

(No Model.)

2 Sheets—Sheet 1.

I. LANCASTER.

GRAIN BINDER.

No. 324,122.

Patented Aug. 11, 1885.

Fig. 1.

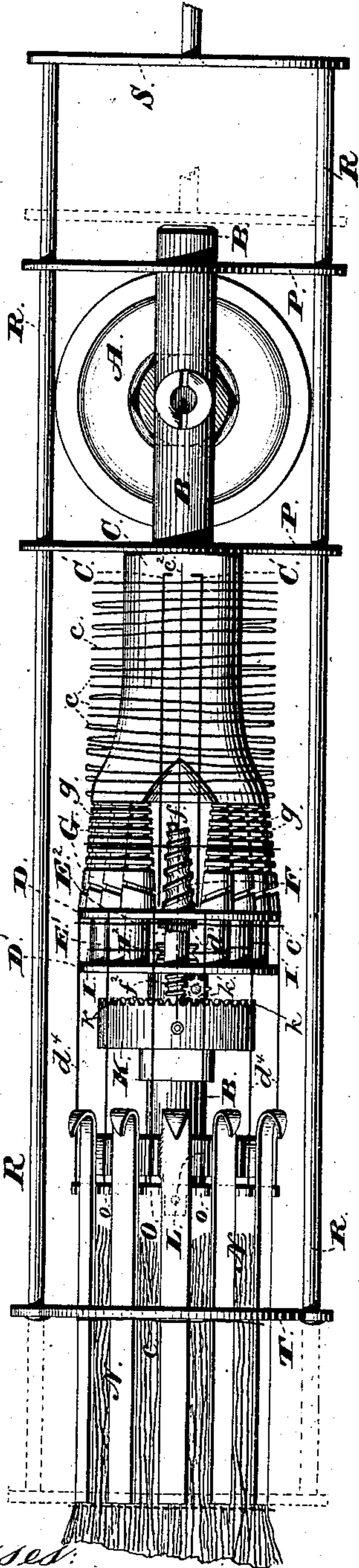
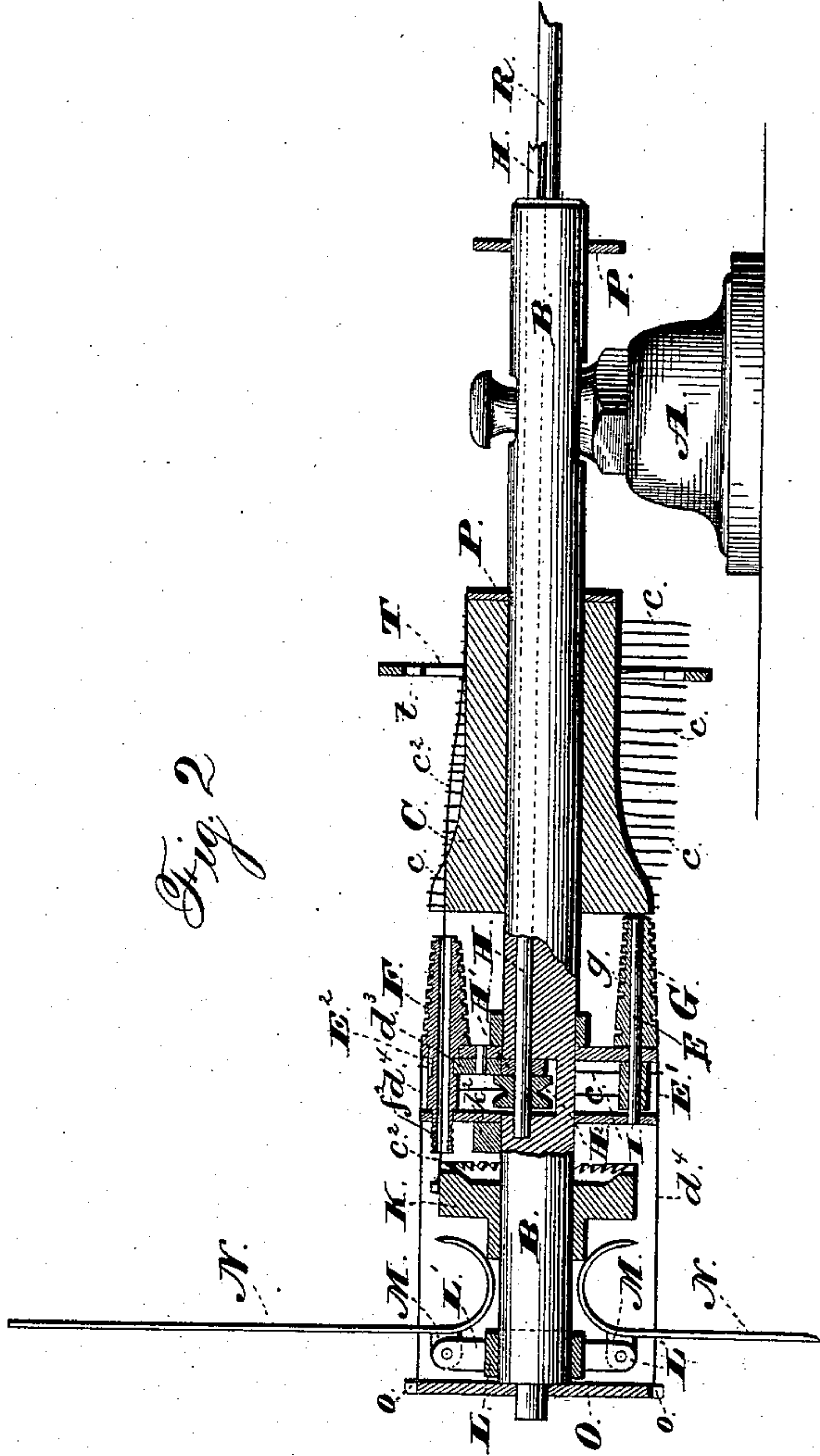


