March 26, 1929. E. H. MARBLE 1,706,535

NEEDLE FELTING MACHINE

Filed Jan. 31, 1927 5 Sheets-Sheet 1

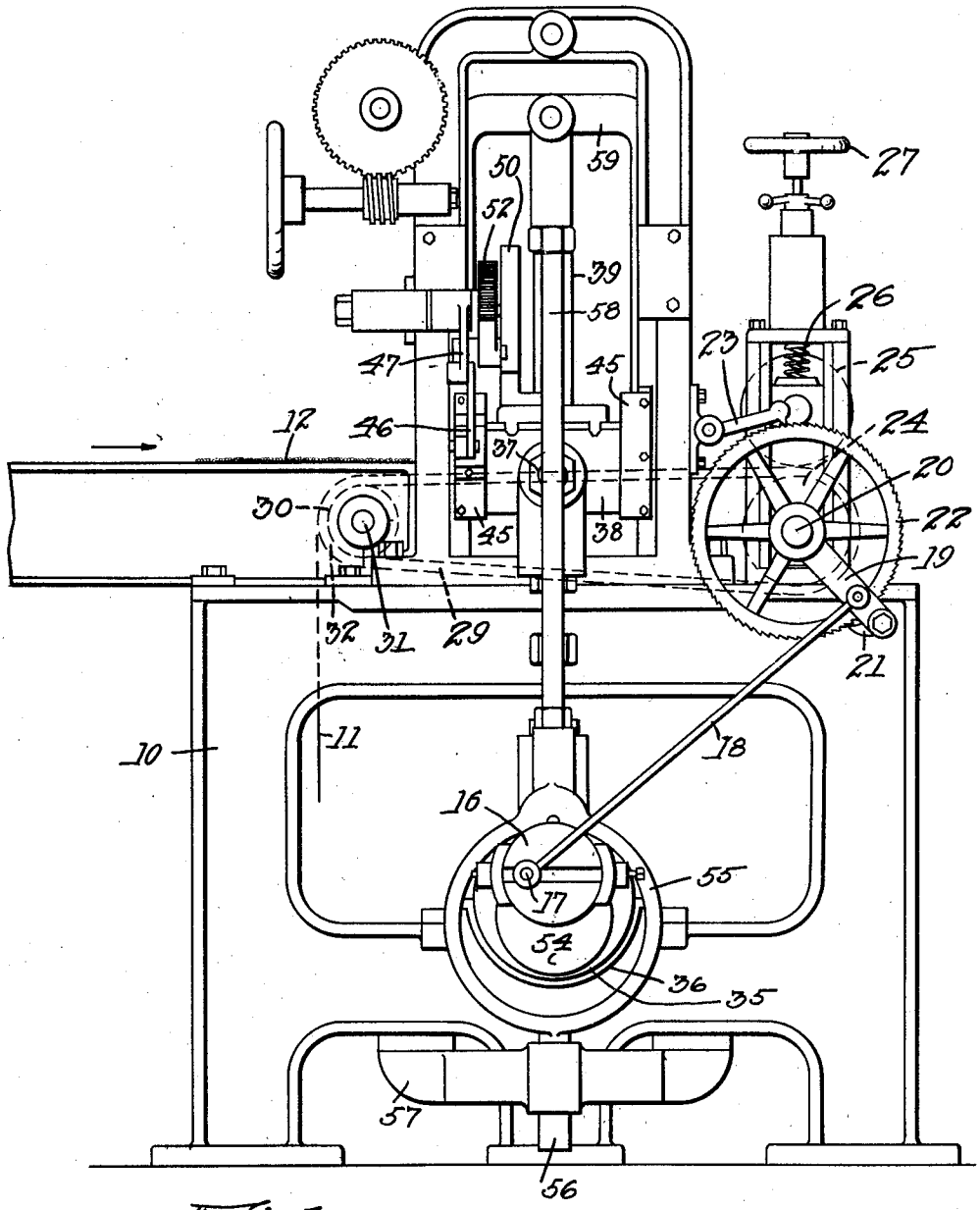


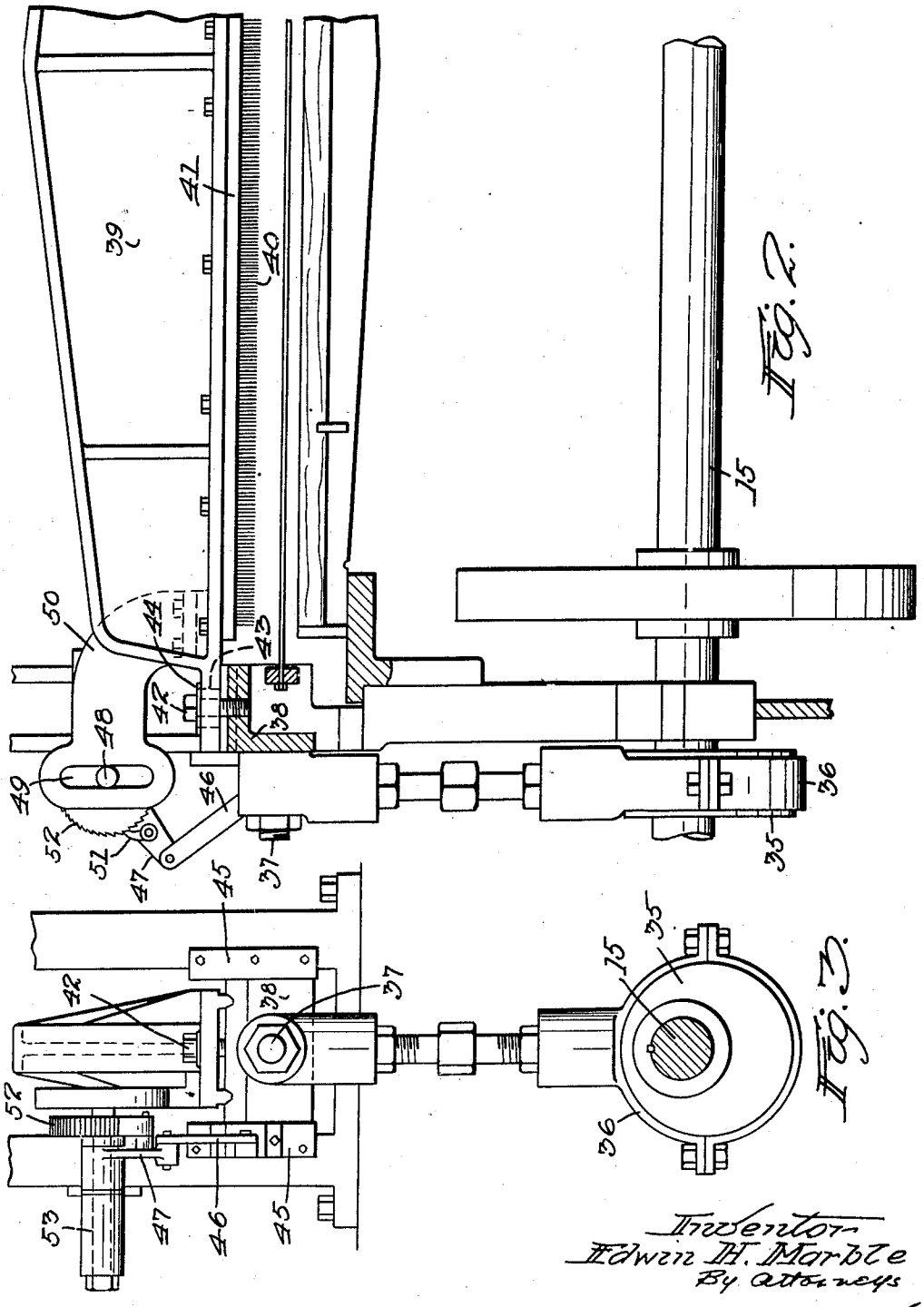
Fig. 1.

Inventor-
Edwin H. Marble
By Attorneys
Coulter & Fay & Harley

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NEEDLE FELTING MACHINE

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Inventor
Edwin H. Marble
By attorneys
Southgate Fay & Hanley

