No. 644,025. Patented Feb. 20, 1900.

J. H. & E. L. WHITE.

APPARATUS FOR MAKING PAPER TUBES.

(Application filed May 5, 1899. Renewed Jan. 15, 1900.)

(No Model.)

6 Sheets—Sheet 1.

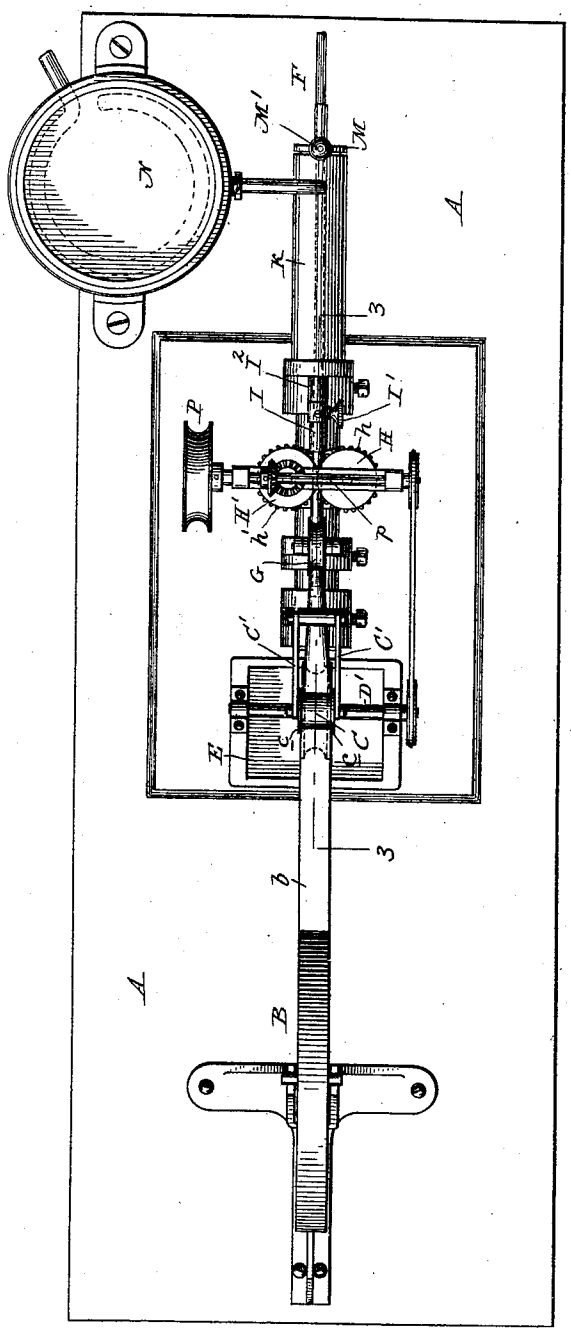

Fig. 1.

Witnesses;
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Walter Rowe Tabbs.

Inventors
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 6 Sheets—Sheet 2.

