

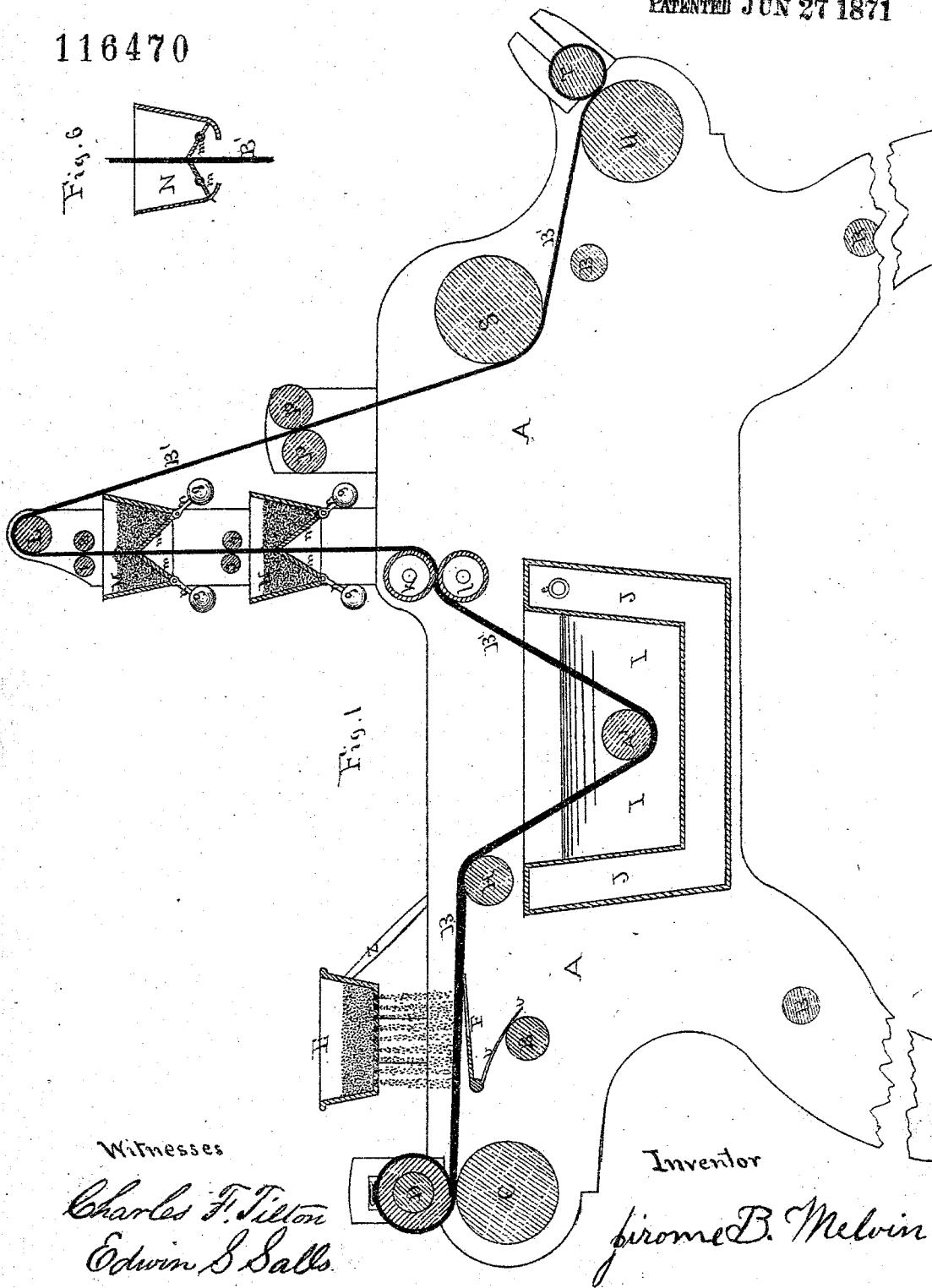
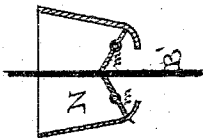
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Machinery for making Fibrous Roofing Felt.

