

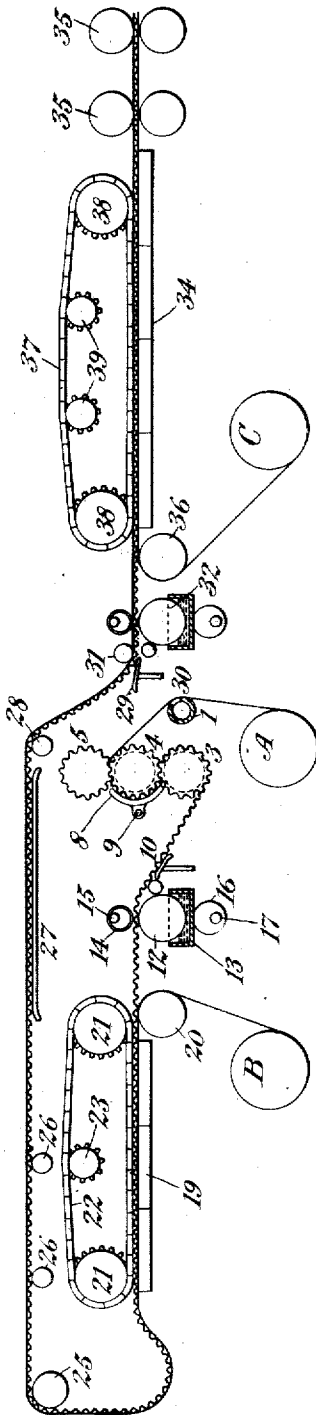
T. E. RAFFEL.  
 MACHINE FOR MANUFACTURING DOUBLE FACED CORRUGATED BOARD.  
 APPLICATION FILED JUNE 26, 1914.

1,146,771.

Patented July 13, 1915.

3 SHEETS—SHEET 1.

Fig. 1



Witnesses  
 Chas. D. King  
 Raymond M. Case

Inventor  
 Tobias E. Raffel  
 By his Attorney  
 Lester D. Dillenkofer

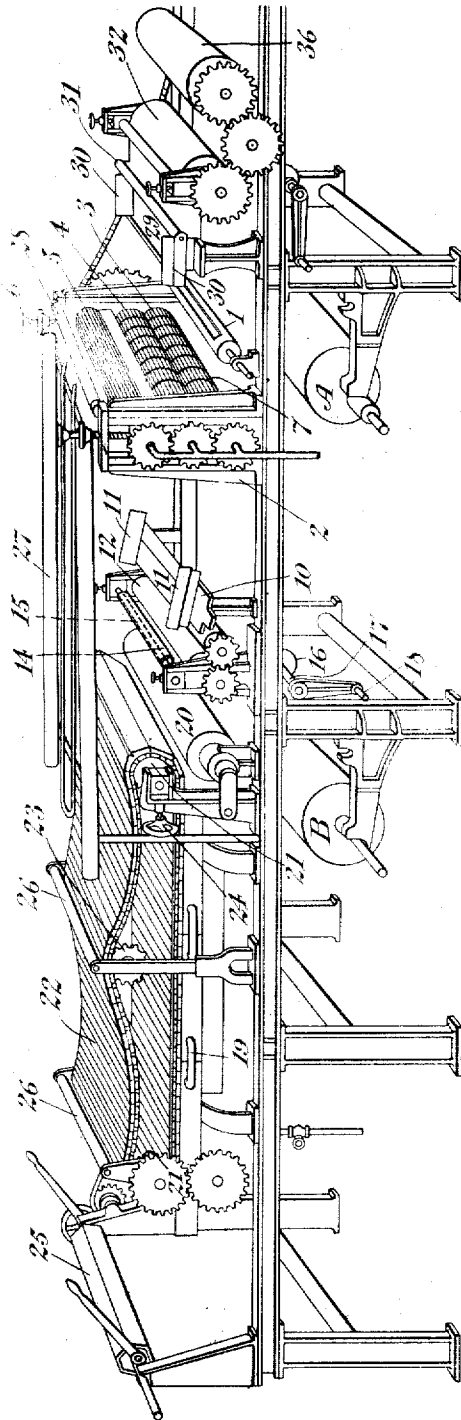
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3 SHEETS—SHEET 2.

