July 27, 1926. 1,594,048

C. C. COLBERT ET AL

COATED BOARD FINISHING

Filed Feb. 6, 1924 5 Sheets-Sheet 1

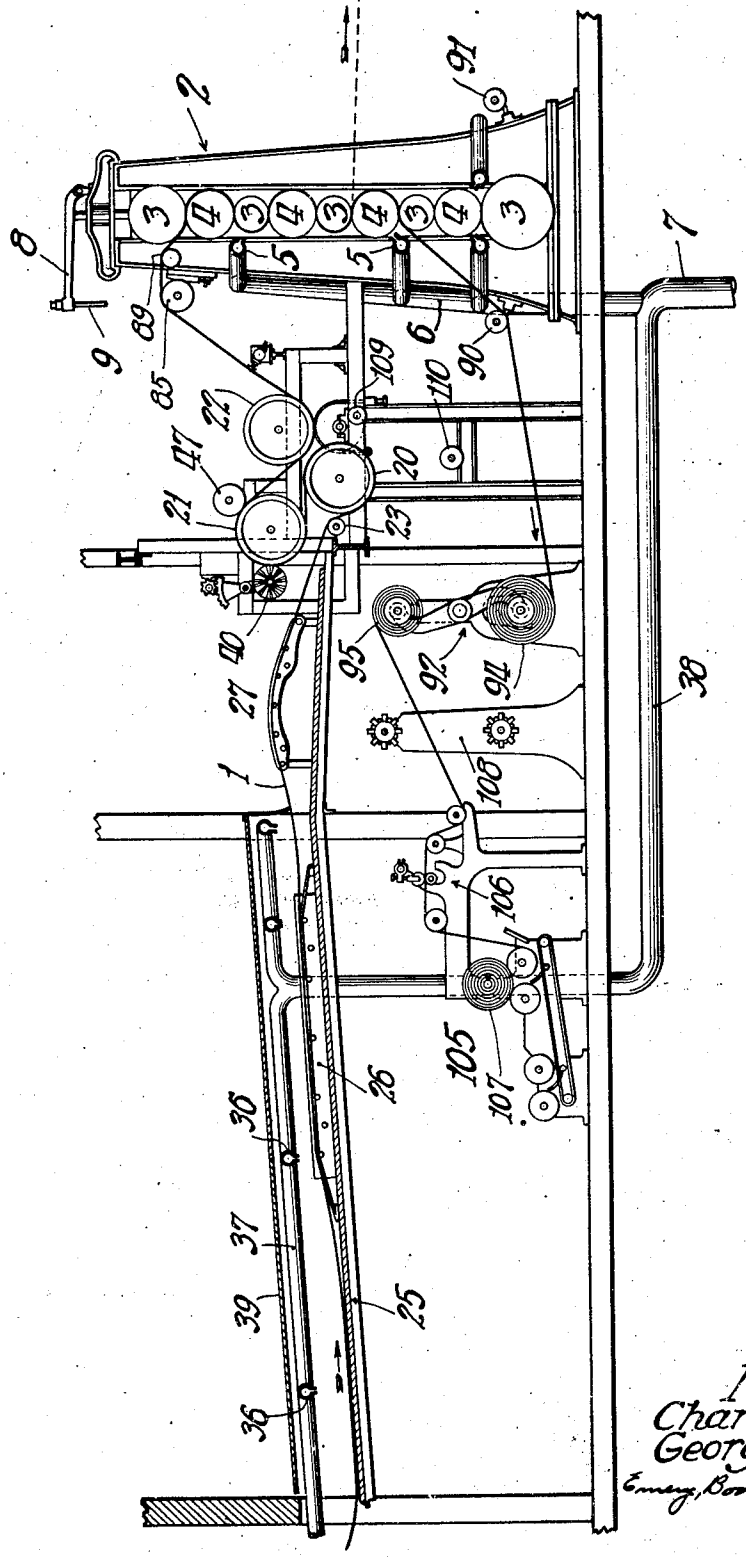


Fig. 1.

