2 Sheets—Sheet 1.

R. EICKEMEYER.

Hat-Sizing or Fulling-Machine.

No. 217,783. Patented July 22, 1879.

Fig. 1.

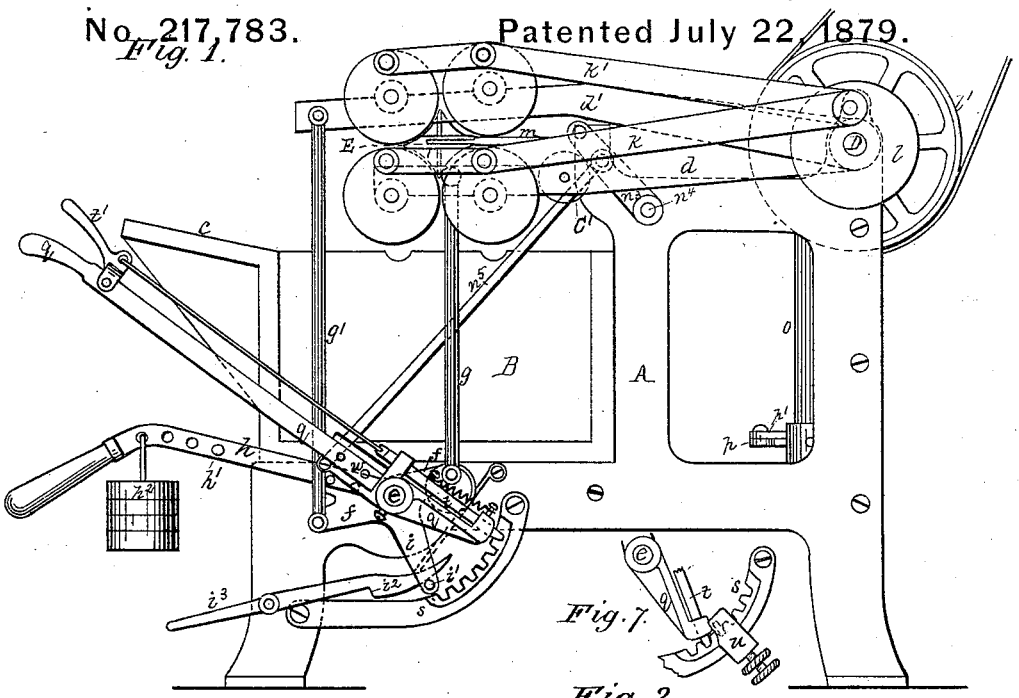
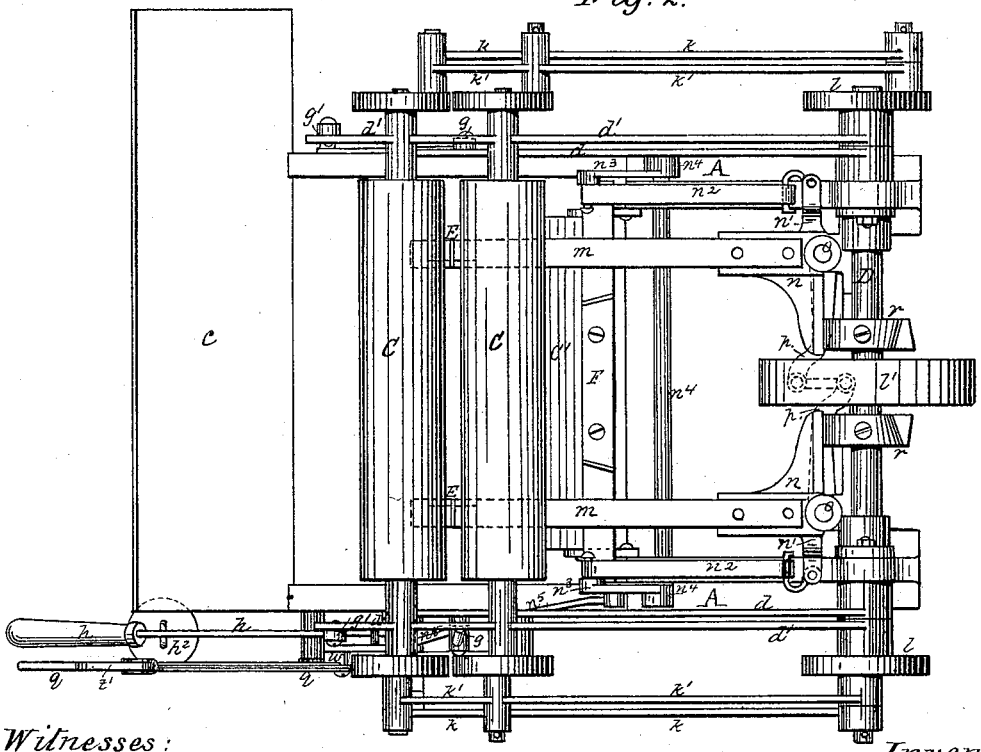