March 26, 1929. E. H. MARBLE 1,706,535

NEEDLE FELTING MACHINE

Filed Jan. 31, 1927 5 Sheets-Sheet 3

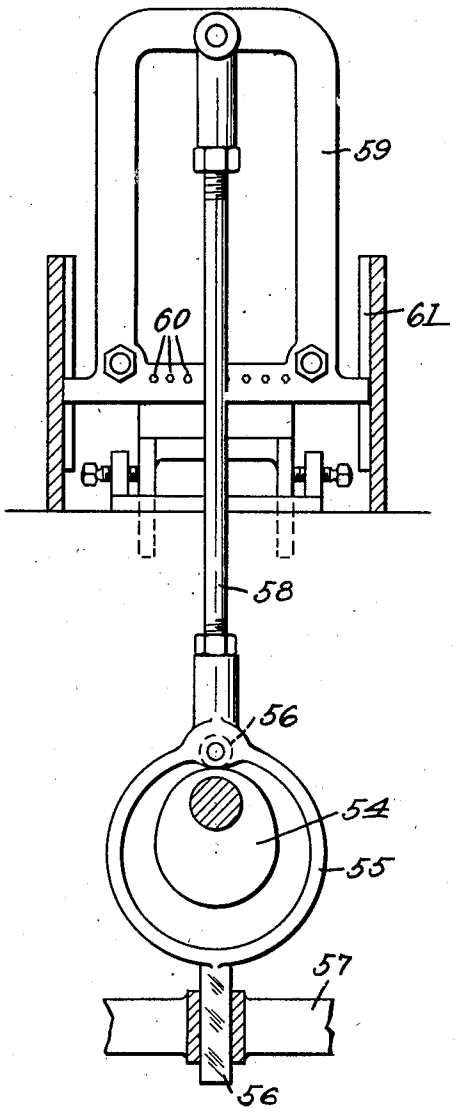


Fig. 4.

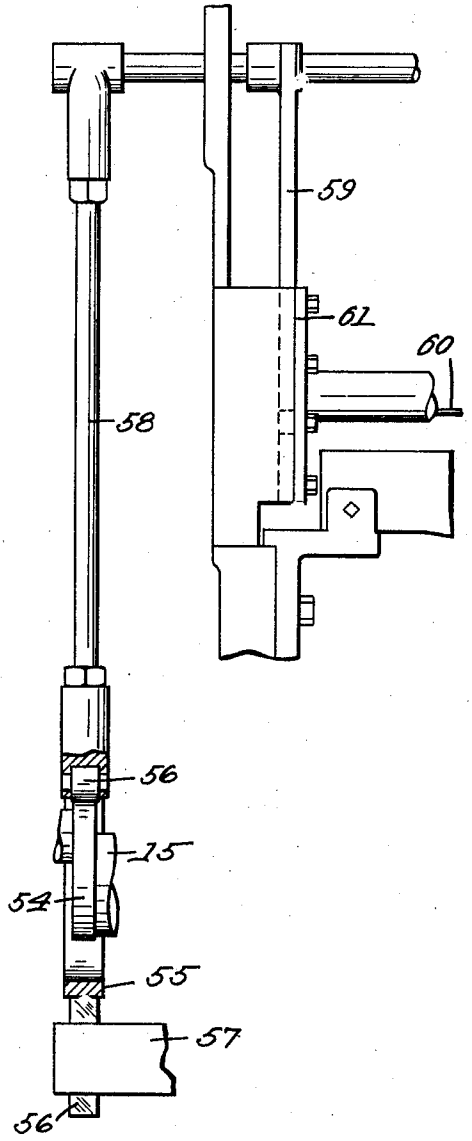


Fig. 5.

Inventor
Edwin H. Marble
By attorneys

Lamb Myers Tay & Hartley

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NEEDLE FELTING MACHINE

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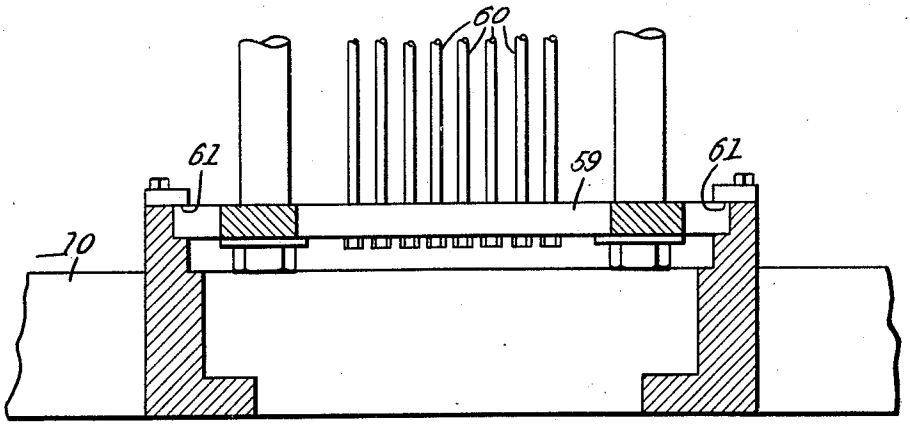


Fig. 6.

