M. G. STOLP.
CIRCLE-DIVIDING INSTRUMENT.

No. 192,093. Patented June 19, 1877.

Fig. 1.

Fig. 2.

Fig. 3.

Witnesses.
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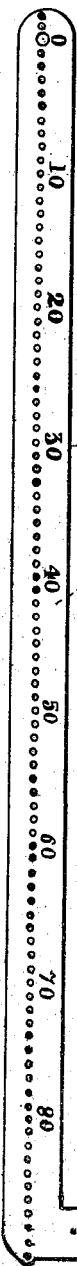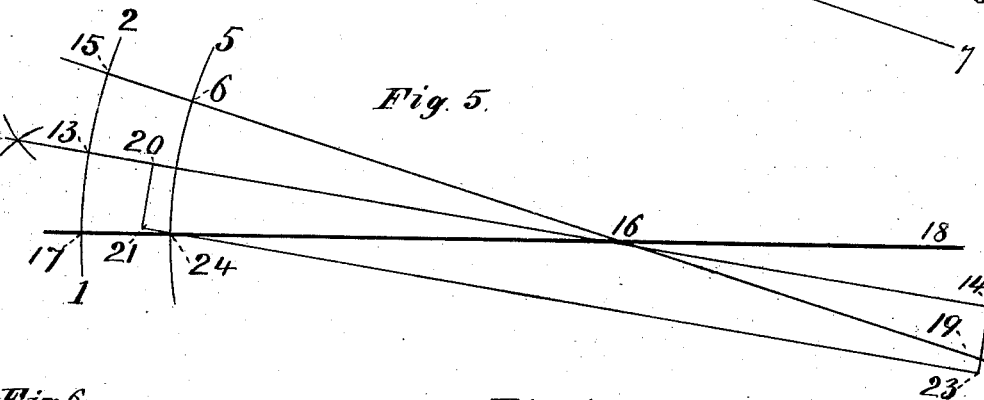No. 192,093.   Patented June 19, 1877.
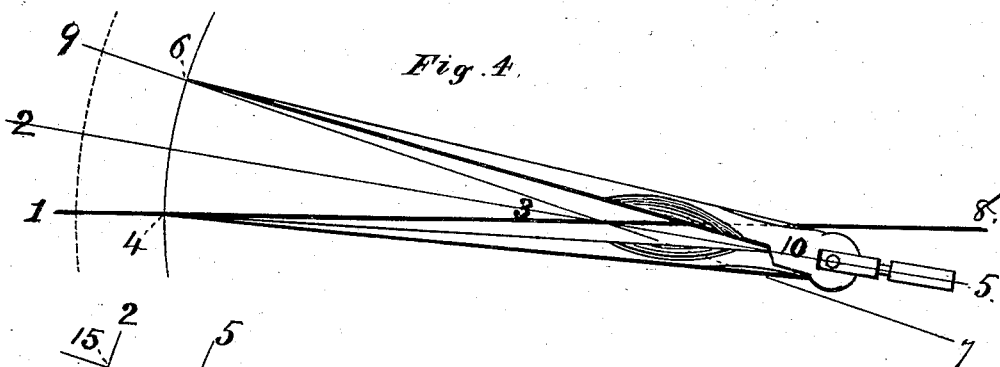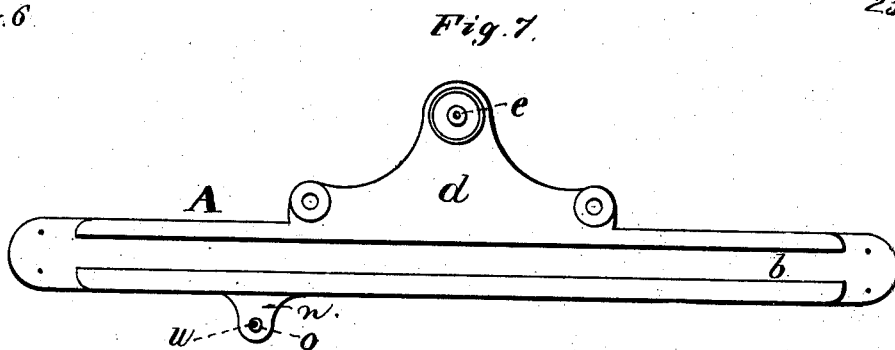