Fig. 7.

Fig. 2.



Witnesses:
Philip F. Larner.
Howell Battle.

Inventor
Rudolf Eickemeyer.
By Munn & Co
Attorneys

R. EICKEMEYER.

Hat-Sizing or Fulling-Machine.

No. 217,783. Patented July 22, 1879.

Fig. 3.

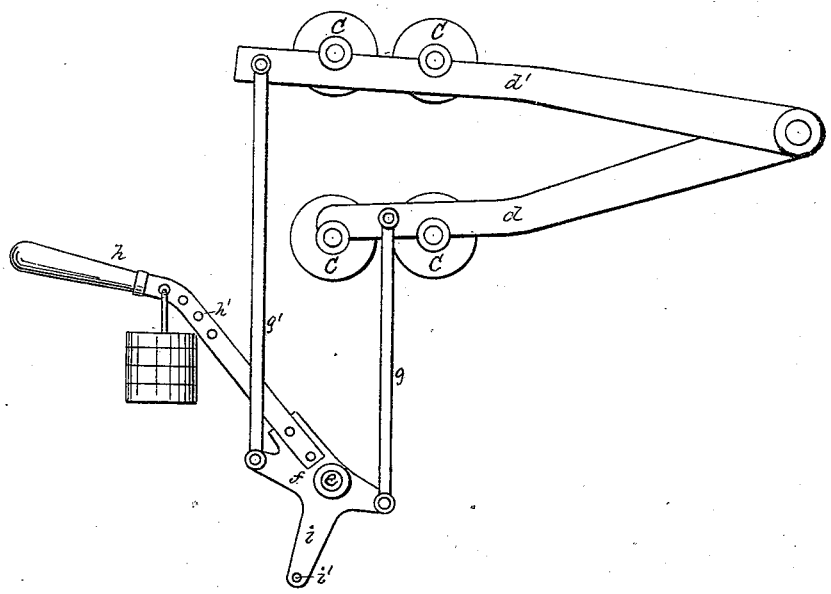


Fig. 5.

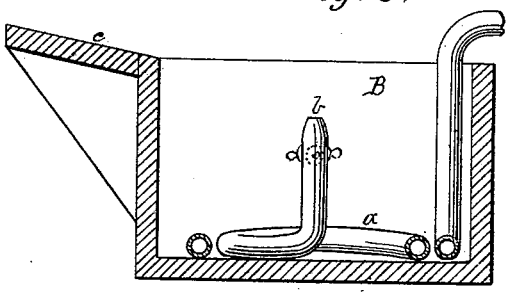


Fig. 4.

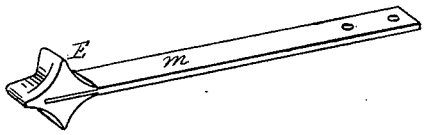
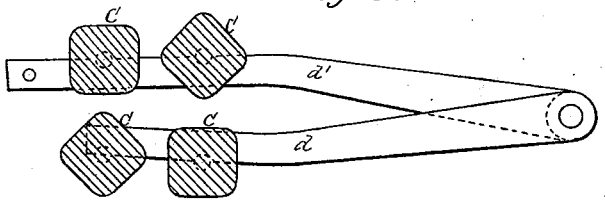


Fig. 6.



