No. 727,229. PATENTED MAY 5, 1903.

F. H. TURNER.

CALENDER PRESS.

APPLICATION FILED JULY 9, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

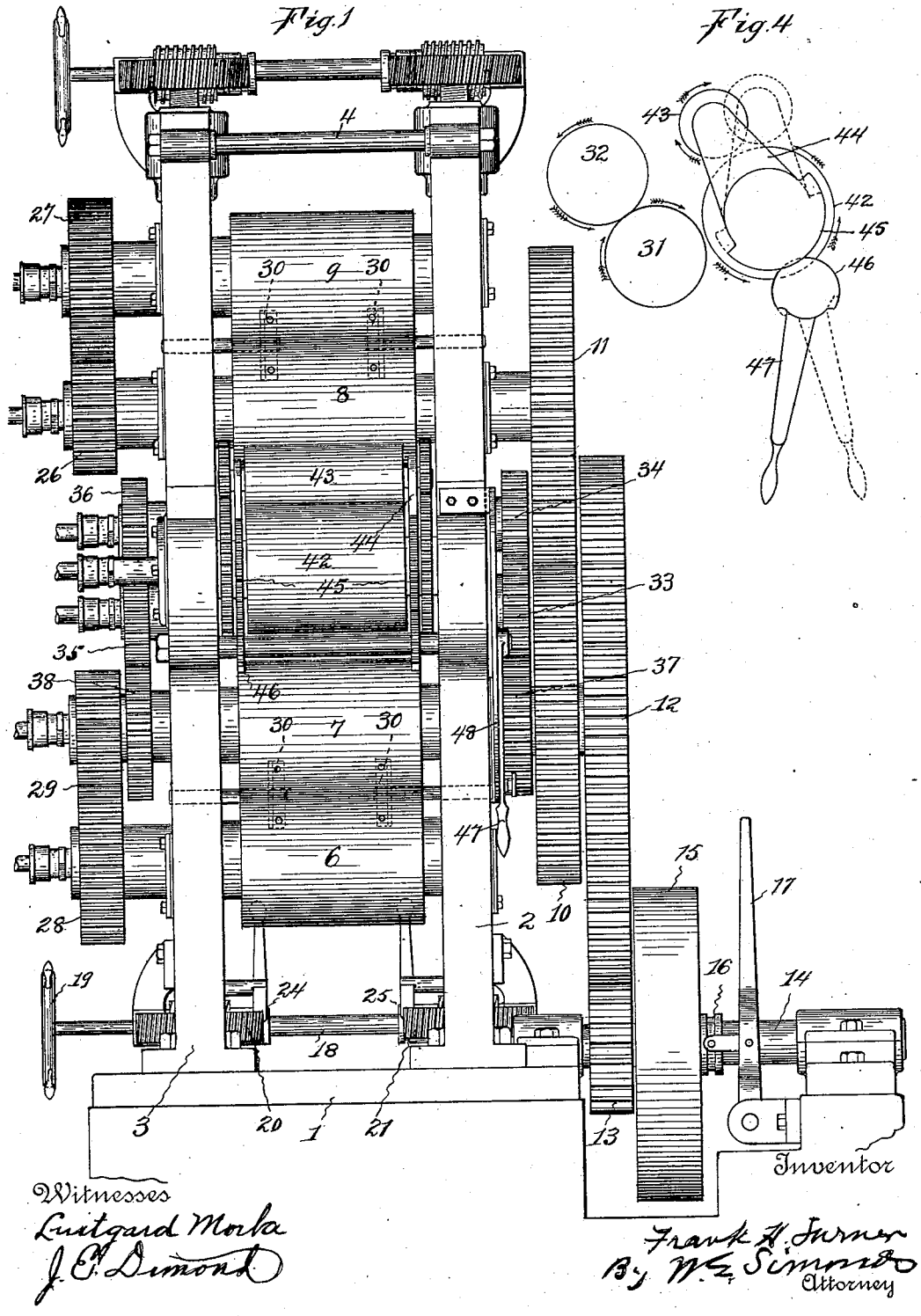


Fig. 4

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

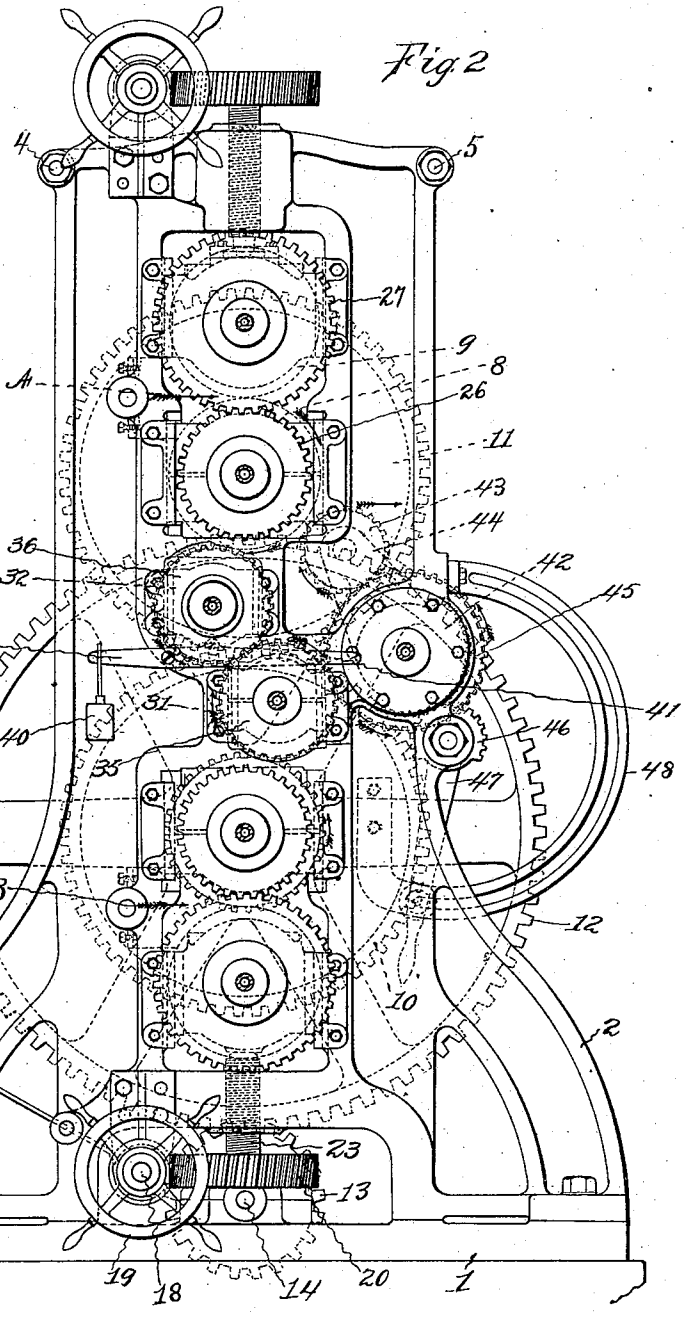
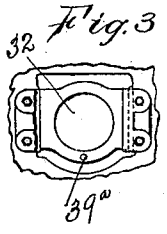


Fig. 3



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UNITED STATES PATENT OFFICE.

FRANK H. TURNER, OF HARTFORD, CONNECTICUT.

CALENDER-PRESS.

SPECIFICATION forming part of Letters Patent No. 727,229, dated May 5, 1903.

Application filed July 9, 1900. Serial No. 22,921. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. TURNER, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, (whose post-office address is No. 738 Park street, Hartford, Connecticut,) have invented certain new and useful Improvements in Calender-Presses, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description, whereby any one skilled in the art may make and use the same.

