(No Model.) 2 Sheets—Sheet 1.

H. S. & L. CROOKE.

Art of Making Ornamental Metallic Foil.

No. 229,677. Patented July 6, 1880.

Fig. 1.

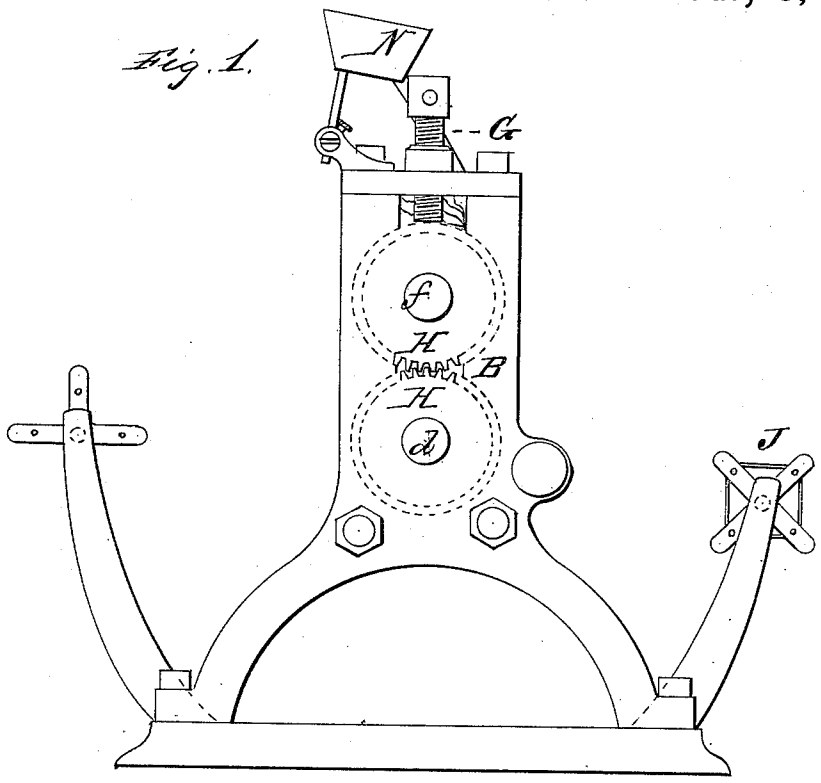
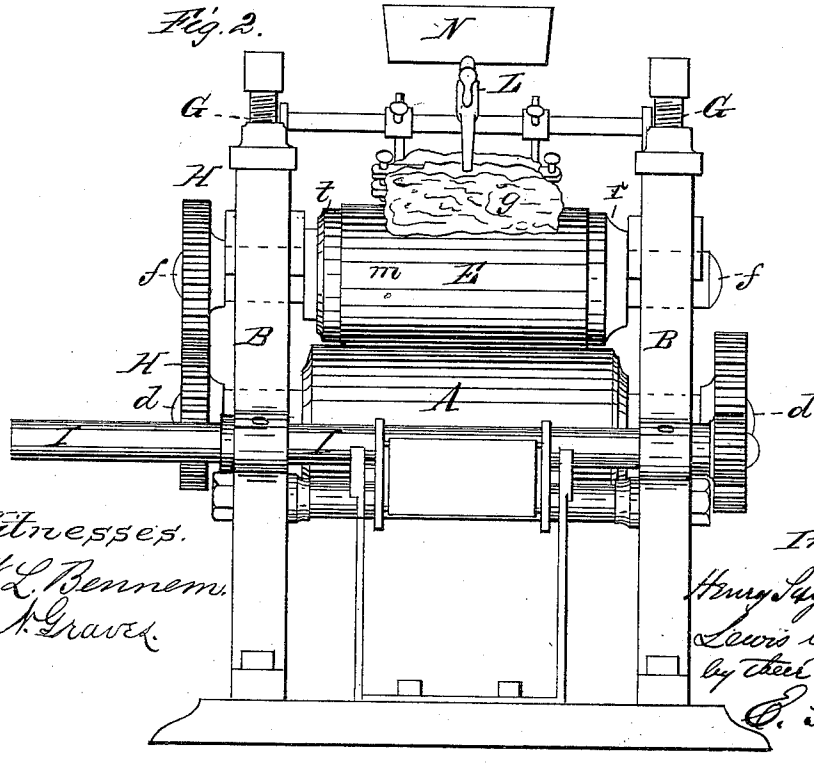


