No. 876,007. PATENTED JAN. 7, 1908.

C. E. MOSS.

MACHINE FOR DRYING SHEET MATERIAL.

APPLICATION FILED FEB. 27, 1907.

3 SHEETS—SHEET 1.

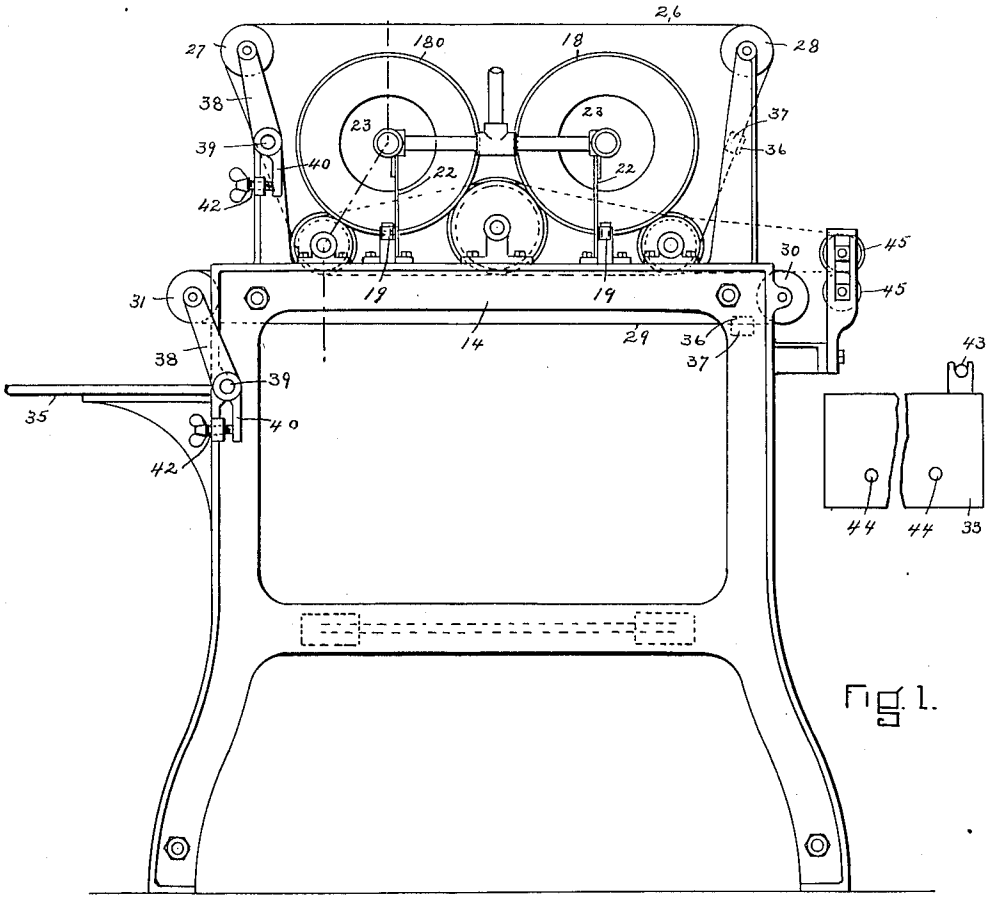

Fig. 1.

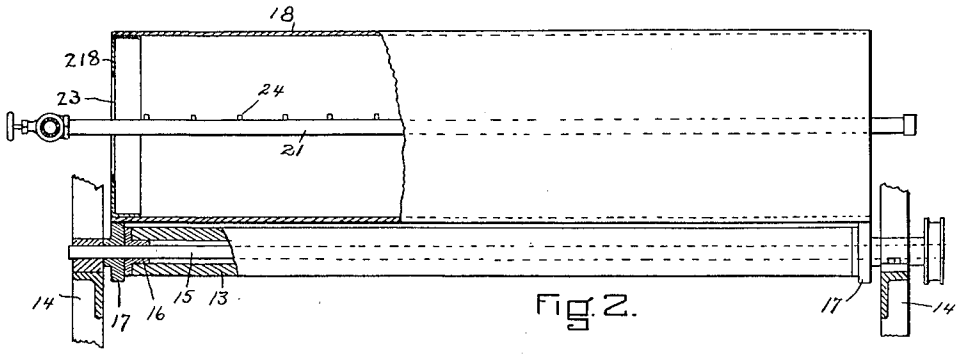

Fig. 2.

