

July 18, 1939.

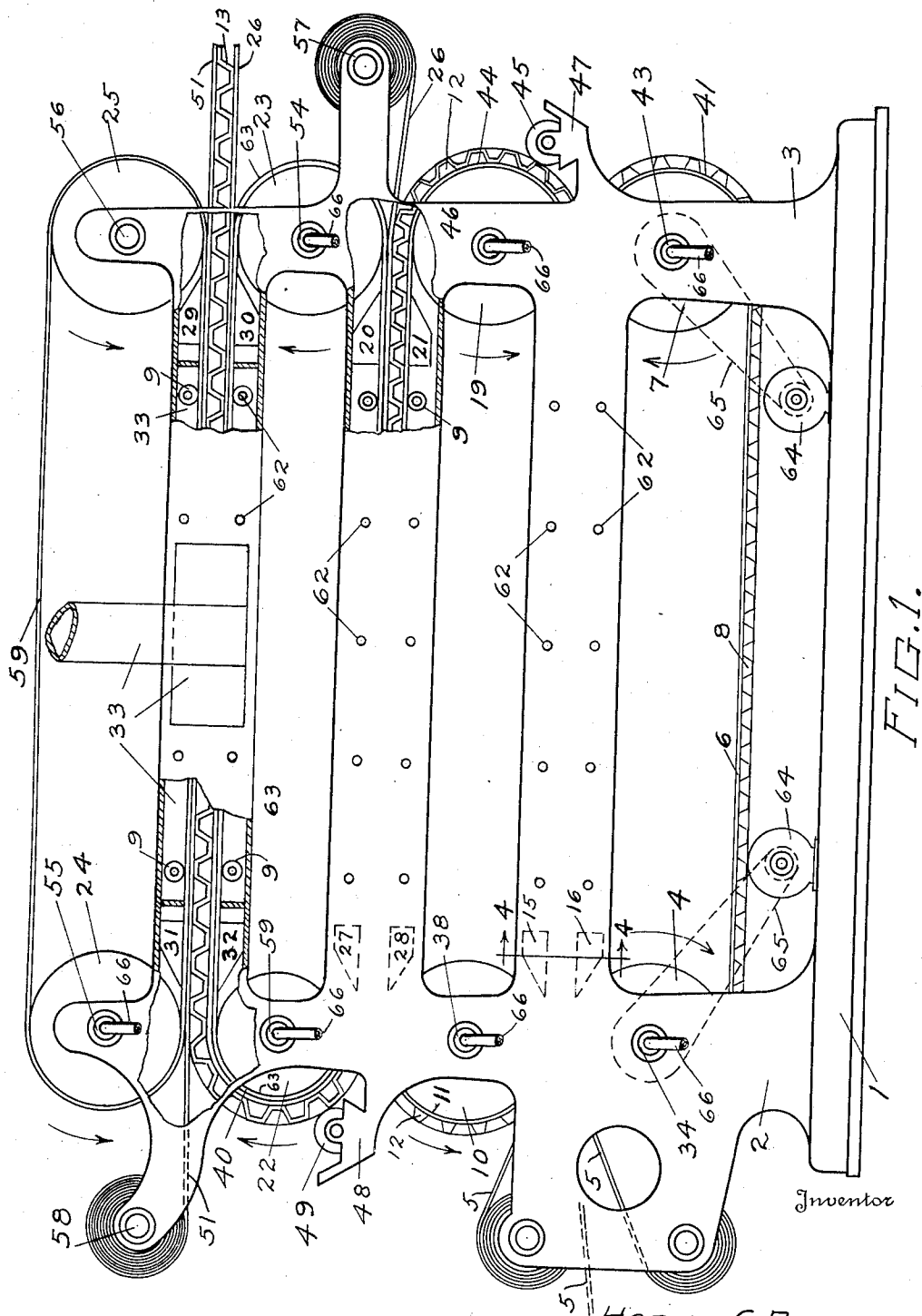
H. G. BURRILL

2,166,749

MACHINE FOR UNDULATINGLY CORRUGATING CARDBOARD

Filed Dec. 22, 1937

4 Sheets-Sheet 1



Inventor

HAROLD G. BURRILL.