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

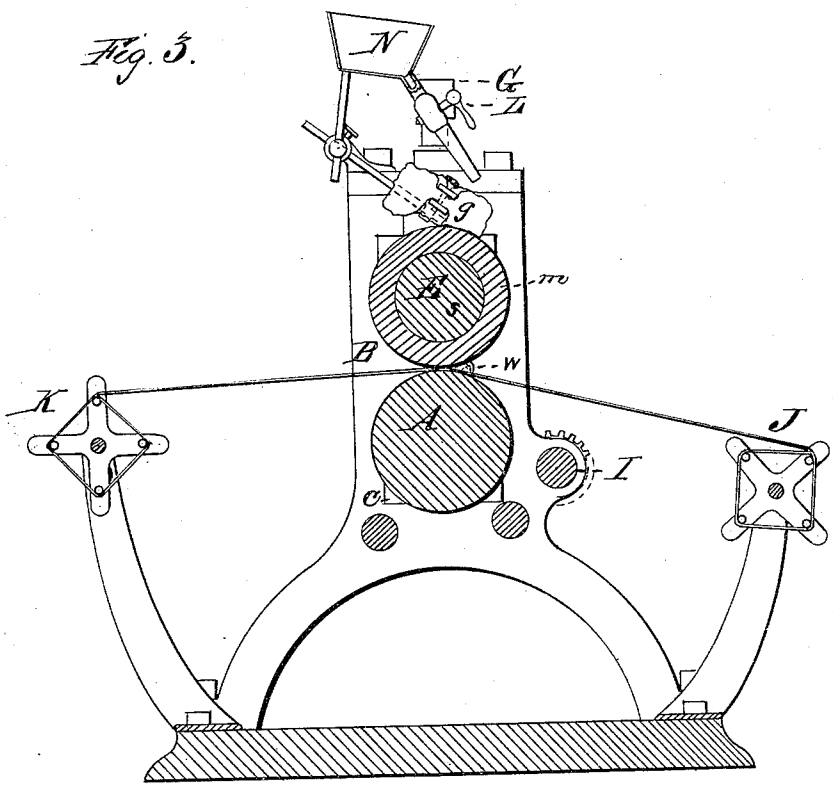
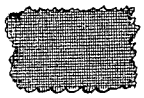


Fig 4.



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UNITED STATES PATENT OFFICE.

HENRY S. CROOKE AND LEWIS CROOKE, OF NEW YORK, N. Y.

ART OF MAKING ORNAMENTAL METALLIC FOIL.

SPECIFICATION forming part of Letters Patent No. 229,677, dated July 6, 1880.

Application filed April 5, 1880. (No model.)

To all whom it may concern:

Be it known that we, HENRY SUYDAM CROOKE and LEWIS CROOKE, both of the city, county, and State of New York, have made an invention of certain new and useful Improvements in the Art of Manufacturing Ornamental Metallic Foil, and in the means employed therein; and I do hereby declare that the following, taken in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

The invention has reference to the manufacture of ornamental metallic foil which has an embossed surface that appears dead to the eye. Previous to this invention we manufactured such foil by the following operations, viz: first, rolling the foil; second, deadening or matting the surface by subjecting the burnished rolled foil to the action of frosting-rollers; and, third, embossing the matted or dead-surfaced foil by subjecting it to the action of embossing-rollers. We also printed the matted or dead surface of the foil between the two operations of deadening it and embossing it. According to the said process of manufacture, at least two distinct operations were required to be performed upon the foil subsequent to rolling it—viz., the deadening of the surface and the subsequent embossing of the dead or mat surfaced foil. We have, however, discovered that practically the same effect to the eye can be produced at a single operation, which can be performed in the same time as either one of the said two operations; and this invention constitutes the main subject-matter of this specification.