Sheet 1-5 Sheets

PATENTED JUN 27 1871

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Fig. 6



Witnesses

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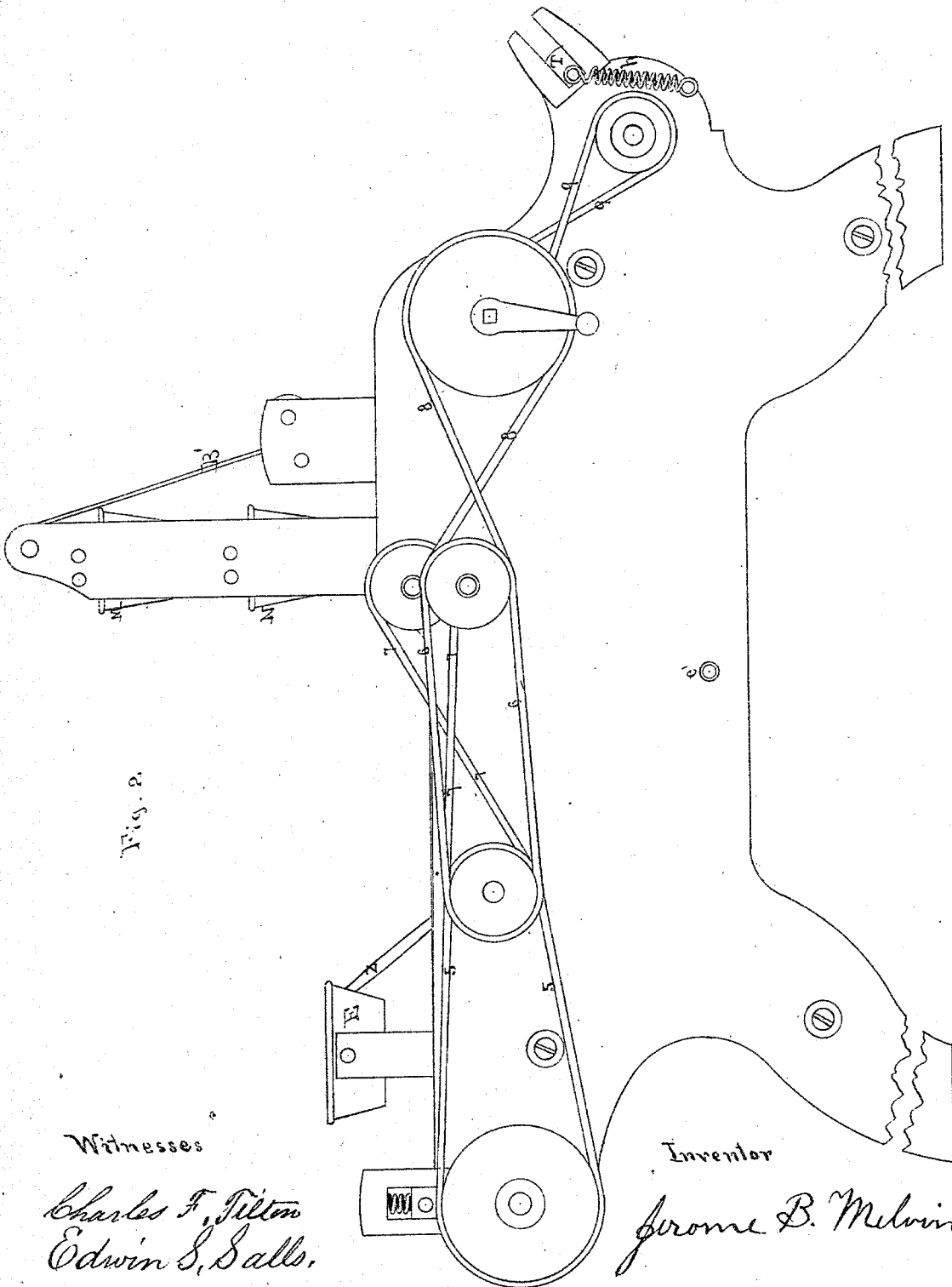


Fig. 2.

