C. E. POPE.

PAPER MACHINE.

APPLICATION FILED NOV. 23, 1911.

1,022,378.

Patented Apr. 2, 1912.

2 SHEETS—SHEET 1.

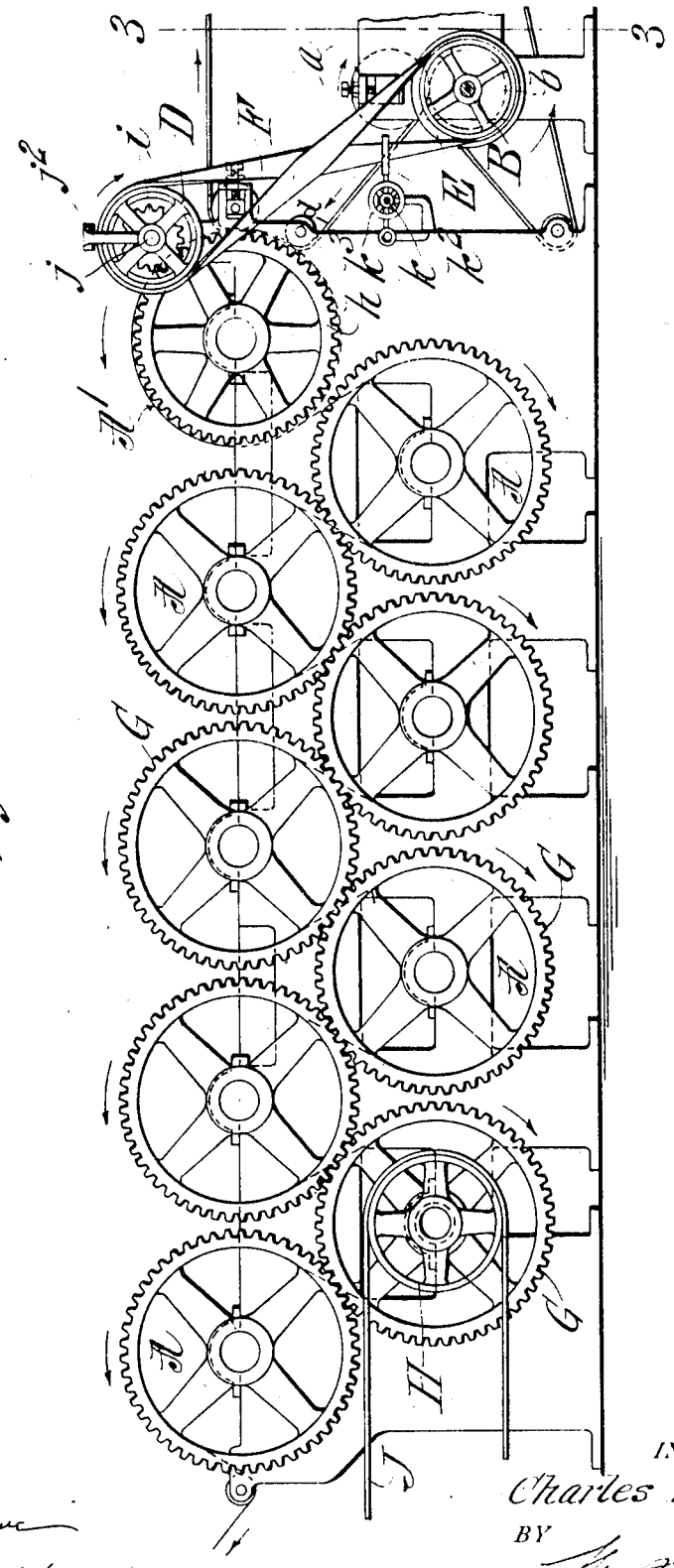

Fig. 1.

