2 Sheets—Sheet 1.

W. DONALDSON.

FIRE-ALARM TELEGRAPH BELL-STRIKER.

No. 186,545. Patented Jan. 23, 1877.

Fig. 1

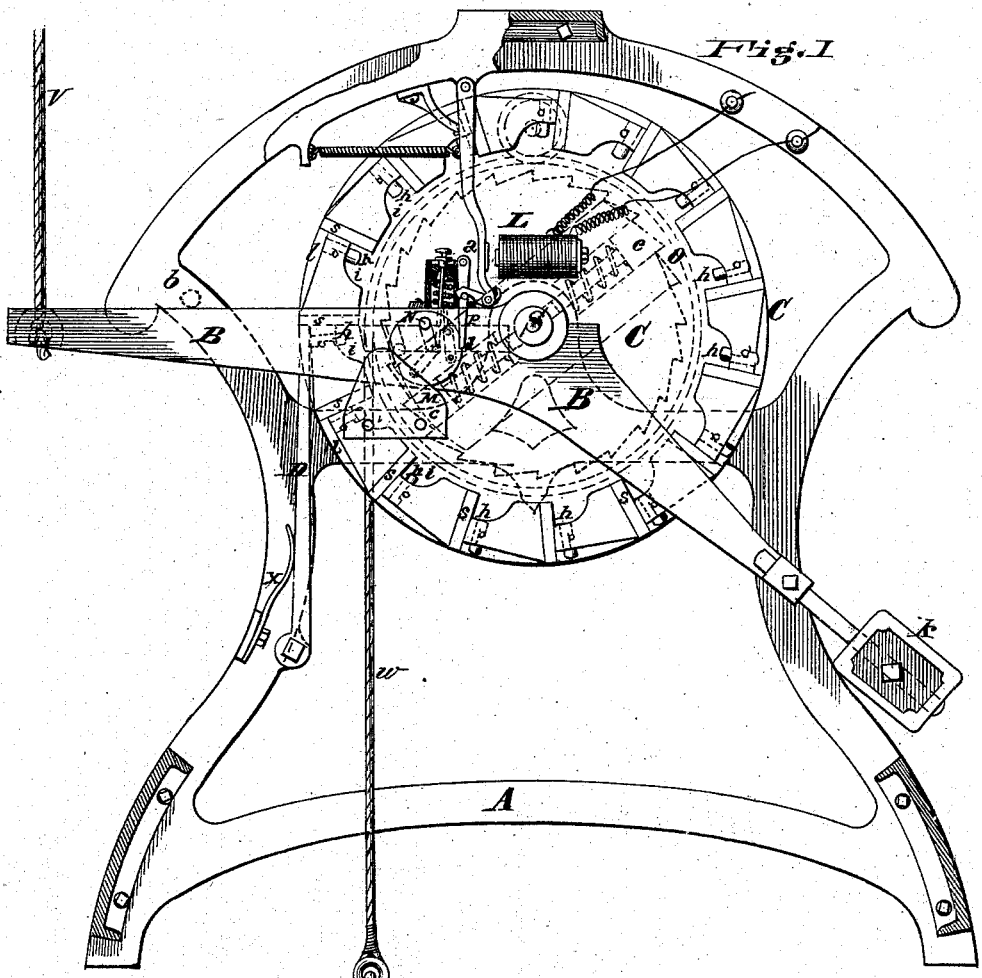
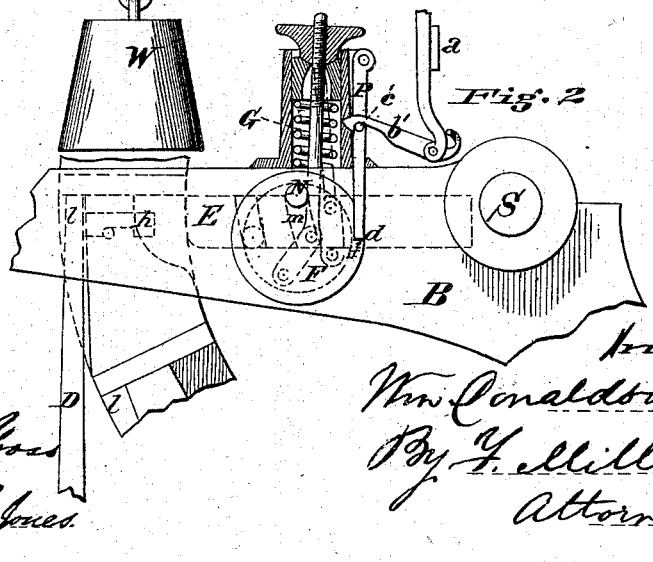


Fig. 2



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2 Sheets—Sheet 2.