Witnesses

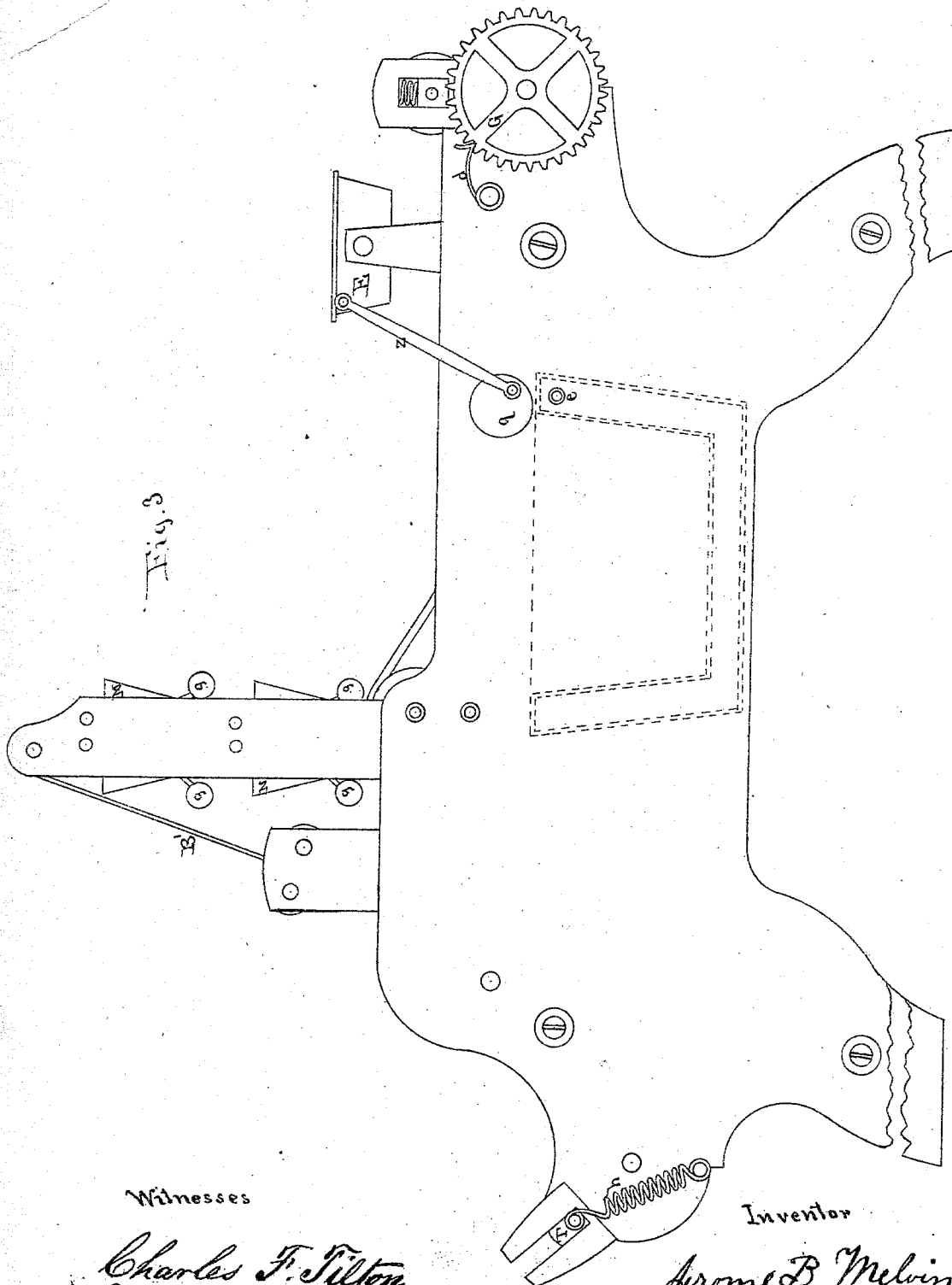
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Sheet 3-5 Sheets



