4 Sheets--Sheet 1.

J. GARRARD

Grain-Binder.

No. 169,252. Patented Oct. 26, 1875.

Fig. 2.

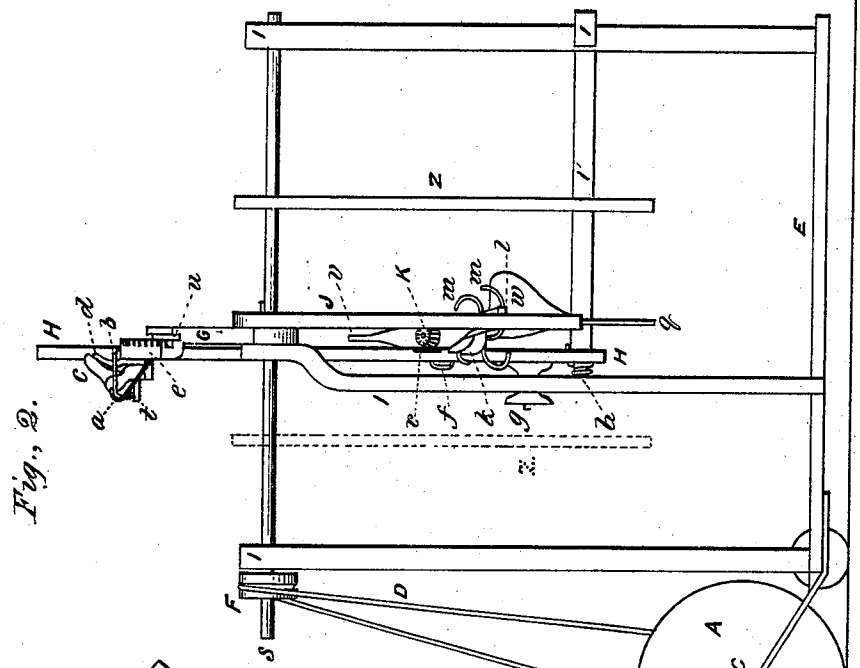
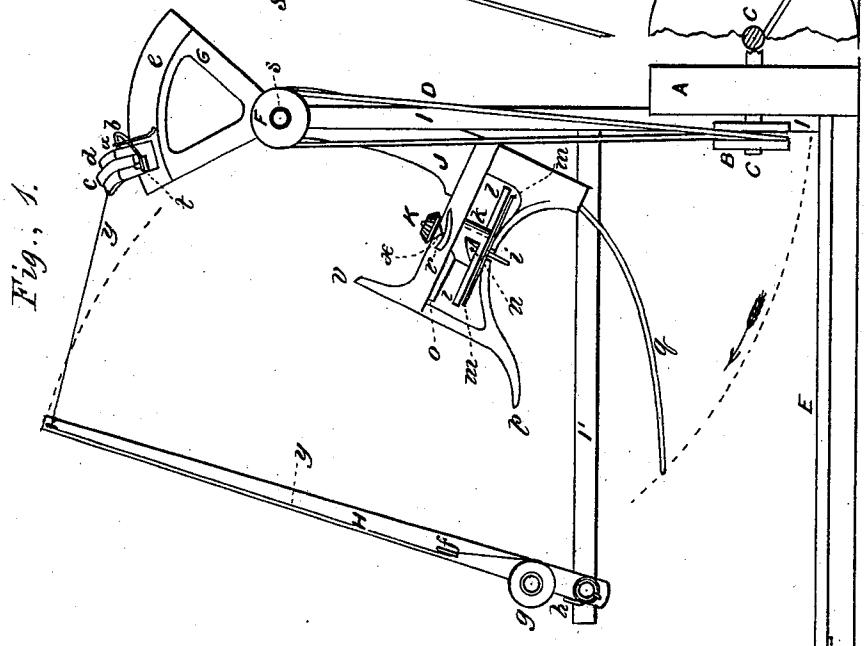


Fig. 1.



WITNESSES.

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Fig., 3.