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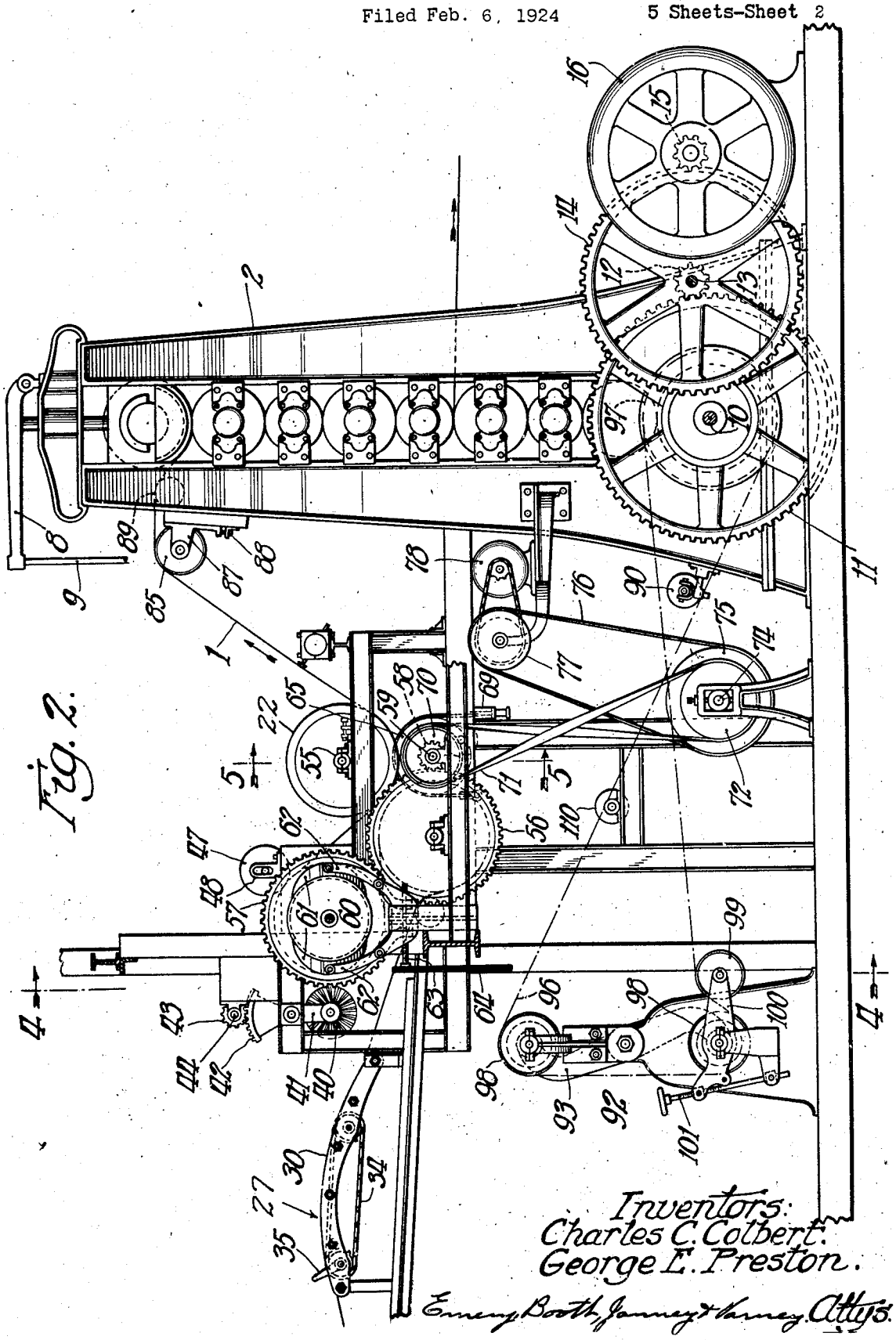


Fig. 2.

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COATED BOARD FINISHING

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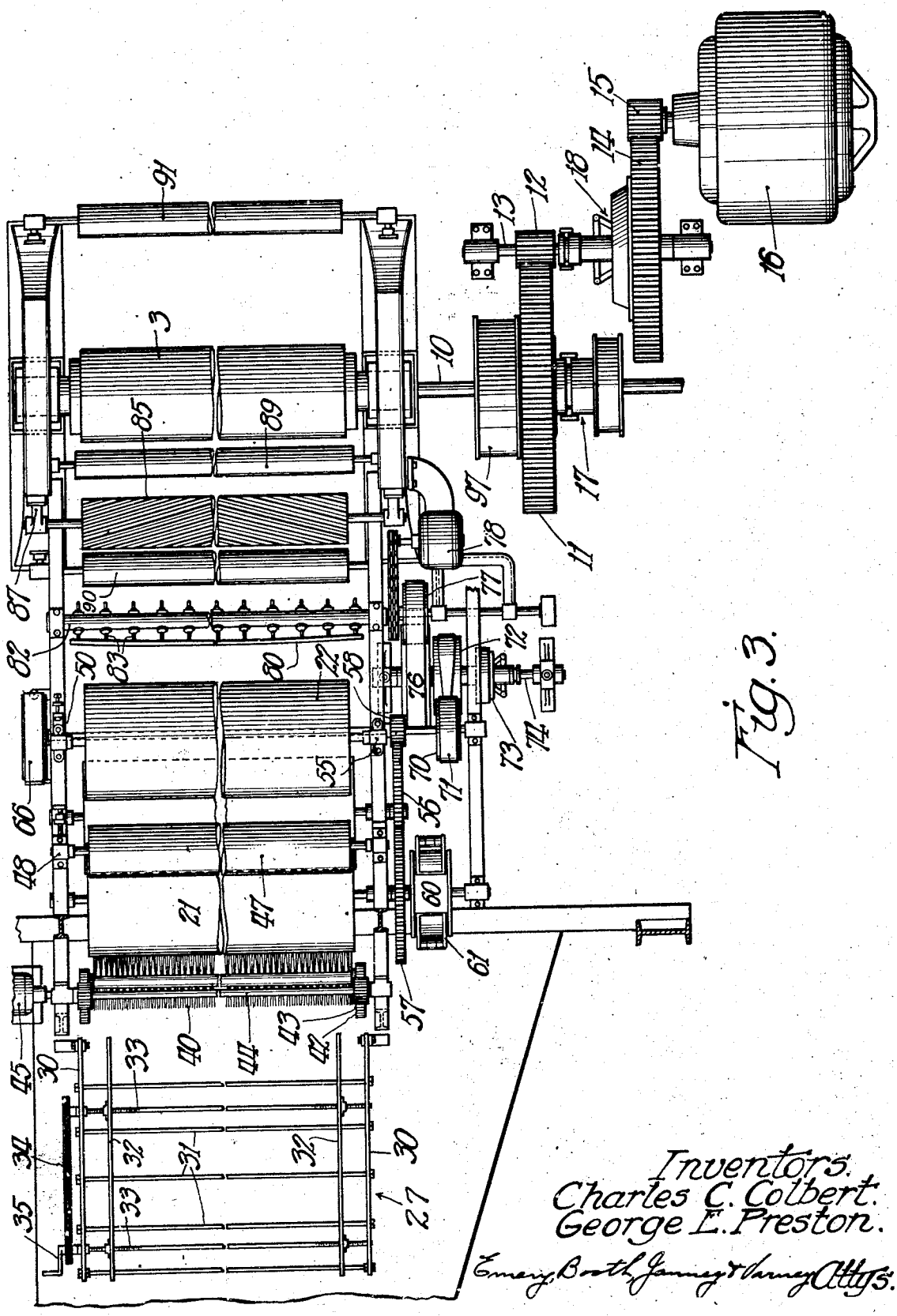


