(No Model.) 4 Sheets—Sheet 1.

W. G. CHAPIN.

MACHINE FOR MAKING TUBES OR CARTONS FROM PAPER.

No. 438,838. Patented Oct. 21, 1890.

Fig. 1.

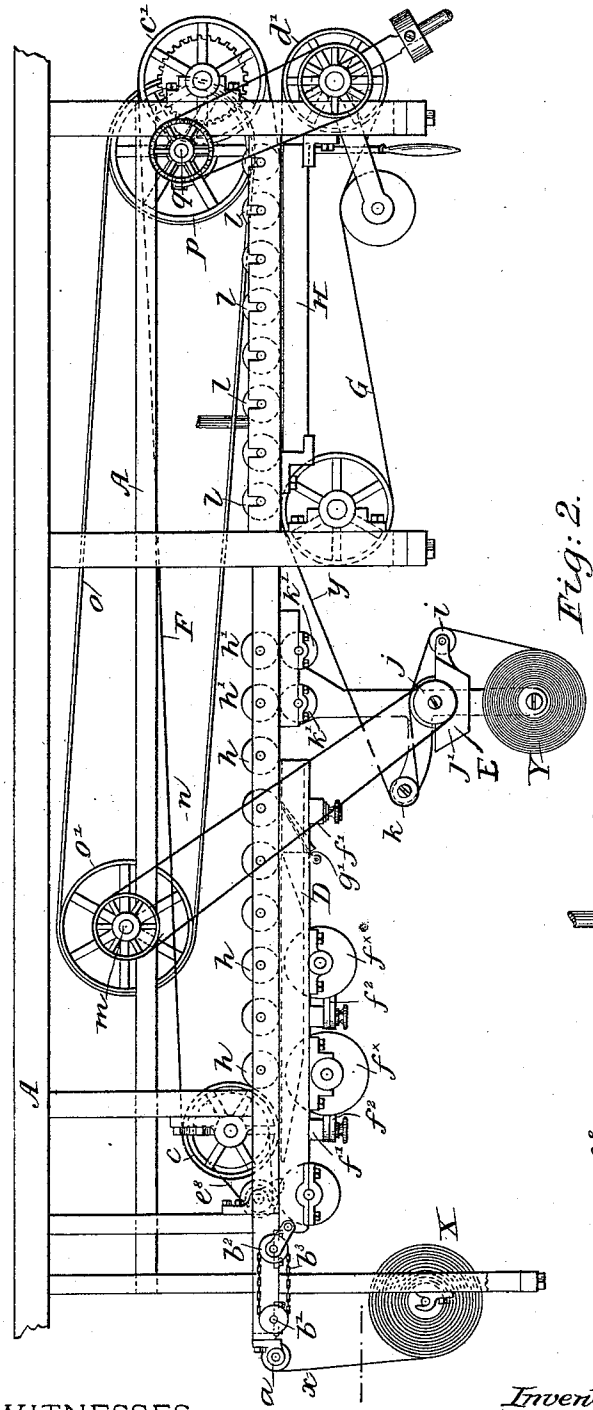
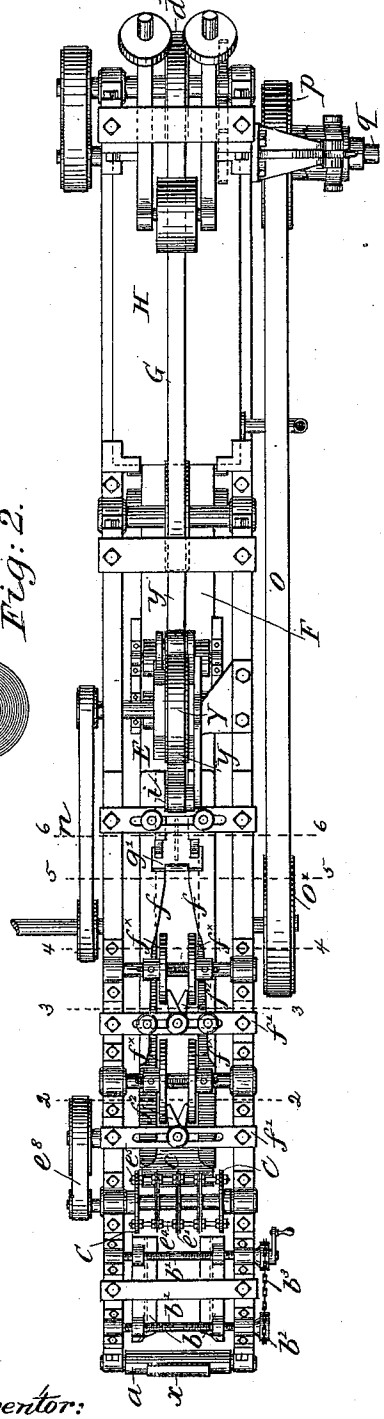


Fig. 2.



