A. JILLSON.

Sliding Scale for Steam Engines.

No. 42,776. Patented May 17, 1864.

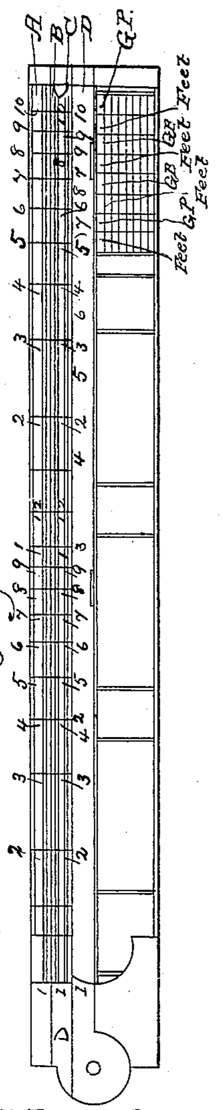

fig. 1.

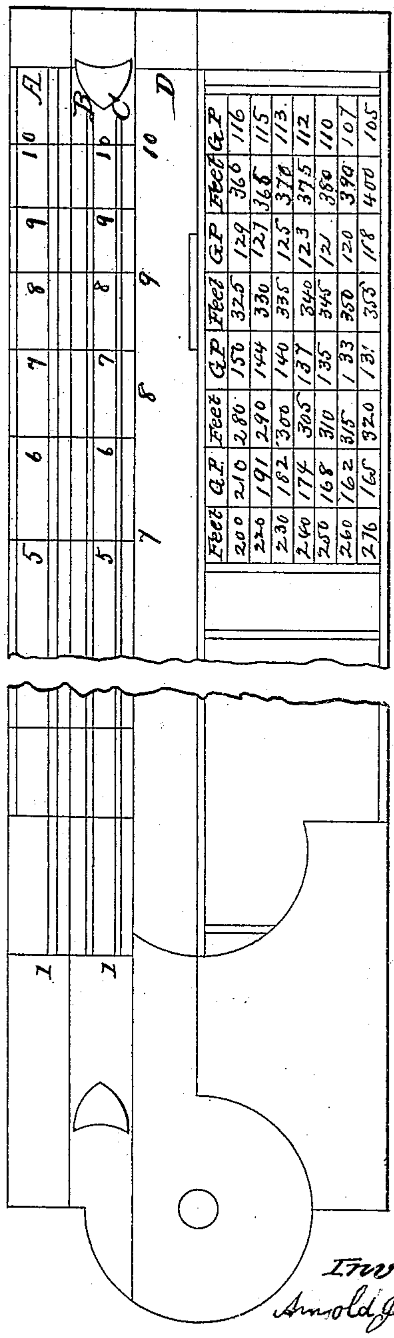

fig. 2

Witnesses
Benj. F. Thurston
John D. Thurston

Inventor
Arnold Jillson

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ARNOLD JILLSON, OF CUMBERLAND, RHODE ISLAND.

IMPROVEMENT IN SLIDING SCALES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 42,776, dated May 17, 1864.

To all whom it may concern:

Be it known that I, ARNOLD JILLSON, of Woonsocket, in the town of Cumberland, county of Providence, and State of Rhode Island, have invented a new and useful improvement in the slide-rule, whereby it is adapted to calculate the power of steam-engines; and I do hereby declare that the following specification, taken in connection with the drawings making a part of the same, is a full, clear, and exact description thereof.

Figure 1 represents the ordinary slide-rule, with the table, hereinafter described, upon the same. Fig. 2 is an enlarged view of the same, in order that the figures of the table may be more clearly read.

The slide rule has long been used by engineers, architects, builders, measurers, and artisans in almost every industrial pursuit for the purpose of computing the solid contents of square, circular, and globular bodies, the measurement of polygons of various sizes, the diameter of gear wheels and pulleys required in mill-work or elsewhere, and generally for tubular calculations in great variety.

The instrument itself, which is called the "slide-rule," is made of box-wood or ivory. It has a joint in the middle, and when opened is twenty-four inches in length. One face of the rule is divided into inches and fractions of an inch, and upon the other face are the tables hereinafter given, and such other tables as are in general use among mechanics, surveyors, and architects for the purpose of instrumental calculations by means of the slide. There are four lines, (marked A B C D.) The first three lines, A B C, are exactly alike, consisting of two radiuses and numbered from the left hand to the right with the figures 1 2 3 4 5 6 7 8 9—1 2 3 4 5 6 7 8 9 10—the spaces between the numbers being divided decimally. The lines A and D are upon the rule itself, while the lines B and C are upon a movable brass slide. The line D is a single radius, double the length of the radius upon the other lines, and numbered from left to right with the figures 1 2 3 4 5 6 7 8 9 10. The numbers and divisions upon the rule are all arbitrary, and the values to be given to them must be such as the nature of the question requires, which will be readily understood after a little practice. The figures 1 2 3 to 10 are called "primes," and the long divisions "tenths," and these again are subdivided into hundredths and thousandths parts of a unit. If the division next the joint marked 1 represents one-tenth, then will 1 near the middle of the rule represent one unit or one whole number, the next, 2, will represent two whole numbers, and so on; but if the first 1 represents one unit, then the middle 1 on the scale will represent 10, 2 will represent 20, and so on to 10, which will represent 100, and if the first 1 have assigned to it a value of 10 the middle 1 will have a value of 100, and 10 a value of 1,000, the values increasing in a tenfold proportion.

