(No Model.) 2 Sheets—Sheet 1.

C. A. SMITH.

T-SQUARE.

No. 307,419. Patented Oct. 28, 1884.

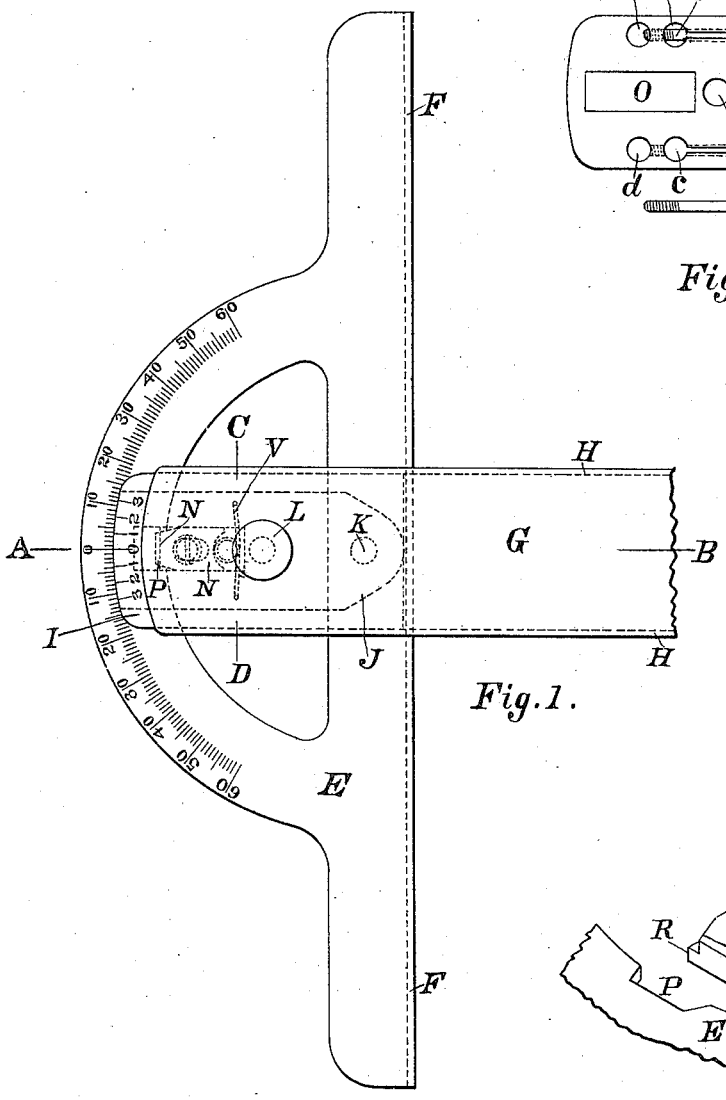

Fig. 1.

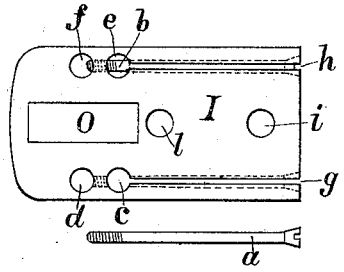

Fig. 4.

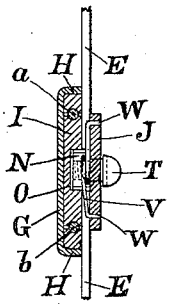

Fig. 3.

Fig. 5.

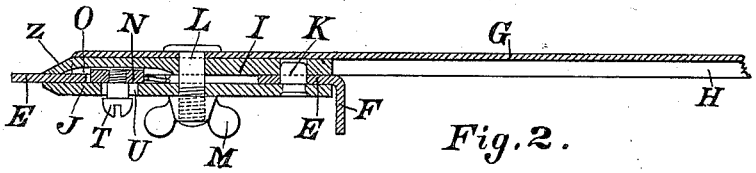

Fig. 2.

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H. S. Grafton

Inventor:
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(No Model.)

2 Sheets—Sheet 2.

C. A. SMITH.

T-SQUARE.

No. 307,419. Patented Oct. 28, 1884.

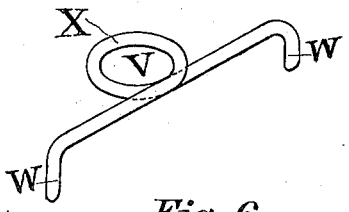

Fig. 6.

