J. A. ETTLER.

COMBINED RECORD BOOK AND SLIDE RULE.

APPLICATION FILED AUG. 4, 1910.

1,009,493.

Patented Nov. 21, 1911.

3 SHEETS—SHEET 1.

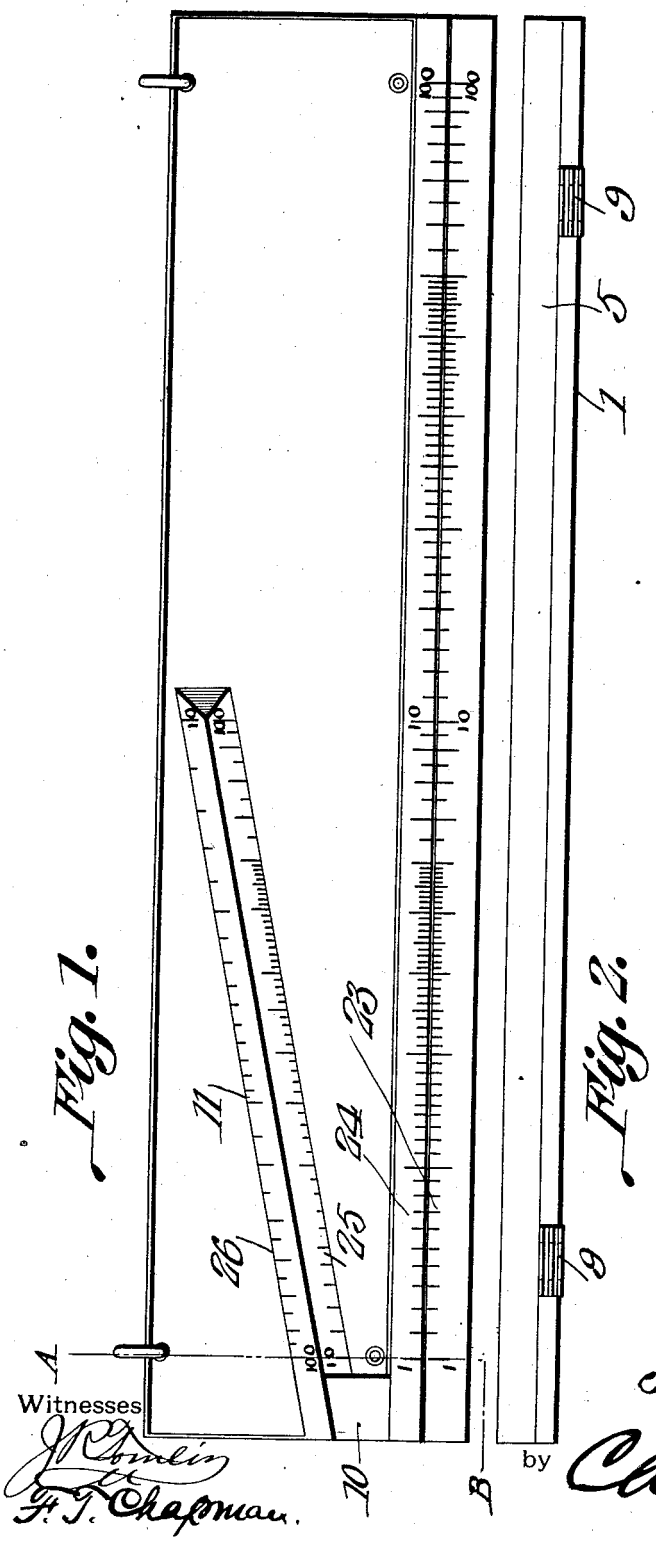


Fig. 1.

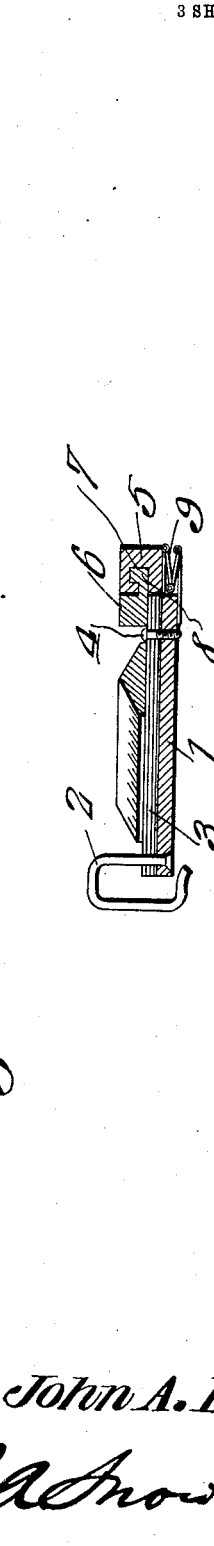


Fig. 2.