Fig. 4.
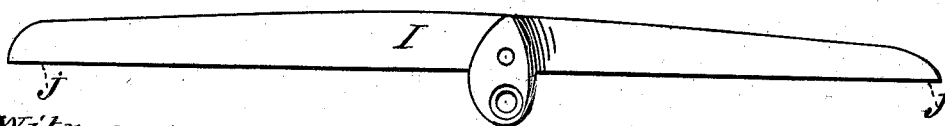
Fig. 5.

Fig. 6.

Fig. 7.

Fig 8.

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UNITED STATES PATENT OFFICE.

MYRON G. STOLP, OF AURORA, ILLINOIS.

IMPROVEMENT IN CIRCLE-DIVIDING INSTRUMENTS.

To all whom it may concern:

Be it known that I, MYRON G. STOLP, of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Circle-Dividing Instruments; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention consists in a novel construction of instrument for dividing a circle into any required number of parts, however minute, and which is, at the same time, adapted for the dividing arrangement of a gear-cutter or dividing-engine, and which is also adapted for ascertaining the radius of the required pitch-circle for blanks for gear-wheels when the number of teeth and the pitch of the teeth are given, and which is also adapted for use as a protractor for laying out an angle, and for similar and kindred purposes.

In the drawings, Figure 1 is a perspective view of my improved instrument. Fig. 2 is a top view with the spacing-pin in the hollow stud o, and with the pin and the edge 5 6 of the T square in contact, and with the latter and the diametric marking-arm I, shown also in dotted lines in another position; Fig. 3, a top view, with the diametric marking-arm shown at two different angles, one being in full lines and the other in dotted lines; Figs. 4 and 5, diagrams representing different modes of ascertaining the pitch of wheels; and Figs. 6, 7, and 8, parts detached.

A is a bed or bar, having on its upper side a dovetailed groove, b, adapted to receive the head of the T square C, and permit it to be held and slid in a straight line therein. A bracket or projection, d, on said bar A supports the journal or journal-pin e of a wheel, F, around whose periphery wind flexible metallic or other bands g g' g', these bands being secured, if desired, at one end to the periphery of the wheel, and at their other end or ends to the respective ends h h' of the head of the T square, these bands winding in opposite directions upon the wheel, so that when the wheel is turned upon its axis it shall coincidently shift the T square to the right or left a distance corresponding to that moved by a given point in the periphery of the wheel F, the full extent of traverse of the T square being, for convenience, equal to one-half the circumference of the wheel F, or a little in excess thereof.

I is a marking bar or rule affixed to the wheel F, and having a straight-edge, j j, in a line diametric with this wheel, such bar projecting beyond the wheel at its two opposite sides, one arm being longer than the other, and this bar also serves as a handle or lever by which to turn the wheel as may be required, and it stands off far enough from the wheel to permit its being turned without any obstruction, and, when so turned, the shorter arm may pass freely beneath the bed A as the latter is lying upon the table, projections or feet k k at the ends of bed A elevating it sufficiently for this purpose. Staple-pins l l', passing through appropriate holes in these feet, serve to secure the bed A to a table when the instrument is to be used. Adjusting-screws m m serve to tighten or loosen the bands g g' g', as may be desired. A bracket or projection, n, on the bed A is provided with a hollow stud or nipple, o, on which may be hung and swung the graduated division-scale P. When the scale is hung on the stud o the hole w answers for the zero-point of the scale, the graduations, for convenience sake, being in equal measurements from zero to 90, and a hole being made in this bar for every one of these divisions; and the bar is further provided at its extremity or free end with a projection, q, drilled with holes to receive a staple, r, or pins, by which it may be secured to the table at any required angle to edge 5 6 of the T square. It has also a vertical projection or angle-pin, s, which is in the ninetieth hole, and serving as a stop when it comes in contact with the edge 5 6 of the T square in laying out angles. The blade of the T square, and its edge 5 6, in its movements may pass over all parts of the length of the division-scale, the extremity of the T square resting upon a foot, t, which elevates it sufficiently for the purpose.

