J. GILL.

CURVE SCRIBER.

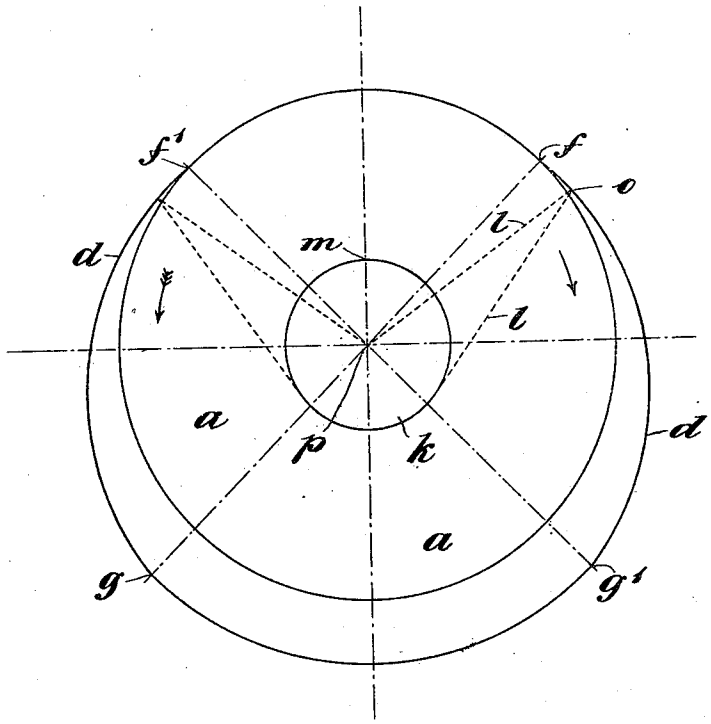
APPLICATION FILED JULY 30, 1906.

922,575.

Patented May 25, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES.

W. P. Burke

A. F. Heuman

INVENTOR.

John Gill

by Richards & Co.

ATT'YS

J. GILL.

CURVE SCRIBER.

APPLICATION FILED JULY 30, 1906.

922,575.

Patented May 25, 1909.

2 SHEETS—SHEET 2.

Fig. 2.

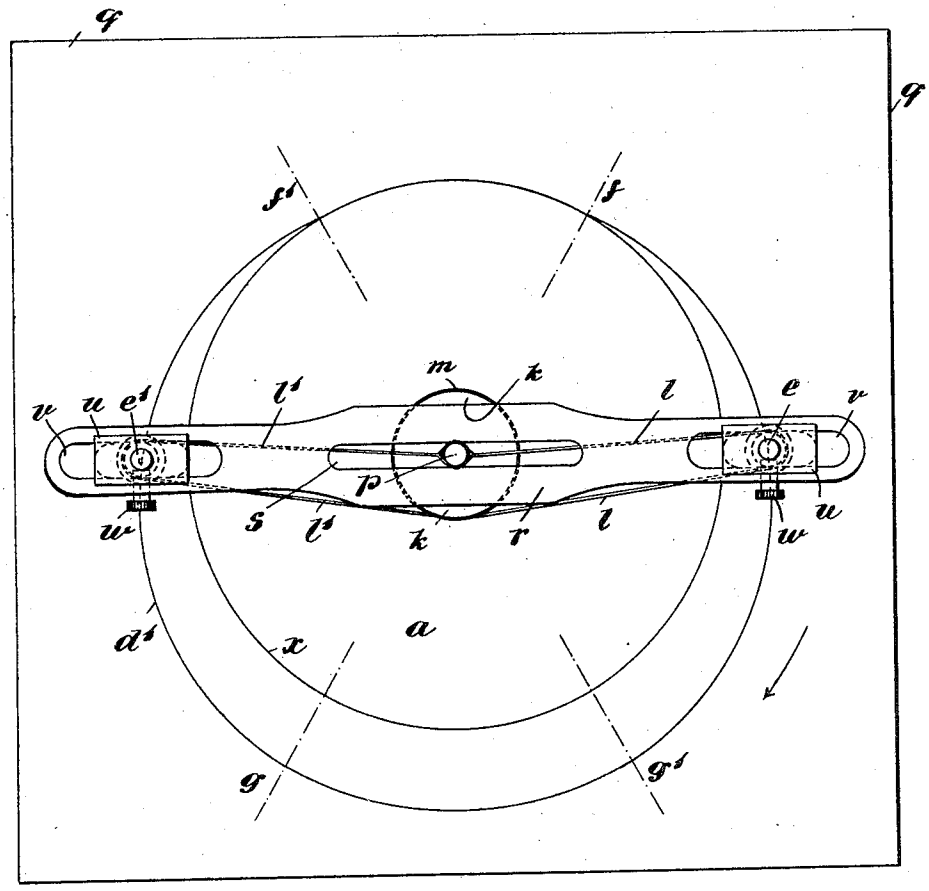
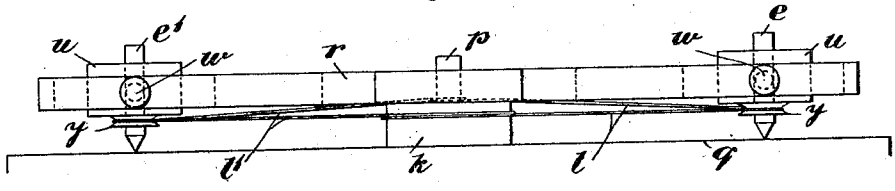