Fig. 2.



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Fig. 3.

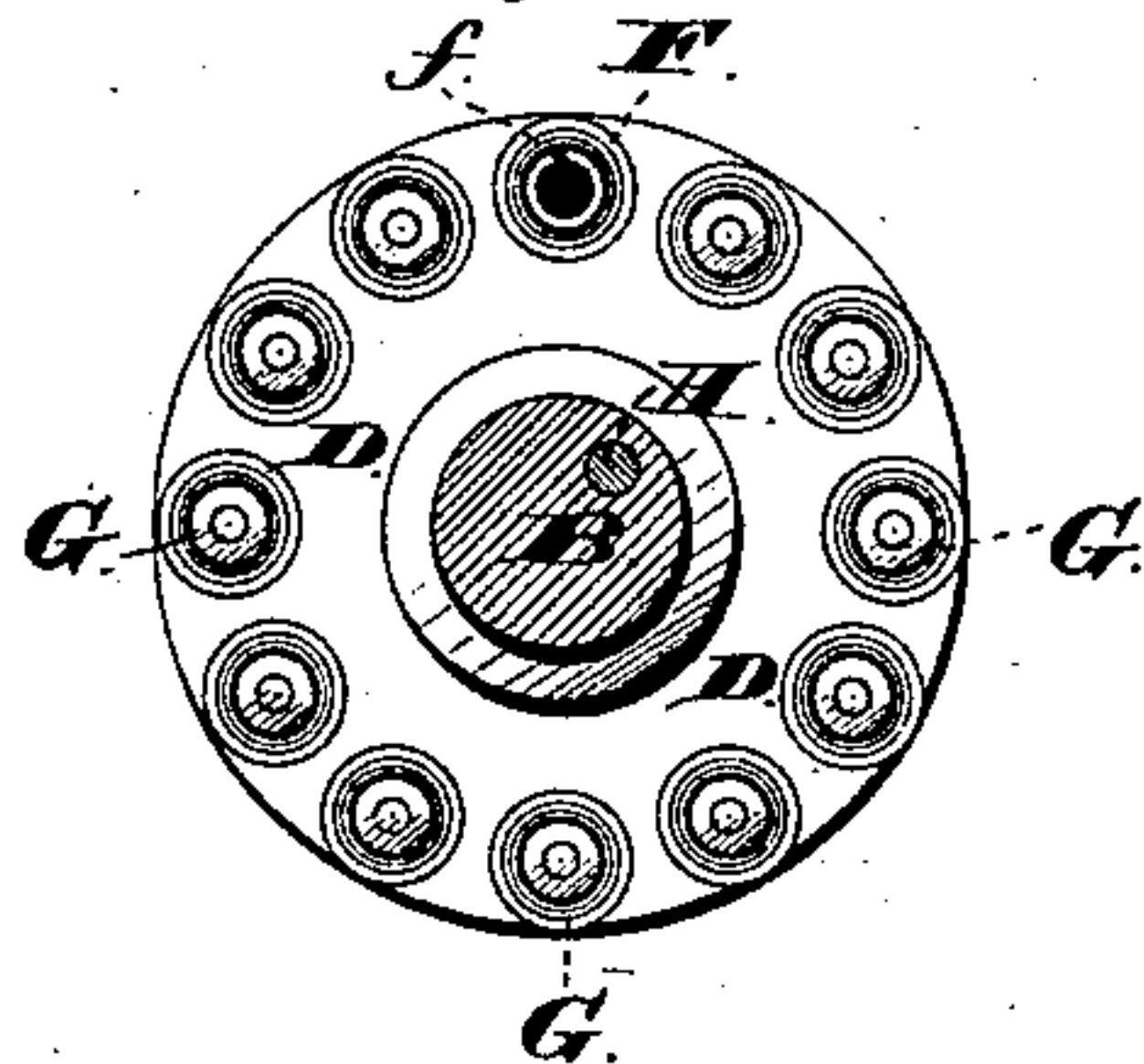


Fig. 4.

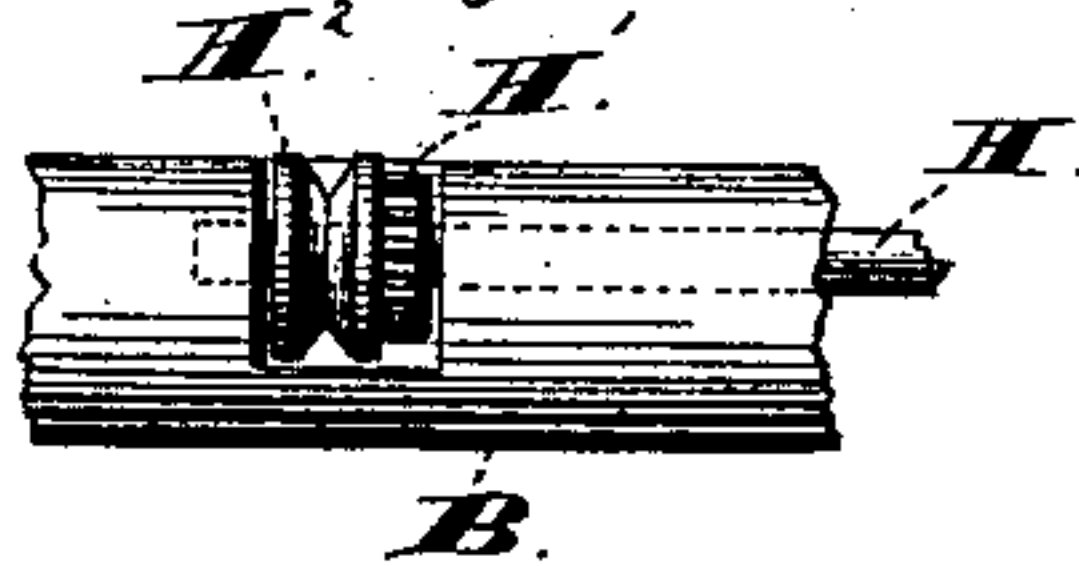


Fig. 5.