Witnesses

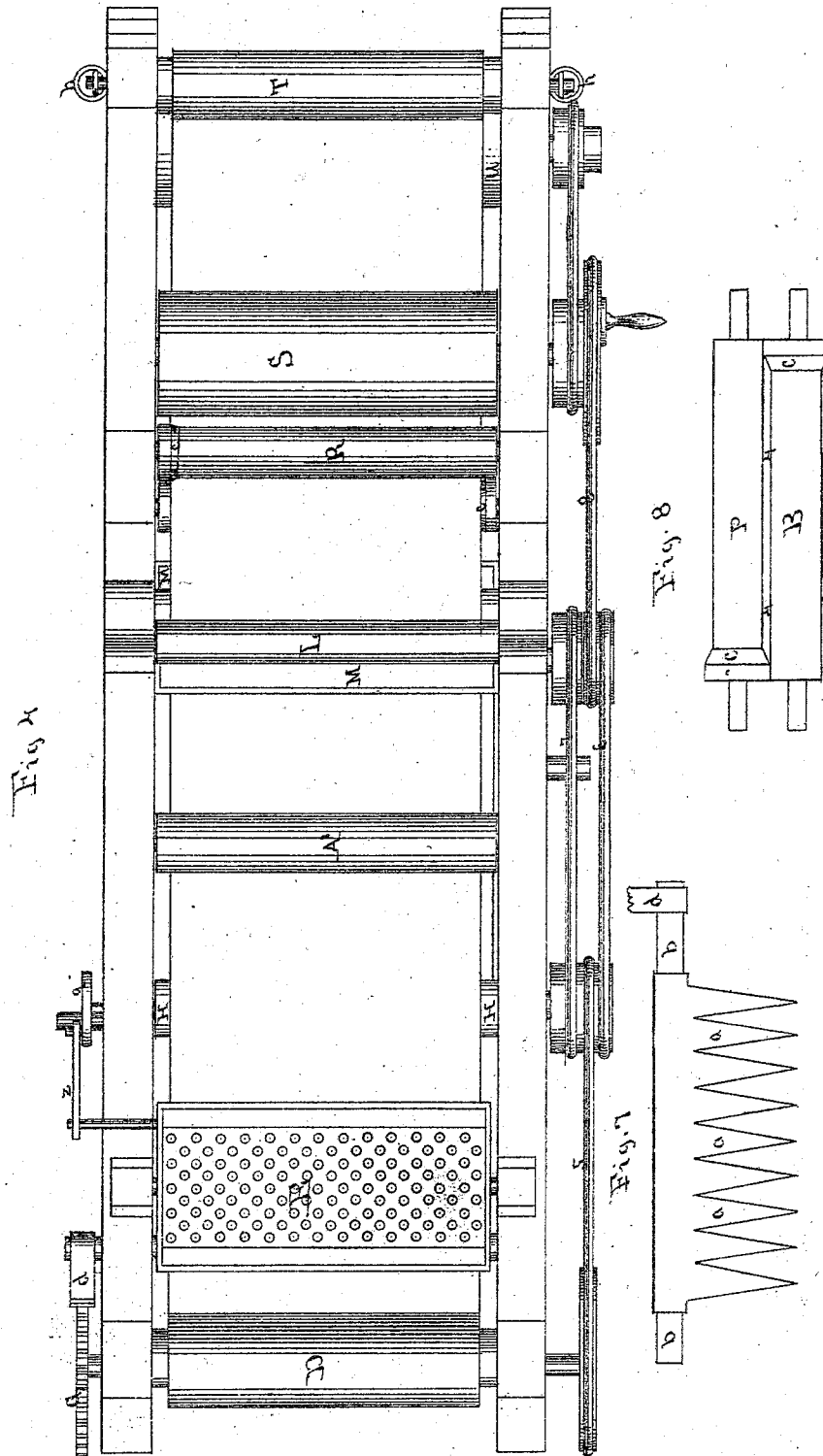
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Sheet 4-53 sheets



Witnesses

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Machinery for making Roofing felt

