2 Sheets—Sheet 1.

W. H. MASE & S. TERWILLIGER.

Fulling-Mill.

No. 203,355. **Patented May 7, 1878.**

Fig. 1.

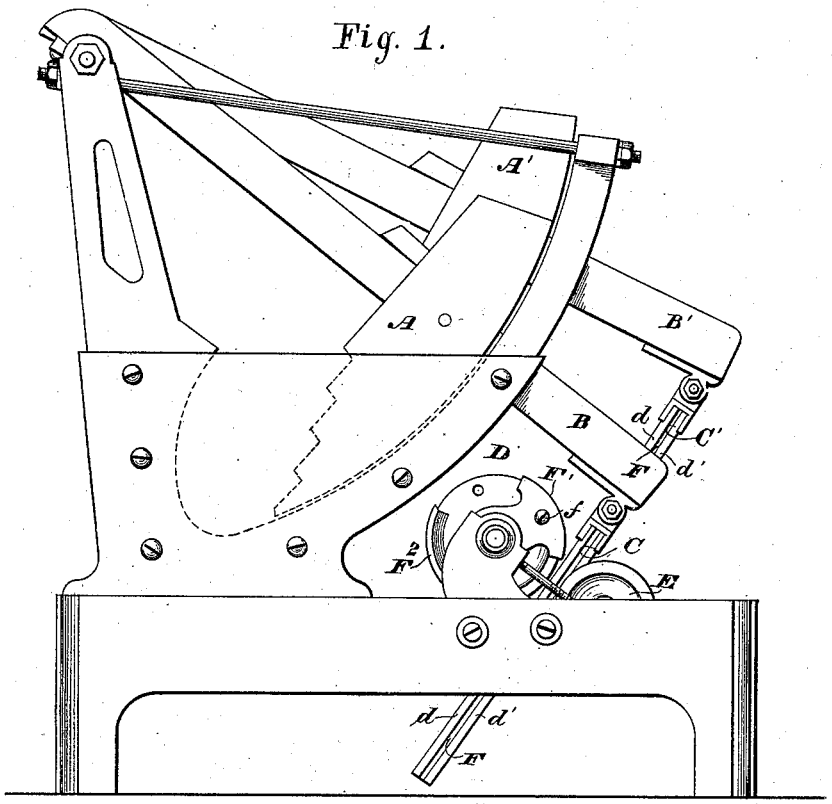
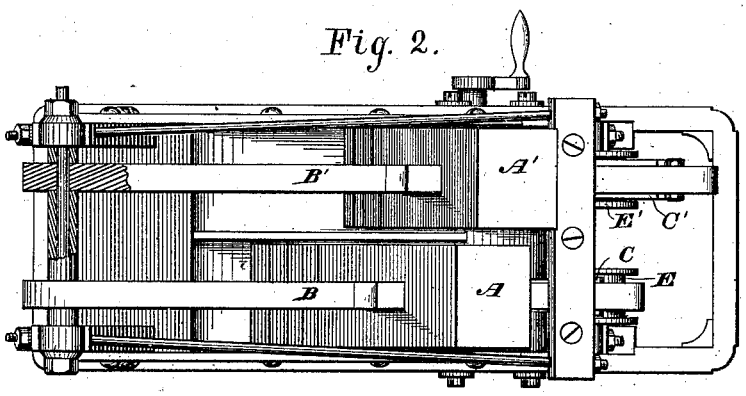


Fig. 2.



WITNESSES

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2 Sheets—Sheet 2.

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Fig. 3.

