2 Sheets—Sheet 1.

(No Model.)

P. C. HEWITT.

PROCESS OF AND APPARATUS FOR MAKING GLUE.

No. 521,371. Patented June 12, 1894.

Fig. 1

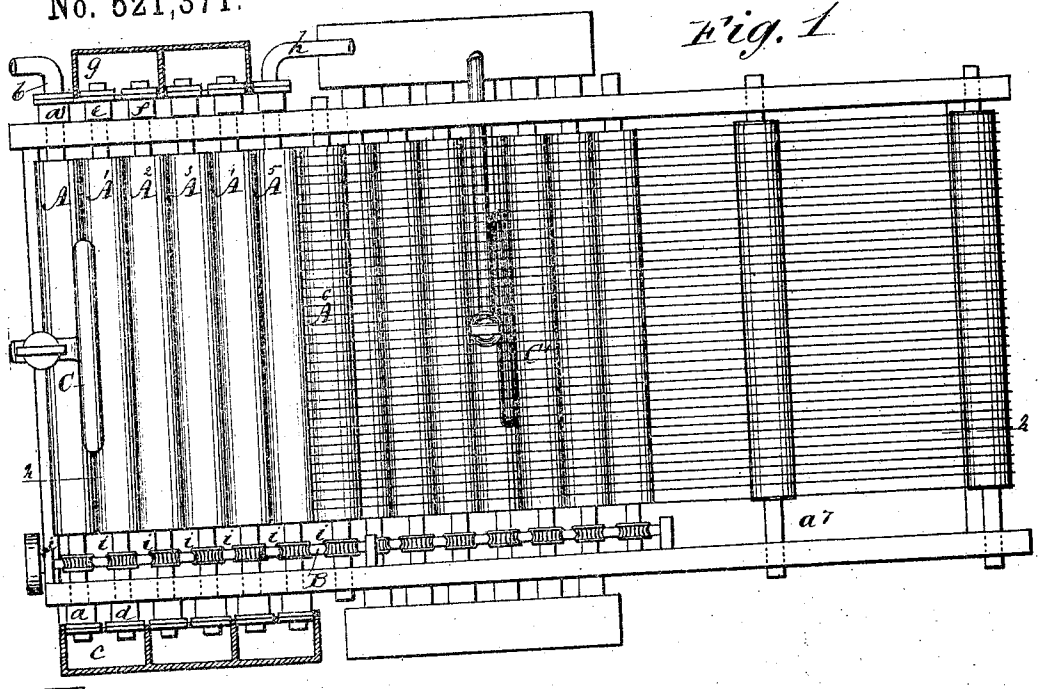


Fig. 2

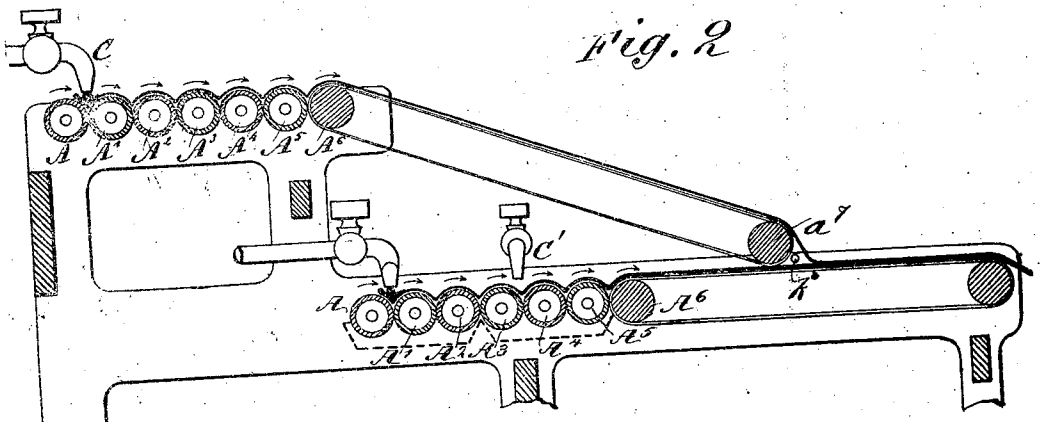
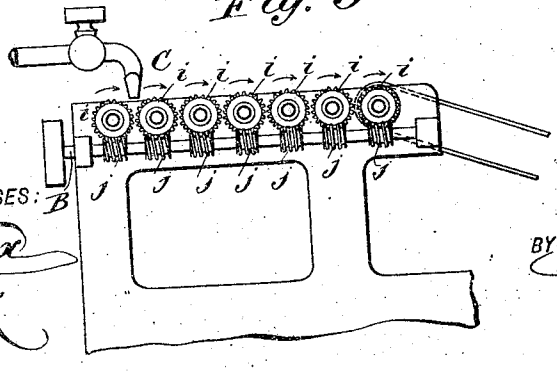