BY *Howard J. Whelan*, Attorney

July 18, 1939.

H. G. BURRILL

2,166,749

MACHINE FOR UNDULATINGLY CORRUGATING CARDBOARD

Filed Dec. 22, 1937

4 Sheets-Sheet 2

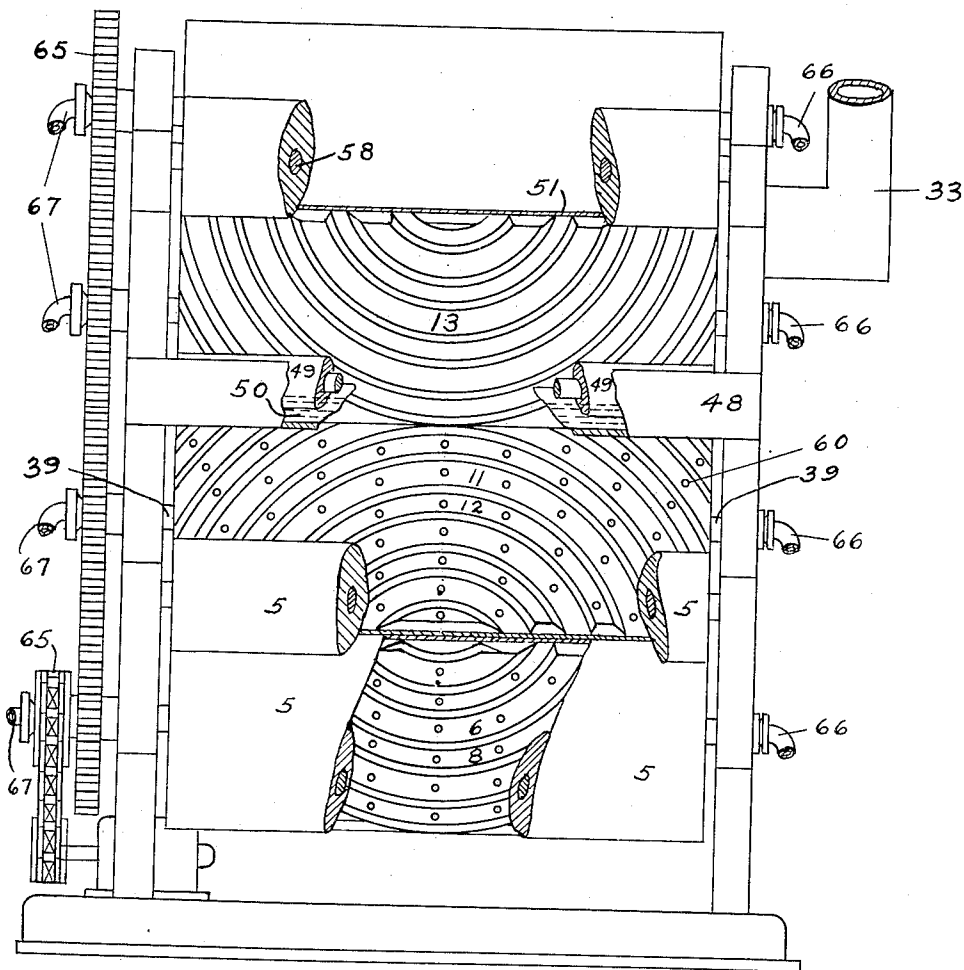


FIG. 2.

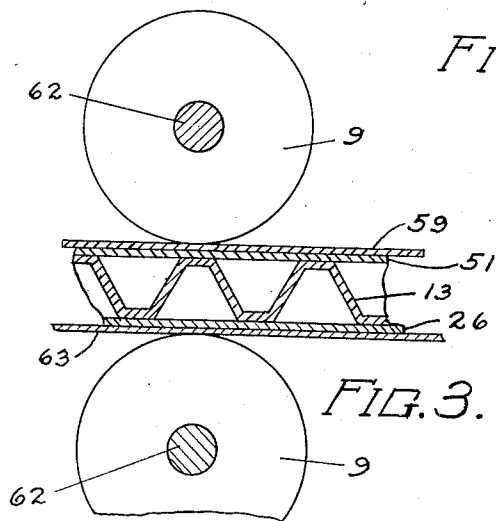


FIG. 3.