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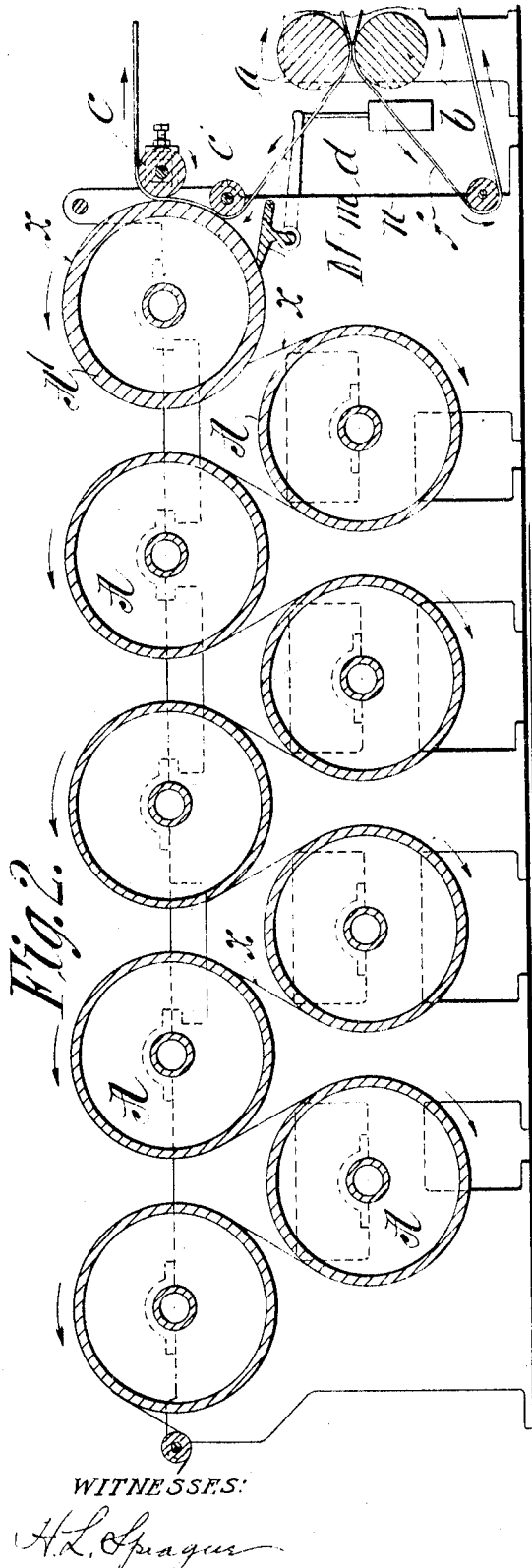

Fig. 2.

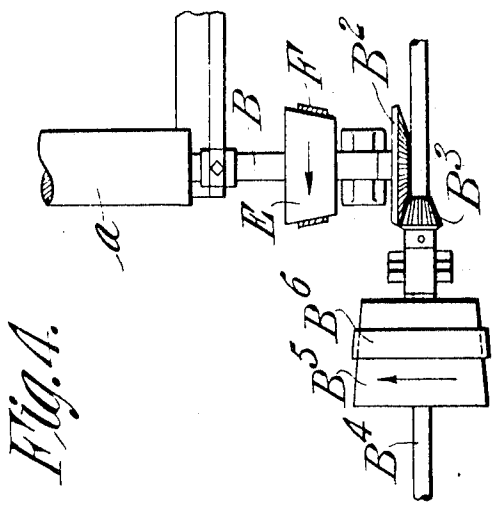

Fig. 4.

