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J. T. FERRES.

APPARATUS FOR CORRUGATING PAPER.

(Application filed July 1, 1901.)

(No Model.)

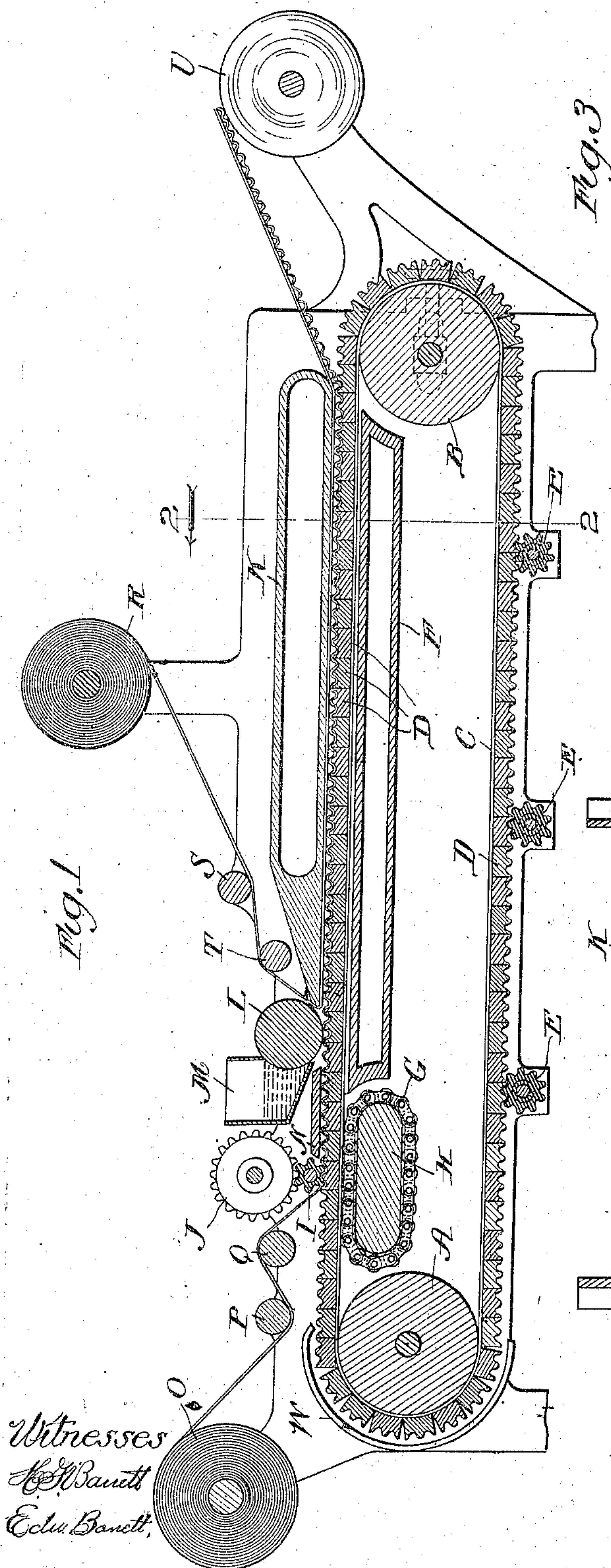


