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PATENTED FEB. 14, 1905.

J. N. HAHN.

CORRUGATED PAPER BOARD APPARATUS.

APPLICATION FILED JUNE 16, 1904.

FIG. 1.

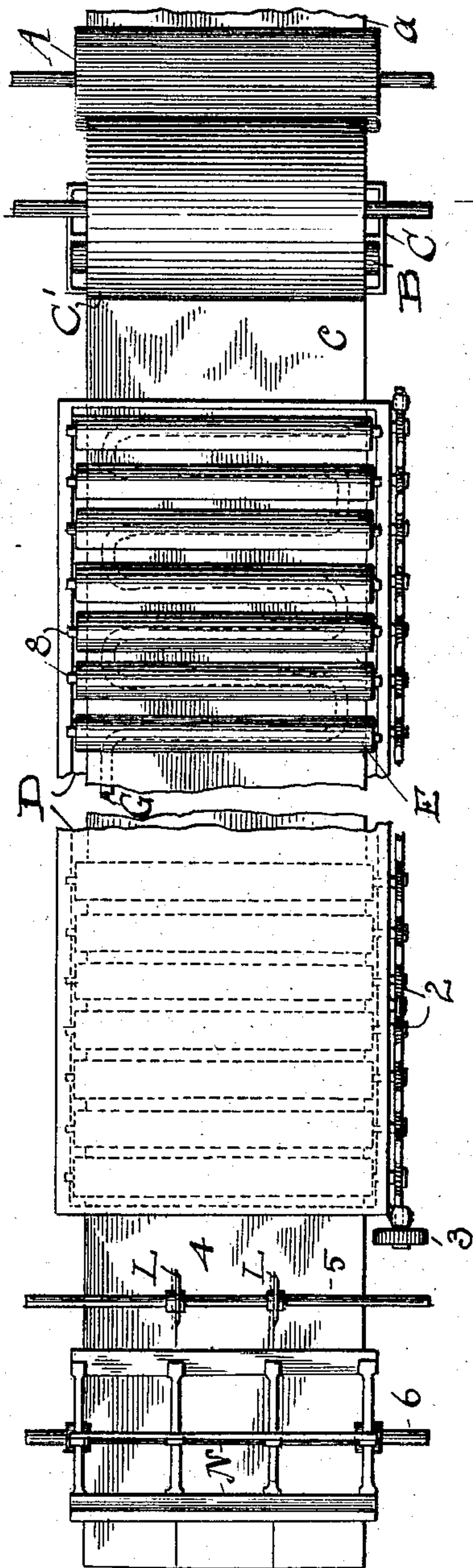
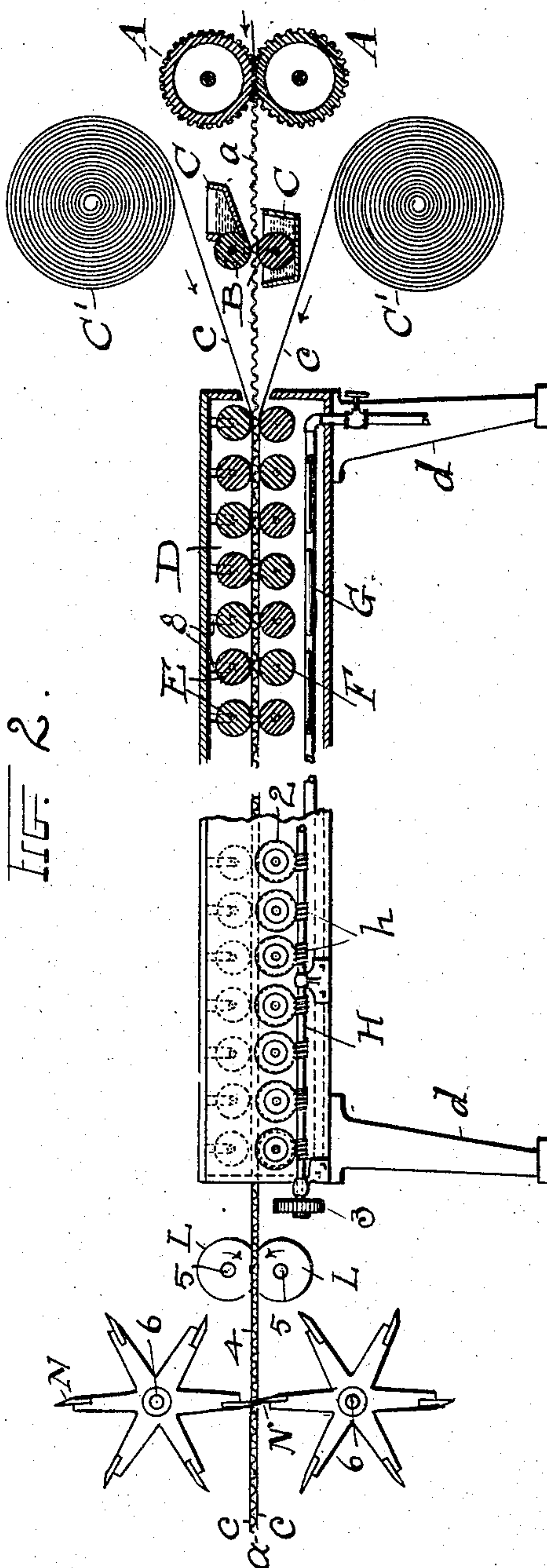