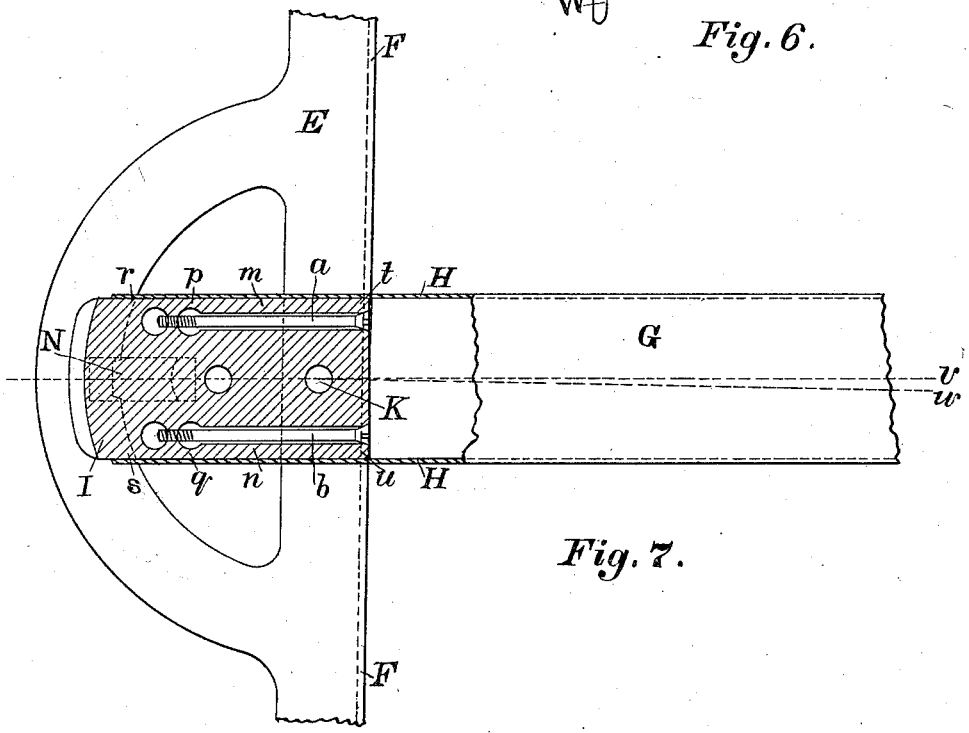

Fig. 7.

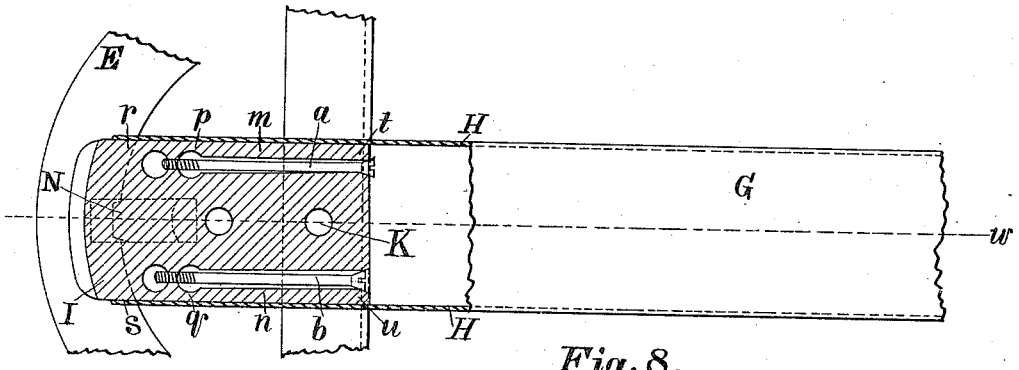

Fig. 8.

Witnesses:
M. J. Grafton
H. E. Grafton,

Inventor:
C. A. Smith.

UNITED STATES PATENT OFFICE.

CHARLES A. SMITH, OF CENTRAL FALLS, RHODE ISLAND.

T-SQUARE.

SPECIFICATION forming part of Letters Patent No. 307,419, dated October 28, 1884.

Application filed December 10, 1883. Renewed September 19, 1884. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. SMITH, a subject of the Emperor of Germany, residing at Central Falls, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in T-Squares, of which the following is a specification.

