R. EICKEMEYER.

FULLING-MILLS.

No. 195,810. Patented Oct. 2, 1877

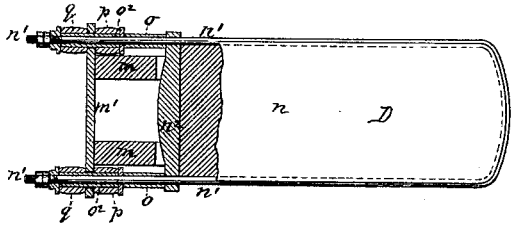
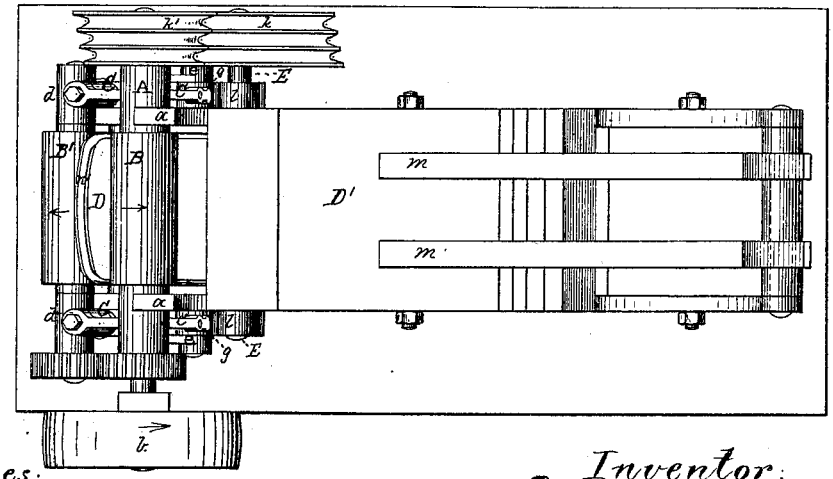


Fig. 4

Fig. 1.

Fig. 3.

Fig. 2.



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UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

IMPROVEMENT IN FULLING-MILLS.

Specification forming part of Letters Patent No. **195,810**, dated October 2, 1877; application filed June 23, 1877.

To all whom it may concern:

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

My improvements relate to that class of fulling-mills in which falling beaters are employed, in contradistinction to the roller-machine class, and also to those having vibratory or swinging beaters.

The object of my invention, broadly stated, is to increase the general efficiency and durability of beater-mills.

The main feature of my invention consists in the combination, with the beater and a lifting-board hinged thereto, of continuously-driven lifting-rolls, one of which is mounted upon a pivoted frame, and a revolving cam-shaft, which intermittingly vibrates the frame, whereby the board is first compressed between the rolls, and the beater lifted by their motion and then permitted to drop, the rolls meantime revolving. By means of this mechanism the rolls gradually bite upon the board, and lift the beater by a smooth and easy motion.

The combination of mechanism already recited includes no means whereby the character of the beat may be varied. This result has heretofore been attained by having the beater lifted only to such a height as would result in a desired beat; but, so far as my knowledge extends, no mill has been heretofore constructed in which the drop could be lessened and the beats made more rapidly without increasing the speed of the driving mechanism of the mill. As heretofore constructed, although the beaters might be working lightly, the mill would be subjected to harder usage than when the beaters were working heavily, because of the increased speed. In my improved mill, although the speed of the driving-shaft is uniform, the beaters may be lifted to full height, or to any lesser extent required, and the beats made more frequently, and in proportion to the lift of the beater; and another feature of my invention consists in the combination, with the beater, the lifting-board, lifting-rolls, and vibrating frame, of adjustable mechanism for vibrating the frame with any required interval between the vibrations, whereby the lifting-rolls are made to engage with the lifting-board for a longer or a shorter time, according to the height of lift required.

The vibrating mechanism preferred by me is a shaft which is driven by variable gearing, and may be revolved at any desired speed, and has a cam or cams thereon, which, at each revolution, cause the roller-frame to vibrate. A desirable degree of adjustability may also be attained by means of a shaft revolving at a uniform speed, and a cam or cams thereon, having two or more operating-faces for engaging with the roller-frame, so that two or more vibrations of the frame may be effected at each revolution of the cam-shaft. In the one case the belt or tooth gearing will require adjustment, while in the other it will require the selection of the proper cams from a series, and their adjustment on the shaft; or a cam constructed in adjustable sections may be employed, which will enable it to operate as a single, double, or triple faced cam, according to the position on the shaft of the sections with relation to each other, they being capable of such adjustment that they will operate as one face, say, for one-sixth of a revolution, or as three faces equidistant from each other around the axis of the shaft, each operating against the frame for one-sixth of a revolution, and causing three lifts of the beater at each revolution of the cam-shaft.

