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W. S. CRANDELL

PAPER MAKING MACHINE

Filed Nov. 14, 1922

3 Sheets-Sheet 1

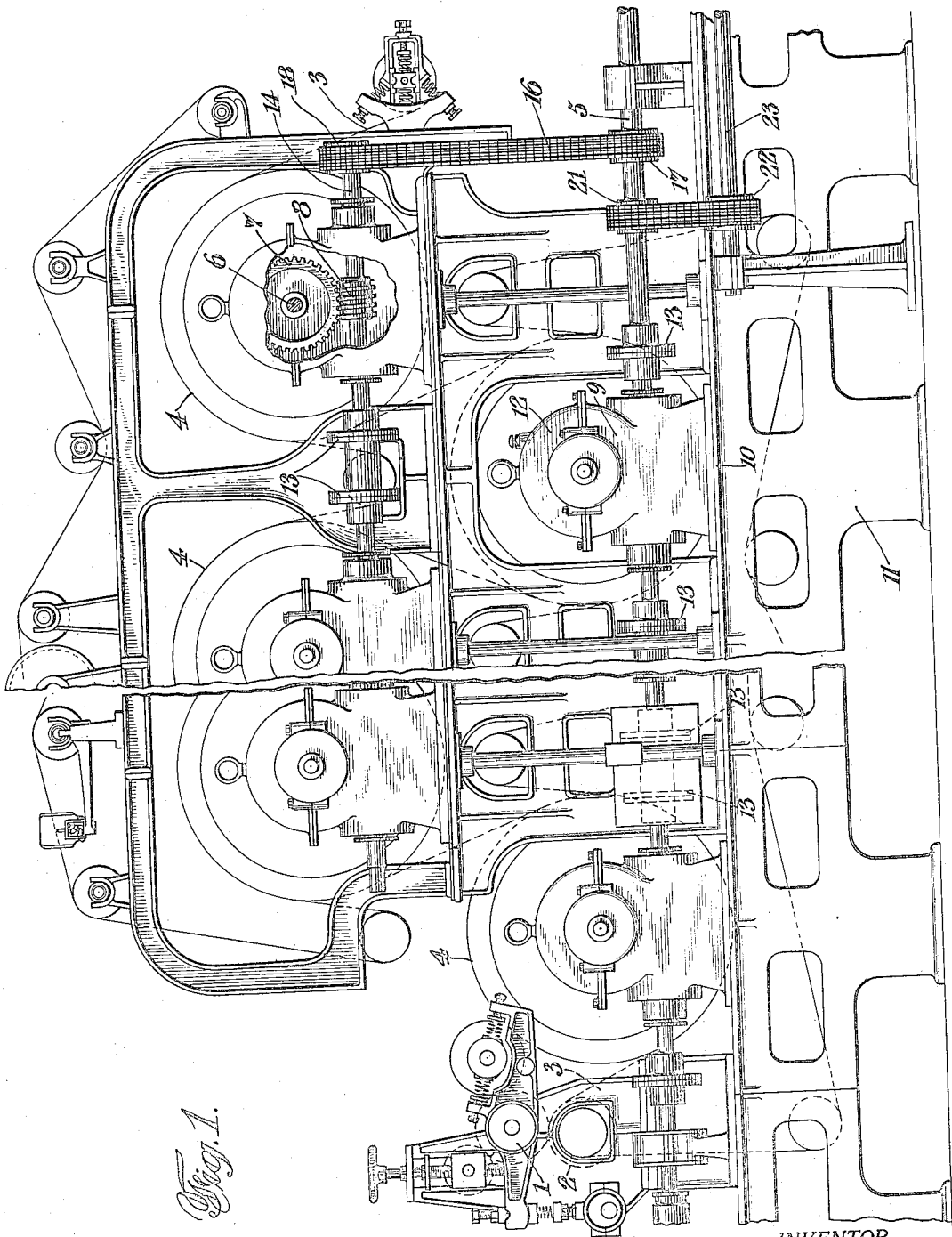


Fig. 1.