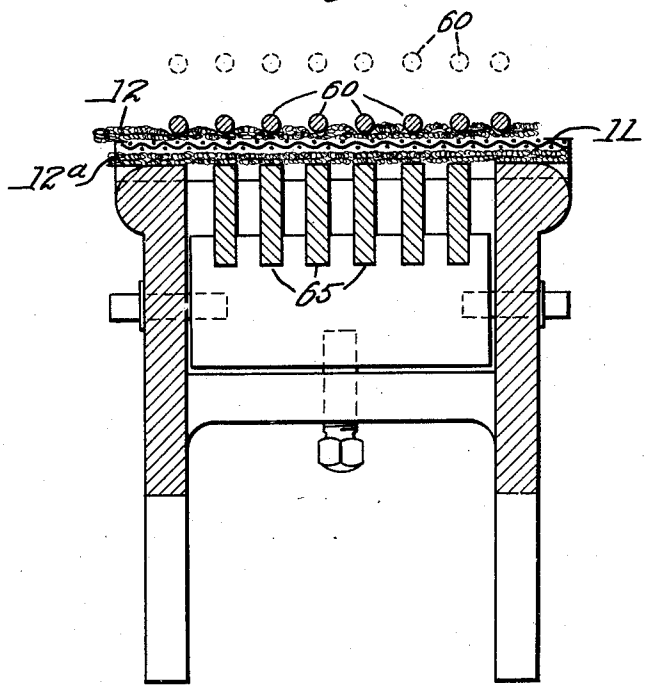


Fig. 10.

Inventor
Edwin H. Marble
By Attorneys
Coudert Fay & Hartley

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NEEDLE FELTING MACHINE

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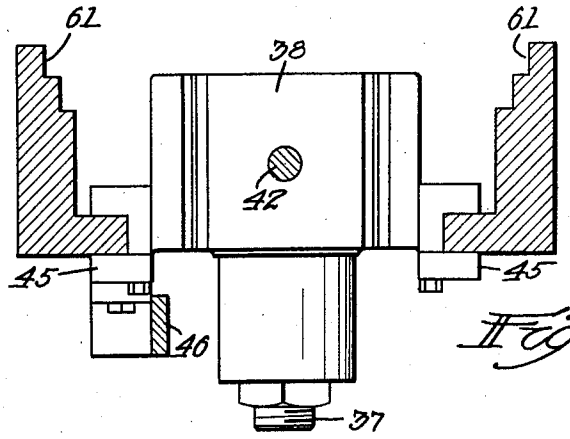


Fig. 7.

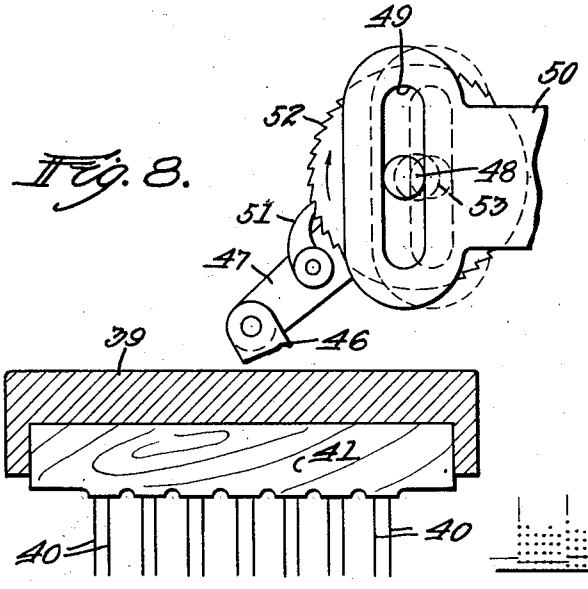


Fig. 8.

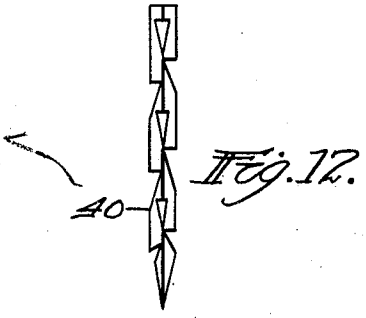


Fig. 12.