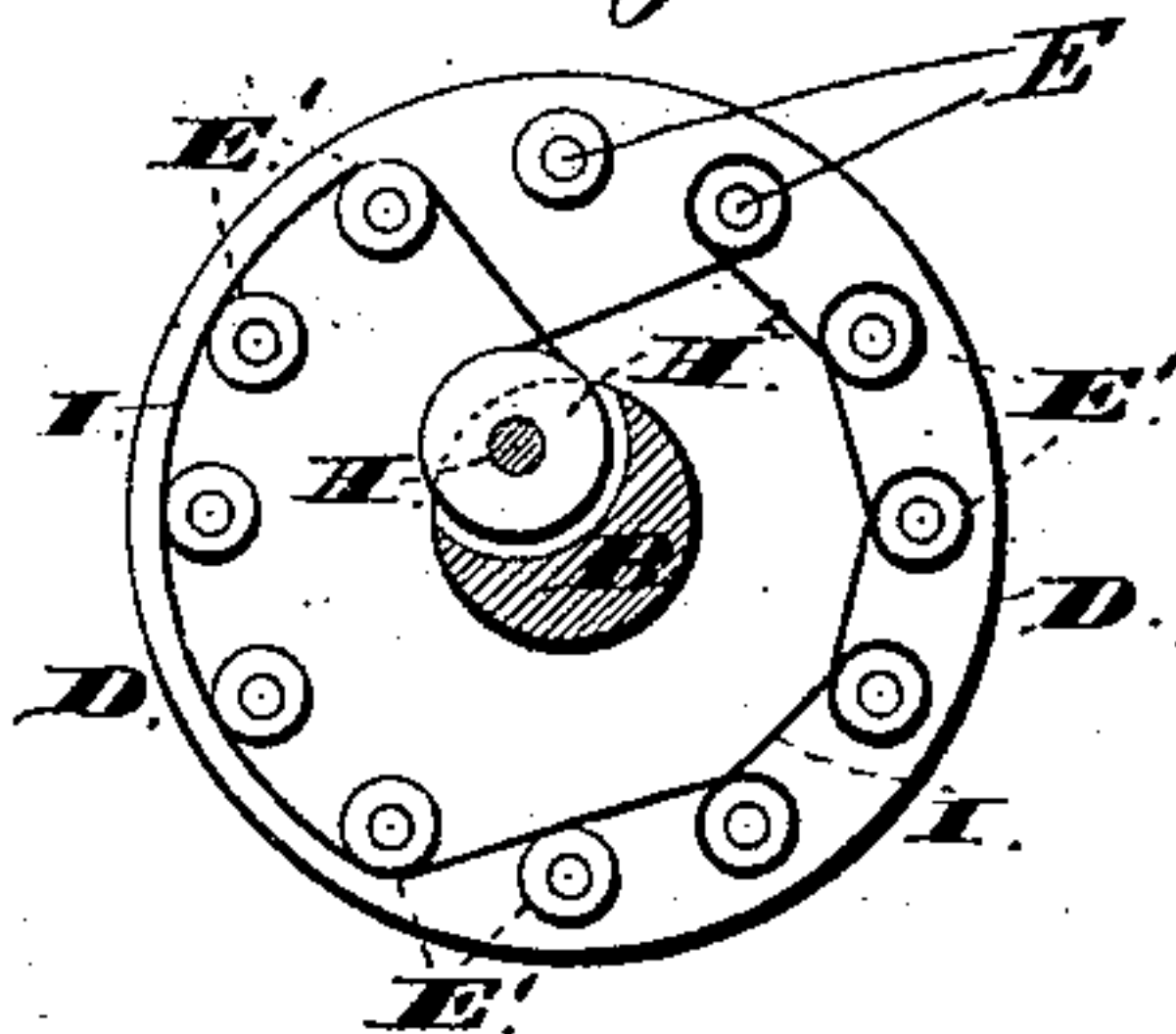
