

G. S. BURNAP.
BOLTING CLOTH CLEANER.

No. 403,088.

Patented May 14, 1889.

Fig. 1.

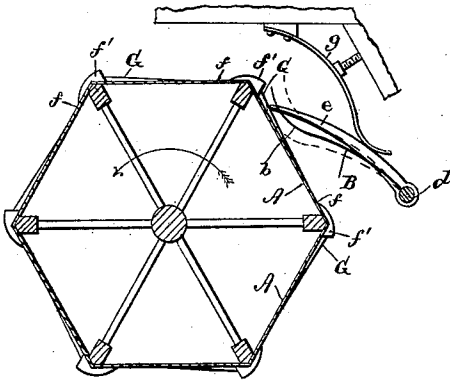


Fig. 2.

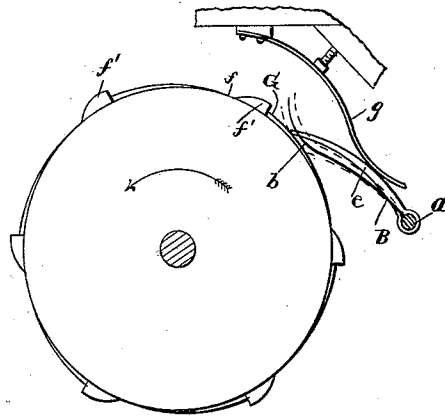


Fig. 3.

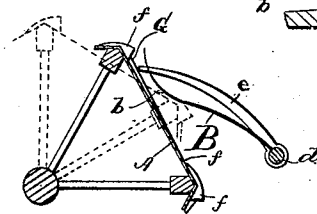


Fig. 4.

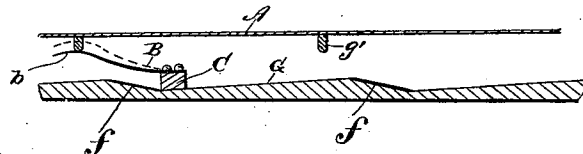


Fig. 5.

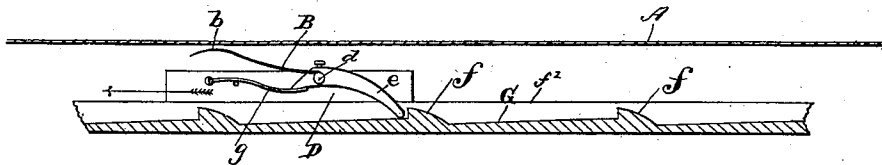
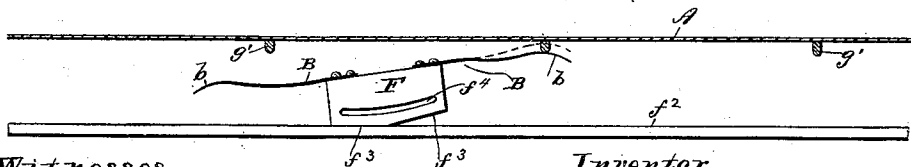


Fig. 6.



Witnesses.

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Fig. 7.

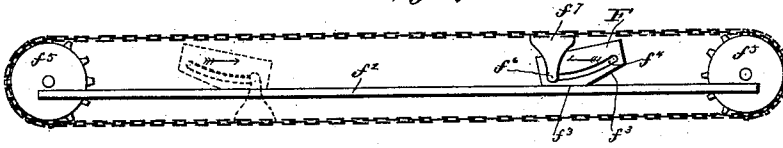


Fig. 8.

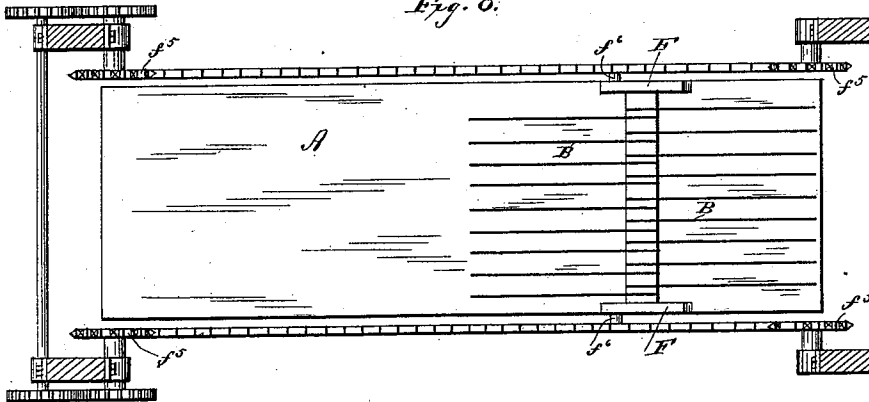


Fig. 9.

