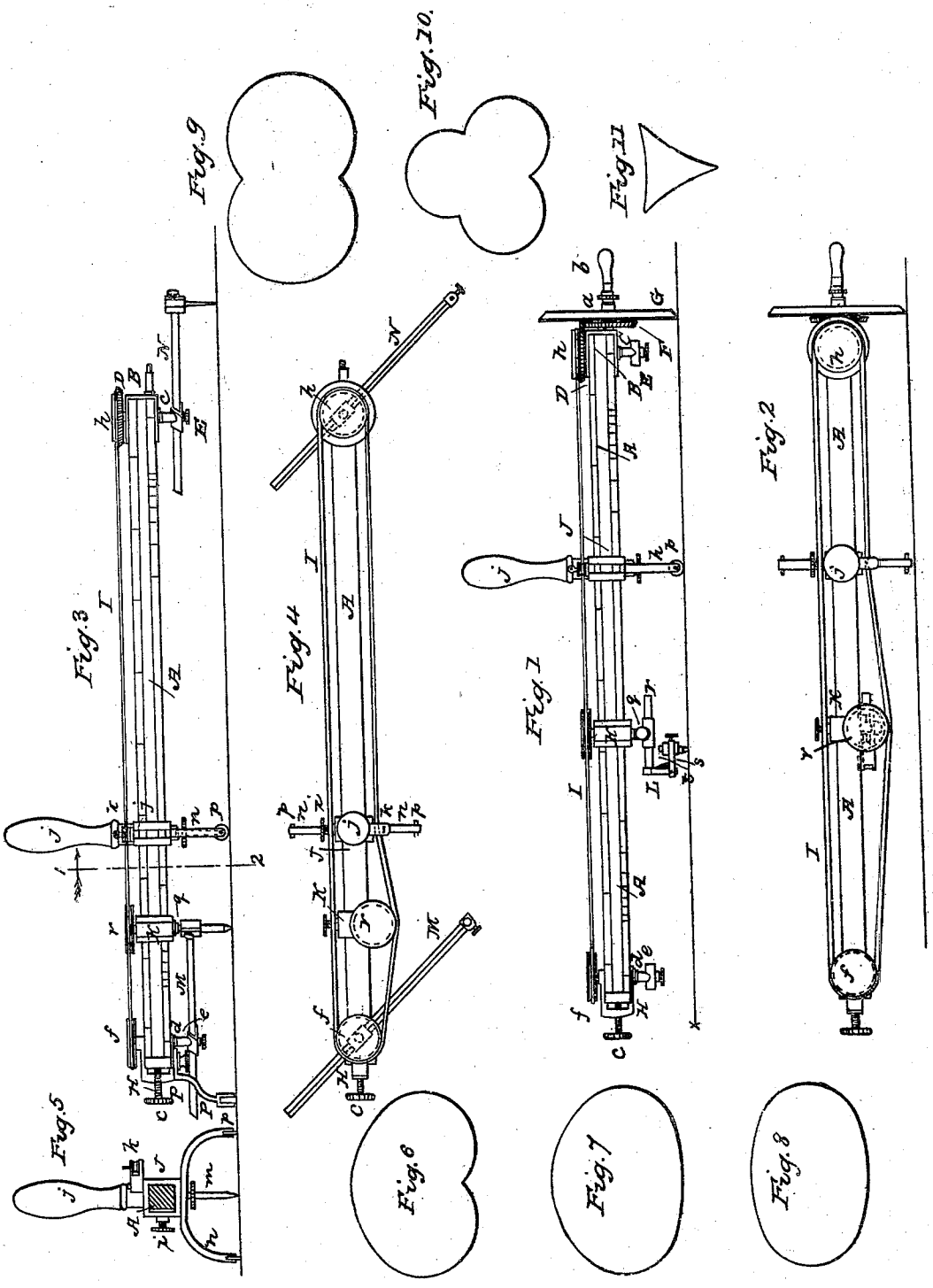
W. W. WYTHES.

Drafting Instrument.

No. 21,041. Patented July 27, 1858.



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

UNITED STATES PATENT OFFICE.

W. W. WYTHES, OF PHILADELPHIA, PENNSYLVANIA.

DRAWING INSTRUMENT.

Specification of Letters Patent No. 21,041, dated July 27, 1858.

To all whom it may concern:

Be it known that I, WILLIAM W. WYTHES, of the city of Philadelphia and State of Pennsylvania, have invented a new and Improved Instrument for Drawing and Copying; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing and to the letters of reference marked thereon.

