Nov. 25, 1924. 1,517,018

C. R. SEABORNE

PAPER MAKING MACHINE

Filed Nov. 24, 1923 2 Sheets-Sheet 1

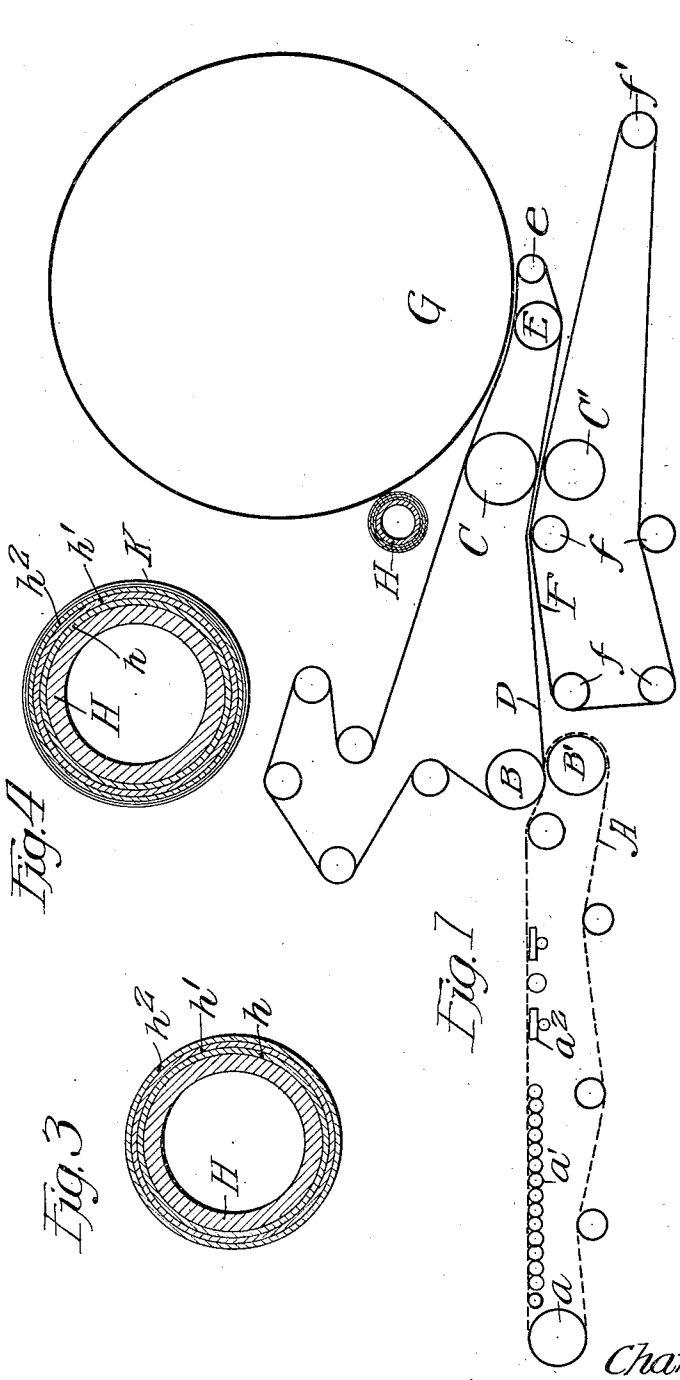


Fig. 1

Fig. 4

Fig. 3

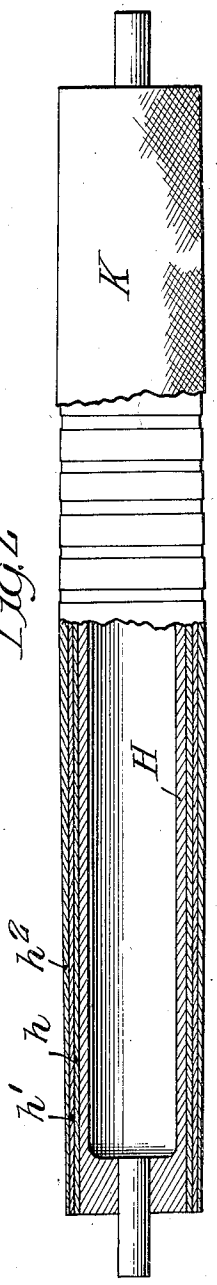


Fig. 2

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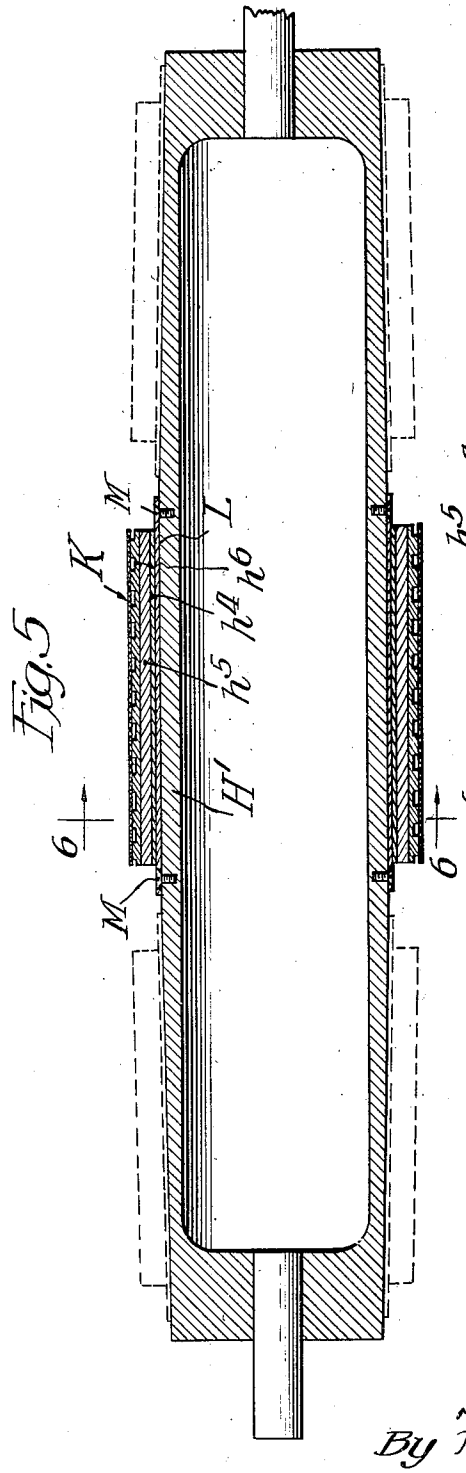


Fig. 5

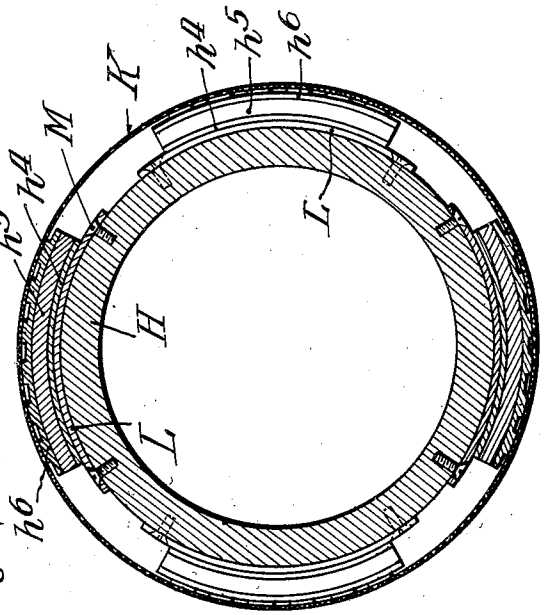


Fig. 6

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Patented Nov. 25, 1924. 1,517,018

UNITED STATES PATENT OFFICE.

CHARLES R. SEABORNE, OF NIAGARA FALLS, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN LAKES PAPER COMPANY, OF WAUKEGAN, ILLINOIS, A CORPORATION OF DELAWARE.

PAPER-MAKING MACHINE.

REISSUED

Application filed November 24, 1923. Serial No. 676,705.

To all whom it may concern:

Be it known that I, CHARLES R. SEABORNE, a subject of the King of Great Britain and Ireland, residing at Niagara Falls, in the county of Niagara, State of New York, have invented certain new and useful Improvements in Paper-Making Machines, of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of the specification.

