56. HARVESTERS.

DRAFTSMAN.

No. 827,288.

PATENTED JULY 31, 1906.

N. BOWDITCH.

COTTON HARVESTING MACHINE.

APPLICATION FILED MAR. 31, 1900.

5 SHEETS—SHEET 1.

Fig. 1.

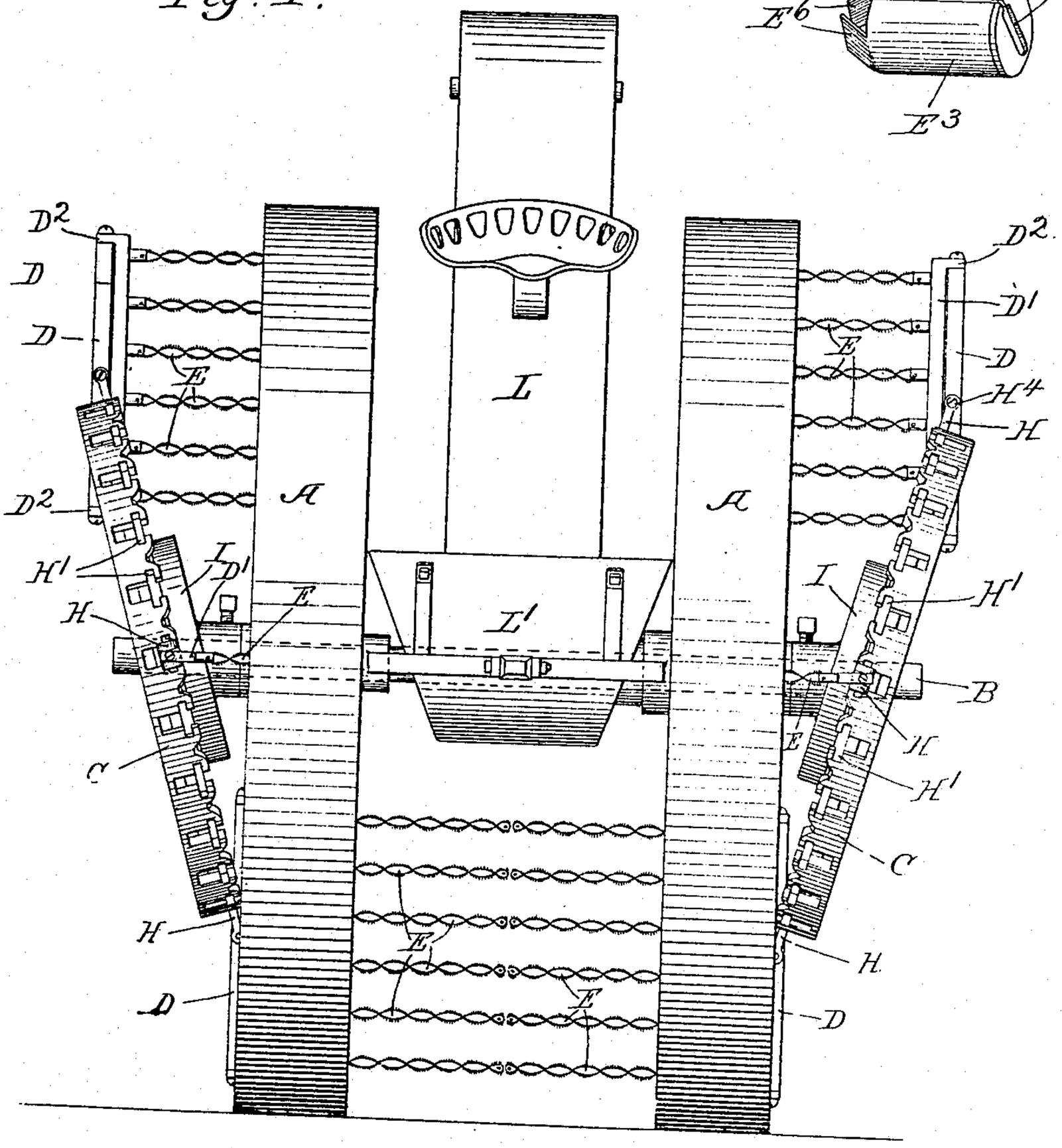


Fig. 8.

Fig. 6.