Fig. 3.

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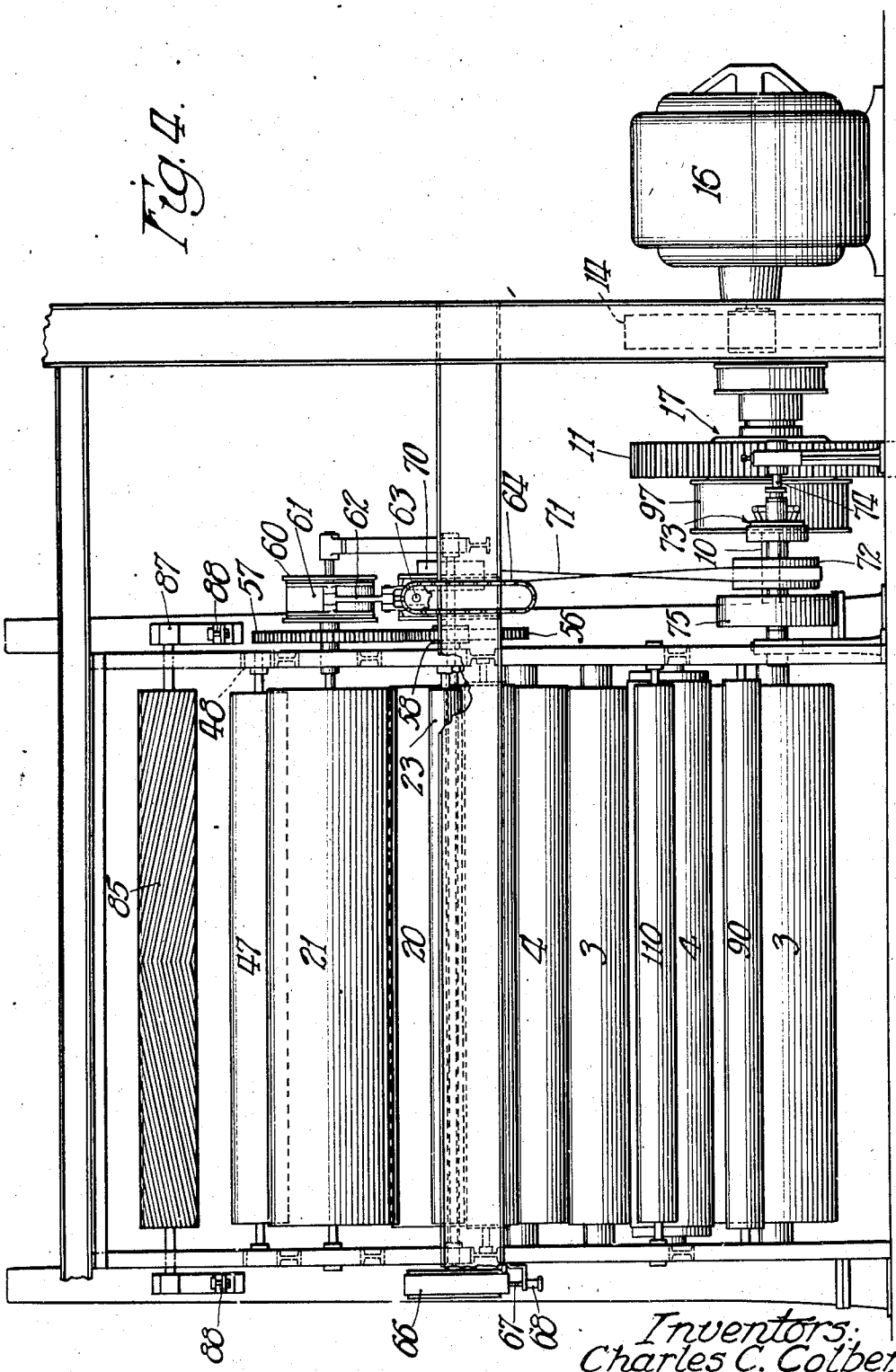
July 27, 1926. 1,594,048

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COATED BOARD FINISHING

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Fig. 4.



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COATED BOARD FINISHING

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Fig. 5.

