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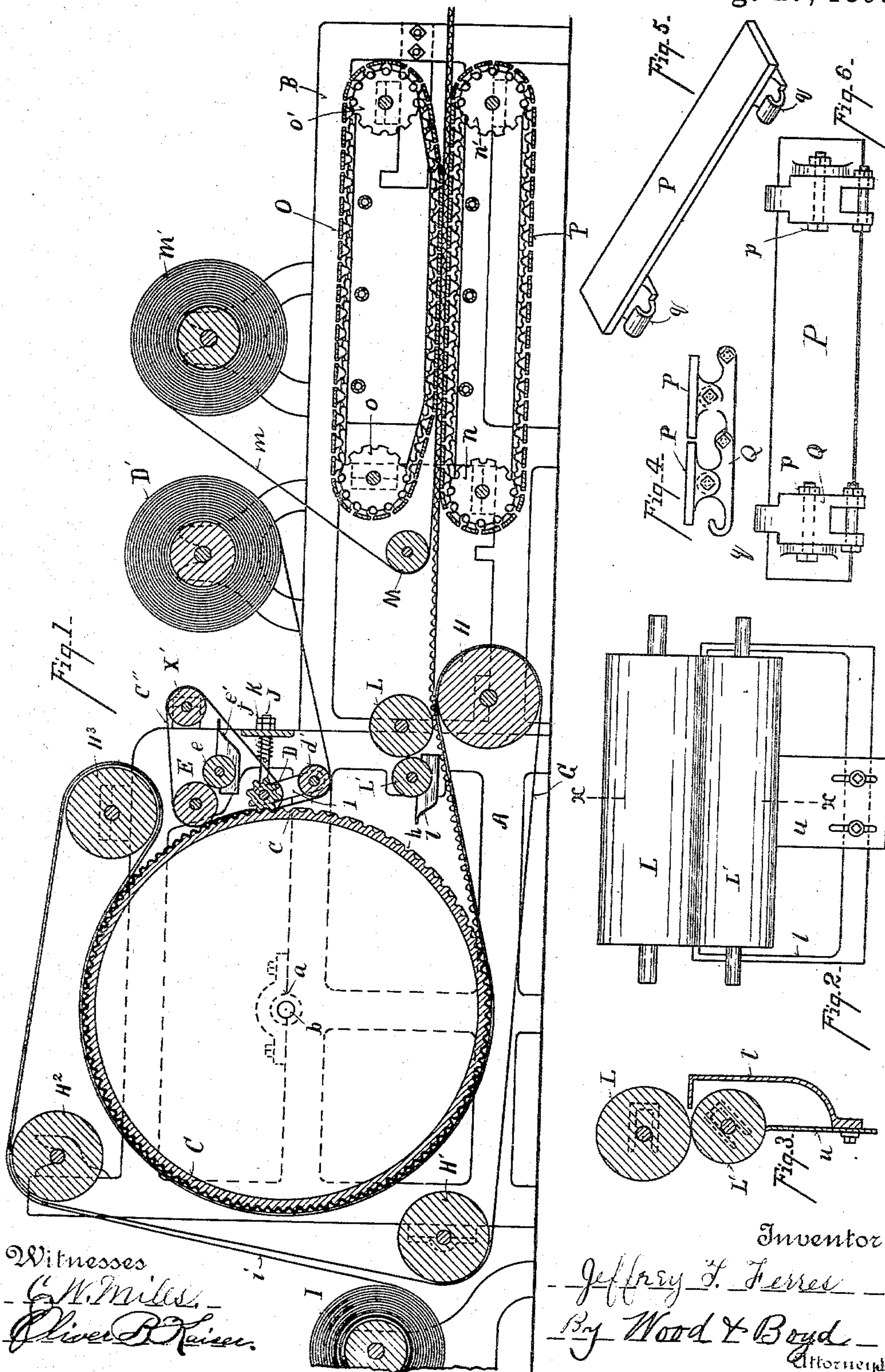
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J. T. FERRERES.

MACHINE FOR CORRUGATING AND FACING PAPER.

No. 545,354.

Patented Aug. 27, 1895.



Witnesses
G. W. Miles.
Oliver B. Kaiser.