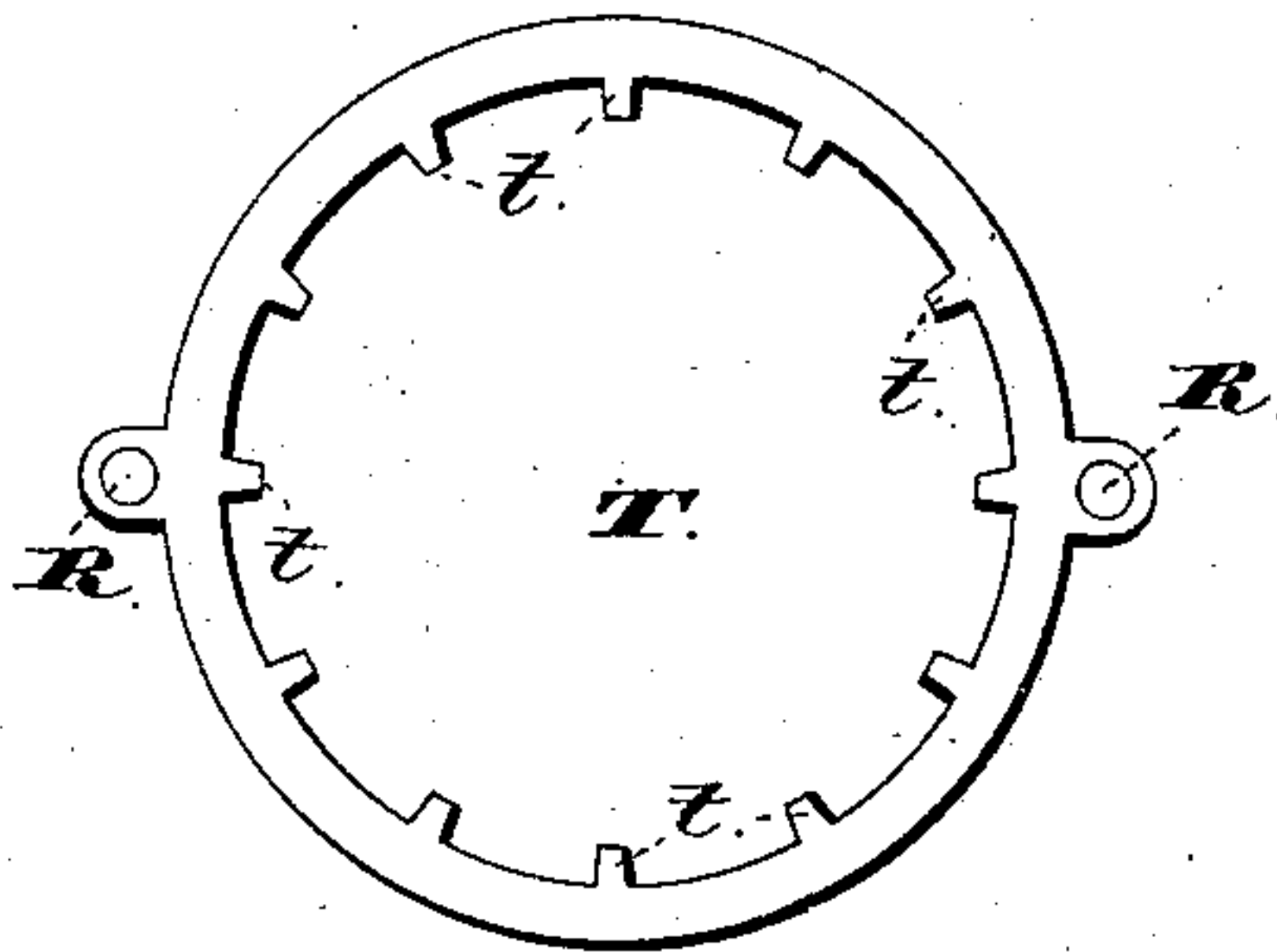