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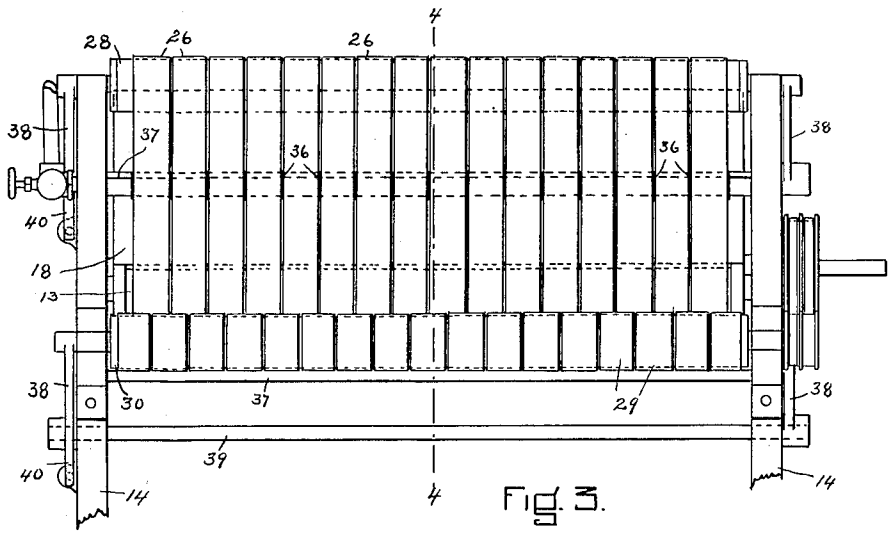

Fig. 3.

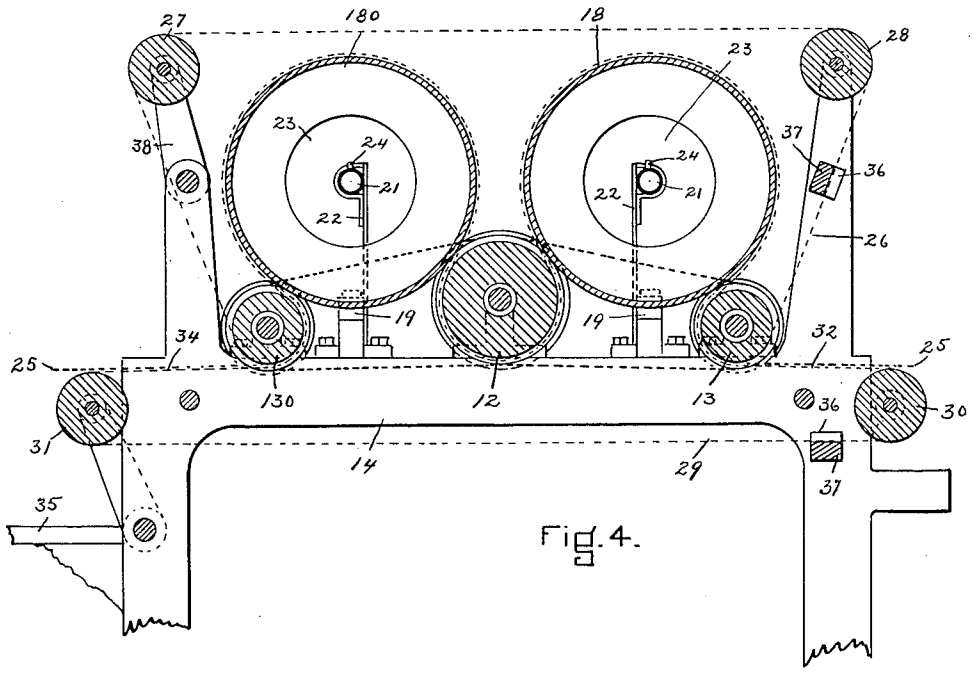

Fig. 4.

