Oct. 13, 1925.

1,556,918

H. F. DUNBAR

PAPER DRYING MACHINE

Filed Dec. 24, 1924

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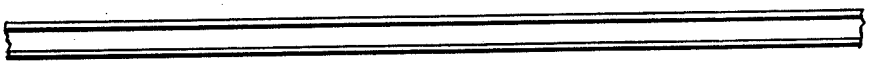
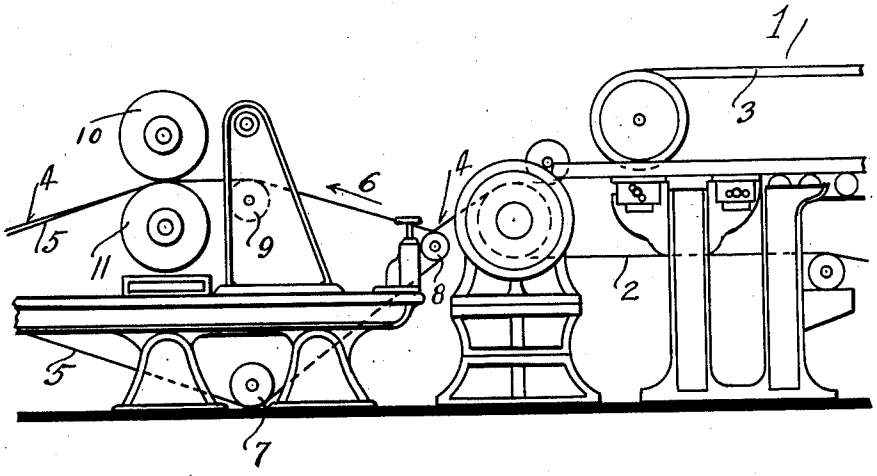


Fig. 1.



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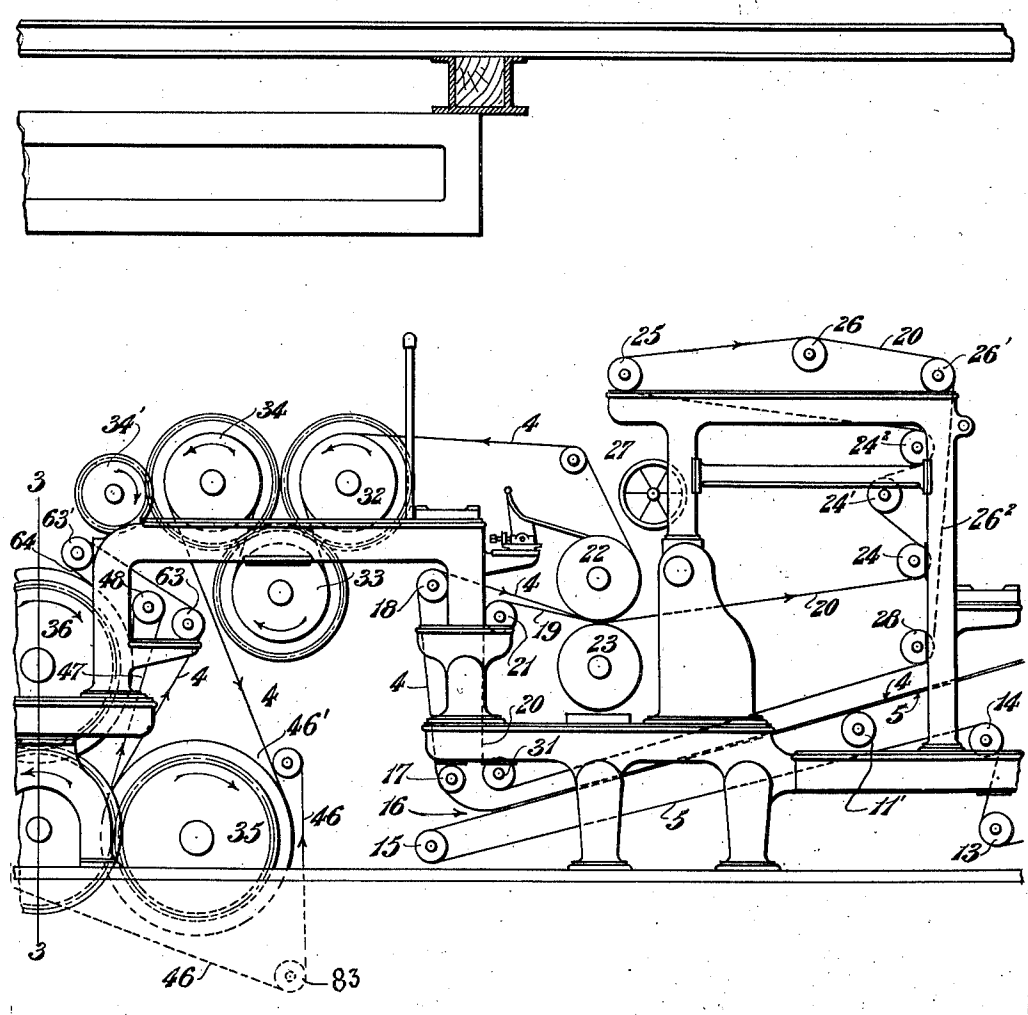
Oct. 13, 1925. 1,556,918

