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D. M. SUTHERLAND, JR
APPARATUS FOR DRYING PULP PRODUCTS

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Fig. 1.

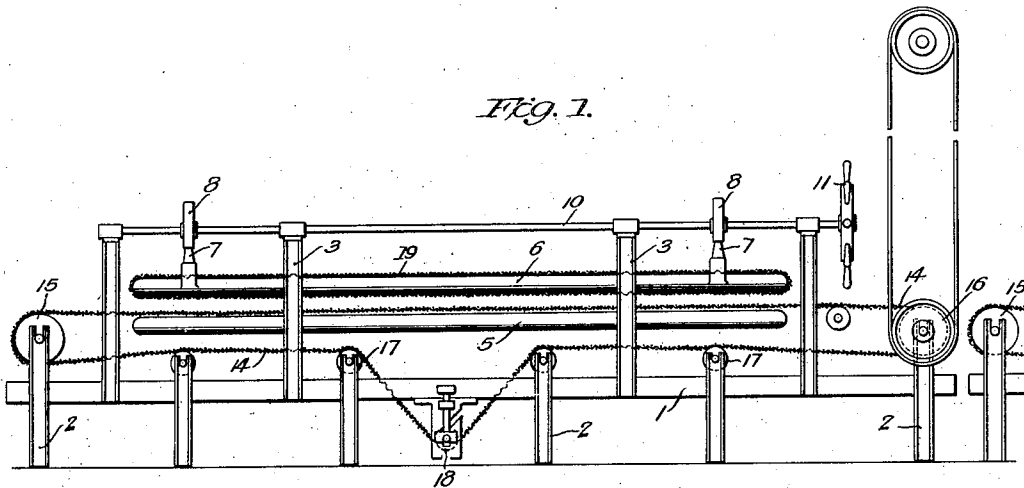


Fig. 2.

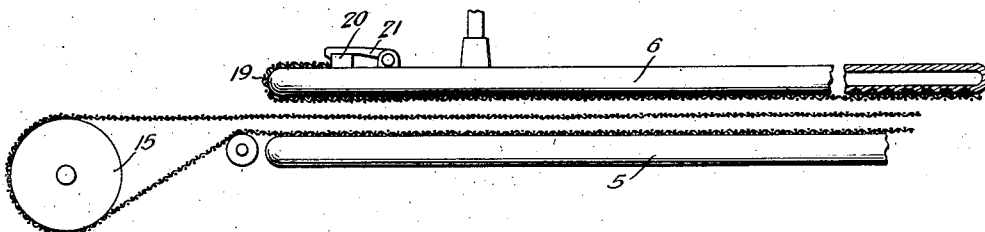
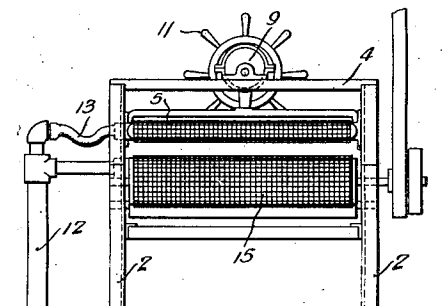


Fig. 3.



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APPARATUS FOR DRYING PULP PRODUCTS.

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To all whom it may concern:

Be it known that I, DANIEL MANSON SUTHERLAND, JR., now a subject of the King of Great Britain, but who in 1922 filed my first papers for naturalization as a citizen of the United States, residing at Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Drying Pulp Products, of which the following is a specification.

This invention pertains to apparatus for drying pulp products such as pulp boards, sheets, slabs, and the like, by means of heating plates or elements. One object of the invention is to evaporate and thus remove such moisture as remains in the board, slab, or body after the same has been molded and compressed to remove such moisture as can be expeditiously and economically removed through pressure.

Further objects are to keep the boards, slabs or articles flat during the drying operation and until such drying is complete, so that they shall maintain such flat form thereafter, and to provide means for mechanically passing the sheets, slabs or bodies into the drying apparatus and delivering them therefrom. A single drying unit may be employed, or a plurality of such machines arranged to deliver one to another, so that the drying shall be progressively done and a practically continuous feed and delivery be secured.

A preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of a single unit drying apparatus complete;

Figure 2, a fragmentary view on a somewhat larger scale, of the drying elements and the woven wire facings therefor; and

Figure 3, an end view indicating a suitable arrangement of pipes for supplying steam or other heating agent to the hollow drying elements.

