3 Sheets—Sheet 1.

S. D. CARPENTER.

GRAIN BINDER.

No. 85,210. Patented Dec. 22, 1868.

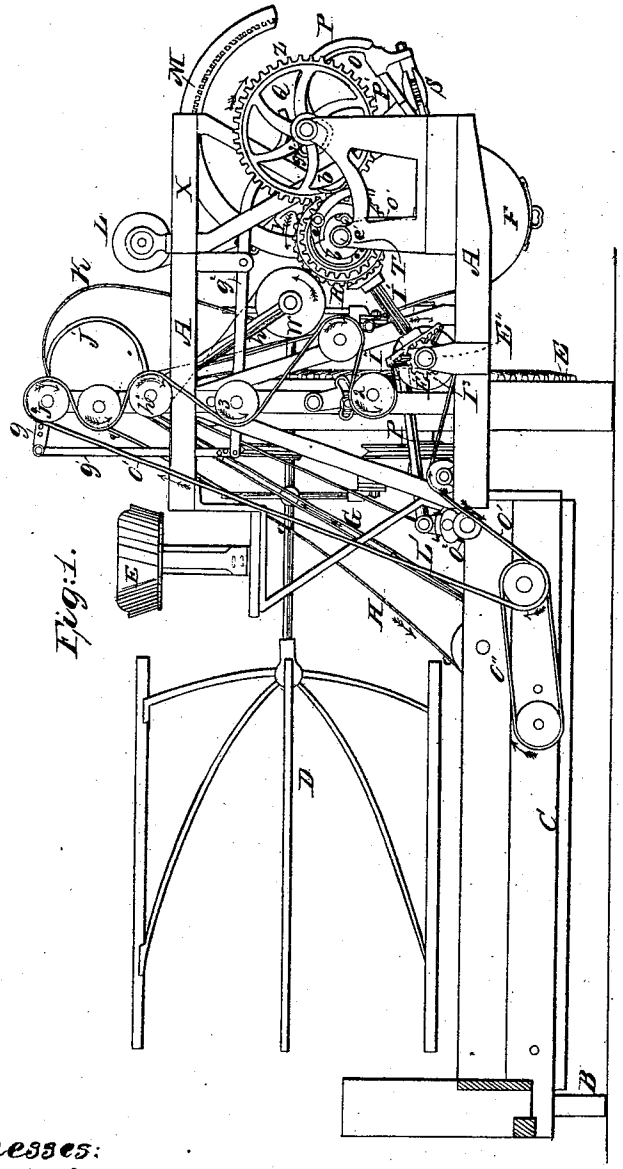

Fig: 1.