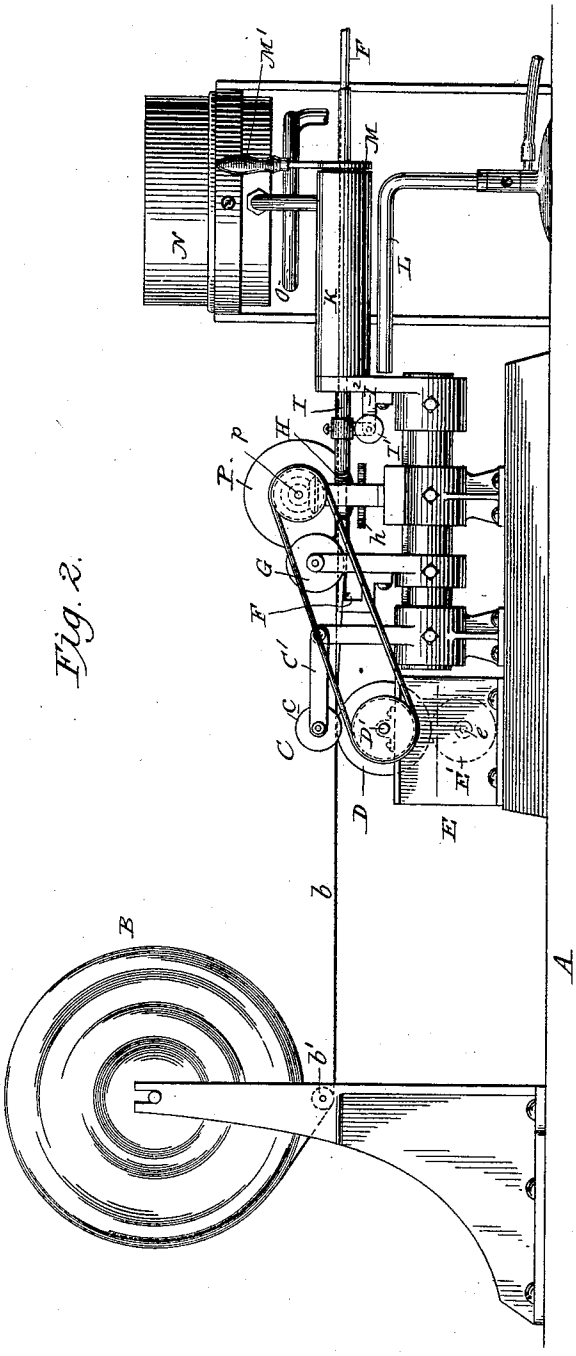

Fig. 2.

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(No Model.) 6 Sheets—Sheet 3.