Fig. 3.



— Witnesses. —

W. P. Brooks

Chas. G. Smith.

— Inventor. —

John Gill

by Richards & G. Attys

UNITED STATES PATENT OFFICE.

JOHN GILL, OF EDINBURGH, SCOTLAND.

CURVE-SCRIBER.

No. 922,575. Specification of Letters Patent. Patented May 25, 1909.

Application filed July 30, 1906. Serial No. 328,350.

To all whom it may concern:

Be it known that I, JOHN GILL, a subject of the King of Great Britain, residing at Edinburgh, Scotland, have invented new and useful Improvements in Curve-Scribers, of which the following is a specification.

This invention relates to an instrument for drawing the involute curves forming part of the internal surface of the outer casing of a rotary engine, pump or the like, of the class in which a cylindrical drum revolves inside an outer casing, and is provided with a sliding plate of unvarying length which passes through the axis of the said drum and forms the piston upon which the motive fluid acts, and in which the inner surface of the outer casing against which the ends of the said piston plate bear, is composed of two circular arcs concentric with the cylindrical drum the ends of which arcs are connected together by two involute curves as shown in the accompanying drawings, in which—

Figure 1 is a diagram of the said arcs and curves, and Figs. 2 and 3 a plan and elevation respectively, of the instrument for drawing the involute curves.

a represents the said cylindrical drum, $f^1 f$ the arc of a circle drawn to the same radius as the drum, $g\,g^1$ the arc of a circle drawn to the radius of the drum plus the given amount of clearance to be left between the drum *a* and the arc $g\,g^1$, and $d\,d^1$ the two involute curves, one connecting the end *f* of one arc to the end g^1 of the other arc, and the other curve connecting the end f^1 of the one arc to the end *g* of the other arc. The essential feature of the contour produced by the combination of the two circular arcs and two involute curves is that all diametral lines drawn through the center of the axis of the drum from side to side of the casing are equal in length, corresponding to the unvarying length of the piston plate *t*. It is for the drawing of these two involute curves $f\,g^1$ and $f^1\,g$ that the instrument forming the subject of the present invention has been devised. This instrument is of the following character: Referring more particularly to Fig. 1, *k* is a disk fixed concentrically with the center of the drum *a*, *l* is an unstretchable flexible cord, one end of which is fixed to the disk *k* at *m* preferably with a loop on a pin at that point, the cord is then carried to the left around the disk *k* to the point *f* at one end of the circular arc $f\,f^1$ and around a pencil or scribing point *e* placed there, and then back to a pin *p* placed at the center of the drum *a* to which pin it is attached by a loop or otherwise, so that it is free to turn thereon. By now moving the pencil or scriber *e*, while keeping the cord *l* taut, around from the point *f* in the direction of the plain arrow to the point g^1 at one end of the circular arc $g\,g^1$, the cord unwinds from the disk *k* and slips, to a certain extent, around the pencil or scriber *e* and the proper curve *d* for that side of the casing is thus described. In order to describe the curve d^1 for the opposite side of the casing it is only necessary to wind the cord *l* around the disk *k* in the opposite direction and around the pencil or scriber *e* placed at f^1 and to move the pencil in the direction of the feathered arrow from the point f^1 at the opposite end of the circular arc $f\,f^1$ to the point *g* at the end of the circular arc $g\,g^1$.