Sheet 5-5 Sheets

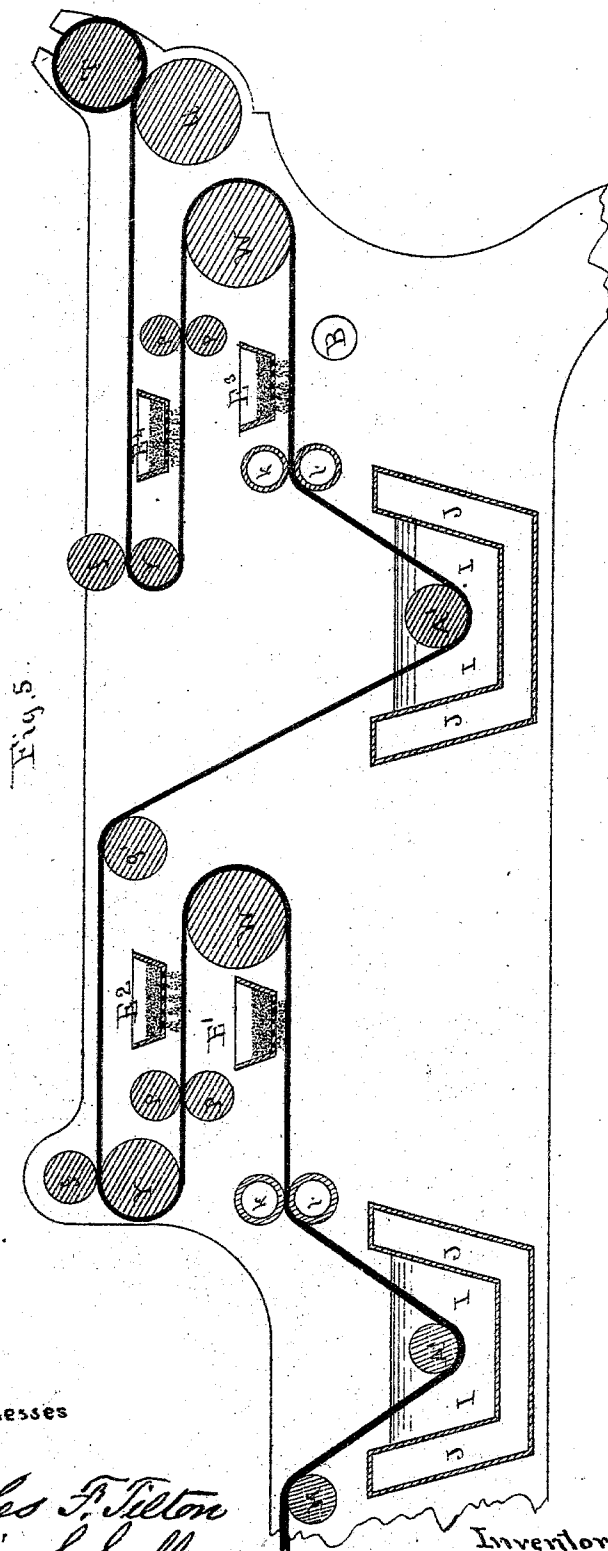


Fig. 5.

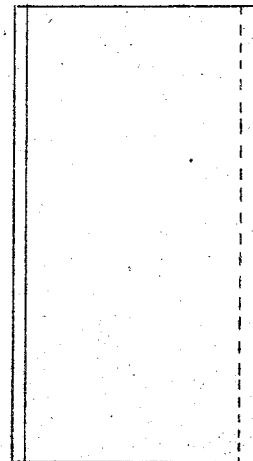


Fig. 9.



Fig. 10.

Witnesses

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UNITED STATES PATENT OFFICE.

JEROME B. MELVIN, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO HIMSELF,
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IMPROVEMENT IN MACHINERY FOR MAKING ROOFING-FELT.

Specification forming part of Letters Patent No. 116,470, dated June 27, 1871.

To all whom it may concern:

Be it known that I, JEROME B. MELVIN, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in the Machinery or Apparatus and in the Process for Making Roofing-Felt, in the felt or fabric as a new manufacture, and in certain additional improvements in the latter, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 represents a sectional elevation of my improved machine. Figs. 2 and 3 are opposite side elevations. Fig. 4 is a plan or top view. Fig. 5 is also a sectional elevation, showing certain modifications not shown in Fig. 1. Fig. 6 represents a modification in one of the sand-boxes. Fig. 7 represents a detached plan of the instrument or mechanism which I employ for agitating or disturbing the felt, or for shaking sand or other suitable substance into the felt preparatory to immersing or saturating. Fig. 8 represents a pair of edge-forming rolls, which I employ in forming a lap-jointed edge or edges on the felted fabric. Fig. 9 represents a plan, and Fig. 10 an end elevation of a portion of the felted fabric having two lap-jointed edges.

This invention consists: first, in the machinery or apparatus; and second, in the process of or for filling, saturating, covering, and finishing continuous sheets of roofing-felt, composed originally of animal or vegetable fibers, such as hair, hemp, grass, or other suitable fibrous substance or material; or for saturating, covering, and finishing such continuous sheets of felt with or without lap-jointed edges. Second, my invention consists of a felting as a new manufacture when composed of fibrous material and filled with sand, silix, silica, pulverized stone, or other similar or suitable substance, and saturated with adhesive material and covered with sand or any of the substances first named, and finished by rolling or pressing the sand-covered surfaces, and thereby producing a very heavy, compact, and durable fabric. Third, my invention and improvement consists in roofing-felt with a lap-jointed edge or edges, whether filled with sand, or other substance, and saturated and covered with the filling or other similar substance; or when the filling-sand is omitted and only the sat-

urating and covering and finishing are performed; or when both the filling and covering sand are omitted and only the saturating material is applied to the previously-prepared roofing-felt.