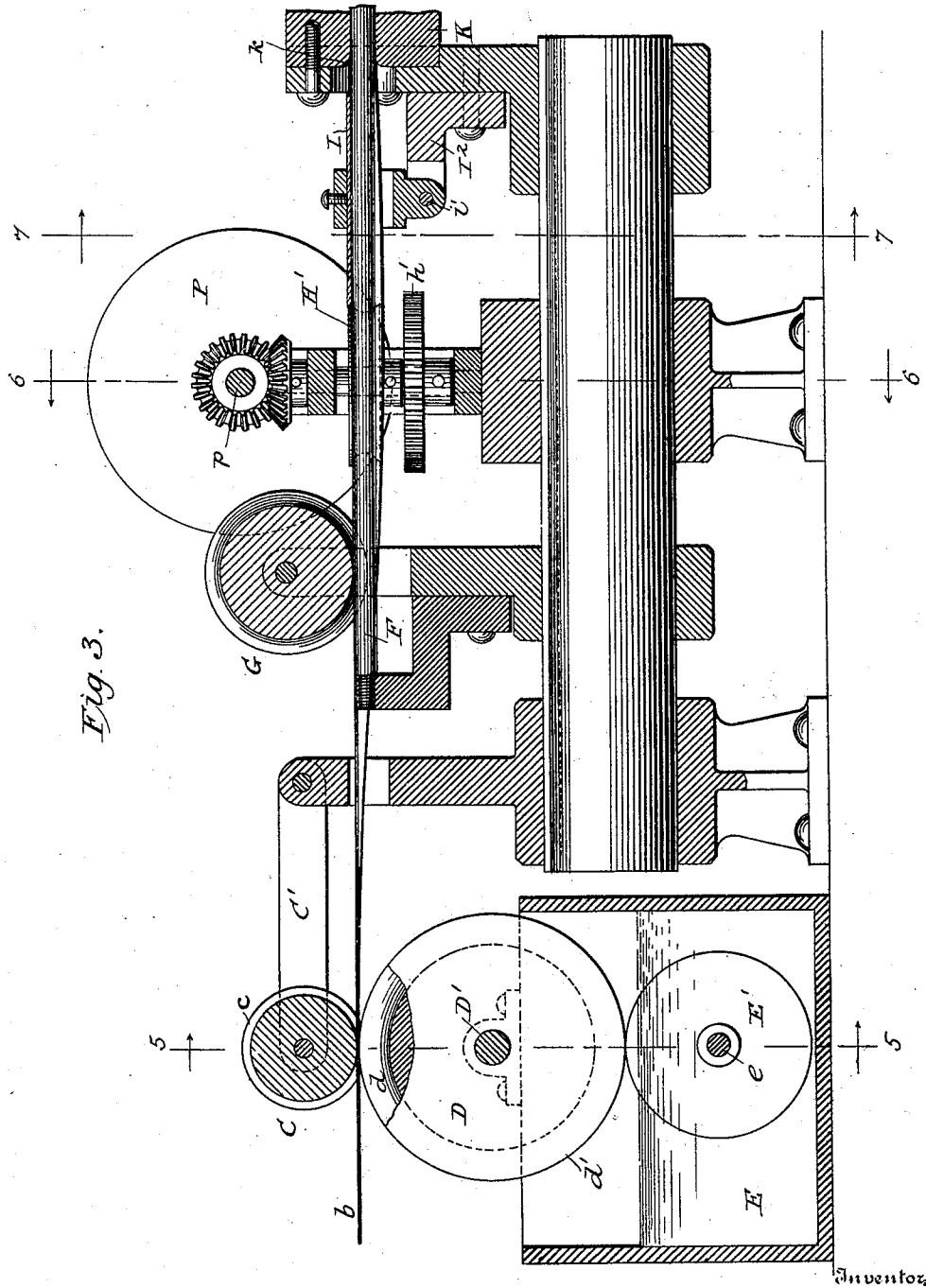

Fig. 3.

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(No Model.) 6 Sheets—Sheet 4.

Fig. 5.