Fig. 6.



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UNITED STATES PATENT OFFICE.

ISRAEL LANCASTER, OF CHICAGO, ILLINOIS.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 324,122, dated August 11, 1885.

Application filed November 23, 1883. (No model.)

To all whom it may concern:

Be it known that I, ISRAEL LANCASTER, of Chicago, in the county of Cook, State of Illinois, have invented certain new and useful
5 Improvements in Grain-Binders; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a plan view of my binding
10 apparatus; Fig. 2, a view in side elevation of the same; Fig. 3, a detail view of the front spindle-supporting plate, showing the arrangement of the spindles; Fig. 4, a detail plan
view showing the spindle-operating gear-wheel
15 and pulley on the shaft journaled in the fixed supporting-shaft, the spindles and their pulleys being removed; Fig. 5, a detail view showing the means of operating the spindles; Fig.
6, a detail view of the ring for forcing the
20 band over the gavel.

The object of my invention is to provide an improvement in grain-binders whereby the usual knotting and twisting mechanism can be done away with; and to this end it consists
25 in the construction, arrangement, and combination of parts of a binding apparatus adapted to use prepared bands, as hereinafter described, and more specifically pointed out in the claims.

30 In the drawings, A designates a supporting-standard, which can be of any desired form and attached at any desired point to the frame of the harvester. This standard may be fixed on such frame, either outside or inside of the
35 driving-wheel, on the stubble side of the machine. Upon this standard is fixed or supported in any desired way the stationary shaft B, which serves to support the various parts of my binding mechanism. This shaft extends
40 toward the rear of the machine in a direction parallel to the line of travel of the latter. Obviously, however, the direction in which the shaft extends can be changed to suit any machine and any kind or manner of delivery
45 of the sized gavels from the reaping mechanism. Upon this shaft, to the rear of the supporting-standard, is fixed a spool, C, upon which the prepared bands *c c* are placed, ready for use; also, fixed upon the shaft and beyond the
50 end of the spool, as shown, are the two disks or plates D D', in which are journaled a series of short shafts, E E. All of these spindles carry