In constructing my improved machine for making continuous sheets of roofing-felt I first provide a suitable frame-work, A, connected together by girts or bars B in any suitable manner. At one side of this frame-work I apply a feed-roll, C, and above this feed-roll a lap-roll, D, for containing or carrying the previously-prepared felt to be fed through the machine. A little forward of this lap-roll is a suspended sand-box, E, so arranged and connected as to be rocked or shaken to sift the sand through the perforated or open-work bottom on the felt passing beneath it. Below this sand-box, and about on a level with the top of the feed-roll, I arrange a whipper or beater, F, for disturbing the felt, or shaking or beating the sand into it while passing beneath the operating sand-box. This felt-beating instrument, in the present instance, consists of a series of prongs, bars, or fingers, *a*, arranged upon a transverse shaft, *b*, extending across the machine and through the frame-work, where one end of the shaft is furnished with a dog or lever, *d*, which is actuated in one direction by a toothed wheel, G, on one end of the feed-roll shaft, and in the opposite direction by a spring, V, bearing against some stationary object, B, as clearly shown in Figs. 1, 3, and 4. A little forward of the sand-box and the beater before named is a guide-roll, H, for guiding the felt to the bath I of adhesive material. This bath consists of a transverse trough or box inclosed within a larger one. The space J between the two is intended for a steam-chamber for the reception of steam to heat the material in the bath, the steam being admitted through a pipe, *e*, and escaping at a similar pipe, *e'*. Near the bottom and inside of the trough or tank I is a submerging-roll, A', for carrying the felt downward and through the liquid material, which saturates and fills the felt, which is then drawn upward by a pair of hollow steam-heated squeezing-rolls *k* and *l*, which squeeze out a considerable portion of the saturating material, and this surplus material runs back again into the tank or bath. Here it will be observed that the squeezing-rolls are arranged one above the other; but these squeezing-rolls will perform their intended office equally as well if arranged side by

side in the same horizontal plane. Passing the squeezing-rolls the forward-moving felt is led directly and vertically to an upper guide-roll, L, and over it, and in its passage it runs through one or more pivoted or hinged-bottomed sand-boxes M and N, and also between pressure-rolls 1, 2, 3, and 4. The sand-boxes last named are suitably supplied with sand or other suitable material, which covers both surfaces of the sand-filled and adhesively-saturated felt while passing through it, and the pressure-rolls press or roll the sand into these surfaces. Passing the upper guide-roll L, the sand-filled and adhesively-saturated and sand-covered felt passes onward or downward to and between certain edge-forming rolls, P and R, which press or roll the edges of the felt at opposite sides thereof, and form those edges at any suitable angle or level, so that an edge of one sheet of such felt will lap onto the edge of another sheet, substantially as shown in Fig. 10, thus forming a lap-jointed edge or edges, which are cemented together generally with some of the adhesive material when the felt is applied to cover the roof or wall of the building. The edge-forming rolls, their construction, operation, and the result thereof, will be well understood by referring to Fig. 8 of the drawing, the space 4 4 indicating the passage-way for the forming-felt which passes between them; each beveled or conical portion *c* forms the lap-jointed edge, and these conical portions may be changed in form or flatness, so as to make a long or a short lap-edge on the felt. If preferred, one roll may have both of its ends shouldered and beveled so as to form both of the lap-edges on the same side of the felt. Passing the edge-forming rolls, and beneath a guide-roll, S, the felt goes directly to the lap-forming roll T, which winds or rolls up the felt in a finished condition. The roll T and the forming-lap rest or bear upon the under roll U, which drives the former and rolls up the felt. Springs *h* or weights are attached or connected with the journals of the lap-roll T, to hold it and the forming-lap against the under roll, since the weight of the lap-roll is insufficient to cause a suitable winding friction between the forming-lap and the under-roll. It will be observed that the sand-boxes M and N have their bottoms pivoted or hinged to their lower edges, and that such bottoms incline upward and their upper edges bear against the felt. In order to prevent too great an amount of friction against the surfaces of the passing felt, caused by the weight of the sand, I apply a counterbalance-weight, *g*, upon the outer end of a lever or arm, *n*, and connect the arm with the pivoted bottom of the sand-box. This weight *g* must be of sufficient specific gravity to overcome or nearly overcome the weight of the sand in the box, which box or boxes are intended to be kept filled to about the same height or degree by a volume of sand passing through a conductor or conductors, or by some other suitable means. Instead of pivoting or hinging the bottoms *m* of the sand-boxes to the edges thereof, and to obviate the necessity of the counterbalance-weights, I sometimes curve the lower edges of the sand-boxes and pivot the bottom to the

ends of the boxes a little outside of the centers of the bottom, about as shown in Fig. 6, and this allows the weight of the sand in the box to bear or to exert a little more pressure upon the bottoms inside of the pivotings than on the outside of them, or sufficient to keep the inner edges of the bottoms bearing slightly against the passing felt B', or so that the continuous sheets of felt will pass readily between the pivoted bottoms and through the sand or other substance above them.

I have specified sand as the filling and covering-substance for the felt. I do not confine myself to the use of sand alone, but I use any and all substances which will answer the purpose, whether it be sand, silex, silica, or other substance found in its natural state, or any pulverized substance, such as pulverized slate, marble, soap-stone, slag, or coal-ashes, or any other substance which will increase the weight of the felt and be retained by the adhesive material, and the same or any other substance which will cover the filled and saturated felt and prevent adhesion when rolled or folded.