Fig. 2



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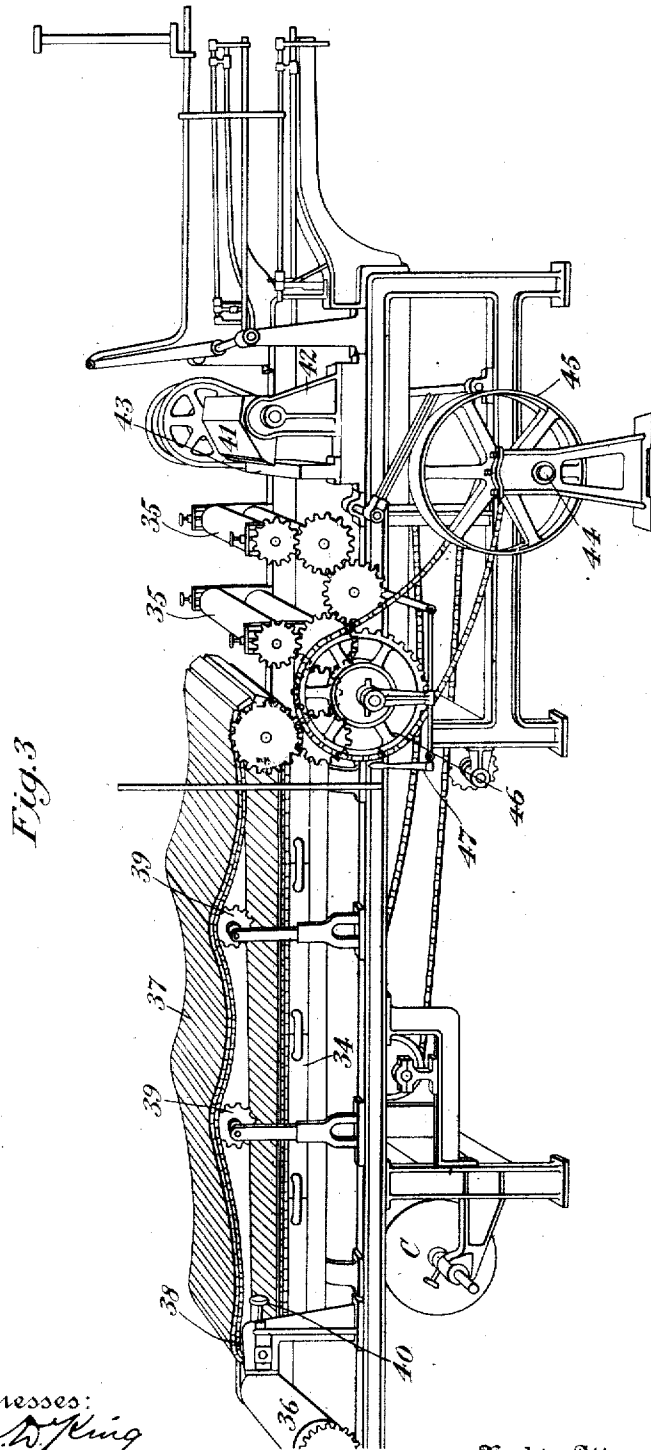


Fig. 3

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*Leester D. Dutton*

# UNITED STATES PATENT OFFICE.

TOBIAS E. RAFFEL, OF NEW YORK, N. Y., ASSIGNOR TO PAPER WORKING MACHINES COMPANY, A CORPORATION OF NEW YORK.

MACHINE FOR MANUFACTURING DOUBLE-FACED CORRUGATED BOARD.

1,146,771.

Specification of Letters Patent.

Patented July 13, 1915.

Application filed June 26, 1914. Serial No. 847,399.

*To all whom it may concern:*

Be it known that I, TOBIAS E. RAFFEL, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Machines for Manufacturing Double-Faced Corrugated Board, of which the following is a specification.

This invention relates to improvements in the manufacture of double-faced corrugated paper board and more particularly to an improved machine for producing corrugations in a sheet of paper and applying facing sheets to both sides of the corrugated sheet.

Double-faced board is a product consisting of a sheet of corrugated paper smoothly faced on both sides with sheets of plain paper. It is ordinarily manufactured by applying, in a separate machine, a second facing to previously formed "single faced" corrugated paper. Attempts have been made to produce the corrugations and apply both facings in a single machine. The machines heretofore employed have generally operated to simultaneously affix the two facings to the corrugated sheet but owing to the difficulty in such mode of operation, of smoothly and firmly applying both facings without crushing or distorting the intermediate corrugations, the product has not been entirely satisfactory. According to my invention I overcome these difficulties by providing a continuously operating machine which is organized to operate, in a continuous series of steps, to first corrugate the intermediate sheet then to successively apply the two facings thereto and finally to cut the board into pieces of desired lengths.

