(No Model.) 2 Sheets—Sheet 1.

D. O. GILLESPIE.

METHOD OF AND APPARATUS FOR TAPERING THE ENDS OF PAPER TUBES.

No. 269,662. Patented Dec. 26, 1882.

Fig. 1.

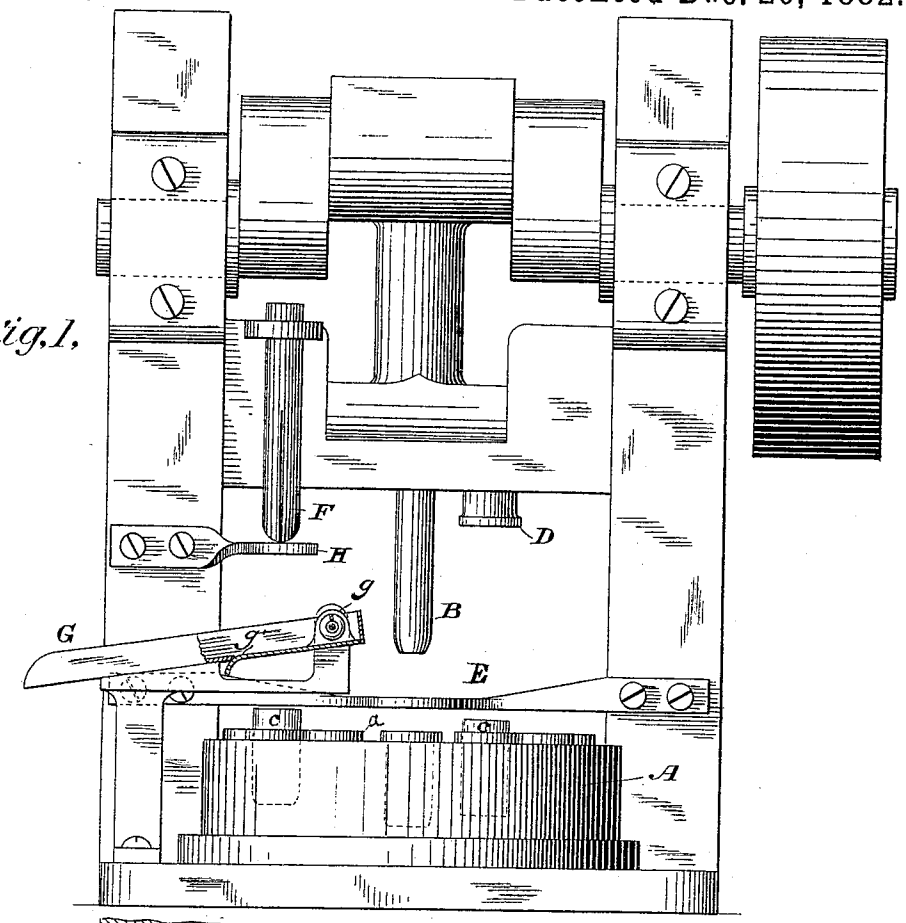
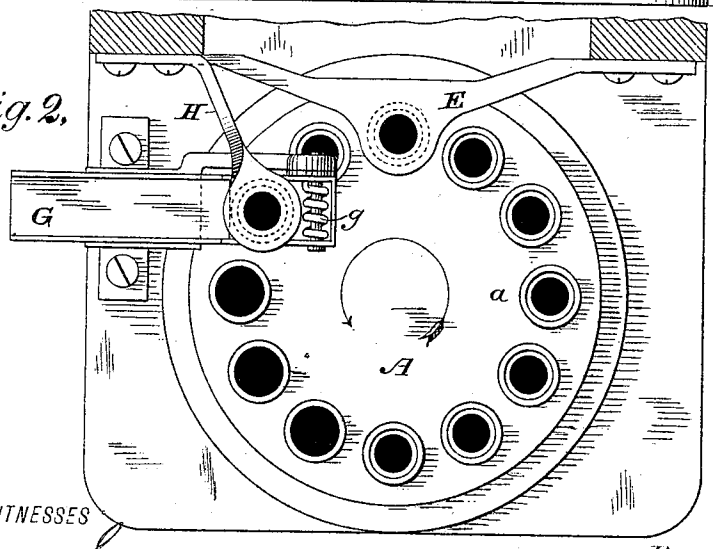


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

D. O. GILLESPIE.

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Fig. 4.