Referring to these drawings, the apparatus illustrated in Fig. 1 comprises a rectangular frame 1 of channel iron, angle iron, or the like, supported by posts 2 of channel iron, and in turn having uprights or standards 3 of the same material, those one on side of the frame 1 being tied or cross-connected with those on the other side by cross members 4 at their upper ends. Any suitable bracing may be adopted, the

drawing being essentially diagrammatic and designed merely to illustrate the general structure of the frame, the details of which may be varied as desired.

Suitably secured to the uprights 3 is the lower drying bed or element 5, which will be made of metal and hollow to receive steam, hot air, or other heating agent. A second drying element or platen 6 similar in form to the fixed bed or element 5, is suspended directly over said element 5 by links or pitman 7 having straps 8 which encircle eccentrics 9 secured to a shaft 10 journaled in boxes or bearings carried by the cross bars 4 at the top of the frame. Shaft 10 may be rotated in any convenient manner, a hand-wheel 11 being shown as a suitable means of turning it, though this may be done by belt or gear transmitting motion from any suitable prime mover.

In order to supply a suitable heating agent to the two drying elements, any common form or type of conductor suitable to the purpose may be employed, the branch extending to the movable element being either flexible or extensible to permit it to follow the movements of such element. Steam hose may be used for carrying steam, hot air, or gas, and the usual flexible metallic conductors for delivering electric current. In Fig. 2 I have shown a pipe or conductor 12 communicating with the element 5, and steam hose 13 communicating with the movable element 6.

14 indicates an endless woven wire belt of a width substantially equal to that of the drying bed 5 and platen 6, and considerably longer than said elements, in order that the sheets or slabs may be carried clear thereof and delivered at the end of the frame of the machine. This belt is carried about two main rolls 15 and 16 at opposite ends of the main frame, one of said rolls, preferably the roll 16 at the delivery end, being driven by belt passing about a band-wheel or pulley thereon, or in any other convenient way, fast or loose pulleys, clutch, or other usual means being provided for throwing the belt into and out of travel as required.

In Fig. 1 I have shown the upper stretch of belt 14 carried about and parallel with but in close proximity to the upper surface of the bed or lower drying element 5, and the lower stretch carried over supporting and guiding rolls 17 and under a roll 18 below the fixed element 5, the roll 18 being ad-

visably mounted for adjustment to permit tightening of the belt in case this shall become necessary. Both stretches of the belt may, however, be carried above the bed or lower drying element 5, as indicated in Fig. 2. This latter arrangement will be found advantageous where a considerable amount of moisture is to be removed, because the double thickness of the wire beneath the body to be dried affords freer escape for the vapor or steam produced through evaporation, and for the further reason that the belt may be removed on lifting from their bearings the journals of such rolls as lie within the belt. This may be done without dismounting any portion of the frame-work, or severing the belt, if woven in endless form, or disconnecting the ends if formed from a length of woven wire webbing the ends of which are laced or otherwise joined together.

To permit ready escape of moisture from the upper face of the body under treatment, one or more layers or sheets of woven wire webbing, perforate metal, or other foraminous material, 19, is or are applied to the under face of the platen 6, as seen in Fig. 2. the ends of such web or webs being secured to the platen in any convenient manner. In said Fig. 2 cross bars or bindings 20 are shown secured to the ends of this webbing, and these are engaged by hooks or fastenings 21, but any suitable holding devices may be employed, or the foraminous webbing may be in the form of an endless belt or band, and carried over both faces and ends of the platen as indicated in Fig. 1. In this form it can be adjusted from time to time to bring fresh portions into use, and thus to distribute the wear over its entire length.

The apparatus being constructed as above described, the molded and compressed slab, sheet, or body is brought to the receiving end of the machine and laid upon the belt 4 above roll 15, the belt being set in motion and the upper stretch travelling toward the delivery end, as indicated by the arrow. The belt hence serves to draw forward the body to be dried, and when the same is properly positioned by such travel between the bed 5 and platen 6, or upper and lower drying elements, the travel of the belt is stopped by throwing said belt to the loose pulley, or throwing out the clutch. Shaft 10 is then turned to lower the platen 6 and press its lower face, or the webbing thereon, into contact with such body, the lowering being continued until by reason of the pressure exerted, such body is caused to lie perfectly flat between the upper and lower webbings, and said webbings are caused to lie in close contact with the bed and platen respectively. Steam from a boiler or generator, or from a superheater if more than

boiler steam heat be desired, or heated air, or the like is introduced through the conductors 12 and 13 to the interior of the bed 5 and platen 6, respectively, thus producing a proper vaporizing temperature for the moisture to be removed. As such evaporation takes place, the steam or vapor escapes through the meshes of the woven wire to the atmosphere.