My invention relates to improvements in draftsmen's T-squares in which the blade swivels on the head and is secured to the same by means of two clamps; and the objects of my improvements are, first, to provide a durable and reliable T-square; second, to combine lightness with strength in a higher degree than has heretofore been obtained; third, to provide a combination of parts by means of which the T-square blade may be readily and conveniently adjusted to any desired angle relative to the head, and by means of which said blade may be as readily and as conveniently returned to its original square or zero position; fourth, to dispense with one of the double heads usually employed on swiveling T-squares; fifth, to provide a T-square in which no part of the head shall project above the surface of the drawing-board while in use, this being unavoidable in the double-headed T-square now in the market; sixth, to provide a combination of parts by means of which the frictional resistance which holds the head firmly in place when set to any angle may be applied at some distance from the swiveling center, instead of being applied at said center, as has been the unsatisfactory practice heretofore; and, seventh, to provide a T-square in which the blade may be quickly and conveniently replaced by a shorter or longer one, according to the pleasure of the draftsman. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan or top view of the T-square complete, with the blade shown broken off to economize space; Fig. 2, a section through the line A B, Fig. 1; Fig. 3, a section through the line C D, Fig. 1; and Figs. 4, 5, 6, 7, and 8 are detailed views, which will be fully explained in the sequel.

Similar letters refer to similar parts throughout the several views.

In Figs. 1, 2, and 3, E is the head of the T-square, and is made of sheet metal, preferably of sheet-steel. The shaping is done on a punching-machine provided with properly-formed dies. A flange, F, is turned downward at right angles with its general top surface, to form a straight edge or surface to be guided in its use along the straight edge of the drawing-board. The blade G is made of sheet metal, preferably of sheet-steel, having flanges H H turned on each edge at right angles with its upper surface, thus giving it the general form of a "channel-bar." This form will admit of the blade being made very light, and still be amply stiff, which is very desirable. The blade G is nicely fitted over the upper clamp, I, which lies on the upper surface of the head. To the lower surface of the head is applied the lower clamp, J. To this clamp J is fastened a pin, K, which passes through a hole in the head E, and into a hole in the upper clamp, I, thus forming a swivel joint or pivot about which the head E turns. The blade G, the upper clamp, I, the head E, and the lower clamp, J, are all secured and fastened together by the screw L, provided with a thumb-nut, M.

For the purpose of locking the head E at the zero position, (at right angles with the blade,) a latch, N, is provided, which rests upon the upper surface of the lower clamp, J, and extends upward into and fits a groove, O, in the bottom of the upper clamp, I, in which groove O said latch N is free to slide in the direction toward the pivot-pin K. A perspective view of this latch is shown in Fig. 5 enlarged and inverted.

At E, Fig. 5, is shown a portion of the head E, into which is cut a notch, P, with slightly-beveled sides. The beveled portion Q of the latch N fits the notch P in the head E, and the straight portion R fits the groove O in the upper clamp, I.

S is a hole to receive a push pin or screw, T, Figs. 2 and 3, which passes through an elongated hole, U, in the lower clamp, J. The latch N is held in the notch P by means of a wire spring, V, (shown in an enlarged perspective view in Fig. 6,) having its ends W turned downward and passing through holes in the lower clamp, J, as shown at W, Fig. 3. The circular portion X is placed against the concave end Y of the latch N.

To facilitate adjusting the blade G exactly at right angles with the edge F F of the head E, the upper clamp, I, is constructed as shown in Fig. 4, which is a bottom view of the same. Near each edge of said clamp are holes drilled longitudinally to receive screws, one of which is shown at *a*. One screw is shown in position at *b*. The metal between the transverse holes *c d* and *e f* is tapped to receive the ends of the screws *a* and *b*. Through the longitudinal screw-holes slits are cut, as shown at *g* and *h*, extending from the end of the clamp to the holes *c* and *e*.

i is the hole for the pivot-pin K, *l* the hole for the clamp-screw L, and O the groove for the latch N, as previously explained.

The use of the screws *a* and *b* in adjusting the blade G at right angles with the edge F F of the head E is illustrated in Figs. 7 and 8, which are horizontal sections, the cutting plane passing through the middle of the clamp I and parallel to the surface of the head E, exposing the adjusting-screws *a* and *b* to view.