Inventor

HAROLD G. BURRILL

By *Howard J. Whelan.*

Attorney

July 18, 1939.

H. G. BURRILL

2,166,749

MACHINE FOR UNDULATINGLY CORRUGATING CARDBOARD

Filed Dec. 22, 1937

4 Sheets-Sheet 3

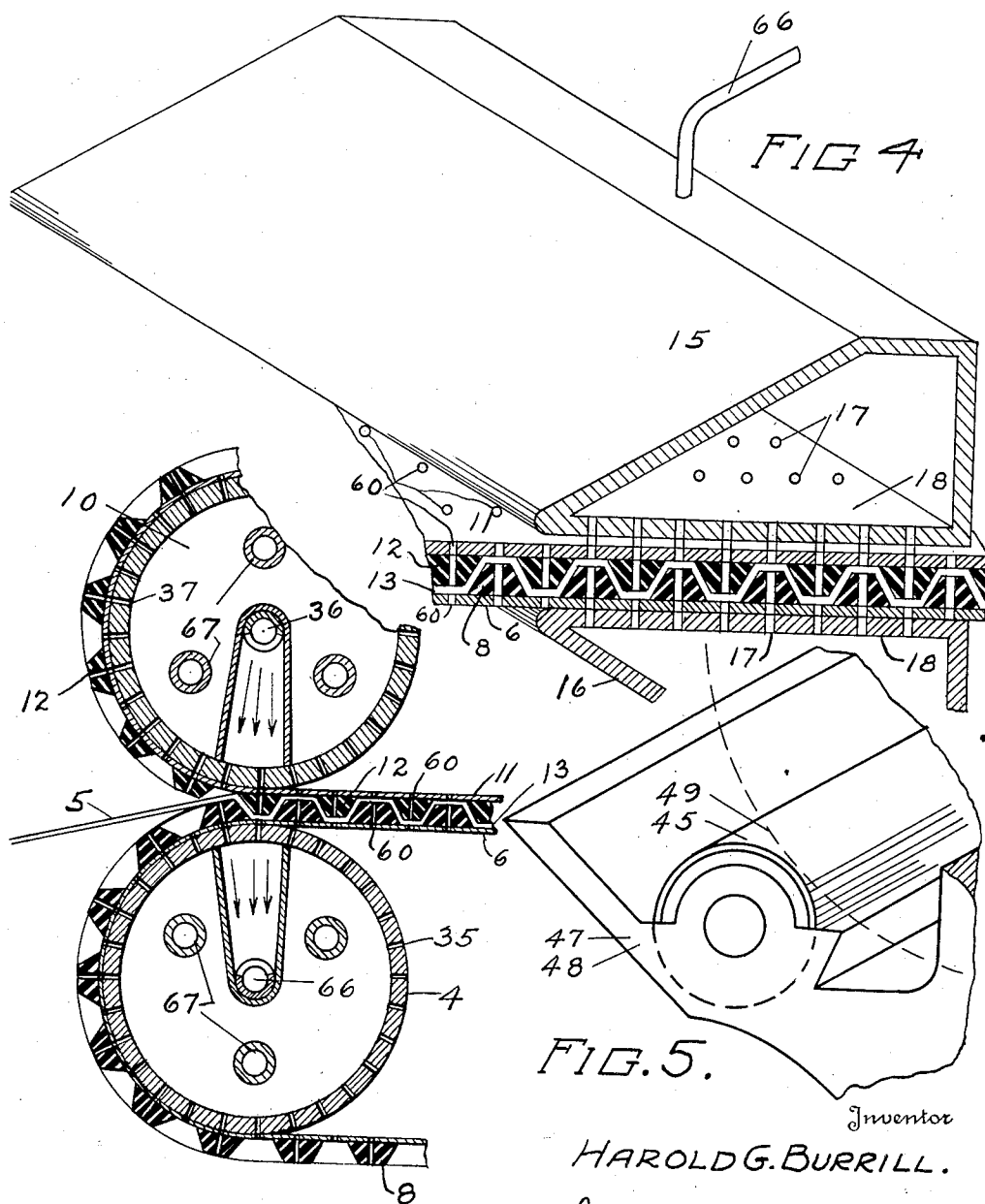


FIG. 5.