WITNESSES:

J. D. Caplinger

John F. Rennie

Inventor:

William G. Chapin

By Henry Connett

Attorney.

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

(No Model.) 4 Sheets—Sheet 2.

W. G. CHAPIN.

MACHINE FOR MAKING TUBES OR CARTONS FROM PAPER.

No. 438,838. Patented Oct. 21, 1890.

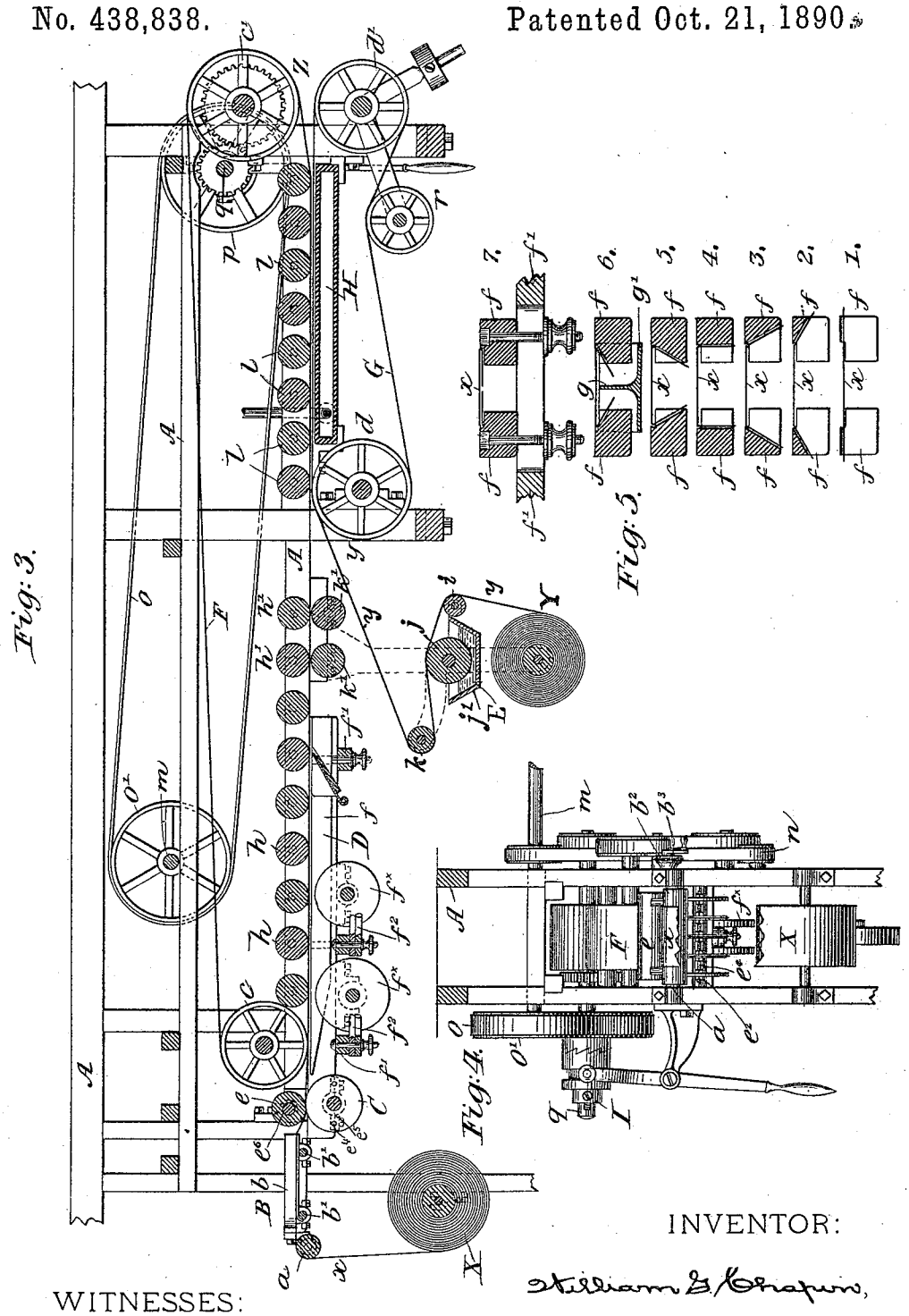


Fig. 3.