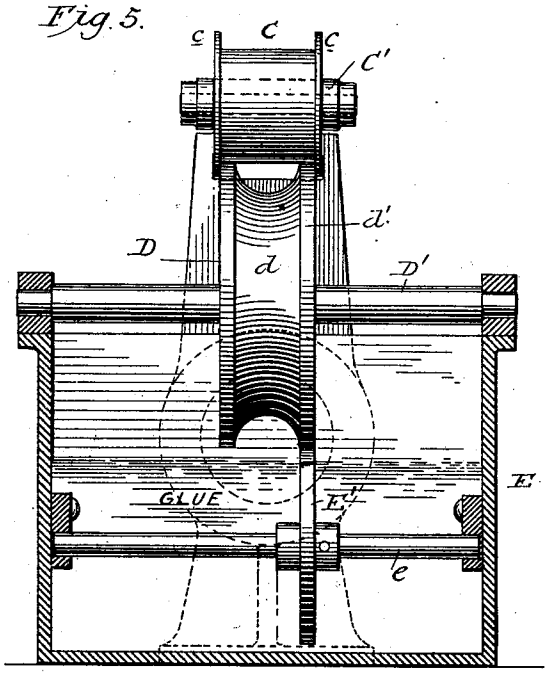


Fig. 4.

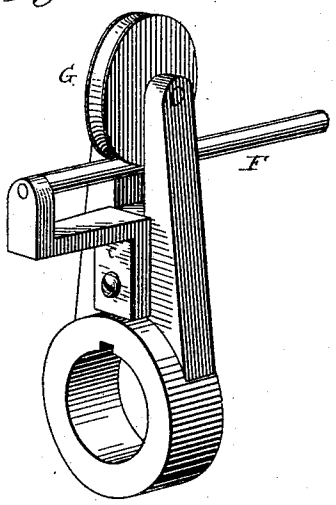
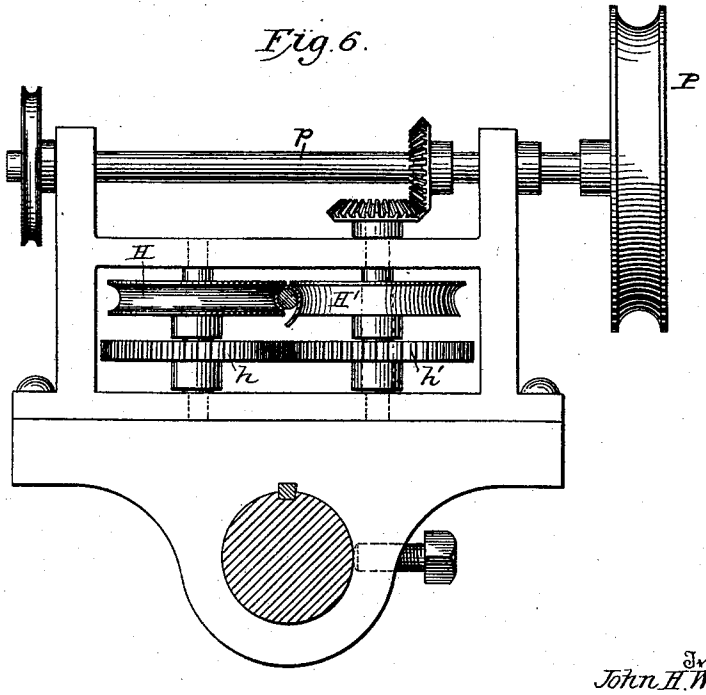