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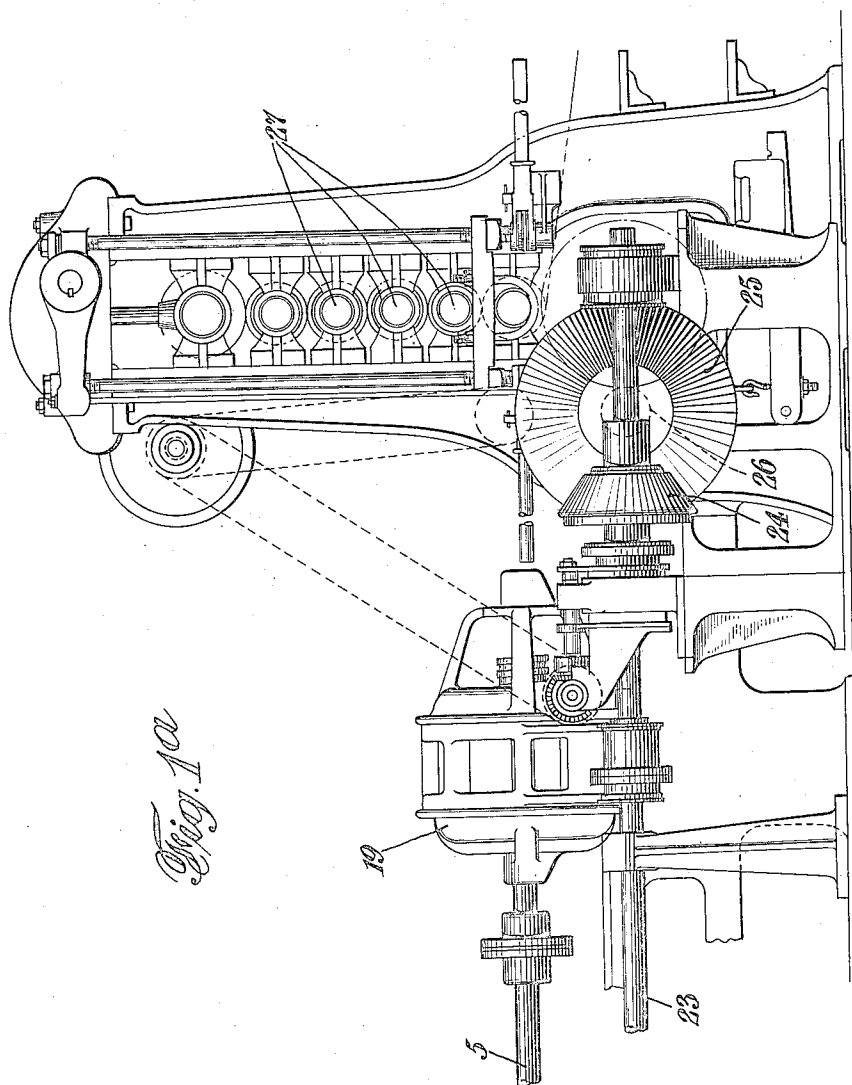