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3 SHEETS—SHEET 3.

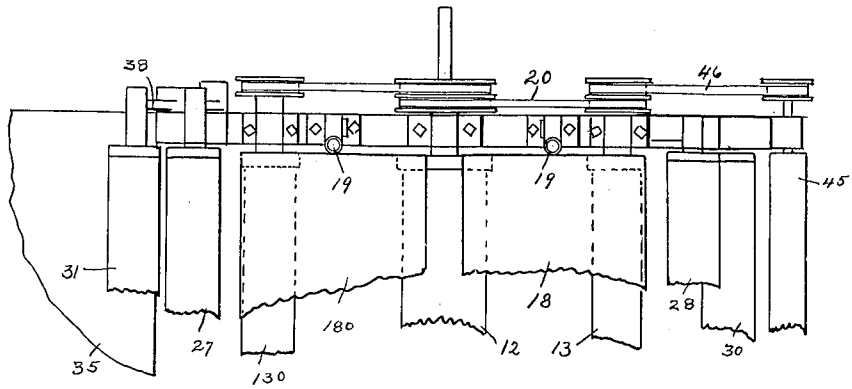

Fig. 5.

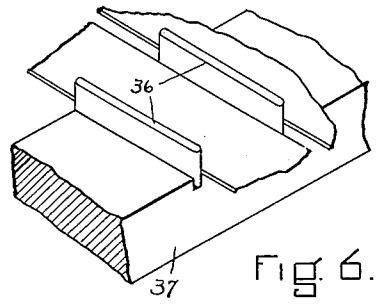

Fig. 6.

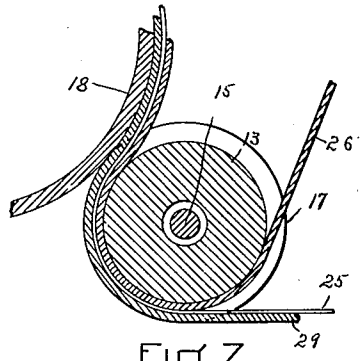

Fig. 7.

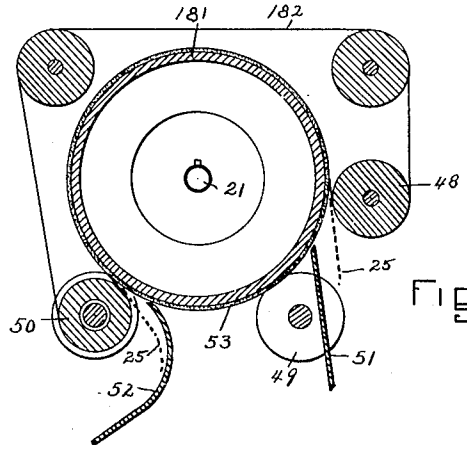

Fig. 8.

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UNITED STATES PATENT OFFICE.

CHARLES E. MOSS, OF BOSTON, MASSACHUSETTS.

MACHINE FOR DRYING SHEET MATERIAL.

No. 876,007. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed February 27, 1907. Serial No. 359,583.

To all whom it may concern:

Be it known that I, CHARLES E. MOSS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Drying Sheet Material, of which the following is a specification.

This invention relates to means for drying sheet material, such as paper, the invention having particular reference to means for drying blue print paper after it has been exposed and developed, the paper being saturated with water when it leaves the developing tank.