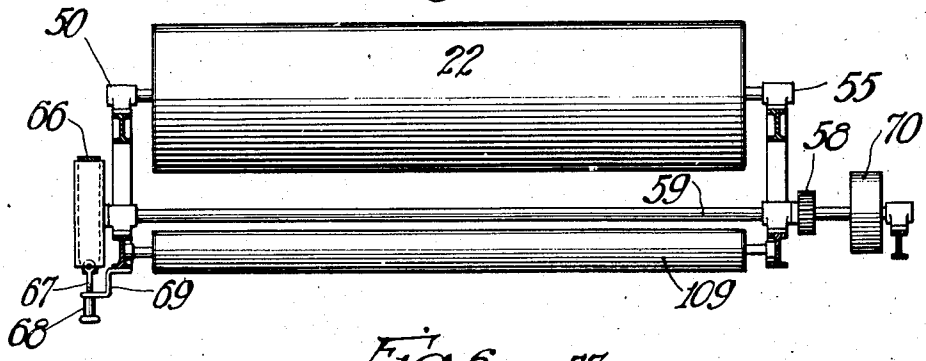


Fig. 6.

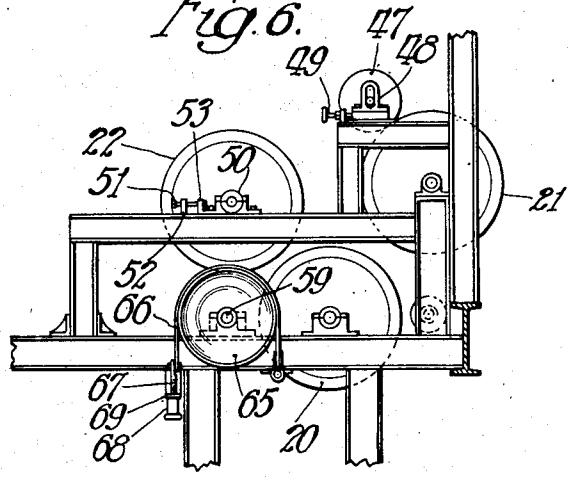
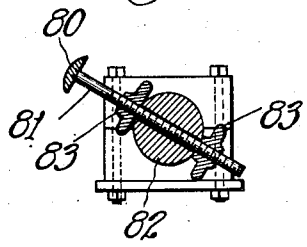


Fig. 7.



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Patented July 27, 1926. 1,594,048

UNITED STATES PATENT OFFICE.

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COATED-BOARD FINISHING.

Application filed February 6, 1924. Serial No. 690,906.

The present invention aims to provide an improved method and apparatus for use in finishing coated paper board.

One practicable apparatus containing an embodiment of the invention is shown for illustration in the annexed drawings, by reference to which the invention will be readily understood.

In said drawings:

Fig. 1 is a longitudinal sectional elevation of the illustrative apparatus.

Fig. 2 is a side elevation of a portion of said apparatus, including a super-calendering machine and a tensioning mechanism through which a web of coated material undergoing treatment is drawn by the calendering machine.

Fig. 3 is a plan view of the subject-matter of Fig. 2.

Fig. 4 is a front sectional elevation taken on the line 4—4 of Fig. 2, looking in the direction indicated by the arrows.

Fig. 5 is a sectional elevation taken on the line 5—5 of Fig. 2 looking in the direction of the arrows.

Fig. 6 is a side elevation of the aforesaid web tensioning mechanism viewed at the opposite side from that shown in Fig. 2.

Fig. 7 is a detail view showing in cross section a web spreading appliance which is utilized in the illustrative apparatus.

A web of coated paper board undergoing a finishing process is designated in the drawings by the numeral 1. The direction of its travel is indicated by arrows in Figs. 1 and 2.

Finishing is effected by super-calendering to iron out the board and impart a sheen or gloss to its coated surface. A calendering machine for this purpose is designated in the drawings by the numeral 2. As will be understood by those acquainted with the art, this machine comprises steel calendering rolls 3 alternating with cotton rolls 4; these rolls bearing one upon another and frictionally driven one by another from the bottommost roll which is power driven.

The board is threaded through the machine with its coated surface in contact with the steel calendering rolls 3. Hot air may be discharged against the back of the board and some of the cotton rolls by perforated pipes 5 connected through pipe 6 with a hot air supply pipe 7. Such application of heat promotes finishing of the board in smooth pressed condition. A desired pressure may be exerted in the calendering operation by application of a load to the uppermost calendering roll through the action of a lever 8 connected by a rod 9 with a controllable weight applying means (not shown).

For driving the calendering machine, the shaft 10 of the bottom calendering roll is shown equipped with a gear 11 driven by a pinion 12 on a counter-shaft 13. Said counter-shaft 13 is shown equipped with a gear 14 driven by a pinion 15 on the shaft of a motor 16. The gears 11 and 14 are connected with their respective shafts through clutches 17 and 18 whereby said shafts may be released from the power connections when required.

The calendering machine draws the board through a tensioning means represented by a number of comparatively large rolls 20, 21 and 22, entrained by and frictionally engaged by the board. In this instance the board is shown running over a guide roller 23 under and around the roll 20, thence backwardly and around the roll 21, and then forwardly and downwardly under the roll 22 and upwardly therefrom to the calendering machine. By this arrangement and the inertia of the tensioning rolls the board is effectively tensioned against the indrawing action of the calendering rolls. The tensioning rolls may be of wood or other appropriate material, preferably surfaced with burlap to promote a frictional grip on the board.