The essential feature of the invention herein claimed resides in the provision, in a machine of the character specified, of a new combination of elements with a new mode of operation whereby the two facing sheets are applied, one after the other, to the corrugated sheet and resulting in the manufacture of a superior product.

In the accompanying drawings, forming a part of the specification, Figure 1 is a diagrammatic side view of a machine embodying by invention. Fig. 2 is an elevation in perspective of the front section of the machine, comprising the corrugating mechanism and the mechanism for applying the first facing sheet, and Fig. 3 is an elevation

in perspective of the rear section, comprising the mechanism for applying the second facing sheet and the cutting mechanism. Figs. 2 and 3 taken together constitute a perspective of the complete machine.

The machine is designed to operate continuously and it comprises a mechanism for drawing a strip of paper from a supply roll and producing corrugations therein; a mechanism for applying adhesive to the corrugations on the under side of the strip; a mechanism for advancing the corrugated strip with its under side in contact with a facing strip over a stationary heater, whereby said strips are united and dried; guiding means for reversing the single faced strip; means for drawing said strip with its unfaced side downward, in contact with a second facing strip over a second stationary heater and under the ironing influence of a series of presser-plates traveling in the direction of motion of the paper but at a relatively slower surface speed; and a rotary cutting mechanism for severing pieces of desired lengths from the board.

Referring to the drawings, A is a supply roll from which the paper to be corrugated is led over a stationary cylinder steam box 1, whereby it is slightly dampened or tempered, and then between the rolls of a suitable corrugating mechanism. As illustrated in the drawings said mechanism is mounted in standards 2, and comprises preferably three co-acting corrugated rolls 3, 4, and 5 which are heated by steam or other suitable medium, and are borne in vertically movable bearings. Adjusting devices 6, acting on said bearings, are provided to afford regulation of the pressure between the rolls. The lower pair of rolls are each provided with a series of alined circumferential grooves 7. A set of curved fingers 8 are mounted on a cross piece 9 in position adjacent to and concentric with the face of the roll 4 and with their lower ends projecting into the grooves of the roll 3. The paper passes between the pairs of heated rolls 5 and 4 and 4 and 3 respectively whereby the corrugations are produced and set. In its passage the paper is guided from the roll 4 to the roll 3 by the fingers 8. The corrugated sheet is drawn forward over the table 10 provided with a pair of adjustable flanges 11 between which it is guided on to the paste-roll 12, rotating in a paste receptacle

13, whereby paste is applied to the crowns of the corrugations on the under side of the sheet. A hollow metal tube 14 hanging loosely on a cross-rod 15 is mounted directly above the paste-roll 12 and supplies sufficient gravity pressure to hold the paper firmly down on the paste roll without crushing the corrugations. The paste receptacle 13 is movable vertically toward and away from the paste-roll 12 and it rests on two cams 16 (one under each of its ends) carried on a spindle 17 which is provided with a handle 18. Normally the receptacle rests on the high part of the cams in position adjacent to the paste-roll but when the machine is idle and in order to keep the paste roll clean, the receptacle may be lowered away from the roll by merely turning the handle 18.

Mounted upon the frame of the machine, forward of the paste-roll 12, is a heated table 19 having a smooth face over which the corrugated sheet passes in contact with the first facing sheet while said sheets are being united and dried. The table is preferably formed of a series of chests having pipe connections for circulating steam or other suitable heating medium therethrough. At the front of the table and in line with its surface is a roller 20 which assists in drawing the first facing sheet from its supply roll B and advancing it upon the heater. This roller is preferably heated so as to heat the facing paper before it comes into contact with the corrugated sheet. Carried on sprockets 21, which are mounted directly above the opposite ends of the table 19, is an endless chain composed of a plurality of presser-plates 22 connected together by links. The lower run of the chain travels substantially parallel to the face of the table and serves to advance the corrugated strip and the facing strip with a slight pressure sufficient to hold them against the heated surface. On its upper run the chain travels over an idler 23. One of the pairs of sprockets 21 is supported in horizontally adjustable journal boxes which are provided with adjusting screws 24 whereby the pressure of the chain may be regulated. On leaving the heater the corrugated sheet having a first facing sheet firmly united thereto, is drawn over a guide roller 25 which serves to reverse the composite strip so as to bring its unfaced side downward. It then travels rearwardly over the small idlers 26, across the bridge 27, downwardly over the idler 28, across the table 29, having adjustable guide flanges 30, under the roll 31, and over the roll 32 of a paste applying mechanism, similar in details of construction to that heretofore described, whereby a coating of adhesive is supplied to the crowns of the corrugations on the unfaced lower side of the strip. If desired the strip may be carried

under the base of the machine instead of over the top as described.