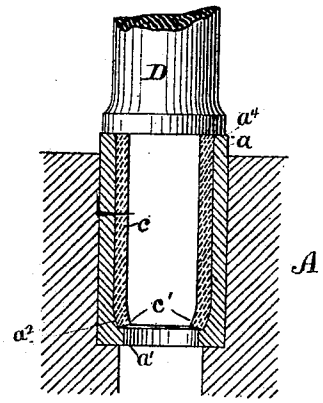


Fig. 5.

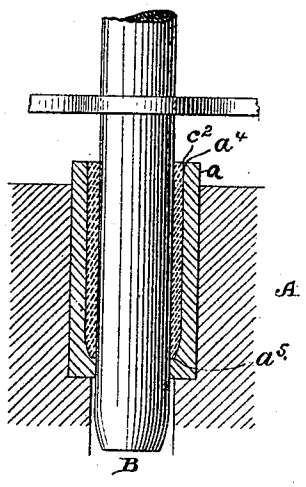


Fig. 6.

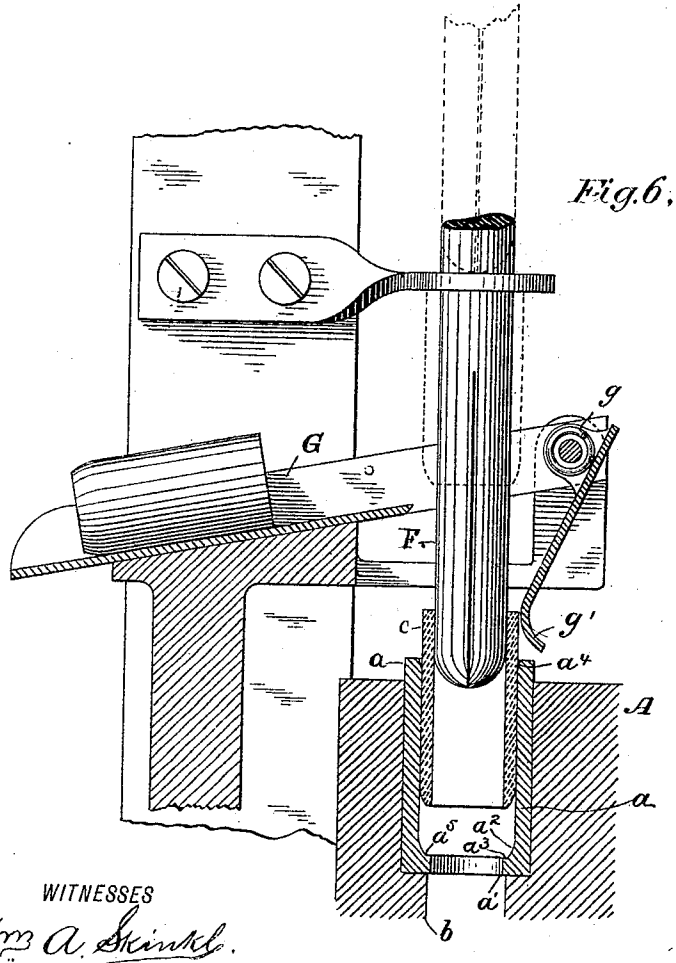


Fig. 3.

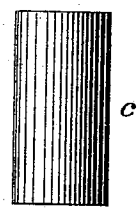
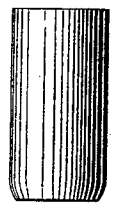


Fig. 7.



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UNITED STATES PATENT OFFICE.

DAVID O. GILLESPIE, OF WILMINGTON, DELAWARE, ASSIGNOR TO JOHN M. C. RODNEY, OF SAME PLACE.

METHOD OF AND APPARATUS FOR TAPERING THE ENDS OF PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 269,662, dated December 26, 1882.

Application filed February 28, 1882. (No model.)