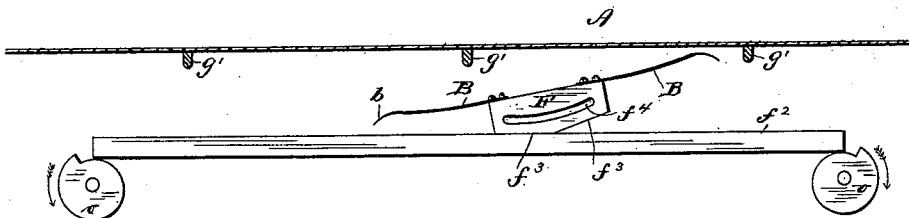


Fig. 10.

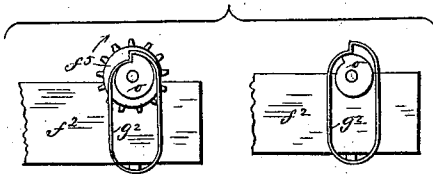


Fig. 13.

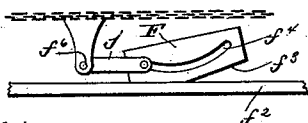


Fig. 11.

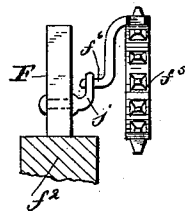
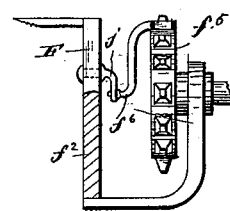


Fig. 12.



Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE S. BURNAP, OF MARIETTA, GEORGIA.

BOLTING-CLOTH CLEANER.

SPECIFICATION forming part of Letters Patent No. 403,088, dated May 14, 1889.

Application filed December 10, 1886. Serial No. 221,216. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. BURNAP, of Marietta, in the county of Cobb and State of Georgia, have invented certain new and useful Improvements in Cleaners for Bolting-Cloths; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to that class of whipping attachments for bolts, whether rotary or reciprocating, wherein the principal co-operating elements are, first, one or more flexible rods or whippers free to vibrate and, when once set in motion, be continued or maintained in vibration during a limited period, by reason of their weight and elasticity, said flexible whippers being supported or held in such proximity to the bolting material as to strike the latter while vibrating freely; and, second, suitable actuating devices operating to set the flexible rod in motion or induce the vibration thereof while removed from contact with the bolting material.

The invention consists in the combination, with said flexible vibrating whippers and the bolting material, of devices for causing the gradual approach of the whippers toward the bolting-surface as the prolonged or sustained vibrations of the rod diminish in extent, to thereby prolong the action of the whippers upon the bolting material by causing the rod to approach as the vibrations diminish in length.

The invention consists, further, in certain details of construction and arrangements of the particular mechanism shown in illustration of the said generic invention, all as hereinafter more fully described, and pointed out in the claims.

I am aware of the fact that attempts have heretofore been made to employ flexible rods or springs which are vibrated at intervals by suitable actuating mechanism, to cause them to strike upon or against the bolting material or the frame supporting the latter, to effect the dislodgment of adhering particles; but in every such instance, so far as I am aware, the whippers, whether flexible or inflexible, have been so arranged and operated that but

a single blow will be given, and that with the full force of the actuating-spring or other mechanism employed for projecting the whippers toward the bolting material. The defects of such a system are both numerous and obvious. Thus it has been found practically impossible to so adjust and regulate the movements of the whippers as to produce the desired clearing action and at the same time avoid unnecessary wear of the bolting material or disarrangement of its bearings or actuating mechanism. Moreover, great difficulty has been experienced in endeavoring to increase the velocity of the whipper so as to produce the desired rapidity of contact necessary to effectually clear the meshes of the bolting material and at the same time preserve the uniformity of the blow.