FIG. 6.

Inventor

HAROLD G. BURRILL.

By *Howard J. Whelan.*

Attorney

July 18, 1939.

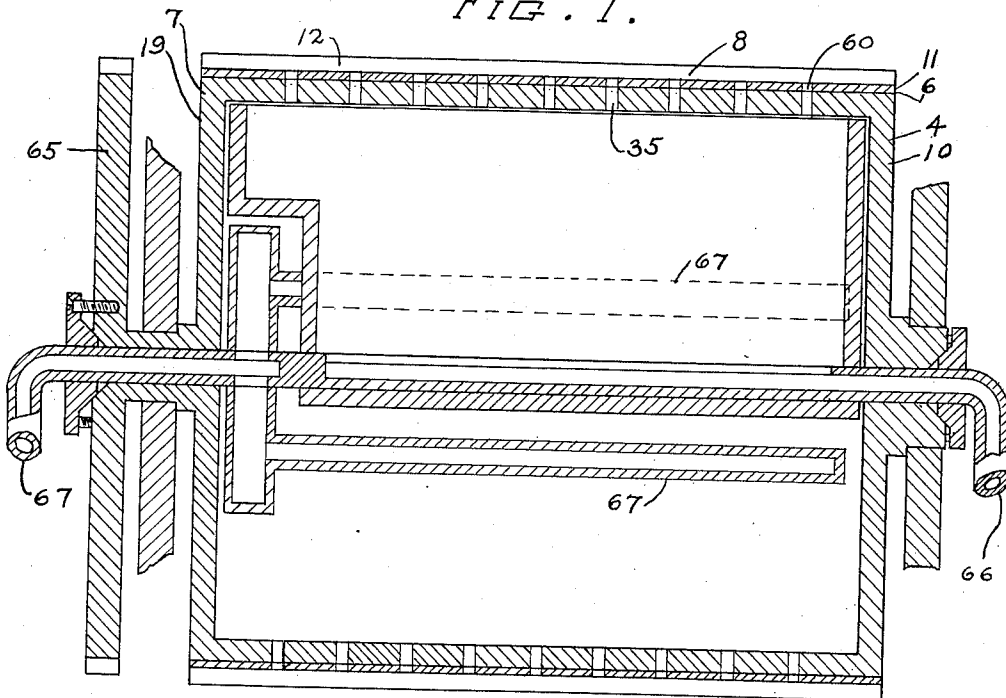
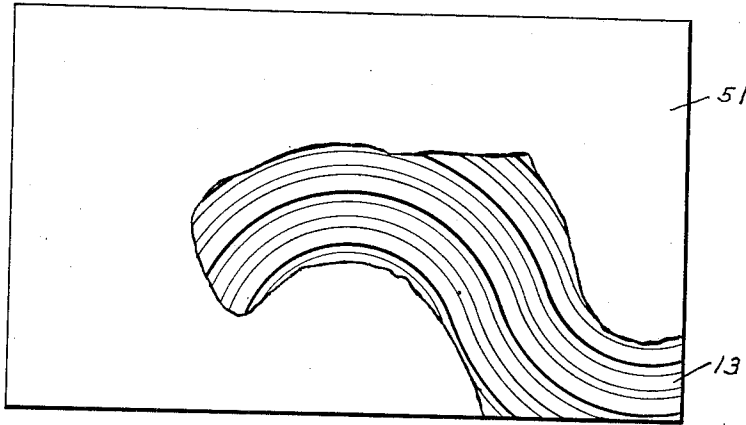
H. G. BURRILL

2,166,749

MACHINE FOR UNDULATINGLY CORRUGATING CARDBOARD

Filed Dec. 22, 1937.

4 Sheets-Sheet 4



Inventor

HAROLD G. BURRILL.

By Howard J. Whelan.

Attorney

UNITED STATES PATENT OFFICE

2,166,749

MACHINE FOR UNDULATINGLY
CORRUGATING CARDBOARD

Harold G. Burrill, Baltimore, Md.