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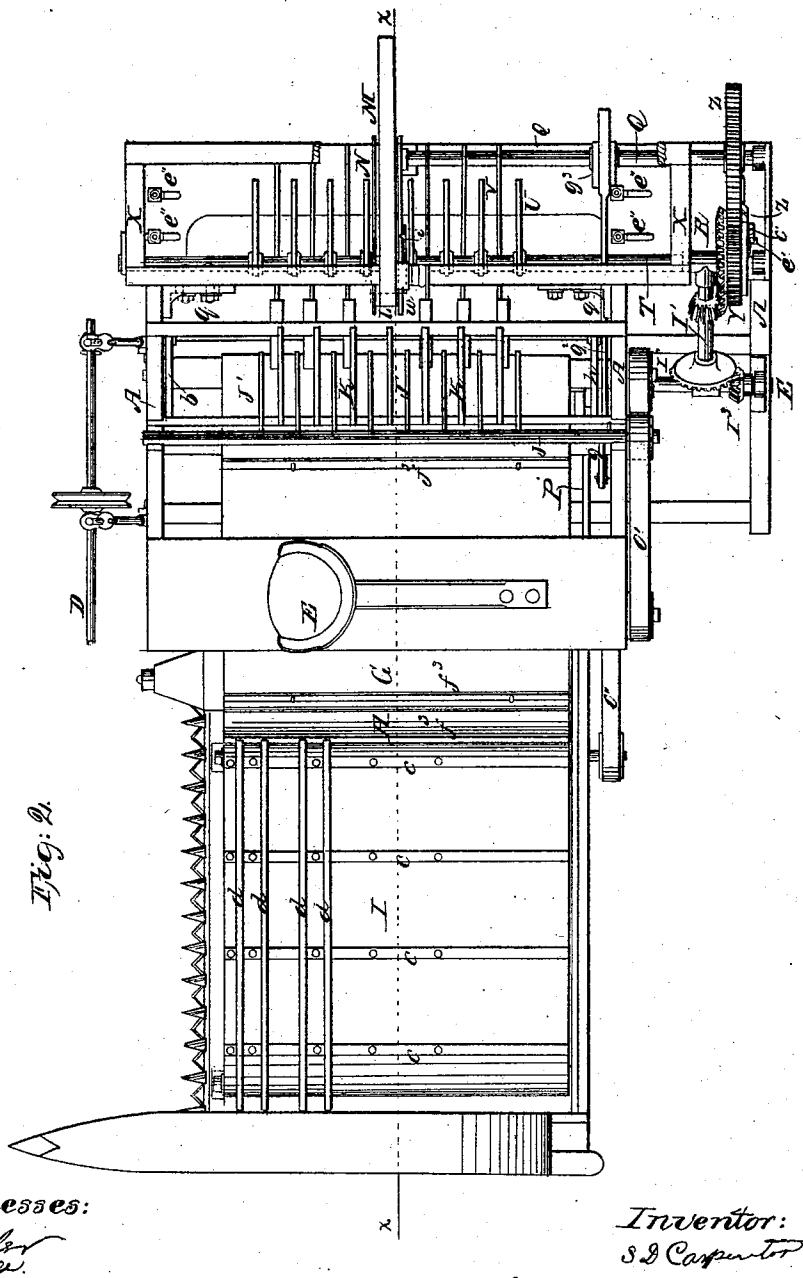

Fig. 2.

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3 Sheets—Sheet 3.

S. D. CARPENTER.

GRAIN BINDER.

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Fig: 3.