FIG. 2.



WITNESSES:

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## CORRUGATED-PAPER-BOARD APPARATUS.

SPECIFICATION forming part of Letters Patent No. 782,558, dated February 14, 1905.

Application filed June 16, 1904. Serial No. 212,845.

*To all whom it may concern:*

Be it known that I, JOHN N. HAHN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Corrugated-Paper-Board Apparatus; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of corrugated paper-board; and the invention consists in an apparatus or machine which is adapted by successive steps to corrugate, paste, face, dry, and sever the board into sheets or pieces of suitable sizes, all substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the machine, and Fig. 2 is an elevation thereof, partly in section, and both views are broken out at the middle across the drying-chamber.

In the machine or apparatus thus shown I begin with a set or pair of paper-corrugating rolls A, constructed to corrugate the middle or body sheet of paper *a* transversely, and the said corrugated body or sheet being carried along passes next between two pasting-rolls B, one directly over the other and each provided with its own paste-receptacle C. These rolls are arranged to merely touch the tops of the corrugations or ribs and deposit thereon all the paste needed to secure the facings *c*. These facings or faces of paper are mechanically drawn from their respective rolls C, with the body-sheet *a* between them, and entering the drier or drying-chamber D at its end the three sheets pass next between the presser-rolls E and F in said chamber, respectively, in parallel series, one above the other, and with the paper-board between them. The said rolls are located one directly over the other and spaced apart such distance as to exert a comparatively slight but yet sufficient pressure upon the board to make complete the union of the faces *b* with the corrugated body *a*; but the pressure thus exerted should in no case tend to crush or flatten the corrugations. On the other hand, I de-

pend on the large number of these rolls acting in unison and each doing a small part in turn successively as the paste dries to make effective the adhesion by the time the board leaves the drier-chamber. The said chamber may have any suitable length—say thirty to fifty feet—and is shown as of box shape and closed all around, with the rolls E and F mounted in its sides, and is provided with steam-pipes G in its bottom for furnishing the necessary heat. Other sources or kinds of heat might be used; but I find that steam heat is most easily controlled and is uniform and regular throughout the chamber and can be made more or less intense, as conditions may require. I might subdivide the chamber transversely and have more heat in one end than in the other, if preferred.

The upper series of rolls require no direct actuation, but are idlers depending on the traveling paper-board, with which they contact, for their rotation; but the lower carrying-rolls have pinions or gears 2 on their spindles or axles outside the box or casing D, which are each engaged by a worm *h* on a shaft H, running the full length of the drier-chamber. This shaft has a gear 3 at one end, with which power connection is made, and thus an even rate of speed is imparted to all said rolls F through said worm-and-gear mechanism, and the contact through or with the paper-board is uniform and the travel is continuous. Either of the two series of rolls may have the direct mechanical actuation and the other become an idler.

When the dried product or board 4 reaches the issuing end of the drier, it is stiff as a board and cannot be handled by bending or rolling, and therefore is required to be cut into sizes according to particular needs to complete manufacture. These sizes depend on the use to be made of the said pieces. In the present machine I employ two sets of longitudinal slitting cutters or disks L, preferably mounted on shafts 5 and running in advance of the transverse cutters N, mounted on shafts 6. The latter cutters are shown here as of the real pattern and have blades or knives N compassing the full width of board 4 and arranged to operate in such way that the successive blades



on opposite sides meet and sever the board with a straight transverse cut. This or any equivalent shearing or transversely-cutting arrangement may be adopted. One or both  
 5 sides of the board may be faced, and the handling of both products proceeds in the same manner practically.

The drying-chamber D stands preferably on legs *d* and is comparatively shallow in depth,  
 10 and the board 4 is fed along by the multiple rolls E and F to the two sets of cutters L and N, which may receive the board without other or intervening support, as shown.

