(No Model.)

H. F. STANDING.

APPARATUS FOR PRODUCING STENCILS.

No. 475,165. Patented May 17, 1892.

FIG:4.

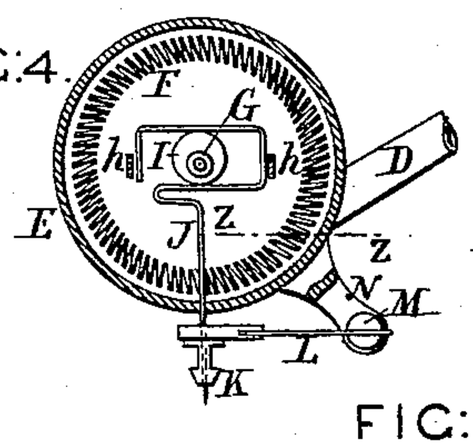


FIG:3.

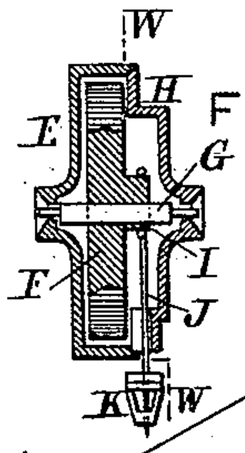


FIG:1

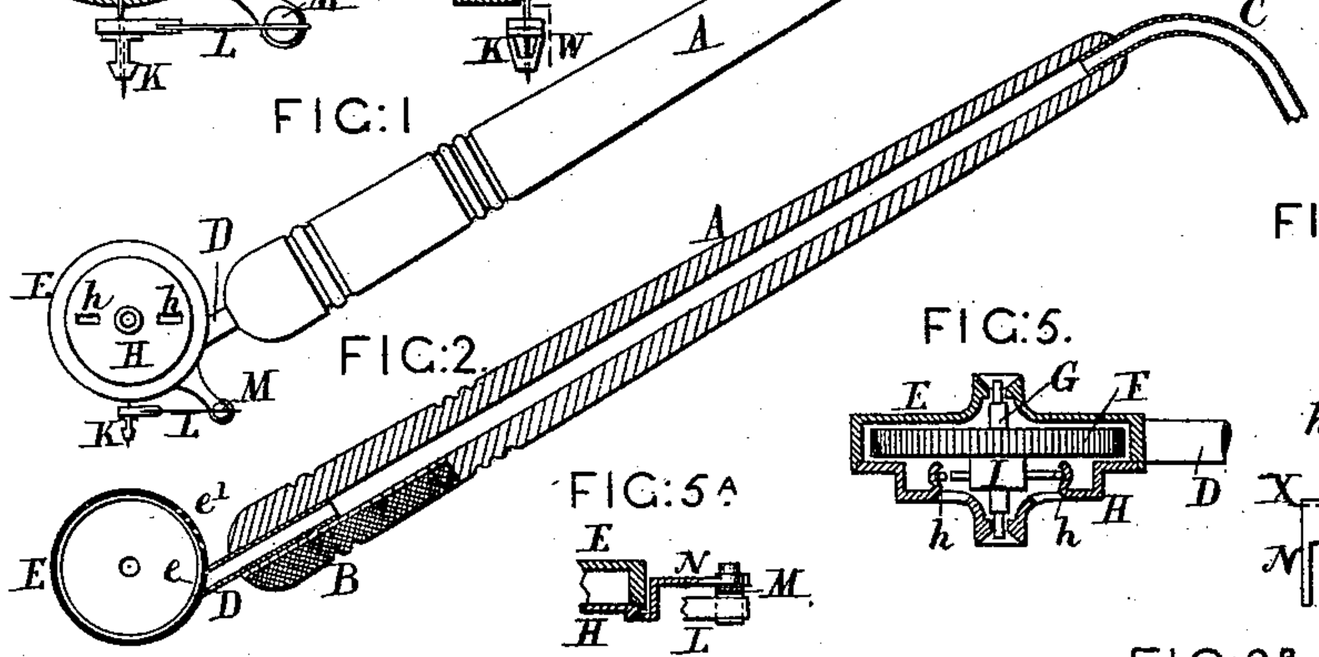


FIG:2.