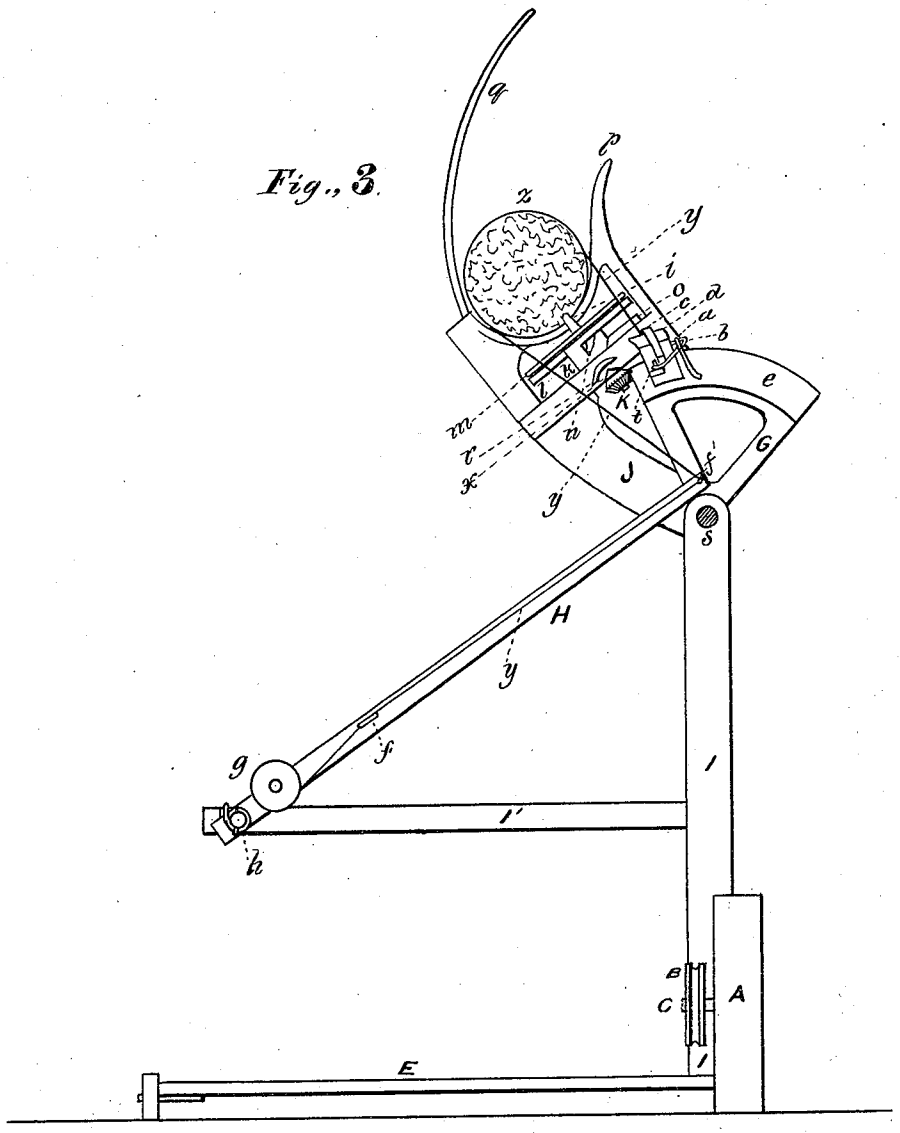

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Fig., 4.

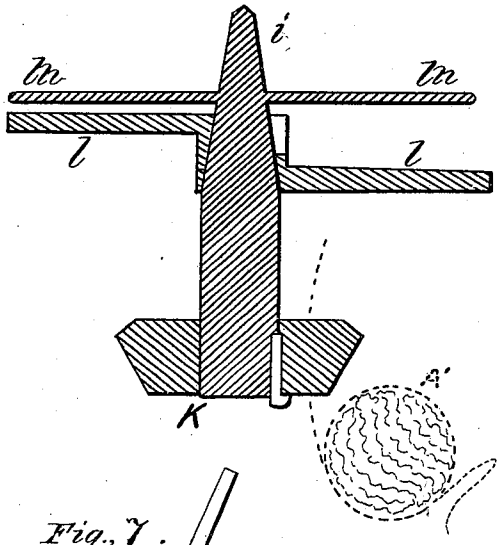

Fig., 5.

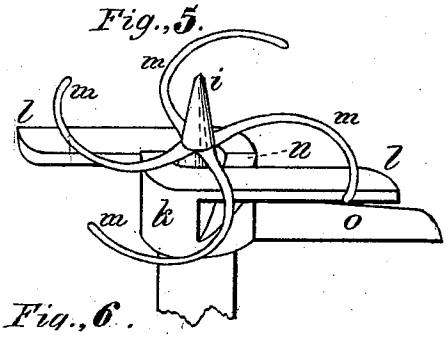

Fig., 6.