Now the idea of this invention is to produce  
 15 a perfect and complete product in the smallest space and in the shortest time practicable. Heretofore in all manufactures of this kind familiar to me there has been encountered the apparently insurmountable difficulty of blistering and imperfect adhesion of the paper  
 20 sheets upon the corrugated body. Contraction of the corrugations from the moistened state by the fresh paste to the dried state has had much to do with this, and hence I have provided a series of idler rolls E and power-driven  
 25 or feed rolls F, suitably spaced apart on both sides of the triple sheet of stock or board and from each other in the same series to do their work progressively as the stock dries and from  
 30 step to step in the drying. Blisters will inevitably develop here and there, and as this occurs in the drying they are pressed or ironed out by the succeeding rolls until at last the stock becomes so dry that no further blistering or  
 35 separation can occur and both outer sheets are evenly and perfectly adhered to the corrugation. A rapid drying of the stock is possible only by successive pressures exerted at suitable intervals through rolls or their equivalent,  
 40 and it is this feature, especially, of drying and pressing at intervals and successively from the moist to the dry state and on both sides alike which constitutes the value and novelty of my improved means for producing  
 45 paper-board or double-faced corrugated paper. Obviously if the travel of the paper be slow through the drying-chamber a shorter chamber may be used than with the same heat and a greater speed of travel; but experience  
 50 has shown that the drying process cannot safely exceed a comparatively slow rate and that there must be pressing contact every so often as this goes on or the work will be defective. Hence I have found a fifty-foot drier  
 55 better than one materially shorter and with rolls from end to end, practically as shown. The upper series of rolls are supported in vertical slots 8, in which they can yield more or less and exert a gravity or yielding pressure.  
 60 By observing the product the operator will be able to regulate both the volume of heat and the speed of travel. By this construction also each roll is absolutely independent of all the others and makes its own contact with its own  
 65 weight.

What I claim is—

1. In the manufacture of corrugated paper-board, a drier-chamber, a series of actuated rolls and a series of idler-rolls, and the rolls of both series arranged one directly over the  
 70 other, and mechanism to drive the actuated series of rolls continuously and uniformly, substantially as described.

2. A drier-chamber for corrugated paper-board and two series of rolls arranged transversely of said chamber one directly over the  
 75 other vertically, a continuous drive mechanism engaging one of said series of rolls and the rolls in the other series supported independently of each other and free to rise and  
 80 fall, substantially as described.

3. In the manufacture of corrugated paper-board, a drier-chamber and two series of transversely-disposed rolls having one roll arranged directly over the other in the same  
 85 vertical plane and uniform spaces between the rolls from end to end of said chamber, and means to impart a continuous rotation to one of said rolls and cause uninterrupted travel of the paper-board through said chamber, substantially as described.  
 90

4. In the manufacture of corrugated paper-board, means to corrugate the middle sheet of paper and to paste the corrugations thereof and means to face the said corrugated sheet  
 95 on both sides, in combination with a drying-chamber and successive upper and lower rolls of uniform size in said chamber in parallel series, one of said series of rolls having power-actuating connections and the other series of  
 100 rolls separate from each other, substantially as described.

5. In the manufacture of corrugated paper-board, means to paste the corrugated sheet of paper and to lay facing-paper on both sides of  
 105 said sheet, in combination with a drier-chamber, a series of free upper idler-rolls and lower power-actuated feed-rolls in series opposite said idler-rolls in said chamber and adapted to engage the said board on opposite  
 110 sides and convey the same through the drier in a continuous movement, substantially as described.

6. In the manufacture of corrugated paper-board, a suitable drying-chamber and two series of rolls in said chamber one above the  
 115 other between which the product is conveyed, gears on the lower of said rolls and a worm drive-shaft engaging said gears, and said upper rolls having independent gravity contact  
 120 with the paper-board, substantially as described.

7. In the manufacture of corrugated paper-board, a drying-chamber, rolls in two series one above the other from end to end of said  
 125 chamber by which the board is carried along, in combination with upper and lower cutters outside said chamber arranged to divide the paper longitudinally and transversely into pieces, substantially as described.  
 130

8. In the manufacture of corrugated paper-  
board, a chamber and two series of rolls be-  
tween which the board is carried forward, in  
combination with disk-shaped cutters to di-  
5 vide the paper longitudinally, and transverse  
cutters for said board succeeding said disk-  
shaped cutters, substantially as described.

In testimony whereof I sign this specifica-  
tion in the presence of two witnesses.

JOHN N. HAHN.

Witnesses:

R. B. MOSER,  
C. A. SELL.