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Filed Dec. 24, 1924 5 Sheets-Sheet 2

Fig. 2.



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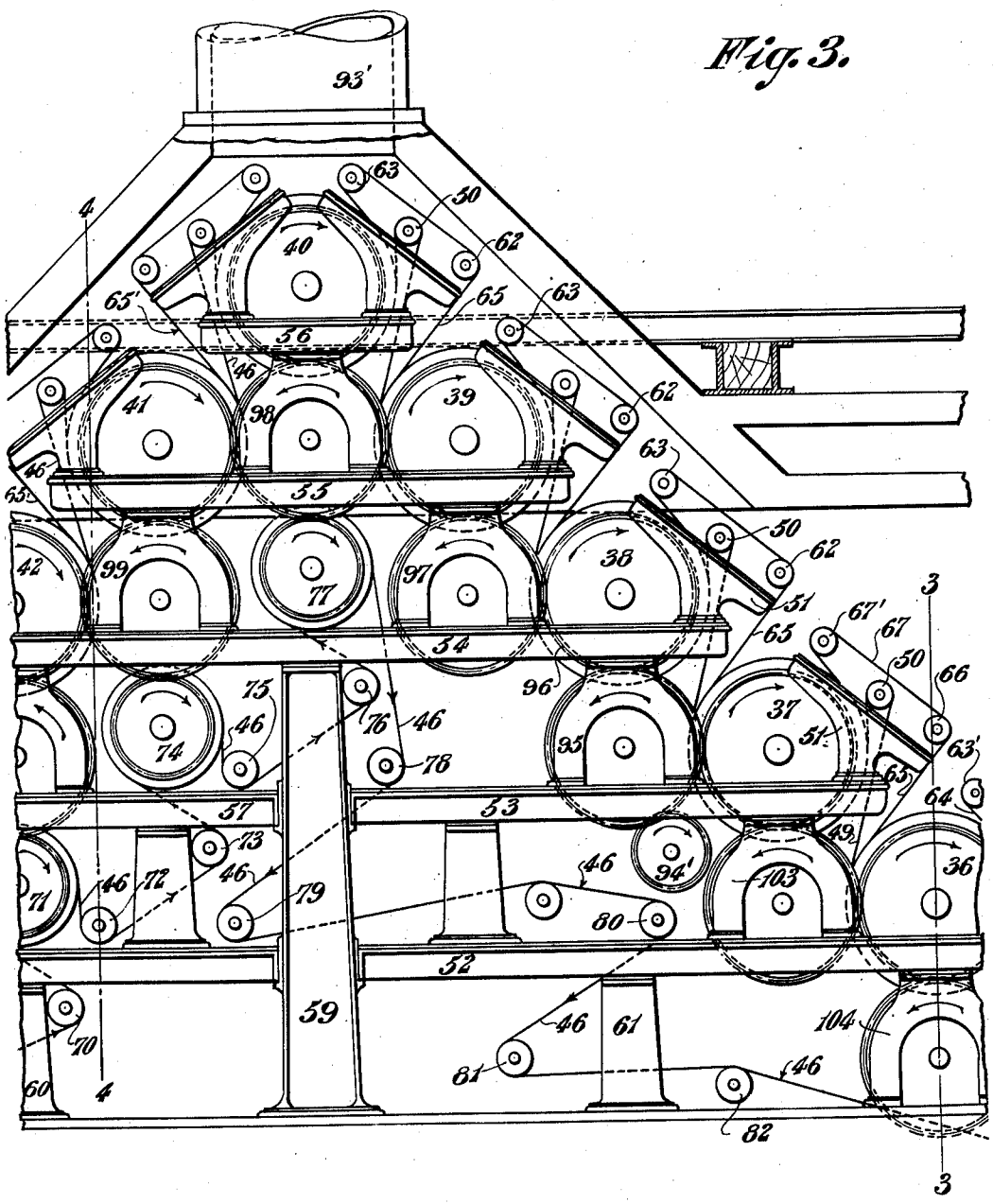
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PAPER DRYING MACHINE