Fig. 1

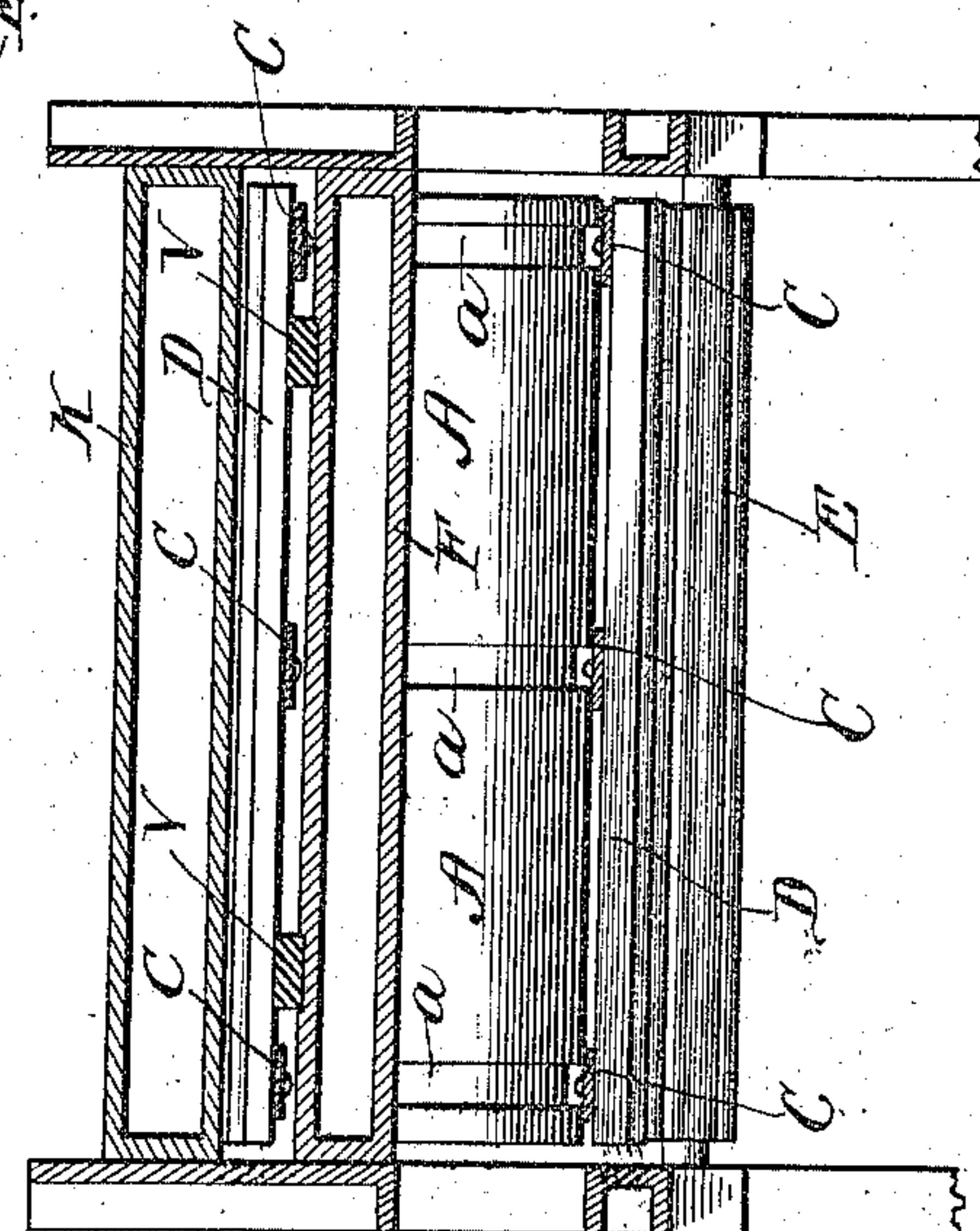
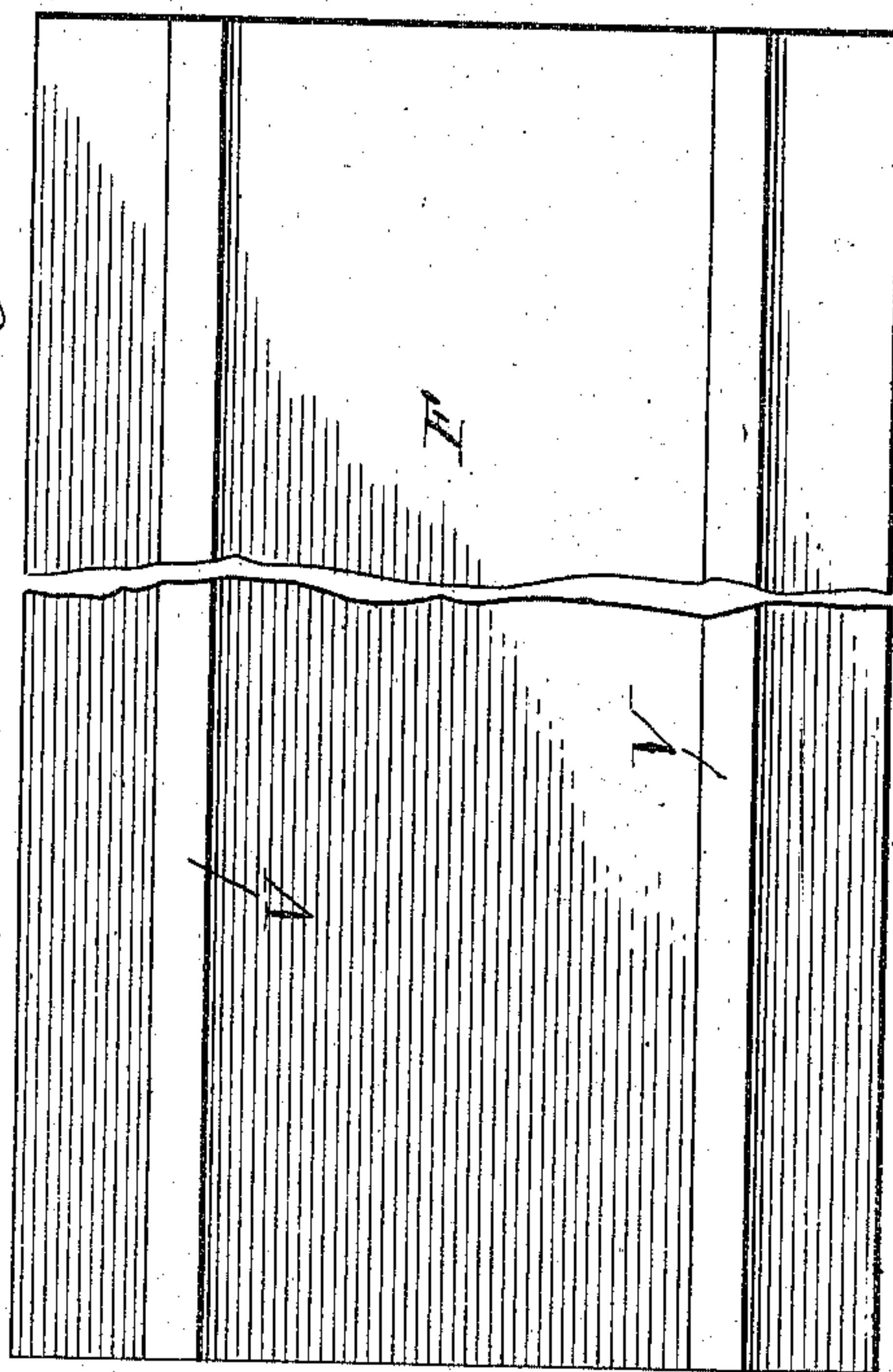