pulleys E' E' between the plates except the uppermost one of the series, which carries instead a pinion, E², driven as hereinafter set forth. 55
Upon the end of this particular shaft, on the front side of the plate D, is carried the conical screw-threaded spindle F, the threads of which are fine and of little pitch at its front end, but increasing in size and pitch toward the rear or
60 large end of the spindle. The extreme front end of this spindle is formed into a hook, *f*, as shown, and a longitudinal central passage, *f'*, extends through the spindle and the shaft thereof, which projects through and beyond 65 the plate D', and is there provided with a worm or screw, *f*², for the purpose to be described. The other shafts of the series journaled in the plates carry on the front side of plate or disk D conical spindles G G G, which 70 for the greater portion of their length from their small ends are provided with circumferential grooves *g g*. Near their rear ends these spindles are provided with spiral grooves of great pitch, as shown. All the spindles 75 except the one marked F extend close to the end of the spool C, and the outer surfaces of their ends close to the spool are within the plane of the periphery of the spool-flange. The spindle F does not extend to said spool. Attached to 80 the spool near its front end are spring-wires C', which extend along over it and the bands placed thereon. The rear free ends of these extend along on each side of spindle F, so as to cause the bands to take the grooves on the 85 latter when they are brought over them. Said wires also serve to keep the bands in place on the spool as they are carried along over it.

Journaled within the stationary shaft B is the rotary shaft H, extending beyond the front 90 end of shaft B, and rearward through said shaft to a point between the planes of the plates D D'. Upon this end of shaft H is fixed a pinion, H', and pulley H², a portion of shaft B being cut away to form a recess in which 95 they can turn, and to allow the pinion to project beyond the surface of said stationary shaft. This pinion or gear wheel meshes with the pinion *d*³, journaled on a stud on the rear face of plate D, and this in turn gears with and 100 drives the pinion on the shaft of spindle F. The shaft H is to be driven from any of the harvester-gearing by suitable intermediate mechanism. It is to be driven at such a rate

and the gearing connecting it with the spindle-shaft referred to is to be so constructed that the hollow spindle will revolve once for every gavel delivered or sheaf bound.

5 Around the pulley H^2 and the pulleys on the spindle-shafts passes the endless band I in such a way as to drive half the pulleys and spindles in one direction and half in the other, all as shown in Fig. 5. The pulleys H^2 and the
10 spindles' pulleys are to be so relatively sized that when the shaft H has turned enough to revolve the spindle F once the other spindles will have been turned through two or three full revolutions. Each of the bands c is com-
15 plete, being either spun in a continuous circle, or being formed of lengths of cord with their ends knotted together, and are to be of proper size to bind an average-sized bundle, or the particular size of bundle to be delivered by
20 the delivery mechanism of the reaper to which my apparatus is to be applied. After the bands have been prepared they are strung upon an annealed wire, c^2 , and detachably fastened in place thereon by means of paste or
25 glue. The end of the wire is passed through the hollow spindle and shaft, and is then attached to a pin on the periphery of the short cylinder or wheel K , journaled on the fixed shaft B to the rear of plate D' . On its side
30 toward said plate it is provided with gear-teeth k , which mesh with the pinion k' , journaled in a bearing-block, k^2 , attached to plate D' . The teeth of this pinion are also engaged by the threads of the worm f^2 on the hollow
35 shaft of spindle F . Said pinion is of such a size and number of teeth that as the spindle revolves once for each bundle bound the feed-wheel K , to which the end of the band-carrying wire is attached, is turned just far enough
40 to pull the wire through the spindle and shaft a distance equal to that between the bands on the wire. Upon the rear end of the shaft B is fixed a sleeve, L , having a series of radial rigid arms, $L' L' L'$, extending from its outer
45 surface. To the outer ends of these arms are pivoted the lugs M , attached to or forming a part of the bars $N N$. As shown, these bars at their ends toward the front of the apparatus are bent up and out to stand at right angles to
50 the main portion of the bars. The lugs on the arms stand at right angles to the surface of the bars, so that the latter swing upon their pivots in planes radiating from the axis of the stationary supporting-shaft B . Beyond the
55 sleeve L , and fixed to the end of the shaft, is the disk O , having notches $o o$ in its edge. The disk is of such size that the bars will be stopped in their turning down on their pivots when they have reached a horizontal and parallel position. These bars are of such a width
60 that when they are turned down parallel with each other spaces are left between them, and they therefore form a slotted cylinder, for the purpose to be hereinafter set forth. Upon
65 the stationary shaft, on each side of the supporting-standard, are fixed plates $P P$, having through their outer ends holes adapted to re-

ceive and guide parallel rods $R R$ on opposite sides of the fixed shaft and outside of the mechanism supported thereon. At their front
70 ends these bars are connected together by a cross piece or plate, S , and at their other ends they are fastened to opposite sides of the ring T , which is provided with inwardly-projecting teeth $t t$, adapted to pass along between the
75 bars $N N$, when they are turned down, so as to form the slotted cylinder, as described, and the ring is slid over them, as shown in Fig. 1. The notches $o o$ in disk O allow the free passage of the teeth on the ring as it is slid onto
80 and off of the bars.