My present invention has for its object to provide improved means whereby a web of paper as it passes through a paper-making machine may be impressed with designs or marks commonly termed "water-marks," which serve to identify or give distinctive character to the paper.

In the water-marking (so-called) of paper, it has heretofore been the practice to provide a marking roll, the surface of which carried the desired design to be impressed upon the paper web, this marking roll being located preferably at some point between the couch rolls and the calendar rolls over which the web of paper passes after leaving the drying cylinder or cylinders. Such marking rolls have commonly consisted of two distinct types. In the one type the marking roll comprises a metal roll upon the surface of which were secured metal plates or types of the design to be reproduced upon the paper web. Ordinarily such roll has been used in conjunction with the drying cylinder of the machine; and to enable the metal types to more effectively accomplish their function it has been the practice to wrap the surface of the marking roll with one or more layers of muslin or like fabric through which the impression of the types or plates was delivered. A serious objection has been found to the employment of marking rolls bearing metal types or plates and wrapped with muslin or like fabric, as the fabric is speedily cut through or worn by the type so that it becomes necessary to frequently withdraw the marking roll in order to rewrap the same with a fresh cloth. Particularly is this objection encountered with marking rolls of very considerable length, since with such rolls it is found necessary, in order to compensate for the "springing" of the rolls, to form the rolls with a slight crown from the ends to the center, with the result that certain parts of the marking roll more speedily wear the fabric than do other parts of the roll. In practice it is found that it becomes necessary to withdraw and re-wrap marking rolls having metal type or plates upon their peripheries as often as every three or four hours, and particularly with very wide machines, such, for example, as are used in forming webs of paper 124 inches in width, the cost of supplying fresh wrappings for a marking roll will add very largely to the manufacturers' cost of the paper. Moreover, when the marking rolls are withdrawn from the paper-making machines to permit their rolls to be re-wrapped, it is customary to allow the operation of the machine to continue, with the result that the paper issuing from the machine while the rolls are thus withdrawn is unmarked and is subsequently gathered up and returned to the beaters to be reconverted into pulp. This occasions a further and very considerable loss to the manufacturer, as the time consumed in re-wrapping such marking rolls is usually about twenty minutes.

Another type of marking roll heretofore used in machines of the character to which my invention relates, comprises one or more rolls upon the peripheries of which are secured marking types or plates of resilient material. These types or plates are ordinarily made as narrow, endless bands of soft rubber, the types or impression surfaces upon the bands consists of harder rubber vulcanized to the soft rubber bands which afford a cushion for the impression types or surfaces. In practice this last style or marking roll is found objectionable for a variety of reasons, the most serious one of which is that it is impossible to vulcanize the soft rubber on to the surface of the metal roll or otherwise rigidly and satisfactorily attach it thereto, so that the soft rubber base or cushion will not slip or creep slightly under the strain or force necessary to effect the impression to the paper web. Such creeping or slipping of the soft rubber that forms a cushion for

the harder rubber type or impression surfaces speedily destroys the accuracy of the impressions upon the paper web, and also hasten the wearing out of the marking types or surfaces and of the cushions carrying the same. Moreover, with marking rolls of the last described type it will be found that where the rolls are used for marking very wide webs of paper from side to side, the tendency of the long rolls to "spring" about the center will result in an inequality of the impression made upon the paper web, the heavier impressions occurring adjacent the ends of the web and the lighter impressions occurring about the center thereof. So also there are mechanical limitations to the width of rubber bands that can be made and adapted for slipping over the ends of the roll, and any inequality of pressure at different points of the roll must necessarily cause such bands to unequally slip or creep and thus destroy the uniformity of the impressions produced thereby.

By my present invention the difficulties heretofore encountered are all overcome, and the invention consists in the features of novelty hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the claims at the end of the specification.

Fig. 1 is a diagrammatic view showing a paper-making machine of the Fourdrinier type having my invention applied thereto.

Fig. 2 is a view in vertical longitudinal section through my improved marking roll.

Fig. 3 is an enlarged view in vertical section through the marking roll.

Fig. 4 is a view similar to Fig. 3, but showing the marking roll wrapped with muslin or like fabric.