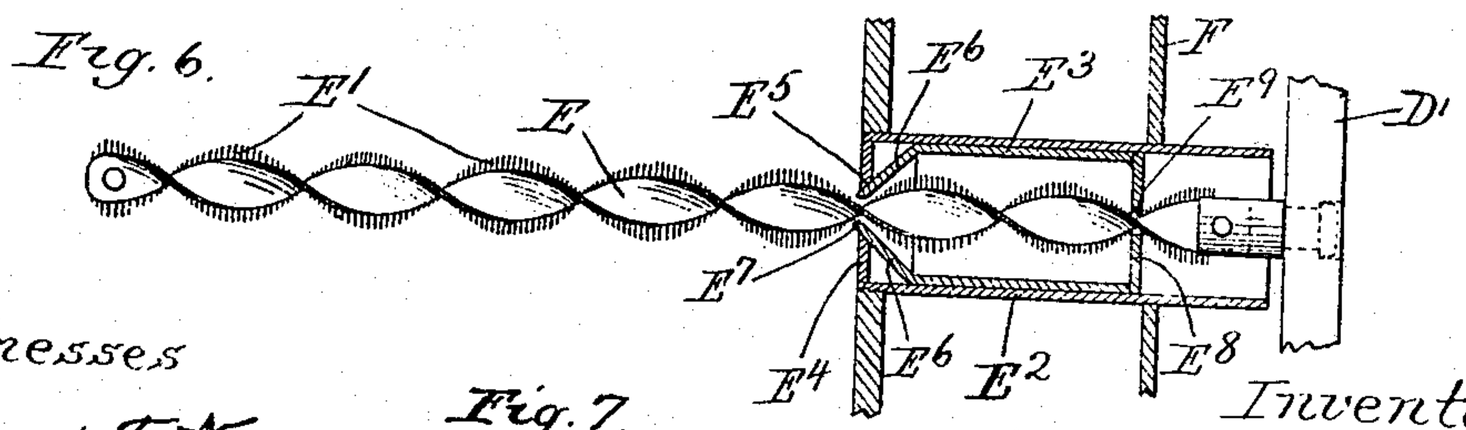
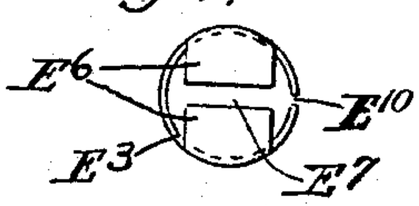


Fig. 7.



Witnesses

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Fig. 2.

