H. BROWN.

PROCESS FOR MARKING PAPER.

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1,231,697.

Patented July 3, 1917.

Fig. 1.

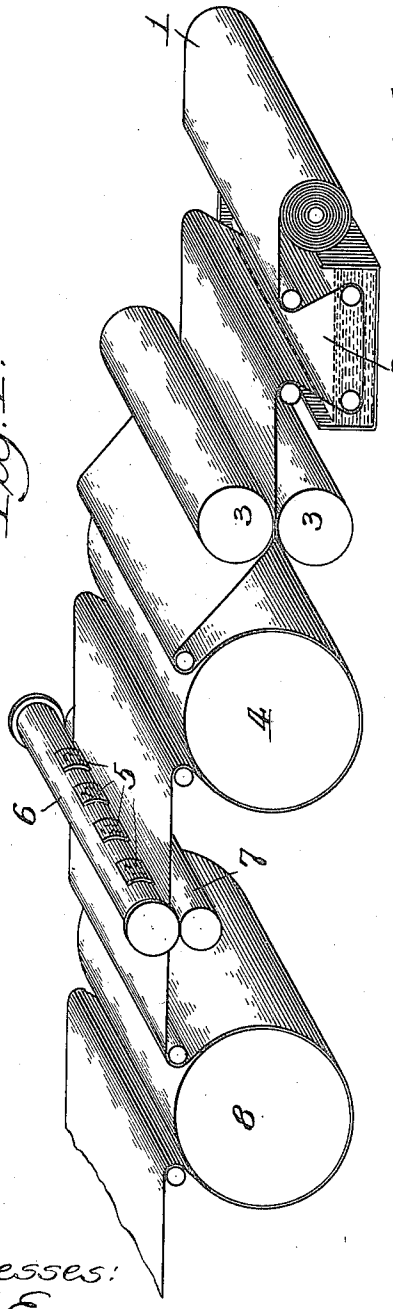


Fig. 3.

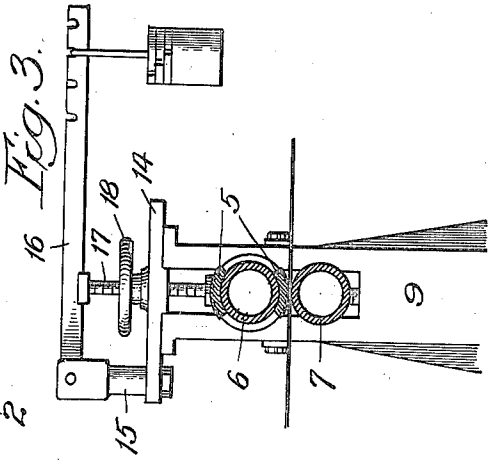
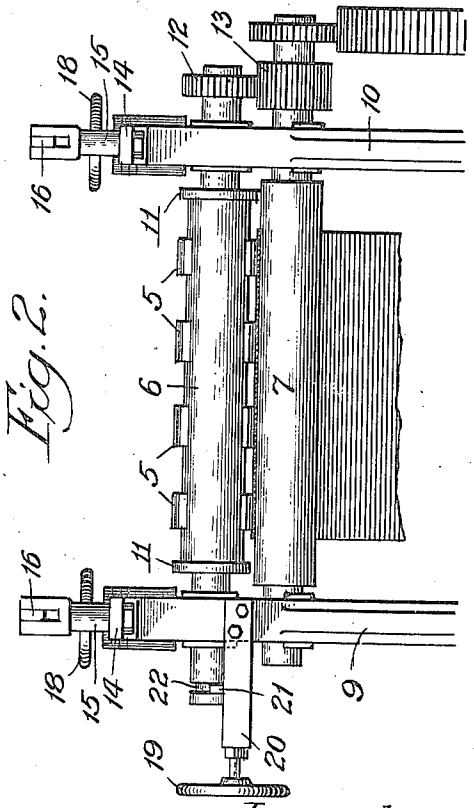


Fig. 2.



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UNITED STATES PATENT OFFICE.

HOWARD BROWN, OF SPRINGFIELD, MASSACHUSETTS.

PROCESS FOR MARKING PAPER.

1,231,697. Specification of Letters Patent. Patented July 3, 1917.

Application filed June 25, 1913. Serial No. 775,617.

To all whom it may concern:

Be it known that I, HOWARD BROWN, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Processes for Marking Paper, of which the following is a specification.

It is the object of the present invention to provide a method of marking paper with identifying characters, figures or illustrations, serviceable in place of a water-mark, to show the origin of the paper or its quality or to set forth illustrations and advertising matter. The marks as put on by the process here disclosed may be of intricate design and sharp in detail and in general effect of the character disclosed more at length in my companion application Ser. No. 774,380, filed June 18, 1913.