I propose to place upon the slide-rule a table of figures whereby the horse-power of steam engines may be readily computed by the use of the rule in a manner similar to that by which results are obtained from the other tables which, for other calculations, have been in use.

Fig. 1 represents a slide-rule upon which are the usual tables for computations, the slide with its vernier and the divisions and subdivisions upon the rule being the same as in common use.

In place of the table upon the right-hand end of the rule for pumping-engines, as the rule has heretofore been constructed, or upon any other part of the rule, I place the following table of figures and letters:

HORSE-POWER STEAM-ENGINES.

Feet.	G. P.	Feet.	G. P.	Feet.	G. P.	Feet.	G. P.
200	210	280	150	325	129	360	116
220	191	290	144	330	127	365	115
230	182	300	140	335	125	370	113
240	174	305	137	340	123	375	112
250	168	310	135	345	121	380	110
260	162	315	133	350	120	390	107
270	155	320	131	355	118	400	105

The explanation and rule for the use of which is as follows:

Four times the length of the crank of a steam-engine, multiplied by the revolutions the crank-shaft makes per minute, gives the number of feet the piston moves per minute.

After computing as above the number of feet the piston moves per minute, find the number in the table nearest to it, and opposite the number so found to the right is the gage-point, or, in other words, a point at which the slide must be set in order to be able to read off the calculations upon the rule. Take the pressure of steam as indicated by the steam-gage upon the boiler, or, for greater accuracy, take the pressure upon the piston as shown by an indicator, find the corresponding number upon the slide on the line B and move the slide until that number is under the number on the line A which corresponds to the proper gage-point, as ascertained by the table. Find the number on D corresponding to the diameter of the cylinder, and above the same, on the line C upon the slide, will be found the horse power. Thus, to apply the above rule, in order to ascertain what is the horse-power of a steam-engine with a diameter of cylinder of twelve inches and four feet stroke of piston making fifty revolutions per minute, with the pressure of steam upon the piston of eighty pounds to the square inch. The velocity of the piston in feet per minute is $2\times4=8\times50=400$. We find the number 400 in the table at the bottom of the last column for feet, and in the next division to the right in the column marked for gage points (G. P.) the number 105. Take now the pressure of the steam at 80, and find on the brass slide in the line marked B the figure 8, (which may be valued at 8, 80, 800, 8,000, or any other decimal.) Let now the brass slide so that the first figure 8 from the left shall come under the number upon the line A which expresses 105. This number is found as follows: Let the figure 1 upon the extreme left be valued at 100, the figure 2 must then have a value of 200. The space between 1 and 2 is divided into fifty parts. Consequently each space will express two parts. The figure 8 on the slide should, therefore, be placed midway between the third and fourth divisions to the right of the figure 1 to be at a point which shall be under a valuation of 105, the diameter of the cylinder being twelve inches. Give to figure 1, to the extreme left on the line D, a valuation of 10, the number 2 on the same line will then have a value of 20, and, as the intermediate space is divided into fifty parts, each part will represent one-fifth of an inch, and ten parts will represent two inches. Look, therefore, to the right of 1 on D, above the tenth division, and the mark on the line C upon the slide expresses the horse-power when properly valued. We find that this mark is the fifth space to the right of the figure 1 midway between 1 and 12. To the figure 1 we should assign a value of 100. Each of the spaces to the right has a value of 2, which gives the horse-power of the engine at 110, which is the same result that would be obtained from the same data by the ordinary mathematical formula for calculating the power of steam-engines. By this means the horse-power of a steam-engine, the piston of which moves at any given velocity, may be readily determined and with entire accuracy.

What I claim as my invention, and desire to secure by Letters Patent, is—

The use of the table of figures, as herein given, in combination with the ordinary slide of a carpenter's rule, for calculating for any given velocity of piston, capacity of cylinder, and pressure of steam the horse-power of a steam-engine, substantially as herein described.

ARNOLD JILLSON.

Witnesses:

JOHN D. THURSTON,
BENJ. F. THURSTON.