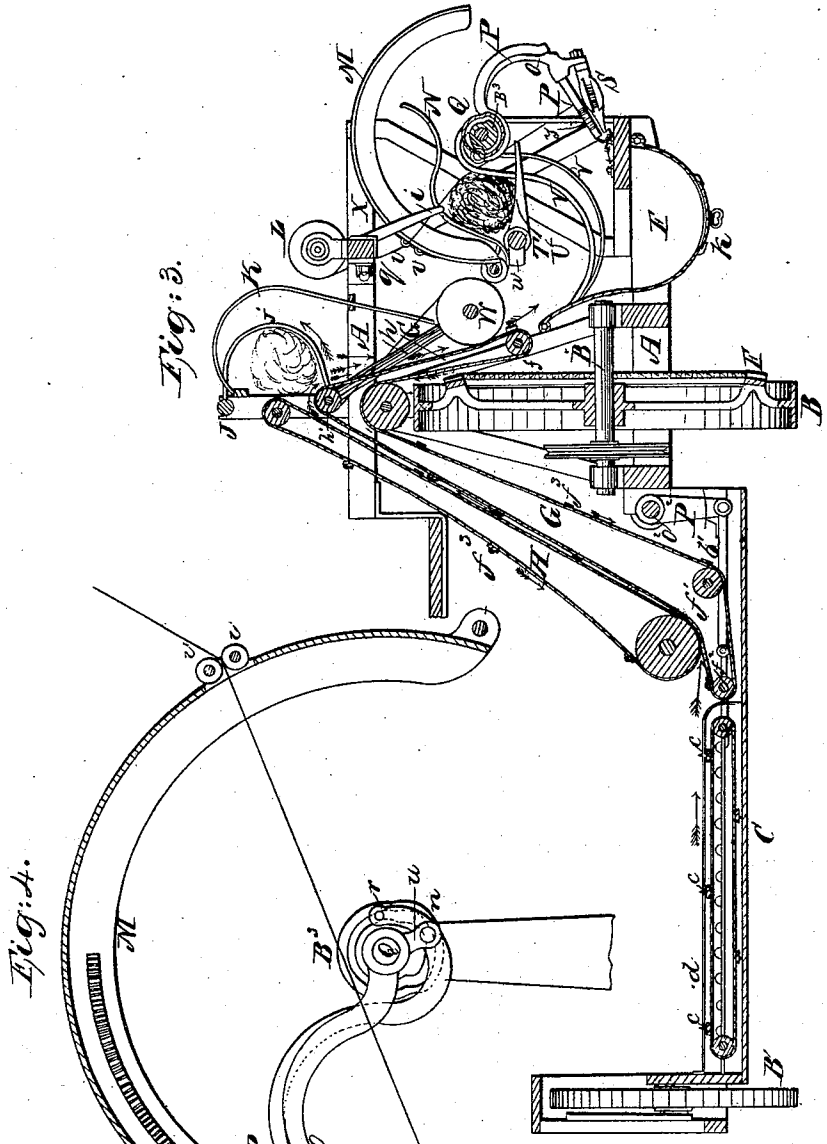

Fig: 4.

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UNITED STATES PATENT OFFICE.

S. D. CARPENTER, OF MADISON, WISCONSIN.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. 85,210, *dated December* 22, 1868.

To all whom it may concern:

Be it known that I, S. D. CARPENTER, of Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Combined Harvesting and Binding Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts wherever they occur.

To enable others skilled in the art to construct and use my invention, I will proceed to describe it.

My invention relates to machines for harvesting grain; and consists in certain improvements for conveying the grain from the platform to the binding mechanism, there compressing it into a bundle, and binding the same automatically; also, in providing means for catching and saving the grain that may be shelled in the process of conveying and binding it, all as hereinafter more fully described.

Figure 1 is a rear elevation of my improved machine. Fig. 2 is a top-plan view, and Fig. 3 is a longitudinal vertical section taken on the line *x x* of Fig. 2. Fig. 4 is a longitudinal vertical section of a portion detached and reversed.

I construct the frame A and the platform C in any suitable manner, and mount them on a single driving-wheel, B, as shown in Figs. 1 and 3, there being a wheel, B, at the outer edge of the platform for supporting it at that end. The wheel B is provided on one face with a circle of bevel-gear teeth, from which motion is imparted to the cutting, conveying, and binding mechanism, through the medium of a shaft, E″, Fig. 1, which has mounted on it, at the proper position, a bevel-gear wheel, engaging with the teeth E, this shaft carrying a bevel-gear, I^3, at its end. Near the back of the machine, and just inside or in front of which, is also secured a pulley, E′, which imparts motion to the belt O′, the latter, in turn, giving motion to the conveying-aprons, as shown in Fig. 1, and as hereinafter more fully explained. About the center of the main frame A is mounted a shaft, T, Figs. 1 and 3, which extends entirely across the machine, and at the edge of the frame is mounted another shaft, Q, which extends about half-way across, so as to bring the binder-arm and band at the center of the bundles. A shaft, I′, is so located that a bevel-gear, I″, on one end engages with a bevel-gear, I^3, near the end of shaft E″, and a similar gear at the opposite end of shaft I′ engages with a wheel, R, on shaft T, and thus imparts motion to the latter. On this same shaft T, by the side of wheel R, is located a spur-gear wheel, Y, which engages with a larger wheel, Z, on shaft Q, and thus imparts motion to the latter; the wheels Y and R being arranged to turn loosely on the shaft T, except when locked by a pawl, *a*, to a hub, *b*, as shown in Fig. 1, the wheels R and Y being either fastened together, or made in one piece, as preferred. The sickle is also operated from the shaft E″ by means of pitmen P^1, connecting at one end to a crank in said shaft, and at the opposite end to an arm, L′, secured to a rock-shaft, O^2, from which, at the opposite end, an arm, P^2, extends downward, and connects by a rod, *b′*, with the sickle, as represented in Figs. 2 and 3. Thus it will be seen that all parts of the mechanism is driven by the wheel B.

