G. YULE.
Fulling Stocks.

No. 219,562. Patented Sept. 9, 1879.

Fig. 1

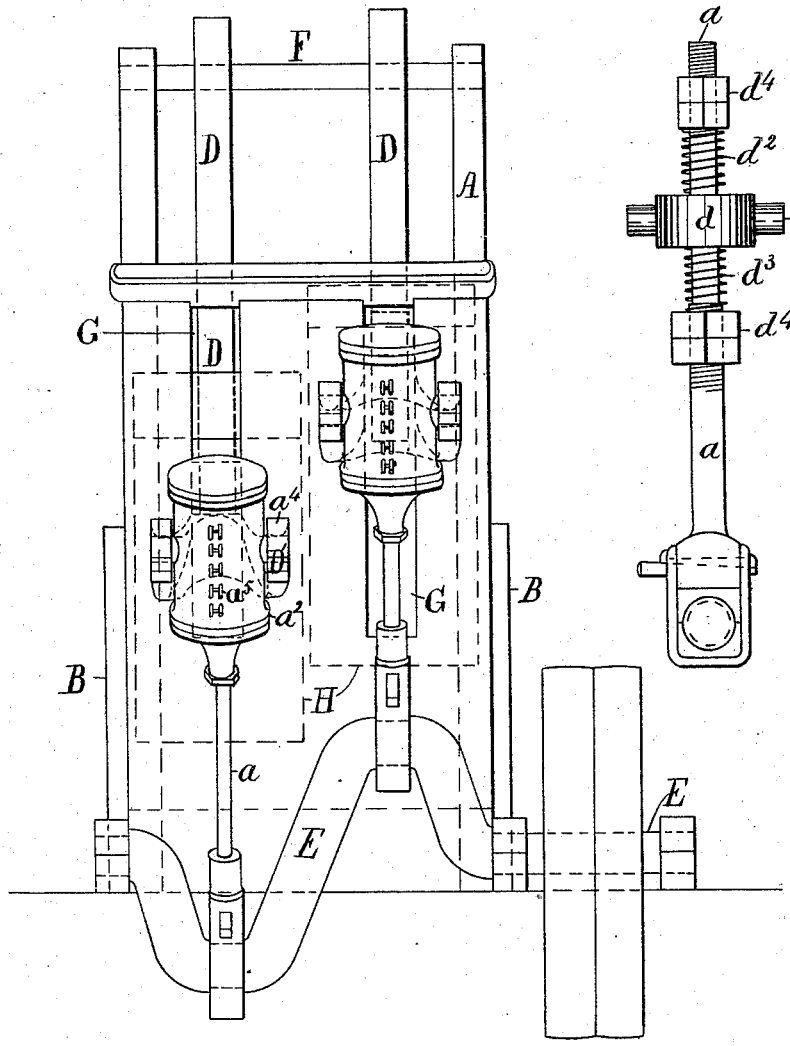

Fig. 4.

Attest:
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Wm L. Breach

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Thos. S. Crane atty

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Fig. 3.