As the result of numerous practical trials and experiments with whipping devices of the character referred to I have discovered that the most effective whipping contrivance is one wherein a series of quick snapping blows are delivered against or upon the bolting material, the blows being delivered sharply and rapidly, but not with any considerable degree of violence—such as would wear the bolting material in any considerable degree or produce a vibratory action of the frame—but a series of quickly-recurring blows whose action is local and of sufficient power to cause interfering particles to be dislodged and thrown off without straining the bolting-cloth or to any considerable degree disturbing the material on the bolting-surface or injuriously vibrating the reel or frame carrying the bolting-cloth or other material. With a view to utilizing this discovery, and as one means well adapted for carrying the same into practice, I have made use of the well-known principle that a flexible rod or bar when supported or held at one or more points will if set in motion continue to vibrate for a certain period, the length of vibration and the rapidity of motion being dependent upon the dimensions and form of the rod or other vibrating medium employed, as is illustrated, for example, in the case of the tuning-fork or the stretched strings of a piano, violin, or other musical instrument. As is well known, if such a rod or its equivalent, a string or wire under tension resting in contact with an elas-

tic or yielding surface—such as the bolting material—is drawn away and suddenly released it will strike a single blow only; but as its movement is arrested at or near the center of oscillation there will be no prolonged or continued vibration; hence the blow will not be repeated. If, however, the rod be supported clear of the bolting-surface, but at such distance therefrom that when set in vibration the free portion of the rod will impinge upon the bolting-surface, while the vibratory motion will be in a measure reduced, it will be not entirely suspended, but the rod will continue to vibrate, and at each recurring oscillation will strike another blow, which action will continue so long as the amplitude of vibration is sufficient to bring the rod within reach of the bolting material. As the vibrations of the rod diminish in amplitude with each recurring contact with the bolting material, provision has been made whereby the action upon the latter may be continued or prolonged by gradually moving the vibrating rod toward the bolting-surface, the combination of mechanism for accomplishing this result constituting a distinct feature of my present invention, as hereinbefore mentioned.

In the accompanying drawings, illustrating certain embodiments of my invention, Figure 1 is an end view of a reel, showing the application of my improved whipping attachment. Figs. 2 and 3 illustrate modifications of the device shown in Fig. 1. Fig. 4 illustrates one mode of applying my improved vibrating whippers to a flat bolting-surface. Fig. 5 shows a modified form of the actuating mechanism in Fig. 4. Fig. 6 illustrates one mode of supporting a double set of the vibrating rods upon a reciprocating carrier or support to operate in both directions. Figs. 7 and 8 are side and top views, respectively, of the double whipping attachment, Fig. 6, and actuating devices therefor. Fig. 9 is a side elevation showing double whipper attachment and elevating device for use in connection therewith. Fig. 10 illustrates a modification of the mechanical devices for elevating the whippers. Figs. 11, 12, and 13 are details of the driving mechanism for the double whippers.

Similar letters of reference in the several figures indicate the same parts.

The letter A in the several figures designates the bolting-surface, usually composed of bolting-cloth or other material.

In bolting or separating machines the bolting material is arranged and supported in a variety of forms, and for the purpose of illustrating the wide applicability of my present invention I have shown three of the most commonly-used forms of bolts—the hexagonal reel in Fig. 1, the cylindrical reel, Fig. 2, and the flat or tray bolt, Figs. 4, 6, and 9.

The letter B designates the whipping-rod, of flexible material, secured at one end to a supporting rod or carrier, with its free portion *b* in proximity to the bolting material, but at

such distance therefrom that it will not make contact while at rest, but when set in vibration upon or about its point of support will be brought into contact with the said bolting-surface. The flexible whippers being thus mounted and disposed relatively to the bolting material, if actuated or set in motion by any of the great varieties of mechanism, such as are well known to be adapted for the purpose, will vibrate freely and for a determinate period, and while so vibrating their free portion will be brought into contact with the bolting material, thereby delivering a quick and sharp blow or snap.

Referring more particularly to the embodiment of the invention contained in Figs. 1 and 2, *d* represents a rock-shaft supported in bearings in the frame, and to which the flexible rod or whipper B, (or, preferably, a series of said rods,) is secured at one end, the free end *b* of said rod projecting over and lying above the reel. To the rod *d* is secured an arm, *e*, the outer end bearing against a cam-surface, *f*, while an adjustable spring, *g*, is arranged to bear against said arm *e*, to hold it down against the cam-surface and vibrate the rod *d*, carrying the whippers toward the reel. The cam-surface *f* is mounted upon a part of the machinery moving in unison with the reel, and preferably upon the head or end of the reel, as shown, and it is provided with a series of inclines or projections, *f'*, which successively engage the arm *e*, operating first to raise the latter and the flexible whippers, and then release the said arm and permit the latter and the whippers to be propelled suddenly and forcibly toward the reel. When the arm *e* passes off from the inclines of the cam and is projected toward the reel by the tension-spring, it strikes upon the cam-track before the flexible rod or whipper reaches the surface of the reel. This sudden stoppage of the arm *e* and attached rod *d* does not, however, arrest the motion of the whipping-rod, as the latter, by reason of its weight and flexibility, continues its motion toward the bolting material and takes on a pendulous or vibrating motion of its own.

