No. 790,023. PATENTED MAY 16, 1905.

J. ARKELL, DEC'D.

W. J. & B. ARKELL, EXECUTORS.

PROCESS OF AND MECHANISM FOR MAKING STRETCHABLE CRINKLED PAPER.

APPLICATION FILED MAY 26, 1904.

2 SHEETS—SHEET 1.

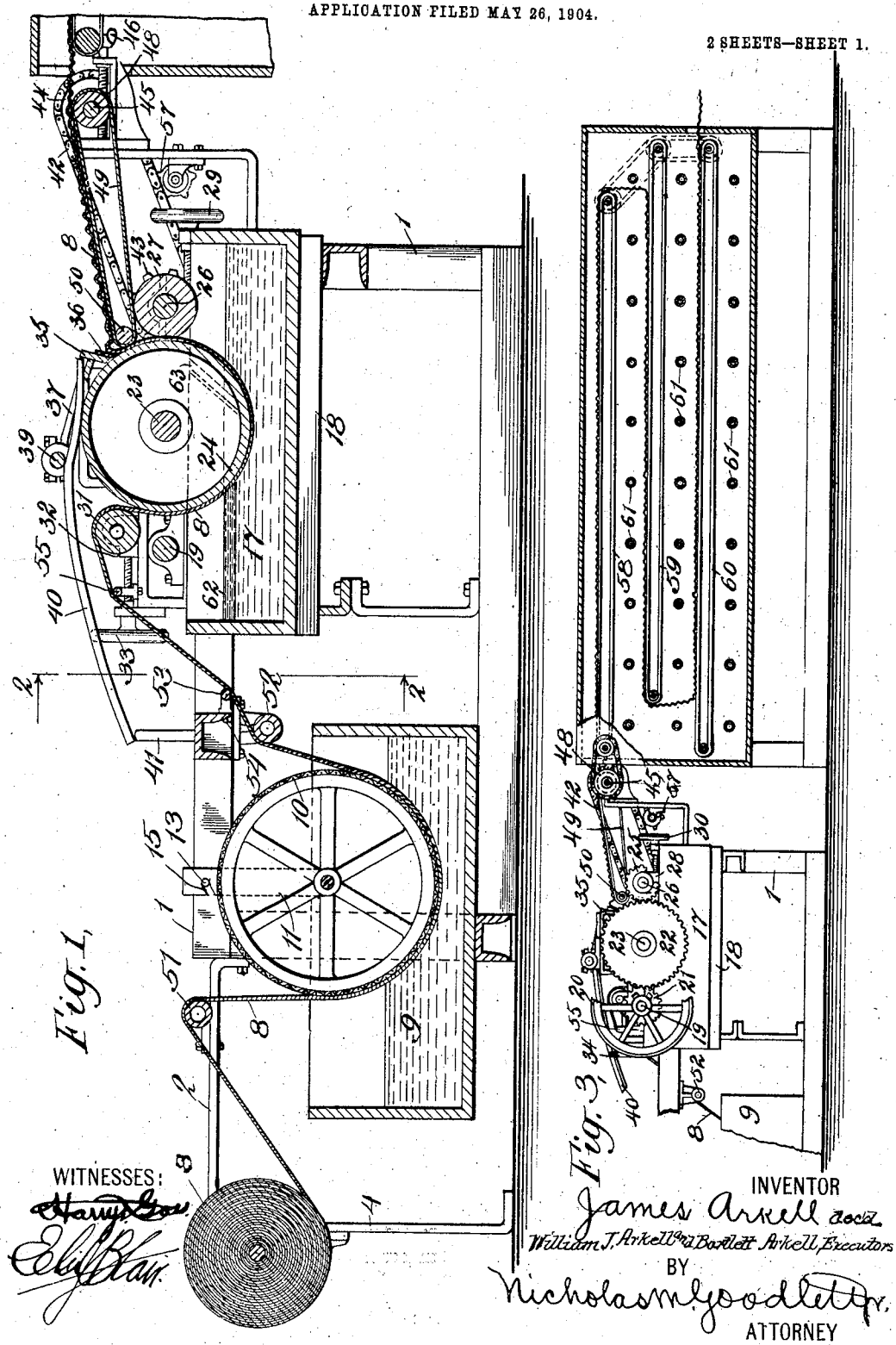


Fig. 1.

Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 2.