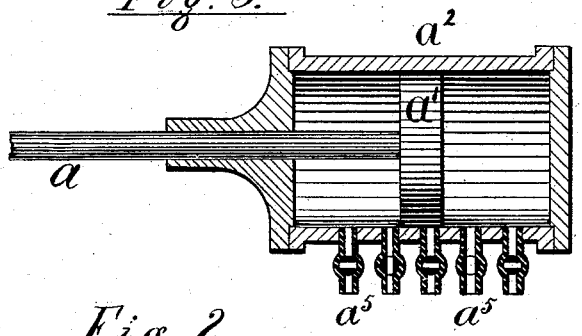
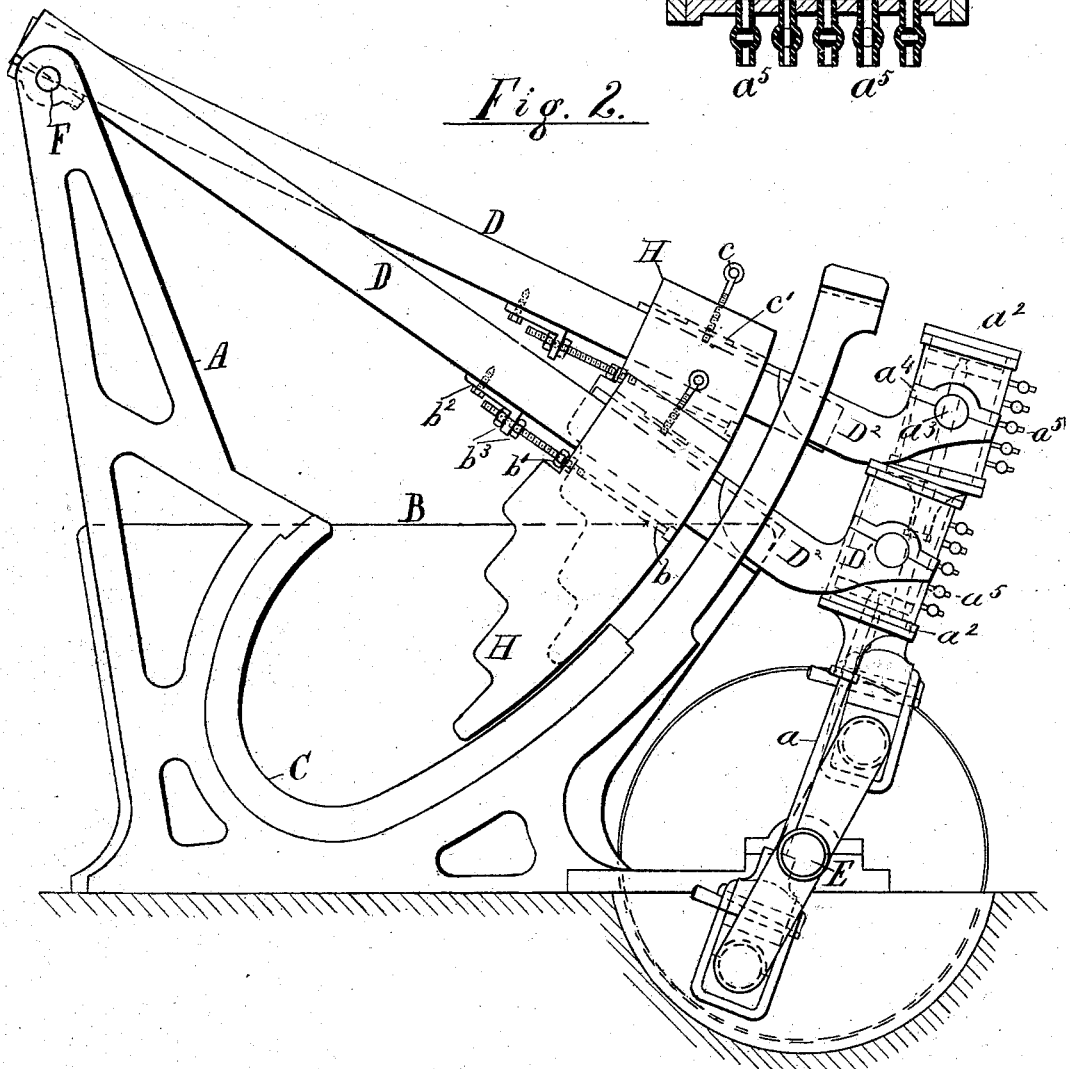


Fig. 2.



Attest:

Wm L. Roth.
Wm L. Breath

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UNITED STATES PATENT OFFICE.

GEORGE YULE, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN FULLING-STOCKS.

Specification forming part of Letters Patent No. **219,562**, dated September 9, 1879; application filed May 15, 1879.

To all whom it may concern:

Be it known that I, GEORGE YULE, of the city of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Fulling-Stocks, which improvement is fully described in the following specification.

My invention relates to an improvement in fulling-stocks; and consists in connecting the hammer-arms of the machine to the driving crank-shaft by an elastic connection to avoid the jar occasioned to the rigid connections in common use, and to improve the quality and quantity of work performed.

In the drawings I have shown my invention applied to hat-fulling stocks; but it is equally applicable to any machinery that may be used for fulling cloth, leather, or other materials by substituting my elastic crank-connections for the rigid ones in ordinary use.

Figure 1 of the drawings is a front view of a fulling-stock constructed with my improvement. Fig. 2 is a side elevation of the machine with one of the side boards, B, removed; Fig. 3 is a sectional view through the center of one of the cushioning-cylinders or elastic connections; and Fig. 4, an alternative mode of constructing the elastic connection.

A A are the frames of the machine, adapted to support the chest C and the hammer-arms D, and provided at the front with the usual bearings for the driving crank-shaft E upon the base or bed of the machine.

The frame is constructed with elevated posts at the rear, upon which the hammer-arms are hinged by the tie-rod F, and has openings G at the front, through which the hammer-arms extend to receive the connections designated by the letters *a a' a''*, &c.

In Figs. 1 to 3 the connections are shown provided with air-cushioning cylinders, while in Fig. 4 an alternative mode of construction with spiral springs is shown.

Referring to one of the air-cushioning cylinders, *a* is the crank-connection, secured to the crank-wrist by boxes, strap, and keys in the usual manner, and formed into a round rod, to the upper extremity of which a piston, a^1, is secured by key or nut. The piston is fitted into an air-cylinder, a^2, provided with trunnions a^3, which are hung in suitable bearings a^4 at the outer ends of the hammer-arms D, which are provided with forked ends D^1 to allow the cylinder to oscillate between them.

Regulating-cocks a^5, of which five are shown in Fig. 3, are inserted in the sides of the air-cylinder, and afford an inlet or outlet to the cylinder.

The forked ends of the arms D are shown made of cast-iron and united to a plate, D^2, which is bolted upon the front end of the hammer-arm D, and aids in securing the hammer H, which is formed with a mortise to slip over the arm D, and embraces also the plate D^2, lying on the arm, a set-screw, *c*, passing through the top of the hammer, and thus clamping it firmly to the hammer-arm. A nut, *c'*, is recessed into the mortise in the hammer to receive the set-screw *c*, which is thus prevented from stripping its thread out of the wooden hammer.

