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C. M. HATHAWAY
ELECTRIC PRESSURE HEAD

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Fig. 1

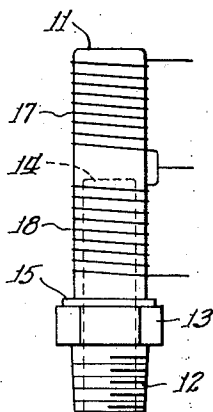


Fig. 2

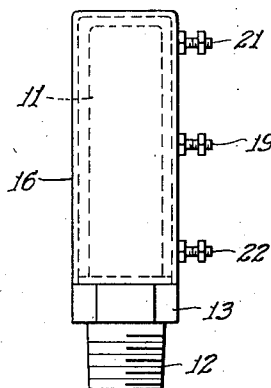
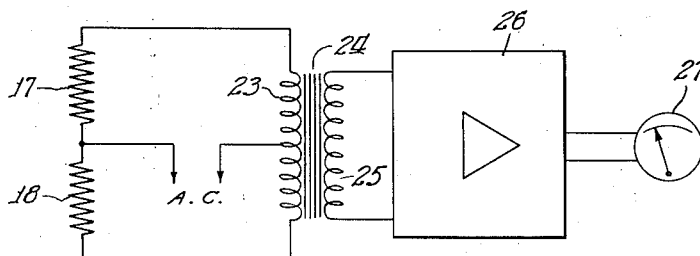


Fig. 3



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ELECTRIC PRESSURE HEAD

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6 Claims. (Cl. 201-63)

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The present invention relates to electric pressure heads, or more particularly to an electric pressure head employing a strain-responsive wire element.

Heretofore it has been proposed to obtain indications of the pressures developed within an internal combustion engine by means of a pressure head which is connected in an electric circuit to give an indication of the high rate at which pressures develop in an engine. In certain engine tests, it is particularly desired to have an indication of predetonation action and pressure heads of the electrical type are particularly suited for observation of this phenomenon. The pressure heads heretofore employed, however, have commonly been of the electromagnetic type or of the piezoelectric crystal type. Both of these types have certain disadvantages, particularly with respect to changes induced by temperature. In the design of the electromagnetic head, it is necessary to introduce compensations for temperature variations and to provide a relatively elaborate supporting means to minimize the effect of temperature variations. The piezoelectric crystal units must also be protected against temperature variations beyond certain limits since the crystal may change in characteristic if elevated in temperature beyond a certain amount. It, therefore, would be desirable to obtain a different type of gauge which is not subject to the aforementioned disadvantages.

In accordance with the present invention it is proposed to provide a pressure head which employs a strain-responsive resistance element. The pressure head constructed in accordance with the present invention is readily compensated for balancing out temperature effects.

It therefore is an object of the present invention to provide an improved electric pressure head particularly suited for use with internal combustion engines.

It is a further object of the present invention to provide an improved electric pressure head employing a resistance wire strain-responsive element.

It is a further object of the present invention to provide an improved electric pressure head which may be connected in an electric bridge circuit for indicating transient pressures.

Other further objects of the present invention subsequently will become apparent by reference to the following description taken in conjunction with the accompanying drawing, wherein:

Figure 1 is a view of a pressure head con-

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structed in accordance with the present invention;

Figure 2 is another view of a pressure head constructed in accordance with the present invention, which has been provided with a protective shield or covering; and

Figure 3 shows an electric circuit diagram, to which is connected a pressure head of the type illustrated in Figures 1 and 2.

Referring more particularly to the drawing, it will be seen that there has been shown in Figure 1 an electric pressure head base formed of metal having an upper cylindrical portion 11 and a lower threaded portion 12. Immediately above the threaded portion 12 there is provided a hexagonal portion 13 which is adapted to be engaged by a wrench for the insertion of the pressure head into a suitable opening in an internal combustion engine. The lower portion of the pressure head 11 is provided with a central hollow aperture 14 so that the lower half of the cylindrical portion 11 may be subjected to stress corresponding to the pressure developed within the internal combustion engine. Immediately above the hexagonal portion 13 there may be provided a shoulder 15, cylindrical in form, for receiving a protective cover 16, which is shown in Figure 2.

The upper solid portion of the cylindrical body portion 11 of the electric pressure head has wound thereabout a number of turns of strain-responsive resistance wire 17. A similar number of turns of strain-responsive wire 18 are wound about the lower half of the cylindrical portion 11 so as to be in the proximity of the relatively thin walls formed by the central aperture 14. The lower resistance unit 18 will be responsive to the strain induced in the walls due to the pressure within the aperture or cavity 14. The upper resistance element 17 will not be subjected to any stress or strain because the cylindrical portion 11 is solid. The upper portion 17, however, will be subjected to the same temperature as the resistance unit 18 because of the conduction of heat along the body 11. Thus, the effects produced in the strain-responsive unit 18 due to temperature are also being produced in the resistance wire unit 17.

