W. H. BROWN.

Dividing Engine Dial.

No. 14,082. Patented Jan'y 15, 1856.

Fig. 2.

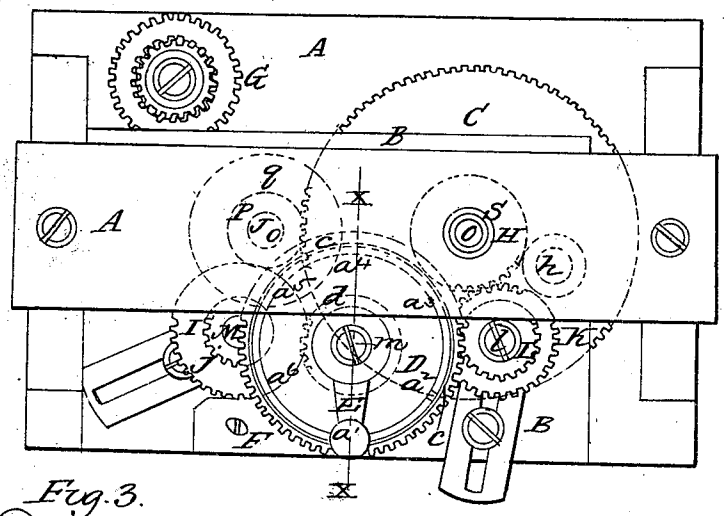
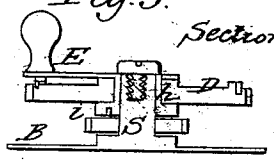


Fig. 3.



Sectional Views.

Fig. 4.

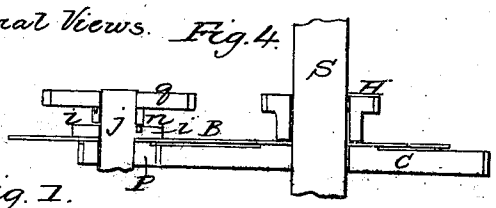
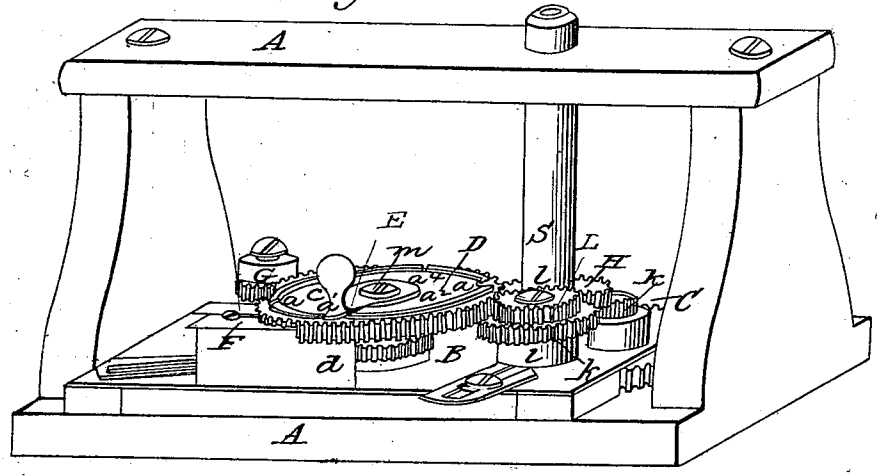


Fig. 1.



UNITED STATES PATENT OFFICE.

WM. H. BROWN, OF WORCESTER, MASSACHUSETTS.

VARIABLE DIAL FOR DIVIDING-ENGINES.

Specification of Letters Patent No. 14,082, dated January 15, 1856.

To all whom it may concern:

Be it known that I, WILLIAM H. BROWN, of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Engines for Dividing Circles and Lines, which I call a "Variable Dial;" and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a perspective view. Fig. 2 is a plan. Fig. 3, a vertical section of the dial and its attachments, in the direction of the line x, x, Fig. 2; Fig. 4 is a vertical section through the centers o, o, of the toothed wheel C, and q, and the pinion P, showing the shaft j, and a portion of the main shaft, S.

