(No Model.) 3 Sheets—Sheet 1.

J. F. STEWARD.

GRAIN BINDER.

No. 453,764. Patented June 9, 1891.

Fig. 1.

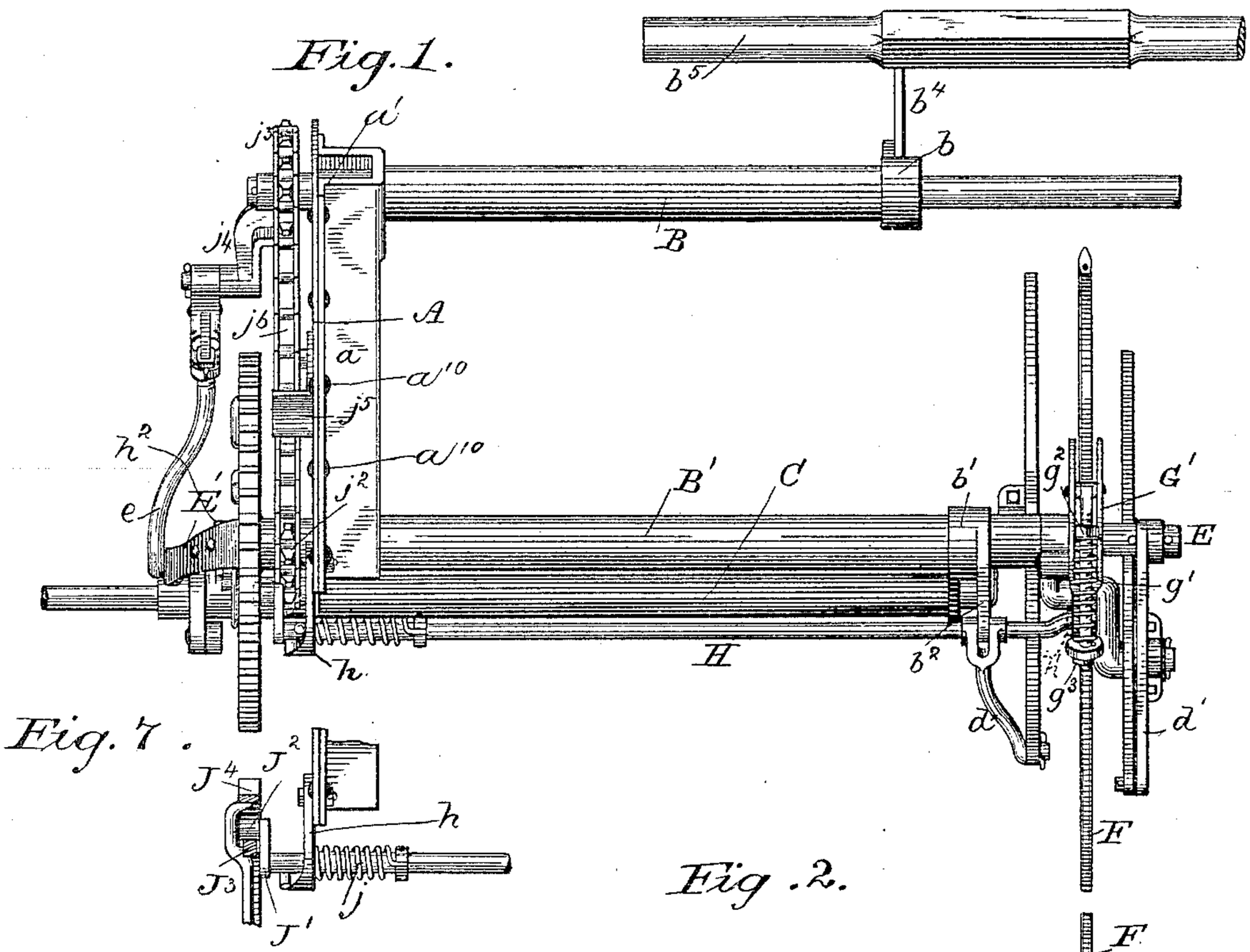
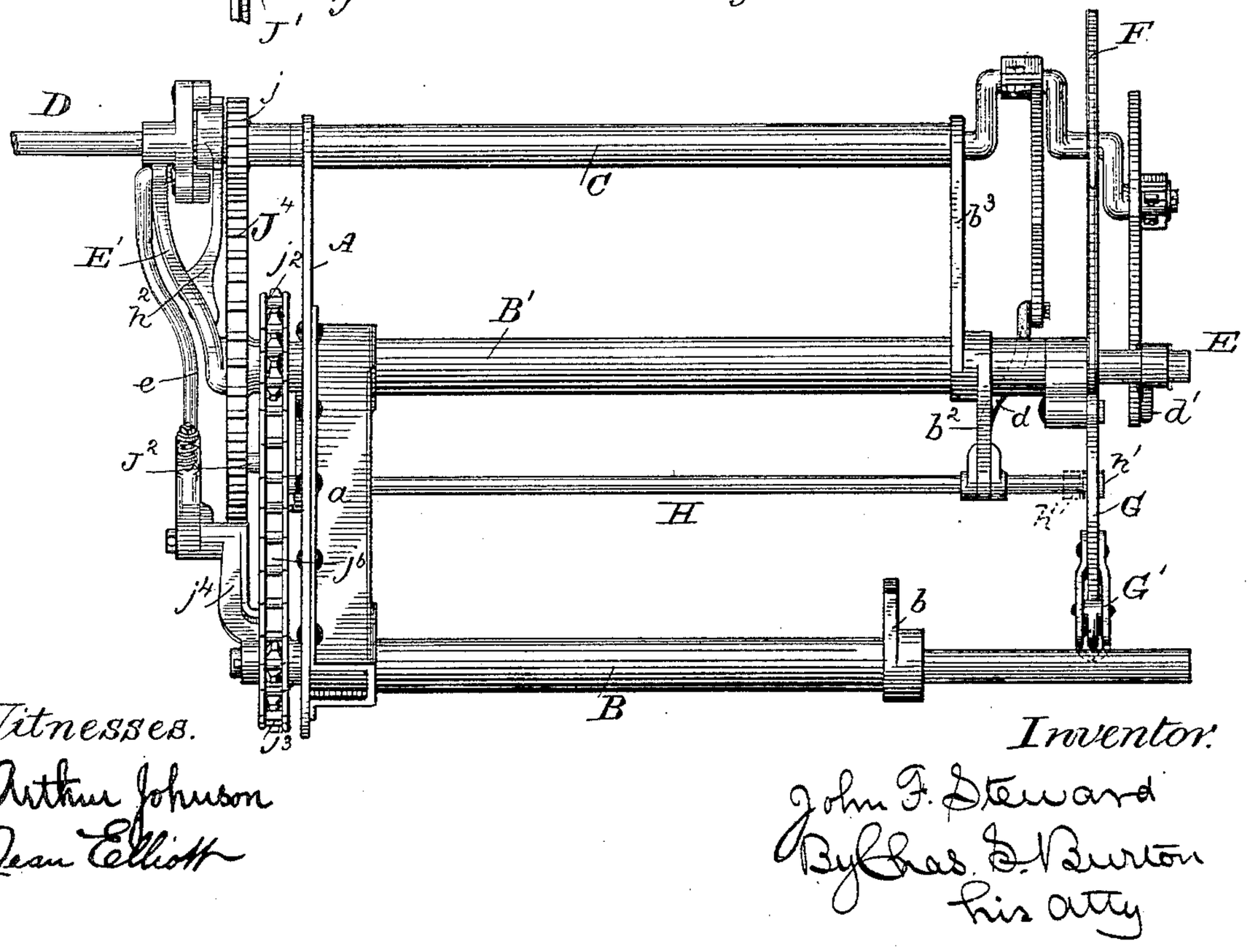