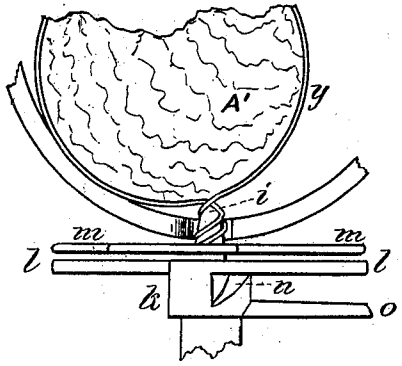

Fig., 7.

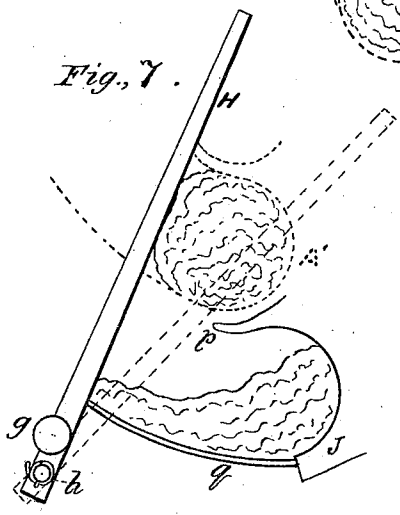

Fig., 15.

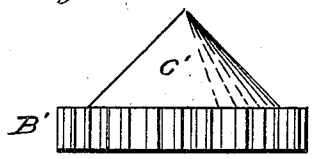

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Fig. 8.

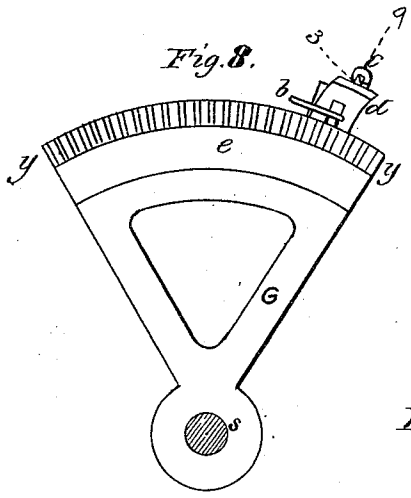


Fig. 9.

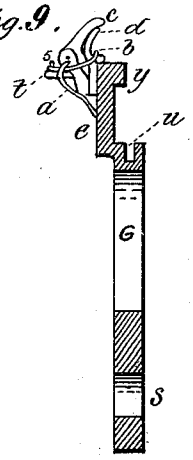


Fig. 10.

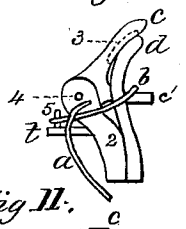


Fig. 11.

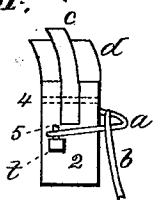


Fig. 12.

Fig. 13.

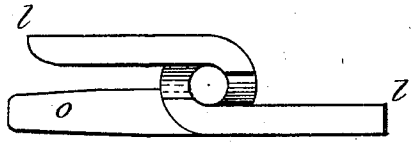
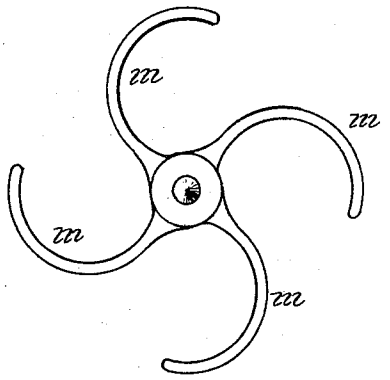


Fig. 14.



WITNESSES

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UNITED STATES PATENT OFFICE.

JEPTHA GARRARD, OF CINCINNATI, OHIO.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **169,252**, dated October 26, 1875; application filed September 11, 1875.

To all whom it may concern:

Be it known that I, JEPTHA GARRARD, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification:

My invention consists, first, in the combination, with a twister having a projecting core or center, as described in another application, of a sleeve constructed with arms and grooves to hold the ends of the wire, to permit their free escape when the sheaf is discharged. The invention further consists in the combination of the cradle, the former, the twister, and suitable wire-carrying devices, adapted and arranged to press the bundle into approximately cylindrical shape, and then release it, leaving the straw free to move upon itself while the band is drawn tightly about it under the action of the twister, as hereinafter set forth. The invention further consists in combining, with a cradle or grain-support, a twister having a fixed relation thereto, and formed with a prominence projecting beyond its twisting-arms and through the said cradle.