Mounted adjacent to the paste applying mechanism 32, is a second heated table 34 which is similar to the table 19 but preferably of a greater length so as to thoroughly dry the completed product. Between the end of this table and the rotary cutter are mounted one or more pairs of adjustable rolls 35 which serve to draw the composite strip together with the second facing sheet, from its supply roll C, over the table 34 and under the traveling plates 37. The rolls 35 are preferably covered with a suitable material, such as rubber, to increase their grip on the paper without undue pressure thereon. At the forward end of the heater is disposed a roll 36 which aids in drawing the facing sheet. A second endless chain composed of a plurality of presser-plates 37 connected by links, is mounted above the table 34 and is carried on driving sprockets 38 and idlers 39. Screw devices 40, acting on the forward sprockets, are provided for adjusting the chain. Said chain is mounted and driven so that the lower plates thereof, which bear on the paper, will move in the direction of travel of the paper but at a slower rate of surface speed than that at which the paper is advanced by the drawing rolls 35, and consequently, said plates will drag on the upper sheet or side of the paper and thereby exert an ironing effect thereon.

The shafts of the supply rolls of facing paper B and C are provided with removable and adjustable friction brakes of any suitable construction, whereby sufficient resistance may be applied to hold the facing sheets taut as they are being drawn from said rolls.

When the product leaves the heated table 34, and as it passes through the drawing rolls 35, it is firmly united, strong and stiff board. To cut this board into pieces of desired length, I provide a rotary cutter 41 mounted in a stand 42 and co-acting with a stationary cutter 43. This cutting mechanism may be of any suitable construction but it is preferably made in accordance with the disclosure of my Patent No. 1,068,447 of July 29th, 1913, wherein is shown and described a mechanism which is particularly well suited for the purpose and which is adapted to automatically sever pieces of desired length from the end of the paper, without interrupting the travel thereof, and to deliver said pieces from the machine.

The several moving parts of the machine are operatively connected by a system of sprockets, chains and gears which are driven from a shaft 44 provided with the usual driving and loose pulleys 45.

While the machine is designed primarily

for the manufacture of double-faced board, the forward end thereof comprising the corrugating mechanism and the mechanism for applying the first facing sheet, may be  
 5 separately employed to manufacture single-faced board. To this end I provide the driving system with a suitable clutch 46 controlled by a lever 47 and operative to  
 10 disconnect the second facing and the cutting mechanism.

From the foregoing description, the operation of the machine will be readily understood by those skilled in the art and it will, furthermore, be understood that various  
 15 modifications and changes may be made in the construction set forth without departing from the spirit or scope of my invention. I do not, therefore, limit myself to the precise construction and arrangement  
 20 of parts herein described except in so far as I am limited by the terms of the appended claims.

What I claim is:

1. In a machine for manufacturing double-faced corrugated board, the combination  
 25 of two stationary flat heaters, means for guiding a corrugated sheet from one to the other and turning said sheet upside down in its passage, and means movable  
 30 relative to each heater for successively applying the opposite faces of the corrugated sheet to separate facing sheets.

2. In a machine for manufacturing double faced corrugated board the combination  
 35 of, a corrugating mechanism, two flat heaters, means movable relative to each heater for successively applying the opposite surfaces of a corrugated sheet to separate facing sheets, and means for guiding the product  
 40 in the course of manufacture from one of the heaters to the other.

3. In a machine for manufacturing double-faced corrugated board, the combination  
 45 of, a smooth-faced stationary heater, means movable relative thereto for advancing the corrugated sheet and a facing sheet over the heater and applying the corrugated sheet to the facing sheet, guiding means for reversing the single-faced sheet, a second  
 50 smooth-faced heater, a plurality of presser-plates traveling in spatial relation thereto for applying the unfaced surface of the single-faced sheet to a second facing sheet, and means for steadily drawing the sheets  
 55 between and in contact with the adjacent faces of the heater and presser-plates.