This operation may be effected wholly by a single unit such as illustrated in Fig. 1, but it is found advantageous in practice, and particularly where the operation is carried out on a large scale, to employ a plurality of such units delivering one to another, the receiving end of a second drying unit being indicated in Fig. 1 in such relation to the first unit as to receive the slab, sheet, or body from the delivery end of said first unit. By this means the drying is carried out in successive steps, and the bodies to be dried remain for a proportionately shorter time in each unit than they would be required to remain were a single unit employed. As a consequence, the feeding and delivery of the dried product may be effected much more rapidly through the use of a plurality of units than by the use of but one.

While I have shown and find it convenient and economical to employ, a framing of structural steel forms, it is obvious that such frame may be built of any materials commonly used for such purposes,—wood, metal, or other, the invention consisting essentially in the arrangement of drying elements and endless wire belt, as more particularly set out in the claims.

Any known heating agency may be employed,—hot air, steam, superheated steam, heated oil, electric or gas heaters, or other. As these are well-known means and appliances, it is deemed unnecessary to illustrate or describe such, pipes being shown for the introduction of any liquid or gaseous heating medium, and it being understood that this is illustrative merely and may be replaced by any of the other agencies or appliances noted.

Numerous modifications or variations in the arrangement of parts may obviously be made without departing from the spirit and scope of my invention. Thus the movable platen or drying element may be below and the fixed bed or element above, or both may be made to move as is common in pressing apparatus.

To better insure the free escape of the vapor incident to the drying operation, the opposing faces of the drying elements may be grooved, advisably lengthwise and crosswise.

What is claimed is:—

1. A drying apparatus for pulp products, comprising a main supporting frame; an upper and a lower hollow drying element

mounted within said frame, one movable toward and from the other; means for so moving one of said drying elements; an endless web or belt of woven wire passing between the drying elements in close proximity to one of said elements and about sustaining rolls; a facing of foraminous material carried by the other of the drying elements; means for heating said drying elements; and means for imparting rotary motion to one of the web-supporting rolls and thereby moving the web.

2. In a drying apparatus, the combination of two drying elements adapted to receive between them the body to be dried; an endless woven wire belt passing between, and in close proximity to one of, the drying elements and about sustaining and driving rolls, the other of said drying elements being provided with a foraminous facing opposed to and parallel with the endless belt; and means for heating said elements.

3. In a drying apparatus, the combination of a main frame; two flat drying elements mounted in said frame and facewise opposed one to the other, one of said elements being capable of movement toward and from the other; means for effecting such relative movement; journal bearings carried by the main frame; rolls at opposite ends of the frame having their journals seated in and readily removable from said bearings; an endless woven wire belt passing about said rolls and having both its upper and its lower stretch carried between

the two drying elements; and a foraminous facing applied to the opposing face of the other drying element.

4. In a drying apparatus of the character described, the combination of a main frame; two drying elements mounted in said frame, one movable toward and from the other; means for effecting such relative movement; an endless belt having its upper stretch carried between and parallel with the opposing faces of the drying elements; and rolls within and at opposite extremities of said endless belt, journaled in bearings on the frame and extending beyond the ends of the drying elements, whereby said belt is adapted to receive at one end and deliver at the other end of the machine the bodies to be dried.

5. In a drying apparatus of the character described, the combination of a main frame; two drying elements mounted in said frame, one movable toward and from the other; means for effecting such relative movement; rolls rotatably mounted in said frame at opposite ends thereof; an endless woven wire belt having its upper stretch carried between and parallel with the opposing faces of the drying elements and passing about said rolls; means for imparting rotary motion to one of said rolls; and means for starting and stopping such motion at will.

In testimony whereof I have signed my name to this specification.

DANIEL MANSON SUTHERLAND, Jr.