A center-pin, u, passing through the axis of

the wheel, and also through the center of any circle of which measurements are required or of which divisions are to be made, has a sharp point, by which it may be pressed into the table and hold its position while the instrument is being used. A spacing-pin, v, adapted for the hole in the stud o, and also for any of the holes of the graduated scale, serves for purposes presently to be described.

The following will illustrate some of the uses to which this instrument is applied and the manner of using it: Suppose it be required to divide a circle accurately into any required number of parts. As shown in Fig. 2, draw the line 1 2, and upon this, as a diameter, describe the circle 1 2 3 4, having a radius less than the length of the shorter arm of the marking-rule I; place the instrument over the center of this circle by means of the centering-pin u, and secure it there by pressing the pin into the table; slide the T square until its edge 5 6 is to the left of the zero-hole w in the stud o; place the spacing-pin v in the zero-hole in the stud o, and slide the T square until its edge 5 6 touches this pin v, still, as yet, keeping the pin and edge in contact; bring the instrument so that the straight-edge of the rule I shall coincide with the diameter 1 2; press in the staple or thumb-tack l, and also that at l', when the head of the T square will permit it; remove the pin v and take hold of the longer arm of the rule I at its end, and move it half-way around or through a semi-circumference until the rule takes the position shown in the dotted lines in Fig. 2. The T square will then be in the position shown also in dotted lines in Fig. 2. Next place the scale or division-bar P on the stud o, its zero-hole being thus the center of the stud, and with the angle-pin s off to the right of the edge 5 6, as shown in Fig. 2. The instrument is now in position for dividing the circle or for laying out an angle. It will be seen that only one-half the circumference of the wheel is used, (this is for convenience only—the whole or part of the circumference might be used, if desired;) and that the distance through which the edge 5 6 has moved to take the new position (shown in dotted lines in Fig. 2) is exactly one-half the circumference of the wheel F. Now, to divide the circle into, say, twenty equal parts, place the spacing-pin v in the hole 60 of scale P, and swing the pin against the edge 5 6 in the position of the dotted lines in Fig. 2; press in the thumb-tack at r; move the edge 5 6 so as to allow the pin v to be shifted to the left and placed in hole 54; slide the edge 5 6 back until it is in contact with pin v, now in hole 54. In this position the longer arm of the marking-arm I will be found to have moved through one-twentieth ($\frac{1}{20}$) of the circumference, and of course the shorter arm will have moved through the same distance, and, therefore, a line drawn along the straight-edge of the arm I on both sides of the center of the wheel, cutting the circle at 20 20, will mark two divisions of one-

twentieth of the circle each, or eighteen degrees. Repeating this operation and shifting the pin v six holes farther toward the zero-hole of the scale—that is, to hole 48—will give two more divisions of one-twentieth of the circle to be marked off, and so on successively until the whole circle shall have been divided into the required twenty parts. If the spacing-pin v had been placed one hole to the left instead of six the circle would have been divided into one hundred and twenty (120) equal parts, or six times too many. If twenty-three divisions be desired, place the pin v in hole 46 (or in 69) and move the pin four (or six) holes, or twice the multiplier of required number of divisions, and generally by moving the pin one hole at a time the circle is divided into twice the number of parts indicated by the hole used in setting the division-scale at the correct angle.