4. In a machine for manufacturing double-faced corrugated board, the combination  
 60 of, a smooth-faced stationary heater, a plurality of presser-plates movable relative thereto for advancing the corrugated sheet and a facing sheet over the heater and applying the underside of the corrugated sheet to the facing sheet, guiding means for reversing the single-faced sheet, a second

smooth-faced heater, a plurality of presser-plates movable relative to said second heater for applying the unfaced surface of the single-faced sheet to a second facing sheet  
 70 and traveling slower than the sheets, and means for steadily drawing the sheets between and in sliding contact with the adjacent faces of said second heater and presser-plates.

5. In a machine for manufacturing double-faced corrugated board, the combination,  
 75 of two stationary plane-faced heaters, an endless traveling belt mounted above each heater with its lower reach substantially parallel to the surface thereof, and a  
 80 guideway disposed relative to said heaters for directing a web from one to the other and arranged to turn the web upside down during its passage.

6. In a machine for manufacturing double-faced corrugated board, the combination,  
 85 of two co-acting mechanisms, adapted to operate successively upon a plurality of layers of material, each including a table, and a member movable longitudinally over  
 90 the table and substantially parallel to the surface thereof, said members being movable in opposite directions with respect to each other, means for actuating said members, and a guideway leading from the discharging end of the first table to the receiving  
 95 end of the second wherein the material is turned upside down in its passage from one of said mechanisms to the other.

7. A machine for manufacturing double-faced corrugated board, comprising a plurality  
 100 of mechanisms organized to operate upon three sheets of paper and in successive steps of a continuous operation, to produce corrugations in one of the sheets, to  
 105 apply adhesive to the lower surface of the corrugated sheet, to draw the second sheet over a plane-surface in contact with and underneath the corrugated sheet and to apply sufficient pressure thereon to unite said  
 110 sheets without crushing the corrugations, to turn the single-faced sheet upside down, to apply adhesive to the unfaced surface of said single-faced sheet, to draw the third  
 115 sheet over a plane-surface in contact with and underneath the unfaced surface of the single-faced sheet, and to apply sufficient pressure thereon to unite said sheets without crushing the corrugations, and to cut  
 120 the united sheet into blanks of desired lengths.

8. A machine for manufacturing double-faced corrugated paper, comprising a corrugating  
 125 mechanism, two flat heaters supported on opposite sides of the corrugating mechanism, a plurality of movable pressure-plates mounted above each of said heaters, and means for guiding the paper from one of the heaters to the other.

9. A machine for manufacturing double 130

5 faced corrugated board, comprising a plurality of corrugating rolls, two heated tables disposed at opposite sides of the corrugating rolls, an endless belt mounted above each of the tables, a plate applying device located adjacent to the receiving end of each table, and a guide for directing the product in the course of manufacture from the discharging end of the one table to the receiving end of the other.

10 10. A machine for manufacturing double faced corrugated board, comprising a plurality of corrugating rolls, two heated tables disposed at opposite sides of the corrugating rolls with their receiving ends adjacent said rolls, a paste applying device between the corrugating rolls and the receiving end of each of the tables, an endless chain of presser-plates mounted above each of the tables, a bridge for guiding the product from the discharging end of the one table to the receiving end of the other, and means for rotating the two endless chains in opposite directions with respect to each other.

25 11. In a machine for manufacturing double-faced corrugated board, a flat heater

having a traveling belt mounted adjacent thereto for applying a corrugated sheet to a facing sheet, guiding means for reversing the single-faced sheet, and a second flat heater having a traveling belt mounted adjacent thereto for applying the unfaced side of the single-faced sheet to a second facing sheet.

35 12. In a machine for manufacturing double-faced corrugated board, a flat heater having a traveling belt mounted thereon for applying the underside of a corrugated sheet to a facing sheet, guiding means for reversing the single-faced sheet, a second flat heater having a traveling belt mounted thereon for applying the unfaced lower side of the single-faced sheet to a second facing sheet, said belts traveling in opposite directions with respect to each other.

45 In testimony whereof, I have hereunto affixed my signature in the presence of two subscribing witnesses.

TOBIAS E. RAFFEL.

Witnesses:

LESTER F. DITTENHOEFER,  
ROSAMOND M. COANE.

It is hereby certified that in Letters Patent No. 1,146,771, granted July 13, 1915, upon the application of Tobias E. Raffel, of New York, N. Y., for an improvement in "Machines for Manufacturing Double-Faced Corrugated Board," an error appears in the printed specification requiring correction as follows: Page 4, line 5, for the word "plate" read *paste*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of July, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,  
*Acting Commissioner of Patents.*