Fig. 6.



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(No Model.) 6 Sheets—Sheet 5.

Fig. 7.

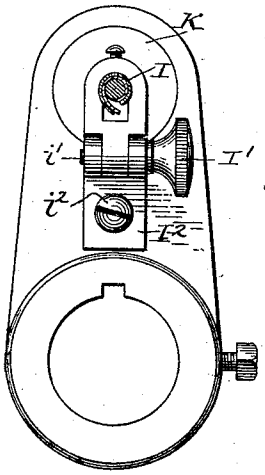


Fig. 9

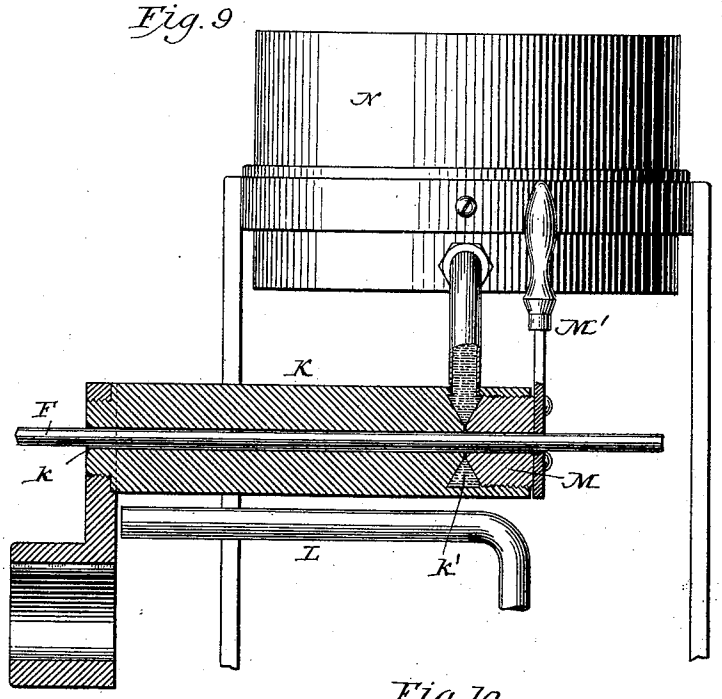


Fig. 8

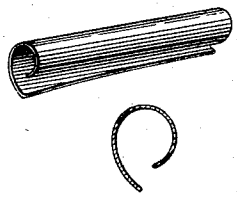
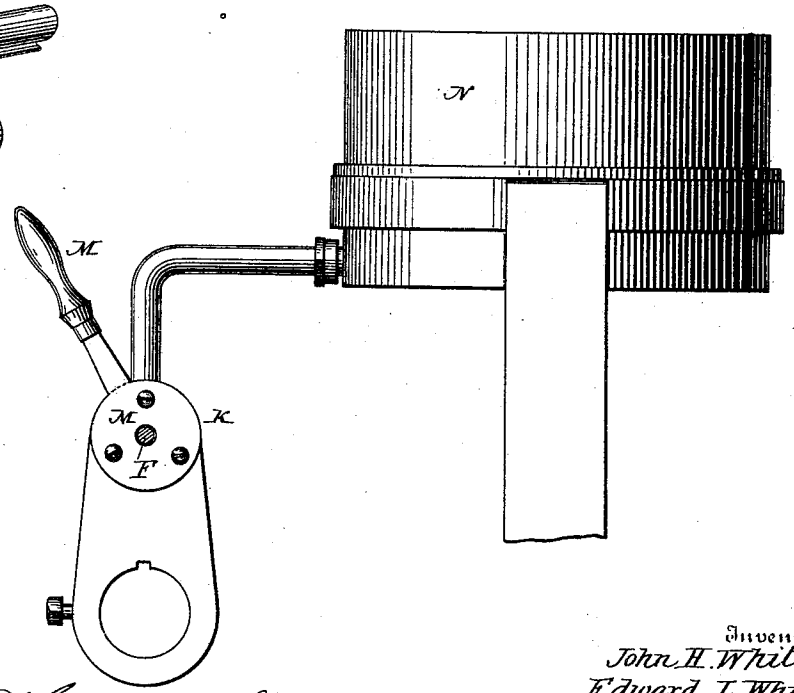


Fig. 10.



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No. 644,025. Patented Feb. 20, 1900.

J. H. & E. L. WHITE.

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(Application filed May 5, 1899. Renewed Jan. 15, 1900.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 11.

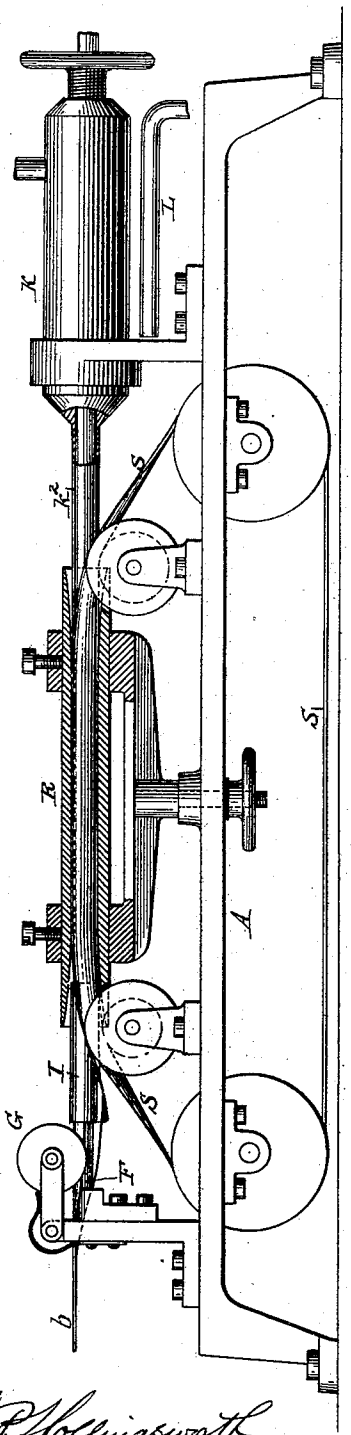
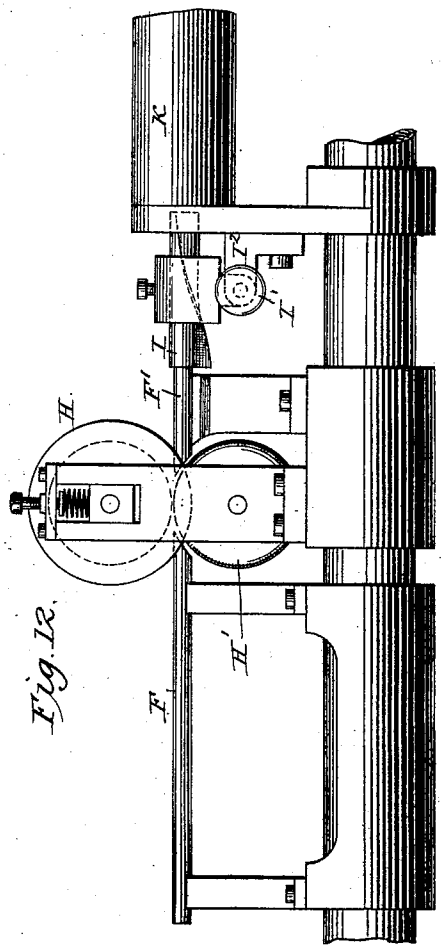


Fig. 12.