Witnesses:
Philip F. Larner
Nowell Bartle

Inventor:
Rudolf Eickemeyer
By Munn & Co
Attorneys

UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

IMPROVEMENT IN HAT SIZING OR FULLING MACHINES.

Specification forming part of Letters Patent No. **217,783**, dated July 22, 1879; application filed June 11, 1879.

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Hat Sizing or Fulling Machines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part thereof, is a clear, true, and complete description of my invention.

So far as my knowledge extends, fulling-machines suitable for sizing hat-bodies, as heretofore constructed, have operated either upon what may be termed the "roller" principle or the "beater" principle. Although machines of either class operate well in their own peculiar way, they are both deficient in some respects for performing full service in sizing hats—as, for instance, the roller machines, being more gentle in their operation than the hammer or beater machines, are best suited for the initial operation in sizing or felting hats, while the beater machines are preferable for the final hardening operation.

In operation, the roller machine works on a number of hat-bodies (usually six or eight) folded and wrapped in the form of a roll, (being inclosed in cloth,) and this hat-roll is axially revolved by the sizing-rollers, which motion, with the incident pressure, is conducive to the felting or fulling of each hat-body in one direction only, and therefore they must frequently be unrolled, rearranged, and rewrapped, and subjected to the action of the rollers many times. On the other hand, the beater machines operate with a more general fulling effect on each hat, and no manipulation is required, because each fall of the beater rolls or tumbles the loose mass of hats, placing each in a changed position.

One object of certain portions of my invention is to provide a machine possessing, at least, all of the operative capacities of the roller machine, as heretofore constructed, and certain other capacities similar to those of the beater machines; and to that end one feature of my invention consists in the combination, with a set of sizing-rollers, of one or two end compressors, whereby a roll of hats, commonly termed a "hat-roll," may be fulled, felted, or sized in a more rapid and more satisfactory manner than with sizing-rollers alone, with the same non-liability of injury to the hat-bodies, and with less requirement for intermediate manipulation during the operation.

It is well known that heat, moisture, and intermittent pressure are essential in the sizing operation. In the roller machines the sizing-rollers inclose a space which contains the hat-roll, and as they all revolve, the latter, in revolving, is subjected to intermittent pressure diametrically, and this is conducive to its elongation, which, in such machines, as formerly made, necessitates the frequent rearrangement of the hats in their wrapper or blanket.

In my novel combination the end compressors serve to resist this tendency to elongation, and therefore the hat-roll is subjected to longitudinal pressure as well as to diametrical pressure. If but one end compressor be used for the hat-roll, said end compressor may be stationary; but when two end compressors are employed at least one should be adjustably movable, so that the space between them may be properly proportioned to the length of the hat-roll. With such stationary end compressors no intermittent longitudinal pressure is attained, except that due to the intermittent diametric pressure of the sizing-rolls, and I therefore prefer that the end compressors be active, instead of passive, elements in the machine; and another feature of my invention consists in the combination, with a set of sizing-rollers, of vibrating end compressors.

For graduating the power of the end compressors, whether they vibrate or not, my invention further consists in the combination, with the sizing-rolls, of end compressors controlled by springs and mechanism for graduating the force of the springs.

The particular mechanism and combinations of mechanism employed by me in connection with the beating end compressors constitute separate features of invention, as follows: the end compressors, their springs, and revolving cams for vibrating the beaters; the end compressors mounted on spindles, which are linked together to secure simultaneous action, and the same in combination with revolving cams; the combination, with the end compressors, of a central striking-block,

which receives the force of the blow of the compressors, should they be operated in the absence of a hat-roll; the combination, with the end compressors and their springs, of a hand-lever, a latch, and a notched bar, for controlling the springs in graduating their force and setting them at any desired adjustment.

For preventing the unduly rapid increase of the power of the compressor-springs, my invention further consists in the combination, with the compressor-lever, its latch, and notched bar, or equivalent mechanism, of an adjustable stop, by which the lever may be limited to any desired extent of movement, and thereby regulate the tension of the compressor-springs.

The simultaneous control of both of the end-compressor springs is effected by means of a rock-shaft, to which both springs are connected, and the hand-lever previously described, and this combination of mechanism constitutes another portion of my invention.