Inventor
Jeffrey F. Ferris
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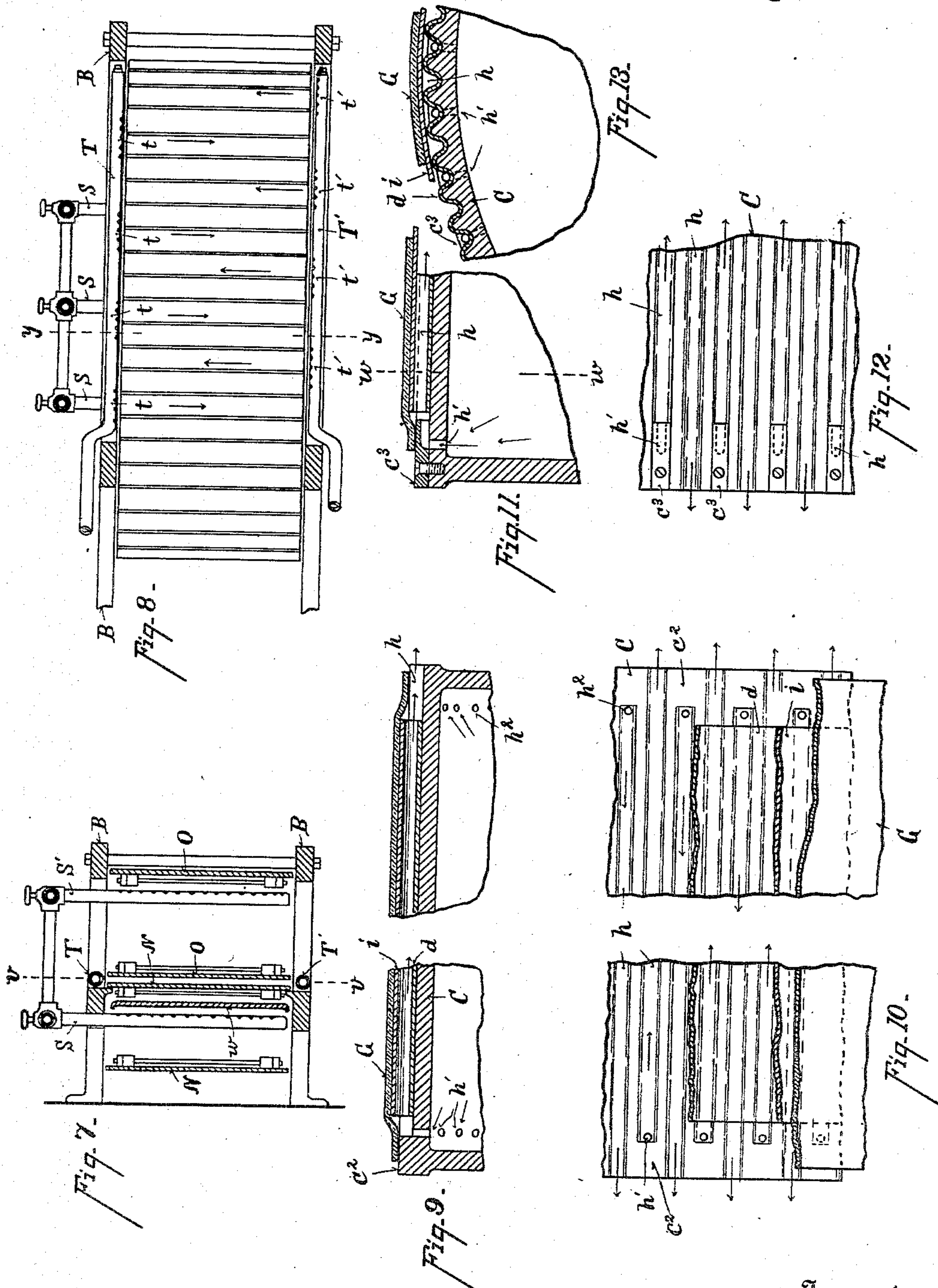
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UNITED STATES PATENT OFFICE.

JEFFREY T. FERRES, OF ANDERSON, INDIANA.

MACHINE FOR CORRUGATING AND FACING PAPER.

SPECIFICATION forming part of Letters Patent No. 545,354, dated August 27, 1895.