Fig. 11.

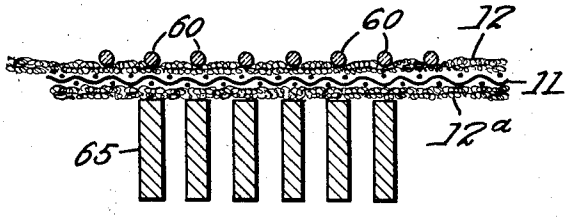


Fig. 9.

Inventor
Edwin H. Marble
By Attorneys
Cauldwell Fay & Harley

Patented Mar. 26, 1929. 1,706,535

UNITED STATES PATENT OFFICE.

EDWIN H. MARBLE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO CURTIS & MARBLE MACHINE COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

NEEDLE FELTING MACHINE.

Application filed January 31, 1927. Serial No. 164,691.

This invention relates to that type of machines in which wool, hair or other fibres, formed into a bat, are fed on a foundation of burlap, cotton cloth or other woven material and forced down into the same for the production of felt. In these machines, the foundation cloth and the bat of wool, hair, or the like, are both fed into the machine, a large number of barbed needles are brought down on it repeatedly and the hair is forced into and through the woven cloth to form a permanent felt which is used in many industries.

The principal objects of this invention are to provide means whereby a compound or built up fabric, having a plurality of layers of bat, is capable of being produced; to provide a machine in which the same machine is capable of manufacturing a felt in a single bat and a felt with three or more layers of bat without reorganizing the machine, in other words, to operate on felts of greatly varying thicknesses; to provide a needle board not only with the usual vertical reciprocating motion, but with a periodic lateral vibrating motion for the purpose of causing the different strokes to introduce the needles into the fabric at different distances from its edge and produce the result of staggered penetrations of the needles; to provide a needle stripper which will bear on the bat with force so as to help keep it in a compact and comparatively smooth mass, independently of its thickness and whose position can be changed so that it will bear on the bat with equal force irrespective of different thicknesses; to provide means for operating the above-mentioned features in such a way that the stripper rod frame comes in contact with the bat just before the needles start to penetrate it and the frame remains in this position until the needles are withdrawn, thus insuring the slight compression of the bat above referred to and preventing the loosening up of the bat by the needles and any adherence of the bat fibres to the needles when the needles are withdrawn; to provide mechanism for operating the needles in such order that the periodic lateral motion commences as soon as the needles are withdrawn from the bat, thus avoiding any possibility of moving them when they would be broken by engagement with the bat; to provide the intermittent motion for feeding the fabric forward out of the machine so timed as to move the fabric when the needles are well out of it and when the stripper frame is out of its compressing position; and, in general, to combine the several features above mentioned so as to increase the speed of the machine, produce a more efficiently interlaced felt, and permit of the manufacture of felts much thicker in character than those heretofore produced.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings in which

Fig. 1 is an end view of a machine constructed in accordance with this invention;

Fig. 2 is a front view with parts in longitudinal section near the center of the machine;

Fig. 3 is an end view of the mechanism for raising and lowering the needles and showing a part of the means for providing the lateral motion, on enlarged scale;

Fig. 4 is a side view of the stripper frame and its operating means;

Fig. 5 is a rear view of the same;

Fig. 6 is a plan of one end of the stripper rod frame showing its relation to the other parts;

Fig. 7 is a plan of part of the needle operating mechanism showing the guides therefor in section;

Fig. 8 is a front view of the needle vibrating device on enlarged scale showing details of construction;

Fig. 9 is a transverse sectional view, showing a double bat fabric in position with the stripper rods resting thereon and the needles up in their highest position;

Fig. 10 is a similar view showing in dotted lines the highest position of the stripper rods;

Fig. 11 is a plan of a small portion of the fabric produced showing the staggered penetrations above mentioned; and

Fig. 12 is a magnified view of one of the barbed needles employed.

I have shown the invention as comprising a machine having a frame 10 with the woven fabric 11 in the form of burlap, cotton cloth or other material passing into it in the manner indicated, and a bat 12 of wool, cows' hair or other animal hair or fibre previously formed into a loose flat bat and fed into the

machine in any desired way on the top of the woven fabric 11. They pass through the machine together.