The same letters refer to like parts.

A is the frame, having made fast to it a plate of metal B, to which the gearing is attached.

S is the main shaft passing through the plate B, having its bearings in the frame work, and bored at its upper end to receive a mandrel holding the work to be operated upon; machinery for cutting teeth or for marking the divisions can be attached to the top of the frame. Attached to the main shaft near its lower end, and concentric with it, is the main toothed wheel C.

D is the dial; E, the index, made fast to the upper end of the hollow shaft h, seen in Fig. 3. This shaft passes through the dial plate, turning freely in it, and has a flange at its lower end forming a shoulder upon which the dial plate rests. It has a hole drilled at i to receive a pin projecting upward from the toothed wheel d, causing the said wheel to receive the motion of the index, the whole being allowed to turn upon the fixed stud s, and being kept in place by the screw m, at the top. From the wheel d motion is communicated by the intermediates I and J, to the toothed wheel q, on the shaft j, which has upon its lower end a pinion P gearing into the main wheel C. This shaft is kept in position by the said pinion beneath the plate B, in which it the shaft turns, and a flange or collar above. This flange has a hole drilled at i to receive a pin projecting downward from a blank wheel n, which in turn receives another from the toothed wheel g, causing the shaft with its pinion to receive the motion of g, the same as described in connection with the index. This arrangement admits gears of various diameters to be used, the intermediate stud M being movable for their accommodation. A set of changes for the various numbers of divisions required to be made is shown at G, all having their pins and holes of the same size, and at equal distances from their centers. The dial has a rim rising from its upper surface which is divided into six equal portions by the notches a' a^2 a^3 made to receive a catch projecting downward from the handle of the index. Outside this rim are segments c c''' of a shorter length than the distance between the notches, and extending slightly above the rim. They are held and are made to slide in a groove made for the purpose, and are used to prevent the catch of the index from being received into the notches, when a part of them only are required to be used. A piece of metal F, is used to prevent the dial from turning when desired, by being made to press upon its outer edge, by means of a screw entering a piece rising from and fixed to the plate B; upon which the edge of the dial rests.

The parts thus far described are the same in their principle and operation as the ordinary geared cutting engine, in which the various divisions are chiefly produced by changes of gears, but which are confined in their operations to the production of numbers, which, or the factors of which, are contained as equal divisors in the numbers used in producing them.

The nature of my improvement consists in causing both the index and dial to rotate at the same time, either in the same or in a contrary direction, with such relative velocity, that at the completion of a revolution of the main shaft, one point of division in the dial shall occupy the position which one of the others had at the beginning; or shall resume its own position, having made one or more revolutions in the mean time, thereby causing a difference in the number of divisions made in a circle rotating with the main shaft, from what would have been made had the dial been stationary, equal to the number of such points of division in the

dial that pass a fixed point during the revolution of the main shaft, less or more according as the dial turns in direction with, or contrary to the index. For this purpose I make use of the toothed wheel H, fixed on the main shaft; the adjustable stud *l* for intermediates of various diameters, which are used for transmitting motion to the dial plate, in such proportion as may be desired, teeth being cut in its outer edge for the purpose; the stud *k* for a second intermediate when required to give the dial a contrary motion. This stud in the model is adjusted to a wheel of 21 teeth.