To attain these objects and others of a similar character, which will become apparent to those skilled in the art, the method contemplates the use of an electrotype or other hard and inelastic plate of stereotype character, this plate being shaped to fit a cylinder or roll and mounted to turn with the roll so that paper fed through between the rolls in a continuous strip may receive the imprint of the electrotype and so can be made to take on the design appearing on the plate. But in order that this effect on the paper may result from its compression between the electrotypes and its opposing roll, the paper strip or web must be in just the right physical condition and more particularly must be just moist and plastic enough to take the imprint but firm and resistant enough to carry the print through until it can be permanently fixed in the paper by baking or similar heat treatment.

In general the process here contemplated starts with paper after it has been made, as on a Fourdrinier machine and has been completely dried and wound up in rolls for storage. Preferably the paper is uncalendered, though calendered paper can be used. This roll of paper with which the operation is started is too dry and firm to be successfully marked, as here contemplated, unless given a preliminary treatment and in a general way this treatment consists in passing the paper through a bath of water where it is soaked and rendered soft and pliant, after which the paper is fed to suitable press rolls for removing the excess water and then goes to a drying mechanism, such as a single drying drum and there the heat of the drum drives out the moisture and so tempers the web or strip of paper that it is in the proper damp and plastic condition for advantageously receiving the imprint from the rotating electrotypes. The entire operation goes on continuously and the paper after receiving its imprint goes to additional drying means, where the marks are baked in and permanently fixed.

Apparatus for carrying out the operations above outlined is disclosed, though somewhat diagrammatically in the annexed drawings, wherein—

Figure 1 is a diagrammatical representation of the complete apparatus employed.

Fig. 2 is a front elevation of a pair of rolls between which the paper strip is passed, and

Fig. 3 is an end elevation of the same.

In the drawings, the roll of paper 1 may be a roll of ordinary high grade paper as made on a Fourdrinier machine, preferably uncalendered. It may be thoroughly dry and may have been in storage a long time and free from any water mark or identifying character.

The operation of marking can go on continuously as the paper is unwound from the roll and at a speed comparable to that at which paper is made on a Fourdrinier machine. The apparatus for carrying out this result may be strung up as shown in Fig. 1 where the paper as it comes from the roll 1 passes through a water bath 2 indicated diagrammatically in the drawings and then to a pair of press rolls 3 of usual construction and at which the excess moisture taken up in bath 2 can be squeezed out in usual manner to deliver a paper web or continuous strip of about the dampness to be found in a Fourdrinier machine, just back of the press rolls. The continuous web of paper then goes around a steam heated drying drum 4, this drum acting much as does the first drum of a paper making machine and serving to drive out some of the moisture remaining in the paper after it leaves the press rolls. This drying cylinder has the further function of serving to temper the paper somewhat for its heat and the evaporation of moisture caused thereby, not only reduces the total moisture in the paper, but

also equalizes it, and the action, although not properly designated a cooking, may, however, be regarded as a tempering action adapted to put paper in that plastic condition best suited to receive and hold the imprint of the rigid impression plates.

The impression plates 5 whereby the mark is fixed in the plastic paper strip as it comes rapidly from the drier drum 4, may consist of electrotypes made by usual methods and each shaped to fit the surface of the supporting roll or cylinder 6 with preferably nothing more than a slightly yielding layer between the plate and its cylinder, as for instance a sheet of paper or the like. Coöperating with the electrotypes is a lower roll 7 moving with the same peripheral speed and presenting a hard and rigid face to hold the paper directly against the electrotypes. The electrotypes may be of intricate pattern and can be used to impress sharp details into the damp and plastic web of moving paper, without substantial displacement of the fibers or tearing apart and without substantial thinning of the paper, except such thinning as may be incident to the direct and forcible compression of the fibers along the points and lines of contact with the raised portions of the plate.

The rigid and unyielding electrotypes, by coming into forcible contact with the plastic material while that material is running as a continuous strip, makes an impression at the stage when the paper is best adapted to receive it and without such tearing or readjustment of the fiber structure as would be detrimental to the paper for the paper strip is at that stage, sufficiently firm to retain the impression while going to and around the succeeding drier or driers, represented diagrammatically in Fig. 1 by the drier cylinder 8.

It may be said that in passing from the marking rolls around succeeding drier drums, the heat of those drums, serves to bake into the paper or fix in the fibers, the impression produced by the momentary and extreme squeezing to which the fibers were subjected while passing through under the moving electrotypes. By impressing the mark at the particular stage above indicated, the paper is in such condition as regards moisture and fiber density and resistance to fiber displacement, that the compression produced by the marking plates brings out a result in striking contrast to the body of the paper and in effect resembling shades and shadows and then by passing the sheet almost instantly around another drying drum, the beauty of the mark is made permanent and beyond all danger of destruction at the calender rolls or at subsequent stages in the treatment or use of the paper.