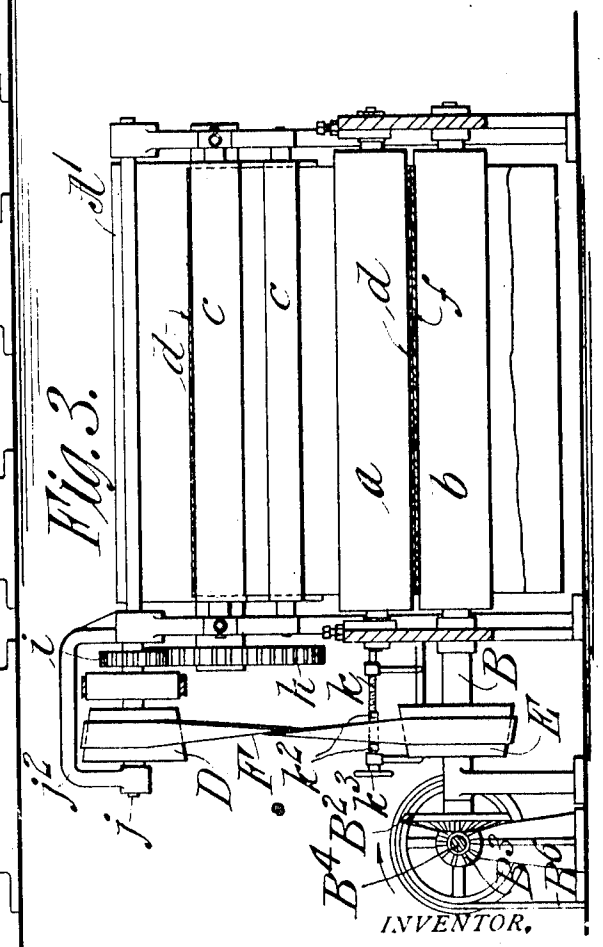

Fig. 3.

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UNITED STATES PATENT OFFICE.

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PAPER-MACHINE.

1,022,378. Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed November 23, 1911. Serial No. 661,913.

To all whom it may concern:

Be it known that I, CHARLES E. POPE, a citizen of the United States of America, and resident of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Paper-Machines, of which the following is a full, clear, and exact description.

This invention, for improvements in paper machines, more particularly relates to the feeding and drying apparatus thereof,—the invention pertaining to a feeding and drying apparatus of the same general character as that described and shown in Letters Patent of the United States issued to me May 16, 1911, No. 992,688.

The particular object of the apparatus in which this invention is comprised is to assure the carrying of the web of paper as it merges from the "wet end" of the Fourdrinier machine through the drying apparatus under its proper tension in all parts of such drying apparatus so that the web will neither be unduly stretched or broken nor allowed to become too slack to form wrinkles or transverse foldings therein.

The invention contemplates the provision in coöperative relations of one of the web carrying felt aprons and a drier drum and variable speed means for the propulsion of the apron, additional variable speed means for the rotative driving of the drier drum, with means for controlling the latter variable speed means, and further drier drums and independent means for rotating them in unison.

In the operation of the machine organized in accordance with my present invention, it becomes possible to run the first drier drum at a surface speed exactly corresponding to that of the web carrying felt apron, irrespective of the thickness of such apron and without dependence upon the means for its propulsion, and to run the further drier drums at a slightly greater surface speed than that of the first drier drum and of the web carrying apron so that after the web shall have been taken off from the apron onto and carried by the first drum, it will in its passage around the further drums be subjected to just a slight degree of tension for its being run through the drier in perfectly smooth, unwrinkled and unbroken condition.

Means with resultant capabilities such as above outlined have been found especially necessary in the forwardly feeding and drying of the web of paper when the latter is especially light and thin, as is the case for the making of tissue paper.

The invention, furthermore, consists in means coacting with the periphery of the first drier drum for imparting an extremely smooth and glass-like surface to the latter, whereby the web brought to and running partially around said first drier drum will readily and of its own accord "break" away or become separated from such peripheral surface so as to have its course to and around the next one of the further series of drier drums.

The invention is described in conjunction with the accompanying drawings and is set forth in the claims.

In the drawings:—Figure 1 is a side elevation including the forward end portion of the wet part of the Fourdrinier machine feeding and drying apparatus; Fig. 2 is a longitudinal vertical sectional view through the same; Fig. 3 is an elevation as seen beyond the plane indicated by the line 3—3, looking in the direction of the arrow; and Fig. 4 is a partial plan view.