FIG:3A

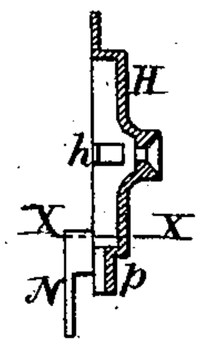


FIG:5.

FIG:5A

FIG:3B

FIG:20.

FIG:6.

FIG:7.

FIG:7A

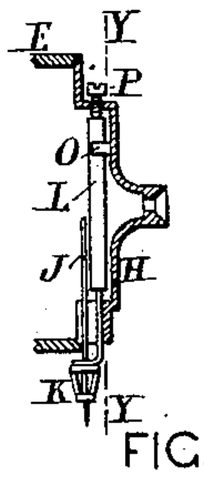


FIG:8. FIG:9. FIG:10.

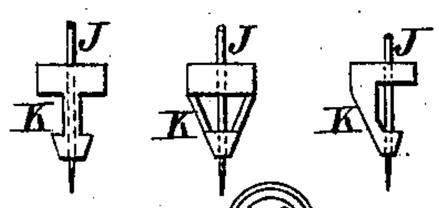


FIG:11.

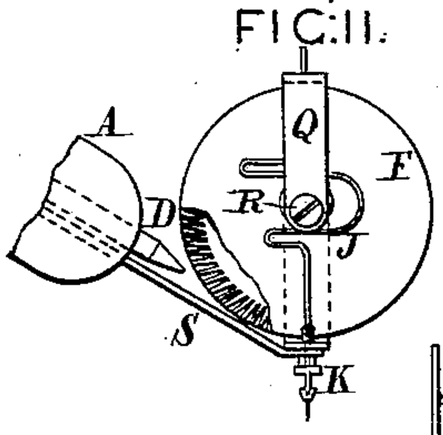


FIG:12.

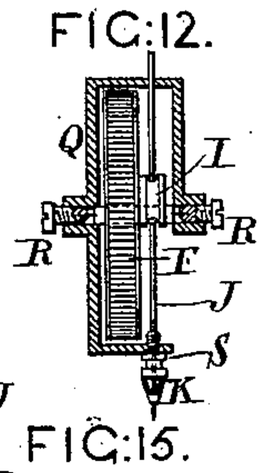


FIG:13.

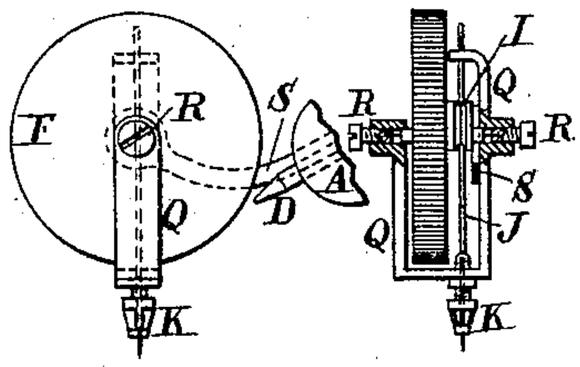


FIG:14.

FIG:19.