Fig. 3.

Witnesses

J. Conklin

F. T. Chapman.

John A. Ettler.
Inventor

by C. A. Snow & Co.
Attorneys

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3 SHEETS—SHEET 2.

Fig. 3.

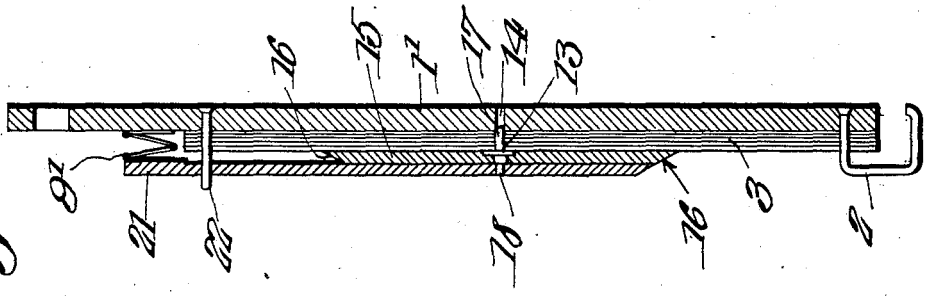
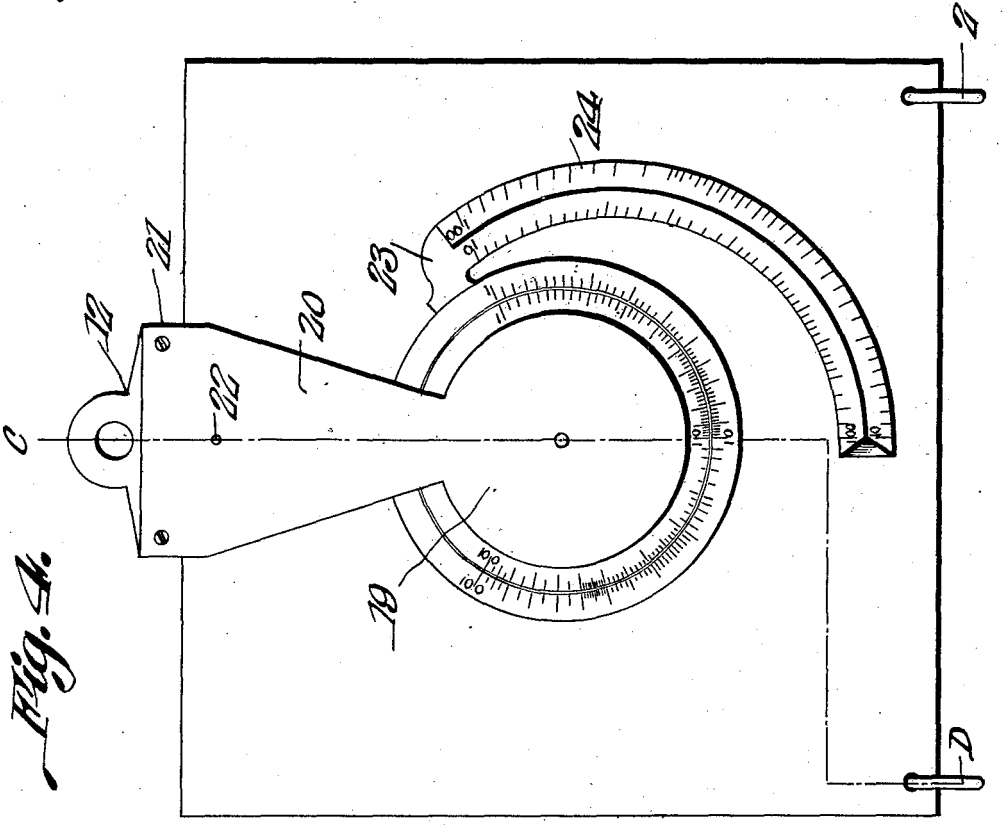



Fig. 4.




Witnesses

H. T. Conklin

F. J. Chapman.

John A. Ettler, Inventor

by Cashow & Co.

Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. A. ETTLER.

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3 SHEETS—SHEET 3.