Fig. 5.

Fig. 4.

WITNESSES:

John A. Rennie.

INVENTOR:

William G. Chapin,

By Henry Connett

Attorney.

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

(No Model.) 4 Sheets—Sheet 3.

W. G. CHAPIN.

MACHINE FOR MAKING TUBES OR CARTONS FROM PAPER.

No. 438,838. Patented Oct. 21, 1890.

Fig: 5a

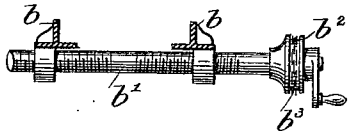


Fig: 5b

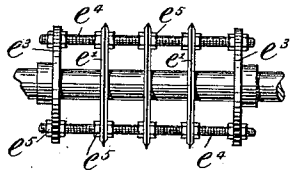


Fig: 5d

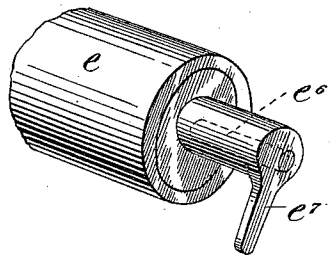


Fig: 5c

Fig: 6.

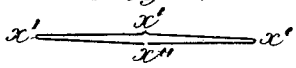
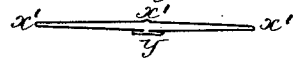


Fig: 6a



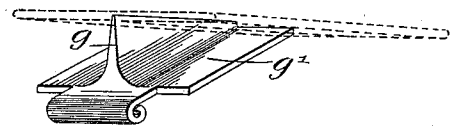
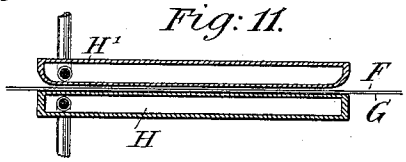


Fig: 11.



INVENTOR:

William G. Chapin.

By Henry Connett

Attorney.

WITNESSES:

John A. Rennie

H. Bagenger

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

(No Model.) 4 Sheets—Sheet 4.

W. G. CHAPIN.

MACHINE FOR MAKING TUBES OR CARTONS FROM PAPER.

No. 438,838. Patented Oct. 21, 1890.

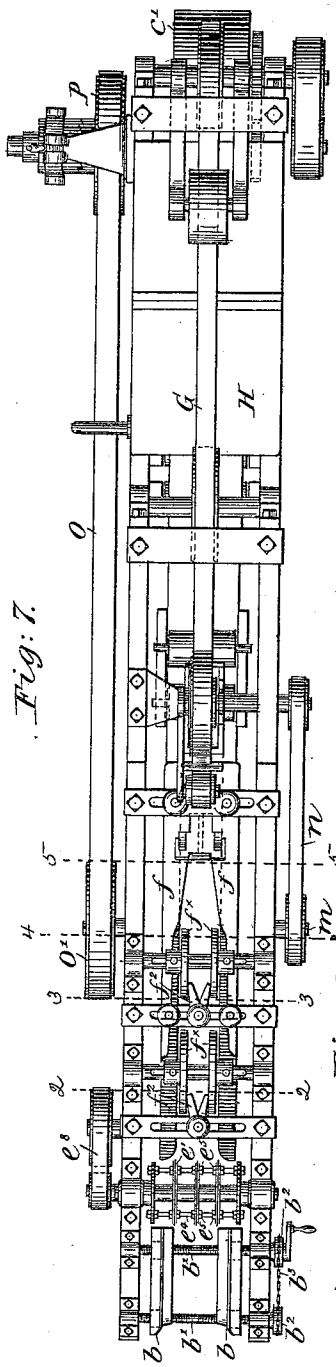


Fig. 7.