The latch heretofore generally referred to in connection with the notched bar is employed by me in the form of a sliding spring-bolt without the inclined face common to ordinary latches, and therefore to move the lever (which controls the springs of the end compressors) in either direction the spring-bolt must first be retired longitudinally; and my invention further consists in the combination, with the hand-lever which controls the end-compressor springs and the notched bar, of a sliding spring-bolt, a finger-lever mounted on the hand-lever, and a rod which connects the finger-lever with the spring-bolt.

A portion of the improvements made by me, and next described, are applicable to roller sizing-machines, whether the same be employed with or without end compressors.

As heretofore constructed, the upper front roll must be lifted bodily for the insertion and removal of a hat-roll.

To afford sufficient space for the insertion and removal of a hat-roll, one portion of my invention consists in the combination, with the sizing-rollers, of two movable frames, in which the pair of upper and the pair of lower rollers are respectively mounted, so that the upper pair may be moved upward and the lower pair moved downward, whereby the movement of neither pair need be more than one-half of the movement required of the front upper roll, as heretofore, thus enabling the opening and closing of the rolls to be promptly effected.

For preventing the hat-roll from passing too far to the rear and falling to the floor when thrown by the workman between the upper and lower sizing-rolls, my invention further consists in the combination, with sizing-rollers mounted in pairs in upper and lower separable frames, of a back roll or guard at the rear of the rear sizing-rollers. Although this back roll is cylindrical in form and axially mounted, its duty could be performed by a simple stationary cross-bar, which would therefore be its equivalent, because the mere form of the roll or its being axially mounted does not materially add to its efficiency.

While I am well aware that these sizing-rollers may be mounted in movable frames which operate or move in vertical slides, I prefer that said frames be pivoted; and my invention further consists in the combination, with a set of sizing-rollers, of two swinging frames hinged on a pivot or pivots common to both frames.

For driving my sizing-rollers more satisfactorily and more cheaply than can be done with gearing, as heretofore, my invention further consists in the combination, with the driving-shaft of the machine and a set of sizing-rollers, of crank-plates and sets of pitmen connecting said crank-plates, respectively, with the upper and the lower pairs of rollers. The crank-pins on the plates are so set with relation to each other and the pitmen so connected with the rollers that a dead-center is impossible.

In order that the rollers, regardless of their open or closed condition, may occupy the same position with relation to the cranks, my invention further consists in the combination, with a main or driving shaft, of a set of sizing-rollers, their swinging frames hinged or pivoted on hubs surrounding the main shaft, crank-plates on said shaft, and pitmen which connect the crank-plates with the rollers.

For conveniently controlling the sizing-rollers in separating them and in closing them upon a hat-roll, my invention further consists in the combination, with a set of sizing-rollers mounted in pairs in upper and lower movable frames, of a rock-shaft provided with levers or arms, each of which is connected to both of said frames, and a hand-lever for operating the rock-shaft.

Each rock-shaft, lever, or arm is connected at one end to the lower frame, and at its opposite end to the upper frame, so that the weight of one pair of rollers balances the other pair, and the movement of the hand-lever causes the pairs of rollers to move from or toward each other, the entire weight of the rollers being practically borne by the rock-shaft.

For attaining desirable pressure of the sizing-rolls upon the hat-roll, my invention further consists in the combination, with the sizing-rollers mounted in movable frames controlled by a rock-shaft, of a weighted lever on said rock-shaft, which forces the upper and lower pairs of rolls toward each other.

The hand-lever previously referred to may also serve as the weighted pressure-lever, and for graduating the pressure the lever is provided with a series of holes at various distances from the rock-shaft or fulcrum, and said weight is also made in sections, furthering the same end; and in this connection my invention consists in the combination, with the sizing-

rollers mounted in movable frames and controlled by a rock-shaft, of a pressure-lever provided with a graduating weight or weights.

For maintaining the rollers in a separated condition, my invention further consists in the combination, with the sizing-rollers mounted in separable frames, of a lever for moving said frames, and a latch for confining the lever when the rollers are separated. I prefer to construct this latch in the form of a spring-treadle, so that the release of the lever may be effected by the foot of the workman.