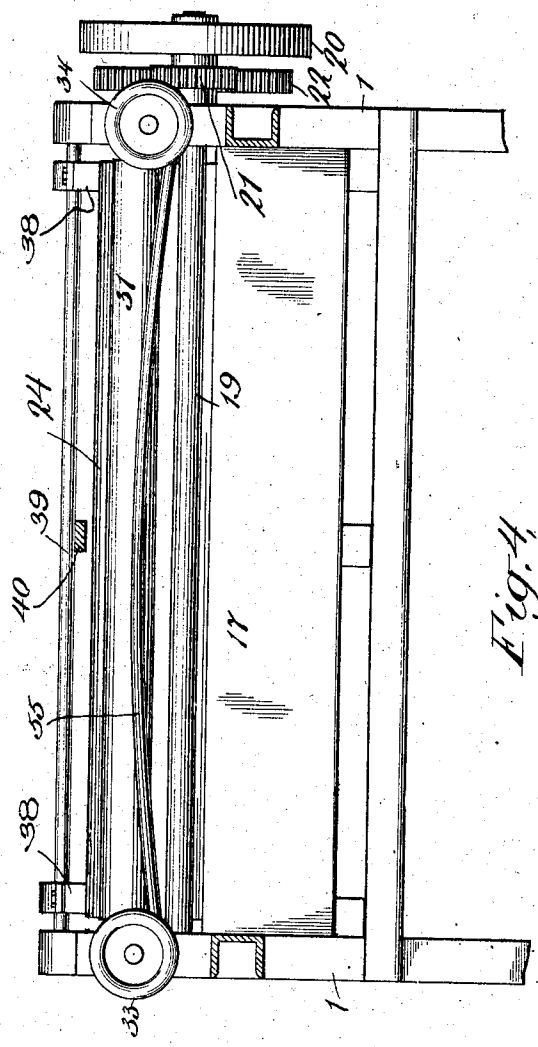
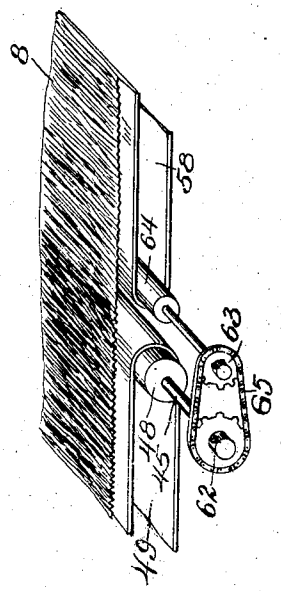


Fig. 4.



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No. 790,023. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM J. ARKELL AND BARTLETT ARKELL, OF NEW YORK, N. Y., EXECUTORS OF JAMES ARKELL, DECEASED.

PROCESS OF AND MECHANISM FOR MAKING STRETCHABLE CRINKLED PAPER.

SPECIFICATION forming part of Letters Patent No. 790,023, dated May 16, 1905.

Application filed May 26, 1904. Serial No. 209,953.

To all whom it may concern:

Be it known that we, WILLIAM J. ARKELL and BARTLETT ARKELL, citizens of the United States, residing in the city, county, and State of New York, are the executors of the last will and testament of JAMES ARKELL, deceased, late of Canajoharie, county of Montgomery, State of New York, and that the said JAMES ARKELL did invent new and useful Processes of and Mechanism for Making Stretchable Crinkled Paper, of which the following is a specification.

This invention relates to the process of and apparatus for producing stretchable crinkled paper.

The invention seeks to produce stretchable crinkled paper in which the extent of the crinkling is reliably regulated with reference to the particular work which the crinkles are required to perform when the paper is in active use. In producing stretchable crinkled paper it has been found that the crinkles formed in paper of a given grade are frequently in excess of what is required and that hence there is an excessive amount of paper used, with a consequent useless expense. For example, in crinkling certain grades of paper in a crinkling-machine it has been found necessary to consume about fifty per cent. (50%) of paper in merely forming the crinkles, whereas an expenditure of thirty per cent. (30%) of the paper for forming the crinkles is all that would be required to enable the finished crinkled paper to do the work required of it. In order, however, to effectively form the crinkles in this given paper, it is necessary to form them initially of such depth and number as to consume far more than thirty per cent. (30%) of the paper. Heretofore there has been no efficient way of effectively reducing this excess of crinkling, while at the same time preserving the required stretchability in the finished crinkled paper.

The invention consists in crowding the wet paper back against itself while adhering to a roll to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and thereafter suitably drying the paper to make the reduced crinkles permanent and render the paper stretchable.

It also consists in certain modifications of the process thus stated and as hereinafter set forth.