The invention has for its chief object to provide a simple and effective machine for quickly drying sheet material, such as blue print paper, for controlling the material and keeping it in a smooth condition free from wrinkles or puckers during the drying operation, and to prevent discoloration of the paper by the drying surface or surfaces.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification,— Figure 1 represents a side elevation of a drying machine embodying my invention. Fig. 2 represents a fragmentary view showing partly in section and partly in side elevation, one of the drying cylinders, one of the bed rolls supporting it and parts of the supporting frame. Fig. 3 represents a front elevation of the machine, the lower portion of the supporting frame being broken away. Fig. 4 represents a section on line 4—4 of Fig. 3. Fig. 5 represents a fragmentary top plan view showing one end portion of the machine. Fig. 6 represents a fragmentary perspective view showing parts of two of the belt sections and guides for the same. Fig. 7 represents an enlargement of a portion of Fig. 4. Fig. 8 represents a sectional view showing a different embodiment of the invention.

The same letters of reference indicate the same parts in all the figures.

In the drawings 12 and 13 represent bed rolls which are journaled in bearings on a suitable supporting frame 14, the bed rolls being horizontally arranged parallel with each other, and separated from each other by an intervening space. The preferred construction of each bed roll is that shown in detail in Fig. 2, each roll being composed of a tubular body portion through which passes a shaft 15 having flanged sleeves 16 which fit the interior of the tubular roll body, the shafts being provided with collars 17 of greater diameter than the roll body, said collars forming cylindrical supporting enlargements at the end portions of the bed roll. The sleeves 16 are preferably engaged by friction only with the shaft 15, so that the body of the bed roll is adapted to move more slowly than the shaft to permit a yielding rotation of the roll body, or a rotation varying from that of the shaft 15 on which it is mounted.

18 represents a hollow cylinder, preferably of sheet metal, resting loosely on the enlargements 17 of the bed rolls, and in frictional engagement therewith, the weight of the cylinder being supported by the bed rolls, so that when the bed rolls are rotated in the same direction, they frictionally rotate the cylinder 18 in the opposite direction. Endwise movement of the cylinder on the bed rolls is prevented by guide rolls 19 mounted on the supporting frame, and bearing against the ends of the cylinder. The bed rolls may be rotated by any suitable means; for example, the shaft of the roll 12 may be driven by power imparted to it in any suitable manner, and motion may be communicated from the bed roll 12 to the bed roll 13 by means of a belt 20 connecting pulleys on the shafts of said bed rolls, as shown in Fig. 5.

Means are employed for internally heating the cylinder 18, the preferred means being a gas pipe 21 mounted on fixed supports 22 on the machine frame, and passing through openings 23 in the ends of the cylinder, the pipe being provided within the cylinder with a series of burners 24, which direct jets of flame upwardly when ignited. The cylinder is therefore more highly heated at its top portion than elsewhere, the object of this being explained hereinafter.

A belt is employed in conjunction with the cylinder and bed rolls, the belt partially encircling the cylinder and being driven by frictional engagement therewith, the sheet material 25 to be dried being interposed between the cylinder and the portion of the belt that conforms to the cylinder. The belt is preferably composed of a series of longitudinal sections 26, placed edge to edge, each section being a narrow belt, and the series of sections collectively making up a sectional belt, the width of which corresponds substantially to the length of the cylinder. For convenience I will hereinafter