When the sizing-rollers are employed with the vibrating end compressors heretofore considered, it is desirable that the sizing-rollers should not be separated while the end compressors are vibrating and working heavily upon the ends of the hat-roll; and my invention further consists in the combination, with the sizing-rollers, the hand-lever which separates them, the vibrating end compressors, and the lever which controls their movements, of a stop on the end-compressor lever, which prevents the movement of the sizing-roller lever while the end compressors are being heavily operated. These two levers are placed side by side, and the stop referred to, in its simplest form, consists of a pin which projects laterally from the end-compressor lever and occupies the path of the sizing-roller lever, so that the latter cannot be moved so long as the end compressors are maintained in operative positions by the depression of their lever.

In sizing-machines as heretofore constructed a hot-water tank has been provided beneath the rollers, into which the hat-bodies, prior to and after being formed into a hat-roll, are frequently dipped, and such tanks have been heretofore provided with a steam-coil for heating.

For the purpose of automatically wetting and heating the hat-roll while between the sizing-rolls, my invention further consists in the combination, with the sizing-rolls and the water-tank, of a steam-coil provided with a jet-pipe centrally located within the tank below the rolls, whereby hot water and steam are projected between the lower sizing-rolls and against the hat-roll.

The water in the tank is kept at a level somewhat above the top of the jet-pipe, so that steam escaping under pressure carries water upward with it.

The jet-pipe is provided with a stop-cock, whereby the coil may be used for heating without discharging hot water and steam against the hat-roll, if desired.

To more particularly describe my invention, I will refer to the accompanying two sheets of drawings, in which—

Figure 1, Sheet 1, represents one of my hat-sizing machines in end view. Fig. 2, Sheet 1, represents the same in top view. Fig. 3, Sheet 2, represents, in end view, the sizing-rollers, their pivoted frames, and their separating-lever, the whole being detached from the frame of the machine. Fig. 4, Sheet 2, represents an end compressor or beater detached. Fig. 5, Sheet 2, represents, in vertical central section, the water-tank containing its jet-pipe and heating-coil. Fig. 6, Sheet 2, represents, in section, a set of sizing-rollers modified as to form. Fig. 7, Sheet 1, represents the devices by which the lever for controlling the end-compressor springs is limited in its movement.

The frame of the machine is composed of two skeletonized side plates, A, provided with suitable journal-boxes; or they are so fitted as to receive said boxes, and united by a rear end plate.

At the front of the machine is a tank, B, for containing hot water, which is provided, as shown in Fig. 5, with a heating-coil, *a*, as heretofore, and also with a jet-pipe, *b*, by which a column of hot water and steam may be projected upward for wetting and heating a hat-roll. This jet-pipe, as a part of the heating-coil, is a novel feature in this connection.

At the front of the tank is a table or shelf, *c*, on which the hat-bodies are placed preparatory to sizing, and then rolled up thereon in a blanket or cloth into what is termed a "hat-roll."

The jet-pipe is provided with a stop-cock, so as to cut off the escape of steam when heating the water in the tank only is desired.

The sizing-rolls C are four in number, and they inclose a central space for receiving the hat-roll, as heretofore.

The sizing-rolls are usually smooth and cylindrical in form, although they may be peripherically scored, or partially squared up and provided with rounded edges, as illustrated in Fig. 6.

I mount my sizing-rolls in a novel manner. Heretofore the upper front roll only could be moved upward to allow for the insertion and removal of the hat-roll. In my machine the two lower sizing-rolls are mounted at each end on levers *d*, which are pivoted on stationary sleeves or hubs on the main frame surrounding the main shaft D at the rear of the machine, and the upper rolls are mounted on similar, but longer, levers *d'*, also pivoted on the same hubs, so that said levers, their roller-axle boxes, and the hubs practically constitute two pivoted frames, in which the upper and lower sizing-rolls are respectively mounted.

To keep the rollers parallel with each other, and to render these frames and the rolls capable of easy separation for the insertion and removal of a hat-roll, they are so mounted that the upper sizing-rollers are practically balanced by the lower rollers. This is effected by means of a rock-shaft, *e*, below the tank, provided at each end with a cross-bar or lever, *f*, the opposite ends of each of which are connected, by links or rods *g* and *g'*, respectively, to the levers *d* and *d'*.