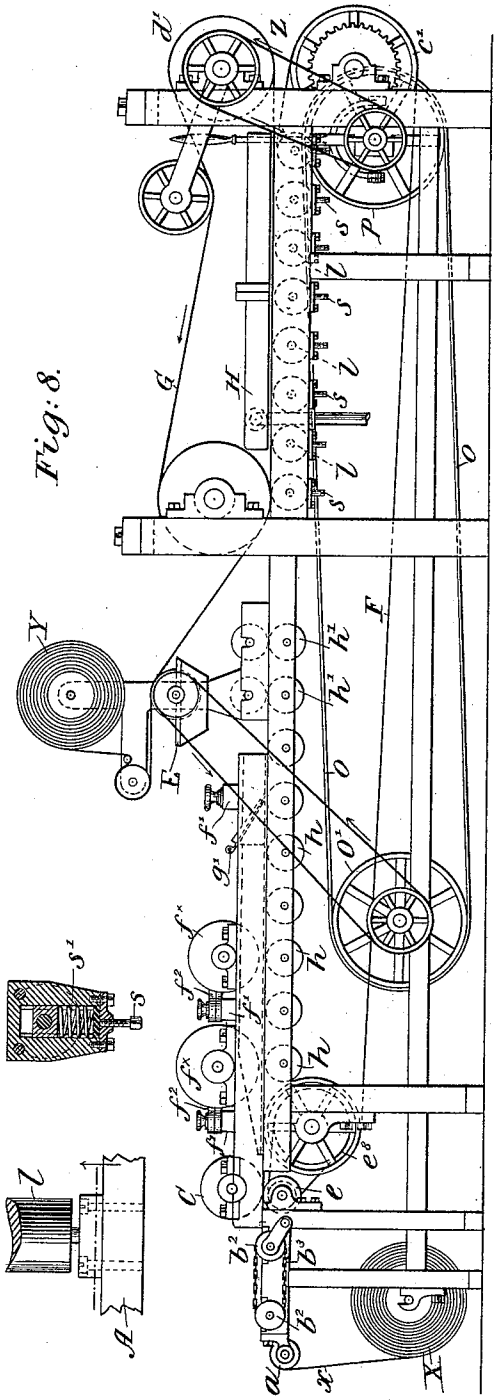


Fig. 8.

Fig. 9.

Fig. 10.

WITNESSES:

J. L. Caplinger

John A. Rennie.

William G. Chapin,
Inventor.

By Henry Connett
Attorney.

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

UNITED STATES PATENT OFFICE.

WILLIAM G. CHAPIN, OF BROOKLYN, NEW YORK.

MACHINE FOR MAKING TUBES OR CARTONS FROM PAPER.

SPECIFICATION forming part of Letters Patent No. 438,838, dated October 21, 1890.

Application filed July 29, 1889. Serial No. 319,005. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. CHAPIN, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have invented certain Improvements in Machines for Making Tubes or Cartons from Paper, &c., of which the following is a specification.

My invention relates to that class of machines employed for making cartons or tubes from paper and the like in which a strip of paper is scored and folded into the form of a flattened tube, and the edges thereof united by a closing-strip of paper or the like, glued or gummed thereto.

The object of my invention is to improve the machine now in use and employed in the manufacture from a continuous strip of corrugated paper of cartons for use in packing bottles for transportation.

My invention will be fully described hereinafter, and its novel features carefully defined in the claims.

The invention is fully illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of a machine for making paper tubes or cartons embodying my improvements. Fig. 2 is an under side plan view of the same. Fig. 3 is a longitudinal sectional elevation of the same, and Fig. 4 is an end view. Fig. 5 is a view showing the folder detached, and is designed to illustrate the peculiar form of the folder-bars and the manner of mounting them. Figs. 5^a, 5^b, 5^c, and 5^d are detail views, that will be hereinafter described. Figs. 6 and 6^a are somewhat enlarged sectional views of the flattened tube at different stages of its construction. Fig. 7 is a plan, and Fig. 8 a side elevation, of a machine for making cartons or tubes of paper embodying my improvements. In these views the machine is represented as resting on the floor. Figs. 9 and 10 are enlarged detail views, that will be hereinafter described. Fig. 11 illustrates a modification.