Filed Dec. 24, 1924

5 Sheets-Sheet 3

Fig. 3.



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1,556,918

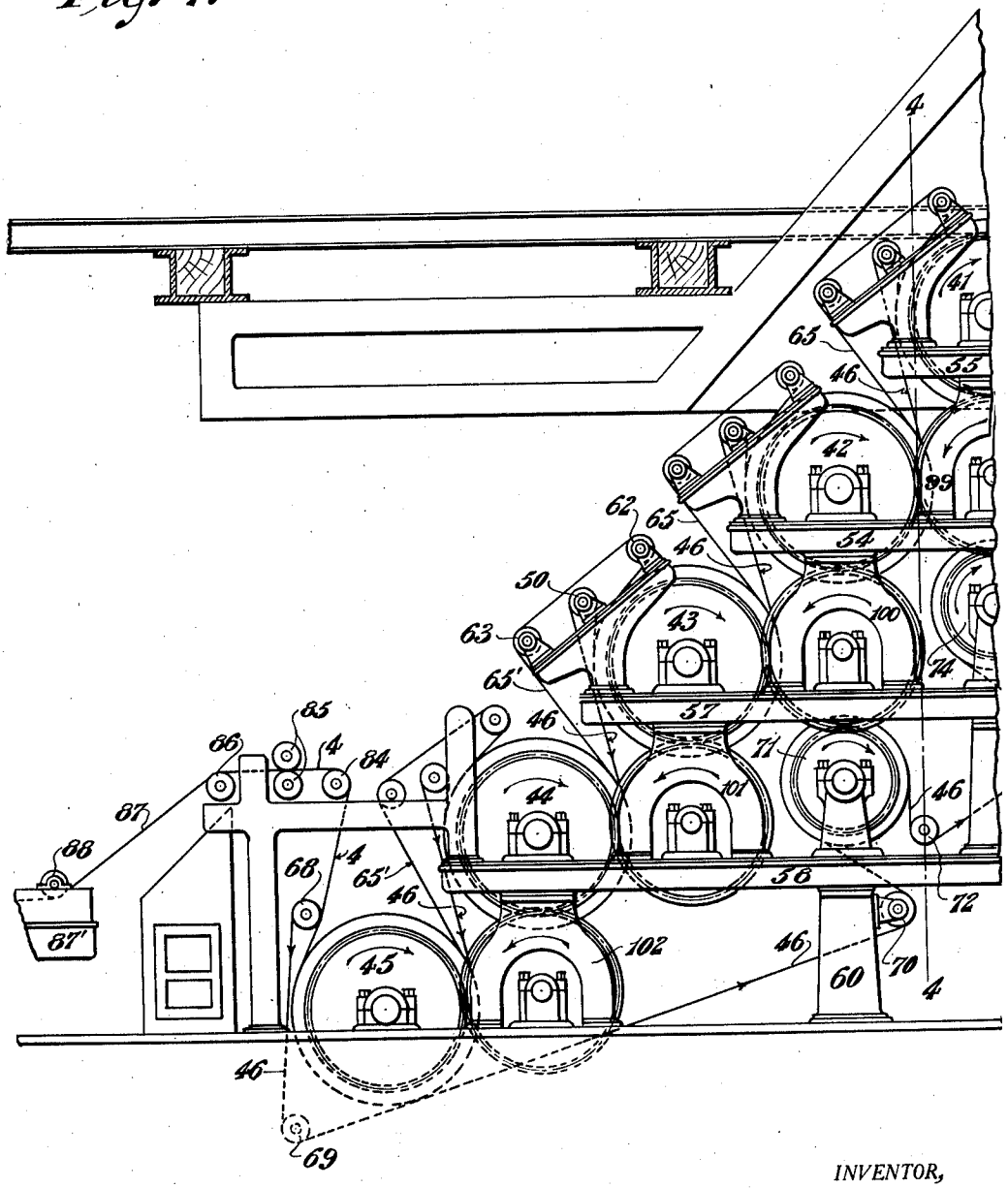
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PAPER DRYING MACHINE