The adhesive material employed for saturating the felt may be any well-known material used for such purposes, whether capable of being used cold, or, from the nature of the material, requiring heat to liquefy it; and for this purpose I sometimes use a composition of petroleum and rosin to follow the first sand-filling process, and in this case the rosin may be a little in excess of the common proportions, so as to make the felt hard in the center when finished. I then pass the felt through the surface-covering sand-boxes and their rollers, or in some other way apply sand to both surfaces of the felt, and either before or after rolling down the lap-jointed edges I pass the thus-prepared felt through a second bath of adhesive material, composed of some other ingredients, which, when finished, will be softer and more pliable than the material first named.

The second adhesive material spoken of may be refined or common coal-tar, or pine-tar, or a mixture of asphaltum and some of its well-known solvents; or, in fact, any well-known substance or material that will confine the filling-sand within the substance of the felt and receive the covering-sand so as to prevent adhesion.

In Fig. 5 of the drawing I have shown a modification of my invention, having two saturating-tanks, I, for repeating the process of saturating and covering the felt with sand. In this modified machine the felt, after passing the squeezing-rolls, passes beneath a sand-distributing device, E¹, round a guide-roll, W, and backward beneath a second sand-distributor, E²; thence between two pressure-rolls, *p*, and around a second guide-roll, Y, beneath a pressure-roll, *f*, and forward over a third guide-roll, *g'*, and downward beneath a submerging-roll, A¹; thence upward and between the second pair of steam-heated squeezing-rolls, beneath a third sand distributor, E³, forward and round a second guide-roll, W; thence backward between a second pair of pressure-rolls, *p*, beneath a third sand-

distributor, E^4 , round a guide-roll, Y , beneath a pressure-roll, f , and forward to the lap-winding roll T , as in the machine first described. The pressure-rolls p are intended to be edge-forming rolls; so also the rolls f and Y . The sand distributors E^1 to E^4 are intended to be substantially similar to that shown in Fig. 1, and used for filling the felt with sand, and these may be operated by any suitable means that will shake or shift the sand onto the passing felt. In the present instance I employ a connecting-rod, Z , with one end pivoted to the sand-box E and the other end to a crank-pin or to a pin projecting from one side of a plate, g , arranged upon the end of a rotating-shaft, which may be the guide-roll H . Instead of using a hard cooling saturating material in the first tank I , and a softer material in the second tank—or, what would be equivalent to this, passing the felt twice through adhesive material, and each time through a different composition or mixture—I sometimes reverse this process and apply the softer material first, and the harder cooling material on the outside of the felt.

Either of the above-described processes will produce a peculiar and very durable roofing-felt, which possesses certain properties, or which has the capacity to resist both cold and heat, the softer portion serving for cold weather and the harder portion for warm weather; and if the harder portion should crack by contraction of cold the softer portion would fill up the crack in the harder portion, and so one part will balance the other. The continuous sheets of felt which I fill, saturate, cover, and finish, are intended to be made of short hair, such as horse-hair, cattle's hair, and the like, and made in the usual way of forming hair-felt; but other fibrous substances, formed in continuous laps, bats, or sheets, would answer the same purpose, hair-felt being preferable for its cheapness. This continuous sheet of felt or other production may be made and wound upon rolls and placed on the machine, as before described, or fed directly from the lap-forming machinery and between suitable feed-rolls C and D , the latter representing the lap-roll in this machine.

The operating parts of the machine may be driven by suitable gearing, or by belts or bands 5 6 7 8 9, each arranged over suitable pulleys, about as shown in Fig. 2, and either shaft may become the driver, and receive the power and motion from the source of supply. In the present instance the guide-roll S is the driver, and imparts motion to all the other rotary movers by suitable connections, clearly shown in the drawing.

If the saturating material for the felt be coal-tar, or in part coal-tar, this should be purified or refined so as to remove or neutralize the acid contained in such tar, as such acid injuriously affects the fibrous material of which the felt is made; but a very good roofing-felt may be made without purifying the tar.

In passing the felt through the aforesaid machine to fill, saturate, cover, and finish the same, or to perform any one or more of these parts of

the process, I sometimes feed in with the felt, or feed into the felt while forming one, two, or more strings, cords, or twine longitudinally with the continuous sheet of felt, and these threads of twine or cord prevent the felt being drawn apart by the draft of the rolls, as they strengthen the felt longitudinally.