Preceding the tensioning rolls, devices are shown for exerting a preliminary tensioning and for centering or guiding the board to maintain its longitudinal alignment.

As shown, the board is drawn over the receiving end of an elevated platform 25, then over a raised guide 26, and then over a curved guide 27 from which the board is drawn over the guide roller 23 around the roll 20. The drag of the board over these successive supports, and especially over the curved guide 27, develops a sufficient resistance in advance of the tensioning rolls to cause the board to be drawn in close frictional engagement with the first roll 20, and the arrangement as a whole provides for a

desirable progressive tensioning of the board. Moreover, if the board comes from its source of supply with any bends or irregularities, as for instance where the board is withdrawn from an accumulation of hanging festoons, the drawing of the board over said successive supports and in tensioned condition around and from the tensioning rolls will promote effectual elimination of such irregularities.

The specific construction of the guides 26 and 27 shown in the drawings will be apparent from the detail illustration of the guide 27 in Figs. 2 and 3. As shown, said guide comprises curved side bars 30 rigidly connected by transverse rods 31. Between the supporting side bars 30 are lateral guide members 32 for engaging the edges of the board to maintain its longitudinal alignment, the board being drawn over the said rods 31 between said guide members 32. These guide members 32 are slidably mounted on the rods 31 and are simultaneously adjustable toward and away from each other by screws 33 having right and lefthand threads engaging said guide members. Said screws, rotatably but non-slidably mounted in the supporting side bars 30, are shown equipped with sprocket wheels engaged by a chain 34 whereby they may be operated in unison by the crank 35, for adjusting the guide members to accommodate the particular width of the board being treated.

Above the platform 25 and guide 26 are shown perforated pipes 36 for discharging hot air upon the coated side of the board, for a drying effect, or for an additional or super-drying action where the board is drawn from a preceding dryer, and for advantageously heating the board to promote smoothing in its drag over the guides and to promote fine finishing of its coated surface. Said pipes 36 are shown connected by pipes 37 and 38 with the aforesaid hot air supply pipe 7. The pipes 36 may be enclosed in a housing 39 to retain the heat.

A rotary brush 40 is shown coacting with the roll 21 for brushing the coated surface of the board prior to calendering, to remove any dust or to contribute a polishing effect or both. As shown, the shaft of this rotary brush is mounted in lever arms 41 having toothed segments 42 engaged by pinions 43 on a shaft 44, by which means the brush may be swung against the roll 21 or retracted therefrom when desired. This allows for substitution of brushes of different diameters and for variation of the pressure of the brush against the board. Said shaft 44 may be secured by any appropriate means in position to hold the brush in operative position. The brush is operated by a small motor 45 on the brush shaft, shown in Fig. 3.

An iron cloth-covered press roll 47 is shown bearing on the roll 21 just in advance of the point where the board leaves the latter. This roll 47, pressing the board against the roll 21, contributes toward smoothing effects and otherwise enhances the efficiency of the tensioning mechanism. Vertical play of said press roll 47 is permitted by mounting its journals in vertically slotted bearings 48. As shown in Figs. 3 and 6, one of said bearings is longitudinally adjustable, being slidable on its supporting frame member and adjusted by an adjusting screw 49 for aligning said press roll to assist in maintaining accurate longitudinal alignment of the board.

The tensioning roll 22, from which the board is drawn to the calendering machine, is likewise axially alignable to insure accurate alignment of the board. For this purpose, as shown in Figs. 3 and 6, one of the journal bearings 50 of said roll is slidable on its supporting member and provided with an adjusting screw 51. Such adjusting screw may be tapped through a fixed lug 52 and swiveled to a lug 53 on the sliding bearing 50. The opposite journal bearing 55 should permit a slight pivotal play to allow for slight lateral adjustment of the bearing 50.

Assuming the board to be drawn in a substantially tense state from the tensioning rolls, it will be understood that, if the board should display any tendency to run at a bias, such tendency may be corrected by slight axial adjustment of the press roll 47 or the roll 22 or both.

Associated with the tensioning rolls 20 and 21 is a braking means for frictionally retarding their rotation to increase the tensioning. As shown, said rolls are equipped with intermeshing gears 56 and 57, and the gear 56 is engaged by a pinion 58 on a shaft 59. The specific braking means shown includes a brake for the geared roll 21 and also a brake for the shaft 59 in gear with said rolls. The first mentioned brake comprises a brake wheel 60 adapted to be engaged by brake shoes 61 carried by brake levers 62. Said brake levers may be simultaneously operated to apply or release the brake shoes by a screw 63 having right and lefthand threads engaging said levers. A sprocket chain for conveniently operating said screw is indicated at 64. The brake for the shaft 59 comprises a brake wheel 65 adapted to be engaged by a strap 66 affixed at one end to the machine frame and having its other end equipped with a screw 67 engaged by an adjusting nut 68 which bears against a bracket 69, whereby said strap may be loosened or tightened on the brake wheel. By appropriate adjustment of one or both of these brakes, a desired frictional resistance may be exerted for tensioning the board as required.