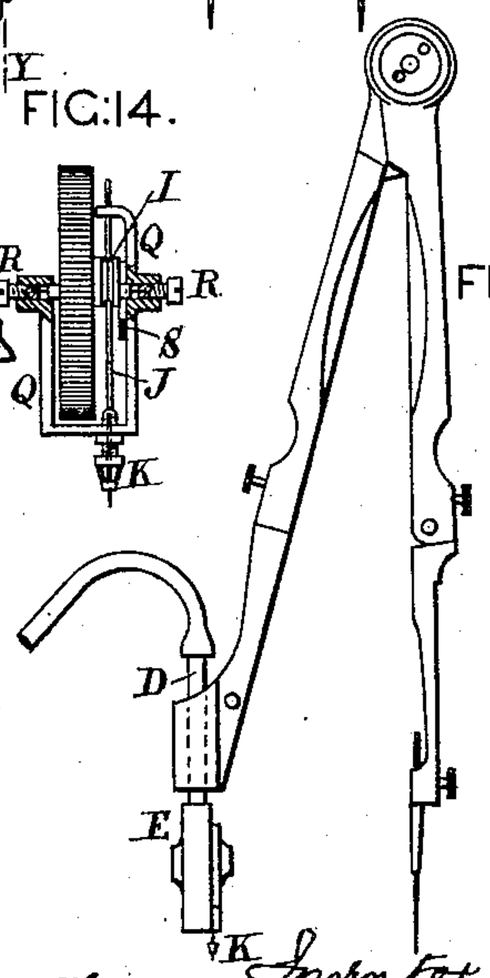


FIG:15.

FIG:16.

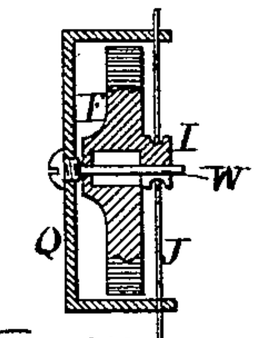


FIG:17.

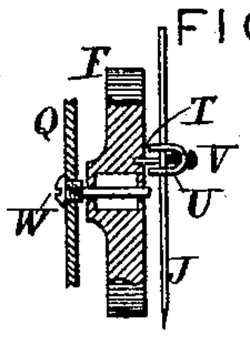
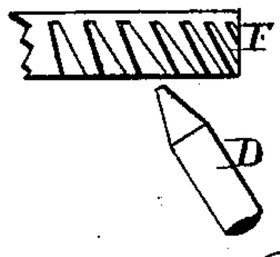


FIG:18.



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Robt. Ewett.

Inventor:
Herbert F. Standing.
By James L. Norris.
Attorney.

UNITED STATES PATENT OFFICE.

HERBERT FOX STANDING, OF BOURNEMOUTH, ENGLAND.

APPARATUS FOR PRODUCING STENCILS.

SPECIFICATION forming part of Letters Patent No. 475,165, dated May 17, 1892.

Application filed August 17, 1891. Serial No. 402,914. (No model.) Patented in England December 16, 1890, No. 20,517; in France July 16, 1891, No. 214,902; in Belgium July 16, 1891, No. 95,654; in Switzerland July 25, 1891, No. 3,878; in Norway August 4, 1891, No. 2,381; in Victoria September 10, 1891, No. 9,035; in New South Wales September 14, 1891, No. 3,256; in Spain September 17, 1891, No. 12,363; in Italy September 28, 1891, LIX, 364; in Canada November 7, 1891, No. 37,747, and in Austria-Hungary November 24, 1891, No. 36,034 and No. 61,876.

To all whom it may concern:

Be it known that I, HERBERT FOX STANDING, a citizen of England, of the Madagascar Mission of the Friends' Foreign Mission Association, but at present of Cadogan Moor, Church Road, Bournemouth, in the county of Hants, England, have invented new and useful Improvements in Apparatus for Producing Perforated Stencils, (for which I have obtained Letters Patent in Great Britain, dated December 16, 1890, No. 20,517; in France, dated July 16, 1891, No. 214,902; in Belgium, dated July 16, 1891, No. 95,654; in Norway, dated August 4 and December 30, 1891, No. 2,381; in Austria-Hungary, dated November 24, 1891, No. 36,034 and No. 61,876; in Spain, dated September 17, 1891, No. 12,363; in Italy, dated September 28, 1891, Vol. LIX, 364; in Switzerland, dated July 25, 1891, No. 3,878; in Canada, dated November 7, 1981, No. 37,747; in Victoria, dated September 10, 1891, No. 9,035, and in New South Wales, dated September 14, 1891, No. 3,256,) of which the following is a specification.

My invention relates to apparatus for producing perforated stencils such as are used for the reproduction of writing or designs, in which apparatus a reciprocating needle carried in a holder is made to reciprocate rapidly, so as to finely perforate the paper or other material forming the stencil while the holder traces the characters or designs.