refer to the belt sections 26 as the outer belt. Portions of this belt are supported by elevated guide rolls 27 28 which hold the top stretch of the belt above the cylinder. From the guide roll 28 the belt passes downwardly under the bed roll 13 and between the latter and the cylinder. The belt passes around the greater part of the periphery of the cylinder, and downwardly under the bed roll 12. In the embodiment of the invention now being described, I employ an inner belt composed of belt sections 29, arranged edge to edge to form a sectional belt of practically the same width as the upper belt. I will hereinafter refer to the belt formed by the sections 29 as the lower belt. The lower belt is supported partly by guide rolls 30 and 31 journaled in bearings on the frame of the machine. The belt passes from the guide roll 30 under the bed roll 13, and is interposed between the sheet 25 being dried and the periphery of the cylinder. The lower belt follows the same course relatively to the cylinder and the two bed rolls as the upper belt, and the paper 25 is held between the two belts in its passage over the cylinder. The guide rolls 30 and 31 are so arranged relatively to the bed rolls that the roll 30 supports a portion 32 of the lower belt in position to receive the advancing end of the sheet 25 as it comes from a developing tray 33, and guide the end of the sheet to the nip of the upper and lower belts, where they commence to run on the bed roll 13. The guide roll 31 is arranged to support a portion 34 of the lower belt in position to guide the dried sheet out from the machine, the sheet falling over the part of the belt supported by the roll 31 on to a table 35 said rolls 30 and 31 being offset outwardly from the bed rolls toward the ends of the machine, so that they support portions of the lower belt in the form of substantially horizontal platforms 32 and 34 projecting outwardly from the bed rolls toward the ends of the machine. In this embodiment of the invention, two drying cylinders are employed, there being a duplicate 130 of the bed roll 13 located at the opposite side of the bed roll 12, the second cylinder 180 being supported conjointly by the bed roll 12 and the bed roll 130. The upper and lower belts pass from the bed roll 12 upwardly and partially around the cylinder 180, and under the bed roll 130. On leaving the bed roll 130 the upper and lower belts diverge, the upper belt passing upwardly to the guide roll 27, and the lower belt passing horizontally to the guide roll 31, and forming the delivering portion 34. Provision is thus made for carrying the sheets in one continuous pass over two heated cylinders. It is obvious that the number of cylinders and bed rolls may be increased, if desired. The sections of the upper and lower belts are prevented from being displaced edgewise by guides 36, which consist of thin strips or blades attached to fixed cross bars 37 on the supporting frame, the guides being interposed between the edges of the adjacent belt sections, and not only preventing displacement of the said sections, but also preserving longitudinal openings between the same, said openings permitting the escape of steam and vapor from the material being dried.

By applying the heat directly to the top portions of the cylinders, I provide for a gradual increase in the heat applied to the sheet 25, the heat increasing from the point where the sheet is first subjected to the action of the cylinder until the strip reaches the top of the cylinder, where the heat is greatest. I find that by thus graduating the heat there is less liability of causing waves or cockles in the paper, than would be the case if the cylinder were uniformly heated at all parts of its periphery.

The enlarged end portions of the bed rolls provide for frictional engagement between the bed rolls and the cylinders at opposite edges of the belts, and provide for suitable spaces between the body portions of the bed rolls and the peripheries of the cylinders for the accommodation of the belts and the interposed sheet 25. The frictional engagement between the bodies of the bed rolls and their shafts, permits any slip of the bed roll bodies on the shaft that may be required by variations between the rate of movement of the belts and that of the shafts of the bed rolls.

The guide rolls 27 and 31 are preferably adjustable so that their distance from the accompanying guide rolls 28 and 30 may be varied to regulate the tension of the belts. To this end the guide rolls 27 and 31 may be mounted on arms 38 pivoted at 39 to the frame of the machine, each arm having an extension 40 forming the shorter arm of a lever, said extension bearing against an adjustable screw 42. The developing tray 33 may be provided with a removable roll or mandrel 43 to support a roll of unwashed or undeveloped paper, and with a submerged guide 44 below which the paper passes from the roll 43.

45 45 represent wringer rolls between which the paper passes on emerging from the tank, one of said rolls being driven by a belt 46 engaged with a pulley on the shaft of the bed roll 12.

The inner belt 29 interposed between the sheet 25 and the metal of the cylinder, prevents direct contact between the wet sheet 25 and the metal cylinder, such contact being liable to cause discoloration.