Roofing-felt, made as above described, may be used in continuous sheets to cover the roof and the walls of the building, or it may be cut into pieces of various dimensions and used in the form of slate or shingles, especially when saturated with a hard drying material.

My object in filling the felt with sand or other similar substance is to increase its weight or its specific gravity, and also to render it, in a greater degree, fire-proof, and therefore better adapted for roof covering.

In order to make the fibrous felt without either filling or covering the same with sand, but using only the saturating material, I generally use an apparatus substantially like that shown in Fig. 5, in which case I dispense with all the sand-boxes E and run the felt from the first squeezing-rolls directly over the roll g' and downward into and through the second bath or tank, which I fill with cold water, and from this cold-water bath I sometimes run the felt through the second squeezing-rolls, over and between the others, viz., $W p Y f$, and then to the lap-forming roll T . In the process last above described the appropriate rolls form the lap-jointed edges, and the cold-water bath cools the felt sufficiently to prevent adhesion when wound upon the lap-forming roll, and this process completes a fibrous and adhesively-saturated felt, in continuous sheets and with lap-jointed edges, suitable and well adapted for sheathing-felt, to be used on the bottoms of ships in the usual way. Any other method of applying cold water to both surfaces of the felt to cool it and to harden the saturating substance would answer the purpose equally as well as passing it through the bath of cold water; and if the edges of the felt are not to be lap-jointed I run the felt from the last squeezing-rolls directly to the lap-forming roll, and wind it up thereon.

In my said machine the sand-box E and the beater or felt-agitating device F , which works the sand into the felt, constitute the sand-filling apparatus, and either of these parts may be considerably modified without further invention, and the same may be said of all the other parts or combinations contained in the machine.

I claim as my invention—

1. A sand-filling apparatus, in combination with a felt-feeding apparatus, substantially as described, and for the purpose set forth.
2. The combination, substantially as described, of a sand-filling apparatus and a felt-saturating apparatus, with a feeding and a carrying and guiding apparatus, for the purpose and substantially as specified.
3. The combination, substantially as described, of a sand-filling apparatus, a bath or saturating apparatus, and a felt-squeezing apparatus, with the feeding and carrying mechanisms.
4. A sand-covering apparatus, which covers

both sides of the roofing-felt with sand simultaneously, or by a single operation or process, as shown and described, in combination with the squeezing-rolls and with the bath or saturating apparatus, and the feeding and carrying mechanisms, with or without the sand-filling apparatus, as set forth.

5. The edge-forming rolls, substantially as described, in combination with the sand-covering apparatus and the saturating apparatus.

6. The combination of the edge-forming rolls with the sand-covering and the saturating and the sand-filling apparatus.

7. The combination of the edge-forming rolls with the bath and the squeezing-rolls and with the feeding and guiding mechanisms.

8. The combination, substantially as described, of a sand-distributor, E, with the beater or felt-agitating device F, operating in connection, substantially in the manner and for the purpose set forth.

9. The combination, substantially as described, of a feeding and carrying mechanism, a sand-filling apparatus, a saturating and a squeezing apparatus, and a sand-covering apparatus, operating in the manner and for the purpose set forth.

10. The combination substantially as described, of a feeding and carrying mechanism, a sand-filling apparatus, a saturating and a squeezing apparatus, a sand-covering apparatus, and an edge-forming apparatus, all operating in the manner and for the purpose set forth.

11. The combination, substantially as described,

of a feeding and carrying mechanism, a sand-filling apparatus, a saturating and a squeezing apparatus, a sand-covering apparatus, an edge-forming apparatus, and a guiding and lap-rolling apparatus, all combined, arranged, and operating substantially in the manner and for the purpose set forth.

12. The process, substantially herein described, of producing sand-filled, and saturated, and sand-covered fibrous roofing-felt.

13. The process, substantially as herein described, of producing adhesively-saturated fibrous roofing-felt, such as herein described, in continuous sheets, with both sides covered with sand, as specified.

14. The process, substantially herein described, of producing fibrous roofing-felt with a lap-jointed edge or edges, whether filled or covered, or both filled and covered, with sand, as set forth.

15. As a new manufacture, sand-filled, adhesively-saturated, and sand-covered fibrous roofing-felt, substantially as described.

16. Roofing-felt, with lap-jointed edges, substantially as described, whether filled or covered, or filled and covered with sand, or only saturated with the adhesive material, as specified.

17. Saturated fibrous roofing-felt, such as herein described, made in continuous sheets, with both sides covered with sand, as set forth.

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