To ascertain the pitch-circle for a gear or blank of a certain number of teeth and predetermined pitch, I proceed as follows: Suppose the gear to have twenty-one teeth and exactly one inch pitch. First set the instrument as above described, and lay off one division on any circle, as shown by the dotted arc in Fig. 4, take the pitch of one inch between the points of common dividers, and move the points of the dividers along the lines 1 3 and 9 3 (which include the division so laid off) until the points rest on both lines, as shown, the center of the dividers 10 being moved on the bisecting line 2 5: the point 4 is the required point, and 4 3 or 3 6 are the radii of the required pitch-circle.

The same result above obtained can also be arrived at by construction, referring to Fig. 5. Draw the line 13 14, bisecting the angles 15 16 17 and 18 16 19; erect the perpendiculars 20 21 and 14 23, making them each equal to one-half ($\frac{1}{2}$) the required pitch, or one-half inch; draw the line 21 23, and the point 24, where this line cuts the line 17 16, is the required point, and 24 16 is the radius of the required circle. In the same manner the radius of the outside circle for blanks or gears may be obtained.

To lay out an angle, after setting the instrument as described for either of the preceding problems, instead of moving or turning the marking-arm I one-half way around, turn it only one-fourth ($\frac{1}{4}$) around, as shown in Fig. 3, and swing the division-scale P until the angle-pin s is in contact with the edge 5 6 of the T square; then press in the thumb-tack at r. The angle-pin s is in the ninetieth hole of the scale, and when the division-bar is at this angle and the edge 5 6 of the T square is brought in contact with the pin s, the longer arm of marking-bar I shows ninety degrees. If forty-five degrees are wanted, place the spacing-pin v in the hole numbered 45; slide the edge 5 6 until in contact with this pin v; then mark the angle across the circumference of the circle. Proceed as above for other angles.

In the same manner that ninety degrees is

divided into ninety parts it is evident that any other part of a circle, however minute, can be divided into ninety parts. Therefore, if forty-five degrees be divided into ninety parts, the divisions are one-half degrees, or $\frac{1}{720}$ of the circle; dividing this one-half degree or $\frac{1}{720}$ into ninety parts, the divisions would be $\frac{1}{90} \times \frac{1}{720} = \frac{1}{64800}$ of a circle.

There is, in fact, practically no limit to the number of divisions.

The instrument is simple, durable, has but few parts, cannot easily get out of order, and is most efficient in use for a wide range of duties, and for accurate work, and with but little practice can be worked with great facility and rapidity.

I can use the whole or any part of the circumference, as preferred. In dividing the circle the T square moves a distance exactly equal to the semi-circumference of the circle, whose radius is that of the wheel; or, in other words, the circumference or any part of it is reduced to a straight line, and then this whole or part is divided into any desired number of parts by means of changing the angle of the dividing scale, rule, screw, or other equivalent device on which are equal divisions.

I claim—

1. A circle-dividing instrument in which a rule adapted to turn upon a center actuates a shifting square, substantially as and for the purpose set forth.

2. In combination with the bed or support, the wheel F and the bar I, affixed thereto and adapted to revolve therewith, and having a straight marking-edge coinciding with the diameter of the wheel, substantially as and for the purpose described.

3. In combination with the bed, a sliding T square, adapted to be held thereto, and to be shifted in right lines thereon, substantially as shown and described.

4. In combination with the bed, the sliding T square, wheel F, and straps connecting the wheel and square, substantially as and for the purpose set forth.

5. In combination, the bed, T square, and graduated bar P, substantially as and for the purpose set forth.

6. The graduated perforated bar P, having its zero-point adapted for connection with the bed, and at its other extremity adapted to be secured to a table, and provided with a projection or pin, s, substantially as shown and described.

7. In combination with the wheel, T square, and straps, adjusting devices for adjusting the tension of the straps, substantially as shown and described.

8. In combination with the bed, the wheel F, and bar I, the centering-pin u, whereby the wheel may be centered and retained in position.

9. In combination, the bed, T square, and their connecting devices, bar I, and graduated bar P, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signatures in presence of two witnesses.

MYRON G. STOLP.

Witnesses:
JOHN MCARTHUR,
LEVI D. MEAD.