The machine is provided with a power shaft 15 driven in any desired way and provided with means in the form of an eccentric 16 with an adjustable pivot stud 17 for operating a link 18. This oscillates an arm 19 centered on the center of a shaft 20 and provided with a spring pawl 21 for intermittently rotating a toothed wheel 22 which is fixed to the shaft 20. A holding pawl 23 is shown for an obvious purpose. On this shaft 20 is a feeding out drum or roll 24 which draws the fabric through and feeds it out of the machine. This drum is pressed upon by a pressure roller 25 forced down by its weight and by springs 26 to insure that the fabric will be discharged as the shaft 20 is rotated intermittently. The pressure is adjusted by hand wheels 27 at the two ends.

On the shaft 20 is a pulley which drives a belt 29 and accordingly drives a pulley 30 on a parallel shaft 31. The latter shaft is provided with a roll 32 for receiving the fabric 11 and the bat 12 so that they are fed straight through the machine in a horizontal direction. The amplitude and frequency of the vibrations of the arm 19 can be adjusted by the adjusting of the pin 17 by means of a screw as indicated.

On each end of the shaft 15 there is an eccentric 35 having a strap 36 adjustably connected with a stud 37 on a slide 38. The slides 38 move in guides 45 and support the needle frame 39 which is provided with a plurality of series of fine barbed needles 40. The needles can be arranged in any desired way but, preferably, are arranged in pairs of series as indicated in Fig. 9. These are mounted in a block 41 which is held by the frame 39 in any of the usual ways. Obviously these needles are brought down through the bat and fabric for the purpose of interlacing the fibres in and through the fabric as is well known in this art.

The frame 39 is not positively fixed to the slides 38. These slides have screws 42 extending vertically from them through slots 43 in the needle frame 39 and provided with washers 44 covering the slots and permitting lateral vibration of the frame 39. For accomplishing this latter purpose, the slide 38 is provided with a link 46 at one end which is pivoted to an arm 47 on a shaft 53 carrying a ratchet wheel 52. On the wheel is an eccentric stud 48 entering a vertical slot 49 on a bracket 50 carried by the frame 39. The movement up and down of the slide 38 causes the arm 47 to oscillate about its center. A pawl 51 thereon thus operates the ratchet wheel 52 and turns it and the shaft, causing the stud 48 to rotate intermittently through a circle, as it is eccentrically mounted with respect to the stud 53. This produces a motion back and forth of the bracket 50 and consequently the whole frame 39, the slots 43 allowing for this motion.

The result of this is that the pins 40 never penetrate the fabric on two successive downward motions at exactly the same distances from the edge of the fabric. The motion of these pins is a wavy one as indicated in Fig. 11. This provides for an additional irregularity in the insertion of the pins and the penetration of the fibres into the fabric. This is desired to secure the penetration of the fibres in all portions of the fabric and not leave any line across the fabric without fibres.

On the ends of the shaft 15 there are two cams 54 each of which operates on a roll 56 in a frame 55. This frame 55 is provided with a guide 56 which extends down into a stationary bracket 57 on the frame 10. It is also provided with an exactly opposite rod 58 extending upwardly and adjustably connected with a stripper frame 59 which carries the stripper rods 60. This frame 59 moves up and down in vertical guides 61. The cam 54 is set of course in stationary position on the shaft 15 so that it operates in definite sequence as the shaft rotates.

These parts are so mounted or adjusted as to permit the stripper rods to come down on the fabric first and apply a comparatively light pressure thereto. Then the needles come down, penetrate the fabric, and move up without any further motion. After the needles have moved up far enough to come up out of the fabric, the needle frame is repositioned a little laterally from its previous position by the action of the ratchet wheel 52. Then the stripper frame starts to move up and at that instant the arm 19 moves the fabric along in the machine a short step. This operation is repeated on the fabric a plurality of times, while it is passing through the machine. This fact, together with the staggered way in which the needles enter the fabric, as shown in Fig. 11, results in a practically uniform fabric without areas which have not been supplied with fibres from the bat. The two positions shown in Figs. 9 and 10 indicate some of the operations above indicated. The needles always come down between two of the rods 60 and in spite of the motions which they make, it is always between the same two rods. The needles also project through the bottom of the fabric into spaces between the supports 65 carried by the frame.