According to my present invention I effect the requisite very rapid motion of the needle by pneumatic action in the following manner: In bearings on the lower end of a tubular holder I mount the axis of a small vane-wheel or turbine, to the periphery of which is or are presented a more or less tangentially-placed nozzle or nozzles communicating with the interior of the holder, the upper end of which is connected by a length of flexible tubing to the receiver of a bellows, which is by preference worked by the foot. On the side of the vane-wheel or turbine is fixed an eccentric or crank pin or pins taking into a loop or loops capable of vertical reciprocating motion in guides and carrying or forming part of the perforating-needle. Thus on causing a jet or jets of air from the nozzle or nozzles to impinge upon the vane-wheel this is put in very rapid rotary motion, and consequently imparts very rapid reciprocating motion to the needle.

I prefer to construct the vane-wheel or turbine of a disk of hard wood, ebonite, ivory, metal, or other material, on the periphery of which are cut a considerable number of fine but deep and more or less radial serrations or notches, forming narrow but deep cells, presenting a sharp edge to the nozzle, so that the air-jet in acting very effectually upon such cells is enabled to impart an exceedingly rapid rotation to the wheel.

Figures 1 to 5 of the accompanying drawings show the construction of the said apparatus which I prefer to employ. Fig. 1 shows a side view; Fig. 2, a longitudinal section through handle and casing without the cover, needle, and wheel; Fig. 3, a vertical cross-section of casing, needle, and wheel; Fig. 4, a sectional front view taken on line W W, Fig. 3, of the casing, needle and wheel; Fig. 3^a, a vertical section through the cover H, detached; Fig. 3^b, a section on line X X, Fig. 3^a; Fig. 5, a horizontal section; and Fig. 5^a, a section on Z Z, Figs. 3, 3^a, 3^b, 5, and 5^a being shown to an exaggerated scale.

A is a tubular holder or handle of any suitable material, such as wood, ebonite, ivory, metal, &c. If made of a light material, it may advantageously have a piece of metal B let into its lower end, as at Fig. 2, the inertia of which will minimize the slight vibrations produced by the wheel and which will also tend to bring the center of gravity lower. Into the upper end of the tubular passage of the holder is inserted a bent tube C for the attachment of a flexible tube, through which the air under pressure is supplied, or the flexible tube may be provided with a small cap fitting onto the end of the holder. Into the lower end of the said passage is fitted an air-delivery nozzle in the form of a tube D, projecting tangentially from a cylindrical casing E, the interior of the latter being in communication

with D through a small hole *e*, drilled almost at a tangent through the case. Into the casing E is fitted a disk or wheel F, of hard wood, ebonite, ivory, metal, or other material, having an axis G, with hard steel ends fitting small central bearings formed on the casing E and in the separate cover H, which merely fits tightly into the open side of the casing. The wheel is provided with a considerable number of small deep notches on its periphery, constituting cells placed at a slight angle to the radius, and which are more or less closed at the sides by the casing and the cover and into which the air-jet entering through the hole *e* impinges, thereby imparting to the wheel an exceedingly rapid rotation. From experiments it has been found that the greater is the number of such cells the more rapid is the speed of rotation. Thus with a wheel of about nine-sixteenths of an inch in diameter and one-sixteenths of an inch thick eighty notches on the periphery give with moderate wind-pressure about four hundred revolutions per second, and the perforations of the needle at this speed give lines which at a medium rate of writing are indistinguishable from continuously-drawn lines. On the one side of the wheel is formed a small eccentric I, which imparts a rapid up-and-down motion to the perforating-needle J. This is formed of a piece of steel wire finely pointed at the lower end, while the upper end is bent into the looped form shown at Fig. 4, in which loop the eccentric I works.

The needle is guided in its motion, first, by its lower part passing through a small hole in the bottom of the cover H, and, secondly, by the sides of the loop being made to work between guides *h*, formed on the inner face of the cover H, such guides being conveniently formed by punching and bending up two strips of the metal of the cover, as shown at Figs. 1 and 5. By preference the cover H is formed with a recessed part *p*, Figs. 3[a] and 3[b], for the needle to work in.