Fig. 3



WITNESSES:

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E. Sedgwick

INVENTOR

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BY Munn & Co

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

P. C. HEWITT.

PROCESS OF AND APPARATUS FOR MAKING GLUE.

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Fig. 4

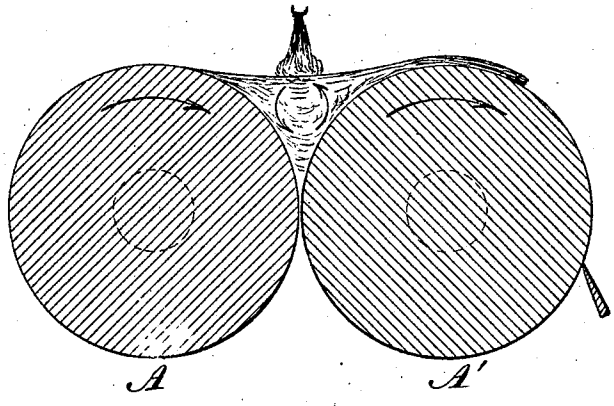

Fig. 5

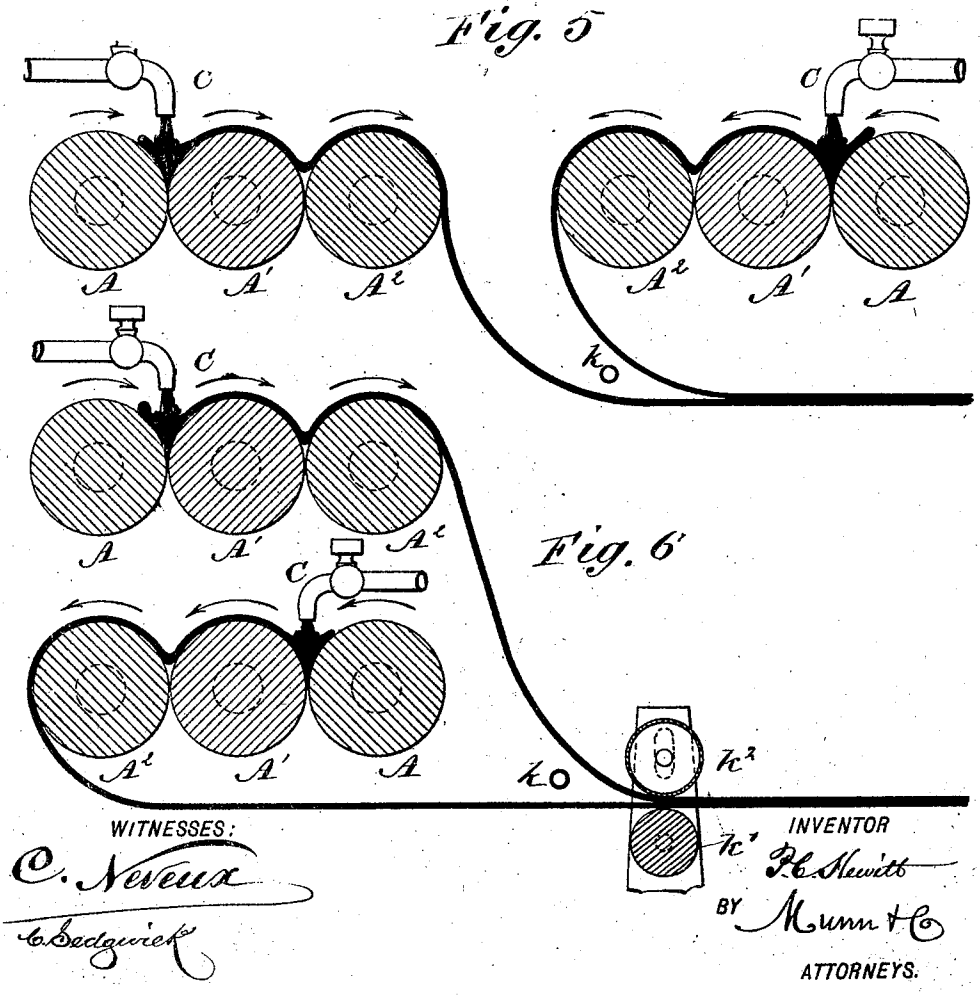

Fig. 6

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UNITED STATES PATENT OFFICE.

PETER COOPER HEWITT, OF NEW YORK, N. Y.

PROCESS OF AND APPARATUS FOR MAKING GLUE.

SPECIFICATION forming part of Letters Patent No. 521,371, dated June 12, 1894.

Application filed July 27, 1893. Serial No. 481,621. (No model.)

To all whom it may concern:

Be it known that I, PETER COOPER HEWITT, of New York city, in the county and State of New York, have invented a new and Improved Process of and Apparatus for Cooling Glue and Forming it into Sheets, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a plan view of my improved glue cooler. Fig. 2 is a vertical longitudinal section taken on line 2—2 in Fig. 1. Fig. 3 is an end elevation of the cooling cylinders. Fig. 4 is a diagrammatic view of the first pair of cylinders, showing the action of the cylinders on the liquid glue. Fig. 5 is a diagrammatic view, showing a modified form of the apparatus in which two thin sheets of glue are joined to produce a thicker sheet; and Fig. 6 is a diagram of another modification.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to provide a process and construct a simple and effective machine for cooling glue and forming it into sheets; also to form a thick sheet by manifolding, thereby effecting a saving in time over that required for producing a thick sheet at one operation.

My invention consists in the combination of two or more hollow, water-cooled cylinders geared to revolve at about the same peripheral speed in the same direction, the said cylinders being arranged to rotate very near each other but not in actual contact, to prevent the liquor from running between the cylinders and to render them self-cleaning.

