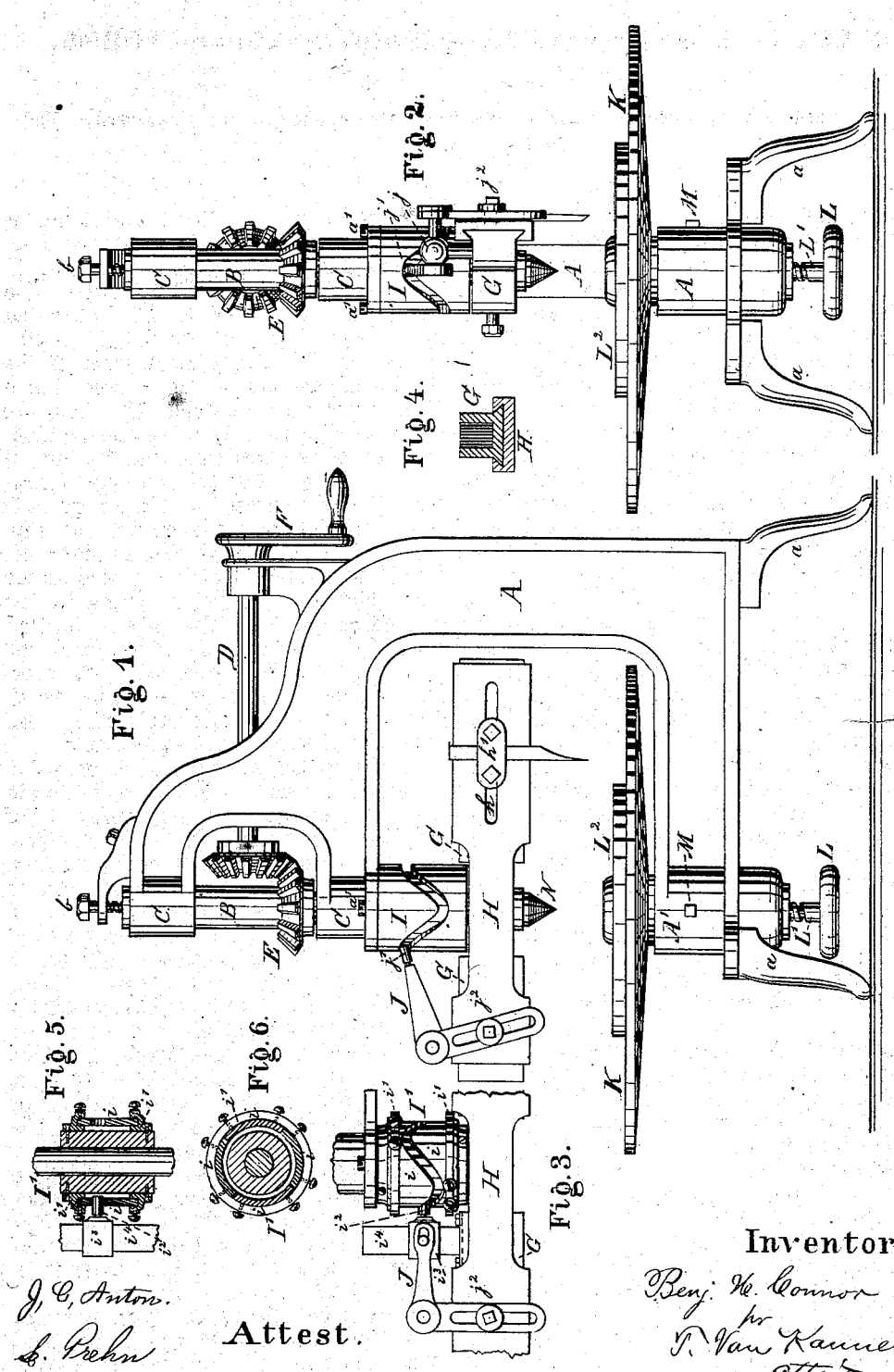
B. H. CONNOR.

Machines for Turning Irregular Forms.

No. 158,629. Patented Jan. 12, 1875.

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN MACHINES FOR TURNING IRREGULAR FORMS.

Specification forming part of Letters Patent No. **158,629**, dated January 12, 1875; application filed June 15, 1874.

*To all whom it may concern:*

Be it known that I, BENJAMIN H. CONNOR, of Cincinnati, county of Hamilton and State of Ohio, have invented an Improvement in Machines for Turning Irregular Forms; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing making a part of this specification.

Figure 1 is a side elevation. Fig. 2 is a front elevation. Fig. 3 is a side elevation, showing a modification of Fig. 1. Fig. 4 is a section of the revolving head and slide, when the latter is used underneath the former. Figs. 5 and 6 represent the sectional cam.

Similar letters of reference indicate like parts.

The nature of my invention relates to a machine for cutting irregular forms, such as ellipses, ovals, rectangles having rounded corners, or having one side and their two opposite corners rounded, as well as other irregular forms and figures. It consists mainly of a rotating shaft having a head revolving horizontally, to which a slide carrying a cutting-tool is attached; also, a simple device fastened to the head, communicating motion to said slide by means of a cam held to the frame. It further consists in making said cam in sections, which sections may be readily interchanged with each other, thereby cutting a large variety of forms with comparatively few parts; also, a device giving that part acted upon by the sectional cam a vertical reciprocating motion.