To all whom it may concern:

Be it known that I, DAVID O. GILLESPIE, of Wilmington, in the county of New Castle and State of Delaware, have invented an Improved Method of and Apparatus for Tapering the Ends of Paper Tubes, of which the following is a specification.

The object of my invention is to produce paper tubes with a cylindrical bore and a tapered end without the cutting, shearing, or removal of any of the material. The tubes produced may be formed under any desired pressure to produce various degrees of compactness and hardness, and are applicable to various purposes in the arts—such as ferrules, packing for condensers, &c. The tapering end of the tube permits of its being inserted into any cavity with facility, and the tubes may be readily applied for packing purposes where it would be difficult if not impossible to use a tube with a square end and obtain the same closeness of fit.

My improved method of operation and organization of apparatus are fully illustrated in the accompanying drawings, and will be specifically claimed hereinafter.

Figure 1 is a front elevation of a dial-press with one of the details in section. Fig. 2 is a plan view of the same with the standards or uprights broken away. Fig. 3 shows a section of tubing the end of which is to be tapered. Fig. 4 is a detail sectional view, showing the cylindrical paper tube or blank driven down into the forming-die. Fig. 5 is a similar view, showing the punch or former as having been forced through the tube and die. Fig. 6 is a detail sectional view of the apparatus for removing the tapered tubes from the die, and Fig. 7 shows the completely-formed tapered tube.

The dial-press shown is in general construction and operation common and well known, having a vertically-reciprocating ram or head and an intermittently-rotating dial, which brings the dies under the ram. Power may be applied to the press and the dial rotated in any suitable and usual way.

Dies *a* are seated in sockets in the rotating dial A. These dies are formed with apertures or openings *a'* at the bottom of the exact size of the reciprocating punch or former B, which passes through it, as will be hereinafter described. The dial of the press is open, as shown at *b*, below each die, in order to permit of the downward passage of the punch. Each die *a* is formed with interior vertical sides or walls, which at the bottom of the die are curved or tapered, as seen at a^2. This taper is not extended to the central opening, *a'*, in the die, but leaves the horizontal shoulder or bottom a^3, against which the square edge of the tapered end of the tube is formed. The interior of the die is of the exact size and shape to be given to the exterior of the paper tube, except at its mouth, where it is slightly flared, as shown at a^4, to facilitate the insertion of the tubes, while the interior of the tube will be formed cylindrically by the punch B, as will hereinafter be described.

The paper tubes, which may be produced in any suitable manner, are made as nearly as possible of the required interior and exterior diameters, and are cut into suitable lengths with square ends, as shown in Fig. 3. The blanks or tube-sections *c* are inserted in the dies by the attendant as the dial is intermittently rotated. When the first die containing a paper tube comes under the plunger D the dial pauses and the plunger descends, driving the tube down into the die, as shown in Fig. 4. It will be observed from this figure that the lower end of the paper tube has been compelled to conform to the curved or tapered portion of the die, and that the interior wall of the paper tube has consequently been somewhat distorted, as shown at *c'*. When the plunger has been raised the dial is again moved round, so as to bring the second die containing a paper tube under the plunger, when the operation just described is repeated. At the moment the second die containing a tube pauses under the plunger the first die, into which the tube has been previously driven by the plunger, comes directly under the punch B, and as the ram of the press descends the punch is driven completely through the die, as represented in Fig. 5, forcing the surplusage or distorted portion *c'* of the lower end of the paper tube compactly and completely into the lower angle, a^5, of the die, and

compelling the exterior of the paper tube to assume the exact shape of the die, except at the flaring mouth a^1, where the pressure is not sufficient to swell or distort the exterior edge, c^2, of the tube. The punch now rises and other dies are brought under the header and punch. The punch is formed with a tapering end to facilitate its entrance into the tubes.

The operation is continuous, and any number of tubes may be operated upon. As the punch rises the paper tube *c* will most likely adhere to it and be drawn out of the die. In order to prevent its discharge from the die at this point, a stripper, E, is provided. This stripper is secured upon the uprights or standards of the press, and the punch works through an aperture in it. The aperture is not sufficiently large, however, to permit the tubes to pass through it, and as the plunger rises the tubes carried up with it are stripped from it and fall back into the dies.