Suitable resistance wire for this purpose has been available on the market under various trade names. An example of such wire is Advance wire which has a favorable ratio of strain sensitivity. While units 17 and 18 may be retained in position on the cylindrical portion 11 in any suitable manner, a lacquer or paint which is capable

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of withstanding the temperatures to which the body 11 is subjected may be employed or the resistance units 17 and 18 may be secured in position by some form of vitreous coating. The upper terminal of the resistance unit 18 and the lower terminal of the resistance unit 17 may be connected to an electric connection 19 mounted on a protective covering 16. The upper terminal of the resistance unit 17 is connected to another electric terminal 21, whereas the lower terminal of the resistance unit 18 is connected to another electric terminal 22. The cover 16 may be employed to give protection to the resistance units 17 and 18 since they are of relatively small diameter of wire. The cover 16 will also serve to ensure that the upper resistance unit 17 is subjected to the same temperature as the lower resistance unit 18, particularly in the instance where the unit may be subject to drafts.

Figure 3 shows a circuit diagram wherein the resistance units 17 and 18 are connected in a bridge circuit which includes a tapped primary winding 23 of a transformer 24. The central tap of the primary winding 23 of the transformer is connected to one side of an alternating current source which has its other side connected to a common juncture between the resistance units 17 and 18. The transformer 24 has secondary winding 25, which is connected to a vacuum tube amplifier 26 which has its output connected to an indicating instrument 27. If desired, the indicating instrument 27 may be of any suitable type, such as a physical indicating instrument, or a recording instrument.

While for the purpose of illustrating and describing the present invention, a certain embodiment has been illustrated in the drawing, it is to be understood that the invention is not to be limited thereby, since such variations in the instruments employed and in their arrangement and configuration are contemplated as may be commensurate with the spirit and scope of the invention set forth in the following claims.

I claim:

1. An electric pressure head comprising an elongated member having a chamber at one end adapted to be connected to a source of pressure, a strain-responsive wire element mounted about the exterior of said member in the proximity of said chamber, and a similar strain-responsive wire element mounted on a portion of said member which is not subjected to stress or strain due to pressure within said chamber.

2. An electric pressure head comprising a cylindrical member having a solid portion and a hollow portion, said hollow portion being provided with means for supplying pressure thereto, a strain-responsive wire element mounted on the exterior of said hollow portion of said cylinder, a similar wire strain-responsive element mounted

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on said cylinder about said solid portion, and means for connecting said strain-responsive elements to a balanced bridge circuit.

3. An ambient temperature compensated electric pressure head for internal combustion engines comprising a cylindrical body member having hollow and solid portions, a pair of strain-responsive resistance wire elements wound about the exterior of body member in the proximities of said hollow and solid portions, and means for connecting said elements to a source of alternating potential and to a balanced bridge circuit.

4. An ambient temperature compensated electric pressure head for internal combustion engines comprising a cylindrical body member having hollow and solid portions, a pair of strain-responsive resistance wire elements, one element being wound about the hollow portion of said body member, the other being wound about the solid portion of said body member, and means for connecting said hollow portion in communication with the combustion chamber of an engine.

5. An ambient temperature compensated electric pressure head for internal combustion engines comprising a cylindrical body member having hollow and solid portions, a pair of strain-responsive resistance wire elements, one element being wound about the hollow portion of said body member, the other being wound about the solid portion of said body member, means for connecting said hollow portion in communication with the combustion chamber of an engine, and means surrounding said body member to shield said elements from air currents.

6. An ambient temperature compensated electric pressure head for internal combustion engines comprising a cylindrical body member having hollow and solid portions, a pair of strain-responsive resistance wire elements, one element being wound about the hollow portion of said body member, the other being wound about the solid portion of said body member, means for connecting said hollow portion in communication with the combustion chamber of an engine, and means surrounding said body member to shield said elements from air currents, said means being provided with electrical connections for connecting said elements in a balanced bridge circuit.

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The following references are of record in the file of this patent:

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Disclaimer

2,474,146.—*Claude M. Hathaway*, Denver, Colo. ELECTRIC PRESSURE HEAD. Patent dated June 21, 1949. Disclaimer filed July 29, 1950, by the inventor. Hereby enters this disclaimer to claims 1 and 2 of said patent.
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