In Fig. 4 the flexible rod or whipper B is shown secured to a bar or carriage, C, adapted to be reciprocated on ways beneath a flat bolting-surface, A. The free end *b* of the whipper B stands normally out of contact with the bolting-surface, and it is thrown into vibration by the engagement and passage over it of pins or bars *g'*, arranged at intervals throughout the length of the bolt.

In Fig. 5 is shown a mechanism similar to that shown in Figs. 1 and 2, but adapted to a flat bolting-surface. In this instance the rod *d*, carrying the flexible rod B, the arm *e*, and the tension-spring, is mounted in a frame or carriage, D, the end of the arm *e* resting upon and being engaged by the cam track or surface *f*. Motion may be communicated to either the carriage D or cam-track *f*, or to both, as desired. Thus the track *f* or the car-

riage D may be connected to a chain or belt and caused to traverse beneath the bolting-surface. When a reciprocating whipping attachment of this character is employed, it is desirable that the whippers should be made to operate upon the return movement as well as upon the forward movement, in order to avoid a dead stroke; and to this end I propose to mount two sets of flexible rods, B, upon a carriage, F, Fig. 6, traveling upon a track, f^2 , said carriage being so arranged and connected to the propelling mechanism that it shall be tilted or rocked to alternately bring the rods B into operative position as the carriage is reciprocated in opposite directions.

In the embodiment shown the carriage F is furnished with two inclined bearing-surfaces, f^3 , and a longitudinal slot, f^4 , for the reception of a pin upon the prime motor. The bearing-surfaces f^3 are so arranged that when one of them rests upon the track one set of rods B will be held in operative position, and when the carriage is tilted until the other face, f^3 , is brought into contact with the track the other set of rods will be elevated and the first depressed or withdrawn. The tilting of the carriage to effect the alternation of the rods B in action is produced by the movement of the pin in the slot f^4 . Thus, if the prime mover be a chain or belt passing around sprocket-wheels f^5 at the ends of the bolt, as shown in Figs. 7 and 8, the pins f^6 , for engaging the slots in the carriages, are mounted upon arms or links f^7 , secured to the chain or belt and projecting inward or toward a line uniting the centers of the sprocket-wheels at opposite ends of the bolt, whereby as the arms f^7 pass around the sprocket-wheels the pin f^6 will be held at about the center of the sprocket-wheel.

Thus far I have described the whipping attachment as involving the principal features of the present improvement—that is to say, the vibrating flexible rods held in proximity to the surface of the bolting material. This feature of the flexible whippers is also illustrated and described in my prior applications Nos. 192,722 and 199,539, wherein specific embodiments are shown and claimed; hence I wish it to be distinctly understood that I do not herein claim any of the special embodiments claimed in my before-mentioned applications.

The next feature of my invention is auxiliary to and designed as an improvement upon the general system wherein flexible vibrating rods or whippers are employed; hence I have illustrated it in connection with the particular embodiments given herein of said system. The said improvement comprises devices so constructed and adapted to operate in connection with the vibrating rods as to cause the gradual approach of the rods and bolting-surface, whereby as the amplitude of vibration diminishes the two will be brought nearer together, thus prolonging the action of the rods upon the bolting-surface. To effect this re-

sult with whipping attachments such as shown in Figs. 1, 2, and 5, I arrange a series of inclined bearing-surfaces, G, in rear of the lifting-cams. These bearing-surfaces G receive the arm e as it drops from the elevating-cams f and hold the whippers at the proper distance above the bolting material; but, being inclined toward the bolt, they permit the arm e to approach the latter, thereby bringing the rods into nearer proximity to the bolting material as the vibrations diminish in amplitude.

As is obvious, the same result can be effected by moving the support or carriage to which the rods are attached bodily toward the bolt, as illustrated in Fig. 4, wherein the carriage to which the rods are secured is caused to traverse beneath the bolt, and is elevated at intervals after the rods have been set in vibration by cams G on the track. The same result can also be secured by elevating the track at intervals, as illustrated in Fig. 9, wherein the track is shown as resting upon cams o , rotated in unison with the sprocket-wheels for driving the carriage. These cams may be located on the shafts of the sprocket-wheels, as shown in Fig. 10, and provided with yokes g^2 , upon which the tracks rest.