An adjuster is shown at *b* for setting the hammer at a suitable distance from the bottom of the chest C, and consists of a bolt passed through the hammer parallel with the arm, and secured to the hammer by its head and a nut, b^1, while its point extends outside of the hammer several inches and passes through a bracket, b^2, secured to the lower side of the arm D near the hammer. Nuts b^3 clamp the bolt to the bracket and afford the means of moving the bolt and hammer in either direction along the arm D, as desired.

From the above description it will be seen that the hammer is much more securely fastened to the hammer-arm than by keys of wood or metal, as the nuts b^3 prevent movement of the hammer in either direction and relieve the set-screw *c* from the hardest part of its task.

The operation of my elastic connection is as follows: The crank-shaft being set in motion, the connections *a* receive a regular reciprocating motion, which is transmitted to the hammers in a peculiar manner, owing to the interposition of the elastic element in the combination. The pistons attached to the rods *a* partake of the positive motion imparted to the rods by the crank, while the hammer-arms, being connected to the cylinders, which, in turn, are loose upon the pistons and only moved by the air compressed in the cylinders, are impelled

by a yielding sort of force, which adapts itself partially to the resistance met by the hammers. Thus the arm of the upper hammer, (shown in Fig. 2,) having no resistance opposed to it at the commencement of its downward stroke, requires no force to move it, and the cylinder attached to it merely lies upon its contained piston and follows its downward movement. When, however, the hammer strikes the contents of the chest C its movement is partially checked; but, instead of imparting a check to the shaft E and a jar to the whole machine, the piston a^1 merely moves in the cylinder a^2 until the contained air exerts pressure enough to advance the hammer H toward its lowest position. In this latter movement every variation in the resistance causes a slight motion of the piston in the cylinder, so that the movement of the hammer, instead of being violent and abrupt, has a trembling character, which greatly improves the quality of the work done by the machine. This effect can be modified to any extent between the softest and the hardest of blows by opening and closing the cocks a^5.

In Fig. 3 the cocks nearest the ends of the cylinder are shown closed, so that nearly half a cylinderful of air is retained in front of the piston and quite a violent blow produced. When the same cocks are partially opened the air escapes during the descent of the hammer, and the force of the blow is much lessened.

The effect of this construction is most remarkable, as by its use I am enabled to drive the hammers about two hundred strokes in a minute, while without my elastic connections a similar hammer of five hundred pounds weight can only be made to deliver about forty blows per minute.

The wear and tear of the whole machine, although operated at so great a speed, is much less than in those otherwise constructed, as the blow is an elastic one in any case, and no injurious jar is transmitted to any part of the machine.

The peculiar trembling blow delivered by hammers thus operated is found, in practice, to have a very advantageous effect upon the material subjected to the blow, just as sizing by hand is found more effectual than by machinery, on account of the peculiar movement of the muscles.

The operation of my invention would be the same if the rod a and its piston were secured to the arm D and the cylinder a^2 to the crank-wrist; but I prefer the arrangement shown, as it throws less weight upon the crank to participate in its rapid circular motion.

In Fig. 4 I have shown an elastic connection for the rod a, consisting of an arrangement of spiral springs similar to that used in car-buffers or draw-bars.

A block, d, is fitted to the rod a and provided with trunnions d to fit the bearings a^4 on the arms D.

Spiral springs d^2 and d^3 are fitted to the rod above and below the block d, and are pressed against it by nuts d^4.

The operation of the springs is the same as that of the air in the cylinder a^2, the lower spring, d^2, yielding during the upward movement of the hammer H and the upper spring, d^3, during its descent. The tension of the springs can be adjusted by the nuts d^4; but, owing to the superior elasticity of the air, I much prefer the use of the cylinders a^2 to produce the best results. They also have this advantage—that the action of the hammers can be instantly changed while the machine is in motion by closing or opening the cocks a^5 on the cylinders. India-rubber springs may, if desired, be used instead of the coiled springs shown in Fig. 4.

I am aware that devices have been employed to produce an elastic blow with the hammer of a fulling-stock; but in such cases cams and eccentrics were used in place of the ordinary crank-shaft, and such devices could not readily be adapted to those machines which were operated by the ordinary crank, while my improvement is especially adapted to such machines, and may be applied to them at any time by merely substituting my elastic connections for the rigid ones in common use.

I therefore claim such a connection as follows:

1. The combination of the frame A, chest C, hammer-arm D, crank-shaft E, and elastic connection between the wrist of the crank and the extremity of the hammer-arms, as and for the purpose set forth.

2. The combination, with the crank-wrist and the extremity of the hammer-arm D, of the air-cylinder a^2, piston a^1, and connection a, operating substantially as shown and described.

3. In combination with the cushioning-cylinder a^2, applied to the crank-connection a in the manner and for the purpose described, the cocks a^5, for regulating the escape of air from the cylinder, substantially as herein set forth.

In testimony that I claim the foregoing I have hereto set my hand this 12th day of May, 1879.

GEORGE YULE.

Witnesses:
E. P. ROBERTS,
T. S. CRANE.