Witnesses:
Sidney P. Hollingsworth.
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Inventors;
John H. White,
Edward L. White;
by Baldwin Howard & Wright
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN H. WHITE AND EDWARD L. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA.

APPARATUS FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 644,025, dated February 20, 1900.

Application filed May 5, 1899. Renewed January 15, 1900. Serial No. 1,542. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. WHITE and EDWARD L. WHITE, citizens of the United States, residing at Washington city, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Making Paper Tubes, of which the following is a specification.

Our invention relates to the manufacture of paper tubes of various forms and sizes and adapted to various uses in a new way and by improved apparatus.

The objects of our invention are to manufacture a paper tube with its edge cemented and which may also have its body strengthened by waterproofing, combustible, or other material, such as paraffin and other substances.

To these ends our invention consists in certain novel constructions, combinations, and organizations of instrumentalities hereinafter described, and specifically designated in the claims at the end of this specification.

In order to carry out our invention in the best way now known to us, we pass a paper strip or ribbon of proper width and thickness through our improved apparatus which applies a film of glue or other adhesive material to the inner edge of one side of the strip. Suitable guides then curve this strip over, so that one edge overlaps the other as it traverses a mandrel, and then presses the pasted edge down upon the unpasted edge, thus completing the formation of the tube, which then passes through an "ironer" or heater, which dries the glue and completes the tube. The tube may also be rendered combustible or waterproof by saturating or coating it with suitable material as it passes through the ironer or heater, or it may be treated with material merely for the purpose of stiffening or strengthening it. We have shown, described, and claimed this ironer or heater in connection with other portions of the mechanisms connected therewith in application for Letters Patent of the United States, Serial No. 714,892, filed by us April 28, 1899, and of course do not claim herein anything claimed in that application.

The accompanying drawings show so much of our improved apparatus as is necessary to illustrate the subject-matter herein claimed. Unless otherwise specified the different parts of the apparatus, broadly considered, are of usual well-known construction. The feed end is herein called the "front" end of the machine and the discharge end the "rear."

Figure 1 represents a plan or top view of the apparatus; Fig. 2, a side elevation thereof; Fig. 3, a vertical longitudinal central section through a portion of the apparatus on the line 3 3 of Fig. 1; Fig. 4, a detail view in perspective of the mandrel and one of the guide-wheels which partially folds the paper strip; Fig. 5, a vertical cross-section through the gumming apparatus on the line 5 5 of Fig. 3; Fig. 6, a similar cross-section on the line 6 6 of Fig. 3, showing folding guide or feed wheels; Fig. 7, a similar section on the line 7 7 of Fig. 3, showing a more advanced stage of the formation of the tube. Fig. 8 shows detail views of the wrapping-guide, consisting of a perspective and cross-section thereof; Fig. 9, a vertical longitudinal section through what we call the "ironer;" and Fig. 10 a rear end view of the rear or discharge end of the machine looking toward the front or feed end thereof. Fig. 11 shows a side elevation, partly in vertical central longitudinal section, of a modified form of the apparatus; and Fig. 12 a side elevation of another modification thereof. Figs. 3 to 12, both inclusive, are on an enlarged scale and the arrows indicate the direction in which the sections are shown.

The drawings show the mechanism as mounted on a suitable bed plate or frame A. A paper strip *b*, of suitable width and texture, passes from a reel or spool B under a roller *b'* between a pressure-roller C and a gumming-roll D, mounted on a shaft D' over a glue pot or chamber E, in which a gumming-wheel E' turns with a shaft *e* in such manner as to apply glue to one edge or rim only of the gumming-roll D. (See Fig. 5.)