Fig. 1a

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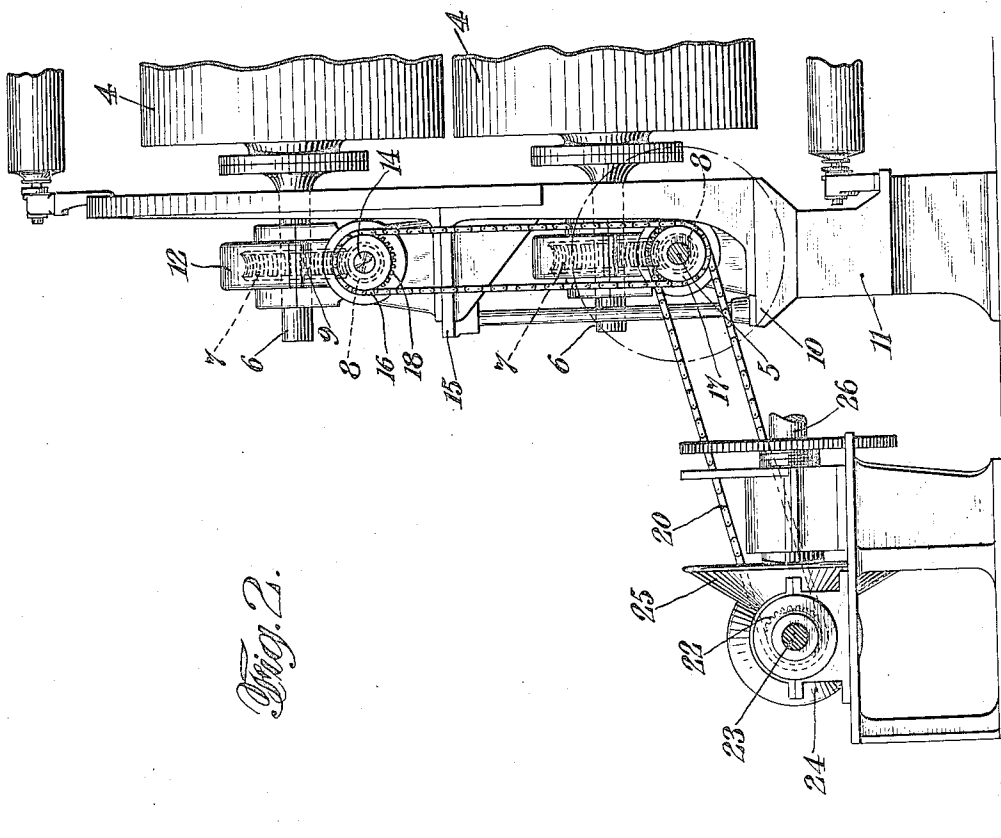
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3 Sheets-Sheet 3



INVENTOR

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UNITED STATES PATENT OFFICE.

WILLIS S. CRANDELL, OF ELSMERE, NEW YORK, ASSIGNOR TO ALBANY PAPER MILL MACHINERY COMPANY, INC., OF ALBANY, NEW YORK, A CORPORATION OF NEW YORK.

PAPER-MAKING MACHINE.

Application filed November 14, 1922. Serial No. 600,855.

To all whom it may concern:

Be it known that I, WILLIS S. CRANDELL, a citizen of the United States, a resident of Elsmere, in the county of Albany and State of New York, have invented a certain new and useful Paper-Making Machine, of which the following is a specification.

The invention relates to paper-making machines of the type in general use, consisting of a web-forming mechanism embodying a forming wire or cylinder, couch rolls and press rolls, between which rolls the paper web is conducted by means of felt aprons and water expressed therefrom, a series of driers or drying rolls, and calender rolls for the purposes respectively of further eliminating moisture from the paper web, and effecting the desired finished surface thereon.

This invention relates particularly to the driving mechanism for a paper-making machine as briefly described above. Heretofore it has been the general practice to drive the different parts of the machine from a line shaft having belting run to intermediate shafts located respectively adjacent the different parts of the machine such as the press rolls, driers, and calender rolls, together with cone pulleys or the like, to permit the necessary adjustment in speed between different parts of the machine, whereby the same may be coordinated to attain a uniform speed of travel of the web therethrough. The power from the different intermediate shafts was then transmitted to the machine parts by belting or gearing, the driers for example being provided with large intermeshing spur gears deriving their motion from one drier which was directly driven from the corresponding intermediate shaft, and therefore served to turn the remaining drier through the medium of the spur gears above-mentioned.

Driving mechanisms of the above nature are open to certain objections; where the power is transmitted through ropes or belts a certain amount of slippage occurs between the belts or ropes and their pulleys, hence the machine is liable to cause breaks in the paper web, or wrinkles therein, due to the fact that the different parts of the machine are not maintained at exactly the proper speed ratios. Also when spur gears are employed to drive parts of the machine, as in the case of the drier rolls above-mentioned,

it is found that if the machine be operated at high speed vibrations are set up which would break the web of paper, particularly if thin tissue paper is being produced. Furthermore, a driving mechanism of the above nature is cumbersome, particularly as regards the amount of space taken up, since it involves shafting, belting, etc., exterior to and separate from the machine proper; certain parts of the mechanism, such as the spur gears above described, in general use for actuating the drying rolls, also obstruct ready access to the adjacent parts of the machine, the spur gears for example being about as large in diameter as the large drying rolls, with the result that when the spur gears are in place they cut off access to the driers from that side of the machine, interfering with the operation of threading the paper web through the driers when necessary as in starting the machine, or if a break in the web has occurred. Moreover, the spur gearing is dangerous to operatives, and should be provided with guards, but if these gears are enclosed, the frame of the machine would be practically solid on that side, and prevent the free circulation of air to the driers which is necessary to carry away the requisite amount of moisture from the paper web.