My improved machine, while it is applicable for use with many kinds of material where it is desired through heat and pressure to reduce the material to a thin web, is more especially designed to be used for working rubber. Calender-presses have long been used for this purpose; but great difficulty has been experienced in producing thin webs of rubber which were free from blow-holes, (small perforations,) these making such a web of rubber valueless when it is desired to use it to prevent the escape of air or liquid, as in the case of rubber tubing. The general method employed for reducing rubber in a calender-press is well known in the art. A bank of rubber which has been refined is placed against two heated rolls, which draw it between them and under the action of the heat and pressure reduce it to a web of proper thickness, dependent upon the distance between the adjacent surfaces of the rolls. The bank of rubber, comprising a mass of uneven consistency and having its fibers or granules unevenly disposed, often contains globules of air or moisture, which as the rubber is passed between the rolls are subjected to such pressure as to cause them to break through the surface of the finished web.

The object of my invention is to so form a calender-press that the difficulties arising from these fine perforations may be avoided, and to secure the best results I provide a machine in which the rubber is first calendered into film-like webs, which while in their green condition are superimposed and united into a single web of the required thickness by the action of pressure. In the accompanying drawings and the following description there is shown and described a machine in which only two films are united into a single web; but the device is not limited to such a use, as it may be arranged to form and unite any reasonable number of films. It is perfectly obvious that there is scarcely any liability of the perforations which may be formed in the separate films ever coming into registering position with each other when the two films are united and while a perforation may exist in one of the thin films the passage of air would be stopped by the second film when the two were united.

Referring to the drawings, Figure 1 is a rear elevation of my improved machine. Fig. 2 is a side elevation of the machine with the main driving-gears removed to better show the construction. Fig. 3 is a detail view of the box of the floating roll, hereinafter described. Fig. 4 is a diagrammatic view of the uniting-rolls and cooling-cylinders.

In the accompanying drawings the numeral 1 denotes the base or bed upon which the side frames 2 3 are secured. These side frames are held in proper relation to each other by cross-ties 4 5, adjustably secured to the tops of the side frames. The side frames may be of any suitable form and have journal-cases for the calender-rolls arranged in them. Two sets of calender-rolls 6 7 and 8 9 are journaled in the boxes formed in the side frames, and one roll of each pair, as 7 and 8, have secured to the outer ends of their shafts gears 10 11, which intermesh. At the end of the shaft of the roll 7 is secured a gear 12, which forms the main driving-gear of the machine and is in mesh with and driven by a pinion 13, mounted on the main driving-shaft 14, and adapted to be driven from any suitable source of power through the pulley 15. A clutch mechanism is arranged on the shaft 14 and comprises a clutch member 16, movable lengthwise of the shaft and adapted to be operated by clutch-lever 17. By this mechanism the machine may be readily started or stopped by the operator. The rolls 6 7 and 8 9 are highly polished and adapted to be heated to the required temperature to work the rubber, and these two pairs of rolls each form a thin film, which is subsequently united, as hereinafter described. As it is often desirable to change the thickness of the films of rubber formed between these rolls, one roll in each pair, as 6 and 9, is made adjustable

with relation to its coöperating roll 7 and 8. As a convenient means of adjustment a worm-shaft 18 is arranged parallel to the axis of the roll 6 and is provided with a hand-wheel 19, by which it may be turned. This worm-shaft 18 bears worms meshing with worm-gears 20 21, which are fast to screw-threaded shafts 23, bearing against the lower sides of the boxes, which are movably mounted in the side frames and bear the shaft of the roll 6. It often happens that one end of the roll needs to be adjusted—*i. e.*, raised or lowered slightly—without interfering with the adjustment of the opposite end of the roll, and to permit such an adjustment clutches 24 25 are arranged on the worm-shaft 18, by which either adjusting worm-wheel 20 or 21 may be permitted to remain at rest while the other is being adjusted. The form of these clutches and their method of attachment to the shaft 18 are immaterial, and it is only necessary that such a clutch shall be employed as will permit one of the worms remaining at rest while the other is being moved. As an easy means of effecting this result one member of the clutches 24 25 may be splined to the shaft 18 intermediate of its ends, and this intermediate section may be made independent of the outer section except when it is joined to it by the clutches being thrown into closed position. From this arrangement it will be seen that the peripheries of the two coöperating calender-rolls may at any time be brought into proper alinement and the distances between their operating-faces may be varied at will to increase or diminish the thickness of the web or film which is formed by them.