In the drawings,—at the right hand portion of Figs. 1 and 2, the web drawing out means, that is the means for forwardly advancing a very thin wet web of paper toward the driers, is indicated as consisting of a pair of press rolls *a* and *b* between which run the endless aprons or bands of felt, the upper endless band *d* being of hard felt while the one *f* is of soft felt, it being well known that the wet web of paper will adhere to and be carried along by the hard felt apron; and such hard felt apron passes forwardly upwardly around the guide rolls *c c* in proximity to which is the first drier drum, A′. One of the press rolls is carried by a rotative shaft B on the end of which is a bevel gear wheel B^2 which meshes into a smaller bevel gear wheel or pinion B^3 carried at the end of a shaft B^4 having a cone pulley B^5 thereon and driven by shiftable or adjustable belt B^6 from a below located cone pulley,—these last described parts constituting a variable speed driving mechanism for the web drawing out means in which the press rolls and endless aprons are important components.

The portion of the hard upper felt apron

d between the separated rolls c c runs with the web in peripheral contact against the rear peripheral portion of the first drier drum, and the web, as usual, thence passes from the first drier drum to and around the series of drier drums A A in upper and lower tiers. The web thence passes to and through the calenders to the reel. The first drier drum A′ has on one end thereof a comparatively large spur gear wheel h with which meshes a smaller spur gear wheel i affixed on a short horizontal transverse shaft j journaled in the bracket j^2. The shaft j has a cone pulley D fast thereon, and the press roll shaft B has a cone pulley E affixed thereon,—the cross belt F running around both of the said cone pulleys so that from the rotation imparted to the driven press roll shaft B, a rotation of the first drier drum will be given in the same direction. The belt F comprised in the cone pulley variable speed drive has the usual description of belt shifting or adjusting means, the same consisting of the screw shaft k having the belt engaged yoke k^2 and the operating hand wheel k^3, the yoke carrying screw shaft having its thread engagement through the hand wheel so that when such wheel is turned the fine adjustment and regulation of the variable speed driving means may be acquired.

All of the drier drums A A of the series are caused to run together and in unison by means independent of the driving means for the first drier drum, that is the drums A A are all connected by the train of spur gears G, one of the gear provided drums having a pulley H run by belt J which is driven from a shaft, not shown but understood as being a primary source of power for the operation of the entire paper machine.

In the running of the machine with unusual rapidity and for the bringing through of the dry web of paper in perfectly smooth, unwrinkled or unfolded, and also unbroken condition, it is very necessary that very delicate adjustment and control of the running parts may be acquired,—that is the first drier drum A must have its surface speed in exact accord with the surface speed of the felt apron d and the paper web carried thereby, and that the rest of the drier drums A A of the series be run at an imperceptible, but practically appreciable higher rate of speed than that of the first drier drum A′. The power shaft for the entire machine or paper plant being started and through the connections therewith the drums A A will be driven by the belt and pulley J, H, and the train of gearing G G; and the web drawing out means will be driven from the cone pulley B^5 having the shiftable belt B^6, bevel gearing B^3, B^2, and press roll propulsion shaft B. This web drawing out means may have its motion at a speed approximately the same as, but generally slightly slower than, the speed of the drier drums A A, and the first drier drum will through the cone pulleys and cross belt be run in conjunction with the web drawing out means.