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FIRE-ALARM TELEGRAPH BELL-STRIKER.

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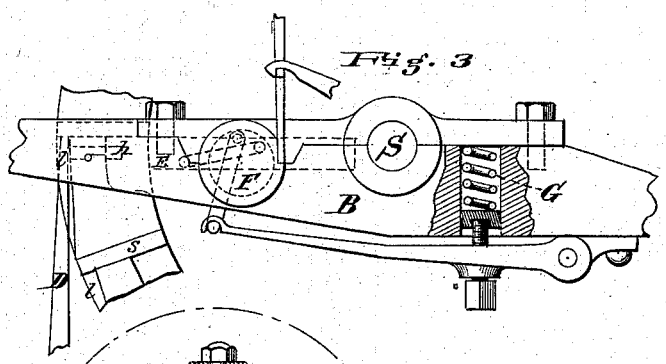
Fig. 3



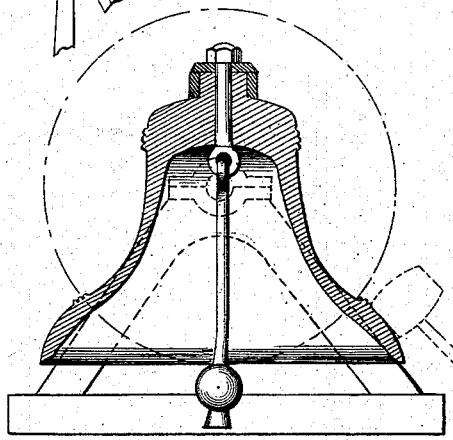


Fig. 4

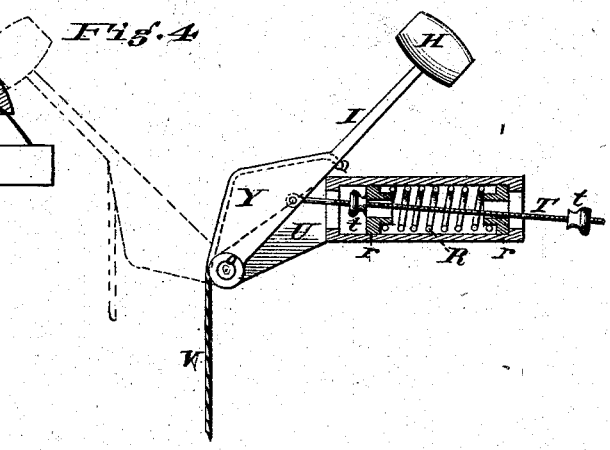
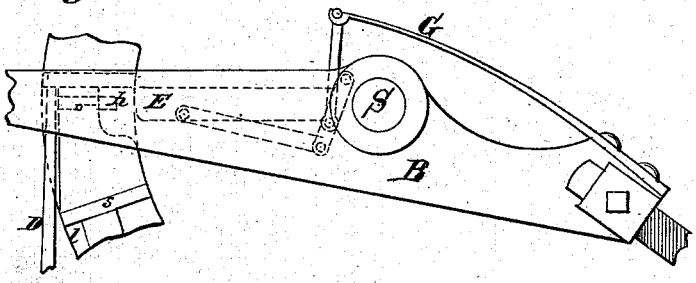


Fig. 5



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UNITED STATES PATENT OFFICE.

WILLIAM DONALDSON, OF CINCINNATI, OHIO, ASSIGNOR TO FRANK MILLWARD, TRUSTEE, OF SAME PLACE.

IMPROVEMENT IN FIRE-ALARM-TELEGRAPH BELL-STRIKERS.

Specification forming part of Letters Patent No. **186,545**, dated January 23, 1877; application filed October 14, 1876.