In order to afford the instrument an elastic action similar to that of an ordinary pen, whereby the writing is capable of being effected with thick and thin strokes, I provide a spring-nozzle K at the under side of the casing, through which the needle works and which in writing with the instrument is made to rest upon and slide over the stencil, so that by pressing the holder more or less downward against the action of the spring-nozzle the tapered needle-point will be made to penetrate to a greater or less depth through the stencil, and consequently in forming larger or smaller perforations produce thicker or thinner strokes in the copies. The nozzle is for this purpose attached to one end of a blade-spring L, the other end of which is fixed in a pin M, that turns with friction in a hole in the bracket N, so that by turning the pin slightly in one direction or the other the position of the nozzle relatively to the needle when in its lowest position, and consequently the degree of penetration through the paper, can be accurately regulated. The bracket N might be formed on the case E; but by preference I form it on the cover, as shown more clearly at Fig. 5[a]. The arrangement of the spring for the nozzle may be variously modified. Thus it might be of the form shown at Fig. 6, or it might consist of a ring L, situated inside the cover, as shown in sectional front view on line *y y* and cross-section at Figs. 7 and 7[a], and connected to the nozzle by a bar passing through a slot in the cover, while at top it rests upon two small supports O O, projecting from the cover, and is acted upon by a screw P, screwing through the top of the cover, so that by screwing this more or less inward it will flatten the ring and thereby raise the nozzle more or less.

It will be seen that by providing the guides for the needle and the attachment for the spring-nozzle all on the cover H the casing, with the holder, can be turned into any position relatively to these parts for varying the angular position of the holder relatively to the vertical position of the needle.

The nozzle is by preference formed with open sides or partly cut away, as shown in front and side views at Figs. 8 and 9, or open on one side only, as at Fig. 10, in order to prevent the interior thereof becoming clogged with wax or varnish from the stencil.

The nozzle might be dispensed with and the blade-spring L be formed so as to rest with its end upon the stencil immediately behind the needle, or it may have a bossed hole, as indicated at Fig. 20, through which the needle slides freely.

The air-jet entering the casing through the hole *e* after passing round with the wheel escapes through openings *e' e'* in the casing.

Although I prefer to construct the instrument in the manner above described, yet its construction is capable of being variously modified while still retaining thorough efficiency. Thus instead of inclosing the wheel F in a casing it may be carried in an open frame, as shown in front view and cross-section at Figs. 11 and 12. In this case the frame Q passes partly round the wheel F, the axis of which is carried in recesses formed in the two screws R, the frame being secured by a bar S to the holder A. The air-delivery nozzle or tube D of the latter is in this case formed with a small hole, through which the air-jet impinges upon the cells of the wheel F. These cells may in this case be closed at the sides, so as to form small buckets, into which the air-jet enters. The eccentric I works in the loop of a needle J of the form shown at Fig. 15, the upper end being guided in a hole in the frame Q, while the lower end is guided in the nozzle K, which is here shown adjustably screwed into the frame without spring action,

but which might also be carried in a spring-support, as in the preceding case.

Figs. 13 and 14 show front and side elevations of another modification, in which the frame Q only passes round the under side of the wheel, the connecting-bar S being carried to one or both sides.

In the arrangement at Fig. 16 the wheel F is carried loose on a pin W, projecting from the side of the frame Q. In this case the eccentric I can be replaced by a crank-pin, as at T, Fig. 17, the end of which takes into a small socket U, which is fixed adjustably on the straight needle J by a set-screw V.

In all the above-described constructions the cells or buckets of the wheel or turbine F might be formed obliquely and closed at one end and also, if necessary, at the periphery, as shown at Fig. 18, the air-delivery nozzle D being in that case arranged in a correspond-angular position at the side thereof.

Instead of making the entire holder A tubular for the passage of the air-current, only the lower part may be made tubular, with a branch tube at an intermediate point of its length for the attachment of the flexible supply-pipe, or the holder may be entirely solid and the air-supply tube be attached to the side of its lower end.