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5 Sheets-Sheet 4

Fig. 4.



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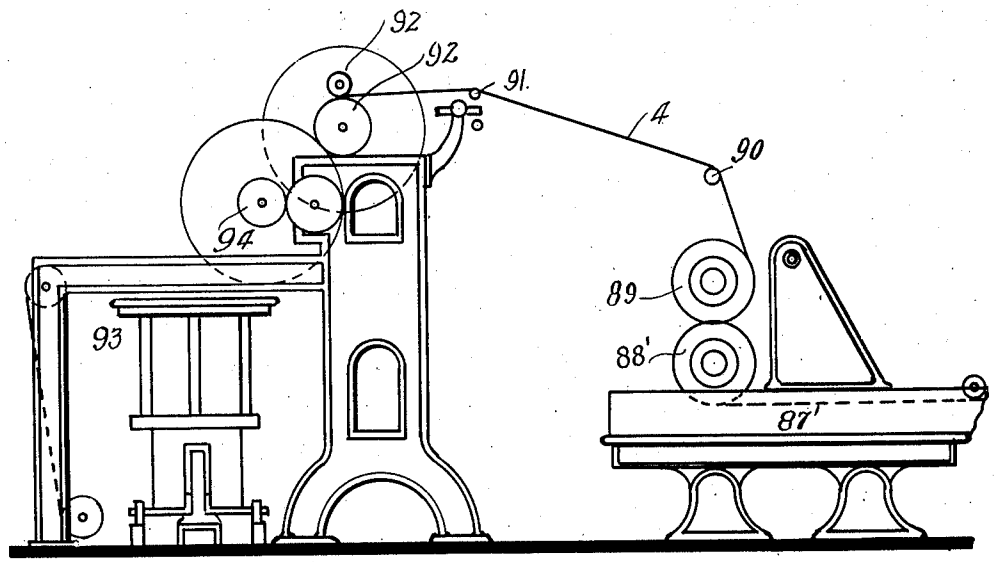
Oct. 13, 1925. 1,556,918

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Filed Dec. 24, 1924 5 Sheets-Sheet 5

Fig. 5.



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Patented Oct. 13, 1925. 1,556,918

UNITED STATES PATENT OFFICE.

HAROLD F. DUNBAR, OF TURNERS FALLS, MASSACHUSETTS.

PAPER-DRYING MACHINE.

Application filed December 24, 1924. Serial No. 757,917.

To all whom it may concern:

Be it known that I, HAROLD F. DUNBAR, a citizen of the United States, residing at Turners Falls, in the county of Franklin and State of Massachusetts, have invented new and useful Improvements in Paper-Drying Machines, of which the following is a specification.

This invention relates to improvements in machines for making paper and more particularly to machines for drying the web of paper as it passes successively from one drying roll to another through the machine.

An object of the invention is to so construct and arrange the drying rolls in order that both sides of the web of paper may be dried.

A further object of the invention is to arrange the drying rolls in what may be termed a pyramid assembly, so that the web of paper and the conveyor felt for supporting the web passes over carrying rolls and around the lower surfaces of drying rolls thus leaving the upper surfaces of the drying rolls unobstructed to permit the moisture in the web of paper and felt to readily escape to the atmosphere.

Heretofore it has been a common practice to carry the web of paper and the drier felt around the upper surface of the upper tier of drying drums when more than one horizontal tier is employed with the result that it is difficult to effectually dry paper due to the trapping of moisture between felt, paper web and drier roll, since the moisture is trapped or retained in the web of paper.