It also consists in the combination with a series of cylinders, of an endless belt of cords or netting, or similar devices, or nets stretched on frames and carried by conveyers, for conveying away the sheets as they are formed upon the cylinders.

My invention also further consists in the combination of two or more series of cooling cylinders arranged to manifold the sheets of glue.

It also consists in the combination with the apparatus for producing the two sheets of glue, of a steam pipe or other device interposed between the sheets to be united, near the line of contact, for superficially heating the glue to insure a perfect cementing of the two sheets, so as to form one thicker sheet.

It also consists in a method of forming glue sheets, as hereinafter described.

My invention also consists in a method of rapidly cooling the liquid glue in the early stage of the operation by successively bringing different portions of the glue into contact with the cooling surface, all as hereinafter more fully described.

The cylinders A, A′, A^2, A^3, A^4, A^5, are provided with tubular journals which revolve in journal boxes provided with water-ways. The journals of the cylinder A revolve in boxes *a*, *a′*, the box *a′* being in communication with a water supply pipe *b*, while the box *a* communicates through the passage *c* with the journal box *d* of the cylinder A′. At the opposite end the hollow journal of the said cylinder is provided with a box *e*, which communicates with the box *f* of the cylinder A^2 through the passage *g*. In a similar manner the remaining hollow journal of the cylinder A^2 communicates with the hollow journal of the cylinder A^3, and so on throughout the entire series of cylinders, the last cylinder of the series A^5, communicating with the water discharge pipe *h*. In front of the cylinder A^5 is journaled a cylinder A^6, which is provided with endless cords running over the cylinder A^7. At one end of the machine all of the hollow journals, together with the journal of the cylinder A^6, are provided with worm wheels *i*, which are driven by the shaft B, carrying the worms *j*. By means of the worm gearing, all of the cylinders are made to revolve in the same direction, as indicated by the arrows in Fig. 3.