In the accompanying drawings, Figure 1 is a front elevation, showing the carrying-arms partly elevated. Fig. 2 is a side elevation. Fig. 3 is a front elevation, showing the position of the parts after the wire is passed around the bundle. Fig. 4 is an axial section of the twister and the sleeve within which it works. Fig. 5 is a perspective view of the same. Fig. 6 is an elevation of the twister and its accessories, illustrating the mode of twisting the wire upon the bundle. Fig. 7 is a diagram illustrating the action of the former on the bundle in different positions. Fig. 8 is a rear elevation of a segment-rack for imparting rotation to the twister, and of a device attached to said rack for holding and cutting the wire. Fig. 9 is a section on the line 9, Fig. 8. Figs. 10 and 11 are, respectively, a side and front elevation of the wire-cutter on a larger scale. Figs. 12 and 13 are, respectively, a front and side elevation of the sleeve within which the shaft of the twister turns. Fig. 14 is a front elevation of the twister. Fig. 15 is a view of a twister of modified form.

The terms "front," "rear," and "side," in the above description, refer to the front, rear, and side of the whole machine, and not to what may otherwise be regarded as the front, rear, or side of a detached part, irrespectively of its position in the machine.

A represents a driving-wheel, and B a band-pulley keyed on the shaft C of said wheel, and carrying a band, D, which drives, by a pulley, F, a counter-shaft, S, which is mounted in suitable bearings in the vertical frame I. On the frame I is rigidly mounted a bracket, G, constructed with a segment-rack, *e*. On the periphery of the bracket G is formed a guiding-groove, *u*. E represents a platform, of any suitable construction. On the counter-shaft S is mounted a carrying-arm, J, formed with cradle-fingers *p q*. One or more supplemental carrying-arms, Z, are also keyed to the shaft S, on either or both sides of the main carrying-arm J, as illustrated in full and dotted lines in Fig. 2. The supplemental arm or arms are constructed with cradle-fingers parallel with those of the main carrying-arm J, and adapted to act in conjunction therewith, forming together a cradle, into which the grain is raked, and by which it is carried upward to the binding apparatus.

The present invention is not limited in its connection to any patent raking mechanism.

A suitable raking apparatus of my invention will form the subject of a separate application for Letters Patent.

At the extremity of the horizontal extension I′ of the frame I is pivoted a former, H, consisting of an arm, which is pressed downward by a spring, *h*, causing it to bear upon the bundle of grain in the cradle formed by the arms J Z. *g* represents a wheel, on which is coiled the wire *y*. The wire is passed through eyes or guides *f f′*, the latter being at the extremity of the arm H. From thence the wire is carried to the cutting and holding jaws *c d*, which project upward from the bracket G, and is there held in readiness to be passed around a bundle of grain.

Fig. 1 shows the position of the parts when the cradle has begun to rise, and before it reaches the former-arm H. The former-arm at this time may be in the position shown in Fig. 3, its extremity resting on the shaft S. The contact of the grain in the cradle will gradually raise the former H, as illustrated

in the diagram, Fig. 7, where A′ represents the bundle of grain gradually acquiring a cylindrical shape under the pressure of the former-arm H during the upward movement of the cradle.

By reference to Figs. 1 and 3 in the drawings, it will be seen that, owing to the relative positions of the cradle, the former-arm, and the wire *y*, the bundle of straw will be pressed down by the action of the spring *h* until it reaches the position shown in Fig. 3, the wire rendering from the reel *g*, and being carried around the bundle of straw, as shown in Fig. 3, in position to be caught and acted upon by the twister, now to be described. This twister is carried by the cradle-arm J, and consists, essentially, of a number of curved arms, *m*, projecting radially from the shaft *i*, the end of which is of a conical form, and projects beyond the plane of the said arms *m*. On the base of the twister-shaft is keyed a pinion, which gears with the segment-rack *y*, to impart the required motion to the rotary twister.

The portion of the shaft *i* directly back of the arms *m* fits within a sleeve, *k*, which is constructed with projecting arms *l l o* and spiral grooves *n*, the parts being so constructed and arranged that, as the sleeve and twister are carried upward by the motion of the arm J, the two parts of the wire *y* will be received beneath or behind the two arms *l*, and will pass into the spiral grooves *n*, which assist in holding the wire before and after it is released from the nippers *c d*, until the completion of the twist. Both ends of the wire are swept into and secured by the sleeve at a half-revolution of the twister, and at this point the nippers *c d* open to release the first wire, and shortly afterward clutch the second. During the formation of the twist by the rotation of the twister *m* the extremities of the wire band are held by the sleeve *k*, the extremities of the wire band being snubbed around the shaft of the twister within the sleeve. This snubbing may give any tension required.