A further object is to arrange the large drier rolls in a pyramid form so that the longitudinal space required to assemble the rolls is very much less than would be the case if they were arranged in the usual horizontal planes.

A further object is to provide means for supporting the drier rolls so that they will be free from vibration.

Further objects will appear in the body of the specification and will be particularly pointed out in the claims.

Referring to the drawings:

Fig. 1 is a view showing the delivery end of the usual Fourdrinier paper making machine with the web of paper being delivered therefrom, onto an endless carrier felt and passing between a pair of press rolls.

Fig. 2 is a continuation of Fig. 1 with the web of paper being carried to a second pair of press rolls and from which it passes into contact with what is known as the baby drier rolls and from these rolls to the series of large drier rolls.

Fig. 3 is a continuation of Fig. 2 on the vertical lines 3—3 showing the series of large drier rolls which are arranged in pyramid formation and illustrating the web of paper and the long felt carrier for the web of paper.

Fig. 4 is a continuation of the arrangement of large drier rolls shown in Fig. 3 on the vertical lines 4—4, and

Fig. 5 is a continuation of Fig. 4 showing the web of paper passing through the sizing tank and between a pair of press rolls and then to the cutters and laying off table.

Referring to the drawings in detail:

1 designates as a whole the usual Fourdrinier machine having a Fourdrinier wire 2 and a deckle strap 3. The web of paper 4 as it leaves this machine passes on to a wool felt 5 which travels in the direction indicated by the arrow 6 between the press rolls 10 and 11 over the supporting roll 11′, around the carrying roll 15 over the carrying roll 14 under the stretch roll 13 under the carrying rolls 7 and 8 which completes the circuit.

At the point 16, the web of paper 4 leaves the felt conveyor 5 and engages the under side of the roller 17, then upward over the roller 18, where at the point 19 it again engages a second conveyor felt 20 which passes over the roller 21 and carries the web of paper between the pair of press rolls 22 and 23.

It will be noticed in Fig. 2 that the conveyor felt 20 after leaving the presser rolls 22 and 23 passes around the rollers 24, 24′ and 24^2, then forwardly around the roller 25, over 26, around 26′ then downward at 26^2, around the rollers 28, 31 and 21 which completes the circuit. 27 is a hand wheel which laterally adjusts the stretch roller 24′. After the web of paper 4 leaves the presser rolls 22 and 23 it passes to the baby drier

rolls 32, 33, and 34. It will be observed that the under side of the web of paper 4 engages the drier roll 32 on one side and its opposite or upper surface next engages the roll 33 then its opposite surface reengages the drier roll 34 as it passes over the roll 34. It then passes under the lowest one of the series of large drying rolls designated by the numerals at 35 to 45 inclusive. 46 designates a long endless conveyor drier felt which engages the under or lower surfaces of the drier rolls 35 to 45. The web of paper 4 engages the endless conveyor drier felt 46 at the point 46′ of the first drier roll 35. The felt then passes upward as indicated at 47, then around the roll 48. The felt and paper web then pass downward under the next drier roll 36. The felt then passes upward again as indicated at 49 where it leaves the roll 36, then over the roll 50 and next with the web of paper 4 under the drier roll 37 and so on to the last roll 45 where it passes over the roll 68. It travels in the direction indicated by the arrow marks thereon. The conveyor felt is supported by the rollers 50 which are mounted on the series of brackets 51 above the drier rolls as shown that are attached to the members 52, 53, 54, 55, and 56, the members 52, 53, 54, and 56 being supported by the posts 59, 60, and 61. These brackets also support the series of rollers 62 and 63 over which the web of paper 4 passes.

Referring now to the web of paper 4. It engages the conveyor felt 46 as already stated at the point 46′ of the lower large drier roll 35. After leaving the roll 35 the web of paper engages the roll 63 thus moving it away from the conveyor felt 47 then in an inclined direction over the roll 63′ and downward at 64 where it passes under the drying roll 36. After leaving this drying roll, as indicated at 65 it engages the roll 66, then upward in an inclined direction at 67 over the roll 67′, and downward under the roll 37 and so on engaging in succession the drying rolls 37, 38, and 39 to the last roll 45 in the same manner as that already described in connection with the rolls 35, 36, and 37.