The apparatus to be used in carrying out the results above set forth, may vary in details, but Figs. 2 and 3 illustrate one mounting of the electrotypes, which will here be described.

Positioned above the drier drums, and these drums may be of the type used on the Fourdrinier machine, are two standards 9 and 10, slotted at their tops to form guideways for the bearing blocks of the rolls 6 and 7, the lowermost of which is a smooth metal cylinder, over which the web of paper runs and the uppermost of which carries the detachable electrotypes. A pair of rings 11 may be carried near the ends of the top roller to limit the possible downward movement of the electrotypes with respect to roll 7, thereby preventing the electrotypes from striking directly against the roll 7 in case of accident to the paper strip. If desired, these rings may also serve to limit the degree of compression applied to the paper strip by the electrotypes.

These rolls may be driven by suitable gears 12 and 13 and may have gear connection with suitable driving mechanism, whereby the rolls can be rotated at just the proper speed to correspond with the speed of the drying cylinders 4 and 8 and of the press rolls 3 which make up other parts of the system as a whole. At the top of each standard 9 and 10, is a removable cross piece 14, carrying a standard 15 from which is pivotally supported a weighted lever 16, whereby an adjustable pressure may be applied to a bar 17 threaded through a hand wheel 18 and passing freely through the cross piece 14 into contact with the bearing block of the top roll. In this way an adjustable and yielding pressure is applied to the top roll and becomes effective for governing the pressure at the electrotypes. By turning the hand wheels 18 their bars 17 may be lifted and with them the two bearing blocks and the roll 6, with its electrotypes. The top roll, can if desired, be entirely removed through the top of the standards for replacement or readjustment of the electrotypes.

A longitudinal shifting of the top roll may be effected by means of a hand wheel 19, operating a shaft having a bearing in a bracket 20, this shaft being connected with a hook 21 engaging in an annular slot 22 at one end of the top roll. By turning the hand wheel 19, the roll can be shifted longitudinally to change the setting of the electrotypes with respect to the paper web. If the web shifts sidewise on the lower roll, as it may in practice, the top roll can be shifted correspondingly.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of marking a paper web after it has been completely dried on the paper making machine and wound up in a roll, which consists in progressively saturat-

ing the paper with water while unwinding it from the roll, removing the excess moisture from the surface thereof and applying the desired impression thereto by means of a rigid plate under heavy and regulable pressure and then quickly drying the web to fix the impression.

2. The method of marking paper which has been wound up in the form of a roll, which consists in progressively unwinding it from the roll and passing it through a water bath to wet the fibers and then compressing and drying to remove excess moisture and to temper the material and then applying the desired impression through a rigid plate under heavy pressure while the web is passing rapidly to a drier drum where that impression can be made more permanent.

3. The method of marking paper which has been completely formed and dried and wound up in rolls, which consists in saturating the paper with water and then driving out excess moisture from the surface thereof to bring it to a damp and plastic condition, and then while said plastic web is in rapid motion impressing a mark thereon by means of a rigid plate acting under heavy pressure and then immediately passing the marked web to drying means where the mark is permanently fixed in the paper web.

4. The method of marking paper which consists in saturating it with water and then impressing the mark under pressure during the drying while the pulp of the paper is wetter interiorly than on the surface.

5. The method of marking a continuous web of paper which consists in progressively unwinding the web in dry condition from a roll, wetting it to excess, squeezing to remove some of the excess moisture, heating with a drier drum to temper the web and deliver it in a damp plastic condition and then applying the desired impression through the action of a rigid plate under heavy pressure, whereby the fibers of the paper are compacted without substantial displacement or destruction and thereafter quickly drying the marked web to retain permanently therein the impression produced by said plate.

6. The method of marking paper which has been completely dried and wound up in a roll, which consists in passing the paper continuously through a water bath and there progressively wetting it to excess, delivering the wet web to press rolls for removal of excess moisture, subjecting the web immediately thereafter to the tempering action of a drier drum whereby the web is brought to the desired plastic condition with some moisture still present and evenly distributed and then applying the desired impression through a rigid plate under heavy pressure and directly contacting with the damp plastic web, whereby the fibers of the paper are compacted without substantial displacement or destruction, this pressure of the plate on the paper being extremely heavy and of short duration, and thereafter quickly drying the web at a second drier drum to fix and retain permanently in the web the impression produced thereon by the plate during its momentary and extremely heavy contact therewith.

In witness whereof, I hereunto subscribe my name to this specification in the presence of two witnesses.

HOWARD BROWN.

Witnesses:
HARLAN P. SMALL,
WILLIAM C. GILES.