The finishing of coated paper board is an operation which, unless conducted under proper conditions, is liable to result in substantial ruination of a considerable percentage of the product by creasing or wrinkling of the board as it is drawn into the rolls of the super-calendering machine. Moreover, if the board is drawn into the calendering rolls with a fold or bad crease, this will injuriously impress the surfaces of the cotton rolls, which will thereafter mar all the board subsequently run through the rolls. To avoid such effects, it is highly important to have the board properly tensioned and aligned, in order to run true and evenly through the calendering rolls. Under certain conditions of manufacture, as for instance when the board is drawn from hanging folds in a drying room or otherwise under conditions tending to promote irregularities in its trend, the board should be drawn perfectly tense as it enters the calendering rolls. This may be efficiently and conveniently accomplished by the tensioning means described.

The intergeared rolls 20 and 21 may be initially power-driven to draw the board from its source of supply in the initial operation of threading the board through the apparatus. For this purpose, the shaft 59 is shown equipped with a pulley 70 connected by a belt 71 with a loose pulley 72 adapted to be connected by a clutch 73 with the shaft 74 on which is a pulley 75 driven by a belt 76 from a pulley 77 chain driven from a motor 78. It will be understood that after the board is threaded through the calendering machine, the power is disconnected, by means of the clutch 73, and thereafter the tensioning rolls are rotated only through the medium of the board entrained about said rolls.

Beyond the tensioning rolls is shown a web-spreading appliance comprising a rounded steel bar 80 bearing against the back or under side of the board and adapted to be bowed for spreading the board to distribute the tension transversely. As shown in Figs. 3 and 7, this bar is carried by a number of screws 81 entered loosely through a supporting bar 82 and secured rigidly thereto by nuts 83 engaging said screws on opposite sides of the supporting bar. The screws may be individually adjusted by turning the nuts thereon, to bow the bar if and as desired.

The board is shown being drawn into the calendering machine over a guide roller 85, provided with oblique ribs disposed symmetrically with reference to the middle of the guide roller and arranged to exert a spreading action on the board. Said guide roller is shown mounted in vertically adjustable bearings 87, provided with adjusting screws 88 for aligning said roller. Just beyond said guide roller 85 is shown a small guide roller 89. The latter may if desired be held stationary to supply increased frictional resistance to the passage of the board.

By the apparatus and mode of treatment described, the operation of finishing coated paper board may be conducted in a highly efficient and advantageous manner and under conditions minimizing tendencies to damage the product by creasing, wrinkling or the like, and promoting production of a maximum quantity of a high grade finished product. Moreover these advantages are procurable even though the board is drawn into the apparatus in a more or less warped or rumpled state, thus permitting safe and efficient finishing practice under such difficult conditions, for instance, as where the board is drawn to the finishing machine from hanging folds in a drying room.

The finished board is drawn from the caldering rolls by any appropriate mechanism; for example, it may be drawn from the calendering rolls by a cutting or subdividing machine or by mechanism for reeling the finished product. In the arrangement shown in the drawings, the finished board is drawn backward from the calendering machine under a guide roller 90 to a reeling machine 92. It might be drawn forwardly, as indicated by dotted lines in Fig. 1. For instance, it might be drawn to a reel or a slitting or subdividing mechanism located beyond the calendering machine. In case of passing to a slitting machine beyond the calendering rolls, it may be drawn backward again under the guide roll 91, bottom calendering roll 3 and guide roller 90 to the reeling machine 92.

The specific reeling machine 92 shown in the drawings is of the type having a pivoted invertible support 93 for two reel-cores, so that after reeling one roll of board the support may be inverted to bring the other reel into play, while the board may be withdrawn from the previously completed roll for trimming and re-reeling. As shown in Fig. 1, a roll 94 is being reeled, while board is being withdrawn from a previously reeled roll 95. As shown in Fig. 2, the reeling machine may be driven by a crossed belt 96 from a pulley 97 on the shaft of the bottom calendering roll; said belt passing around pulleys 98 on the shafts of the respective reel-cores and being tensioned by a roll 99 carried by an adjustable support 100 controlled by the adjusting screw 101. The reel-core shafts may be clutch-connected with the pulleys 98 to permit freeing the upper roll of board 95 from the driving belt. As the roll of board being reeled gradually increases in diameter, the driving belt will slip on the pulley of the corresponding reel core

A re-reeling machine is indicated at 105,

and its tensioning and edge trimming mechanism is indicated as a whole at 106. A roll of board in the re-reeling machine is indicated at 107. Between the reeling machine 92 and the re-reeling machine 105 is shown a reeling machine 108 on which the board may, if desired, be rewound from the reeling machine 92 with its coated side out instead of in, and then re-reeled accordingly on the machine 105. These machines, as well as the reeling machine 92, are of standard character and require no further specific description.

It will be observed that the elevated position of the platform 25, guides 26 and 27 and tensioning rolls 20, 21 and 22 provides a subjacent clear floor space utilized to receive the reeling and re-reeling machinery, with the advantage of compactness of arrangement. Under the receiving end of the platform 25, workmen may remove the finished rolls of the product.

In some instances, to comply with particular trade requirements, or in treating certain kinds of material, it may be desirable to obtain the advantageous treatment accorded in the fore part of the illustrative apparatus but to reel the web undergoing treatment before calendering. To render the equipment flexible for such a purpose, guide rollers 109 and 110 are shown, permitting the web to be drawn under the roll 20 and around said guide rollers to the reel, or from the reel around said guide rollers and thence around the tensioning rolls 21 and 22 to the calendering machine.