Application December 22, 1937, Serial No. 181,213

7 Claims. (Cl. 154—32)

This invention refers to paper making machinery and more particularly to the type applicable to the manufacture of corrugated or ribbed cardboard. It has among its objects to provide a machine for making corrugated cardboard that will manufacture a more efficient type of cardboard, that will provide same with reinforcing liners of paper; that will cure the cardboard as it passes through same, and that will enable the whole process to be accomplished in the one machine. Another object is to have a machine capable of handling several sheets of corrugating cardboard at a time. Other objects will become apparent as the invention is more fully set forth.

The machine embodying this invention receives dry paper off the roll and moistens it; or it may receive wet sheet of cardboard or medium to be corrugated, from the Fourdrinier or wet end of a paper machine, without going through the driers. It carries same into its own rolls or rollers where steel carrier belts with rubber or other elastic moulding matrix cross-pieces press into the soft cardboard or medium and impress it with the corrugated form obtained through the use of the belt mentioned. As the medium passes through the first sets of rolls, the moulding pieces mounted on metallic or fabric carrier belts press into the medium surfaces above and below. The use of air under pressure or vacuum keeps the carrier belts and medium suitably placed and functioning in cooperation with vacuum or suction used on the rolls. This serves to make the impression more distinct on the medium, as well as remove excess moisture and hold same in place while drying. The machine, preferably uses a wave form of corrugation to increase its practical applicability and avoid crushing possibilities that tend to come up in the use of other forms of corrugation. After the corrugations are formed in the medium, the machine is arranged to paste or glue additional liners on the crests of the corrugations and thereby stiffen same and keep them more rigidly in place. In addition, the feeding of several strands of medium into the machine will permit several layers of corrugated cardboard to be rolled together, instead of the single layer now used. The corrugations used are of a wavy type which strengthens the cardboard in all directions, instead of in one direction, as in the existing corrugated cardboard.

In the drawings which illustrate an embodiment of this invention:

Figure 1 is a side elevation of a cardboard cor-

rugating machine partly in section, embodying the invention,

Figure 2 is an end view of Figure 1, partly in section,

Figure 3 is an enlarged section through the auxiliary rollers of the machine shown in Figure 1,

Figure 4 is a section along the line 4—4 of Figure 1, showing the construction of the air box,

Figure 5 is a detail in perspective of the glue "rule" and trough with bracket,

Figure 6 is a sectional view through a pair of rolls to indicate the manner of forming the corrugations on the sheet of cardboard,

Figure 7 is a detail of the cardboard after corrugation in the machine,

Figure 8 is a section through one of the drying rollers having a vacuum and steam arrangement.

Similar reference characters refer to similar parts throughout the drawings.

In the construction indicated in the drawings 1 represents the foundation or base of a corrugating cardboard machine, having front and rear side frames 2 and 3, respectively supporting and holding the various rolls or rollers for carrying and making the corrugated cardboard. These rolls or rollers include a primary one 4 which is shown in section in Figure 6 that serve to take the soft plain cardboard 5 and carry same on its flexible carrier belt 6 perforated at 60, to the rear primary roller 7. This primary carrier belt has a series of perforated rubber cross strips 8, formed as indicated in the drawings, for impressing the cardboard with the desired corrugations 13. A row of pressure rollers 9 are arranged under the primary carrier belt to carry same straight and pressed against the cardboard strip. The secondary roll 10 is mounted in the frame 2, and located adjacent the primary roll 4 and meshes with carrier belt 6. It has a secondary flexible carrier belt 11, with openings 60 and perforated rubber cross-strips 12, adapted to impress into the corrugating medium 13 in the cardboard 5 in cooperative conjunction with the rubber cross strips 8 in the first mentioned carrier belt. This enables the cardboard to be symmetrically impressed or moulded simultaneously on both sides as it passes through the primary rolls 4 and 10. Also the carrier strips are kept in the corrugations as the cardboard is pressed between the auxiliary pressure rolls 9, placed above and below the travelling belt. These last mentioned rolls have their axes 62 in the machine frames. The chambers 15 and 16,