Application filed February 21, 1896. Serial No. 539,304. (No model.)

To all whom it may concern:

Be it known that I, JEFFREY T. FERRES, residing at Anderson, in the county of Madison, State of Indiana, have invented certain new and useful Improvements in Machines for Corrugating and Facing Paper, of which the following is a specification.

One object of my invention is to provide a combined corrugating and drying drum of such dimension that the paper is corrugated, pasted, set, and dried in the teeth and grooves which form the corrugations.

Another object of my invention is to provide proper means for distributing air-currents across the paper drying both edges alike while seated in the corrugations.

Another object of my invention is to provide proper means for pasting on a second sheet of paper when it is desired to make a double-faced corrugated paper, with proper means for circulating air-currents for quickly and evenly drying the same and giving it a smooth calendered surface. Heretofore it has been necessary to use a certain grade of paper dried just right, so as to retain the impression given it by the corrugating-rollers until it is carried forward and pasted to the sheet forming the face, and as the paper on a damp day would not retain the impression as in dry weather the result has been a product in which the corrugations were not all alike; but in my machine the sheet forming the face is pasted to and dried on the corrugated sheet while it is held by the corrugating-roll, retaining the precise shape given it by the said roll; also, in using currents of air more or less heated as an auxiliary for drying it has been customary to exhaust or blow the air through the corrugations or across the paper from one side only. As such a method tends to dry one side more than the other, it can be readily seen that an inferior product would be the result. My invention obviates this objection by drying both edges of the paper evenly and continuously.

The various features of my invention will be more fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a central vertical section of the machine embodying my invention. Fig. 2 is a top plan view of a modification of the past-

ing-rolls. Fig. 3 is a section on line *xx*, Fig. 2. Fig. 4 is an end elevation of two links of the carrying-chain. Fig. 5 is a perspective view of one of the links and lags. Fig. 6 is a bottom plan view of Fig. 5. Fig. 7 is a section of a secondary paper supporting and drying apparatus on line *yy*, Fig. 8. Fig. 8 is a section of the same on line *vv*, Fig. 7. Fig. 9 is a broken sectional elevation of the corrugating-drum. Fig. 10 is a detailed face view of Fig. 9. Fig. 11 is a modification of Fig. 9. Fig. 12 is a sectional face view of Fig. 11. Fig. 13 is a cross-section on line *ww*, Fig. 11.

A represents the main frame of the machine.

B represents the frame supporting the secondary supporting, pasting, and drying apparatus.

a represents the shaft supporting the corrugating and drying drum C. This shaft is made hollow, so as to serve as a pipe through which the currents of air are supplied to the interior of the drum C. The shaft *a* has openings inside the drum to let the air into the interior of the drum. The periphery of said drum is provided with cogs or teeth running transversely across the face of the drum.

D represents the coacting corrugating-roll provided with similar cogs or teeth meshing with those of the drum C.

D' represents the roll of paper to be corrugated. This paper *d* passes around the idler-roller *d'* and thence between the cogs or teeth of roll D and drum C, which corrugate or flute the paper. In order to prevent the corrugated paper from rising on leaving the corrugating-drum C, a series of belts *C*² are provided, and they run in circumferential grooves pierced in the roll D. Said belts extend upward and forward around the paste-roll E, which is likewise provided with a similar series of circumferential grooves, thence over the idler-roller X'. The roll E coacts with the pasting-roll *e* to spread the paste upon the corrugated paper for attaching the first of lining or facing paper *i*.

e' represents the pasting-trough, into which the pasting-roll *e* dips and spreads the paste upon roller E.