Fig. 7.

Fig. 2.



Witnesses.
Arthur Johnson
Jean Elliott

Inventor.
John F. Steward
By Chas. D. Burton
his atty

(No Model.)

3 Sheets—Sheet 2.

J. F. STEWARD.

GRAIN BINDER.

No. 453,764. Patented June 9, 1891.

Fig. 3.

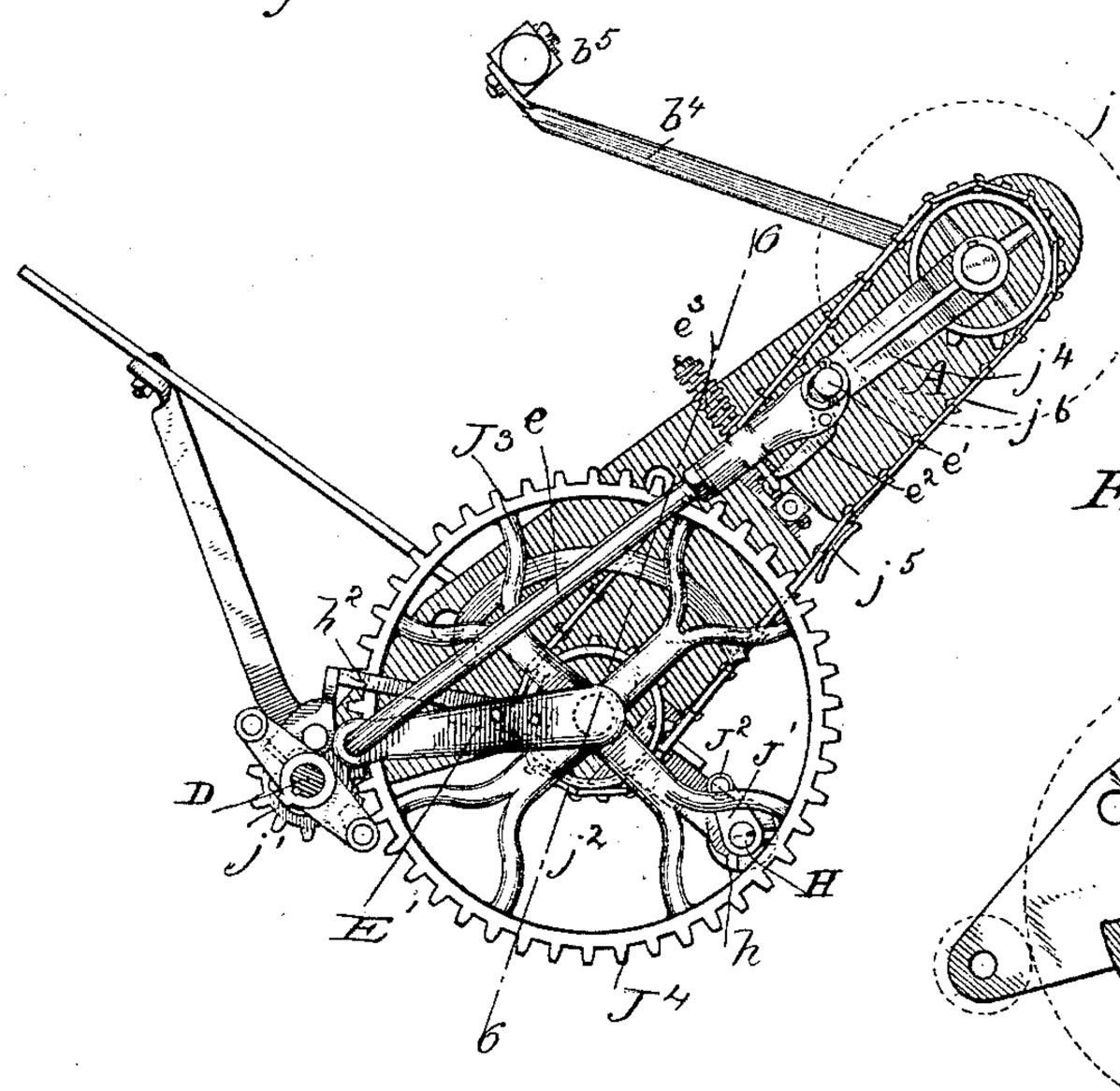


Fig. 8