It will be understood that in the form shown in Figs. 9 and 10, a felt fabric is illustrated in which the lower portion of the bat 12^a has previously been through the machine and the bat felted on the fabric 11. This bat and fabric are turned over and then put into the machine in the man-

ner shown herein so that the bat 12 will rest on the upper side of the piece of felt and the felt treated as if it were to be only a one layer fabric. If it is to have another layer of fabric 11, that will be afterwards placed on this fabric and a layer of bat above that and then this substance containing two fabrics and three bats will again pass through the machine. In this case it will be noted that the stripper rods 60 are operated in the same way and the only adjustment that has to be made is by the lengthening or shortening of the connecting rods 58.

It will be seen that by this machine the timing of the parts is done so that the needles cannot become entangled in the bat and broken by lateral movement therein; that the stripper rod frame is permitted to serve as a compressor frame with different thicknesses of fabric and bat; that the needles more easily penetrate the bat because it is held down by the aid of the pressure of the stripper rods; and that the bat is not loosened, as the stripper rods are still held firmly against the bat while the needles are withdrawn. This prevents adherence of fibres to the needles during this motion. The vibratory motion is provided because with heavier and thicker bats it is particularly desirable that the needles shall not penetrate in lines parallel to the selvage. As the action of the cam which controls the lateral motion of the needle frame is controlled by the upward motion thereof, there is no possibility of the needles being moved when they are still in the bat. The stripper frame is moved up out of its compressing position also before the fabric is moved along by the feed mechanism. The combination of these three movements has permitted the increase of the speed of the machine and at the same time a firmer and more efficient interlaced fabric is produced than by any of the previous methods.

Although I have illustrated and described only a single form of the invention I am aware of the fact that modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claims. Therefore I do not wish to be limited to the details of construction herein shown and described, but what I do claim is:

1. In a machine for introducing fibres into a fabric for the purpose of felting it, the combination with a frame for receiving a fabric and a bat of felting fibres, a series of stripper rods adapted to rest on the bat, a series of rows of needles movable up and down between the stripper rods into the bat and fabric for felting the same, and means whereby only at a time when the needles are raised they will be automatically shifted slightly toward or from the selvage of the fabric.

2. In a felting machine, the combination with means for supporting a continuous fabric and a bat of fibres thereon, of a set of felting needles adapted to be projected through the bat and fabric for the purpose desired, a stripper frame comprising a series of rods for engaging the top of the bat, and means for holding the stripper frame down on the bat and retaining it under pressure until the needles are withdrawn.

3. In a felting machine, the combination with means for supporting a fabric and bat of fibres, of a stripper frame comprising a series of parallel rods, means for holding said rods against the bat to compress the same, means for introducing a series of barbed needles through the bat and fabric while the rods are in position to compress the bat and for withdrawing the needles freely, means for then shifting the needles as a whole side-ways slightly, and means for thereafter raising the stripping rods to release the fabric.

4. In a felting machine, the combination of means for supporting a fabric and bat of fibres, of a stripper frame comprising a series of rods extending in a parallel direction across the machine, means for holding said rods against the bat to compress the same, means for introducing a series of barbed needles through the bat and fabric while the holding means is in position to press the rods against the bat and for withdrawing the needles freely, and means for then automatically shifting the needles as a whole side-ways relatively to the rods while the needles are elevated.

5. In a felting machine, the combination with a support over which the fabric and bat are adapted to travel, of a shaft, a pair of slides at the opposite sides of the machine, means connecting the shaft with the slides for raising and lowering them, a needle frame supported by said slides, and means for intermittently moving the needle frame thereon in a plane at right angles to the direction of motion of the slides only when the needle frame is in raised position.

6. In a felting machine, the combination of a main shaft, a pair of slides at the opposite sides of the machine, means connecting the main shaft with the slides for raising and lowering them, a needle frame supported by said slides, but movable thereon in a plane at right angles to the direction of motion of the slides, and means for moving the needle frame in said plane by a step-by-step motion only at a time when the needles are raised out of the fabric.

7. In a felting machine, the combination with means for supporting the fabric and bat, a main shaft, eccentrics on the oppo-

site ends of said shaft, adjustable rods extending from said eccentrics, and a pair of slides connected with said rods to be reciprocated thereby, of a needle frame supported at opposite ends by said slides, and means for obtaining an interrupted transverse motion in a horizontal plane thereon only at a time when the needles are raised out of the fabric.

