pressure may vary slightly, and to compensate this the length of the link and the position in which it is secured by the clamp to one of the rods may be initially adjusted so that no movement is imparted to the link when equal fluid pressures exist in the two tubes.

To limit the extent of the movements that can be imparted to the link by differential deformation of the tubes, any convenient adjustable stops may be provided.

A gauge as above described is particularly suitable for measuring small differences between high fluid pressures.

The invention is not, however, limited to the example described as subordinate constructional details may be varied to suit different requirements.

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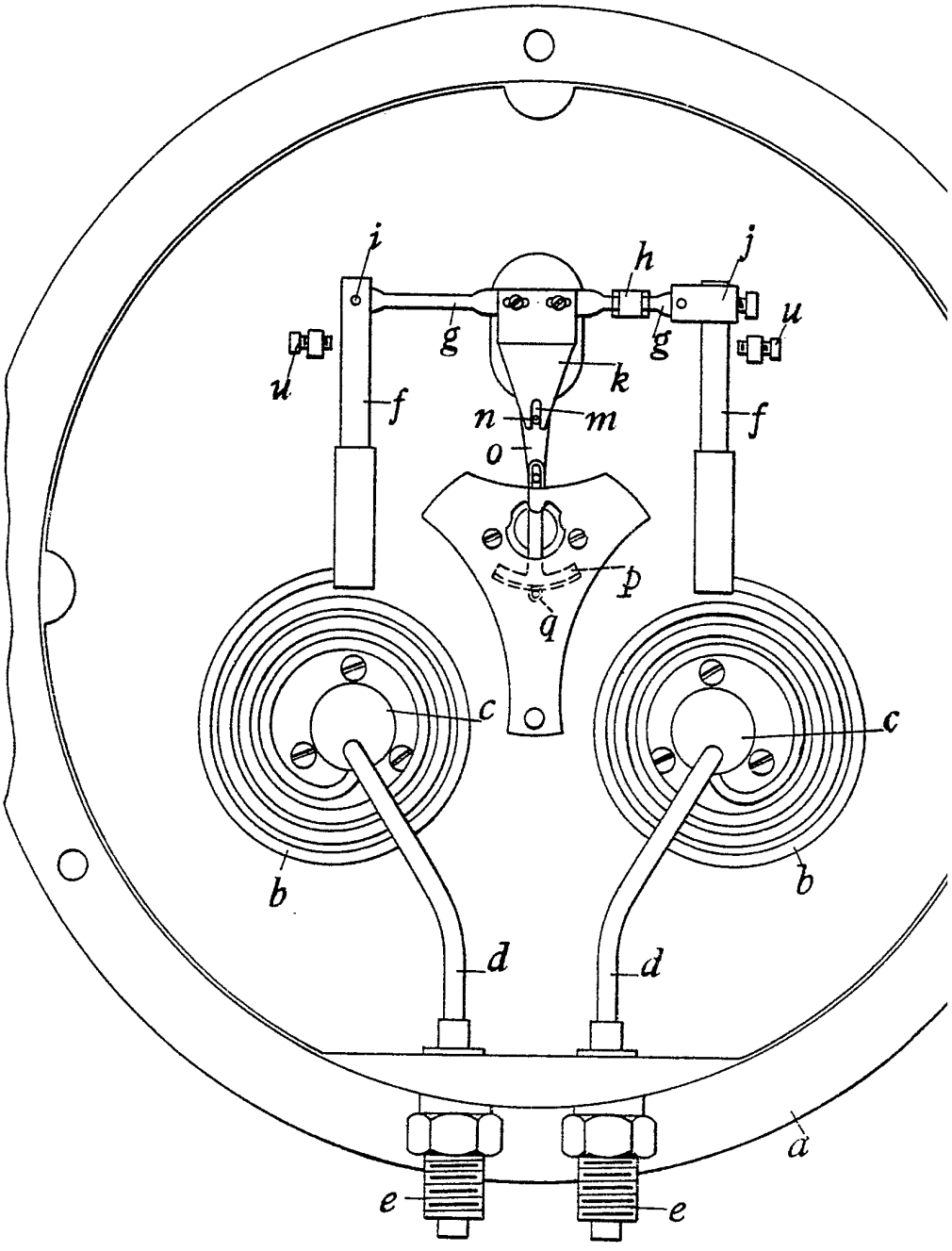

Fig.1

739,001 COMPLETE SPECIFICATION
3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