Experience and practice have shown that although the drawing out means and the first drier drum may be run more or less nearly in unison when both are driven from a common shaft, such as the one B^4, there will, nevertheless, be found a slight variation as between the surface speed of the felt apron d and the periphery of the drum A′, sometimes occasioned by variations between the thicknesses of old and new aprons, and also between the thicknesses of the wet web of paper being made; therefore, for the nice and exact regulation of the machine where for a short part of its length the apron d runs next to the periphery of the first drier drum, the variable speed driving means for said drier drum is of very great importance. If the first drier drum A lags relatively to the traveling speed of the web drawing out means, its running speed may be increased as required, and vice versa; and by reason of the first drier drum being at all times out of gearing connection with all of the other drums of the series, such other drums may, by their independent propulsion means, be driven at a very slightly greater running speed than that of the drum A′, so that there may be a take-up and tensioning action exerted relatively to the web which becomes expanded or slightly increased in length, after having been subjected to the heating and drying action of the first drier drum in which I maintain a higher pressure for the acquirement of a much greater heat than is the case in respect to the remainder of the drums.

The web of paper by reason of having the greatest degree of moisture at the time it comes to and runs partially around the first drier drum, has the tendency to adhere to, and be carried entirely around by such first drum; and in order that this tendency of adhesion may be overcome, and so that the web will break away and assume a line of progression more or less nearly tangential to the periphery of the first drum, and about as indicated in Fig. 2, (x representing the web). I provide means coöperative with the first drier drum for polishing the circumferential surface thereof and imparting thereto a highly smooth, bright and glass like surface.

The first drier drum is made of cast iron with greater thickness of walls than usual; and beneath the same is horizontally transversely and pivotally mounted a comparatively bulky tiltable bar M,—see Fig. 2,—provided, at each end, outside of its pivotal

or journal support with a lever like extension *m* to which a comparatively heavy weight *n* is hung. This bar M is made of cast iron and being in edgewise contact at all times and under considerable pressure against the surface of the drum A′, renders such surface of a highly polished, smooth and bright character,—all pits, roughness and inequalities in the web carrying surface of this hollow cylinder being automatically removed.

I claim:—

1. In a paper machine, the combination of web drawing out means, and variable speed driving means therefor, a drier drum with which the web drawing out means coöperates, and variable speed driving means for said drier drum, a series of further drying drums, and independent means for rotatively driving them in unison.

2. In a paper machine, in combination, web drawing out means including a roll guided felt apron, a shaft by means of which the roll guided apron is propelled, and variable speed mechanism for the driving of the shaft, a drier drum with which the felt apron coöperates, variable speed driving means between said shaft and said drier drum, a series of further drier drums and independent means for rotatively driving them in unison.

3. In a paper machine, the combination with a web drawing out means including the press rolls and felt aprons, a shaft on which one of the press rolls is carried and variable speed mechanism for the driving of said shaft, of a drier drum with which one of the felt aprons coöperates, a cone pulley having a driving connection with said drier drum, a cone pulley on the press roll shaft, a belt around said cone pulleys, and belt adjusting means, a series of further drier drums, and independent means for rotatively driving them in unison.

4. In a paper machine, the combination with a web drawing out means including the press rolls and felt aprons, a shaft on which one of the press rolls is carried and variable speed mechanism for the driving of said shaft, of a drier drum with which one of the felt aprons having a gear wheel thereon coöperates, a smaller gear wheel in mesh with the first named gear wheel, having a cone pulley associated therewith, a cone pulley on the press roll shaft, a crossed belt around said cone pulleys, and belt adjusting means, a series of further drier drums, and independent means for rotatively driving them in unison.

5. In a paper machine, in combination, the press rolls and felt aprons, a shaft on which one of the press rolls is carried having a cone pulley and a gear wheel thereon, another shaft having a cone pulley with driving belt therefor, and a gear wheel in mesh with said first named gear wheel, a drier drum with which one of the felt aprons cooperates, a cone pulley having a driving connection with said drier drum and a pulley running around the last named cone pulley and the cone pulley on the press roll shaft and adjusting means for said belt, a series of further drier drums geared together for rotation in unison, and means for the rotative propulsion of the said further drier drums.

Signed by me at Springfield, Mass., in presence of two subscribing witnesses.

CHARLES E. POPE.

Witnesses:
G. R. Driscoll,
Wm. S. Bellows.