The paper is preferably dried by subjecting it to a drying atmosphere, this method of drying being simple, effective, and capable of being carried out without injuriously affecting the reduced crinkles.

The invention also consists of a suitable apparatus by means of which the process may be carried out. Such an apparatus is shown in the accompanying drawings, in which—

Figure 1 is a central longitudinal sectional elevation. Fig. 2 is a sectional elevation on the line 2 2 of Fig. 1. Fig. 3 is a fragmental side elevation, partly broken away, showing the means for drying the paper. Fig. 4 is a detailed view in perspective.

The various steps of the process will appear from the following description of the particular apparatus shown in the drawings.

Referring now to said drawings, 1 is the main frame of the machine.

2 and 3 are rails supported by legs 4 and bolted to the main frame. On the legs 4 is supported the rotatable roll of plain paper 8 which is to be crinkled.

9 is a tank designed to carry a bath of suitable liquid, generally water. In this tank rotates a drum 10, preferably made of foraminous material and supported by arms 11, which depend from bolts 13, fixed in the upper part of the frame. These bolts enter slots 15 in the arms, so that the latter, together with the drum, may be removed.

17 is another tank designed to contain a bath of suitable liquid, generally water, and supported by the shelf 18, carried by the main frame.

19 is the shaft on which are secured the driving-wheel 20 and the gear 21, which latter meshes with the gear 22 on the shaft 23. The shaft 23 carries a smooth-faced crinkling-roll 24, preferably of iron and rotating partly submerged in the tank 17. Meshing with the gear 22 is a gear 25, carried on the shaft 26,

which carries a roll 27, preferably having a rubber or other yielding surface. This roll 27, which works in close proximity to the roll 24, for a purpose hereinafter to be explained, is carried in boxes 28, supported by the main frame. These boxes 28 are adjustable to and from the roll 24 by the screws 29 and 30, so as to vary the pressure of the roll 27 against the roll 24.

31 is a guide-roll working in boxes adjustable by screws 33 and 34 and operating to guide the paper web to and deposit it upon the receiving-roll 24.

Associated with the roll 24 is a doctor consisting of a cross-bar 35, having a blade 36, which is preferably secured to and removable from the cross-bar by screws. The doctor is carried by two arms 37, which are pivotally supported by the cross-rod 39, so that the doctor may be swung up away from the roll when required. The doctor is pressed down in contact with the roll by means of a variable-pressure device, preferably consisting of a bent iron bar 40. This bar extends beneath the rod 39 and has one end resting upon the doctor and the other end supported by an adjusting-wedge 41. This bar 40 is elastic, and by adjusting the wedge 41 the pressure which the bar imparts to the doctor may be varied, as required.

42 is a sprocket-chain driven from a sprocket-wheel 43 on the shaft 26 and passing around a sprocket-wheel 44, carried on the shaft 45, which latter is adjustable in its bearings by means of screws 46. The shaft 45 carries a roll 48, which drives the carrier 49, extending around the roll 50, supported in close proximity to the doctor. The carrier 49 operates to carry away the crinkled paper as it is stripped from the roll 24 by the doctor and deliver it to the drying apparatus. (See Fig. 3.)

51 and 52 are rods or rolls for guiding the paper in its progress.

53 is a curved cross-rod adjustable up and down by means of bolts 54 and against which the wet paper passes on its way to the roll 24. 55 is a similar curved rod horizontally adjustable and operating for the same purpose as the rod 53.

57 is an adjustable wheel to take up slack in the sprocket-chain 42.

After the paper has been crinkled it is then delivered to a drying apparatus, which may be of any suitable construction capable of drying the paper so as to make the crinkles therein permanent, and thus render the paper stretchable. In Fig. 3 is shown diagrammatically the preferred arrangement of such drying apparatus and by means of which the paper is subjected to a drying atmosphere.