To all whom it may concern:

Be it known that I, WILLIAM DONALDSON, of Cincinnati, Hamilton county, State of Ohio, have invented an Improvement in Bell-Strikers, of which the following is a specification:

My invention relates to that class of machines used more particularly for striking fire-bells by means of the electrical current; but it is equally applicable to bells used for other purposes.

The general principle of my machine consists in shifting the weight or driving power from a localized stop onto a vibrating arm, which arm is suitably connected to a hammer for striking the bell, and also in bringing all parts back to their normal position.

My invention consists in the devices for shifting the weight from a movable stop onto a vibrating arm, and thence to the hammer, and also in providing means to stand the shock and wear consequent upon checking the weight or driving-power after striking the blow. My invention also consists in certain mechanisms to entirely overcome the tendency of such machines to strike out of time. My invention also consists in so applying the power (which travels through a stated distance) to the hammer, as to fully utilize the effect of said power.

Figure 1 is a front view of my improved machine, with the front side of the frame removed, except that portion which carries the armature. Fig. 2 is a partial view of the arm B, showing more clearly the manner of operating the bolt E. Figs. 3 and 5 show modified ways of accomplishing the same purpose. Fig. 4 shows the hammer in position ready for a blow.

A is the frame, supporting in suitable bearings the shaft S, upon which is mounted the striking and escapement wheel C, drum O, (seen in dotted lines,) and vibratory arm B. The stop or localized detent D is also supported in the frame A by a lug suitably situated, as shown. B is a vibratory arm connected to the hammer by a wire rope, or other suitable connection, and is counterbalanced by the weight K, so that it is normally kept against stop *b*. On the back side of the arm B is a projection corresponding in depth to the rim of wheel C. This projection carries the bolt E. C is what I denominate the striking and escapement wheel. It has a raised rim on its front side. This raised rim is divided by radial grooves into equal-sized spaces, which spaces are made ratchet-shaped on the outer side, and with recesses *i* on the inside. Each groove is fitted with a piece of tempered steel, *s*, for the purpose of taking the shock when stopped by the stop D, and also for standing the wear consequent upon withdrawing the bolt E. In the narrow place in the rim, caused by the ratchets *l* and notches *i*, are drilled holes, into which are inserted pins *h*, held by suitable means to prevent dropping out, but allowed to work loose. These pins are for the purpose of transmitting the force of the bolt E onto the stop D.

On the back side of the wheel C suitable projections or lugs are cast, in which are drilled holes to receive spring-pawls *c*, that permit the winding up of the weight, and that engage with the ratchet-teeth on the inside of the drum O, (see dotted lines of Fig. 1,) around which is wound the wire rope *w*, to which is suspended the weight W. D is a stop or localized detent, supported by the frame A, and held up to the wheel C by the spring X. This stop is for the purpose of arresting the wheel C after each beat of the work, and also to hold the wheel in place when not in use. E is a bolt or electric detent, sliding in the inner projections of the arm B. This bolt is propelled forward by a pin on the back of tumbler F, working in a groove, *m*, in the bolt, as shown in Fig. 2, or by the tumbler and link, as shown in Fig. 3, or by the toggles, as shown in Fig. 5, the tumblers or toggles in each case being actuated by the spring G. The office or use of the bolt E is to force off the stop D, at the same time taking its place, and locking the striking-wheel C and the vibrating arm B together, so that the wheel is permitted to swing the arm B and strike the bell. The tumbler F works in a bearing in the arm B, and is used to force out and draw back the bolt E, which it forces out, as already described, and draws back through the medium of the pin N, which engages the guide M, so that as the arm B swings down the guide causes the tumbler to rotate backward and withdraw the bolt. At the same instant the bolt E is withdrawn the stop D has caught

again in the ratchet, so as to stop and hold the wheel C. The arm B is now free to swing back to its first position, which it is caused to do by the retraction of the spring R of the hammer. The tumbler F has on its periphery a flange, in which is cut a notch, *d*. When the tumbler is turned back by the guide M the pawl P drops into this notch, thereby holding the bolt E back against the force of the spring G.