The tubes are extracted or discharged from the dies in the following manner: An extractor, consisting of a plunger, F, split so as to be elastic, and having a round or tapered end, is carried by a bracket on the ram of the press, and is arranged in such relation to the dies that as the dial pauses for the paper tubes to be operated upon by the plunger and punch the die containing the finished tube will be brought immediately beneath the extractor F, which descends with the ram, enters the tube, and withdraws it from the die.

The discharge-trough G is provided with a hinged bottom directly in the path of the descending extractor. This bottom is normally held closed by a spiral spring, *g*, as will be well understood, and is curved or bent at g', as clearly seen in Figs. 1 and 6. The extractor also passes through a stripper, H, secured upon the frame. As the extractor descends it forces aside the hinged bottom of the trough, as clearly seen in Fig. 6, and enters the tube. As the extractor rises with the tube the hinged bottom closes up after it, the tube is stripped from the extractor by the stripper H, and, falling upon the trough, is discharged from it, as seen in Fig. 6. The curved edge g' of the hinged bottom of the trough prevents its edge from engaging with the tube and stripping it from the extractor.

By the method of operation and apparatus above described I am enabled to produce with great rapidity, facility, and accuracy paper tubes with cylindrical bores and tapered ends. As before remarked, such tubes may be made of any required degree of compactness or hardness, and may be used for various purposes in the arts.

Variations of detail of the apparatus herein described will doubtless suggest themselves to those skilled in this class of machinery without departing from the spirit of my invention.

My improved method, which has been described, contemplates the forcing of a blank or section of paper tubing into a die, to the interior of which it is to be conformed by the operation of a punch or former which passes through the tube, forming the bore of the tube cylindrically and conforming its exterior to the die.

What I claim as my invention is—

1. The herein-described improvement in the method of tapering or forming the ends of open-ended paper tubes, which consists in forcing the tube into a die open at both ends, to which the exterior of the tube is to be made to conform, and then forcing a punch or former through the tube and die, whereby the bore of the tube is shaped by the punch and its exterior compelled to conform to the die.

2. The combination, substantially as set forth, of a die open at both ends, in which a tube is to be tapered, a plunger for forcing or setting the tube down in the die, and a punch or former which passes through the tube and die, for the purpose set forth.

3. The combination, substantially as set forth, of an intermittently-rotating dial, a series of dies, in which the tubes are to be tapered, carried in the dial, the vertically-reciprocating ram of the press, a plunger carried by the ram, which forces or sets the tubes to be operated upon down in the die, and a plunger, also carried by the ram, which passes through the tube and die, for the purpose set forth.

4. The combination, substantially as set forth, of a rotating dial, a series of dies carried thereby, a punch for setting or forcing the tubes to be operated upon down in the dies, a plunger or former which passes through the tubes and dies, which punch shapes the bores of the tubes and compels their exteriors to conform to the die, a stripper through which the punch works, and which strips the tubes from the punch as it rises, and an extractor which enters the tubes and withdraws them from the dies.

5. The combination, substantially as set forth, of a die, a reciprocating extractor, the discharge-trough, its hinged bottom, and the stripper for the extractor.

6. The combination, substantially as set forth, of a reciprocating extractor, a discharge-trough having a hinged bottom in the path of the extractor, and a spring which normally holds the bottom closed.

7. The combination, substantially as set forth, of an intermittently-rotating dial, a series of dies carried thereby, in which tubes are to be operated upon, the vertically-reciprocating ram of the press, a plunger carried thereby for setting or forcing the tubes to be operated upon down into the dies, a punch, also carried by the ram, which passes through the tubes and dies to shape the interior of the tubes, an extractor, also carried by the ram, and a stripper for the extractor.

8. The combination, substantially as set forth, of the open-bottomed die having verti-

cal walls which are curved or tapered at the bottom, as described, and a punch which passes through the die.

9. The combination, substantially as set forth, of the die formed with a slightly-flaring mouth and having vertical walls which are curved or tapered at its bottom, as described, and a punch which passes through the die.

In testimony whereof I have hereunto subscribed my name this 24th day of February, 1882.

DAVID O. GILLESPIE.

Witnesses:
JOHN C. COLE,
E. W. GOSEWISCH.