Referring now to Fig. 3, the paper 8, having been crinkled, is delivered by the carrier 49 to the drying apparatus, whose receiving end is arranged in close proximity to the delivery end of the carrier 49. This drying apparatus, as shown in Fig. 3, consists of a plurality of endless carriers 58, 59, and 60, between which are arranged steam-pipes 61. The paper is first delivered to the carrier 58 and by it delivered to carrier 59. The carrier 59 delivers the paper to carrier 60, from which the paper issues as a finished product. By means of this arrangement of the drying apparatus the paper is carried back and forth several times and as many as may be desired, while the heat from the steam-pipes acts to dry the paper. Thus it will be seen that the crinkles are made permanent and the paper rendered thereby stretchable. After the paper has been crinkled and while it is still wet it is stretched so as to reduce the crinkles initially formed by the doctor 35. This stretching of the paper to reduce the crinkles may be accomplished in various ways. It is preferred, however, to carry out this step by delivering the paper to a carrier which travels faster than the wet crinkled paper is delivered from the crinkling-roll 24. In the best arrangement and as shown in the drawings the carrier 58 is made to travel faster than the carrier 49, so that the crinkles are reduced owing to this difference in speed of the carriers. (See Fig. 4.) Any suitable means may be adopted for effecting this difference in the speed of the carriers. The means shown in the drawings for accomplishing this result consists of a sprocket-wheel 62, fixed on shaft 48, a smaller sprocket-wheel 63, fixed on roll 64 of carrier 58, and a sprocket-chain 65, connecting these two sprocket-wheels 62 and 63. Thus it will be seen that the carrier 58 is driven at a higher speed than the carrier 49 and the paper is stretched in passing from the latter to the former, so as to reduce the crinkles. Of course this same result might be effected by driving the carrier 49 at a higher speed than the crinkled paper is delivered thereto.

The wheels 62 and 63 are removable, so that wheels of varying sizes may be substituted for either or both. This enables the ratio of the diameter of these wheels to be varied as desired, so as to regulate the amount of crinkle in the paper as finally finished. This variation may of course be produced in a variety of ways.

It is sometime desirable to waterproof the paper at some stage during its passage through the apparatus. In effecting this result the waterproofing material, such as paraffin, is preferably turned in on top of the water in the tank 17 and on the front side of the roll 24. The presence of such waterproofing material is indicated in Fig. 2 at 62 by the heavier shade-lines representing the liquid in the tank 17. This waterproofing material 62 floats on the surface of the water, and in order to pre-

vent it from passing to the rear side of the tank by the action of the rotating roll 24 baffle-plates 63 are fixed on the inner sides of the tank 17 opposite the ends of the roll 24. These baffle-plates prevent the waterproofing material from passing around the ends of the roll 24 to the rear of the tank, where it would not effectively reach the paper.

In the operation of the machine the paper is taken from the roll, passes thence over the guide bar or roll 51, through the tank 9, where it is submerged by means of the drum 10. Thence it passes over the guide bar or roll 52, against the curved bars 53 and 55, over the guide-roll 31, down and around the roll 24, which submerges the paper in the liquid contained in the tank 17. Thence it is carried by the roll 24 up against the doctor, which crinkles the paper and strips it from the roll 24 and deposits it upon the carrier 49, whence the moist crinkled paper is delivered to the carrier 58 of the drying apparatus, at which carrier the paper is stretched to reduce the crinkles, as heretofore explained. The roll 27 presses the paper against the roll 24 just before the paper meets the doctor. This accomplishes two results—first, it causes the paper to smoothly and firmly adhere to the smooth face of the roll 24, so that the paper in its adherence to the roll 24 may resist the action of the doctor sufficiently to cause the doctor to crowd the paper back against itself, and thereby crinkle it. Moreover, the roll 27 operates to extract or press out any surplus moisture that may be retained by the paper just before it meets the doctor. These purposes may be effected by other means without departing from the scope of the invention. As the paper emerges from the tank 9 it swells because of the moisture absorbed and is therefore wrinkled. It is desirable to remove these wrinkles before the paper reaches the doctor, and for this purpose suitable means are employed to extend the paper laterally before it reaches the doctor. In the present form of apparatus shown in the accompanying drawings the curved rods 53 and 55 are employed for this purpose, the paper passing over the rods being thereby smoothed out, so that it may be deposited upon the roll 24 smooth and free from wrinkles. In some cases only one curved rod need be used.

It is to be understood that the various combinations of features constituting the mechanical part of the invention may be variously modified from what is specifically shown in the drawings without departing from the invention.

In carrying out the invention either finished or unfinished paper may be operated upon; but finished paper is preferred.

What is claimed is—

1. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

2. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

3. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

4. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

5. The process of making stretchable crinkled paper, which consists in pressing wet paper in close adherence to a roll, then crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

6. The process of making stretchable crinkled paper, which consists in pressing wet paper in close adherence to a roll, then crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

7. The process of making stretchable crinkled paper, which consists in pressing wet paper in close adherence to a roll, then crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier

which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

8. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, then drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the wet paper being extended laterally before it is crinkled.

9. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the wet paper being extended laterally before it is crinkled.