Fig. 2

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APPARATUS FOR CORRUGATING PAPER.

SPECIFICATION forming part of Letters Patent No. 690,713, dated January 7, 1902.

Application filed July 1, 1901. Serial No. 66,678. (No model.)

To all whom it may concern:

Be it known that I, JEFFREY T. FERRES, a citizen of the United States, residing at Anderson, in the county of Madison, in the State of Indiana, have invented a certain new and useful Improvement in Apparatus for Corrugating Paper, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

The object of my invention is to provide a simple and efficient apparatus for converting plain paper into corrugated paper whose corrugations shall be uniform and at an equal distance from each other and also for securely affixing the facing-strip of plain paper to one surface of the corrugated strip and giving it a smooth and polished appearance, forming what is commonly known as "single-faced" corrugated paper.

The novelty of my invention will be hereinafter set forth, and more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side view, partly in section, of my improved apparatus; Fig. 2, a vertical section upon the line 2 2 of Fig. 1, and Fig. 3 a top plan view of the lower heater.

The same letters of reference are used to indicate like parts in the several views.

Journalled at opposite ends of the framework are two rolls or drums A B, over which pass a plurality of endless steel bands C, in the present instance three in number, Fig. 2. Secured to these bands transversely of the machine and parallel with the rolls A B is an iron lagging D, composed of a plurality of iron lags or bars extending transversely of the machine, parallel with the rolls A B, and abutting tightly together side by side. These lags D are fluted or corrugated longitudinally upon their outer surfaces, so that the outer surface of the entire lagging is corrugated transversely of the machine, as shown. At its lower side the lagging D is supported by three fluted or corrugated rollers E, meshing with the corrugations of the lagging, and at its upper side it travels over and is supported by a hollow steam-heated plate F and also by a chain of rollers G, passing around a fixed block H. Immediately above the

block H and chain of rollers G there meshes with the corrugations in the lagging D a small fluted or corrugated roller I, while located immediately above the roller I and meshing therewith is a larger corrugated roller J, which is steam-heated. Supported above but resting upon the upper surface of the lagging D above the heater F is a second hollow heater K, whose forward or left-hand end is tapered or beveled off, as shown, in order to extend into close proximity to the lower side of a paste-roll L, coöperating with a paste-box M. A flat plate N is secured in the framework transversely of the machine between the paste-roll L and the corrugated roller I, immediately above the upper surface of the lagging D.

Under this construction and arrangement of parts the operation is as follows: The strip of plain paper to be corrugated is led from a suitably-supported roll O downward beneath a guide-roller P, thence upward over a second guide-roller Q, and thence downward beneath the roller I, by which it is pressed into the corrugations in the lagging D, and from whence it passes onward with the lagging beneath the plate N and paste-roll L, by which latter paste is applied to its upper surface. The plate N serves to hold the paper down in the corrugations of the lagging and prevent it from springing upward and being crushed out of shape in its passage beneath the paste-roll L. The strip of facing-paper is led from a roll R, thence downward and forward beneath a guide-roller S, thence over a second guide-roller T, thence downward and forward around the thin forward edge of the heater K, and thence rearward beneath the latter. The lagging D is heated by its passage over the heater F, and the small corrugating-roller I is heated by the larger roller J, so that the corrugated strip O and its facing-strip R are heated as they pass from the roller I rearward through the machine, and the pressure and heat of the heater K upon the upper side of the strips as they pass beneath it causes the facing-strip to be securely attached to the corrugated strip and ironed and polished and both of them dried and firmly secured together by the time they emerge from the rear end of

said heater, whence they are led to and wound upon a storage-reel U.

The purpose of the block H and chain of rollers G (of which latter there may be several sets placed end to end lengthwise of the block H) is to support the lagging D at each side of the vertical plane of the corrugating-roller I as well as immediately beneath it, and thereby prevent the lagging from rocking, as it would be liable to do if supported beneath the roller I by a single plain roller, and also obviate the friction which the pressure of the rollers I J upon the upper side of the lagging would cause between the under side of the lagging and any fixed support, such as a forward prolongation of the heater F, for the lagging at such point.

It is essential that the strip of paper to be corrugated shall be pressed into the corrugations of the lagging by a roller of comparatively small diameter, so that only a few of its teeth or corrugations can mesh with the corrugations of the lagging at the same time, in order to prevent mutilation of the paper; but as a roller of such small diameter but of sufficient length for a wide strip of paper would not be strong and rigid enough to exert the necessary pressure upon the strip of paper the entire width of the machine the heavier and more powerful roller J is provided, which is located immediately above the roller I and holds the latter in firm engagement with the lagging.

In the present instance the lagging D is secured to the steel bands C by rivets, and to accommodate the heads of the rivets upon the inner surface of said bands in passing over the rolls A B the latter are provided with circumferential grooves *a*, Fig. 2, in line with the rows of rivets.

In its passage over the upper surface of the heater F the lagging D is subjected to sliding friction, to relieve which I provide the upper surface of said heater with a plurality of longitudinal grooves, which I fill with strips of Babbitt metal or brass V, projecting a sufficient distance above the surface of the heater to hold the steel bands C and heads of the rivets out of contact therewith, as shown in Fig. 2. These friction-strips can be readily removed when they become worn down and cheaply replaced with new ones.

To accommodate the expansion and contraction of the steel bands C under varying temperatures, one of the rolls A B, which support the lagging, may be mounted in adjustable bearings, as in the case of the roller B in Fig. 1, or for the same purpose the supporting-rollers E may be mounted in vertically-adjustable bearings to permit more or less sag to the lower part of the lagging.

To prevent any particles of dirt or other matter from falling between the lags D in their passage over the forward and upper side of the roll A, and thereby prevent the lags coming tightly together again, I provide a curved shield W for the lagging at that point.

A similar shield may be provided at the rear end of the machine; but anything that might fall between the lags as they pass over the upper and rear side of the roll B would be apt to fall out again as the lags passed around the under side of the roll.