Provision is made for accommodating the vertical movement of the carriage when driven by a chain or belt by interposing a loose link or crank-arm, j , between the pin f^6 on the chain or belt and a pin in the slot f^4 , as shown in Figs. 11, 12, and 13.

Although the present improvements are especially designed for use in connection with the bolting material of purifiers, it is obvious they may be used upon all kinds of bolting or screening machines.

Having thus described my invention, what I claim as new is—

1. The combination, in a clearing attachment such as described and with the bolting material, a tilting traveling carriage provided with two sets of flexible rods or whippers and reversed bearings, ways co-operating with said bearings to maintain the whippers in position and guide the carriage, and devices, substantially such as described, acting upon the carriage to reciprocate and tilt the latter to bring each set of whippers into operative position alternately, substantially as described.

2. In combination with a flat bolting-surface, a reciprocating carriage supported upon ways and provided with one or more flexible rods or whippers held removed from the bolting-surface, ribs or projections engaging said rod or rods as they are reciprocated to set the latter in vibration, and cams acting upon the ways to elevate the carriage, substantially as described.

3. In combination with a horizontal bolting-surface, a reciprocating carriage supporting two sets of flexible whippers, guiding-plates having reversed inclines or bearings resting upon ways, and an endless belt at each end of the carriage, provided with a crank

carrying a pin for engaging and tilting the carriage at the opposite ends of the bolt to alternately bring the whippers into operative position, substantially as described.

5 4. In combination with the traveling carriage, its two sets of whippers and the reversed bearings, the ways, the lifting-cams, the two endless belts, the arms on said belts, and the links connecting said arms to the carriage, substantially as described.

10 5. In combination with a horizontal bolting-surface, a reciprocating carriage provided with a flexible rod or whipper whose free end is held in proximity to the bolting-surface, 15 ways upon which said carriage is guided, and ribs or projections engaging said flexible rod to set the latter in vibration and cause it while vibrating to impinge against the bolting material, substantially as described.

20 6. In combination with a horizontally-disposed bolting-surface, a reciprocating carriage supported upon ways, a flexible rod or whipper mounted upon the carriage, ribs or projections engaging said rod to set the latter in vibration, and inclines or cams operating upon 25 the carriage to gradually advance the latter toward the bolting-surface while the rod is vibrating, substantially as described.

7. The combination, with a bolting-surface, 30 of a reciprocating carriage or support, a flexible whipper mounted thereon, its freely-vibrating portion normally supported in proximity to but removed from the bolting-surface; and devices, substantially as indicated, connected 35 to the support on which the whippers are carried for advancing the latter toward the bolting-surface while vibrating, substantially as described.

8. The combination, with a bolting-surface 40 and an endless belt or chain supported upon pulleys, of a reciprocating cleaning attachment attached to the said belt or chain on the inner side thereof at a distance substantially

equal to the radius of the pulleys, substantially as and for the purpose set forth.

9. In combination with a bolting-surface, an endless belt surrounding supports located at the ends of the bolting-section, and a cleaning attachment mounted to reciprocate beneath the bolting-surface, said attachment being 50 pivotally connected to the traveling belt at a point below the upper line of belting, substantially as described, whereby the cleaning attachment will be caused to traverse back and forth and in substantially the same plane be- 55 neath the bolting-surface, as set forth.

10. In combination with a bolting-surface and a flexible vibrating rod held in proximity thereto, a reciprocating support upon which said rod is mounted for advancing the latter 60 toward the bolting material as the vibrations of the rod diminish in length, substantially as described.

11. In combination with a bolting-surface and a vibrating flexible rod or whipper, a laterally-movable support for said whipper, and devices, such as described, engaging the whipper to set it in vibration, substantially as described.

12. In combination with a bolting-surface, a carriage reciprocating in a plane substantially parallel with said bolting-surface, and vibrating whippers mounted upon said reciprocating carriage in proximity to the bolting-surface.

13. In combination with a bolting-surface, a carriage reciprocating in a plane substantially parallel with the bolting-surface, and two series of vibrating whippers mounted upon said reciprocating carriage, one series operating alternately with the other as the carriage is 80 reciprocated, substantially as described.

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Witnesses:

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