Attached to the edge of disk D are wires $d^1 d^1$. They are fastened, as shown, preferably, in notches in the edge of the disk, so that their front ends extend down between the spindles
85 while their rear ends extend to the disk O , and preferably rest in the notches therein. If desired, they can be so arranged that their ends just extend to but do not rest on said disk. To the cross head or piece S is attached
90 a pitman or rod to be reciprocated by suitable connection with some moving part of the reaper mechanism, so that it shall be given one full reciprocation to carry the ring on the other end of the rods from the point marked
95 x in Fig. 1 to the end of the pivoted bars and back again at the delivery of each gavel.

My binding apparatus is intended to work in connection with that kind of reaper where the cut grain falls on a moving apron and is
100 elevated to the binding-platform; but it can also be used equally well on the low-down form of reaper. The ring T may be connected by pitman and pin to the driving-wheel of the reaper, if desired.
105

The operation of my binding apparatus is as follows: By the action of the feed-wheel pulling upon the wire carrying the bands they are brought up in succession within reach of
110 the separating hook or spur on the end of the hollow screw-spindle F . As this hook is carried around by the revolution of the spindle it separates the band from the wire, and by the action of the screw-threads on the spindle the band is then carried up and back on the
115 spindle. Such carrying back of the band by the threads on the screw-spindle also serves to move them back over the other spindles. As these spindles revolve half in one direction and half in the other the band is not moved
120 around the series of spindles, as would be the case if they all revolved in the same direction. When by the action of the screw-spindle a band is carried backward until it becomes engaged by the grooves of great pitch at the base
125 of the other spindles, it is quickly carried back over the rest of the length of said spindles and brought up onto the wires d^1 within reach of the teeth within the traveling ring.

When my apparatus is in operation, as many
130 bands will be on spindle F as there are turns in its thread, so that one will be carried up into place for every turn of said spindle. The mechanism is so turned that a band will be

brought up off the spindles into place just before the ring starts from its position over the spool on its travel toward the rear of the apparatus. The pivoted bars are then in position at right angles to and radiating from the stationary shaft, with their bent ends down between the feed-wheel and the series of fixed radial arms on which they are pivoted. A gavel is then to be brought by the delivery mechanism of the reaper with its butt-end within reach of the pivoted bars. The band-carrying ring is then forced toward the bars and gavel by its connection with the actuating-gearing of the reaper through the arms to which it is attached. In its travel it strikes the band and carries it along over the supporting-wires therefor. When the ring strikes the bars, it turns them down so that they clasp the gavel and compress it, and then carries the band along over the slotted cylinder formed by such bars, and off the end thereof onto the gavel so as to bind it into a bundle. The ring then travels back to its first position, on its way to which it strikes the upturned short ends of the bars, and so turns the bars up into the radial positions they occupied at the beginning of the operation. The band-feeding mechanism can be turned as desired to bring a band up into position to be engaged by the ring, either just after the ring has passed over the disk D on its return travel toward the front of the apparatus, or just before it reaches such disk on its travel toward the bundle-compressing end of said apparatus.

Having thus described my invention, what I claim is—

1. In combination with the series of bars pivoted to swing in planes radial from the same center, each one at its pivoted end turned up at or near a right angle, the ring adapted to slide over the bars, and provided with teeth or projections to extend between the bars as the ring passes over them, means for reciprocating the ring over the bars, and means for feeding a prepared band into position in front of the ring, so as to be carried along thereby, substantially as and for the purpose described.

2. The notched disk on the fixed shaft, adapted to limit the swing of the pivoted bars inward toward each other, in combination with the bars pivoted to swing in radial planes from the fixed shaft and bent up at right angles at their pivoted ends, the internally-toothed ring, and means for forcing it over said bars to their ends and off again, substantially as shown and described.