The spring G is connected to the tumbler F in such a manner that when the bolt is drawn back and the spring compressed it will exert very little force against the pawl P. This is accomplished through the medium of the link in Figs. 2, 3, and 5, being so arranged that when the spring is compressed it exerts its force very near the center, or in a line almost through the center, reducing the pressure on the pawl to a minimum.

The armature *a* is swung from the top of the frame A, and has a hook, *b'*, pivoted at itt lower end, so that when the armature is free, or away from the magnet, it will engage the pin *c'* on the pawl P, as shown plainly in Fig. 2.

L is the magnet, supported from the frame A, and connected to the battery in the usual manner.

Fig. 4 shows the manner of placing the hammer, and also the arrangement of the spring which sets the hammer. The hammer H is mounted on the helve I, which is pivoted or made to swing on the pin *o*. Attached to the helve I is a cam-shaped projection, Y, serving as a guide for the rope V. Connected to the helve I is a rod, T, having a nut, *t*, on each end, for the purpose of adjusting the spring R, which is confined between the collars *r*. The spring R is inclosed in a box, U, which also serves as a bearing for the hammer-helve I. This spring answers the double purpose of a cushion for the hammer when the hammer is drawn back, and also to forcibly draw the hammer back after the blow is struck, and in drawing the hammer back it also sets the arm B against stop *b*, ready for another stroke.

The cam-shaped projection Y is used as a guide for the rope V, and permits of a better application of the weight in this, that, while the hammer is at rest, as shown in Fig. 4, its weight is compensated by the spring, and the rope V is pulling down close to the center; but, as the hammer is drawn over, the rope keeps getting farther from the center, consequently paying out faster, which is in accordance with the law governing falling bodies; and when the blow is struck the weight is suspended a great distance from the center.

Operation: The weight W is wound up on the drum O, which is all the attention the machine requires. Immediately on the current being established, the magnet L becomes charged, and attracts the armature *a*, which causes the hook *b'* to pull the pawl P out of the notch *d* of the tumbler F, which, being released, allows the spring G to rotate the tumbler, causing the bolt E to shoot out against the pin *h*, which, in turn, forces the stop D out of the ratchet *l*. The bolt E is now substituted for the stop D for receiving pressure, and, as a consequence, the weight W is on the arm B, and from and through it also on the hammer, causing it to strike the blow. As the arm B is swinging down the pin N strikes against the guide M, and the bolt E is gradually withdrawn. At the same time it is withdrawn the stop D has arrested the wheel C, and the hammer has struck the bell. The arm B is at the same time released, and the spring R pulls the hammer back, which also brings the arm B into position against stop *b*, ready for another blow, and so on, as often as may be required. In the event of anything occurring to the battery or wires, causing the magnet to attract the armature out of time, it will have no effect, for the hook *b'* will not engage the pin *c'* on pawl P until the full stroke of the arm B, down and up, has been completed. If, on the other hand, anything should happen to cause the armature to stick, (as is sometimes the case,) the hook *b'* will then not engage the pawl P, nor will the machine operate until the obstruction is removed.

I claim—

1. An electric bell-striking apparatus for giving alarms or signals, having in combination, first, a striking escapement-wheel rotated by a falling weight or spring, and held, when not giving an alarm, by a localized detent, and, second, a swinging arm carrying an electric detent or bolt, whose operation, in transmitting motion and an alarm from the electro-magnet, first releases the localized detent from the escapement-wheel, and then transfers the pressure of the stop-wheel to said arm, whereby the latter is swung, so as to actuate the bell-hammer connected thereto.

2. The escape-wheel C, having steel faces *s* to meet the surfaces of the interior and exterior detents D E, substantially as and for the purpose specified.

3. The combination of swinging bell-striking arm B, tumbler F *d*, pawl P *c'*, hook *b'*, and electric armature *a*, operating not only to release the mechanism of bolt E on time, but to prevent an alarm being given out of time.

4. The combination of swinging bell-striking arm B, rope V, and hammer-helve H I, the latter having cam-guide Y, by which the hammer is given the increasing velocity due to a falling weight.

In testimony of which invention I have hereunto set my hand.

WILLIAM DONALDSON.

Witnesses:

JOHN E. JONES,

J. L. WARTMANN.