The invention is divided into two principal parts, viz: first, the improvement in the art of producing ornamental metallic foil (whether with or without printing) by embossing the foil in a wet state or with the aid of a liquid; second, a certain improvement in the machinery for practicing said art, consisting of a certain combination of mechanical devices, which is set forth in the claims at the close of this specification.

In order that our invention may be fully understood, we have represented in the accompanying drawings, and will proceed to describe, the best apparatus which we have thus far devised for carrying out our invention.

Figure 1 of said drawings represents a side view of our said apparatus. Fig. 2 represents a front view of the same. Fig. 3 represents a section of the apparatus. Fig. 4 represents the appearance of a fraction of the surface of the embossing-roller.

The apparatus represented in the said drawings consists, mainly, of rollers for operating upon the foil; of a reel from which the foil is unrolled to be passed to the embossing-roller; of a second reel, upon which the foil is rolled after it is embossed, and of the means for supplying the liquid which is used in connection with the action of the embossing-roller.

The embossing-roller A is a steel roller, which is first turned true, and then has its surface grained by means of a hard steel roller, the form of graining which we prefer being that produced by small grooves which divide the surface into protuberances resembling in appearance that represented at Fig. 4, and amounting to about six thousand four hundred to the square inch of surfaces. This embossing-roller is supported in suitable stands, B B, having suitable boxes, *c*, for its shaft or journals *d*. Immediately above this embossing-roller is a counter-roller, E, which, in this example of our machine, has a paper surface, *m*. This counter-roller has its shaft *f* sustained in boxes, which can be pressed toward the embossing-roller by means of powerful screws G.

The shafts of the two rollers A E are connected by cog-wheels H H, so that their surfaces move with the same speed, and the shaft of the embossing-roller is connected with a driving-shaft, I, by means of a cog-wheel and pinion. The driving-shaft is fitted, in practice, with fast and loose pulleys for the driving-belt.

At the side of the embossing-roller we prefer to place a reel, J, from which the foil to be ornamented is unwound; and at the opposite side of the said roller we prefer to place a second reel, K, upon which the ornamented foil is wound up.

In carrying out our process the liquid may be supplied in various ways—as, for example, by applying it to the foil or to the counter-roller by hand, a sponge, swab, or a cloth being used for the purpose. When water is

the liquid employed it may also be applied by permitting a jet of steam to issue closely to the surface of the foil, to condense upon it and to wet the surface which comes in contact with the counter-roller; but however the liquid be applied, care should be taken that the surface of the foil which is in contact with the steel roller and the surface of that roller are not wet.

We prefer, however, to apply the liquid by the means represented in the accompanying drawings—that is to say, we combine the rollers with a sponge, *g*, (or some equivalent therefor,) secured to the apparatus so as to wet the counter-roller E; and we supply the liquid by means of a pipe fitted with a stop-cock, L, so that the quantity of liquid can be regulated. If water be the liquid employed, it may be drawn from the customary water-pipes of the building, or it may be drawn from a tank either connected with the apparatus (as at N) or situated at some higher level in the building; and such a tank is convenient when some other liquid than water is used.

We prefer to construct the surface of the counter-roll of paper or other fibrous material, such as cotton or linen cloth, which, when wet, will be sufficiently plastic to permit the protuberances of the embossing-roller to indent themselves in it.