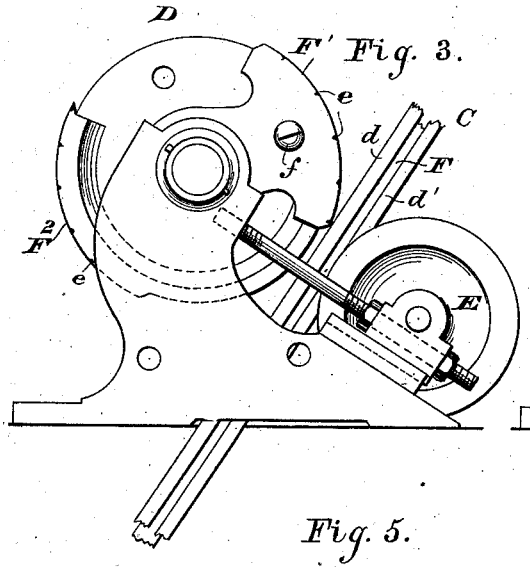


Fig. 4.

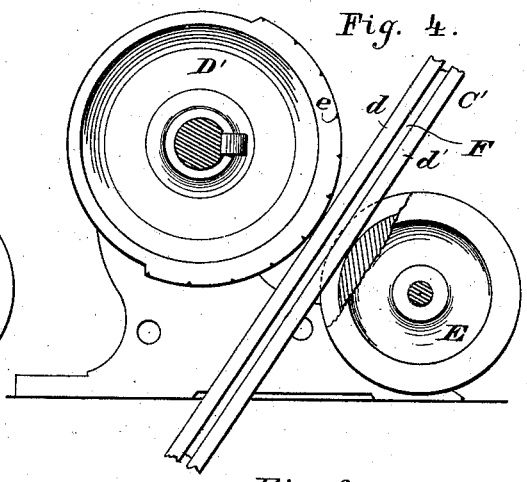


Fig. 5.

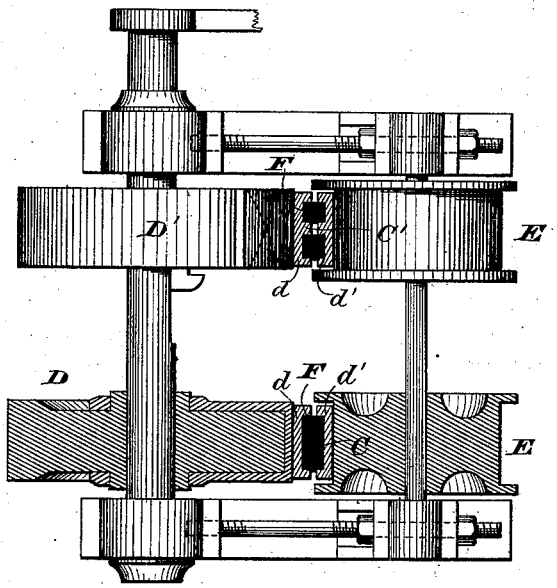


Fig. 6.

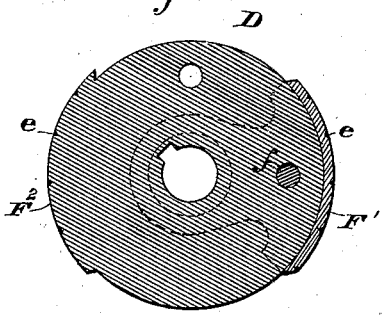


Fig. 7.

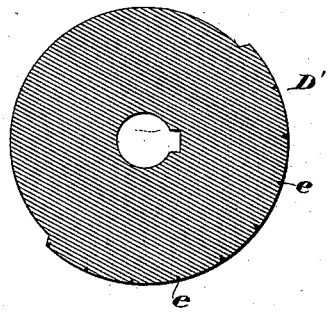
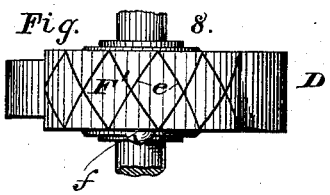


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLARD H. MASE AND SILAS TERWILLIGER, OF MATTEAWAN, NEW YORK.

IMPROVEMENT IN FULLING-MILLS.

Specification forming part of Letters Patent No. **203,355**, dated May 7, 1878; application filed April 10, 1878.

To all whom it may concern:

Be it known that we, WILLARD H. MASE and SILAS TERWILLIGER, both of Matteawan, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Fulling-Mills, of which the following is a specification:

Our invention resembles in some important respects that shown by United States Letters Patent granted us April 11, 1876, No. 176,023, and mainly relates to improvements especially applicable thereto.