The pressure-roller C is shown as being made flat and provided with flanges or rims *c*, which overlap the edges of the gumming-roll D, the rim of which is grooved so as to form a semicircular groove *d*, as clearly shown in Fig. 5. The glue in the chamber is kept below the lower edge of this gumming-roll, so as to keep its rim *d'* out of contact there-

with except as applied by the gumming-wheel E'. The pressure-roller C is shown as mounted on an arm C', pin-jointed on the frame, so as to press upon the gumming-roll D by gravity; but spring-pressure may be employed in well-known ways to vary this pressure. (See Fig. 11.) The gummed strip then passes over the mandrel F, extending through the machine in the line of the travel of the blank.

An annularly-grooved forming-wheel G bends the paper strip around the mandrel, the strip then passing between similarly-grooved folding guide or feed wheels H H', which fold it into the form shown in Fig. 6, which shows the gummed edge as free or out of contact with anything. One of the guide or feed wheels H', for instance, it will be seen, is formed with one edge of smaller diameter than the other, or, in other words, with a groove of a radius greater than the semicircular groove, so as to allow the gummed edge of the paper to keep clear of the other edge and of the guide or feed wheel until the proper time arises for sealing the tube. The strip also passes through a folding or wrapping guide I, (see Fig. 8,) which presses the gummed edge down upon the ungummed edge of the strip. After leaving the wrapping-guide the paper strip passes through what we term a "heater" or "ironer," consisting of a longitudinally-bored block K, provided with a slightly-flaring mouth k, Fig. 3, to facilitate the entrance and closure of the tube. This heater or ironer is kept sufficiently hot to "set" the tube permanently as it passes between the inner wall of the block and mandrel by a suitable heater, such as a vapor, gas, or Bunsen burner. The heat employed may vary from about 200° to 500° Fahrenheit and even higher, depending upon the quality and thickness of the paper and the speed with which it is passed through the mold. The heat is sufficient to soften the sizing in the paper, thus rendering the paper temporarily soft and pliable, so that it may be, as it were, molded about the mandrel. The heat is sufficient not only to heat the block, but also the mandrel, and the paper is subjected simultaneously to heat and pressure which mold the paper so as to cause it to retain its tubular form, even without the use of cement; but where cement is used, as in the present case, it takes the strain of the paper from the cement, the cement acting to close the seam and render it air-tight from end to end, as well as to aid in holding the paper in permanent tubular form. This wrapping-guide I is made adjustable in various directions (see Figs. 2 and 7) by making it movable endwise in a socket provided with a clamp-screw and rocking on a pivot i', a thumb-nut I' clamping it in the desired position. The bracket I^2 is also adjustable laterally on its fastening-screw i^2. A recess k' in the rear end of this block K is closed by a screw-plug M, actuated by a handle M'. The ends of the block and screw-plug are beveled so as to form an annular flaring chamber with a narrow neck (see Fig. 9) which can be entirely closed or its area regulated by the handle M' of the screw-plug above described. This chamber is kept supplied with suitable waterproofing or stiffening material, such as paraffin, or with a combustible composition, if desired, supplied from a tank or reservoir N, the contents of which are kept fluid by heat applied thereto by means of a burner O, Fig. 2, of suitable construction. This device enables us to thoroughly saturate, impregnate, or coat the tube in its passage through the ironer.

The moving parts of the apparatus may be driven in usual well-known ways. The drawings show these parts as actuated by means of a driving-pulley P on a shaft p, extending crosswise of the machine. The gumming mechanism is driven by pulleys and belts from this shaft, while the forming and feeding rolls or wheels H H' are shown as driven by bevel-gears (see Figs. 5 and 6) on the main shaft actuating suitable gears on the axis of one of them, the two rolls being geared together by gears h h'. (See Fig. 6.)

In the modification shown in Fig. 11 the mandrel F extends from end to end of the machine, and an annularly-grooved spring-actuated forming guide-wheel G acts thereon to partially fold the strip passing between them after leaving the gumming apparatus, as before. Directly after leaving this guide-wheel the strip enters the wrapping-guide I, which further folds the strip and conducts it to a point where it passes through a closing-tube R, having flared ends. A carrying or folding feed-belt S, traversing suitable rollers on the frame, as shown in the drawings, passes through this tube R and grasps and encircles the paper strip, folding and carrying it forward to the heater, the front end of which is tapered and provided with a nose k^2, between which and the mandrel the paper strip passes. This nose serves to bridge the space between the closing tube and heater. The operation of the heater and other parts is similar to that hereinbefore described.