In order to hold the corrugated paper closely in contact with the drum for the major part of its revolution, I provide the following in-

strumentalities: G represents an endless belt passing around the rollers H H' H² H³. This endless belt may be driven by power applied to any one of said rolls, as desired. I represents a roll of facing-paper from which the strip *i* passes over the rolls H² H³, together with belt G, and thence around upon the corrugated paper between it and the endless belt G. This belt therefore serves the triple function of pressing the facing-paper to the corrugations and holding the same in position until wholly or partially dried, and likewise holding the contact of the corrugated paper with the corrugating-drum until the corrugated paper is set and dried in the corrugations, and also forms the top of air-ducts between the paper and the orifice where air is taken from the interior of the drum. In order to facilitate the drying, I provide the following instrumentalities: The grooves *h* in the face of the drum C are closed at one end and provided with an orifice *h'*, leading from the interior of the drum, whereby a current of air is admitted into one end of a corrugation in the paper and compelled to pass across through the corrugation and escapes at the opposite side, as shown in Fig. 9. These orifices are arranged in each groove alternately at opposite ends of the drum, so that the current is opposite in directions in each alternate corrugation. *h*² represents a series of orifices at one end of the drum and *h'* at the opposite end of the drum. In this form of construction the belt G is made broad enough to cover the orifices *h'* and rest upon the face *c*² of the drum. Instead of constructing the orifices in this form I have shown a modification in Fig. 11, whereby the orifices are carried horizontally through the filling-piece *c*³ and opened into the corrugations *h*, the opposite end of the drum being provided with alternate passages in the opposite direction. In order to regulate the depth of the corrugation, roll D is supported upon links 1, which are yoked together in any appropriate manner and pivoted on the center of idler-roll *d'*. J represents a pressure-bar controlled by spring *j*. K represents nuts for adjusting the inclination of links 1, so as to move the roll D to or from the corrugating-drum and thereby regulating the depth of the corrugations.

When the single-faced corrugated paper has left the corrugating and drying drum C, it may be continued on through the endless aprons N O to still further dry it, or if it is desired to face the opposite side of said corrugated paper I provide the following instrumentalities: L L' represent a second set of pasting-rolls, and *l'* the pasting-trough, which parts are similar in construction to rolls E *e*, but not having any circumferential grooves as there are in roll E. As the paper passes between the rolls H L, it receives the paste from the latter roll and thence passes under the roll M, where it is brought into contact with the strip of paper *m* from the roll *m'*.

In order to support the corrugated paper against suitable pressure brought upon the strip *m* to cause it to adhere and thence to dry it, I provide the following instrumentalities: N represents an endless chain passing over sprocket-wheels *n n'*. O represents a similar chain upon the sprocket-wheels *o o'*. P P' represent lags pivoted to the sprocket-links Q by the ears *p* and bolts *l*². Said chain may be of any suitable kind adapted to run on sprocket-wheels with a suitable number of links provided with attachments, so that the lags P may be pivoted at or below the center at the end of said attachments, thus forming an endless belt or apron. The upper endless chain O depends and rests upon the face of the paper, which is supported in a horizontal position by the chain N. The weight of the chain and lags is sufficient to press the facing-sheet upon the corrugated paper and hold it in that position until it is dried or set.

In order that the paper may be properly dried, I provide the following instrumentalities: S S' represent a series of jet gas-burner pipes, as shown in Fig. 7, supplying heat to the under side of the lags of the sprocket-chain. I also use a set of air-pipes T T', through which a current of air is blown, and in order to have the paper dried uniformly I arrange a series of orifices *t t'* at alternate intervals, each series of jets in one set being opposite the space between the jets of the pipe at the opposite side of the paper, so that a current of air is blown in each direction alternately through the corrugations of the paper as it is carried along between the endless aprons.

As a measure of cheapness and economy it is sometimes desirable to paste only sections of the facing-paper to the face of the corrugations. When this is desired, I place on the paste-trough *l'* a scraper *u*, one end of which is secured to the trough and the opposite end engages with the face of the pasting-roll L', thereby removing the paste from the section or sections of said roll which the end of the scraper comes in contact with. Of course as many scrapers or sections of scrapers are employed to engage with the face of the pasting-roll as are desired.

As it would assist the drying of the paper materially to use heated air in the drum C and pipes T, it is optional with me whether the air is heated before its introduction into the drum C and pipes T or heated in them by steam-pipes or other well-known means.

In Fig. 7 *w* represents a metal plate interposed between the burners S and the lags of apron N to prevent the paper from being burned.

I claim—

1. In a machine for making faced corrugated paper the hollow corrugating and drying drum C the face of which has teeth or corrugations formed thereon, and a series of passages pierced in the shell of the drum at the ends

of the corrugations for admitting currents of air from the interior of the drum into the corrugations, in combination with a corrugating roll and a pasting roll, substantially as specified.