It is the object of the present invention to provide a driving mechanism for paper-making machines which will overcome the disadvantages of the character above-mentioned, and permit the speed of the machine to be increased without injurious effect on the paper web, and which will enable the driers to be operated more satisfactorily from the standpoints of the elimination of moisture and ready access to adjacent parts of the machine.

The invention also aims to provide a self-contained paper-making machine in which the driving mechanism is incorporated into the structure of the machine proper, thus rendering the machine compact, and avoiding the necessity of employing lines of shafting, belting, etc., which have to be separately installed around the machine proper.

Further objects and advantages of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained, which, taken in connection with the accompanying drawings,

discloses a preferred embodiment thereof; such embodiment, however, is to be considered merely as illustrative of its principle. In the drawings:

5 Fig. 1 is a side view of the press rolls and drying rolls of a paper-making machine constructed in accordance with the invention, certain of the intermediate driers being cut out.

10 Fig. 1^a is a view similar to Fig. 1, and constituting in effect an extension of Fig. 1 to show the delivery end of the paper-making machine which includes the calender rolls.

15 Fig. 2 is an end view of certain portions of the machine as seen when looking from the right of Fig. 1^a.

Referring to the drawings, I have shown at the left of Fig. 1, a set of press rolls 1—2 which will be understood as receiving the paper web 3 from the web-forming part (not illustrated) of the machine. After passing between the press rolls 1 and 2 the web is conducted over a series of steam heated drying rolls or driers 4 which may be in one or two tiers, according to the size of the machine, the web then passing through a series of calender rolls (Fig. 1^a). Generally speaking, the above parts of the machine may be considered as of any suitable construction, and accordingly the same will not be described in greater detail herein.

In accordance with the present invention 35 the several driers 4 of the machine are actuated from a driving shaft 5 extending longitudinally of the machine in proximity to the ends of the spindles 6 for the drying rolls; and each drier is individually driven 40 from the shaft 5 by means of gears of the spiral type mounted respectively on the ends of spindles 6 and adjacent portions of shaft 5. In the present instance this gearing consists of worm wheels 7 mounted on the spindles 6 and worms 8 on shaft 5. Gears of the 45 above type engage with a rolling motion, obviating the difficulty of vibration heretofore encountered with spur gears, and thus the speed of the machine may be substantially increased without increasing the risk of injury to the paper web in this part of the machine. Furthermore, although the spur gears previously used have been of as large 50 or larger diameter than the driers themselves, for example 48 or 50 inches, the gear 7 of the present machine need not be more than one-fourth or one-fifth the size of the spur gears previously employed, thus rendering the adjacent ends of the driers and 60 associated parts, readily accessible from the side of the machine which carries shaft 5, and permitting free circulation of air to the driers.

I prefer to provide supporting members 65 or housings 9 for the several sets of gears 7

and 8, such housings in the present instance being detachably mounted upon shelf 10 on the frame or bed 11 of the machine. The housings provide bearings for the shaft 5 and spindles 6, and thus may serve to support the corresponding ends of rolls 4, instead of such rolls being journaled in the frame of the machine as has heretofore been customary. The casings 9 are preferably provided with detachable top sections 12 to permit ready access to the interior thereof. 70 The housings serve as well to protect the operatives from injury and to confine the lubricant which usually is employed for the gears, away from the operatives or the 80 paper web.

Preferably the driving shaft 5 is made in sections detachably connected together by means of the several couplings 13, in such manner that each shaft section corresponds 85 to one of the driers 4; this permits the parts associated with each drier to be disassembled as a unit without disturbing the machine as a whole.