For the purpose of conveying the cut grain from the platform to the binder, which is located at the outer part of the frame A, I arrange on the platform an endless apron, I, which extends nearly across it, as shown in Figs. 2 and 3; this apron passing around rollers at each end, and having secured upon it, at intervals of about four inches, slats *c*, from the face of which a series of spikes or teeth project, there being a series of rods or bars, *d*, arranged above the apron, in such a manner as to support the grain and permit the spikes or teeth to project up between them, and thus take hold of the grain and carry it along as the apron moves, in the direction indicated by the arrow, Figs. 2 and 3, the rods *d* being curved eccentrically to the roller at the end where the grain is delivered, so as to carry the grain beyond the reach of the spikes in the slats, and thereby prevent the spikes from drawing the grain around under the apron, as shown in Fig. 3. Motion is imparted to this apron I by a belt, *o″*, as represented in Fig. 1.

Extending from the platform to the top of frame A are two endless aprons, G and H, the former extending up over a roller near the top

of the frame, and from thence down around another roller, f, which is located just above a series of curved bars, V, which serve as a cradle or pocket to receive and hold the grain as it is delivered by the apron G, as shown in Fig. 3. At its lower end this apron G has its under layer passing under a roller, f^1, and from thence extends along the platform around another roller, f^2, close by the end of the apron I on the platform, for the purpose of readily receiving the grain from the latter. The apron H is placed directly in front of and parallel with the main portion of the apron G, and so close to it as to bring the two so nearly in contact as to hold the grain securely between them, and thus insure its being carried up by them. In order to prevent the grain from slipping between these aprons and to keep it straight and in good order for binding, I secure upon the face of each apron a series of slats, f^3, the slats being arranged transversely across the aprons, as represented in Figs. 2 and 3. For the purpose of rendering them more efficient, I arm the slats on the apron H with a series of projections in the form of staples, the rounded surfaces of which prevent their catching or tearing the adjoining apron G, and at the same time prevent their retaining a hold upon any of the grain as it is delivered at the top and passes down on the rear into the cradle.

At the top of the frame A, and in rear of the point where the aprons G and H deliver the grain, I locate a series of curved rods, K, which serve as a guard to prevent the grain from being thrown backward, and causing it to pass down upon the cradle or bars V, as shown in Figs. 1 and 3. Upon the extreme top of the frame I locate also a shaft, J, to which is attached a series of curved arms or rods, J′, which serves as a cut-off to stop the flow of the grain into the cradle while the quantity therein is being removed by the rake-teeth U, as hereinafter explained. The shaft J has an arm, g, which is connected by a rod, g^1, to a lever, g^2, the rear end of which rests upon and is actuated by a cam, g^3, mounted on the binder-shaft Q, as shown in Fig. 1, this cam g^3 being of such a form, and so located on the shaft, as to raise the cut-off or rods J′, and hold them up about one-half of the time, long enough to permit a sufficient quantity of grain to pass down into the cradle to form a bundle of the required size.

Directly in rear of the rear portion of apron G is placed a shaft having a series of rollers, W, secured thereon at proper intervals, to permit the teeth of rake U to pass between them, the shaft being suspended, by arms h, loosely from the journals of the pulley h', over which the upper portion of apron G passes, as shown in Fig. 3, the rollers W thus swinging loosely, and resting against the rear face of apron G, and serving to assist in separating and conveying the grain down into the cradle, and prevent the straw from becoming disarranged or crossed, and at the same time preventing it from being thrown upon the binding mechanism. The rollers W are driven by a cross-belt from roller h', as shown in Fig. 3.

Upon the shaft T, which is located about midway between the rear end of apron G and the binder-shaft Q, I secure a set of arms, U, which thus form a revolving rake, the function of which is to sweep the grain from the cradle around under the shaft T, and up to the position indicated in Fig. 3, where it is held while the wire is passed around it. In order to compress the grain into a bundle, the central bars V′ of the cradle are raised somewhat above the others, as shown in Fig. 3; and above the bundle is located a compressor, N, which consists of two or more bent rods, pivoted to the end of a curved frame, M, and held down by a spring arm or pawl, i, which is released at the proper time by the shuttle-arm, as will be hereinafter explained.

The wire, which is fed from a spool, L, is carried around the bundle (while the bundle is held between the teeth U of the rotating rake and the compressor N) by means of a curved arm, O, secured upon and rotating with the shaft Q, as represented in Fig. 3. This binder-arm O carries at its outer end a shuttle, S, of peculiar construction, for twisting, cutting off, and holding the wire, which shuttle, together with the spool L, will form the subject of a separate application for a patent, and therefore need not be herein specially described.