One of the levers *f* is provided with a sizing-roller lever, the same being a hand-lever, *h*, by which the sizing-rolls are separated;

and in order to attain the desired pressure of the sizing-rolls upon the hat-roll, said hand-lever is provided with a series of holes, h^1, for the reception of the hook of the weight h^2, this latter being composed of sections readily applied or removed.

At the rear of the sizing-rolls is a stationary back roll, C′, which is not driven, but serves as a guard or means for preventing the hat-roll from passing too far to the rear when thrown between the sizing-rolls by the workman.

For maintaining the sizing-rolls in a separated condition, there is adjacent to the foot of the hand-lever h an arm, i, which projects downward from lever f on rock-shaft e, having a laterally-projecting stud or pin, i^1, which is engaged by the stop i^2 on the spring-treadle i^3.

From the description thus far given it will be readily understood that by lifting the hand-lever h upward the sizing-rollers will be separated and held in that position by the spring-treadle until the latter, being depressed by the foot of the workman, will cause a release and allow the sizing-rolls to close upon the hat-roll. From the fact that both the upper and the lower sizing-rollers are simultaneously moved in opposite directions it is obvious that neither pair need be moved as far as is necessary to move the single upper front roll, as heretofore.

Sizing-rollers have heretofore been connected with and driven by cog-gearing, which is noisy and expensive. I have devised means for driving them by which they are smoothly and quietly operated. Said means are less expensive than cog-gearing, and while easily adapted to machines as formerly constructed, they are particularly of value with sizing-rolls mounted as already described.

The lower pair of sizing-rollers are connected together at both ends by pitmen k, and the upper pair are similarly connected by pitmen k', and both sets of pitmen are respectively connected with the opposite ends of the main shaft by means of crank-wheels l, these latter being variably set on the main shaft with crank-pins at an angle of about ninety degrees to each other, in a manner well known, so that a dead-center cannot occur.

The main shaft is provided with a band-pulley, l', by which the sizing-rollers are all smoothly revolved in the same direction at from one hundred to one hundred and twenty revolutions per minute, causing the inclosed hat-roll to revolve in the opposite direction. The levers on which the rolls are mounted being pivoted on the main shaft, and the two pitmen on each side being connected with the same crank-pin, the position of the sizing-rollers with relation to the main shaft and the crank-wheels remains the same, whether they are closed upon the hat-roll or widely separated.

As so far described in detail the novel features specified may properly be deemed as improvements upon the well-known roller sizing-machine, and I will next describe those novel features by which the machine is made to operate with results unlike those of any roller machine heretofore constructed.

I have already stated that the sizing-rollers, in operating upon a hat-roll, elongate the latter by an intermittent diametric rolling pressure, because each of the four sizing-rolls presses against the hat-roll as it is revolved, while the portions of the latter successively opposite the spaces between said rolls are free from pressure; and I have also stated that because of the absence of longitudinal pressure the fulling of the hat-body is effected in but one direction. To attain simple end pressure would only require oppositely-located heads, between which a fresh hat-roll may be placed endwise, and then when the sizing-rolls operate and lengthen the hat-roll longitudinal pressure must necessarily follow in resistance to the elongating tendency.

My novel end compressors E may be arranged to operate passively, or, otherwise stated, so as to compress solely by resisting elongation, or actively, in two ways—either by spring-pressure applied continuously with a uniform or variable force, or by intermittent vibration, after the manner of a beater, this latter being preferred by me.

An end compressor, E, is shown in Fig. 4, detached from the machine. It has a flat face corresponding generally in its outline to the space inclosed by the sizing-rolls, or, in other words, it is concaved at four points, so as to be closely approached by the rollers when fully closed in without contact therewith, and afford a desirable bearing with the end of a hat-roll. It is mounted on an arm, m, which is drilled at its opposite end for securing it by bolts to a bell-crank lever, n, (shown in Fig. 2,) pivoted on and secured to a vertical shaft, o, mounted in boxes at the rear end of the machine-frame. There are two of these end compressors, and to secure uniformity in their operation their pivot-shafts o are connected with each other by arms p and a link, p'. (Shown in dotted lines below the band-pulley in Fig. 2, and also partially shown in Fig. 1.)