Obviously the present invention is not restricted to the precise details of construction, arrangement and mode of operation of the illustrative machine, since the details may be variously modified to suit different conditions or requirements. Moreover it is not indispensable that all the features of the invention be used conjointly, since they may be advantageously used in various different combinations and sub-combinations.

What we claim is:

1. A method of the class described characterized by drawing the coated web undergoing treatment from a source of supply through calendering rolls, while intermediately guiding the longitudinal edges of the web and subjecting the web to successive smoothing and tensioning actions until the web is drawn tense for the calendering operation.

2. A method of the class described characterized by successively smoothing and tensioning the web, while drawing it from its source of supply, until the web is drawn to a highly tensioned state; and calendering the web while thus drawing it highly tensioned; meanwhile imposing influences on the web to counteract tendencies to draw or run unevenly; whereby the web undergoes the calendering operation without creasing or wrinkling.

3. A method of the class described characterized by drawing the coated web undergoing treatment from a source of supply through calendering rolls while intermediately subjecting the web to progressive tensioning action and truing influences until the web is drawn tense under conditions to run true and evenly through the calendering rolls.

4. A method of finishing a coated web characterized by discharging hot air on its coated surface, while drawing the web from a source of supply; and calendering the web.

5. A method of finishing a coated web characterized by heating and brushing its coated surface and then calendering the web.

6. A method of the class described characterized by drawing the coated web undergoing treatment from a source of supply; applying heated air to the coated surface of the web; subjecting the web to successive smoothing and tensioning influences; and calendering the web while maintaining it tense.

7. A method of the class described characterized by drawing the web from a source of supply while imposing successive smoothing and tensioning actions on the web and then further progressively tensioning the web until a high tension is imposed thereon; and calendering the web while drawing it highly tensioned.

8. A method of the class described characterized by calendering paper board while drawing it to a state of high tension substantially exceeding the tension at which paper board has customarily been calendered, and while imposing web-truing influences to cause the board to draw evenly and undergo the calendering operation without creasing or wrinkling.

9. A method of the class described characterized by drawing the web undergoing treatment from a source of supply through calendering rolls, while intermediately carrying the web in contact with frictionally retarded rollers.

10. A method of the class described characterized by drawing board having irregularities in its trend from a source of supply; eliminating said irregularities and drawing the web tense; and calendering the tense web, while imposing conditions to cause the web to run true and evenly through the calendering rolls.

11. A method of the class described characterized by smoothing the web, as it is drawn from its source of supply, by rubbing engagement with contacting surfaces; then drawing the web tense; and calendering the web while drawing it tense.

12. A method of the class described characterized by drawing the web against a re-

sistance imposed by surfaces in rubbing engagement with the web and then against a succeeding resistance imposed by rollers of considerable inertia entrained by and rotated against their inertia by the web; and calendering the web while drawing it tense from said rollers.

13. A method of the class described characterized by drawing the coated web undergoing treatment from a source of supply around frictionally retarded cylinders and calendering the web while drawing it taut from said cylinders.

14. An apparatus of the class described comprising, in combination, calendering rolls; web tensioning rolls entrained by the web drawn by the calendering rolls; and means comprising surfaces in rubbing engagement with the web for applying a frictional drag on the web in advance of said tensioning rolls.

15. An apparatus of the class described comprising, in combination, calendering rolls; web tensioning rolls entrained by the web drawn to the calendering rolls; and means associated with said web tensioning rolls for maintaining alignment of the web and causing it to run true and evenly through the calendering rolls.

16. An apparatus of the class described comprising, in combination, calendering rolls; and preceding web tensioning rolls, including an axially alignable roll, as 22, from which the web is drawn to the calendering rolls.

17. An apparatus of the class described comprising, in combination, calendering rolls; web tensioning means including rolls, such as 20 and 21, successively entrained by the web drawn to the calendering rolls; and a press roll bearing on the roll 21 adjacent the off-running web, said press roll being axially alignable to assist in maintaining accurate longitudinal alignment of the web.

18. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning rolls, including an axially alignable roll, as 22, from which the web is drawn to the calendering rolls; and an axially alignable press roll cooperating with the tensioning roll immediately preceding said alignable tensioning roll; said press roll and alignable tensioning roll cooperative to promote true running of the web.

19. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning means including a roll entrained by the web; and means for frictionally retarding the rotation of said web entrained roll.

20. An apparatus of the class described comprising, in combination, calendering rolls; and preceding web tensioning means comprising frictionally retarded rolls entrained by the web and an axially alignable roll from which the web is drawn to the calendering rolls.

21. An apparatus of the class described comprising, in combination, calendering rolls; a preceding web tensioning means comprising intergeared rolls entrained by the web; and associated braking means for frictionally retarding the rotation of said rolls.

22. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning rolls; and associated braking means for frictionally retarding the rotation of said rolls.

23. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning rolls; and means providing a curved web rubbing surface over which the web is drawn to said tensioning rolls.

24. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning means including a plurality of comparatively large rolls successively entrained by the web as it is drawn to the calendering rolls; and a guide roller, as 23, associated with the first of said rolls.