The practical efficiency of a fulling-mill is largely increased if it be constructed so that parts specially liable to wear may be easily replaced, or adjusted to compensate for wear, or capable of good service even after such parts have become considerably worn; and to these ends my invention further consists in the combination, with the lifting-board and the beater, of a metallic frame, which incloses the board and clamps it to the helve of the beater, and which admits of the ready removal of a worn board and the substitution of a new one; and, further, in the combination, with the vibrating frame and its roller, of a spring which forces the roll into contact with the board, whether the latter be new or worn at some points more

than at others; and, further, in the combination, with the vibrating frame, of a lifting-roller mounted on the frame in boxes which have axes transverse to the axis of the roll, whereby, although one edge of the board be worn thinner than the other, the rolls will have a firm bite thereon from edge to edge; and, further, in the combination, with the vibrating frame and its springs, of adjusting-screws, whereby the yielding pressure of the roll upon the board may be increased or lessened.

The durability of such mills is largely increased by having the lifting mechanism so constructed that in lifting the beater and dropping it there shall be no undue shock; and my invention further consists in the combination, with the beater and the lifting-board, of elastic cushions or springs below the board, which bear the weight of the beater as it is lifted; and, further, in the combination, with the beater and the lifting-board, of elastic cushions or springs, which are interposed between the board and the helve of the beater, whereby, when the beater is dropped, these springs or cushions will receive the force of the drop due to the weight of the board.

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

Figure 1 represents, in vertical longitudinal section, a fulling-mill embodying the several features of my invention. Fig. 2 represents the same in top view. Fig. 3 represents the vibrating roller-frame detached. Fig. 4 represents the lifting-board detached from the mill.

The driving-shaft at A is mounted in the upper part of the frame *a* in suitable boxes, and is provided with a driving-pulley, *b*.

The lifting-rollers are shown at B and B′. The roll B is mounted on the driving-shaft A, and roll B′ is parallel therewith, mounted on the vibrating frame C, and driven by gearing from the main shaft A.

D denotes the lifting-board, which is attached to the beater-helves, and extends upward between the lifting-rolls B B′. D′ denotes the beater. E denotes a cam-shaft, which vibrates the frame C to and fro, and causes the lifting-rolls to bite upon the lifting-boards and lift the beater, and then to release the board and permit the beater to fall.

The two sides of the vibrating frame C are pivoted to the frame *a* of the mill by a rod or shaft, *c*. Each of the side pieces of the frame has a box, as at *d*, for the journals of roll B′. The boxes *d* are provided with axes which are transverse to the axis of the roll, which permits the side pieces to be unequally moved without causing the roll-journals to bind in their boxes, and permits the rolls to properly engage with the lifting-board, even if it be worn thinner at one edge than at the other.

Each side piece has also a pendent lever, as at *e*, pivoted at *e′*. At their lower ends the two levers *e* are connected by a cross-rod, *f*, which also serves as an axis for two friction-rollers, *g*, one of which is at the foot of each lever.

Near the lower end of each side piece of the frame C is a rod or pin, *h*, which projects through an opening in the adjacent lever *e*, and is encircled with an expansive spring, which has an abutment at one end against the surface of the lever, and at the other against a washer, which is held in place on the rod by nuts, in a manner well known.

An adjusting-screw at *i* passes through a threaded hole in the lever, and abuts endwise against the lever, so that the yielding pressure of the roll B′ against the lifting-board may be properly adjusted.

The cam-shaft E has boxes at each side of the frame *a*, below the main shaft and parallel with it. In this instance the cam-shaft is shown to be driven by a belt on the grooved cone-pulleys *k k′*, the latter being on the main shaft A. The cam-shaft has two counterpart cams, *l*, each being opposite and arranged to engage with friction-roller *g* on pendent lever *e*.

Constructed as thus far described, it will be seen that the revolution of the main shaft and roll B in the direction of the arrow will cause the roll B′ to revolve in the opposite direction, the cam-shaft meantime revolving, and that when the cams *l* engage with the friction-rollers *g* the frame C will be vibrated, the lower end being moved away from the cams, and the roll on the upper end moved toward its fellow into close frictional contact with the lifting-board D, which is thereby drawn upward, lifting the beater; and it will also be evident that this lifting action will continue so long as the cams continue in forcible contact with the vibrating frame through its levers, but that the moment the cams in their revolution cease said contact the roll B′ will move outward and permit the beater to fall. It will also be seen that the height of the lift may be varied by using cams suited to each particular height required, or that it may be attained by varying the speed of the cam-shaft without changing the speed of the lifting-rolls, and this is the method illustrated in the drawings. By shifting the belt on the cone-pulleys the cam-shaft may be revolved at quick or low speed, and therefore the time during which the lifting-rolls operate as such will be proportionately lessened or increased, which will secure such a lift as may be required.