placed on the frame above and below the belts and cardboard respectively, that leave the rolls 4 and 10, provide air under pressure to blow through the holes 17 in their walls 18. This air drives out moisture from the corrugated cardboard, thereby forming and setting it sufficiently to carry it more easily through the machine. The carrier belts 6 and 11 bring the corrugated cardboard between them to the rear primary roller 7, and rear secondary roller 19. From thence the cardboard is carried around the external portion of the rear secondary roller 19 on its carrier belt 11, to the upper surface or level of the latter after passing between to the air chambers 20 and 21 respectively, situated above and below same. Roll 19 has incorporated within it a vacuum box suitably arranged. It acts on a corrugated medium in the corrugations of belt 11. Continuing, the sheet of moulded cardboard or medium is carried between the perforated cross-pieces of the carrier belt 11 to the front tertiary roller 22 which picks it up and bears it exteriorly to the tangential upper level, where the sheet passes along with liners attached, under its own strength to the rear tertiary roller 23. The calender rolls 24 and 25 press on it sufficiently to hold and force it along to the cutter or storage waiting to receive same. The auxiliary rollers 9 indicated on the upper levels for supporting the sheet or sheets of cardboard, are similar to those on the lower level and for similar purposes. Air boxes 27, are provided above the upper level of the carrier belt 11 in the front, and 28, under same. At the rear air boxes 29, above and 30 below the same carrier belt afford means for driving air pressure onto the finished sheet of cardboard. On the high-level on which the sheet of finished cardboard discharges, the air boxes 31 and 32 are provided at the front above and below as indicated, respectively. On this level is also arranged a curing chamber 33 for directing hot dry air through the corrugations of the board passing through the machine at this level.

The front primary roller 4 has a central shaft 34 for supporting and journalling it on the frame, which roller and shaft are both hollow, to permit moisture drawn or sucked in through holes 35 in the peripheral wall of this roller to be carried off into the pipes 66 passing through holes 36 in the shaft, through the latter to a vacuum engine suitably located in the plant. The adjacent and upper roller 10 has piping passing through similar holes 37 and 38 in its peripheral wall and shaft respectively, which serve to conduct air under pressure from the interior of the rollers and shaft outwards, connections being provided on the shaft 39 to enable this to be done. This causes the medium or sheet of cardboard to be held tight under suction towards the surface of the roller 4, and by the pressure from the secondary roller 10, which pressure and suction also act through the perforated carrier belts running on these rollers.

All of the air boxes are provided with holes 17 in their walls, through which streams of air continually blow onto the carriers and the sheets of cardboard passing between them. This is to dry the board and make it set or form in the carrier belt's moulds. The rear primary roller 7 is provided with holes 41 in its exterior wall and holes in its hollow shaft 43. The air in this roller is under pressure forcing the air outwardly. The rear secondary roller 19 is similarly provided with holes 44 in its roller and shaft

46 respectively to which suitable piping is connected. The air in this roller is under a vacuum and draws in the air and moisture, as well as keeps the carrier belt 11 and sheet of cardboard tight against this roller. A trough 47 of paste or glue is mounted adjacent this roller, to contain the fluid for gluing the paper liner 26 onto the face of the sheet of corrugated cardboard, a suitable brush or roll 45 dipping into the glue or paste and carrying it to the surface to be covered. A similar trough 48 with brush 49 adjacent the front tertiary roller 22 provides glue or paste for the other surface of the corrugated sheet. This roller 22 has holes 40 in its external wall and in its shaft 59, and arranged to act under a vacuum, and also provided with suitable heating means. The rear tertiary roller 23 is provided with similar holes and is heated through a hollow shaft 54 and provided with suitable heating means. The calender rolls 24 and 25 are provided with suitable heating means; their shafts 55 and 56 respectively are positioned and journalled in the frames 2 and 3.