The bell-crank levers n have each an arm, n^1, to which one end of a band-spring, n^2, is attached, its opposite end being connected to an arm, n^3, on a rock-shaft, n^4, and one of these arms n^3 is connected by a link, n^5, with a hand-lever, q, so that by depressing the hand-lever the tension of the rubber band-springs may be increased to any desired extent, and thus increase the pressure of the end compressors upon the hat-roll; or, by elevating the hand-lever, the end compressors will be unable to exercise any pressure whatever.

Instead of employing springs, it is obvious that if the arms of the end compressors were provided with pawls which were arranged to engage with toothed bars on the inner sides of the frame of the machine, the hat-roll could be compressed endwise by setting the

pawls up tooth by tooth by hand as the sizing operation progressed; but the springs, applied as described, afford a yielding pressure, and both end compressors are simultaneously controllable, and the pressure is uniform upon both ends of the hat-roll.

To provide an intermittent end compression the end compressors are thrown outward and suddenly liberated, so that they may strike as beaters, with a force varying according to the tension of their springs, which, instead of rubber, may be composed of metal in any of the well-known forms. This beating movement of the end compressors is effected by means of cams *r* on the main shaft, which operate with a wiping stroke on the rear edge of the bell-crank levers *n*, causing both compressors to make a beat at every revolution of the sizing-rollers; but as these rollers are usually larger in circumference than the hat-roll, the latter is revolved more rapidly than the rollers.

The cams are secured to the main shaft by set-screws, so that, if desired, they may be loosened and admit of the operation of the end compressors with the continuous force of the springs without the beating motion.

The end compressors, being connected through their spindles, arms, and link, may be operated by a single cam and a single spring, because neither compressor can be thrown backward independently of the other.

The beating of the end compressors should be graduated from a light blow upward as the sizing operation progresses, and this is effected by means of a curved toothed bar, *s*, below the end of the hand-lever *q*, with which a bolt or latch, *t*, on lever *q* engages tooth by tooth as the lever is depressed, according to the spring-tension required.

The bolt or latch *t* is provided with a spring, and is controlled by a rod and a finger-lever, *t'*, on the upper end of lever *q*.

To prevent the workman from operating the end compressors, with a too rapidly increased spring-tension, I provide an adjustable stop having set-screws, by which it may be moved from point to point and firmly fixed, and enable it to limit the movement of the hand-lever.

In Fig. 1 there is no stop shown; but adjacent thereto, in Fig. 7, it is shown at *u*. If the lower end of the hand-lever *q* be provided with a plate or finger, extended downward parallel with the outer side of the toothed bar, and the latter be provided with a series of lateral holes, a pin may be employed as a stop instead of the set-screw stop *u*.

As it is desirable that the end compressors should not operate except when the sizing-rollers are in close contact with the hat-roll, I have provided the hand-lever *q*, a little above its stud or pivot, with a laterally-projecting stop-pin, *w*, which so overlies the path of the sizing-roller lever *h* that the latter cannot be lifted while the compressor-lever *q* is depressed and the end compressors are in action.

For relieving the force of the blow of the end compressors in case a hat-roll be not in position, I have provided a striking-block, F, which is located on a cross-bar at the rear of the sizing-rolls, and between the two arms of the end compressors. This block or buffer is composed of a top plate, secured with screws to the cross-bar, and an intervening layer of soft wood, leather, rubber, or other material, suitable to receive and deaden the force of the blow of the compressor-arm against it.

The mode of operation of the complete machine shown will be fully comprehended from the detailed description.

It is to be understood that I do not limit my invention to the precise construction of the several parts, nor to the embodiment of all the several stated combinations of mechanism in one machine, as it is obvious that many of these combinations may be employed independently of any of the others as improvements upon machines heretofore in use, and such improved results attained thereby as are due to said separate and distinct portions of my invention.

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

1. The combination, with a set of sizing-rollers, of one or two end compressors, substantially as described, whereby a hat-roll, while subjected to diametric compression, may also be compressed longitudinally, as set forth.