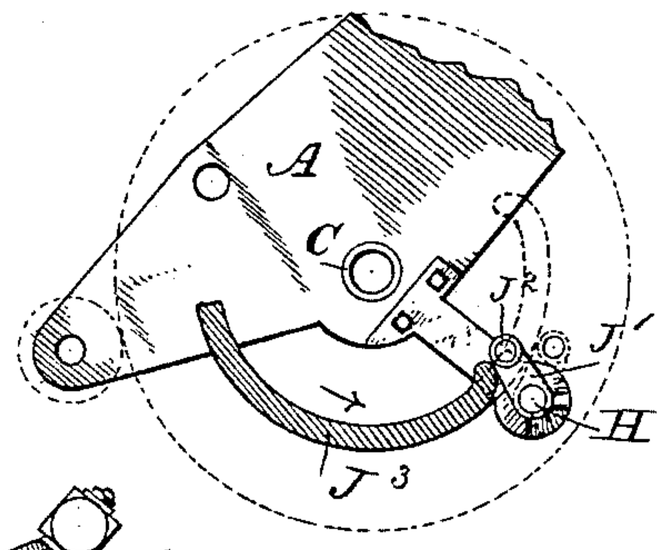
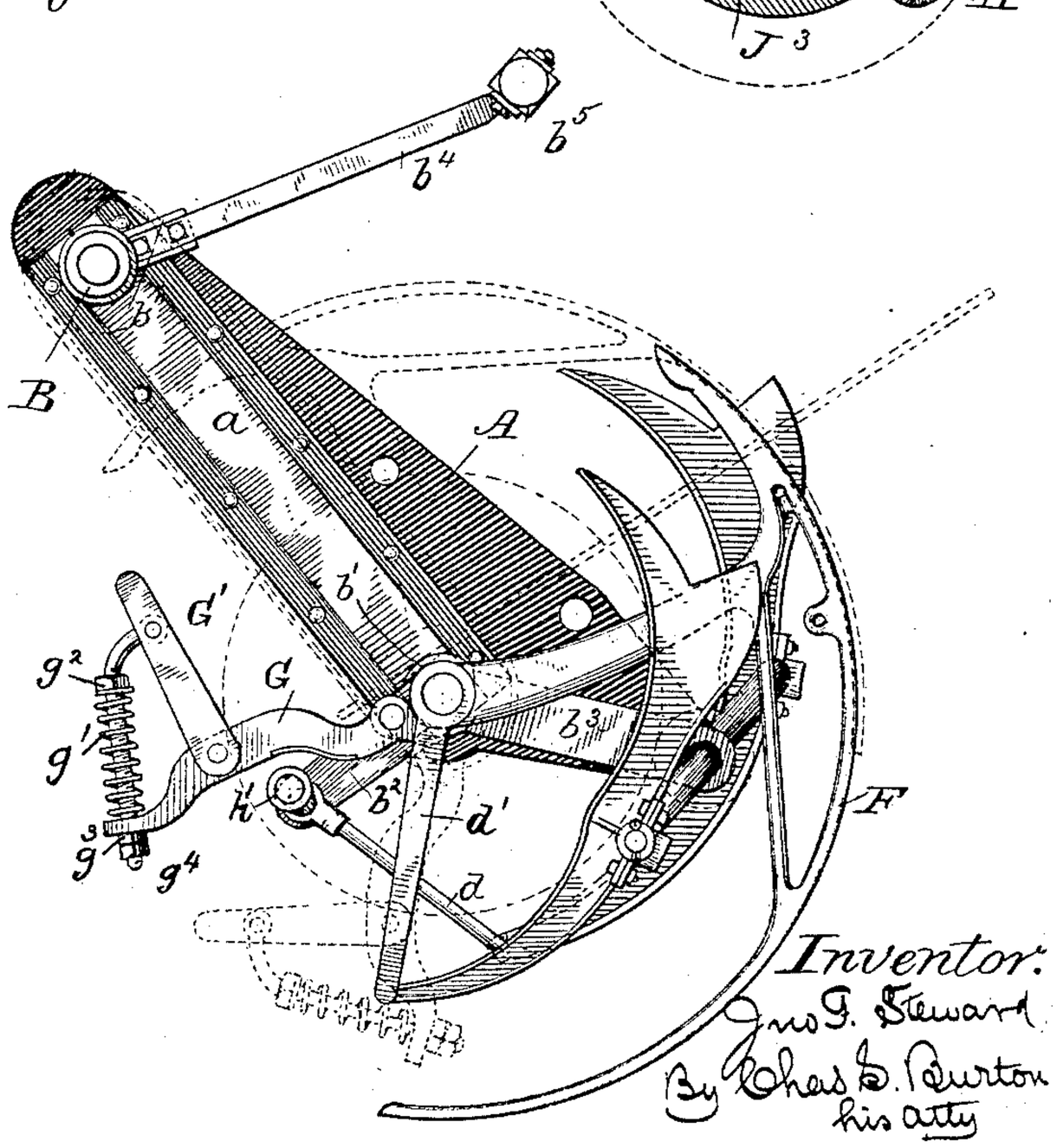


Fig. 4.



Witnesses.
Arthur Johnson.
Jean Elliott.

Inventor.
Jno F. Steward
By Chas D. Burton
his atty

(No Model.) 3 Sheets—Sheet 3.

J. F. STEWARD.

GRAIN BINDER.

No. 453,764. Patented June 9, 1891.