To cause the movable jaw *c* to bear upon and snub the wire, it is constructed with a projecting arm, *c′*, Fig. 10, which is pressed down by a spring, *b*, which may be secured to a pin, 5, on the lug *d*, and held down by the hook or yoke *x*. A guiding-stud, *v*, projecting backward from the base of the cradle, is received in the guiding-groove *u*, so as to hold the pinion K firmly in gear with the rack *y*. As soon as the twisting has begun, and the wire is carried into the grooves *n* of the sleeve *k*, a cam-flange, *r*, on the cradle-arm passes over the nipper-lug *c′*, holding the nipper firmly on the wire until the twister has begun its work. The nipper-arm *c′* is then thrown up by the tappet *x*, so as to release the end of the wire. The motion of the twister now carries a new portion of the wire between the cutters, and this is immediately severed by the contact of the depressed heel of the cam-flange *r* with the nipper-arm *c′*, the construction of the jaws being such that a portion of the wire attached to the shaft is left free, while the end of that portion going to the extremity of the former-arm H is snubbed, and firmly held in readiness to be carried around a new bundle at the next stroke of the machine. The continued motion of the twister *m* now forms a conical twist of wire on the projecting point of the twister-shaft *i*, the projecting end of the shaft causing the coil or twist to be carried closely to the surface of the bundle, so as to form it in cylindrical shape. The arms J Z being then carried beyond the bracket G, the sheaf is discharged from the cradle, the form of the spiral grooves *m* permitting the free escape of the ends of the wire after the twist is completed.

The characteristic value of my invention is, that the wire is so applied and twisted that it is closed firmly around and up to the surface of a rounded bundle. From the nature of the invention there results a continuous reduction of the diameter of the bundle until the twisting stops, and no change of form in the bundle is permitted after the twist is completed.

Straw freshly cut is practically inelastic, and when once pressed will be held in the required shape by a comparatively slight pressure.

My invention contemplates the use of any necessary pressure, of whatever amount, to bunch and approximately round the bundle, and the cessation of all pressure at the point where the twister begins to work.

The pressure is attained in my invention by the use of the former to compress and approximately round the bundle while the latter is held in the moving arms, and continuing in action no longer than the beginning of the movement of the twister, so that the tightening of the wire during the twist shall occur in the absence of all pressure or constraint on the straw by the former.

The reason for the cessation of pressure during the twist is this: the tendency of a bundle of straw free to move upon itself is to round itself from whatever shape it may have had impressed upon it. Therefore, when the former leaves the bundle and the twister begins its work, the reduction of the diameter of the bundle, free to move upon itself by the action of the spindle, must result in a cylindrical shape for the bundle. All that is necessary to a good bundle is to fix this shape. A perfect bundle is impossible unless this shape be fixed.

The wire may be used with any tension deemed necessary; but I do not depend on the wire for any compressing function until the twister begins to work, and then its function properly is to round the bundle and retain it, the spindle taking up the slack in the wire, which results from the bundle assuming a perfectly cylindrical shape.

It is essential to the full and effective operation of this invention that the twist be formed in actual contact with the surface of the bundle, while the latter is free to move on itself, so that it may assume its final cylindrical form

while the twister is revolving. To accomplish this I have provided means whereby the bundle is formed into approximately cylindrical shape; but instead of being held rigidly by clamping-arms while the twist is formed, as in many binders heretofore devised, it is released during the twisting operation, to enable it to take its permanent cylindrical shape while the twist is formed. The twist that secures the bundle is formed at the circumference of such cylindrical bundle, instead of leaving any slack or non-circular portion in the band to be taken up by the expansion of the bundle when it is discharged.

The following is claimed as new:

1. The combination of a sleeve, *k*, and a twister, constructed and operating substantially as herein set forth, to hold the loose ends of the wire band by snubbing them while the twister is in operation, and to permit their free escape when the twist is completed.

2. The combination of the former H, the carrying-arms J Z, the sleeve *k*, the arms *l*, the twister-arms *m*, and the spindle *i*, in conjunction, substantially as herein described, to press the bundle into approximately cylindrical shape, and then release it while the wire is drawn tightly about it, and locked by twisting, as set forth.

3. In combination with a cradle or grain-support, which leaves the bundle free to round itself during the twisting of the wire, a twister having a fixed relation to said cradle, and constructed substantially as set forth, with a prominence projecting beyond the plane of the twisting-arms, and through the cradle or surface on which the grain rests.

JEPTHA GARRARD.

Witnesses:

OCTAVIUS KNIGHT,

WALTER ALLEN.