At the top of the machine a mechanism similar to that just described is arranged for adjusting the roll 9 with relation to its coöperating roll 8.

To secure the proper relative movement between the two rolls of each pair, intermeshing gears 26 27 are arranged and secured upon the outer end of the shafts of the rolls 8 9, and similar gears 28 29 are secured to the shafts of the rolls 6 7. By this connection, as the rolls 7 8 are driven from the main driving-shaft 14 through the train of gears 13 12 11 10, the rolls 6 9 are always moved at a proper rate of speed to correspond to the movement of the rolls 7 8. Each of these rolls is hollow and is adapted to be highly heated, as by circulating steam therein. Connections for the introduction of steam to the rolls are sufficiently shown at the left-hand ends of the tubular shafts in Fig. 1. Adjacent to the contacting surfaces of the rolls are arranged gage-plates 30, which determine the width of the web or film formed by the calender-rolls. The operation of this portion of the mechanism is evident from the drawings. The rubber to be operated upon is placed adjacent to the contacting surfaces of the two pairs of rolls, as indicated by the letters A B. The two surfaces of the coöperating rolls moving in the same direction cause the rubber to be drawn between them, and under the action of the heat of the rolls it is formed into a thin film, which is carried about the roll (in this case on the rolls 8 and 7) until it comes into contact with the uniting-rolls 31 32. These uniting-rolls are arranged between the pairs of calender-rolls and are caused to move in the proper direction by intermeshing gears 33 34 and 35 36, which are driven by gears 37 38 fast to the shaft of the roll 7. The roll 32 is what may be called a "floating-roll," in that it has automatic movement toward and from the opposing roll 31 whenever the rubber that is passing between these two rolls is of varying thickness. Ordinarily the weight of this roll 32 is sufficient to compress the films of rubber which are passed between the uniting-rolls; but for convenience and to secure the best results a pivoted lever 39 is arranged with its fulcrum between the point of attachment of the lever to the box of the shaft which bears the roll 32, as at 39^a, Fig. 3, and a weight 40. This lever preferably has an extension 41 extending beyond the center of the roll on the side opposite its attachment-point. It will be seen that with a lever of this sort the position of the weight as regards the lever will either force roll 32 away from the roll 31 or bring it into closer contact with it. These rolls 31 32, lying in close contact, respectively, with the rolls 7 and 8, receive the thin films of rubber carried by the latter and, picking them up much after the manner of a couch-roll, bring them together and unite them by pressure into a single web of double the thickness of the films first formed. From the uniting-rolls the web of rubber is carried to the cooling-cylinder 42 and after passing about its periphery is taken off from the idler 43 and rolled up upon a web of cloth or other material which has been suitably prepared to receive it. Of course it is understood that the rubber as it comes from the calendering and uniting rolls, where it has been highly heated, is in a very sticky condition and must be cooled somewhat before it can be handled with safety or convenience. The cylinder 42 is specially arranged to present a large cooling-surface to the web of rubber as it comes from the uniting-rolls. The idler 43 is mounted in a swinging frame 44, which turns upon the axis of the roll 42 and is provided with a segmental gear 45, which meshes with a segmental gear 46, adapted to be moved by a lever 47. This lever 47 has its outer end working in a guide 48, to which it may be secured in any desired position of adjustment. It is obvious that as the lever 47 is moved the idler 43 will, through its swinging frame, be revolved about the cooling-roll 42, and upon its position with relation to the said roll is dependent the amount of cooling-surface over which the web of rubber will pass after it comes from the uniting-rolls. This mechanism also provides a convenient means of allowing ready access to the rolls for the

purpose of starting the web of rubber about them. The cooling-cylinder 42 may be cooled in any suitable manner—as by the introduction and circulation of a jet of cold water. The diagram view in Fig. 4 shows the operation of the mechanism adjacent to the cooling-roll.