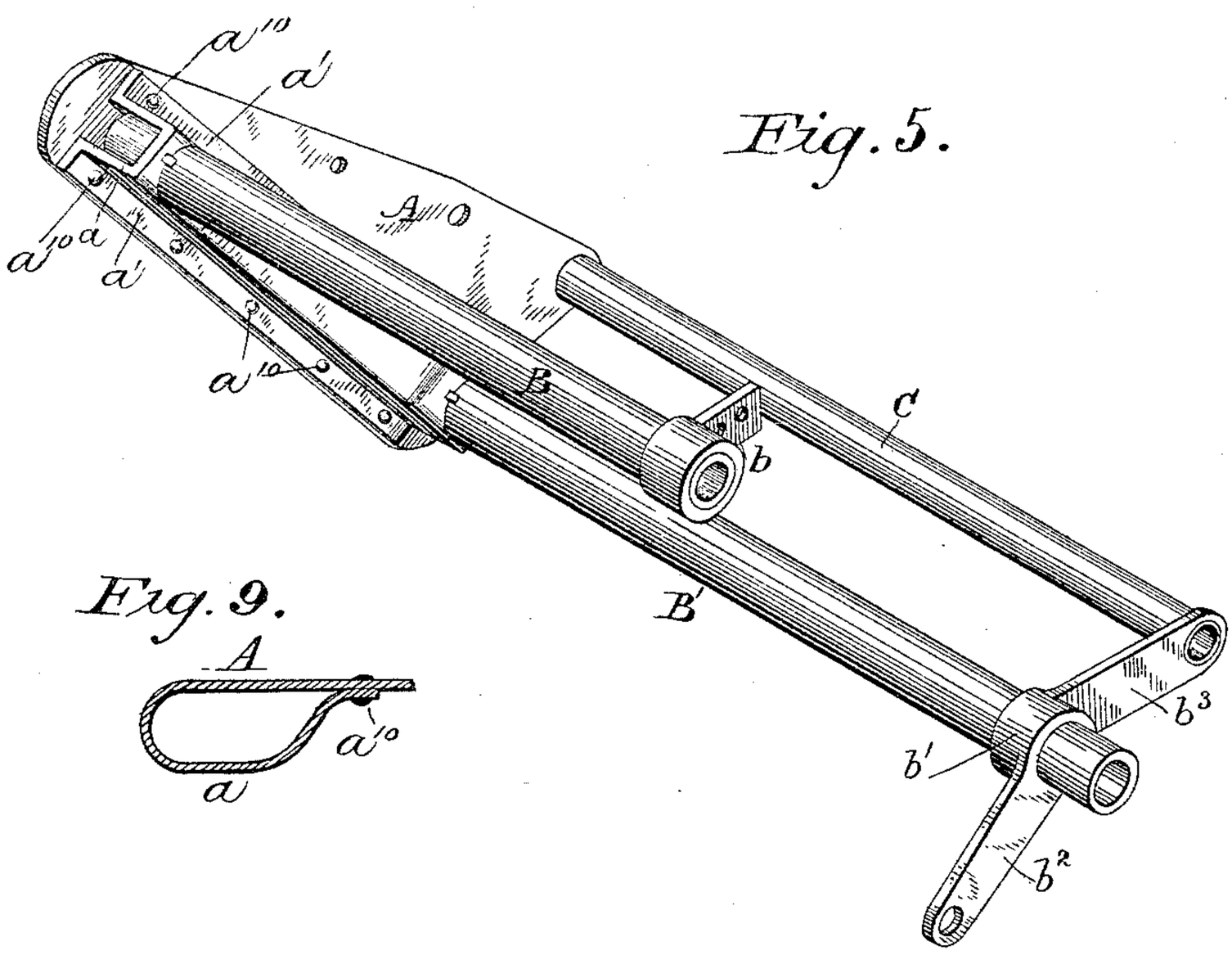


Fig. 5.

Fig. 9.