Fig. 12 shows another modification, in which the mandrel is shown as divided into two sections F F' on opposite sides of feed and guide or forming rolls H H', the upper one of which is preferably mounted in adjustable spring-actuated bearings, as shown, to bear upon the strip with yielding pressure. After being partly folded upon these rollers the paper strip passes through the wrapping-guide I before entering the ironer K.

The construction and operation of our improved apparatus will be readily understood from the foregoing description.

We do not herein claim, broadly, the method or art of making paper tubes by folding a paper strip into tubular form and then heating the tube to soften the sizing and set the paper permanently in tubular form, nor the art of

forming paper tubes, then heating the tubes, and then applying waterproofing or strengthening material thereto, as such claims are made in our application for patent filed April 28, 1899, Serial No. 714,892. Nor do we herein claim means for forming a tube from a paper strip, a heater for softening the sizing to enable the tube to retain its tubular form, and an ironer which heats and presses the tube into its final form, nor the combination of means for forming a paper tube, a hollow block, a mandrel extending therethrough, and means for heating this block, as such claims are made in our application for patent, Serial No. 741,314, filed December 22, 1899, which application also claims the combination of means for forming a paper tube, means for heating the tube, and means for coating the tube while hot, and also the combination of means for forming a tube from a paper strip and a matrix or ironer which heats and presses the tube to set and mold the same into its final form. Such applications also contain other claims based on the invention set forth in the claims above quoted, and we hereby reserve for said applications claims to such features of novelty shown and described in the present application, but which are not claimed herein.

We claim herein as our invention—

1. The combination, substantially as hereinbefore described, of a gumming-wheel, an annularly-grooved gumming-roll in contact with one edge of the rim of which the gumming-wheel rotates, and a flanged pressure-roller, between which and the gumming-roll the paper strip passes, so that one of its edges may be gummed.

2. The combination, substantially as hereinbefore described, of gumming mechanism, a mandrel, and annularly-grooved folding guide or feed wheels on opposite sides thereof; one of said guide-wheels having one of its edges cut away so as to keep the gummed edge of the paper strip clear of the guide or feed wheel.

3. The combination, substantially as hereinbefore described, of gumming mechanism, a mandrel, a forming-wheel, annularly-grooved folding guide or feed wheels, and a wrapping-guide which closes and seals the gummed paper strip into a tube.

4. The combination, substantially as hereinbefore described, of gumming mechanism, a forming-wheel, annularly-grooved folding guide or feed wheels, a wrapping-guide, a heater, and a mandrel between which and the above-mentioned tube-forming devices, the paper strip passes to form and seal the gummed tube.

5. The combination, substantially as hereinbefore described, of gumming mechanism, annularly-grooved folding guide or feed wheels, a wrapping-guide, a heater, a coating-chamber, and a mandrel between which and all the above-mentioned devices, except the gumming mechanism, the paper strip passes, to form, seal, and coat the gummed tube.

6. The combination, substantially as hereinbefore set forth, of gumming mechanism, tube-forming mechanism, a heater, and a mandrel passing through all except the gumming mechanism to form, seal and dry the tube.

7. The combination, substantially as hereinbefore set forth, of gumming mechanism, tube-forming mechanism, a heater and a coating device to gum, form, seal, dry and coat the tube.

8. The combination, substantially as hereinbefore set forth, of gumming mechanism, tube-forming mechanism, and an ironer or mold comprising a heated chamber and a mandrel within the chamber over which the tube passes after it is gummed.

9. The combination, substantially as hereinbefore set forth, of gumming mechanism, tube-forming mechanism, a heated chamber through which the gummed tube passes, and a mandrel within the heated chamber which the tube traverses.

In testimony whereof we have hereunto subscribed our names.

JOHN H. WHITE.
EDWARD L. WHITE.

Witnesses:
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LLOYD B. WIGHT.