Fig. 5 is a view in cross section through a modified form of marking roll embodying features of my invention.

Fig. 6 is a view in vertical longitudinal section through the marking roll shown in Fig. 5.

The paper-making machine illustrated in Fig. 1 of the drawings is shown as comprising the usual forming wire A that passes over a breast roll a at the pulp-receiving end of the machine, over the tube rolls a', suction boxes a^2 and between couch rolls B and B', in a manner well understood. Around the upper couch roll B and under the press roll C passes an endless felt D, this felt also passing around a pressure roll E, a tail roll e, and around a series of tightener, guide and carrying rolls shown above the upper couch roll B. A lower endless felt F passes around a plurality of felt-carrying rolls f over the lower press roll C' and around an end felt roll f'. The web of paper as it passes from the surface of the forming wire A adheres to the bottom of the upper endless felt D and passes with said felt and over the lower endless felt F between the press rolls C and C', and thence with the felt D around the tail roll e and between the pressure roll E and the drying cylinder G to the surface of which the endless paper web adheres. From the drying cylinder G the web of paper will be passed in the usual manner either directly to the winding reels or through additional drying cylinders or calendar rolls.

My improved marking roll is preferably located adjacent the drying cylinder G so as to co-operate therewith in marking the surface of the partially dried endless paper web; but this marking roll may be located in any other suitable position to co-operate with any other roll for the marking of the paper web. This marking roll in the preferred form of the invention (see Figs. 1 to 4 of the drawings), comprises a metal cylinder H, the surface of which is covered with a layer of hard rubber h vulcanized thereon and forming preferably a continuous sleeve or tube around the surface of the roll body H. In practice it is found that this layer of vulcanized hard rubber h may be about $\frac{1}{4}$ of an inch in thickness, although this thickness may be increased or diminished as desired. Over the layer of hard rubber h and vulcanized thereto is another layer or sleeve of soft rubber h' which may be approximately about $\frac{3}{16}$ of an inch in thickness, and over the layer of soft rubber h' and vulcanized thereto is an outer layer or sleeve of hard rubber h^2 that is preferably about $\frac{5}{16}$ of an inch in thickness. By providing the surface of the metal cylinder H with a layer of hard rubber vulcanized thereto, it is found that all possibility of any slipping or creeping occurring between the metal surface of the cylinder H and the hard rubber cover or layer h is avoided; and this surface or cover h of hard rubber affords a base to which the soft rubber layer h' of the cover may be securely vulcanized. This soft rubber layer h' affords a cushion for the outer layer h^2 of hard rubber in or on the surface of which is to be formed the designs, type, or the like, whereby the marking or ornamenting of the paper web will be effected. Inasmuch as the outer layer of hard rubber h^2 is vulcanized to the layer of soft rubber h', all possibility of any slipping or creeping between these two surfaces is avoided.

Preferably the outer diameter of the metal cylinder H is uniform from end to end, but in order to compensate for any "springing" of the marking roll, particularly if this roll be a very long one, the peripheral surface of the outermost hard rubber layer or cover h^2 will be turned or ground down, the grinding or turning being diminished towards the center of the roll, so that the roll is thus left slightly crowned.

Upon the surface of the outermost cover h^2 will be ground, formed or cut, any designs which it is desired to impress upon the surface of the paper web. In Fig. 2 of the drawings, the surface of the hard rubber cover h^2 is shown as formed with a series of circumferential ribs and grooves adapted to mark stripes upon the endless paper web. One advantage of providing a soft rubber cushion h' for the outermost hard rubber cover h^2 is that in case any irregularity or excess thickness occurs in the paper web, the soft rubber cushion h' will permit the hard rubber cover h^2 to yield or give and thus avoid all danger of impairing the impression surface of the marking roll. Moreover, it is practically impossible to form the surface of the drying cylinder G perfectly uniform from end to end and so maintain it under variations in temperatures to which such cylinder is subjected, and by yieldingly mounting the hard rubber cover h^2 carrying the impression surface upon a yielding cushion or cover h', the inequalities of the drying cylinder are compensated for and uniformity of impression upon the paper is secured.