25. An apparatus of the class described comprising, in combination, calendering rolls; and preceding web tensioning means comprising a set of comparatively large rollers successively entrained by the web, said rollers having a considerable inertia and being rotated against their inertia by the web as it is drawn about said rollers into the calendering rolls.

26. An apparatus of the class described comprising, in combination, a support over which the web is drawn; means for applying hot air upon the web as it runs over said support; a curved support beyond said first-mentioned support over which the web is drawn; means associated with said supports for longitudinally aligning the web; web tensioning means beyond said supports, with associated web truing means; and a calendering machine drawing the web from said tensioning means.

27. An apparatus of the class described comprising, in combinuation, web heating means; web smoothing and tensioning means with associated means for aligning the web; web tensioning rolls; and a calendering machine which draws the web from said tensioning rolls.

28. An apparatus of the class described comprising, in combination, web aligning means; web tensioning means beyond said aligning means; and a calendering machine which draws the web from said tensioning means.

29. An apparatus of the class described comprising, in combination, a curved guide

over which the web is drawn, having lateral guide members for aligning the web; tensioning rolls engaged by the web beyond said guide; and a calendering machine which draws the web from said tensioning rolls.

30. In an apparatus of the class described, a web guide comprising lateral guide members between which the web is drawn; screws having right and lefthand threads engaging said guide members for moving them simultaneously toward or from each other to adjust the guide for the width of the web; and means for simultaneously operating said screws.

31. In an apparatus of the class described, a guide over which the web is drawn comprising side supporting members; transverse rods; lateral guide members slidably mounted on said rods; and means for simultaneously moving said lateral guide members toward and away from each other to adjust the guide for the width of the web.

32. An apparatus of the class described comprising, in combination, web aligning and tensioning means, including rolls engaged by the web; a calendering machine which draws the web from said tensioning rolls; and a web spreading appliance engaging the web between said tensioning rolls and calendering machine.

33. An apparatus of the class described comprising, in combination, web aligning and tensioning means, including rolls engaged by the web; a calendering machine which draws the web from said tensioning rolls; and a web spreading appliance engaging the web between said tensioning rolls and calendering machine, said web spreading appliance comprising a flexible bar, a supporting bar, and a plurality of screws carrying said flexible bar and independently adjustable in said supporting bar.

34. An apparatus of the class described comprising, in combination, means over which the web is drawn exerting a frictional drag; cylinders entrained by the web; a calendering machine which draws the web from said cylinders; and driving means for rotating said cylinders to draw the web from its source of supply in the initial operation of threading the web through the apparatus, said cylinders being disconnectable from said driving means so as to be rotated against their own inertia by the web as it is drawn through the calendering machine.

35. An apparatus of the class described comprising, in combination, calendering rolls; preceding web tensioning cylinders; and driving means clutch-connectable with said cylinders.

36. An apparatus of the class described comprising, in combination, a calendering machine having a guide roller, as 85, provided with oblique ribs; preceding web tensioning rolls; and the spreader bar 80 engaging the web between said tensioning rolls and guide roller.

37. An apparatus of the class described comprising, in combination, web finishing means; preceding web tensioning means from which the web is drawn taut to said finishing means; and web smoothing means from which the web is drawn to said tensioning means including a curved support providing surfaces in rubbing contact with the web.

38. An apparatus of the class described comprising, in combination, web finishing means; preceding web tensioning means from which the web is drawn taut to said finishing means; and web smoothing means from which the web is drawn to said tensioning means, said web smoothing means comprising a succession of transverse rods over which the web is drawn.

39. An apparatus of the class described comprising, in combination, web finishing means; preceding web tensioning means from which the web is drawn taut to said finishing means; and a guide in advance of said tensioning means comprising parallel guide members between which the web is drawn; and means for simultaneously adjusting said guide members to and from each other to adjust them to suit the width of the web.

40. An apparatus for finishing a coated web comprising, in combination, web aligning means; web tensioning means beyond the aligning means; and means drawing the web through said aligning and tensioning means while applying a finishing action on the web.

41. An apparatus for finishing a coated web comprising, in combination, means through which the web is drawn, including devices for aligning and smoothing the web; succeeding means through which the web is drawn comprising rolls entrained by and rotated against their own inertia by the web; and finishing means through which the web is drawn taut from said rolls.

42. An apparatus of the class described comprising, in combination, web-tensioning means comprising a plurality of rolls entrained by the web, said rolls having a considerable inertia and being rotated against their inertia by the web as it is drawn about said rolls; and means for drawing the web taut from said rolls while applying a finishing action on the web.

43. An apparatus of the class described comprising, in combination, means for finishing a coated web while drawing the web taut through tensioning means; said tensioning means comprising rolls entrained by the web; and means providing a curved web-rubbing surface over which the web is drawn to said tensioning rolls.

44. An apparatus of the class described comprising, in combination, means for finishing a coated web; and cooperating means for maintaining the web tense while undergoing the finishing operation; said last mentioned means including a roll entrained by the web and about which the web is drawn, and means for frictionally retarding the rotation of said web-entrained roll.

45. An apparatus of the class described comprising, in combination, web finishing means; preceding web tensioning rolls from which the web is drawn taut to said finishing means; and driving means clutch-connectable with said rolls.

In testimony whereof, we have signed our names to this specification.

CHARLES C. COLBERT.
GEORGE E. PRESTON.