Above the line of contact between the cylinders A, A′, is arranged a supply nozzle C, for delivering to the first pair of cylinders the melted glue to be cooled. Since the glue spreads laterally on the cylinders A A′, the supply nozzle C is made shorter than the cylinders. As the glue is carried forward by the cylinder A′, it is cooled by the water passing through the said cylinder, and the cylinder A^2 receives the cooled glue from the cylinder A′, carrying it forward to the cylinder A^3, and so on throughout the series. The first stage of the cooling is effected by a contact

of the liquid glue with the cylinders A, A'. The movement of the glue resulting from its contact with the said cylinders is illustrated in Fig. 4. The contact of the glue with said cylinders causes it to set up a rotary movement within itself, as indicated by the arrows, thus causing the different portions of the body of the glue to come into contact with the cylinders A, A'. This is an important action, as the conductivity of the liquid glue for heat is low, and as in other viscous liquids the cooling cannot be as rapidly effected by conduction as it is by convection. The same action occurs between the other cylinders of the series so long as the glue has not congealed. When the glue reaches the last cylinder of the series, which in the present case is the cylinder A^5, it is cooled and set so that it can be removed by the endless cords or netting carried by the cylinders A^6 and A^7. The glue supply, as well as the speed of rotation of the cooling cylinders, is regulated according to the time required to cool and set the glue. When the glue is to be dried in a single thickness it is carried forward and delivered on nets on which it is dried out in the usual way. When it is desired to produce sheets thicker than can conveniently be made in this way, a second series of cylinders A, A', &c., is placed below the first, as shown in Fig. 2, and the sheet of glue formed by the first series of cylinders is delivered to the sheet of glue formed by the second series, and the two sheets are made to unite, and when necessary, by heat from the steam pipe k placed in front of the cylinder A^7 of the upper series and the endless apron of cords or netting of the lower series, so that the sheet delivered by the lower series passes under the steam pipe. The two sheets are united in this manner and carried forward and dried. Where two series of cylinders are used, the endless apron of cords or netting of the upper series will be placed in an inclined position, as shown in Fig. 2, while the endless apron of the lower series will be preferably arranged horizontally. It is obvious that when the sheet delivered by the upper series of cylinders is tough and tenacious, it may be delivered to the lower sheet without employing the inclined endless apron.

In making thick sheets of glue advantage is taken of the low temperature of the wholly or partly cooled sheets, for cooling an additional layer of glue flowed over a single sheet, or introduced between the upper and lower sheets while they are being formed on or delivered from the machine. This is accomplished by flowing liquid glue on the lower sheet after it is partly set or set, and partly or entirely cooled. The liquid glue which is supplied through the nozzle C', (Fig. 2) spreads out on the lower sheet and is carried along and brought into contact with the upper sheet which also assists in cooling.

When it is desired to unite the two sheets of glue by bringing their upper or natural faces into contact, two series of cylinders are arranged as shown in Fig. 5, with the terminal cylinders of the series adjoining each other, the two series being arranged to turn in opposite directions so that when the sheets are delivered, the natural face of the sheet delivered by the right hand series will contact with the natural face of the sheet delivered by the left hand series, and in this case as in the other, the steam pipe k may be introduced to superficially warm the sheets and cause them to unite as they come into contact, when necessary. In the case shown in Fig. 6, the series of cylinders are arranged one above the other, and they are made to rotate in opposite directions, but the upper surface of the sheet delivered from the lower series of cylinders and formed by contact with the said cylinders is made to contact with the under surface of the sheet delivered from the upper series of cylinders, thus bringing the natural surfaces of the sheets upon the outside, the surfaces of the two sheets formed by contact with the cylinders being brought into contact with each other and united, forming the thicker sheet.