8. In a felting machine, the combination with means for supporting the fabric and bat, of a main shaft, eccentrics on said shaft, adjustable rods extending upwardly from said eccentrics, a pair of slides connected with said rods to be raised and lowered thereby, a needle frame supported at opposite ends on said slides, and means whereby when the slides are raised, but not otherwise, the needle frame will be shifted side-ways.

9. In a felting machine, the combination with means for supporting the fabric and bat, of a pair of slides at the sides of the machine, a needle frame carried by the slides to move up and down with them, capable of motion transversely with respect to the feed of the felt, and means whereby when the slides are raised to remove the needles from the fabric, the needle frame will be moved slightly and in varying amounts in a direction across the machine.

10. In a felting machine, the combination with a needle frame extending across the machine and movable transversely of the machine, of means for raising and lowering the needle frame, a projection extending from the frame and having a vertical slot, a toothed wheel having an eccentric stud entering said vertical slot, and means for turning said wheel through a short arc every time the needle frame is raised, whereby the position of the frame will be shifted.

11. In a felting machine, the combination with a support over which the fabric and bat are adapted to travel, of a main shaft, a pair of slides at the opposite sides of the machine, means connecting the main shaft with the slides for raising and lowering them, a needle frame supported by said slides, but movable thereon in a plane at right angles to the direction of motion of the slides, a stripping frame comprising a series of parallel rods extending across the machine between which the different series of needles are adapted to enter the fabric, and a cam on said shaft connected with said frame to bring the rods down on the fabric before the needles are inserted and to raise them after the needles are withdrawn.

12. In a felting machine, the combination with a support for the fabric and bat, and means for introducing a series of barbed needles into the bat and fabric periodically, of a stripper frame comprising a series of rods adapted to rest on the bat, vertical guides for said frame, means for adjusting the frame, and a vertically guided device for raising and lowering said frame in proper sequence to cause the stripper rods to press down on the fabric just before the needles are introduced and to be raised therefrom after the needles are withdrawn.

13. In a felting machine, the combination with a support for the fabric and bat, and means for introducing a series of barbed needles into the bat and fabric periodically, of a stripper frame comprising a series of rods adapted to rest on the bat, vertical guides for said frame, means for adjusting the frame, a vertically guided device for raising and lowering said frame in proper sequence to cause the stripper rods to press down on the fabric just before the needles are introduced and to be raised therefrom after the needles are withdrawn, an intermittent feeding device for feeding the felted fabric out of the machine, and means for operating the feeding device to advance the fabric when the stripper frame is raised to release the fabric from its pressure.

14. In a felting machine, the combination with means for supporting a fabric and bat of fibres, of a stripper frame comprising a series of rods, means for positively holding said rods against the bat, means for introducing a series of barbed needles through the bat and fabric while the rods are positively held in position against the bat, means for thereafter raising the stripping rods to release the fabric, a feeding device for intermittently feeding the fabric from and through the machine, and means for actuating said feeding device after the stripping rods have been raised from the fabric.

15. In a felting machine, the combination with means for supporting a fabric and bat of fibres, of a stripper frame comprising a series of rods extending in a parallel direction across the machine, means for holding said rods against the bat to compress the same, means for introducing a series of barbed needles through the bat and fabric while the rods are in position to compress the bat, means for withdrawing the needles, means for shifting the needles as a whole side-ways, means for thereafter raising the stripping rods to release the fabric, a feeding device for intermittently feeding the fabric to and through the machine, and means for actuating said feeding device after the stripping rods have been raised to release the fabric from their pressure.

16. In a felting machine, the combination with means for supporting a fabric and a bat of fibres thereon, of a set of felting needles adapted to be projected through the bat and fabric for the purpose desired, means for moving the needles up and down, a stripper frame for engaging the top of the bat, and means for moving the stripper frame down on the bat arranged to operate positively in

a definite relationship to the motion of the needles before the needles enter the bat.

17. In a needling machine, the combination with means for supporting a bat of fibres thereon, of a set of needles adapted to be projected through the bat for the purpose desired, a stripper frame comprising a series of rods for engaging the top of the bat and means for holding the stripper frame down on the bat and retaining it under pressure until the needles are withdrawn.

In testimony whereof I have hereunto affixed my signature.

EDWIN H. MARBLE.