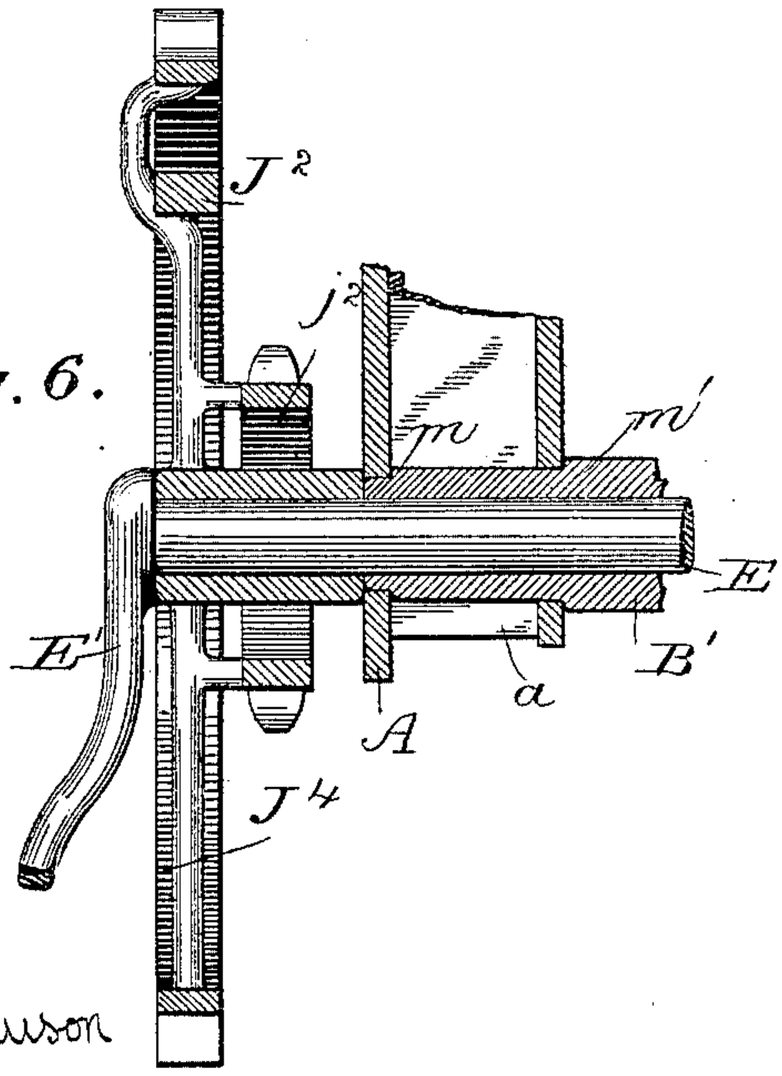


Fig. 6.

Witnesses.
Arthur Johnson
Jean Elliott

Inventor.
Jno F. Steward
By Chas. S. Burton
his atty.

UNITED STATES PATENT OFFICE.

JOHN F. STEWARD, OF CHICAGO, ILLINOIS.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 453,764, dated June 9, 1891.

Application filed August 30, 1888. Serial No. 284,311. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. STEWARD, of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Grain-Binders, of which the following is a full specification, reference being had to the accompanying drawings, in which—

Figure 1 is a stubble-side view. Fig. 2 is a plan view. Fig. 3 is a rear view. Fig. 4 is a front view. Fig. 5 is a perspective view of the frame. Fig. 6 is a sectional detail showing the bearing of the needle rock-shaft and the principal gear-wheel thereon and a portion of the frame adjacent thereto, the rock-shaft and its crank-arm being shown in elevation, section being made at the line 6 6 on Fig. 3; and Figs. 7, 8, and 9 are details.

The object of my invention is to overcome the objection found in grain-binders, due to their excessive weight, which necessitates greater strength and rigidity in the supporting-frames than would otherwise be necessary, and as much as possible to simplify the same.

The binder-frame consists of two shaft-supports, one for the needle-shaft and one for the knotter-driving shaft, and the said supports secured to one or more suitable pieces that shall sustain them and preserve their parallelism.

A is a plain plate of metal.

a is a channeled piece having flanges *a a'* turned so as to lie upon the plate A and the two parts secured by a series of rivets a^{10}, passing through both. The depth of the channel-piece is such as to give a thickness sufficient to support the shaft-supports B and B'. I find that if the plate A is made of metal one-fourth-inch thickness and the plate *a* three-sixteenths-inch thickness sufficient strength and stiffness will be produced. The support B is preferably of pipe and adapted to form journal-bearings for the knotter-driving shaft, and the support B' preferably of pipe for the needle-shaft. Upon the pipe B is a collar *b*, which forms means for securing the knotter-supporting brackets. Upon B' is a sleeve *b'*, having the arm b^2 to support the compressing device and the arm b^3 to support the packer-shaft.

The head-piece of the binder-frame consists of the parts A and *a*. It may be made of one piece of metal folded as shown in Fig. 9, and the single line of rivets a^{10} serves to unite the edges of the two parts.

In manufacturing, the holes through the head-piece of the frame into which the tubes are inserted may be punched before the said two parts of the frame are put together, and then the said holes counterbored to the exact size required and thus aligned. The hole through the plate *a* may be a little larger than the hole through the plate A, and the pipes B and B' may be turned down to fit the holes, forming the stop-shoulders *m* and *m'*, respectively. This, however, is not material. The pipes B and B' should be forced in by hydraulic or screw pressure and there keyed. The parts *b* and *b'* may be applied in the same manner. As means further than the pressure upon the tubes to hold them in place, it is advisable to galvanize the whole frame when completed, the galvanizing process soldering the joints perfectly, and thus preventing them from ever working loose. Extending from the head-piece A to the outer extremity of the arm b^3 is a sleeve C. This forms bearings for the packer-shaft. To the arm *b* is secured the brace b^4, supporting the wooden rail b^5, which in turn assists in supporting the usual knotter-frame. (Not shown.)