The mode in which we have made such counter-rollers with success is as follows: The roller is formed with a strong metal core, *s*, having one collar, *t*, solid with the core, and a second collar, *r*, that can be secured to the core. A quantity of paper rings whose holes fit the core, and whose peripheries are a little larger than the diameter of barrel required, are stamped out of paper and are applied to the core. Hydraulic pressure is then applied to compress these paper rings lengthwise of the shaft, and the pressure is left on a sufficient number of hours (say twelve) to practically destroy the tendency to expand when the pressure is removed. An additional quantity of paper rings is then applied to the core of the roll, and they are compressed as before. The operation is repeated until the core is covered to the requisite extent, whereupon the movable steel collar *r* is secured to the core to hold the paper from escaping, and the paper barrel is turned off truly in a lathe.

The mode in which we practice our improvement in the art with the above-described apparatus is as follows: The paper-surfaced roller is wetted with water, so as to dampen its surface sufficiently to permit it to be indented by the protuberances of the embossing-roller, and during this wetting we find it expedient to place a piece of tin-foil between the rollers to protect the surface of the embossing-roller from being wetted.

When the counter-roller is sufficiently damp, as above stated, the end of the web of foil on the reel J is introduced between the rollers, and they are set in motion. The foil as it leaves the rollers is conducted upon the receiving-reel K, and is wound thereon.

During the rolling, water is supplied to the sponge *g* by the cock L; and we find it expedient to supply sufficient water to keep a roll or puddle of it lying on the surface of foil close to the counter-roller, as represented in the drawings at *w*, Fig. 3.

When a reel of foil is about being exhausted a web of foil from a full reel is introduced between the rolls before the last end of the web of the first reel passes between them, so as to make the embossing continuous.

In case the work is interrupted, as it is at night, we find it expedient to cover the barrel of the counter-roll closely with tin-foil, so as to prevent it from drying, and thus to keep it in working condition.

The foil treated as above described by the embossing-roller with the aid of a liquid has its surface changed so that it has a different effect upon light from that produced by foil whose surface has been embossed without the aid of a liquid, and the former appears to be matted or dead-surfaced.

If the foil is to be printed, it is printed before being embossed with colors which are not soluble in the liquid employed during the embossing operation—as, for example, with oil-colors when water is the liquid used during embossing.

By printing the foil before embossing it the color is found in the indentations of the embossed foil as well as in its protuberances.

If inscriptions or symbols are to be applied to the foil, they may be applied by rolling or stamping the foil after it has been embossed, suitable dies or type being used for the purpose.

The kinds of foil which we have treated with success are foil of commercially pure tin and of its alloys with lead, preferably those having a lead core with a tin surface.

We have described and represented the embossing-roller and the counter-roller as geared together by means of the cog-wheels H H, and this gearing together of the two rolls is expedient, provided the proportion between the diameters of the two rollers is the same as the proportion between the diameters of the pitch-circles of the connecting cog-wheels. The counter-roll E, however, when made of paper, wears away by use, and as soon as it becomes worn enough to produce slipping relatively to the surface of the embossing-roller A one or both cog-wheels must be removed, leaving the counter-roll to be driven by the revolution of the embossing-roll, by frictional contact with the foil passing between the two.

If deemed best, the connecting cog-wheels may be omitted even when the surfaces of the rollers, if connected, would revolve with the same superficial speed.

We claim as our invention—

1. The improvement in the art of manufacturing ornamental metallic foil consisting,

substantially as before set forth, of the embossing of the foil with the aid, in the manner substantially as described, of a liquid.

2. The improvement in the art of manufacturing printed metallic foil consisting, substantially as before set forth, of the printing of the foil and the subsequent embossing of it with the aid, in the manner substantially as described, of a liquid.

3. The combination, substantially as before set forth, of the embossing-roller, the counter-roller, and the means of supplying liquid to the said counter-roller.

In witness whereof we have hereto set our hands this 1st day of April, A. D. 1880.

HENRY SUYDAM CROOKE.
LEWIS CROOKE.

Witnesses:
H. P. WEST,
A. I. DALTON.