10. The process of making stretchable crinkled paper, which consists in crowding wet paper while adhering to a roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable, the wet paper being extended laterally before it is crinkled.

11. The process of making stretchable crinkled paper, which consists in pressing wet paper in close adherence to a roll, then crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the wet paper being extended laterally before it is crinkled.

12. The process of making stretchable crinkled paper, which consists in crowding wet finished paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, then drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

13. The process of making stretchable crinkled paper, which consists in crowding wet finished paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and bringing the paper into a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

14. The process of making stretchable crinkled paper, which consists in crowding wet finished paper while adhering to a roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, then drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

15. The process of making stretchable crinkled paper, which consists in pressing wet finished paper in close adherence to a roll, then crowding the wet finished paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

16. The process of making stretchable crinkled paper, which consists in pressing wet finished paper in close adherence to a roll, then crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

17. The process of making stretchable crinkled paper, which consists in crowding wet finished paper while adhering to a roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the wet paper being extended laterally before it is crinkled.

18. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

19. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and subjecting the paper to a drying atmosphere so

as to make the reduced crinkles permanent and render the paper stretchable.

20. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

21. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

22. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

23. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

24. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the wet paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable.

25. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the wet paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and subjecting the paper to a drying atmosphere so as to make the reduced crinkles permanent and render the paper stretchable.

26. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the paper being extended laterally while it is wet.

27. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then stretching the wet crinkled paper to reduce the crinkles, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the paper being extended laterally while it is wet.

28. The process of making stretchable crinkled paper, which consists in depositing finished paper upon a roll, wetting the paper while on said roll, pressing the wet paper against said roll, crowding the wet paper while adhering to said roll back against itself to crinkle the paper, then delivering the wet crinkled paper to a carrier which travels at a greater speed than the paper is delivered from the crinkling-roll, whereby the wet crinkled paper is stretched and the crinkles reduced, and drying the paper so as to make the reduced crinkles permanent and render the paper stretchable, the paper being extended laterally while it is wet.

29. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for crowding the wet paper back against itself while adhering to said roll to crinkle it; means for stretching the wet crinkled paper to reduce the crinkles; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

30. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for pressing the wet paper in close adherence to said roll before the paper is crinkled; means for crowding the wet paper back against itself while adhering to said roll

to crinkle it; means for stretching the wet crinkled paper to reduce the crinkles; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

31. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper, means for wetting the paper; means for crowding the wet paper back against itself while adhering to said roll to crinkle it; means for stretching the wet crinkled paper to reduce the crinkles; means for extending the paper laterally after it is wet and before it is crinkled; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

32. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for pressing the wet paper in close adherence to said roll before the paper is crinkled; means for crowding the wet paper back against itself to crinkle it; means for stretching the wet crinkled paper to reduce the crinkles; means for extending the paper laterally after it is wet and before it is crinkled; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

33. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for crowding the wet paper back against itself while adhering to said roll to crinkle it; a carrier for the paper arranged to travel at a greater speed than the wet crinkled paper is delivered from the crinkling-roll so as to reduce the crinkles; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

34. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for crowding the wet paper back against itself while adhering to said roll to crinkle it; means for stretching the wet crinkled paper to reduce the crinkles; and a drying apparatus having carriers on which the paper is loosely carried.

35. In an apparatus for making stretchable crinkled paper, the combination of a roll to receive the paper; means for wetting the paper; means for crowding the wet paper back against itself while adhering to said roll to crinkle it; a carrier for the paper arranged to travel at a greater speed than the wet crinkled paper is delivered from the crinkling-roll so as to reduce the crinkles; and a drying apparatus having carriers on which the paper is loosely carried.

36. In an apparatus for making stretchable crinkled paper, the combination of suitable means for forming crinkles in the paper while it is wet; a carrier for the wet crinkled paper; and means for driving the said carrier faster than the crinkled paper is delivered to the carrier so as to reduce the crinkles in the paper.

37. In an apparatus for making stretchable crinkled paper, the combination of suitable means for forming crinkles in the paper while it is wet; a carrier for the wet crinkled paper; means for driving the said carrier faster than the crinkled paper is delivered to the carrier so as to reduce the crinkles in the paper; and means for drying the paper to make the reduced crinkles permanent and render the paper stretchable.

In witness whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM J. ARKELL,
BARTLETT ARKELL,
Executors of the estate of James Arkell, deceased.

Witnesses:
DANIEL EWING,
GEORGE L. LEWIS.