In Fig. 8 I show a different embodiment of the invention in which but one heated cylinder and one belt is employed, 181 representing the cylinder and 182 the belt, the latter being preferably composed of sections. Three bed rolls 48, 49 and 50 are employed,

the same supporting and frictionally engaging the cylinder 181. The belt is engaged with the bed rolls 48 and 50, the intermediate bed roll being employed simply as a support for the cylinder. The sheet 25 passes between the bed roll 48 and the portion of the belt that conforms to the cylinder, and emerges between the said portion of the belt and the bed roll 50, suitable guides 51 and 52 being employed to direct the paper in its course to and from the cylinder. To prevent contact between the sheet and the metal cylinder, the latter is provided with a jacket 53 of any suitable fabric or material which will prevent discoloration of the blue print paper. The jacket 53 constitutes a non-metallic member for preventing direct contact between the blue print paper and the metal cylinder, and the discoloration which would result from such contact, the inner belt 29 also constituting a non-metallic member which accomplishes the same result. The jacket 53 and the inner belt 59 are therefore equivalent means for preventing discoloration of the paper by the metal of the cylinder.

The cylinder 18 is provided at its ends with inwardly-projecting annular flanges 218, the inner edges of which form the openings through which the gas pipe 21 passes. Said flanges retain the heat in the upper portion of the cylinder.

I claim:

1. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow cylinder frictionally engaged therewith, means for internally heating the cylinder, and a belt engaged by the cylinder and rolls.

2. A drying machine of the character stated, comprising bed rolls, a hollow cylinder frictionally engaged with the bed rolls, a gas pipe extending into the cylinder and provided with burners, and a belt engaged with the cylinder and rolls.

3. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow cylinder frictionally engaged therewith, means for internally heating the cylinder, a belt engaged by the cylinder and rolls, and means for rotating the bed rolls to rotate the cylinder and move the belt.

4. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow cylinder frictionally engaged therewith, means for internally heating the cylinder, a belt engaged by the cylinder and rolls, the belt being composed of a plurality of longitudinal sections arranged edge to edge and separated by crevices, and fixed guides for said sections.

5. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow metal cylinder frictionally engaged therewith, a non-metallic belt engaging the cylinder and rolls, and a non-metallic member between the belt and cylinder to prevent contact between the material being dried and the metal body of the cylinder, the said material being passed between the said belt and the member without contact with metal.

6. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow cylinder frictionally engaged therewith, a belt engaged with the rolls and cylinder and partially surrounding the latter, guide rolls for keeping portions of the belt out of contact with the cylinder, and means for varying the distance between said guide rolls to regulate the tension of the belt.

7. A drying machine of the character stated, comprising a plurality of bed rolls each having enlarged end portions, a hollow cylinder bearing on the said end portions and adapted to be frictionally driven thereby, and a belt engaged with the bed rolls between their enlarged end portions.

8. A drying machine of the character stated, comprising a plurality of bed rolls, a hollow cylinder frictionally engaged therewith, a pair of belts, portions of which are superimposed and engaged with the bed rolls and cylinder, elevated guide rolls engaging one of the belts, and outwardly offset guide rolls arranged to support stretches of the other belt in the form of substantially horizontal platforms adapted to receive and deliver the material.

9. A drying machine of the character stated, comprising a central bed roll and two outer bed rolls at opposite sides of the central roll, two hollow cylinders supported side by side on said bed rolls, a pair of belts having superimposed portions engaged with the bed rolls and cylinders, guide rolls supporting portions of one of the belts above the bed rolls, and guide rolls offset outwardly toward the ends of the machine from the bed rolls, and supporting portions of the other belt in the form of platforms adapted to receive and deliver the material.

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHARLES E. MOSS.

Witnesses:
C. F. BROWN,
E. BATCHELDER.