The packer-shaft D is provided with two cranks, each adapted to support a packer, one in front and one in rear of the needle. The packer at the rear of the needle is connected by means of link *d* to a pivot in the eye of the arm b^2. The packer in front of the needle is connected to the link *d'*, pivoted to the needle-shaft E. As the links *d* and *d'* do not vibrate upon coincident axes, I make them of different lengths, the link B' being enough longer than the link D, so as to give the operative points of the packers substantially a similar path of travel relatively to the arc of the needle F. The needle is provided with a heel-extension, in which is pivoted a compressor-bar G. The said compressor-bar is extended grainward and adapted to reach under the hub of the needle. This construction I do not claim, as it is shown in Patent No. 90,807 to John Appleby, dated

June 1, 1869. The compressor-bar G is thus drawn toward the needle as the latter moves up to lay the bands around the gavel, and compression thus produced.

Pivoted to the compressor-bar G is the compressor G′, and passing from near the top of the compressor downward through the stubbleward extension of the bar G is a rod bearing a spring g'. Upon the spring-rod are shown two nuts g^2 and g^3. By turning the nut g^2 downward the tension of the spring g' is increased, so as to render the compression more effective. If it is desired to rock the compressor G′ outward relative to the compressor-bar G to adapt it for large bundles, the nut g^3 is run farther onto the spring-rod, which effects the desired result. The jam-nut g^4 is provided to prevent the nut g^3 from working off.

H is a rock-shaft adapted to reach from end to end of the binder-frame, supported at one end in the eye of the arm b^2 and at the other end in the bracket h. The link d is adapted to span the end of the arm b^2 and the shaft H passes through both. At the rear end the shaft H is cranked upward to a slight extent, and to its end is applied the anti-friction roller h' in position to lie very close but not come in contact with the compressor-bar G when the binder is at rest. I make the compressing device act also as tripping mechanism, and for that reason I place the said roller h' a slight distance below the compressor-bar, so that the latter may move downward under the pressure of the accumulated gavel, and the downward movement under the pressure of the packers causes the needle to move slightly upward.

h^2 is an arm riveted to the needle-crank E′.

e is a pitman connecting the needle-shaft crank with a crank on the knotter-driving shaft, and is provided with an eye e' at its upper end.

e^2 is a lever adapted to press upon the wrist of the crank by means of a spring-rod e^3 and define the length of the pitman, but yet to permit it to shorten under pressure applied by the needle-crank, due to the compaction of the grain against the tripping mechanism. As this tripping mechanism constitutes no part of this invention, I will describe it no further, but refer to patent to Calvin P. Shufelt, No. 265,159, dated September 26, 1882, where it is fully shown and described. As soon as the binding mechanism is tripped into motion the compressor-bar rests upon the anti-friction roller h' and is drawn thereover by the movement of the compressor-bar G until the act of compression is completed. At this time it is desirable to permit the compressing device to drop, in order that the bundle may be ejected. To accomplish this I rock the shaft H upon its axis, and thus carry the supporting-roller h' downward. If the crank upon the shaft H is made sufficiently long, the supporting-roller h' will be carried so far as to permit the compressor G to fall sufficiently; but I have also shown means by which the said shaft is pulled endwise simultaneously with its rocking movement, which draws the supporting-roller from under the compressor-bar. To accomplish this I journal the shaft in the support h at the rear end of the binder-frame and adapt the lower end of this bearing to form a cam upon which rides a pin projecting from the shaft H.

J′ is an arm at the rear end of the shaft H, having an anti-friction roller J^2 upon its wrist.

Upon the gear-wheel J^4 there is fixed the cam J^3, concentric with said wheel throughout the greater portion of its extent, but eccentric at the end which is foremost in the direction of rotation of the wheel. This cam is located at such distance from the center of the wheel that its eccentric end collides with the anti-friction roller J^2, and thereby rocks the shaft H while the eccentric portion of the cam is passing said roller and holds it in the position in which it is thus rocked while the remainder of the cam is passing the roller.

In assembling the binder mechanism the wheel J^3 is so timed in respect to the remainder of the binder-train that this rocking movement of the shaft H takes place while the bundle is still resting upon the compressing device, and hence, although the former position of the crank supporting the roller h' is such that the stress brought upon it by the compressor-bar is exerted directly toward the crank-shaft axis, the rocking action of the shaft H drops it from said position, when the pressure upon the bar G will cause it to fall rapidly. The cam J^3 is sufficient to rock the shaft H to the full extent required to draw it endwise; but I prefer to have the downward movement of the compressor-bar aid in rocking it, because if it did not the roller h' would be drawn directly endwise from under the compressor-bar and considerable friction would result. Although it moves endwise, resistance to the withdrawal of the roller is less, because of the said rolling contact.