In manufacturing these T-squares it would be very difficult and expensive to make the relation of all the parts such that the blade G would lie exactly at right angles with the edge F F after the parts were assembled. In any lot of squares manufactured some would vary more than others. This defect, which is the result of bad workmanship, is illustrated in Fig. 7, where the dotted line *w* is at right angles with F F, and *v* is the center line of the blade G. When the workmanship is perfect, the line *v* should coincide with the line *w*. In practice the line *v* will ordinarily vary from the line *w* from zero to one-eighth of a degree, ($\frac{1}{8}°$). This defect is very quickly corrected by means of the screws *a* and *b*, as follows: Suppose we have a T-square whose center line *v* varies from the true position, as shown in Fig. 7. We simply loosen the screw *a* and tighten the screw *b*. By so doing the outer strip, *n*, of the clamp I is forced at *u* from the central portion of the clamp by the taper screw (*b*) head being drawn between the same and acting as a wedge. This throws the flange H of the blade farther from the center K at *u*, and the opposite flange H at *t* is drawn nearer to the center K, the screw *a* having been previously loosened to release the wedging action of its head. The metal at *p* and *q* is sufficiently reduced to allow the outer strips, *m* and *n*, to spring freely at those points. The central portion of the clamp I is firmly fixed in reference to the head E by the pivot-pin K and the latch N. While the blade is being shifted at the points *t u* in relation to the center line *w*, it remains substantially stationary in relation to said center line at the points *r* and *s*; hence the effect is the same as though the blade were revolved about a center in the neighborhood of N. After the blade has been thus revolved so its center line *v* coincides with the "square" line *w*, the screw *a* is tightened up so that the outer strips, *m n*, and the heads of the screws *a b*, in combination with the central portion of the clamp, form close metallic connection and fill up the space between the the flanges H H of the blade. After the adjustment has thus been made the relation of the parts will be as shown in Fig. 8. This adjustment must not be confounded with the adjustment or setting of the blade to any angle described in the paragraph relating to the "operation" of the T-square. The screws *a* and *b* are introduced solely for the purpose of correcting inaccuracies in the manufacture of the different parts. The circular part of the head E has an arc graduated in the usual way, with the divisions one degree, or less, apart, as may be desired. The beveled end Z of the upper clamp, I, may also be provided with a vernier to read to any fraction of a degree desired. The one shown in Fig. 1 is designed to read to quarter-degrees.

Two or more blades, all differing in length only, may be fitted to one head. This will save the draftsman the expense of having more than one T-square, to adapt the same alike to large and small work, since the blade can be replaced at any time by one of a suitable length by simply removing the clamp-screw L.

The operation of my T-square is as follows: The normal position of the blade is at right angles with the edge F F of the head, as shown in Fig. 1. To set the blade G to any other angle than ninety degrees with the edge F F, it will be simply necessary to loosen the thumb-nut M a little, to release the friction between the clamps J and I and the head E. Then a little pressure from the forefinger on the push-screw T in the direction of the pivot K will release the latch N, after which the head E will be free to turn and the latch N may slide along the inner circular edge of the head. After it is set to its desired position, it will be held in place by the friction of the clamps J and I, after tightening the thumb-nut M. In returning the head to the zero position the latch N will slide along the inner circular edge until it arrives at the notch P, into which it is then forced by the spring V, thus locking the head in its exact original position. In the graduated circle on the head E the divisions are one degree apart, and the vernier is graduated to read to quarter-degrees, the divisions being three and three-quarters ($3\frac{3}{4}$) degrees apart. The vernier is made double for convenience—that is, there is really an independent scale and vernier on each side of the zero-line. The vernier is of the class known as "direct"—*i.e.*, the numbers on the vernier ascend in the same direction as those on the circle. In the present case the numbers on the circle denote degrees and those on the vernier quarter-degrees; hence, to set the blade to an angle of ten and one-quarter ($10\frac{1}{4}$) degrees, we bring the zero-mark of the vernier between the tenth and eleventh degree-marks on the circle and the mark "1" on the vernier to coincide with a

mark on the circle. If the fraction be three-quarters, then the mark "3" on the vernier should coincide with a mark on the circle, &c.

As graduated circles and verniers have been made and used prior to my invention, I do not claim this as a part of the same; but

What I do claim as new, and desire to secure by Letters Patent, is—

The combination, in a T-square, of a lower clamp, J, a head, E, and an upper clamp, I, provided with a latch, N, and fitted to a blade, G, all secured by a screw, L, substantially as set forth.

CHARLES A. SMITH.

Witnesses:

CHARLES H. BARRETT,

ARTHUR BOOTHBY.