In our machine patented as above mentioned all of the beaters or hammers were operated uniformly by correspondingly-formed cams acting on pendent links of their arms or helves. Said links were practically non-compressible or unchangeable in thickness, and self-adjustable pressure-rollers were employed to bear upon the links on the sides opposite those on which the cams acted, so as to give the requisite bite or gripe upon the links for raising the hammers at intervals.

The objects of our present improvements are to give to one hammer or set of hammers quick, short movements, so as to strike an increased number of light blows upon the material when first placed in the mill, and to the other hammers or set of hammers longer movements, so as to strike more forcible blows to finish the goods; also, to provide adjusting mechanism by which the same hammer or set of hammers may be employed to operate upon the goods both at starting and finishing, in the manner above set forth; and, further, to improve the machine by the employment of compressible links.

The improvements claimed consist in certain novel organizations of parts, and in combinations of devices hereinafter first described, and then specifically designated by the claims.

The accompanying drawings show so much only of our improved machine as is necessary to illustrate the subject-matter hereinafter claimed. Our improvements, however, are adapted for use in combination with the most highly-organized machines of the present day, and are intended to be accompanied by usual and well-known means of adjusting and assembling or removing the parts, so as to permit either one set of beaters or one beater of a set to be removed without stopping them all. We usually run four beaters—two for each set.

Figure 1 is a side elevation; Fig. 2, a plan or top view, showing two beaters only; Fig. 3, a side elevation, showing the adjustable cam arranged for giving short, quick blows to the hammer or set of hammers for first operating upon the goods, a section of the pendent link being shown between the cam-roll and friction-roller. Fig. 4 is a similar view of the cam, &c., for operating the finishing-hammer or set of hammers. Fig. 5 is a view, partly in plan and partly in section, of a portion of the machine, clearly showing the construction of pendent links or hinged thrust-bars of the hammers and the positions occupied by them between the cams and rollers. Fig. 6 is a section of one of the short-throw cams and its adjustable section. Fig. 7 is a similar view of one of the long-throw cams for operating the finishing-hammers. Fig. 8 is a plan view of the short-throw cam.

The hammer helves or arms are hinged or pivoted at their ends upon a cross-shaft between the uprights of a supporting-frame, as in our former patent hereinbefore mentioned. Two beaters or hammers, A A′, are shown by the drawings; but in practice we use four, composing two sets of a pair each. A represents one of the first or starting set, and A′ one of the finishing-set, of beaters. As one hammer of a set ascends the other descends, as usual.

Pivoted thrust-bars or pendent links C C′ are attached to the free ends of the hammer-arms B B′, as in our said patent, and these links are acted upon by cams D D′, between which and sustaining anti-friction rollers E E′ the links are clamped at intervals and moved upward to lift the hammers, and then released to allow the hammers to drop. Both the links and the cams differ from those shown in our former patent in the particulars presently to be described. Instead of yieldingly mounting the rollers which support the links against the pressure of the cams, we propose to adjust them so as to revolve upon their shaft in a fixed relation to the cams. Each of the pendent links is composed of two parallel

strips or bars, *d d'*, with one or more yielding strips or pieces, F, preferably composed of rubber, between them, dovetailed in place. We prefer to use two pieces of rubber, and when very heavy hammers are employed and the links made wide, we use three such central pieces. The number of strips may be changed to suit the circumstances. By the use of the compressible link, automatically conforming to the space between the cam and sustaining-roller, the necessity of having the roller self-adjusting is obviated, and comparative noiseless working of the parts is the result.

The cams are roughened on their faces by corrugations or serrations *e*, or in other equivalent way, so as to take a better hold on the links. By the use of the compound links and the serrated cams, much less pressure upon the links between the cams and rollers will serve to insure the proper action of the cams than would answer were the cams smooth and the links unyielding. Wear is also compensated.