I will say as a preliminary to the description of the machine embodying my invention that heretofore such machines have embodied a guide for the paper on its way to the creasers, a creaser for forming longitudinal creases in the strip of paper where it is to be folded, a folder, a gumming device to supply gum or cement to a narrow closing-strip of paper, which latter is pressed down on the moving flattened tube and unites the abutting edges of the same, an endless carrying-belt of canvas for the flattened tube, said belt being arranged under the tube, and a steam-heated chamber arranged over the moving tube and serving as a drier. These features I do not claim, broadly. Such machines have always been arranged to stand on the floor, with the creasers, the gumming mechanism, and the heater above the moving strip or tube, and the guide, folder, and endless carrying-belt below the strip or tube. In the preferred form of my machine I reverse this arrangement by inverting the machine and suspending it from the ceiling of the room or from the beams overhead.

Heretofore the machine referred to has been employed for making tubes or cartons from cross-corrugated paper, to be employed, when cut to the proper length, for incasing bottles to be packed for transportation. My improved machine is designed for the same purpose; but it may be employed for making paper tubes for other purposes.

The first four figures of the drawings illustrate the preferred form of my machine, and this I will now describe.

A represents any suitable frame-work to support the moving parts. This frame-work is arranged overhead and is secured to the ceiling of the room.

X represents the roll of paper from which the tube is to be formed. It is mounted in suitable bearings or brackets in a well-known way, and the end of the strip x of paper from the roll is led over a roller a to an adjustable guide B, which keeps the strip straight and guides it to a creaser C. From the creaser the strip passes through a folder D, which folds the side flaps of the strip inwardly. The strip now has the form seen in the enlarged cross-section, Fig. 6, in which x' indicates the three longitudinal creases, along two of which the strip is folded, and x'' represents the nearly-abutting edges of the inwardly-folded flaps. The folded strip passes on from the folder to the point where the closing-strip is applied.

E represents the gumming device, and Y

the roll from which is led the closing-strip *y*. This is a narrow strip of paper, cloth, or the like, which receives gum or other adhesive material from the gumming device, and then passes to the folded strip *x*. The strip *y* is applied to the folded strip *x* in a manner to cover the nearly-abutting edges *x''* in Fig. 6, of the latter, and to close the joint and form a flattened tube, as seen in Fig. 6ª, which is an enlarged cross-section of said tube. When the strip *y* has been applied, the tube passes between two endless belts, which run face to face. The upper belt F, which may be of canvas, is mounted on two pulleys *c* and *c'* and extends the whole length of the machine, while the lower belt G, which is of thin sheet metal, is mounted on two pulleys *d* and *d'*. Under the metal belt G is placed the drier H, which will usually be a tight, shallow chamber of metal, charged with live steam. The metal belt G is interposed between the steam-chamber and the under side of the tube, and the closing-strip *y* will in passing be next to the said metal belt. The portion of the machine occupied by the drier H may be of any desired or suitable length, the limited space on the drawings making it necessary to represent this portion much shortened. I will say, however, that this drying portion of the machine will be long enough to insure the thorough setting of the gum or cement before the tube emerges from the machine at the delivery-point Z.

I will now describe more particularly the details of construction of the machine.

The guide B consists of two like bars *b b*, mounted in the manner of nuts on two screw-shafts *b' b'*, which are transversely arranged in the machine-frame. These shafts have right and left screws, whereby when they are rotated the two guide-bars are moved toward or from each other simultaneously, and the center of the strip *x*, whatever may be its width, will always coincide with the center or axis of the machine. Each guide-bar *b* has an L-shaped cross-section, as seen in the detail view, Fig. 5ª, whereby the strip *x* is provided with an upright side guide and a plane surface to move over.

In order to be able to rotate both of the screw-shafts uniformly, and thus preserve the parallelism of the guide-bars, these shafts are provided with sprocket-pinions b^2 b^2, on which is mounted a link belt b^3, and one of said shafts is or may be provided with a suitable crank for rotating it.

The creaser C consists of a bearing-roller *e*, covered with rubber or some other yielding material, and creasing-disks *e'* (see Fig. 5ᵇ) on a shaft e^2, the edges of said disks being arranged to press the paper to be creased up to the bearing-roller.

In order to be able to adjust the creasing-disks or set them nearer to or farther from one another, I fix on the shaft e^2 two heads e^3 e^3 and connect these heads by screw-threaded rods e^4, which pass through apertures in the several creasing-disks. Nuts e^5 on these rods serve to fix the disks firmly in place after they have been properly spaced and adjusted.

In order to be able to set the bearing-roller *e* up to the creasing-disks *e'*, so as to make a deeper crease, I mount the said roller in eccentric bearings. This is illustrated in Fig. 5ᵈ, wherein e^6 represents an eccentric sleeve on the bearing of the roller *e*, said sleeve being provided with a handle e^7 for rotating it. There will be a similar sleeve on each journal of the roller. This roller is driven by a belt e^8. (Seen in Fig. 2.)