While I have described and shown herein a specific machine for so working webs of rubber as to prevent blow-holes and have shown and described a machine for accomplishing the desired results which comprises only two pairs of calendar-rolls adapted to form two webs and mechanism for uniting the two webs, I do not wish to limit myself to the exact construction shown, as it is perfectly apparent that almost any number of films might be formed and united in a single machine. The essential feature of my invention consists in providing a machine which will form a plurality of thin films of rubber or like material and will automatically unite such films into a single web.

I claim as my invention—

1. In combination in a machine of the class specified, a plurality of calendering mechanisms each adapted to produce a film of material, and a floating pressure-roll coacting with a suitable opposing surface, to unite the films thus formed into a single web.

2. In combination in a machine of the class specified a plurality of calendering mechanisms each adapted to produce a film of material, and a floating pressure-roll coacting with a suitable roll, to unite the films thus formed into a single web.

3. A plurality of calendering mechanisms each adapted to form a film of material, in combination with means to unite the two films into a single web, said means including a floating pressure-roll, substantially as described.

4. A plurality of calendering mechanisms each adapted to form a film of material, in combination with means to unite the two films into a single web, said means including a floating pressure-roll adjustable as to pressure, substantially as described.

5. In combination in a calendering-press, pairs of calendering-rolls, a pair of uniting-rolls, one of which is a floating roll, located adjacent to the calendering-rolls and adapted to coöperate with the latter, as and for the purposes specified.

6. In combination in a calendering-press; pairs of calendering-rolls; means for applying heat to them; a pair of uniting-rolls one of which is a floating roll; said uniting-rolls located adjacent to the calendering-rolls and adapted to coöperate with the latter, for the purposes specified.

7. In combination a series of pairs of rolls adapted to operate upon a material and reduce by the action of heat and pressure; means adjacent to the series of reducing mechanisms adapted to unite the materials formed into a single web of material; and means appurtenant to the uniting mechanism for cooling and delivering the material.

8. In combination; two pairs of rolls adapted to calender material by the action of heat and pressure; uniting-rolls operatively mounted with relation to the calendering-rolls and adapted to unite the materials formed by the latter; means for cooling the material after it has been united.

9. In combination in a device of the class specified, a series of calendering-rolls adjustably arranged with relation to each other; a pair of uniting-rolls one of which is adjustable with relation to the other, said uniting-rolls being mounted in operative relation to the series of calendering-rolls and coöperating with them; and a cooling-cylinder coöperating with the above-mentioned mechanism and having means for varying the amount of cooling-surface used.

10. In combination in a device for calendering rubber, calendering-rolls adapted to reduce the "bank" to thin films; uniting-rolls coöperating with the calendering-rolls and adapted to unite the material passed from them; means for varying the pressure between the uniting-rolls and means for cooling and removing the material united by them.

11. In combination in a rubber-working machine, calendering-rolls adapted to form thin films of rubber; a uniting mechanism adapted to receive the films and unite them, comprising a pair of rolls one of said rolls being provided with means for forcibly removing it from its mating roll; said means including a pivoted lever and weight so arranged that the roll may be removed from or brought into contact with its mating roll.

12. In combination, in a calendering-press comprising a series of calendering-rolls, uniting-rolls, and means for driving them; of a cooling-cylinder; an idler mounted in a swinging frame and adapted to be revolved about the cooling-cylinder; and means for locking the idler in a predetermined position with relation to said cylinder.

13. In combination in a calendering-press comprising calendering and uniting rollers, a cooling-cylinder having means for varying the extent of the cooling-surface acted upon; said means including an idler mounted in a swinging frame, the latter provided with a segmental gear coöperating with a segmental gear carried by an operating-lever; and means for locking the lever in a predetermined position.

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Witnesses:
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