PROVISIONAL SPECIFICATION.

An Improved Slide Rule.

I, John Gray, of 83, Cannon Street, London, E.C., Chartered Patent Agent, do hereby declare the nature of this invention (a communication from C. S. Jeffry, of 76, Merchant Street, Rangoon, Electrical Engineer) to be as follows:—

5   This invention relates to calculating devices and has for its object to provide a device suitable for giving the ratio of the actual vacuum to the vacuum corresponding to the condenser discharge water temperature of a steam plant without the necessity of referring to a curve or chart.

In warm climates or where artificial cooling of the condensing water has 10 to be resorted to, it is very important that a high vacuum efficiency be maintained and for this reason it is desirable to be able to determine the efficiency easily and quickly at any moment without having to make calculations or to refer to tables, curves, charts or the like.

This invention consists in a form of slide-rule provided with logarithmic 15 scales so marked off that the vacuum efficiency can be readily read off when the actual vacuum and the temperature of the discharge water from the condenser are known. The calculator therefore consists of three logarithmic scales, the first representing the vacuum reading on the gauge corrected for constant barometer, the second the temperature of the discharge water in 20 degrees Fahrenheit as given by the thermometer, and the third the vacuum efficiency. Either the first or the second of these scales may be movable so as to slide between the other two in the usual manner. The first and second scales may each be provided with a mark so arranged that when the marks are in line the corresponding temperature for any vacuum is obtained. To 25 obtain the vacuum efficiency the corrected reading of the vacuum gauge on the first scale is brought into line with the temperature of the discharge water on the second scale the vacuum efficiency can then be read off on the third scale opposite the end of the movable scale which represents zero if the temperature scale is the movable one or thirty inches of vacuum if the vacuum 30 scale is the movable one.

Dated this 17th day of December, 1914.

JOHN GRAY,
83, Cannon Street, London, E.C.,
Applicant.

35   COMPLETE SPECIFICATION.

An Improved Slide Rule.

I, John Gray, of 83, Cannon Street, London, E.C., Chartered Patent Agent, do hereby declare the nature of this invention (a communication from

[*Price 6d.*]

C. S. Jeffry, of 76, Merchant Street, Rangoon, Electrical Engineer) and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to calculating devices and has for its object to provide a device suitable for giving the vacuum efficiency, or the ratio of the actual 5 vacuum in a condenser to the vacuum corresponding to the condenser discharge water temperature of a steam plant, without the necessity of referring to a curve or chart.

When no air or other gas is present in a condenser the water vapour and therefore the discharge water from the condenser have a definite temperature 10 for each absolute pressure. It is usual in practice not to speak of absolute pressures but of so many inches of vacuum; thus an absolute vacuum is termed 30 inches vacuum, a barometric pressure of 30 inches of mercury having been adopted as standard. The actual vacuum in a condenser as indicated by the vacuum gauge must therefore be corrected for the prevailing barometric 15 pressure as follows:—30 inches minus actual barometer reading plus vacuum gauge reading.

Theoretically the condenser discharge water temperature should indicate the existence of a particular degree of vacuum in the condenser but owing to the difficulty of avoiding the presence of air and gases it will be found in 20 practice that the temperature and inches of vacuum do not correspond to theory and the temperature of the discharge water will be found to be less than the theoretical value. The actual vacuum divided by the theoretical vacuum as indicated by temperature multiplied by a hundred gives the vacuum efficiency as a percentage. 25

Tables giving the temperatures corresponding to particular vacua have been worked out and from these when the temperature is known the theoretical vacuum can be obtained, but these tables are not always to hand and the object of this invention is to provide a scale giving the vacua and temperatures for reference purposes arranged in the form of a slide rule by means of which the 30 vacuum efficiency may be readily obtained.

According to the invention the slide rule comprises three scales, one of which is movable relatively to the others, the first of these scales divided logarithmically representing the vacuum reading, the second having a logarithmic basis and representing the corresponding theoretical temperature 35 and the third divided logarithmically to indicate the vacuum efficiency. Either the first or the second of the above scales may be made movable so as to slide between the other two in the usual manner.

The accompanying drawing illustrates a slide rule arranged in accordance with the invention. a and c are fixed scales and b is a movable scale arranged 40 to slide between a and c. Scale a is divided according to logarithms of the numbers from 25 to 30 and represents inches of vacuum. Scale c is divided according to the logarithms of the numbers from 83.5 to 100 and represents vacuum efficiency as a percentage Scale b is primarily the same as scale a but is marked in corresponding theoretical temperatures in degrees Fahrenheit 45 instead of degrees of vacuum to avoid reference to a chart. The graduations shown in the drawing are not absolutely accurate because there is very little difference in the logarithms of the numbers in the ranges 25 to 30 and 84 to 100 respectively and to draw the slide rule accurately would require considerable skill. But for making the slide rule the following directions are 50 sufficient. Take a Faber's ten inch slide rule and prepare a scale corresponding to a divided in proportion to the divisions on Faber's lower scale between 2.5 and 3. Then prepare another scale c and divide it according to the divisions on Faber's lower scale between 8.34 and 10. Then mark off on a scale b the corresponding theoretical temperatures for the inches vacuum 55 indicated on the lower scale a. These temperatures can be obtained for example, from "Marks and Davis" steam tables.

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In using the slide rule the temperature of the condenser discharge water on the slide *b* is brought into line with the corrected reading of the vacuum gauge on scale *a*. The vacuum efficiency can then be read off on scale *c* opposite the zero mark on the slide *b*, namely, the right hand end of the slide.

5 Having now particularly described and ascertained the nature of my said invention, and in· what manner the same is to be performed, I declare that what I claim is:—

A calculator for determining the ratio of the actual vacuum to the vacuum corresponding to the condenser discharge water temperature, comprising three 10 scales one of which is movable relatively to the others, one of said scales being logarithmic and representing the vacuum reading on the gauge corrected for constant barometer, another having a logarithmic basis and representing the temperature of the discharge water and the third being logarithmic and indicating the vacuum efficiency, substantially as hereinbefore described.

15 Dated this 16th day of June, 1915.

JOHN GRAY,
83, Cannon Street, London, E.C.,
Agent for the Applicant.

Redhill : Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1916

A.D. 1914. Dec. 17. N° 24,239.
GRAY'S COMPLETE SPECIFICATION.

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