My invention consists of a beam, on which is an adjustable point and an adjustable pencil-holder, so arranged in connection with a disk, endless chain, and other devices, fully described hereafter, that a rotary motion is imparted from the disk to the pencil holder, while the latter is turned on the adjustable center, thus causing the pencil to produce a variety of figures, the form of which depends upon the relative position with each other of the above mentioned parts.

My invention further consists of a combination of the above mentioned adjustable center and endless chain with certain spindles and arms, described hereafter, whereby the instrument may be used as a pantograph.

In order to enable others to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the drawing, which forms a part of this specification, Figure 1 is a side view of my improved drawing and copying instrument, as arranged for producing elliptical, epicycloidal, angular and other figures, and compounds of the same. Fig. 2 a plan view of Fig. 1. Fig. 3 a side view of my instrument, arranged to act as a pantograph. Fig. 4 a plan view of Fig. 3. Fig. 5 a transverse section on the line 1, 2, (Fig. 3) looking in the direction of the arrow. The remaining views represent some of the figures drawn by the instrument.

On reference to Figs. 1, 2 and 5, (A) is a plain square beam of wood, to the end of which is permanently secured a plate (B). In the latter turns a vertical spindle (C), to which, (above the beam,) is secured a bevel wheel (D), and (below the beam) a triangular socket (E), for the reception of portions of the instrument hereafter referred to. From the end of the plate (B) projects a pin, on which a bevel wheel (F), gearing into and having the same number of teeth as the wheel (D), is arranged to turn freely. and with it a disk (G) with milled edges. A nut (*a*) serves to maintain the wheeels (G) and (F) in their proper position, and to this nut a handle (*b*) is attached, in such a manner as to turn freely independent of the nut, for facilitating the handling of the instrument. On the opposite side of the beam (A) a plate (H) is so attached, as to be readily adjusted longitudinally with the beam, by means of a thumb screw (*c*). In this plate (H) turns a spindle (*d*), to which, (underneath the beam) is attached a triangular socket (*e*), and (above the beam), a pulley (*f*), around which, as well as around a pulley (*h*) on the spindle (C) at the opposite end of the beam, passes an endless chain (I).

(J), Fig. 5, is a sliding piece, so adapted to the beam (A) as to be readily moved backward and forward along the same, a set screw (*i*) serving to retain it in the position to which it has been adjusted. To the top of the sliding piece (J) is secured a handle (*j*), for the operator of the instrument, and a projection (*k*), on which is hung a pulley which serves to guide the endless chain. To the underside of the sliding piece (J) is secured the central pointed rod (*m*) and an arched piece (*n*), forming two legs to which are hung small pulleys (*p*). Another sliding piece K is adapted to the beam (A), and furnished with a triangular socket below the beam, and above with a pulley (*r*) against which bears the endless chain (I). When the instrument is used for drawing, a pencil holder I, is fitted into the triangular socket attached to the end of the spindlee (*q*) in the sliding piece (K).

Th pencil holder consists of the bar (*r'*), fitting into the socket, and a plate (*s*), hinged to a projection on the bar (*r*). A light spring (*t*) attached to the projection, serves, by pressing on the plate (*s*) to maintain the point of the pencil in contact with the paper, which is represeented by the line (*x*), Figs. 1 and 3.

The point of the pin (*m*) projects slightly below the pulleys (*p*) on the arched piece (*n*), so as to penetrate the paper, and this point is the center on which the beam A and its appendages turn.

The operator steadies the instrument by applying one hand to the handle (*j*) on the central sliding piece (J), and, with the other hand applied to the handle (*b*) on the end of the beam (A), turns the instrument around, pressing slightly on the last named handle, in order that the milled edge of the disk G may bear on the paper sufficiently to

insure the turning of the disk. The instrument being turned, a rotary motion will be imparted through the bevel wheels (F) and (D) and endless chain to the spindle *q*, and consequently to the pencil. If the point of the pencil coincides with the center of rotation of the holder, a simple circle only, with the point (*m*) as the center, will be drawn. But when the pencil holder is so adjusted in its socket, that the point of the pencil is eccentric with the center of rotation of the holder, different figures will be drawn, their forms depending first, upon the position of the point (*m*), with regard to the periphery of the disk G; second, upon the position of the pencil, as regards the center of rotation of the holder and the situation of the point (*m*); and third, upon the bearing of the chain on the inner or outer edge of the pulley (*r*).