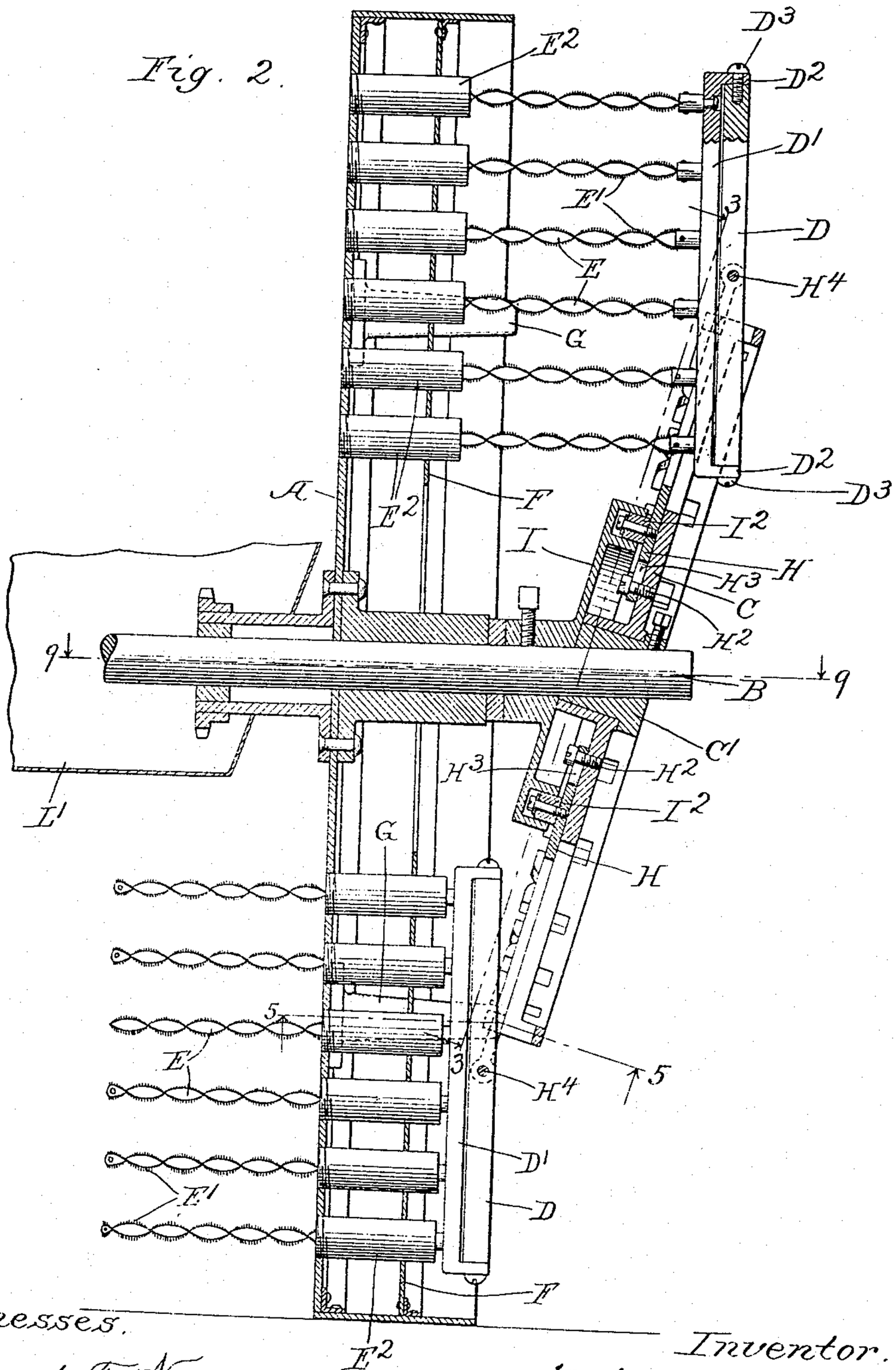

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Fig. 3.