The shaft Q, with the binder-arm, is constantly revolving, while the rake-shaft T revolves only at intervals, remaining stationary in the position shown in Fig. 3 one-half of the time. These relative motions are produced by the following means:

As previously described, the wheels R Y turn loosely upon the shaft T, except when locked thereto by means of the pawl a and collar b, as shown in Fig. 1. As they are constantly in motion, and gear into the wheel Z on shaft Q, it follows that the latter has imparted to it a continuous motion. On the wheel Z is a cam, l, which, when the wheel brings it around to the proper position, strikes against the free end of the lever-pawl a, and thereby disengages it from the notch in the collar b, which permits the wheels R Y to turn loosely on the shaft T, while the latter remains stationary, thus holding the teeth U in the position shown in Fig. 3, and where they remain, as previously stated, while the wire is wound around the bundle, and until the wheels R Y have made one revolution, at which time the wheel Z, which is double the diameter of the others, will have made a half-revolution, thus carrying the cam Z over to the opposite side, which leaves the pawl a free to engage with the collar b again, and thereby start the rake again. As represented in Fig. 1, there is a spring-arm, c', standing vertically by the side of collar b, with a notch or recess in its face, in which a pin, e', on the collar engages when

the pawl *a* is released, this spring-arm thus serving to hold the rake in the position shown in Fig. 3, while the bundle rests thereon.

The binder-arm O is secured rigidly to the shaft Q, and, as shown in Fig. 4, has a short arm, *u*, projecting from the opposite side of the shaft; and to this short arm is pivoted, at *n*, another curved arm, P, to the side of which, at its rear end, is secured a pin, *r*, which works in a cam-groove in the adjoining face of a stationary plate, B^3. Near the front end of the binder-arm O, and alongside of the shuttle S, is attached a tube, P^1, and in this tube is a flexible rod, having its upper end jointed to the arm P, while its other end is bent so as to protrude through a slot in the side of the tube P^1, where it terminates in a pointed hook, *t*, which has a shoulder on its upper and outward face. With these parts thus constructed and arranged, it follows that when the shaft Q has revolved far enough to bring the shuttle S around opposite the rollers *v*, where the wire enters the frame M, and at which time the shuttle will take hold upon the wire again, after having carried its end around the bundle, the offset in the cam-groove, operating on the short end of arm P through the medium of pin *r*, will cause its opposite end to recede from arm *o*, thereby drawing up the hook *t*, over the shoulder of which the wire will have slipped, and thus draw the loose portion of the wire up into the slot in the shuttle to the center of the twister Z, where it is held while being twisted, as will be more fully explained in my specification relating to the shuttle proper, to be hereafter filed.

A semicircular frame, M, is located directly over the shaft Q, in such a position as that when the binder-arm O revolves, the shuttle S will travel in this frame, which is recessed for that purpose, it forming about one-half of the circle described by the shuttle in its revolution, as represented in Fig. 4. The shuttle carries within it a circular, twisting, and cutting device, Z, which has on its periphery teeth that protrude through openings on each side of the shuttle, and on the inner face of the side of the frame M, next to the shaft Q, is arranged a rack, *m*, by which the twister Z is made to rotate as the shuttle passes along through that portion of the frame or race M, the rack *m* being of such a length as to give four revolutions to the twister.

As previously stated, the shaft Q extends only about half-way across the frame A, and the binder-arm O is secured upon its extreme end, directly under the frame or race M, to permit the wire to be carried past the end of shaft Q as it is wound around the bundle, and the end of arm O is beveled to prevent the wire from being caught thereon, and insure its passing on the free side of the arm O as the end of said arm passes by the wire where it enters the race or frame M. The shuttle S is swiveled on the end of the binder-arm O, so as to turn freely thereon, so that as soon as the shuttle leaves the race the tension of the wire from the spool pulls the shuttle over, causing it to make a half-revolution, and thereby assist in bringing the wire on the free side of the binder-arm.

Underneath the binding apparatus I locate a receptacle, F, for catching and saving the heads and shelled grain, there being an opening in the bottom, closed by a slide, *k*, for removing it when necessary.