2. The combination, with a set of sizing-rollers, of one or two vibrating end compressors, substantially as described, whereby a hat-roll is subjected to the usual diametric compression and an intermittent longitudinal pressure, as set forth.

3. The combination, with a set of sizing-rollers, of end compressors, their actuating-springs, and graduating mechanism for controlling the springs, substantially as described, whereby the pressure upon the hat-roll by the end compressors, whether it be intermittent or continuous, may be graduated, as set forth.

4. The combination, with the sizing-rollers, of the end compressors, their springs, and the revolving cams for vibrating the compressors, substantially as described.

5. The vibrating end compressors mounted on spindles, in combination with arms on said spindles connected by a link, substantially as described, whereby the simultaneous movement of the compressors is assured, as set forth.

6. The vibrating end compressors, their spindles, arms, and link, in combination with one or more actuating-cams, substantially as described.

7. The combination, with the end compressors, their springs, and cams, of a striking-block, substantially as described.

8. The combination, with the end compressors and their springs, of the hand-lever, its bolt or latch, and notched bar, substantially as described, whereby the force of the springs may be graduated, as set forth.

9. The combination, with the end compressors, their springs, the hand-lever, and notched bar, of an adjustable stop on said bar, substantially as described, for preventing the unduly rapid increase of the power of the springs, as set forth.

10. The combination, with the two end compressors and their springs, of the rock-shaft to which said springs are connected, and the hand-lever by which said rock-shaft is partially rotated and the tension of the springs controlled, substantially as described.

11. The combination, with the end compressors, their springs, the hand-lever which controls said springs, and the notched bar, of the sliding spring-bolt, the finger-lever, and the rod which connects them, substantially as described.

12. The combination, with a set of sizing-rollers, of a pair of movable frames, in which said rolls are mounted in upper and lower pairs, substantially as described, whereby said pairs of rolls may be separated by the movement of both pairs, as set forth.

13. The combination, with a set of sizing-rollers separable in pairs, of a back roll or equivalent guard for preventing a hat-roll from passing too far to the rear of said rolls, substantially as described.

14. The combination, with a set of sizing-rollers, of two swinging frames, each carrying a pair of rollers and hinged on a pivot or pivots common to both frames, substantially as described.

15. The combination, with sizing-rollers, of a driving-shaft, crank-plates on said shaft, and pitmen for connecting said rollers in upper and lower pairs with the crank-plates, substantially as described.

16. The combination, with sizing-rollers and their driving-shaft, provided with crank-plates, of swinging frames for the rollers, pivoted on hubs surrounding said shaft, and pitmen which connect the crank-plates with the rollers, substantially as described.

17. The combination, with the sizing-rollers and their movable frames, of a rock-shaft having levers, each of which is connected to both of said frames, and a hand-lever for controlling the rock-shaft, substantially as described, whereby the upper and lower pairs of rollers are separated or placed in working position, as set forth.

18. The combination, with the sizing-rollers mounted in movable frames and controlled by a rock-shaft, of a weighted lever, substantially as described, whereby the upper and lower pairs of rollers are forced toward each other upon a hat-roll, as set forth.

19. The combination, with the sizing-rollers mounted in movable frames and controlled by a rock-shaft, of a pressure-lever provided with a graduating weight or weights, substantially as described, whereby the pressure of the sizing-rollers upon a hat-roll may be increased or diminished, as set forth.

20. The combination, with the sizing-rollers mounted in separable frames, of a lever for moving the frames and a latch for confining the lever when the rollers are separated, substantially as described.

21. The combination, with the sizing-rollers, their controlling-lever, the end compressors, and their controlling-lever, of a stop which prevents the movement of the roller-lever while the end compressors are in full operation, substantially as described.

22. The combination, with sizing-rollers and a water-tank, of a steam-coil provided with a jet-pipe centrally located in said tank below the rolls, substantially as described, whereby hot water and steam may be projected upon a hat-roll, as set forth.

RUDOLF EICKEMEYER.

Witnesses:
GEORGE OSTERHELD,
I. GEORGE NARR.