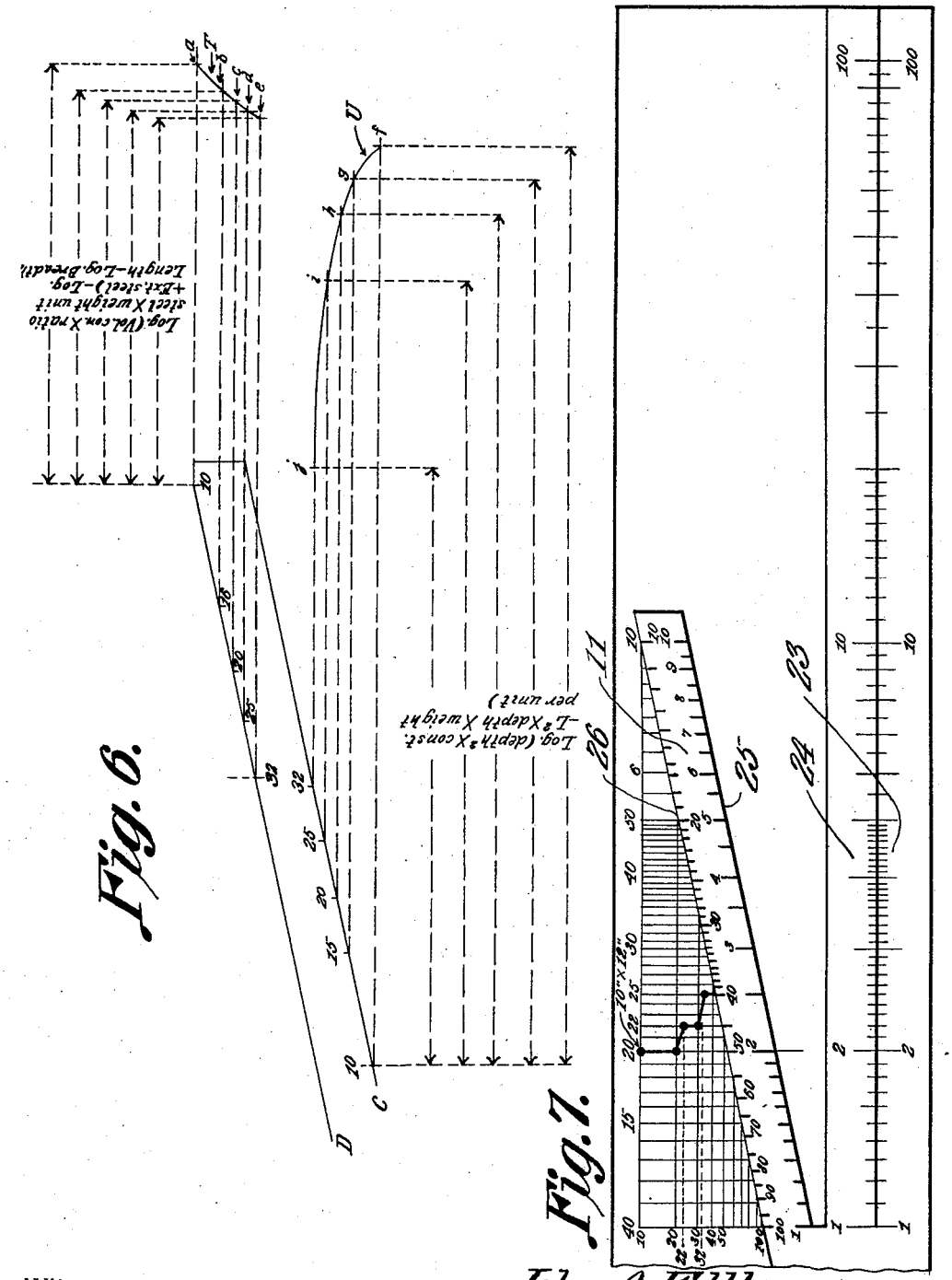


Fig. 6.

Fig. 7.

Witnesses

J. A. Tomlin

Herbert D. Lawson

John A. Ettler, Inventor

by C. A. Snow & Co.

Attorneys

# UNITED STATES PATENT OFFICE.

JOHN A. ETTLER, OF SAN FRANCISCO, CALIFORNIA.

## COMBINED RECORD-BOOK AND SLIDE-RULE.

1,009,493. Specification of Letters Patent. **Patented Nov. 21, 1911.**

Application filed August 4, 1910. Serial No. 575,538.

*To all whom it may concern:*

Be it known that I, JOHN A. ETTLER, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Combined Record-Book and Slide-Rule, of which the following is a specification.

This invention has reference to improvements in combined record books and slide rules and its object is to provide a record book showing stress and cost diagrams or other data together with a slide rule attachment adapted thereto so that the desired information may be readily read off the same as it is now obtained by means of schedules or tables.