The folder D consists of two bars arranged parallel extending lengthwise of the machine and having warped surfaces which turn over inwardly the side flaps of the strip as the latter passes through the folder. The form of these bars in illustrated in Fig. 5, in which the lower view No. 1 represents the receiving ends of the folding-bars *f f*, and the upper views Nos. 2, 3, 4, 5, 6, and 7 represent transverse sections of these bars at different points along the same. The warped surface of the folding-bar is such as would be generated by a straight line turning about a small circle as a center, the line being tangent to said circle, said line having at the same time a movement longitudinally of the folding-bar. The object of this peculiar warped surface is to turn the flaps of the strip *x* over flat or without curving them, as is done with folders as usually constructed.

This machine is designed to work on stiff and heavy paper, and it is difficult to fold it with the usual folders—as, for example, those used on an envelope-machine, where the warped surface is not generated by a straight line. My folder bends the strip along the crease only, the flap turned over remaining flat.

Two pairs of rollers $f^\times$ $f^\times$ bear on the strip *x* along the lines of the creases as the flaps are being folded and provide a bearing or support for said strip. The bars of the folder may be set nearer or farther from one another, being secured by screws and nuts to slotted transverse bars *f'* on the machine-frame. The rollers $f^\times$ are set out to the creases by means of adjustable fingers f^2, also secured by screws and nuts to two of the bars *f'*. These rollers $f^\times$ will be set back of the point where the folders begin to turn the flaps inwardly from a vertical position, and they require nothing to keep them from moving outward on their shafts, the tendency of the moving strip and the folders being to force them inward or toward each other. The fingers f^2 prevent any inward movement, and the rollers thus remain where they are set. In Fig. 3 these rollers $f^\times$ are represented as standing with their peripheries far enough from the belt F to permit a strip of thick cross-corrugated paper to pass between them. The distance these rollers stand from the belt will be governed by the thickness and character of the paper used.

In order to keep the folded strip straight, I mount in the folder-bars at the point where the said strip emerges from the folder a guide *g* in the nature of a blade set perpendicularly to the strip and standing in the narrow space *x''* in Fig. 6 between the abutting edges of the folded flaps. This guide and its function will be best understood by reference to Fig. 5ᶜ, which shows it in position with respect to the folded strip. The guide *g* consists of a guiding-blade and an attaching-plate *g'* secured thereto. The edges of the latter plate engage recesses in the faces of the folder-bars *f*, and wedges are employed for securing it in said recesses. The plate *g'* stands inclined to the plane in which the folded strip moves, and its lower advanced end stands close to said strip and serves to hold the edges of the flaps between the faces of the folders up to the body of the strip and smooth out any irregularities at said edges. At the same time the blade *g*, which stands between the adjacent edges of said flaps, assures the alignment of the folded strip and its proper presentation to the rollers, through which the strip shall pass immediately after leaving this guide.

While passing through the folder D the strip *x* is carried forward by the belt F, which is backed by a series of rollers *h*, rotatively mounted in the frame of the machine. After the strip emerges from the folder it passes under pressure-rollers *h'* and over their respective bearing-rollers *k'*, and thence between the two belts F and G. At this point the folded strip receives the closing-strip *y*, which comes from the gummer. This latter strip, after leaving the roll Y, passes over a roller *i*, and thence over the gumming-roller *j*, which applies the adhesive material to it. The roll *j* is driven positively in a direction opposite to that in which the strip *y* moves, and is supplied with gum from a reservoir *j'* in a well-known way. The gum-roller *j* is driven independently of the other mechanism, in order that it may remain in motion should the machine be temporarily stopped, otherwise the gum would dry and cause the roller to adhere to the strip *y*. After passing the gumming-roller the strip passes over a guide-roller *k* and thence to the drier.

I do not wish to limit myself to any special form of gumming device, nor do I claim that herein shown.

I do not consider the belt F as absolutely essential to the operation of that portion of the machine where the drying of the gum is effected, but I prefer to employ it. It is less important where the tube is made from a continuous strip than where short strips or sheets are being folded to form tubes.