The general operation of the machine is as follows: First the flat wet sheet of medium or cardboard to be corrugated is fed between the rollers 4 and 10 and pressed between carrier belts 9 and 11 into the spaces between the rubber cross pieces 8 and 12, forming a wavy corrugation. As the wet corrugated sheet is passed along, it is partially dried by the air flowing from the air boxes 15 and 16 and then pressed as it shrinks into the spaces more deeply as the carrier belts and sheet pass between the rolls at the first level. When the rear rollers 7 and 19 are reached, the air pressure flowing from the former against the corrugated sheet, and the vacuum in the latter, cause the sheet to go up the peripheral walls of roller 19 and between the rollers 19 and 23, continuing to the front portion of the machine again. At the same time, the paper liner 26 from the liner paper roll 57, is pushed in between the rollers 19 and 23 after getting a coating of glue from the tray 47 and brush 45, and becomes attached to upper surface of the sheet. It is then passed between the air chambers 29 and 30 to be partially dried by the air flowing from same, and made to stick in place securely. The auxiliary rolls 9 exert the necessary pressure to bring the liner in tighter contact with the surface of the sheet of corrugated cardboard. After, which, the liner and sheet are dried by the air flowing from the air chambers 27 and 28 as the cardboard is carried around on the vacuum roller 22. The brush 49 and glue 50 are used to apply adhesive to the other surface of the sheet and make ready for the attaching of a second liner paper 51 from the roll 58 as it passes between the tertiary roller 22 and the calender roll 24. The calender roll 24 is preferably provided with a continuous smooth belt 59 which also passes around the rear calender roll 25 as shown. As the cardboard is now lined on both sides with liner papers and proceeds towards the rear rolls, it passes between the air boxes 31 and 32 and dried by the air flowing on both sides of same. The air from the curing chambers 33 is then passed through and cures the cardboard as it leaves the rolls 22 and 24 on this level so that, as it reaches the rear rollers 23 and 25 it is ready for the cutter or storage. The process continues indefinitely, or as long as it is desired to run the machine for the purpose. The belt 63 carries the corrugated cardboard between rollers 22 and 23. Vac-

uum or pressure piping is denoted by character 66 and steam piping by 67.

The auxiliary rolls 9 have their axles 62 in the portions of the frame that supports the main rollers. The various rollers and rolls are powered by suitable motor mechanism 64. These through the gearing 65 of conventional form connect the moving parts to perform the mechanical operating functions required of them. They are not specially described on the assumption that such will be appreciated fully without further detailed outline, other than already given or shown on the drawings.

While but one form of the invention is indicated in the drawings, it is not desired to limit this application for patent to this particular construction, other than limited by the prior art, as it is understood that other constructions could be used that would employ the same principles and come within the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. A machine for corrugating mediums, comprising in combination, a frame, a plurality of rollers on the frame for processing the medium, carriers for conveying the medium between the rollers, cross-pieces on the carriers for corrugating the mediums thereon by their pressure on the upper and under surfaces thereof, means connected with the rollers for removing moisture from the medium, a plurality of auxiliary rolls for supporting the carriers and causing the medium to be additionally moulded thereby, as the moisture is removed therefrom, a plurality of rollers on the frame for adding reinforcing materials to the mediums after corrugation, calender rollers for finishing the medium after reinforcing, and curing chamber means mounted on the frame arranged to surround the medium passing to the calender rolls, means for operating the rollers and carriers.

2. A machine for corrugating mediums, comprising in combination, a frame, a plurality of rollers perforated in their peripheral walls for exerting pressure and suction on the mediums, said rollers being mounted on the frame, undulating toothed carriers operated by said rollers for conveying the mediums between the rollers, and moulding the medium thereon, means for heating the rollers for removing the moisture in the mediums being conveyed on the carriers, a plurality of rolls for exerting pressure on the carriers and the mediums in between and increasing the molding pressure thereon as the mediums travel through the machine, a curing chamber on the machine for taking the mediums and processing same and completing the product of the machine, and means for operating the rollers and carriers.

3. A machine for corrugating mediums comprising in combination, a frame, a plurality of rolling members mounted rotatably on the frame, for processing the medium passing through the machine, a plurality of carriers for conveying the mediums from and to the said rolling members and having means thereon for creating a wavy form molding action of the undulating tooth on the mediums, said carriers being mounted on the frame and actuating cooperatively with the said rolling members, means for removing moisture from the mediums by air pressure and suction through the members mounted on the frame, a plurality of rolls for supporting the carriers and exerting pressure

thereon and the mediums passing therebetween, means for operating the rollers and carriers, calenders for finishing the corrugated mediums, and chamber facilities for curing the product.