The number of revolutions which the pencil makes around the center of rotation, for one complete revolution of the beam on its center (*m*) of the holder, will depend upon the distance of that center from the periphery of the disk. The beam may be graduated, so that the first division of the scale is equal to the redius of the disk, the second to twice that radius, and so on throughout the whole length of the beam. If the center (*m*) be arranged to coincide with the first division of the upper scale, and the beam is turned, the pencil will make one revolution around the axis of its holder, while the beam makes one upon the center (*m*), producing cardioids, as seen in Fig. 6. This is only the case, however, when the chain bears on the outer edge of the pulley (*r*), Fig. 2; when it bears on the inner edge of the pulley, the figure formed will be an eccentric cam, Fig. 7. The forms of both figures may be modified, according to the amount of eccentricity of the pencil with the center of rotation of the holder. When the center (*m*) coincides with the second division of the upper scale of the beam, the pencil will make two revolutions for one of the beam, and the figure formed, when the chain bears on the outer edge of the pulley (*r*), will be an ellipsoid, Fig. 9.

When the chain is caused to bear on the inner edge of the pulley, the figure formed will be a simple ellipse, Fig. 8 the length of its axes depending upon the position of the pencil.

When the point (*m*) coincides with the third division of the scale, and the chain bears on the outer edge of the pulley *r*, the figure formed will be an epicycloid with three branches, as seen in Fig. 10, the form of which may be modified, by changing the position of the pencil as before. When the chain bears on the inner edge of the pulley (*r*), a hypocycloid of three branches will be formed, as seen in Fig. 11, the shape of this figure being likewise dependent upon the position of the pencil.

When the center coincides with any intermediate point on the scale, the distance of which from the periphery of the disk is such as not to be immediately divisible by the radius of that disk, a series of finite or infinite transcendental figures will be formed around the center (*m*).

It will be seen without further description, that, by placing the center (*m*) to coincide with the fourth, fifth, or sixth divisions of the scale and so on, a variety of figures may be produced, of the most complicated and varied natures, forming ornamental devices, which can be applied to many artistic purposes. The instrument may be also arranged to produce various figures applicable to mechanical devices, such as cams or the teeth of wheels.

When the instrument has to be used as a pantograph, it must be arranged as represented in Figs. 3, 4 and 5, that is to say the disk (G), handle (*b*) and pencil holder I, must be removed. A bar (M), furnished at the end with a pencil, is attached to the socket (*e*) on one end of the beam, and a similar bar N, furnished with a plain point to the socket (E) on the opposite end of the beam. A bracket (P) is also secured to the plate (H), and to the end of the bracket is hung a roller, which rests on, and moves over, the paper as the instrument is used. The lower scale on the beam is so graduated, that, when the center point (*m*) is placed midway between the centers of the spindles (*d*) and (*e*), the copy produced by the pencil will be exactly similar to that traced by the pointer on the arm N from the original. It will be readily understood, that, when the point is placed at intermediate points on the scale, the copy will be enlarged or diminished, according to the position of these points.

In preparing the instrument for copying purposes, a straight line is first drawn on the paper, the position of the point (*m*) determined upon, and one or both of the rods (M) and (N) so adjusted, that the point of the pencil, that of the tracer and the central point will all coincide with the straight line. Care must of course be taken that the bars (M) and (N) should invariably be parallel with each other.

Having now described the nature of my invention, and the manner in which the same may be operated to produce the desired results, I wish it to be understood, that I do not desire to confine myself to the precise form or arrangement of the several parts illustrated and described; but

I claim and desire to secure by Letters Patent,—

1. Causing the adjustable pencil holder to revolve, as the beam is turned on the ad-

justable center (m), by means of the disk (G) and endless chain (I), with the wheels and pulleys, (or their equivalents) acting in conjunction with the same, for the purpose specified.

2. The adjustable sliding piece (K), with its spindle (q) and adjustable pencil holder (L), when constructed and arrange as and for the purpose herein set forth.

3. The spindle (d) with its adjustable bar (M) and pulley (f) and the spindle (C) with its adjustable bar (N) and pulley (h), in combination with the adjustable point (m) and endless chain (I), the whole being arranged on the beam (A) substantially in the manner and for the purpose herein specified.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

WM. W. WYTHES.

Witnesses:

HENRY HOWSON,

JNO. W. ODIORNE.