An important feature of this arrangement of drier rolls 35 to 45 is that the web of paper 4 as it leaves the rolls 35 to 45 passes in nearly a vertical direction upward, as indicated at 65 and downward as indicated at 65′, whereby any moisture in the paper is permitted to freely escape to the atmosphere. Another important feature is that these running strands 65 and 65′ of the web of paper are located substantially over the upper surfaces of the drier rolls 35 to 39 and 41 to 45 with the resulting effect that the web of paper is separated from the long conveyor felt and the moisture is not therefore retained in the web of paper, or in other words, it is more effectually dried by reason of the position of the running strands 65 and 65′.

Another important feature is that by arranging the rolls 35 to 45 in a pyramid manner the longitudinal length of the machine is very much lessened over the usual construction of arranging the rolls in a horizontally arranged series of tiers.

Referring again to the conveyor felt 46 it will be noticed that after passing around under all of the drier rolls 35 to 45 inclusive, as shown it passes around the roll 68, as shown in Fig. 4, then downward and under the roll 69, then upward and around the roll at 70, then over the felt drying roll 71, then under the roll 72, then upward around the roll 73, next over the felt drying roll 74, then under the roll 75, then around the roll 76, next over the felt drying roll 77, then downward around the rolls 78, 79, over the roll 80, around the felt stretching roll 81, over the roll 82 around the roll 83 back to the starting point 46′.

The web of paper 4 leaves the roll 68 adjacent the last large drying roll 45, where it passes upward and over the roll 84 then between the slitters 85, over the roll 86, and downward at 87 under the roll 88 which is located in the sizing tank 87′. After passing through this tank it is carried between the press rolls 88′ and 89 and up over the roll 90 to the spreading rolls 91 thence between rolls 92 and 92′ and vertically downward in the path of revolving knife 94. It is next cut and stacked on the lay boy 93 in the usual manner. Located over the series of rolls 35 to 45 is a hood 93′ for the purpose of carrying away any moisture that rises from the drier rolls and from the web of paper and conveyor drier felt in the usual manner.

It will be noticed from this description that I have provided a paper making machine in which the series of drier rolls are located and arranged in a pyramid formation with means for rigidly supporting the same. The construction and arrangement are such that the web of paper as well as the conveyor felt passes under these drier rolls and not over the same.

It will be observed that the felt drier rolls 71, 74, and 77 are arranged below the pyramid paper drier formation and are spaced from each other so that the conveyor felt will have a substantially long travel or span in passing over these driers without the web of paper carrying moisture to the felt during its travel from roll 71 to 77. It is obvious that the long span of felt which provides for free circulation of air conditions the felt very much better and makes for more rapid drying during its travel in contact with drier rolls.

It will be observed that with this arrange-

ment of driers and conveyor felt that the drier section has only one long conveyor felt with separate driers for conditioning all of which is advantageous to longer life of the conveyor felt, more perfect and rapid drying, greater production and greater economy in costs of felts and loss of time in renewals.

The main drive gear for the drier rolls is indicated at 94', see Fig. 3. This gear meshes with the gear 95, which in turn meshes with the gear ring 96 on the drier 38, which drives gear 97, that drives roll 39, that drives gear 98. This gear drives rolls 40 and 41 and the felt drier roll 77. The gear on drier roll 41 drives gear 99. This gear drives the drier roll 42 and felt drier roll 74. The gear on roll 42 drives the gear 100 which in turn drives the felt drier roll 71 and paper drier roll 43. The gear on roll 43 drives the gear 101 and then drives the drier roll 44, which roll drives the gear 102 that meshes with the gear ring on the last drier roll 45.

The gear 95 also drives the drier roll 37 which in turn drives the gear 103. This gear drives the drier roll 36, which in turn drives the gear 104, which drives the drier roll 35. It will therefore be seen that the main drive gear 94 operates all of the paper drying rolls as well as the felt drier rolls. The felt conveyors 5 and 20 are termed the wet felts and the conveyor 46 is termed the drier felt.

What I claim is:

1. In a paper drying machine, the combination, with a plurality of conveyor felts for receiving the web of paper, a series of drier rolls arranged in substantially a pyramid formation around which the web of paper passes, the web of paper being passed around the upper-most roll of the series in such a manner as to cause the same surface of the web of paper to be engaged on all of the rolls.