The construction of the device will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of this specification, in which drawings:—

Figure 1 is a plan view of a combined record book and slide rule constructed in accordance with the present invention. Fig. 2 is a side elevation. Fig. 3 is a section on the line A—B of Fig. 1. Fig. 4 is a plan view of another form of the invention. Fig. 5 is a section of the same on the line C—D Fig. 4. Fig. 6 is a diagram of curves pertaining to the calculation of the weight of steel reinforcements in concrete beams and lifeload capacity. Fig. 7 is a diagram showing a specific case laid out in coöperation with a log. chart.

Referring to the drawings and first to Figs. 1, 2 and 3 there is shown a base-board or support 1 of general rectangular shape having at one edge near the corners hook members 2 bent to form nearly closed eyes. These hook members are designed to receive and hold leaves 3 which may be of approximately the size of the base board 1 and are designed to contain the necessary tables or other data for stress and cost or whatever it is desired these tables should contain, this matter depending upon the use to which the structure is to be put. At points remote from the hooks 2 the leaves may be traversed by screws 4 or other holding devices whereby the leaves are maintained flat against the base board 1. By removing the screws 4 the leaves may be readily moved on the hooks 2 and removed or replaced as desired in any order wanted, and when in place these leaves are held flat against the base board by replacing the screws 4.

Along the long edge of the board 1 remote from that carrying the hooks 2 is a slide rule made up of two members 5, 6. The member 5 is provided along one edge with an under-cut groove 7 to which is adapted a flanged tongue 8 formed on the member 6, so that the member 6 may be moved longitudinally of the member 5 to any desired extent without escape therefrom. The member 5 is attached to the corresponding edge of the board 1 by an extension hinge 9 permitting the slide rule made up of the members 5 and 6 to be readily tipped away from the leaves 3 or as readily moved into engagement therewith, while the extension hinge permits a greater or less number of leaves 3 to be upon the face of the board at one time as may be desirable or necessary. At one end the slidable member 6 of the slide rule is connected by a bridge piece 10 to a divergent rule member 11.

The structure of Figs. 4 and 5 differs in some respects from the structure of Fig. 1 although the operation of the structure is similar to that of Fig. 1.

In Figs. 4 and 5 the base board, indicated at 1′, is square in outline and has an extension 12 on one side terminating in an eye whereby the board may be hung from a suitable support. The leaves 3 are also square in outline and are formed at the center with a perforation 13 matching a like perforation 14 in the base-board 1′. Overlying the leaves 3 is a rotatable disk 15 with bevel edges 16 designed to contain a suitable scale and secured to and rotatable on a pin 17 having a threaded extension 18 beyond the point where the pin traverses the disk 15. The threaded portion 15 is screwed to another disk 19 overlying the disk 15 and provided with a radial arm 20 expanding as it recedes from the disk 19 and overlying for a distance the corresponding edges of the leaves 3, this overlying portion being indicated at 21 and is connected by a hinge 9′ to the matching portion of the base board 1′ or the extension 12 thereof. The hinge 9′ is an extension hinge like the hinge 9 of Fig. 1. The leaves 3 are held in place by hooks 2 as in Fig. 1 and by a pin 22 removably mounted in the base-board 1 and traversing both the leaves and the radial extension 20 of the disk 19. The disk 15 has at one point a radially projecting bridge 23

carrying at its outer end a graduated arc 24 in eccentric relation to the graduated part of the disk 15.

The graduations on the sliding portion 6 of the slide rule of Fig. 1 and on the divergent member 11 are in agreement, the division lines on the divergent member 11 being so spaced as to match the like lines on the slide rule member 6. The same relation of division lines occurs between the graduated portion of the disk 16 and the arc 24. The divergent member 11 slopes from the central portion toward each edge and the same is true of the arc 24.

The scale markings of the logarithmic scales are not fully shown in the drawings for simplification of the illustration. The division of the scales will be marked to suit the special requirements and consequently the invention is not limited to any special arrangement of the scale markings. There are four logarithmic scales 23, 24, 25 and 26, respectively, shown. The scale 25 is for divisions, the scale 23 is the result and the other scales are for multiplications.

The loose leaves 3 have printed or engraved or otherwise produced thereon diagrams representing test results of structural members or other members or their cost or any information desired which may be prepared by any one having at hand the necessary data and these prepared leaves may be sent to various stations or persons requiring such information when the leaves may be inserted into the hooks and the slide rule applied when the information with regard to strength or cost or whatever the data be may be read off the same as is now obtained by the use of schedules or tables.