In construction my invention is as follows: A A′ is the frame, supported on legs *a a*. The vertical shaft B rotates in journal-bearings C, and receives motion from the horizontal shaft D, through bevel-gearing E, from crank F, or belt and pulley in its stead. The upper end of shaft B is held tightly to its bearings by means of a screw, *b*, and to the lower end of said shaft is bolted the revolving head G. This head has upon one side a dovetailed flange, over which a slide, H, is fitted snugly, the latter moving freely over the former. A slot, *h*, in the slide admits a tool-post, *h′*, which may be adjusted to or from the center of motion, according to the size of the figure to be cut. A cam, I, to cut a regular elliptic form, is seen in the drawing, Figs. 1 and 2, and is held to the frame by means of screws *a′ a′*. A right-angle lever is seen at J, vibrating in bearing *j*, which is bolted to the head G. To the horizontal arm of said lever is journaled a friction-roller, $j^1$, which fits snugly in the groove of cam I. The vertical arm of the lever is slotted, as seen in Fig. 1, receiving a pin, $j^2$, and fastened into slide H. This pin may be adjusted vertically in the slide, which, by being placed farthest from the fulcrum of the lever, gives the slide the greatest throw, and being placed nearest the fulcrum gives it the least. This adjustment regulates the ellipticity of the form, as will be readily observed.

The work to be operated on is placed on the table K, which has a plunger fitting in the bore of the frame at A′. The table is elevated or lowered by a hand-wheel, L, operating the screw $L^1$, and is kept from turning by set-screw M engaging with the plunger through a vertical groove cut therein; the table being also held tight by means of the same screw. A plate, $L^2$, of any convenient size or shape is placed on the material to be cut, which plate is brought in contact with the center N of shaft B, which holds the work firmly in place. When such irregular forms as ovals, &c., are to be cut, the device shown in Fig. 3 is made use of. Herein, the cam I′ is sectional, being composed of parts *i i*. The rim $i^1$ is grooved to take in the parts *i*, and is screwed to the frame by means of machine-screws. Above this cam is an exact counterpart, similarly constructed and attached, which two together give the required motion to the roller $i^2$. This roller is journaled in a vertically-moving slide, $i^3$, which is fitted over an upright stand or guide, $i^4$, bolted to the revolving head G. The lever J here connects with the slide $i^3$ by means of a loop of the former engaging with a pin in the latter. From the lever out the construction is the same as in the former case. The revolving head G is cast in such proportions from the center out as to give it as nearly as possible a balance.

In Fig. 4 is seen a section of the revolving head and slide, the slide being in this case underneath the head, whereby the tool moves in line with the radius, which is necessary in certain kinds of heavy and accurate work.

The device for feeding the tool down on the work is not shown herein, as any suitable feed may be made use of.

In operation my invention is as follows: The proper adjustment having been given the tool-post for the required size of the form to be cut, and the pin having been adjusted to give the required shape to the same, the work is then placed on the table K and the foot-plate $L^2$ on the work. The table is then elevated until the plate $L^2$ is brought tightly against center N. The set-screw M is then tightened, which prevents the table from shaking in consequence of any loose motion it may have. Motion is then given the driving-shaft D, which communicates its motion to the vertical shaft B by the intervention of gearing E. As the shaft in Figs. 1 and 2 rotates, it carries with it the head G, with all the working parts belonging and attached to it. As the lever J rotates around the fixed cam, the roller of the former passing through the groove of the latter, the said lever receives a vibrating motion, which is communicated to slide H and the tool attached thereto, which gives it the required motion to form an ellipse. In the case of the sectional cam, and the device used in connection therewith, as shown in Fig. 3, the rotation of the shaft B, carrying the head, is identical with that shown in Figs. 1 and 2. In this case the cam is held in the same position, but the roller operating it moves in a direct vertical line, giving the face of the cam its full bearing. This roller, being connected to the slide $i^3$, gives the angle-lever J the same motion as in the former case. When it is desired to change the shape of the figure the sections may be taken out and interchanged or others placed in their stead to give the required cutting line.

It will be observed that, although I have herein described a machine for cutting paper and other material, the same may be adopted on a horizontal machine, such as a lathe, and may also be used for what is known as "oval-lathes" for turning purposes.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The fixed cam I, in combination with a rotating head, G, carrying the angle-lever J and slide H, all constructed and operating substantially as described.

2. A cam, I′, made in sections $i$ $i$, interchangeable with each other and mounted in the grooved rings $i^1$ $i^1$, in the manner substantially as and for the purpose set forth.

3. The guide-stand $i^4$ and vertically-moving slide $i^3$, in combination with the cam I′ and slide H, as and for the purpose specified.

4. The detachable rims $i^1$ $i^1$, fastened to the frame and holding the sections composing cam I′ in position, as above described.

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