j is a spring coiled around the shaft H and adapted to return to its former position, thus restoring the crank which supports the anti-friction roller h' and returning the arm J′ to position for being operated by the cam J^3.

j' is a pinion clutched to the packer-shaft by the usual methods and adapted to engage and drive the gear J^4.

j^2 is a sprocket-wheel cast upon the gear-wheel J^4, and j^3 is a sprocket-wheel keyed to the knotter-driving shaft and provided with a crank j^4.

j^5 is an adjustable shoe provided for the purpose of taking up the slack in the chain j^6, which is thrown over the sprocket-wheel j^2 and j^3. The wheel J^4 is journaled on the needle-shaft. The band-placing and band-uniting devices are driven from the packer-shaft at one-fourth the rate of speed thereof. It is found desirable to provide the packer-shaft with a small pinion adapted to drive a

gear directly or indirectly four times its size. As usually constructed, a large gear is placed upon the knotter-driving shaft and between said pinion and the gear two intermediate gears. The placement of the large gear upon the projecting end of the binder-frame causes the binder mechanism to look top-heavy, besides throwing the weight upon the unsupported end of the binder. By placing the wheel J^4 upon the needle-shaft as an axis and the small sprocket-wheel upon the knotter-shaft the appearance is much improved, as well as the weight thereof being thrown to the supported portion of the binder. It is not essential that the tube C be soldered by galvanizing process, but it may be secured by any other means.

I consider the galvanizing process to be a valuable improvement, yet not essential, because the parts may be more thoroughly riveted, and hence said process dispensed with; but experience in manufacturing these frames has shown me that it is a valuable improvement.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A wrought-metal binder-frame consisting of a sheet-metal head-piece having two walls and the shaft-supporting arms thrust through said walls and supported therein, said frame being galvanized with zinc or other suitable metal, whereby the joints between said frame-walls and said shaft-supporting arms are soldered together, substantially as set forth.

2. A wrought-metal binder-frame consisting of a sheet-metal head-piece having two walls, the shaft-supporting arms B and B′ thrust therethrough and supported therein, all combined substantially as described.

3. In combination with the needle having the heel-extension, the compressor-bar pivoted thereto, the shaft H, having a crank which stands beneath and upholds the compressor-bar and along which support the said compressor-bar may be drawn, and mechanism in the binder-train which rocks the rock-shaft to withdraw the crank and allow the compressor-bar to fall, substantially as set forth.

4. In combination with the needle having the heel-extension, the compressor-bar pivoted thereto, the crank-shaft H, having a crank which stands beneath and upholds the compressor-bar and over which support the said compressor-bar may be drawn, and having also a crank at the opposite end, a wheel in the binder-train, which makes one revolution for each complete operation of the binder, having a cam which engages the last-mentioned crank to rock the rock-shaft and cause the first-mentioned crank to withdraw from the compressor-bar and allow the latter to fall, substantially as set forth.

5. In combination with the needle having the heel-extension, the compressor-bar pivoted thereto, the compressor pivoted to the compressor-bar and provided with a spring which reacts between it and said bar to elastically uphold the compressor thereon, the shaft H, having a crank upon which the compressor-bar directly rests and over which said bar may be drawn, and mechanism in the binder-train which rocks the rock-shaft to withdraw the crank to allow the compressor-bar to fall, substantially as set forth.

6. In combination with the needle having the heel-extension, the compressor-bar pivoted thereto, the crank-shaft H, having a normally-upstanding crank to support the compressor-bar mechanism in the binder-train, which rocks the crank-shaft once in each revolution to remove the compressor-bar-supporting crank from beneath the same, and a cam adjacent to one bearing of said crank-shaft, the crank-shaft having an abutment which traverses said cam as the shaft rocks, whereby the shaft receives an endwise as well as a rocking movement to withdraw the compressor-bar-supporting crank longitudinally from beneath said bar while it is also rocked away from it, substantially as set forth.

7. In a grain-binder, in combination with the needle rock-shaft, knotter-driving shaft, and the packer crank-shaft, a pinion on the packer crank-shaft, and a gear-wheel meshing therewith, loose on the needle rock-shaft between its crank-arm and its bearing, a sprocket-wheel rigid with said gear-wheel, a sprocket-wheel fast on the knotter-driving shaft, and the driving-chain connecting said sprocket-wheels, whereby the reduction of speed from the packer crank-shaft to the band-placing and band-tying mechanisms is effected between said pinion and said gear-wheel, to the avoidance of large gear-wheels at the upper part of the frame, substantially as set forth.

JOHN F. STEWARD.

Witnesses:
W. L. MILES,
S. C. HUMPHREY.