4. A machine for corrugating mediums comprising in combination, a frame, a plurality of rolling members mounted rotatably on the frame, for processing the medium passing through the machine, a plurality of carriers for conveying the mediums from and to the said rolling members and having means thereon for creating a wavy form molding action of the undulating tooth on the mediums, said carriers being mounted on the frame and actuating cooperatively with the said rolling members, means for removing moisture from the mediums by air pressure and suction through the members mounted on the frame, a plurality of rolls for supporting the carriers and exerting pressure thereon and the medium passing therebetween, means for operating the rollers and carriers, calenders for finishing the corrugated mediums, and chamber facilities for curing the product, a plurality of air boxes for providing air pressure and suction through the carriers on the said mediums and mounted on the said frame, and independent of the aforementioned means for removing moisture, and a curing chamber mounted on the frame encompassing a portion of said carriers.

5. A machine of the class described for corrugating cardboard, comprising in combination, a plurality of primary rollers having perforations in the peripheral walls thereof, a plurality of carriers operatably mounted and connected with said primary rollers for conveying cardboard thereon, wavy-form strips mounted on the carriers for molding the cardboard transversely in wavy-form corrugations, secondary rollers having perforated peripheral walls, carriers connected with said rollers adapted to cooperatively align with the first mentioned carriers, wavy-form strips mounted on the last mentioned carriers for molding the cardboard cooperatively with the first mentioned wavy form strips, a plurality of tertiary rollers having perforated walls, carriers mounted on and operated by the said tertiary rollers and adapted to cooperatively function with the carriers on the secondary rollers and convey and mold the cardboard thereon, a frame for carrying the said rollers, and means for operating the rollers, and means for providing air pressure and suction at the perforations in the said rollers.

6. A machine of the class described for corrugating cardboard, comprising in combination, a plurality of primary rollers having perforations in the peripheral walls thereof, a plurality of carriers operatably mounted and connected with said primary rollers for conveying cardboard thereon, wavy-form strips mounted on the carriers for molding the cardboard transversely in wavy-form corrugations, secondary rollers having perforated peripheral walls, carriers connected with said rollers adapted to cooperatively align with the first mentioned carriers, wavy-form strips mounted on the last mentioned carriers for molding the cardboard cooperatively with the first mentioned wavy-form strips, a plurality of tertiary rollers having perforated walls, carriers mounted on and operated by the said tertiary rollers and adapted to cooperatively function with the carriers on the secondary rollers and convey the mold and cardboard thereon, a frame for carrying the said rollers, means for

operating the rollers, means for providing air pressure and suction at the perforations in the said rollers, a plurality of rolls for carrying the carriers and cooperatively exert pressure to bring
 5 them close together against the cardboard being processed therebetween, a plurality of rollers for providing reinforcement to the corrugated cardboard passing from the aforementioned carriers, and means for supporting the rolls and the last
 10 mentioned rollers.

7. A machine of the class described for corrugating cardboard, comprising in combination, a plurality of primary rollers having perforations in the peripheral walls thereof, a plurality of
 15 carriers operatably mounted and connected with said primary rollers for conveying cardboard thereon, wavy-form strips mounted on the carriers for molding the cardboard transversely in wavy-form corrugations, secondary rollers having perforated peripheral walls, carriers connected
 20 with said rollers adapted to cooperatively align with the first mentioned carriers, wavy-form strips mounted on the last mentioned car-

riers for molding the cardboard cooperatively with the first mentioned wavy-form strips, a plurality of tertiary rollers having perforated walls, carriers mounted on and operated by the said
 5 tertiary rollers and adapted to cooperatively function with the carriers on the secondary rollers and convey and mold the cardboard thereon, a frame for carrying the said rollers, means for operating the rollers, means for providing air pressure and suction at the perforations in the
 10 said rollers, a plurality of rolls for carrying the carriers and cooperatively exert pressure to bring them close together against the cardboard being processed therebetween, a plurality of rollers for providing reinforcement to the corrugated cardboard passing from the aforementioned carriers,
 15 and means for supporting the rolls and the last mentioned rollers, air chamber means for curing the reinforced corrugated cardboard, calenders for finishing said finished cardboard, and means
 20 for supporting the air chamber means, and calenders.

HAROLD G. BURRILL.