Where the invention is applied to machines having two tiers of driers, as is the case with the machine illustrated, the upper tier of driers may be driven from a shaft 14, similar to the shaft 5 previously described, and associated with gears 7 and 8, 90 housings 9, etc., as above-mentioned, the housings 9 for the upper tier of driers being preferably detachably mounted on a shelf 15 (Fig. 2) on the main frame of the machine, similar to shelf 10 previously described. 95 Where the shaft 5 is the primary driving element, driving connections will extend between the same and the shaft 14; for this purpose I prefer to employ a chain 16 running over sprockets 17 and 18 on shafts 5 and 14 respectively. The chain drive is not subject to slippage or undue vibrations, and thus does not interfere with the operation of the machine at high speeds. 100

Preferably the shaft 5 extends far enough forwardly of the machine to enable one of the lower press rolls to be actuated therefrom by devices (not illustrated) which may be similar to the gears 7 and 8 previously described. Since the shaft 5 is incorporated into the structure of the machine proper the above-mentioned parts of the machine are thus self-contained. 105

The calender rolls also preferably derive their motion from shaft 5. This shaft, in the present embodiment, is direct connected to an electric motor 19 (Fig. 1^a) with a chain 20 running over sprockets 21 and 22 respectively on an auxiliary shaft 23 extending toward the calender rolls. In the present instance, a friction cone 24 on auxiliary shaft 23 cooperates with a driven friction cone 25 on a shaft 26 running parallel to calender rolls 5, and connected to drive the latter in any suitable manner which it is 120 125 130

not considered essential to describe in detail. The cone 24 also preferably is adjustably mounted to permit adjustment of the speed ratios between the driers and the calender rolls, as is described more in detail in my pending application Serial No. 573,903, Adjusting mechanism for friction gears, filed July 10, 1922.

While a specific embodiment of the invention has been disclosed, it will be obvious that many changes may be made therein without departing from the spirit of the invention as defined in the following claims.

I claim:

1. A paper-making machine comprising a series of drying rolls having spindles and carrying gears adjacent ends of their spindles, a driving shaft extending longitudinally of said series of drying rolls adjacent said gears, said driving shaft carrying gears meshing respectively with the gears which are carried by the drier spindles.

2. A paper-making machine comprising a series of drying rolls having spindles and carrying gears adjacent ends of their spindles, a driving shaft extending longitudinally of said series of drying rolls adjacent said gears, said driving shaft carrying gears meshing respectively with the gears which are carried by the drier spindles, said machine including a frame, and supporting members carried by said frame each providing bearings for their corresponding drier spindles and for the driving shaft.

3. The combination set forth in claim 1, wherein the gears comprise worm wheels carried by the drier spindles, and worms carried by the driving shaft.

4. The combination set forth in claim 2,

wherein the driving shaft is divided into sections coupled together, with each section corresponding to one of the supporting members.

5. A paper-making machine comprising a frame, a series of drying rolls with spindles mounted above said frame and carrying gears adjacent the ends of their spindles, a driving shaft extending longitudinally of said series of drying rolls adjacent said gears, said driving shaft carrying gears meshing respectively with the gears which are carried by the drier spindles, said frame including a shelf adjacent said gears, and supporting housings mounted on said shelf and enclosing said gears, said housings providing bearings for the shaft and drier spindles.

6. A paper-making machine comprising upper and lower tiers of drying rolls, said rolls having spindles and carrying gears adjacent ends of their spindles, driving shafts extending longitudinally of the machine respectively adjacent the gears of said tiers of drying rolls, said driving shafts carrying gears meshing respectively with the gears which are carried by the drier spindles, and means for transmitting motion from one of said gears to the other.

7. The combination set forth in claim 1, together with calender rolls, an auxiliary shaft extending from said first-mentioned shaft to said calender rolls, and means for transmitting motion of said first-mentioned driving shaft to said auxiliary shaft.

In testimony that I claim the foregoing, I have hereunto set my hand this 20th day of October, 1922.

WILLIS S. CRANDELL.