3. In combination with the notched stop-disk, the pivoted hooked bars, the disk on the same fixed shaft with the stop-disk and beyond the hooked ends of the bars, the wires attached to the edge of such disk and extending to the periphery of the stop-disk, means for feeding a prepared band up into place on these wires, and the traveling ring adapted to force the band along over these wires and the pivoted bars onto the gavel compressed

between the latter, substantially as and for the purpose described.

4. In combination with the series of prepared bands strung upon a wire or cord, means for taking one of these bands from its wire or cord and feeding it up into position to be engaged by the carrier-ring and forced along over the gavel-compressing bars, substantially as and for the purpose described.

5. In combination with the wire or cord carrying the prepared bands strung thereupon at certain distances apart, means for feeding said wire or cord along so that a new band will be engaged by the band-feeding mechanism for each bundle bound, substantially as shown and described.

6. In combination with the wire carrying the bands, the feed-wheel to which one end of the wire is attached, in combination with means for turning it so as to feed the wire along to bring a new band to the band-feeding mechanism for each bundle bound, substantially as shown and described.

7. The spirally-grooved spindle on the hollow shaft, provided at its smaller end with a hook adapted to take the bands in succession from the wire upon which they are strung and pass them over the spindle, to be engaged by the grooves thereon as the wire is pulled through the hollow shaft by the mechanism provided therefor, substantially as shown and described.

8. In combination with the band-feeding spindle, the feed-wheel for the wire upon which the prepared bands are strung, driven through suitable connecting mechanism from the shaft of the spindle, substantially as and for the purpose set forth.

9. In combination with the spirally-grooved band-feeding spindle provided with the separating-hook, the rotating shaft of the spindle, the feed-wheel for the band-carrying wire or cord, and suitable connecting mechanism between the spindle-shaft and the wheel, whereby the wheel is driven at such a rate that the feed-wire is pulled along to bring a new band within reach of the separating-hook at each revolution of the spindle, substantially as and for the purpose described.

10. The combination of the spirally-grooved spindle, having the band-separating hook at its small end, its hollow shaft with screw-threaded portion, the pinion adapted to engage with its teeth this threaded portion of the shaft, and the teeth on the feed-wheel, to which is attached the end of the band-carrying wire which passes through the hollow spindle-shaft, substantially as shown and described.

11. In combination with the spirally-grooved band separating and feeding or conveying spindle, the series of rotating grooved spindles, adapted to bring the band into a circular form as it is carried along over them and aid the spirally-grooved spindle in bringing the band into position to be acted upon by the

mechanism for forcing it over the gavel, substantially as and for the purpose described.

12. In combination with the spirally-grooved band separating and conveying spindle, the
5 series of rotating spindles circumferentially grooved for a portion of their length, and at their large ends provided with spiral grooves of quick pitch, as shown and described, and means for rotating half of the spindle in one
10 direction and half in the other, substantially as and for the purpose described.

13. In combination with the spool upon which the bands are placed, the wires attached at one end to said spool and extending
15 over the bands to keep them in place on the spool, and at their free ends lying alongside of and a little below the plane of the upper surface of the spindle, so as to insure the engagement of the bands by the grooves of the
20 latter, substantially as shown and described.

14. In combination with the fixed supporting-shaft, the two disks or plates fixed thereon, the series of band feeding or conveying spindles on shafts journaled in the plates, the
25 rotating shaft journaled within the fixed shaft and provided with a gear-wheel and pulley upon its end between the disks, the pinion on the shaft of one of the spindles driven through suitable mechanism from the gear on the shaft,

and the band-pulleys on the shafts of the other
30 spindles driven from the pulley on the shaft by means of a suitable band, substantially as shown and described.

15. In combination with the rods or bars carrying the band-placing ring, and actuated
35 by any suitable connection with the harvester or delivery mechanism, the guide-arms through which the rods pass fixed upon the stationary shaft supporting the gavel-compressing and band-feeding mechanism, sub-
40 stantially as shown and described.

16. In combination with the feed wire or cord, the prepared bands for use in a grain-binder, strung upon and attached to the wire
45 or cord, substantially as and for the purpose described.

17. The prepared bands for grain-binders, strung upon a wire or cord, and fastened thereto by paste or glue, substantially as and for
50 the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of November, A. D. 1883.

ISRAEL LANCASTER.

Witnesses:

WM. H. FOULKE,
THOS. CHARLES.