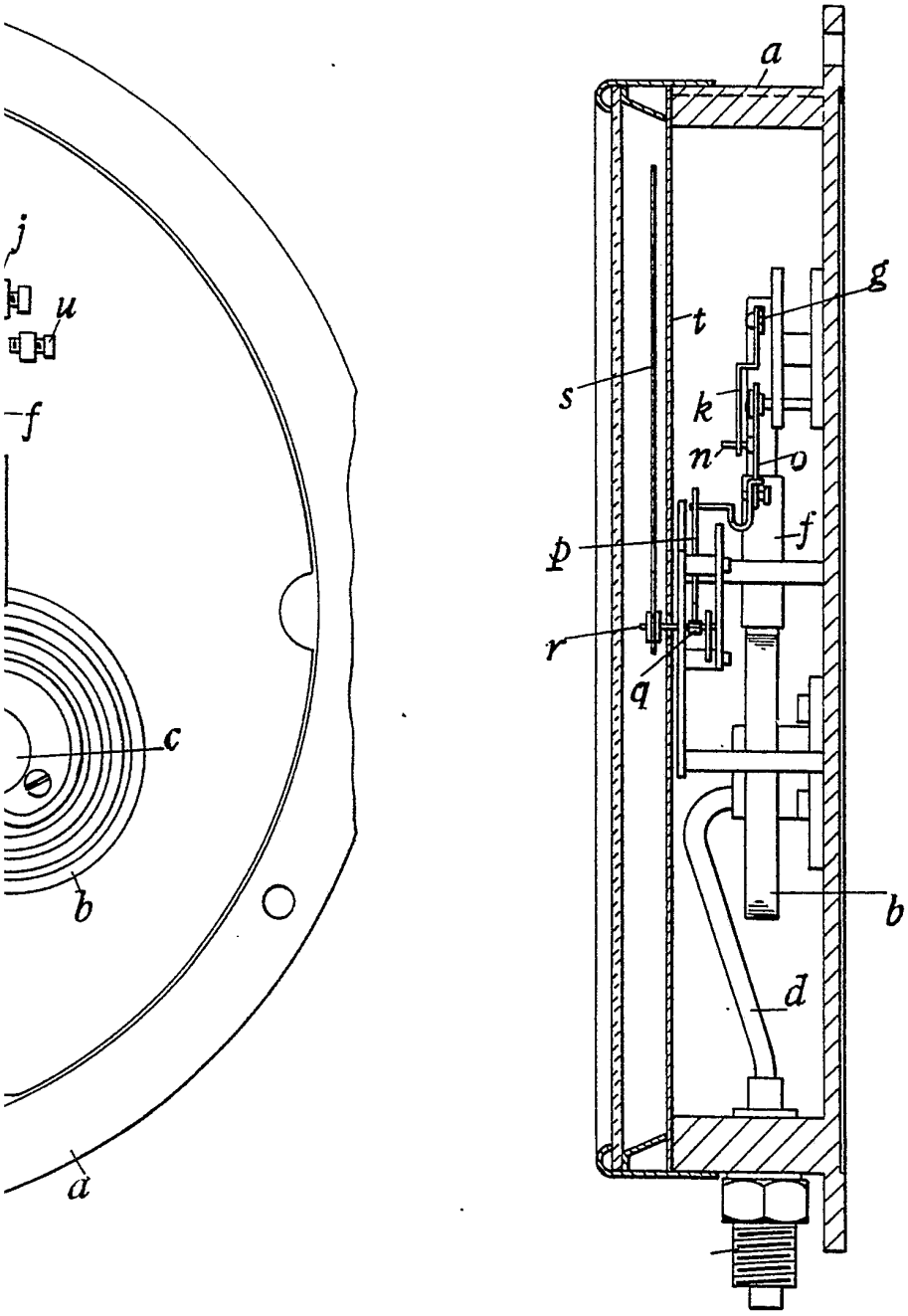

Fig.2

739,001 COMPLETE SPECIFICATION
3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