2. In a machine for making faced corrugated paper the hollow drum C supported upon a hollow shaft through which air is supplied to the interior of the drum, said drum having teeth or corrugations formed on its face, each alternate corrugation or depression having one of its ends closed at one end of the drum and the next corrugation closed at the opposite end, and alternate series of air passages pierced through the face of the drum between the closed end of the corrugations and the corrugated paper adjacent thereto, substantially as specified.

3. A machine for making faced corrugated paper composed of a suitable frame, a combined corrugating and drying drum, a coacting spring controlled corrugating roll meshing therewith, means for forcing currents of air through the corrugations while they are carried around said drum, paste rolls for applying paste or its equivalent to the ribs of the corrugated sheet, and an endless belt supported upon a series of rolls arranged outside of the periphery of the corrugating and drying drum and partially embracing the periphery thereof, substantially as specified.

4. In a machine for corrugating and facing paper the combination with a combined corrugating and drying drum and a coacting corrugating roll, of an endless circumferential embracing belt supported on suitable rollers outside of the drying drum, a pasting device interposed between the corrugating roll and endless embracing belt, means for feeding a strip of facing paper upon the pasted surface of the corrugated paper and between it and the circumferential belt, and means for forcing currents of air through the corrugations while they are carried around said drum, substantially as specified.

5. In a paper pasting and corrugating machine the combination with the hollow corrugating and drying drum C having its peripheral face corrugated, and the idler roll d' of the coacting corrugated roll D mounted upon links 1 hinged to the axis of roll d' , and means for adjusting roll D to and from the drum C, substantially as specified.

6. In combination with the combined corrugating and drying drum C and the coacting roll D, paste roll E and idler roll X' , the belts resting upon the corrugated paper as it passes from said roll D and holding the same in contact with drum C, substantially as specified.

7. In a machine for corrugating, facing and pasting paper, the combination with the toothed corrugating and drying drum C, the toothed corrugating roll D, paste roll E, and means for feeding paper between the corrugating drum and roll, of the pasting roll L,

L' , means for feeding facing paper to and pasting it upon the corrugated paper, and the two sets of endless aprons N, O, one of which supports the under side of the paper and the opposite apron resting upon and pressing the facing paper upon the face of the corrugated paper, whereby the corrugated paper and facing paper applied thereto are held in close contact until set and dried substantially as specified.

8. A machine for making faced corrugated paper composed of a suitable frame, a combined corrugating and drying drum, a coacting corrugating roll, meshing with said corrugating and drying drum, paste rolls for applying paste or its equivalent to the ribs of the corrugated sheet, an endless belt supported upon a series of rolls arranged outside the periphery of the corrugating and drying drum and partially embracing the periphery thereof, and two endless metal aprons for additionally drying the single face or for applying a second strip of paper to form a double faced corrugated paper, substantially as specified.

9. In a machine for facing corrugated paper employing one or more endless aprons N, a series of heater jet burner pipes S arranged transversely across the path of the apron lags and close to the under side of said lags whereby the same are heated to dry the paper carried by said lags, substantially as specified.

10. In combination with the two series of endless aprons N, O, composed of the lags P, P', fastened to sprocket chains, a series of jet burner pipes S, S', arranged along the path of travel and between the loops of each apron whereby the lags are heated and distribute the heat to both facings of the corrugated paper, substantially as specified.

11. In combination with an endless apron having lags P, P', supported on sprocket chains driven by sprocket wheels, the air pipes T, T', arranged at each end of said lags, opposite the open ends of the corrugations of the paper resting thereon and a series of holes in pipes T, T', for ejecting currents of air through the flutes of the corrugated paper, substantially as specified.

12. In a machine for facing corrugated paper employing an endless apron composed of lags P, P', mounted upon carrying chains, the air pipes T, T', arranged just outside of the path of paper travel, each having a series of openings and alternating spaces, the openings of one pipe being opposite the spaces of the opposing pipe, whereby the currents of air are passed alternately in opposite directions through the flutes of the paper, substantially as specified.

In testimony whereof I have hereunto set my hand.

JEFFREY T. FERRES.

Witnesses:

D. H. DURBIN,
A. O. BERNARD.