The instrument may be employed for describing circular arcs, in which case either the holder A may constitute one leg of compasses or part thereof, or a short compass-leg may be pivoted to the lower end of a holder in a similar manner to that now frequently employed with lead-pencils, or, again, the case may be formed with a spring socket or sleeve for fitting onto the leg of ordinary compasses, or the air-tube D or a separate short stem may be secured in the pencil-socket of compasses, as at Fig. 19.

I am aware that it has already been proposed to actuate needles for perforating stencils by means of vane-wheels or turbines rotated by a jet of air, the said turbines being arranged at the upper end of a tubular stem forming the holder, down which the needle passes, and I do not claim such an arrangement of parts. These arrangements are more or less inoperative, first, because of the comparatively great length of the needle, which has to extend through the whole length of the holder, whereby it requires to be of such a strength and weight as to prevent the possibility of imparting thereto the great speed required for producing writing, &c., consisting of continuous lines and not dots; secondly, the use of ordinary vane-wheels with comparatively few vanes or buckets—such as have heretofore been proposed—also prevent the attainment of any high speed; thirdly, the necessity for holding the stem in the vertical position which is required for the needle to act properly prevents the writer from writing rapidly in his ordinary hand-writing, and, lastly, the absence of the spring-support resting upon the stencil—such as is used in the present invention—prevents the formation of thick and thin or graduated strokes, as in ordinary writing and drawing.

Having thus described the nature of this invention and in what manner the same is to be performed, I claim—

1. An apparatus for producing perforated stencils, consisting of a tubular holder A, having an air-duct and provided at its lower end with an air-delivery nozzle, a wheel-supporting frame or casing attached to the lower end of the tubular holder, a needle supported by and reciprocating on the wheel-supporting frame or casing, and a notched wheel journaled on the supporting frame or casing and arranged in juxtaposition to the air-delivery nozzle at the lower end of the tubular holder, so that the currents of air forced through the tubular holder and through the air-delivery nozzle at the lower end thereof impinge on the notches of the wheel, and a connection between the wheel and the needle for reciprocating the latter, substantially as described.

2. In apparatus for producing perforated stencils, the combination of a revolving disk or wheel having a large number of small notches or recesses on its periphery, a frame or casing carrying said wheel, a tubular holder, to the lower end of which said frame or casing is attached and which constitutes a duct for an air-jet made to impinge on the notches of the wheel, an eccentric or crank-pin attached to the said wheel, a perforating-needle arranged in guides wholly outside of the tubular holder and having a loop embracing the said eccentric or crank-pin, so as to be vertically reciprocated thereby, and a spring-support attached to the casing or holder, having a guide through which the needle reciprocates and adapted to rest upon the stencil to enable thick and thin lines to be produced by the needle, substantially as described.

3. In an apparatus for producing perforated stencils, the combination of a tubular holder having an air-duct and provided at its lower end with an air-delivery nozzle, a wheel-supporting frame or casing connected with the lower end of the tubular holder, a needle supported by and reciprocating on the wheel-supporting frame or casing, a notched wheel journaled on the frame or casing and arranged in juxtaposition to the air-delivery nozzle at the lower end of the tubular holder, and a spring connected with the wheel-supporting frame or casing and provided at its free extremity with a guide, through which the needle reciprocates, substantially as described.

4. In apparatus for producing perforated stencils, the combination of a tubular holder A, casing E H, air-tube D, notched wheel F, eccentric I, needle J, and a spring L, having a nozzle K, through which the needle reciprocates, all arranged and operating substan-

tially as described with reference to Figs. 1 to 10 of the drawings.

5. In an apparatus for producing perforated stencils, a reciprocating needle, the upper part of which is bent to form a rectangular loop, in which works the eccentric or crank pin that imparts motion thereto, the vertical portions of such loop being arranged to move between guides on the casing of the apparatus, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 1st day of August, A. D. 1891.

HERBERT FOX STANDING.

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