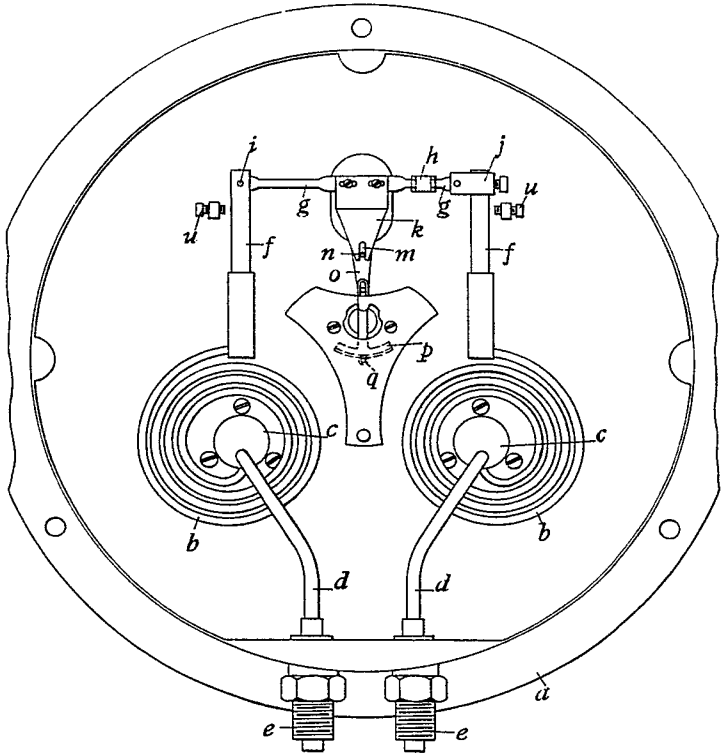

Fig.1

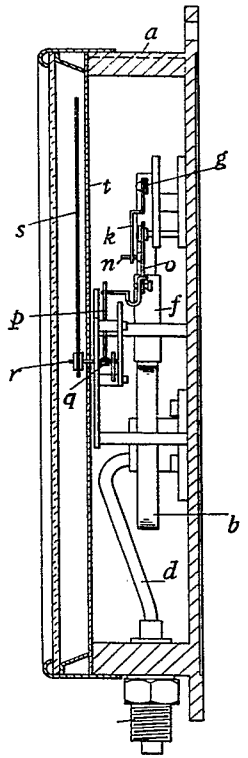

Fig.2

739,001 COMPLETE SPECIFICATION
3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 3

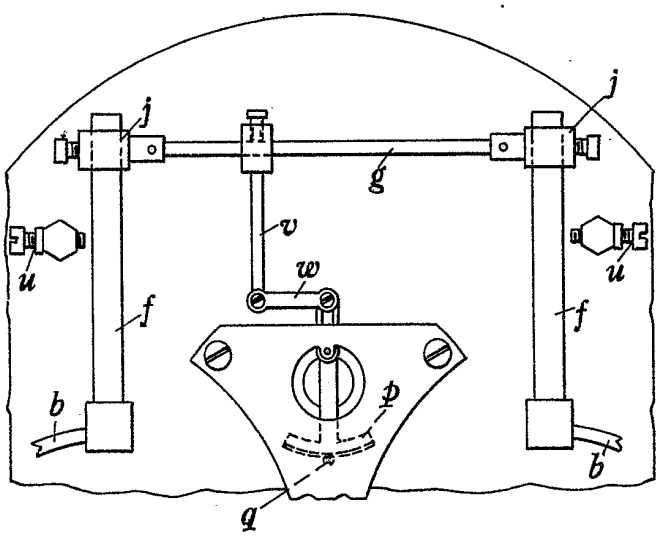

Fig.3

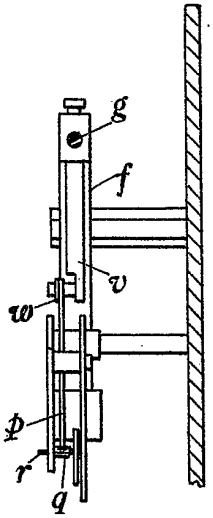

Fig.4

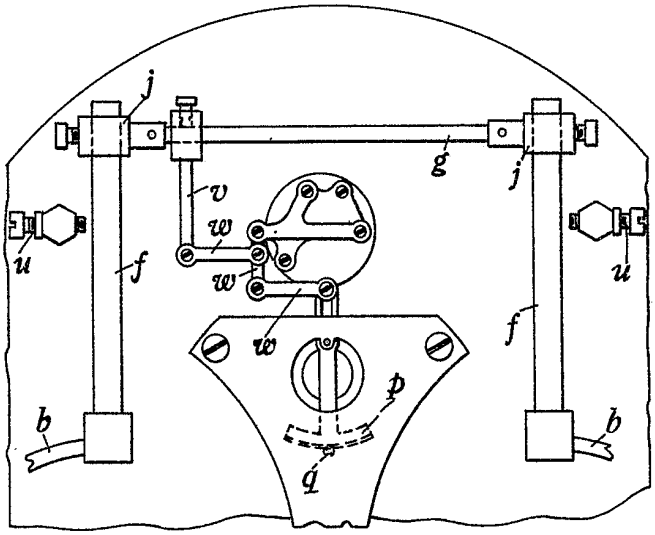

Fig.5

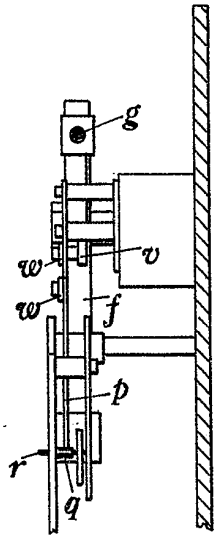

Fig.6