In order to describe the operation, let us suppose the wheel *d* to have 25 teeth; I 36; J 18; *g*, 40; P 18; and C 90; and that each alternate notch in the rim of the dial plate, is closed by the segments used for the purpose, leaving the others to be used making 3 equal division in the dial. This arrangement, if the dial be stationary will give $\frac{25}{36}\times\frac{18}{40}\times\frac{18}{90}\times\frac{1}{3}=\frac{1}{48}$ of a revolution to the main shaft for each division of the dial, causing 48 divisions to be made in a circle rotating with it; but if the dial is made to communicate with the wheel H, by the intermediates K and L, H having 30 teeth, K 30, L 20, and the dial plate 60, then a revolution of the main shaft will give to the dial $\frac{20}{60}=\frac{1}{3}$ of a revolution,—equal to one of its divisions, causing thereby—(as by the arrangement, the dial moves contrary to the index,)—48+1 divisions to be made instead of 48, as in the first instance. For supposing the index to coincide with the notch *a'* at the beginning, and is caused to turn in the direction indicated by the arrow seen in Fig. 2. Now as 16 complete revolutions of the index are required to cause one of the main shaft, the index will resume the same position at the close which it had at the commencement,—but when the index has made 16 circuits of the dial, giving 48 divisions, it will again coincide with the notch *a'*, which will then be near the point a^3, and to complete the 16 revolutions it must pass over one more division of the dial to the point of starting, then occupied by the notch a^5, thus making 48+1=49 divisions as before stated. By using another intermediate upon the stud *k* to cause the dial turn in the same direction as the index, the other arrangements being the same, then at the completion of 16 revolutions of the index, and consequently one of the main shaft, the notch a^2 will coincide with the index, occupying the position which *a'* had at the beginning, and the distance between a^3 and *a'* or one division will be wanting to complete 16 revolutions with respect to the dial, giving as the number of divisions made, 48−1=47, a prime number, it will be noticed, and not an equal divisor of any of the numbers used in producing it.

By using the wheel of 20 teeth in the place of K, and one of 40 instead of L, a revolution of the dial will be made in the same time as one of the main shaft, in which time 3 divisions of the dial will have passed a fixed point, giving as the result 48+3 and 48−3 respectively, as the numbers of divisions made in the work. In any case the result may be exhibited by the following simple formula. Let *n* represent the number of divisions which would be made with the dial stationary, and *d*, the number of the points of division in the dial, which pass a fixed point during a revolution of the main shaft; then if the dial and index turn in the same direction, the number of divisions made, will be *n*—*d*; if they turn in contrary directions, *n*+*d* will represent the number produced.

From the foregoing description it will be seen that using the same intermediates K and L, at least 3 times as many different numbers of divisions can be made with a given number of changeable gears, as can be produced with the dial stationary, and by using a few changes on the stud *l* the numbers may be increased many fold.

The advantages of my improvement will be made still more apparent by a description of the manner of producing the various gears required, in constructing a cutting engine. First having constructed the frame-work, and cutting apparatus, I divide the periphery of the main wheel as accurately as possible, by any of the known methods, into a convenient number of equal parts,—say 360,—and cut teeth corresponding to the same; and using this for a dial I then make other gears the numbers of the teeth in which will be aliquot parts of 360. Using these on the various shafts and studs to transmit motion from the index to the main shaft, and from thence to the dial, I am enabled in the manner described to make variations to any extent desired.

My improvement is not necessarily confined to engines in which gearing is used to connect the dial with the main shaft; but may be applied to the more common form of engines, in which the dial and main shaft are united;—by attaching the index or pin, which is usually stationary, to a toothed segment, concentric with the dial and having motion given to it by means of a worm gear or pinion on the main shaft,—intermediate gearing being used for the purpose,—so that during a revolution of the dial the index will pass over a space equal to one or more of the divisions used, making a difference in the work equal to the number of divisions thus passed over,—the same as before described. It may also be applied to engines for dividing right lines, and as there are many known methods of producing uniform linear motion from rotary, the application will be obvious without further description.

I do not claim the use of gearing as a means of transmitting, or varying rotary motion; but

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

Causing both the index and dial to rotate at the same time, by means substantially the same, and for the purpose set forth in the foregoing specification.

WM. H. BROWN.

Witnesses:
F. G. WOODWARD,
IVERS GIBBS.