To insure the uniting of the sheets of glue, and to exclude air bubbles, I carry the double sheet over the roller k', and allow the light roller k^2 to press upon the upper sheet as it passes away from the machine.

When sheets are delivered in the manner illustrated in Fig. 5, any figure, imprint, trade-mark, or the name of the manufacturer may be impressed upon the surface of the glue, where it will remain after the glue is dried, and in the case of the method shown in Fig. 6, the sheet of glue will have on both sides the luster due to the preservation of the natural surface.

When it is desired to combine different grades of glue in the same sheet, I deliver the different grades in liquid form to the different series of cylinders. This method of procedure is advantageous, for example, when it is desired to face sheets of dark colored glue with glue of a lighter color, or to facilitate drying of slow-drying, low grades of glue, by producing a skin or coating of tenacious glue on opposite sides of the sheet of low-grade glue, for retaining the low grade glue in the form of a sheet during drying.

I may employ a stream of water from a body of water naturally cooled for circulation in the cylinders A A', &c., or I may use the same water, or brine or other medium, keeping it in circulation through the rollers and through a refrigerating apparatus, or instead of applying the cooling medium to the interior of the cylinders I may apply it to the outside of the cylinders by causing them to dip in a cooling liquid as they revolve, the said liquid being contained in pans supported under the cylinders, as shown in dotted lines in Fig. 2. Where the flow of water is rapid through the cylinders A, A', &c. it is immaterial at which end of the series the water is

introduced, but when the flow of water is not rapid, I prefer to introduce it into the last or delivering cylinder of the series.

Although I have described the cylinders A, A', A^2, &c., as revolving in contact with each other, it is not essential that they should be in absolute contact, as it is sufficient that they should be in approximate contact with each other.

By the term "natural surface" as used herein, I mean the upper surface formed by the free flowing of the liquid glue without contact with solids in any form. By the term "rough surface" as applied herein, I mean the surface of the glue sheet formed by contact with the cooling cylinder.

When it is desired to cool liquid glue and remove it from the cylinders in liquid form the speed of the rotating cylinders or the temperature or the flow of the cooling medium may be regulated to secure the desired result. The cooled liquid glue is removed from the delivery cylinder by a scraper, as shown at the right in Fig. 4.

Although I have shown the series of cooling cylinders arranged in a horizontal plane, I do not limit myself to this arrangement as the series may be inclined at any desired angle.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a glue cooler, the combination of two or more cylinders arranged to revolve in the same direction in close proximity one to another, the first cylinder being arranged to deliver the cooled glue to the second cylinder, and means, substantially as described, for cooling the cylinders.

2. In a machine for forming liquid glue into sheets, the combination of two or more cylinders arranged to revolve in the same direction in close proximity one to another, and a supply for delivering the liquid glue to the cylinders, substantially as described.

3. In glue cooling apparatus, the combination of two glue coolers, one cooler being arranged to deliver the sheet of glue to the sheet delivered by the other cooler, thereby forming one sheet, substantially as specified.

4. In glue-cooling apparatus, the combination of two series of cooling cylinders, one series being arranged to deliver the sheet of glue to the other series, and means for cementing the two sheets of glue together, substantially as specified.

5. The method of cooling glue, which consists in bringing a body of liquid glue into contact with a body of glue cooled below the gelatinizing point, removing the heat from the liquid glue by contact with the body of cooled gelatinized glue, and causing the body of liquid glue to attach itself to the body of gelatinized glue without mixing the two bodies of glue, thereby forming a single sheet of glue, which consists at first of a layer of gelatinized glue and a layer of liquid glue, and which, by the absorption of heat from the liquid glue by the cooled glue, becomes a single thick sheet of gelatinized glue, substantially as specified.

6. The method of forming a thick sheet of glue, which consists in separately forming two or more sheets of gelatinized glue, superposing said separately formed sheets, causing the adjacent surfaces of the sheets to adhere, and finally evaporating the sheets to dryness, substantially as herein specified.

PETER COOPER HEWITT.

Witnesses:
F. W. HANAFORD,
EDGAR TATE.