In some cases where it is desired to modify or soften the effect of my marking roll and to give to the impressions made upon the paper web an appearance resembling a fabric weave, it is desirable to cover the outer surface of the marking roll with one or more layers of textile fabric, such as muslin or the like, K, as illustrated in Figs. 2 and 4 of the drawings. The fabric K after being wrapped around the roll will have its ends suitably fastened to prevent it slipping or working loose. If preferred the fabric cover K may be made in tubular form so as to be slipped over the end of the roll and shrunk thereon.

Aside from the fact that a marking roll constructed in accordance with my invention has an initial cost far below that of a metal marking roll of the usual design, and enables a much more satisfactory impression of the paper to be effected, the following economical advantages result therefrom: Where the roll is not wrapped or encircled by a sheet of fabric the cost incident thereto is avoided as well as the delays incident to re-wrapping the marking rolls. When the surface of the roll is encircled by a fabric cover the frequency with which the roll needs to be re-wrapped is greatly diminished and in practice it has been found that the rolls of my improved construction need be re-wrapped not oftener than once a week, thus not only effecting a great saving in the cost of the wrapping fabric, but also avoiding the delay in the operation of the machine during the time required for re-wrapping the rolls. In this respect my invention has accomplished a very great saving over marking rolls carrying metal impression surfaces wrapped with fabric, since with such rolls the cost to the manufacturer of the re-wrapping of the rolls is very large, whereas with my improved rolls the cost incident to wrapping the rolls amounts to only a few cents per ton. Again, inasmuch as my improved roll needs to be re-wrapped only about once a week, the time during which the marking roll is withdrawn from the machine and during which the machine is making unmarked paper that must be returned to the pulp vats, is so greatly reduced that a very material saving in this respect is also effected.

It will be understood that modifications of the invention may be made within wide limits without departing from the scope thereof, and the features of the invention may be employed without its adoption as an entirety. Thus, in Figs. 5 and 6 of the drawings, I have illustrated a modified construction of marking roll embodying certain features of my invention. Referring to Figs. 5 and 6 of the drawings, the metal body of the roll designated as H' has mounted thereon a series of marking plates instead of having thereon continuous sleeves of rubber. Each of these marking plates is shown as comprising a thin, flexible metal base plate L that will be secured to the periphery of the surface of the roll body H' as by screws M. To the base plate L is vulcanized a sheet h^4 of hard rubber upon which sheet h^4 is a sheet h^5 of soft rubber; and upon this sheet of soft rubber h^5 is vulcanized a sheet h^6 of hard rubber, the outer surface of which carries the design to be impressed upon the web of paper. I have shown the marking plates last described as encircled by a wrapping or sleeve of muslin or like fabric K, as in the construction illustrated upon Sheet 1 of the drawings. In the forms of the invention shown in Figs. 5 and 6 of the drawings, the peripheral surface of the metal body H' of the marking roll is shown as higher about the center of the roll than adjacent the ends thereof, the purpose of thus crowning the roll being to compensate for any "springing" of the roll such as is apt to occur, particularly with rolls of considerable length. This crowning of the periphery of the body H' of the roll insures a like crowning of the impression surface of the plates mounted upon the roll.

In describing the form of the invention illustrated in Sheet 1 of the drawings, I have referred to the layers of rubber that encircle the body of the marking roll as being preferably continuous tubes or sleeves. In practice each of these tubes or sleeves is preferably formed by wrapping a sheet of rubber about the periphery of the body of the roll, the lap edges of the sheet being scarfed and united by rubber cement so that

in the subsequent vulcanizing operation each sheet becomes in effect a continuous tube.

While the density or plasticity of the layers or covers of rubber upon the marking roll may be varied within wide limits, and while the expressions "hard rubber" and "soft rubber" will sufficiently define, to those skilled in the art, the difference between the character of the layers or covers, I may state that I have found in practice that a very satisfactory density or plasticity for the several layers or covers may be somewhat as follows, viz.: For the innermost hard rubber layer or cover of the marking roll, the density or plasticity as measured by the familiar Pusey & Jones plastometer using a .125 ball is approximately 0/100 mm.; while the density or plasticity of the outermost hard rubber sheet or cover is between 5/100 to 15/100 mm.; and the density or plasticity of the intermediate sheet or cover of soft rubber is somewhat in excess of 80/100 mm.