The pulleys 1, 2, 3, and 4 are loose pulleys, used simply to give to the belt the proper direction and sufficient bearing on the other pulleys. One of these pulleys, 2, is hung on a swinging or pivoted arm, *s*, which has a slot in it, through which a set-screw passes, and by which the position of the arm and its pulley 2 may be adjusted, so as to tighten up the belt O′, as may be necessary.

The speed of the binding mechanism may be changed at any time by simply replacing the bevel-gear I^3 by another of a different size, either larger or smaller, and then adjusting the gear-wheel I″ on the shaft I′ to correspond. When the grain is heavy or thick on the ground the speed will need to be increased, and when light or thin the speed should be decreased—the speed of the sickle remaining the same in each case.

It will be observed that the frame X of the binder is made separate, and attached to the frame A by means of slotted corner-pieces *q* at the top, and by slats *e″* in its bottom piece, as shown in Figs. 1 and 3, to permit the binder to be adjusted forward or backward on the machine, so as to always bring the binder-arm and wire at the center of the bundle, whether the grain be long or short.

The shaft T has a bend or crank at its center, opposite the point of frame or race M, as shown in Fig. 3, and also in dotted lines in Fig. 2, this bend being for the purpose of furnishing room for the end of the binder-arm with the shuttle to pass through, and at the same time permit the shafts T and Q to be brought nearer together, and thereby reduce the size of the wheels necessary to be used thereon.

The binder-arm, as it passes the rollers *v*, where the wire enters the frame or race M, (the loose part of the wire having been received by the hook *t*,) at the same time releases the spring-arm *i* from its hold on the compressor N, thereby allowing the latter to rise, as the bundle is pressed up against it by the binder-arm, which carries the bundle up over the shaft Q, and drops it out behind on the ground. The compressor N is also intended to prevent the straw from rising so as to force the wire too high to be received by the hook *t*, as the line of the wire should not go above a line drawn from center of shaft 2 to center between rollers *v v*, before the hook *t* has received the loose end of the wire; and it may also serve to prevent the straw from getting into the race, where it would interfere with the

movements of the shuttle, or with the twister Z, by catching in the teeth and preventing it from rotating. Thus I am enabled to produce a complete working machine, which shall perform all the labor of cutting, conveying, compressing, and binding the grain into bundles, and then delivering it from the machine with no other help than that of the driver.

The operation will be readily understood from the foregoing description by any one familiar with this class of machines.

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

1. The combination, in a grain-cutting and binding machine, of the horizontal apron I, with its guards or rods *d*, the inclined aprons G and H, the cut-off J′, the revolving rake U, and the rotating binder-arm O, all constructed and arranged to operate substantially as and for the purpose herein described.

2. The slats f^3, with the staples, or equivalent devices, applied to the apron H, as shown and described.

3. The revolving rake, when arranged to move at stated intervals, substantially as described, for the purpose of sweeping the grain from the cradle, and holding it under the compressor while being bound.

4. A rotating binder-arm, constructed and arranged to operate substantially as described, for carrying the band around the bundle, and then removing the bundle, as set forth.

5. The combination of the arm P, having the sliding hook *t* attached, and the cam B^3, when constructed and arranged to operate substantially as described, for the purpose of drawing the wire to the center of the twister, to insure the operation of the latter, as set forth.

6. The shuttle-race or frame M, provided with the rack *m*, when arranged in relation to the binder-arm, substantially as described.

7. The receptacle F, located under the binding mechanism, for receiving and saving the grain, as herein described.

8. The compressor N, constructed and arranged to operate as and for the purpose set forth.

9. The cut-off consisting of the rock-shaft J, provided with the curved arms J′, arranged to be operated by means of the cam g^3 on the binder-shaft Q, through the medium of the levers g^2, rod g^1, and arm *g*, substantially as described.

10. The swinging rollers W, arranged to operate in connection with the apron G, as set forth.

11. Changing the speed of the binder, independently of the cutting or carrying mechanism, by means of gear-wheels l″, of varying sizes, applied to the shaft E″, as herein described.

12. The combination of the wheel Y, carrying the pivoted pawl *a*, the notched collar *b*, and wheel Z, with its cam *l*, when arranged to operate as and for the purpose set forth.

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