2. In a paper drying machine, the combination with a conveyor felt for receiving the web of paper as it leaves the Fourdrinier machine, a second conveyor felt to receive the web of paper as it leaves the first conveyor felt for conducting the web of paper between a pair of press rolls, a plurality of drier rolls to receive the web of paper as it leaves the said press rolls and a series of drier rolls arranged in pyramid formation to receive the web of paper as it leaves the said plurality of drier rolls, a third conveyor felt being arranged in such a manner as to engage only the under surfaces of the pyramid series of drier rolls for carrying the web of paper in contact with the under surfaces of the last mentioned drier rolls.

3. In a paper drying machine, the combination with a series of drier rolls which are arranged in pyramid formation, a drier conveyor felt engaging the rolls for receiving the web of paper to be dried, means for passing said felt around all of the drier rolls, the construction and arrangement being such that the web of paper engages only the bottom surfaces of the drier rolls, the conveyor felt and the web of paper being carried substantially in vertical paths above the upper uncovered surfaces of the drier rolls, whereby the web of paper is exposed to the free action of the atmosphere and the heat which is radiated from the upper uncovered surfaces of the drier rolls which serves to dry the felt and the web of paper during their travel in the vertical planes and before they engage the under surface of the next drier rolls.

4. In combination, a series of drier rolls which are arranged in pyramid formation, a conveyor drier felt which engages the rolls to receive the web of paper to be dried, means for supporting the said felt both above and below the rolls so that the web of paper is arranged in vertical planes as it engages and leaves the rolls for permitting the heat which is radiated from the upper uncovered surfaces of the rolls to come directly into contact with the web of paper for drying the same.

5. In a paper making machine, the combination, with a Fourdrinier machine, a conveyor felt to receive the web of paper from said machine, a pair of press rolls, the second pair of press rolls, a second conveyor felt to receive the web of paper from the first felt for passing it through the second pair of press rolls, a plurality of small drier rolls around which the web passes, a series of drier rolls, a third conveyor felt to receive the web as it leaves the small drier rolls for conducting it around the lower surfaces only of the series of drier rolls, said series being arranged in pyramid formation, and means for operating the said conveyors and press rolls.

6. A paper making machine having in combination, a series of drier rolls which are arranged in pyramid formation and means for leading a web of paper around the lower surfaces only of the rolls and directly above the uncovered upper surfaces of the drier rolls.

7. A paper making machine having a series of drier rolls which are arranged in pyramid formation, means for leading a web of paper around the lower surfaces only of the rolls, said means being so arranged that the web engages and leaves the series of rolls in substantially vertically arranged planes, and means for operating the rolls and said means.

8. In a paper drying machine, drier rolls arranged in an inclined manner, means for supporting the drier rolls, roller supporting

brackets arranged on the roller supporting means of the rolls, the said rollers being for receiving a conveyor felt and a web of paper, the construction and arrangement being such that the conveyor felt and web of paper each engages only the under surfaces of the drier rolls.

9. In a paper drying machine, in combination, a supporting frame, a series of drier rolls, rotatably supported on the frame in pyramid formation, means for successively directing the web of paper about the series of drier rolls, the construction and arrangement being such that the drier roll at the apex of the formation serves the purpose of causing the same surface of the web of paper to engage all of the drier rolls, a sizing tank and means for cutting and stacking the finished paper.

10. A paper drying machine comprising, in combination, a conveyor felt, press rolls through which the felt and web pass a second conveyor felt and press rolls, a plurality of small drier rolls for drying the opposite surfaces of the web of paper and a series of larger drier rolls which are arranged in pyramid formation for the purpose of drying the original surface of the web of paper.

11. In a paper drying machine, a series of drier rolls arranged in pyramid formation, a long conveyor felt for receiving the web of paper to be dried, the construction and arrangement being such that the web of paper engages the series of driers on its same surface, the drier roll at the apex of the series being engaged by both the web of paper and the conveyor felt, as described.

12. In a paper drying machine, a series of drier rolls which are arranged in pyramid formation, a conveyor felt engaging the lower surfaces only of the rolls, a plurality of rolls for drying the conveyor felt and arranged below the pyramid formation of the driers and so arranged that the felt will have a long travel from one of its drier rolls to the other.

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