As an example of the diagrams displayed upon the sheet 3 let it be assumed that the diagram relates to reinforced concrete beams. Reinforcement in any concrete beam is equal to the volume of the beam, that is in the clear span, multiplied by the ratio of the steel plus the rod extension into the support, and since this extension is practically alike in all lengths of beams this quantity remains fixed while the other varies with the length of beams. Expressing this in an equation we have: volume of concrete, times ratio of steel, times weight of unit of steel, plus weight of extension of steel, equals weight of total reinforcement. Dividing both sides by the product of the length and breadth of the beam and expressing the equation in logarithms, we have: log. (volume concrete, times ratio steel, times weight per unit, plus extension steel) minus, log. length in feet, minus log. breadth in inches, equals log. weight of total reinforcement, minus log. length, minus log. breadth. Now by moving the slide toward the right until the length mark desired on scale 26 intersects the chosen point the slide will have traversed a distance equal to the above stated expression plus log. of length, and by adding log. of breadth of beam there is obtained the log. of the total reinforcement readable on scale 23 numerically.

To plot the transverse strength diagram notice is taken that the lifeload capacity of any beam is equal to the total strength minus the dead weight of the beam itself and the points with relation to scale 25 are found as follows for rectangular bems. Total strength, equals, (depth$^2$ times breadth), divided by the length, times constant. Life load, equals, as above, minus length, times breadth, times depth, times weight per unit. It follows: (Lifeload, times length) divided by breadth, equals depth$^2$, times constant, minus length$^2$, times depth, times weight per unit. Expressed in log. terms: Log. lifeload, plus log. length, minus breadth, equals log. (depth$^2$, times constant, minus length$^2$, times depth, times weight per unit). Now moving the slide to the right until the desired length mark intersects the stress curve, the same will have traversed the above distance minus the log. length, and adding this to the log. breadth of beam, there is established the log. of the lifeload of the desired beam, numerically expressed on the scale 23.

In Fig. 6 the curves pertaining to the foregoing calculation have been illustrated in diagram.

In Fig. 7 a specific case has been laid out in coöperation with a log. chart. In said figure the heavy line represents the price of lumber 10″x12″ in dimension, at $20 per mille for lengths between 10′ and 20′; $22 per M. for lengths between 22′ and 30′; and $25 per M. for lengths between 32′ and 40′. When the member 11 is adjusted longitudinally of the board 1, the scale 24 moves therewith. Scale 23 is, however, held against longitudinal movement. Assuming that the graduation on scale 23 designed by the numeral 1 represents $10, the graduation indicated by the numeral 2 designates $20, etc., it will be apparent that when the member 11 (upper edge) is adjusted so as to intersect any point in the heavy line in Fig. 7, the price of one or more pieces of lumber can be readily determined by picking out the graduation on scale 23 which is directly opposite the point whereby the upper edge of member 11 intersects the heavy line. By referring to Fig. 7 it will be seen that the graduation indicating $25 is directly opposite the graduation 40 on member 11 thus indicating that the price of lengths between 32′ and 40′, is $25. It will be apparent that if the price is laid out on the chart from left to right and the length is laid out on the chart from top to bottom the points so located occupy proper positions in coöpera-

tion with member 11. If a chart or charts underlie the member 11, then the graduations on said member are superfluous and when the said member 11 is graduated the charts are superfluous. In Fig. 7 however both the charts and the member 11 have been shown graduated.

These examples show the manner of ascertaining the weight of the enforcement and the transverse strength of a concrete beam and are deemed sufficient for an understanding of the present invention, but it is obvious that other useful calculations may be made, particularly the cost of lumber where the prices differ in the various sizes and lengths and are frequently altered. It is evident therefore that a vast amount of information may be conveyed upon a few leaves and this information may be readily read off by means of the slide rule. It is further evident that errors are practically obviated.

What is claimed is:—

1. A slide rule including a base, means for holding a chart fixed upon the base, a rule, an expansion hinge connecting the base and rule said rule being held against longitudinal movement by said hinge, a second rule carried by and shiftable longitudinally relative to the first mentioned rule, and a divergent scale member extending from said second rule.

2. A slide rule including a base, means for holding a chart against displacement on the base, a rule, an expansion hinge connecting the rule to the base, said rule being movable onto the chart and being held against longitudinal movement relative to the base by the hinge, a second rule engaging and movable in the direction of the length of the first mentioned rule, and a divergent scale member carried by said second rule.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN A. ETTLER.

Witnesses:

A. K. DAGGETT,

E. J. ENRIGHT.