The thin metal belt G interposed between the drier H and the folded strip or tube is driven at the same speed as the tube, and while it serves to transmit the heat from the drier to the tube it interposes a shield to prevent the freshly-gummed and moist strip *y* from being rubbed off by contact with a fixed part, as is apt to be the case where the said strip moves in contact with the surface of the fixed drier.

In order to provide the moving tube with a yielding pressure on its upper face to keep it pressed down upon the drier, I mount a series of rollers *l* in the frame of the machine in position to rest upon the upper belt F, and these rollers are provided with slotted bearings, so that they may rise and fall, and thus adapt themselves to inequalities in the tube.

Any suitable gearing, shafts, or belting may be employed for driving the machine. That shown herein comprises a driving-shaft *m*, from which the gumming-roller *j* is driven by a belt *n*. A belt *o* from a pulley *o'* on shaft *m* drives a clutch-pulley *p* on a shaft *q*. From this shaft *q* the belts F and G are driven by suitable gearing. The bearing-roller *e* of the creaser is driven from the shaft on which pulley *c* is mounted. The metal belt G is provided with a tightening-pulley *r*.

The construction illustrated in Figs. 7 and 8 is the same as that last described, except that the machine is inverted and changed in some minor details, which I will point out.

The gumming device is placed above the machine and the roll Y is above the gumming-roller. The pressure-rollers *l* being now below the flattened tube cannot press thereon by gravity, and are pressed upward by springs under their journals. This construction is illustrated in Figs. 9 and 10, in the former of which the screw *s* for regulating the tension of the spring *s'* is shown.

There may be two driers—one above and one below the tube and carrying-belts. This is illustrated in Fig. 11, which is a fragmentary sectional elevation. In this view H' represents the upper heater, arranged to replace the yielding pressure-rollers seen in Fig. 3.

Sheets or short strips of paper may be formed into tubes or cartons by this machine, as well as a long or continuous strip from a roll, and the tubes may be formed from plain as well as corrugated paper. Usually the closing-strip *y* will be of thin tough paper; but it may be of cloth, for example. Any suitable adhesive material may be used for attaching this strip, as glue, gum, paste, &c.

Within limits my machine is readily adjustable laterally to strips of different widths, it being only necessary to adjust the guide B, creaser C, and folder D, the bearing-rollers f^{x} forming a part of the latter. These parts will usually be set by a tram; but the slotted bars *f'* may be graduated along the slots therein for convenience in setting the folder-bars.

The machine may be set in motion or stopped by means of the clutch I. (Seen best in Fig. 4.) This clutch is a well-known device and will need no description.

The advantage in suspending the machine overhead lies in the economy of room on the floor thus attained, and the advantage due to the use of the metal belt G lies in the in-

creased speed that may be given to the machine and the consequent increase in the amount of work turned out. The yielding backing furnished by the rollers *l* prevents the choking of the machine. This latter difficulty is overcome by the rising of these rollers to permit any obstacle to pass. In replacing the roll X by a new one the rear end of the leading strip will be overlapped by that which follows, and this will produce a lump or obstruction which will readily pass the yielding rollers *l*.

Having thus described my invention, I claim—

1. In a machine for making tubes or cartons, an adjustable creaser C, consisting of a bearing-roller, a shaft e^2, provided with heads e^3, screw-threaded rods e^4, extending longitudinally of the shaft between said heads, a creasing disk or disks mounted loosely on said shaft, said screw-threaded rods passing through apertures in the creasing disk or disks, and the nuts on said rods, all arranged to operate substantially as set forth.

2. The combination, with the bars *f* of the folder, of the bearing-wheels $f^\times$, free to move longitudinally on their shaft, and the adjustable fingers f^2, for holding said wheels out to the line of the folding-creases in the strip, substantially as set forth.

3. The combination, with the drier and an endless belt arranged to move in close proximity to the face of the drier, of a yielding backing arranged on the side of the belt opposite to the drier.

4. The combination, with an endless weighted and yielding carrying-belt F and a drier H, said belt running in close proximity to the face of said drier, of the endless metal belt G, running between said drier and the belt F and at substantially the same speed as the latter, as and for the purposes set forth.

5. The combination, with the drier and the endless belt F, arranged to move in close proximity to the face of the drier, of the metal belt G between the belt F and the drier and a yielding backing composed of rollers *l*, which bear on the said belt F, substantially as and for the purposes set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM G. CHAPIN.

Witnesses:
HENRY CONNETT,
JOHN D. CAPLINGER.