The circumference of the disk *k* to be used in the above described device for drawing the involute curves is dependent upon two factors, namely:—the radial distance between the drum *a* and the arc $g\,g^1$ (which distance may be conveniently called the "clearance"), and the fraction of the whole circumference of the drum *a* subtended by one of the involute curves; but is independent of the size of the drum; and the rule for finding approximately the circumference of the disk from these data is that twice the "clearance" in inches is approximately equal to the fraction of the circumference in inches of the disk that corresponds to the fraction of the circumference of the drum subtended by one of the involute curves. For example, assuming the "clearance" is to be about three inches, and that the involute curve is to subtend one-fourth of the circumference of the drum, twice three inches will be equal to one-fourth of the circumference of the disk *k;* hence the whole circumference of the disk will be approximately $2 \times 3 \times 4$ equal 24 inches, which will be found slightly too large if it is desired to make the clearance exactly three inches, and in that case the size of the disk must be reduced by trial and error until it is such as will cause the ends $g\,g^1$ of the involute curves drawn with its assistance to join exactly up to the corresponding ends of the circular arc $g\,g^1$ on the radial lines $f\,g$ and $f^1\,g^1$ respectively. If, however, it is permissible not to make the clearance exactly three inches but only approximately that dimension, it will be sufficient to use the disk made to the

above size and to draw the involute curves by its means, the result of which will be that the ends g g^1 of those curves will cut the radial lines f g and f^1 g^1 at points slightly more than three inches from the drum a, and then, instead of drawing the arc g g^1 at the exact distance of three inches from the drum, it can be drawn so as to connect the said ends of the involute curves. Either of these methods will produce a contour that will fulfil the above enunciated condition of equality of diametral lines sufficiently exact for all practical purposes. Again, assuming the "clearance" to be three inches, and that the involute curve is to subtend three-eighths of the circumference of the disk, the whole circumference will be approximately $\frac{2\times3\times8}{3}$ equal 16 inches, and a disk of that size can be used in either of the ways above explained in order to draw curves that shall either terminate so as to give the exact clearance of three inches or one of approximately that dimension, as may be desired.

A convenient arrangement of the instrument which forms the subject of the present invention is shown in Figs. 2 and 3, in which k is the disk hereinbefore referred to which is fixed on a board, sheet of paper or other flat material q, (upon which the curves are to be drawn) concentrically with a circle x previously drawn on the board q and representing the drum a of the engine, the contour of the outer casing of which is required. p is a pin standing up at the center of the disk a. r is a bar of metal or other suitable material having a slot s which takes over the pin p, the bar being thereby free to slide longitudinally while being guided by the pin p. e and e^1 are pencils or scribers fixed one at each end of the bar r at a distance apart from point to point exactly equal to the diametral line f g or f^1 g^1 of Fig. 1. l is a cord one end of which is fixed to the disk k at m. The cord is then carried to the left around the disk k to and around the pencil e and thence to the pin p on to which the end is looped so as to be free to turn thereon. l^1 is a similar cord one end of which is fixed to the disk k at m, the cord is then carried to the right around the disk k to and around the pencil e^1, and thence to the pin p on to which the end is looped so that it is also free to turn on the said pin. It will now be understood that on turning the bar r around in a horizontal plane on the pin p, say in the direction of the arrow in Fig. 2, the cord l will unwind from the disk k while the cord l^1 will wind on to it, the result being that the bar r is caused to slide on the pin p in the direction from e^1 to e. On the contrary if the bar r is turned in the opposite direction the cord l is wound on to the disk k and the cord l^1 is unwound therefrom, with the result that the bar is caused to slide in the direction from e to e^1. If now the bar r is placed so that the pencil e coincides with the point f, and the pencil e^1 with the point g, and the bar is turned in the direction of the arrow, the pencil e will describe on the board q the involute curve d and the pencil e^1 the involute curve d^1.

In order to adapt the instrument for drawing the involute curve for drums a of various diameters and various clearances, the pencils e and e^1 may be mounted in movable blocks u sliding in slots v so that they can be adjusted to any required distance apart and fixed by set screws w.

To facilitate the movement of the cords l and l^1 around the pencils e and e^1, small pulleys y may be mounted rotatably on the pencils around which the cords are passed instead of around the stationary bodies of the pencils, whereby frictional resistance is reduced.

Instead of the bar r being made double-ended, that is to say, with a pencil at each end, it may be made single-ended, that is with a pencil at one end only, and with one cord; in that case, however, each curve has to be drawn separately, and after one curve is drawn the bar has to be turned to the other side and the cord reversed on the disk k in order to draw the other curve, but I prefer the double-ended arrangement shown in the drawings.

I claim as my invention:—

A device for drawing curves comprising a disk, an inextensible cord fixed at one end to a point in the circumference of and passing around said disk, and rotatably attached at the other end to the center of said disk, and a pencil or scriber in the bend of the cord.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN GILL.

Witnesses:
JAMES GILL,
DAVID GALLOWAY ANDERSON.