To adjust the throw of the hammer-arms, and consequently regulate the rapidity and force of the blows struck by the hammers, we provide the cam roll or wheel D with a swinging adjustable cam-section, F^1. This adjustable portion may be held, by means of a set-screw, *f*, and screw-threaded hole or screw-tap in the cam-wheel, in the proper position to cause the cam, as it revolves with the shaft, to lift and release the link twice at each revolution; or the adjustable cam-face may be moved, so as to unite with the fixed face F^2 of the cam-wheel, and thus cause the cam to lift and then drop the hammer once for each revolution, and give a heavy blow instead of light, quick blows.

It is obvious that, instead of the means shown for adjusting the movable portion or face of the cam, other devices may be employed—such, for instance, as a curved slot in the side or arm of the movable portion of the cam and a set-screw or pinch-nut carried by the cam-wheel.

In practice, we prefer to make a single cam-wheel or drum, D', operate the finishing and hard-striking hammers, the cam-face or raised peripheral portion for operating upon the link of one hammer-arm being opposite the cut-away or recessed portion between the ends of the cam-face for operating the other hammer. Independent cam-wheels may be used, however. The cams for operating the first or light-striking hammers, when made adjustable, are separately made.

From the foregoing description it will be seen that in first treating the goods light, quick, rebounding blows are given, (usually about one hundred and twenty to the minute,) thus avoiding the tearing or breaking of the goods in the weak, tender state in which they are first placed in the mill. The rapid action of the beaters also heats the goods and makes them full faster than slow-acting beaters would.

When the goods are sufficiently fulled to stand a heavy blow they are subjected to the action of the second set of hammers; or, where the second set of hammers are not employed, the cams are changed so as to cause the hammers to strike a single blow at each revolution. When thus operating, the hammer-arms are elevated much higher, and harder blows at longer intervals—say sixty to the minute—are given.

By the use of two sets of beaters, operating as described, it will be seen that, while the preparatory treatment of the goods is going on in the receptacle or bed for the starting-hammers, the finishing treatment of the goods previously prepared in said bed is going on in the bed of the other set of hammers.

We do not broadly claim varying the throw of the fulling-mill hammers by adjustable cams, as this has been done before. Neither do we claim a series of such hammers adjustable together so as to strike throughout the series either light or hard blows.

We are not aware, however, of any mill of the class to which our improvements relate, prior to our invention, in which the series of hammers are divided into two distinct sets or pairs, each pair or set provided with its respective bed or goods-receptacle, and one set or pair adjustable independently of the other, so that a common driving-shaft is made to simultaneously operate independently-acting quick and slow moving hammers, as hereinbefore explained.

We claim as our own invention—

1. The combination, in a fulling-mill, substantially as hereinbefore set forth, of two sets of simultaneously-operating hammers, the one set acting quickly and striking light blows, and the other set operating at longer intervals and striking harder blows, with separate beds or receptacles for the goods, whereby the goods are prepared by the one set of hammers, to be finished by the other without injury, as set forth.

2. The combination, substantially as hereinbefore set forth, of the hammer-arm hinged at one end, and the yielding or compressible thrust-bar or pendent compound link pivoted to the other end of said arm, for the purpose specified.

3. The combination of the hammer-arm, the pendent compound link or thrust-bar, and the roughened cam, substantially as set forth.

4. The combination of the hammer-arm, the pendent link, the cam D, and the adjustable cam-face F^1, acting directly upon the link, substantially as and for the purpose set forth.

5. A fulling-mill constructed substantially as hereinbefore set forth, with a series of hammers arranged in two sets, one set for start-

ing and the other for finishing the fulling, the hammer-arms, the pendent links, the cams for operating the starting-set of hammers twice for each revolution of the cam-shaft, the cams for operating the finishing-set of hammers once for each revolution of said shaft, and the anti-friction rollers, between which and the cams the links are griped.

In testimony whereof we have hereunto subscribed our names.

WILLARD H. MASE.
SILAS TERWILLIGER.

Witnesses:
A. L. CONINE,
ABRAM WESTCOTT.