The functions of the heater-plate F are, first, to heat the lagging D, and, second, to support said lagging in its passage rearward from the forward supporting-roll A to the rear roll B. The first of these functions, however, may be performed by the rolls A B, which may be made hollow and steam-heated for the purpose, in which event the heater-plate may be dispensed with and any other suitable support for the lagging be provided, although I consider it preferable to employ said heater, as shown, for both of said purposes. So, also, the functions of the upper heater K may be performed; but in a less satisfactory manner, by a series of rollers bearing upon the upper surface of the lagging, which to smoothly iron the upper surface of the corrugated paper and prevent it having a ribby appearance should be placed diagonally or at least at a slight angle to the corrugations of the lagging. Likewise the corrugating-roller I may be drilled longitudinally and steam-heated, in which event it will be unnecessary to heat the larger roller J, the latter being then employed simply to support the roller I and hold it in firm engagement with the corrugated lagging.

I am aware that it has heretofore been proposed to employ in a machine of this character an endless corrugating-lagging composed of fluted or corrugated lags secured side by side at their opposite ends to the links of endless chains; but such construction is not practicable, for the reason, among others, that the wearing of the joints of the chains permits separation of the lags and consequent destruction of the uniformity of the corrugations.

Having thus fully described my invention, I claim—

1. In apparatus for corrugating paper, an endless corrugated lagging composed of a plurality of endless metal bands and a plurality of longitudinally fluted or corrugated lags secured thereto side by side transversely of the machine; substantially as described.

2. In apparatus for corrugating paper, an endless lagging composed of a plurality of endless steel bands and a plurality of longitudinally fluted or corrugated iron lags riveted to said bands side by side transversely of the machine; substantially as described.

3. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller cor-

rugating-roller to maintain it in firm engagement with the corrugations of the lagging throughout the length of said roller, and a support for the lagging beneath said rollers; substantially as described.

4. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller corrugating-roller to maintain it in firm engagement with the corrugations of the lagging throughout the length of said roller, a supporting block or bar extending transversely of the machine beneath said rollers, and an endless chain of antifriction-rollers passing around said block and supporting the lagging beneath the corrugating-rollers; substantially as described.

5. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger steam-heated corrugated roller located immediately above and meshing with the smaller corrugating-roller to heat the latter and maintain it in firm engagement with the corrugations of the lagging throughout the length of said rollers, and a support for the lagging beneath said rollers; substantially as described.

6. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger steam-heated corrugated roller located immediately above and meshing with the smaller corrugating-roller to heat the latter and maintain it in firm engagement with the corrugations of the lagging throughout the length of said roller, a supporting block or bar extending transversely of the machine beneath said rollers, and an endless chain of antifriction-rollers passing around said block and supporting the lagging beneath the corrugating-rollers; substantially as described.

7. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums for said lagging at the opposite ends of the machine, a corrugating-roller meshing with the corrugations of the lagging adjacent the forward supporting-roll, and a heater-plate located immediately above the lagging in its passage from the corrugating-roller to the rear supporting-roll; substantially as described.

8. In apparatus for corrugating paper, the

combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a corrugating-roller meshing with the corrugations of the lagging adjacent the forward supporting-roll, a paste-box and paste-roll located in rear of the corrugating-roller, and a heater-plate located immediately above the lagging in its passage from the paste-roll to the rear supporting-roll to heat and dry and iron the paper in its passage with the lagging beneath said plate; substantially as described.

9. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, a corrugating-roller meshing with the corrugations of the lagging adjacent the forward supporting-roll, a paste-box and paste-roll located in rear of the corrugating-roller, and heater-plates located immediately above and beneath the lagging in its passage from the paste-roll to the rear supporting-roll; substantially as described.

10. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting-rolls therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage rearward from the forward supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller roller, a support for the lagging beneath said rollers, and a heater-plate located immediately above the lagging in its passage from the corrugating-roller to the rear supporting-roll; substantially as described.

11. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting-rolls therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage rearward from the forward supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller roller, a support for the lagging beneath said rollers, and heater-plates located immediately above and beneath the lagging in its passage from the corrugating-roller to the rear supporting-roll; substantially as described.

12. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting-rolls therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller roller, a support for the lagging beneath said corrugating-rollers, a paste-box and paste-roll in rear of said corrugating-rollers, and a heater-plate located immediately above the lagging in its passage from the paste-roll to the rear supporting-roll; substantially as described.

13. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting-rolls therefor at the opposite ends of the machine, a small corrugating-roller meshing with the corrugations of the lagging in its passage from the forward to the rear supporting-roll, a larger and stronger corrugated roller located immediately above and meshing with the smaller roller, a support for the lagging beneath said corrugating-rollers, a paste-box and paste-roll in rear of said corrugating-rollers, and heater-plates located immediately above and beneath the lagging in its passage from the paste-roll to the rear supporting-roll; substantially as described.
14. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, corrugated supporting-rollers meshing with the under side of said lagging in its passage from the rear to the forward supporting-roll, and means for supporting the upper side of the lagging in its passage from the forward to the rear supporting-roll; substantially as described.
15. In apparatus for corrugating paper, the combination of an endless corrugated lagging composed of a plurality of endless metal bands and a plurality of longitudinally fluted or corrugated lags secured to said bands side by side transversely of the machine, supporting rolls or drums for said lagging at the opposite ends of the machine, corrugated supporting-rollers meshing with the under side of said lagging in its passage from the rearward to the forward supporting roll or drum, and means for adjusting the supports of said lagging to accommodate expansion and contraction of the metal bands; substantially as described.
16. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, and a supporting heater-plate located immediately beneath said lagging in its passage from the forward to the rearward supporting-roll and provided with longitudinal strips of antifriction metal projecting above the surface of said heater and upon which the lagging rests and travels in its rearward passage; substantially as described.
17. In apparatus for corrugating paper, the combination of an endless corrugated lagging, supporting rolls or drums therefor at the opposite ends of the machine, and a shield for said lagging in its passage over one of said rolls; substantially as described.
18. In apparatus for corrugating paper, the endless corrugated lagging, composed of the plurality of metal bands C and the longitudinally fluted or corrugated lags D secured thereto side by side transversely of the machine; substantially as described.
19. In apparatus for corrugating paper, the plurality of metal bands C and the longitudinally fluted or corrugated lags D riveted to said bands, in combination with the rolls or drums A B for supporting said lagging and provided with the circumferential grooves *a* for the passage of the heads of the rivets by which the lags are secured to the bands; substantially as described.
20. In apparatus for corrugating paper, the combination of the endless corrugated lagging composed of the metal bands C and lags D, the supporting rolls or drums A B for said lagging at the opposite ends of the machine, the corrugated supporting-rollers E for the under side of said lagging, the corrugating-roller I meshing with the upper surface of the lagging, the corrugated roller J located above and meshing with the roller I, a support for the lagging beneath the roller I, and the heater-plates F K adjacent the lagging between the roller I and supporting-roll B; substantially as described.
21. In apparatus for corrugating paper, the combination of the endless corrugated lagging composed of the metal bands C and lags D, the supporting rolls or drums A B for said lagging at the opposite ends of the machine, the corrugated supporting-rollers E for the under side of said lagging, the corrugating-roller I meshing with the upper surface of the lagging, the corrugated roller J located above and meshing with the roller I, a support for the lagging beneath the roller I, the paste-box M and paste-roll L in rear of the roller I, and the heater-plates F K adjacent the lagging in rear of the roll L; substantially as described.
22. In apparatus for corrugating paper, the combination, with the endless corrugated lagging D and its supports, of the small corrugating-roller I, the larger corrugated roller J meshing therewith, the supporting-block H beneath the roller I, and the endless chain of rollers G passing around said block and supporting the lagging beneath the roller I, substantially as described.
23. In apparatus for corrugating paper, the combination, with the endless corrugated lagging D and its supporting rolls or drums A B, of the corrugated supporting-rollers E meshing with said lagging in its passage from the rear roller B to the forward roller A; substantially as described.
24. In apparatus for corrugating paper, the combination, with the endless corrugated lagging D and its supports, of the corrugating-roller I meshing with said lagging in its passage rearward from the supporting-roll A, the paste-box M and paste-roll L in rear of the roller I, and the plate N located immediately above the lagging D between the roller I and paste-roll L; substantially as described.

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Witnesses:

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