I have previously referred to a sectional cam for use in this connection. It will be seen, for instance, that if the cams *l* had two opposite working faces of one-half the length shown, or, say, ninety degrees each, at each revolution of the shaft, two lifts would be made instead of one, and that each lift would be one-half as high as if the cam shown were employed. The friction-rollers have broad faces, and therefore the cams may be made in sections placed side by side on the cam-shaft, and each provided with a set-screw for separate adjustment rotatively on the shaft. It will be seen that if, for instance, three of such sections be em-

ployed, each having a face of, say, sixty degrees, they may be so adjusted as to operate as a cam with three faces, which would at each revolution of the cam-shaft result in three short lifts, or that they may be so adjusted as to operate as a cam, with one face varying in extent from sixty to one hundred and eighty degrees. There are various other well-known mechanical arrangements by which the vibration of the frame may be adjustably varied, and I do not, therefore, limit that feature of my invention to any particular construction of the mechanism by which the vibration of the frame is accomplished.

Although the action of the rollers upon the lifting-board is easy and gradual, it is important that a yielding connection be employed between the lifting-board and the beater. In Fig. 4 the beater-helves are shown in section at m, with a cross-bar, m', secured to their lower edges near their ends. The wooden portion of the lifting-board at n is embraced within a metallic frame, n^1, composed of a length of round iron forged or bent to conform to the sides and top of the wooden board and to occupy a groove therein. A cross-bar, n^2, serves as a base for the wooden board n, and it is provided with holes, through which the two parallel sides of the frame extend downward to a point below the helves. Each side of the frame n^1 constitutes a threaded rod, which is provided with a sleeve, o, next below the cross-bar n^2, a washer beneath sleeve o, a sleeve, o^2, beneath the washer, and a spring, as at p, between the washer and the upper surface of the cross-bar m', which is attached to the beater-helves m. Below the cross-bar, and surrounding the sleeve o^2, is another spring or cushion, as at q, which is compressed between the lower surface of the cross-bar and a washer backed by nuts on the threaded ends of the board-frame.

It will be seen that with this construction the nuts on the ends of the frame will slightly compress the springs, and that the upper spring will receive the shock due to the weight of the lifting-board when the beater falls, and that when the beater is lifted the lower springs will sustain the weight of the beater. The holes in the cross-bar m' through which the sleeved portions of the frame pass are of sufficient size to permit the lifting-board to freely operate and to freely change its position with relation to the cross-bar during the upward and downward movement, thus securing a connection between the lifting-board and beater which has the characteristics of a hinge-joint.

The wooden portion of the lifting-board, when worn out, may be readily removed and a new one substituted, and the yielding pressure of the vibrating frame secures successful operation even if the board be unevenly worn.

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

1. The combination, with a fulling-mill beater and a lifting-board hinged to the beater, of continuously-driven lifting-rolls, a vibrating frame, and a cam-shaft, substantially as described, whereby the rolls are made to alternately compress the lifting-board for lifting the beater, and to release the board for permitting the beater to fall, as set forth.

2. The combination, with a fulling-mill beater its lifting-board, the continuously-revolving lifting-rolls, and a vibrating frame, of adjustable mechanism, substantially as described, for vibrating the frame at desired intervals, substantially as set forth, whereby the beater may be lifted much or little, and the number of beats in a given time increased or lessened, without varying the speed of the lifting-rolls.

3. In a fulling-mill, a lifting-board provided with a frame which incloses the wooden portion thereof, substantially as described, whereby the wooden portion may be readily removed when worn and a new one substituted.

4. The combination, with lifting-rolls which engage with the lifting-board in a fulling-mill, of a vibrating frame which supports one of said rolls, and springs or cushions which afford a yielding pressure of the roll on the lifting-board, substantially as described.

5. The combination, of the vibrating frame and a lifting-roll mounted in said frame in journal-boxes provided with axes which are transverse to the axis of the lifting-roll, substantially as described, whereby the roll may effectively engage with a lifting-board which is thicker at one edge than at the other, as set forth.

6. The combination, with the vibrating frame, its lifting-roll, and its springs, of adjusting-screws for graduating the pressure of the lifting-roll, substantially as described.

7. The combination, with a fulling-mill beater and a lifting-board, of a spring or cushion below the board which supports the weight of the beater, substantially as and for the purposes specified.

8. The combination, with a fulling-mill beater and a lifting-board, of a spring or cushion which supports the weight of the lifting-board, substantially as and for the purposes specified.

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