I claim as my invention:

1. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having vulcanized thereon a layer of rubber provided with a marking surface.

2. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having vulcanized thereon a sleeve of rubber provided with a marking surface.

3. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a sleeve of hard rubber provided with a marking surface.

4. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a cushioning layer of soft rubber and an outer sleeve of hard rubber provided with a marking surface.

5. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having vulcanized thereon a cover or sleeve of hard rubber provided with a marking surface.

6. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a layer of hard rubber, a second layer of soft rubber and a third or outer layer of hard rubber, said several layers being vulcanized together and the outer layer being provided with a marking surface.

7. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a continuous cover or sleeve of hard rubber, a layer of soft rubber upon said hard rubber sleeve and an outer layer of hard rubber upon said soft rubber layer and provided with a marking surface.

8. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a continuous sleeve of hard rubber, a continuous sleeve of soft rubber vulcanized to said hard rubber sleeve and an outer continuous sleeve of hard rubber vulcanized to said soft rubber sleeve and provided with a marking surface.

9. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a layer of rubber provided with a marking surface, said marking roll having a greater exterior diameter about its central portion and gradually decreasing in diameter toward its ends.

10. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a layer of rubber provided with a marking surface, said layer of rubber being thickest about the center of the roll and gradually diminishing in thickness towards the ends of the roll.

11. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a plurality of layers of rubber, the outermost layer being harder than the layer beneath it and being provided with a marking surface, said outermost layer being thickest about the center of the roll and gradually diminishing in thickness towards the ends of the roll.

12. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a plurality of cylindrical covers or sleeves of rubber united together, the outermost sleeve or cover being provided with a marking surface and being of harder rubber than the sleeve beneath it, said outermost sleeve being thickest about the central portion of the roll and gradually diminishing in thickness towards the ends of the roll.

13. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a layer of rubber provided with a marking surface, and a sheet of fabric interposed between said marking surface and said cylinder or roll.

14. In a paper-making machine, the combination with a suitable cylinder or roll, of a marking roll comprising a body having thereon a continuous sleeve or tubular cover of rubber provided with a marking surface and a sheet of fabric extending around the marking surface of the roll.

CHARLES R. SEABORNE.

DISCLAIMER

1,517,018.—*Charles R. Seaborne,* Niagara Falls, N. Y. PAPER-MAKING MACHINE. Patent dated November 25, 1924. Disclaimer filed July 24, 1933, by the assignee, *American Lakes Paper Company.*

Petitioner, therefore,

1. Disclaims from the scope of each and all of the claims of said Letters Patent any paper making machine having a marking roll which has an outer rubber layer or cover unless said layer or cover has a marking surface ground or cut thereon.

2. Disclaims from the scope of each and all of the claims of said Letters Patent any paper making machine having a marking roll provided with an outer rubber layer or cover with a molded marking surface.

3. Disclaims from the specification of said patent the word "formed" in line 2 of page 3, of said specification.

4. Limits the scope of each and all of the claims of said Letters Patent to paper making machines having a cylinder with which cooperates a marking roll having an outer layer or cover wherein the marking pattern or design is ground or cut.

[*Official Gazette August 22, 1933.*]

DISCLAIMER

1,517,018.—*Charles R. Seaborne,* Niagara Falls, N. Y. PAPER-MAKING MACHINE. Patent dated November 25, 1924. Disclaimer filed September 22, 1934, by the assignee, *American Lakes Paper Company.*

Therefore—

1. Disclaims from the specification of said patent, Figs. 5 and 6 of the drawings and the description thereof in lines 41 to 46 inclusive of page 2 of said patent, and that portion of page 3 of said patent commencing with the words "Thus, in Figs. 5 and 6" in line 84, and terminating with line 120 on said page.

2. Disclaims from the scope of each and all of the claims of said Letters Patent any paper making machine equipped with a marking roll having an engraved hard rubber cover which is not continuous.

3. Limits the scope of each and all of the claims of said Letters Patent to a paper making machine having a marking roll with a single one-piece outer hard rubber sleeve in which the design is engraved.

[*Official Gazette October 23, 1934.*]