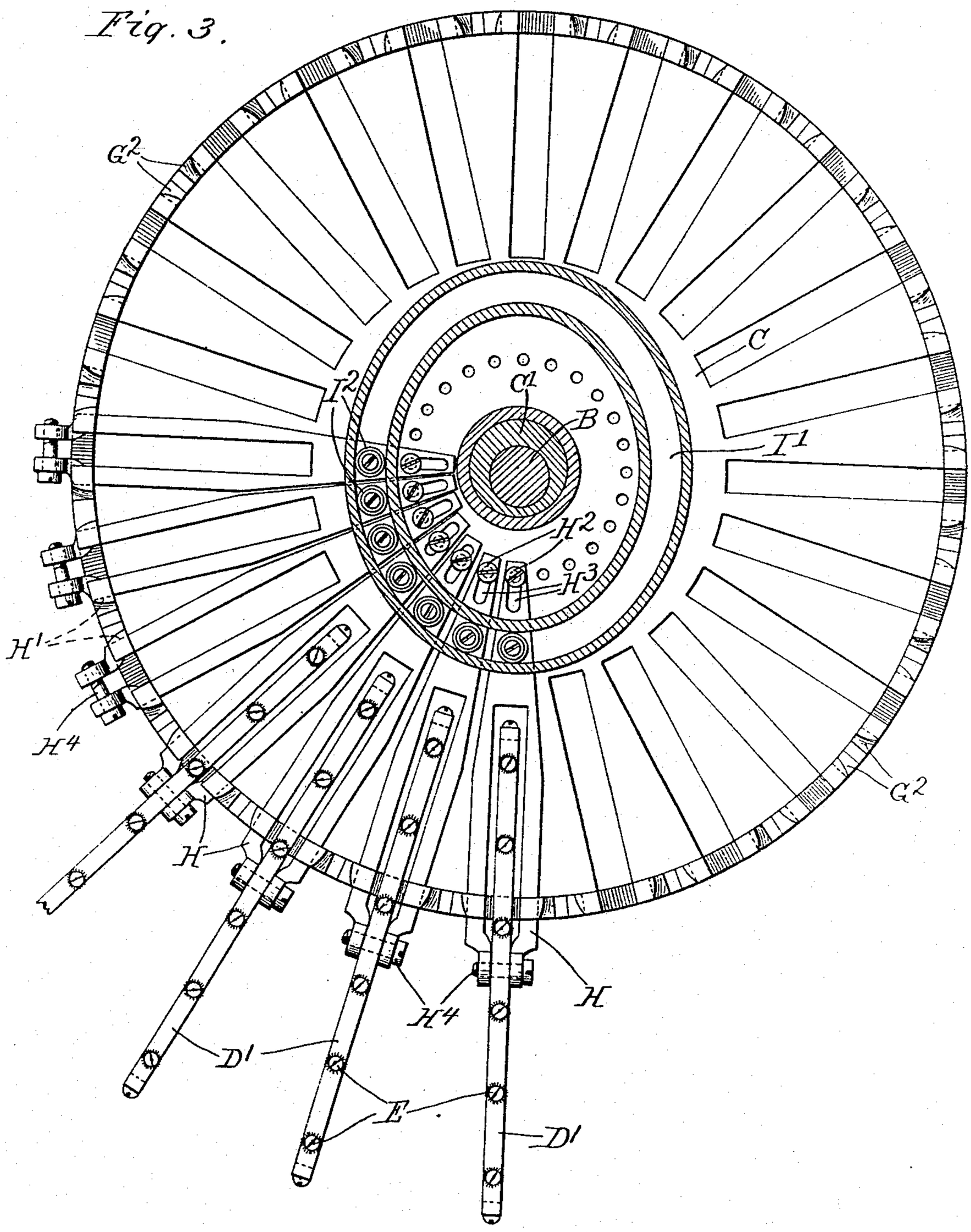

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Fig. 4.

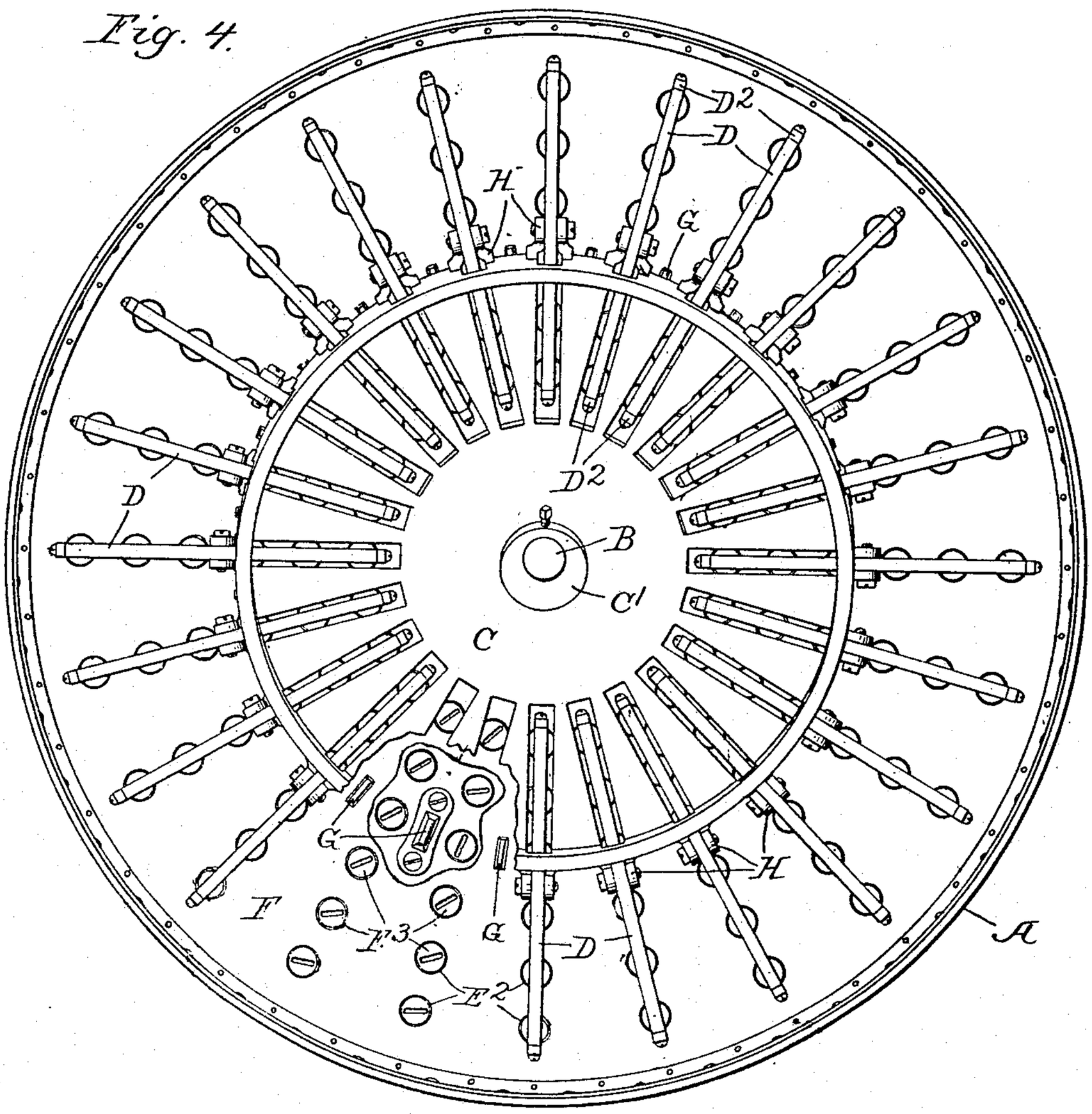
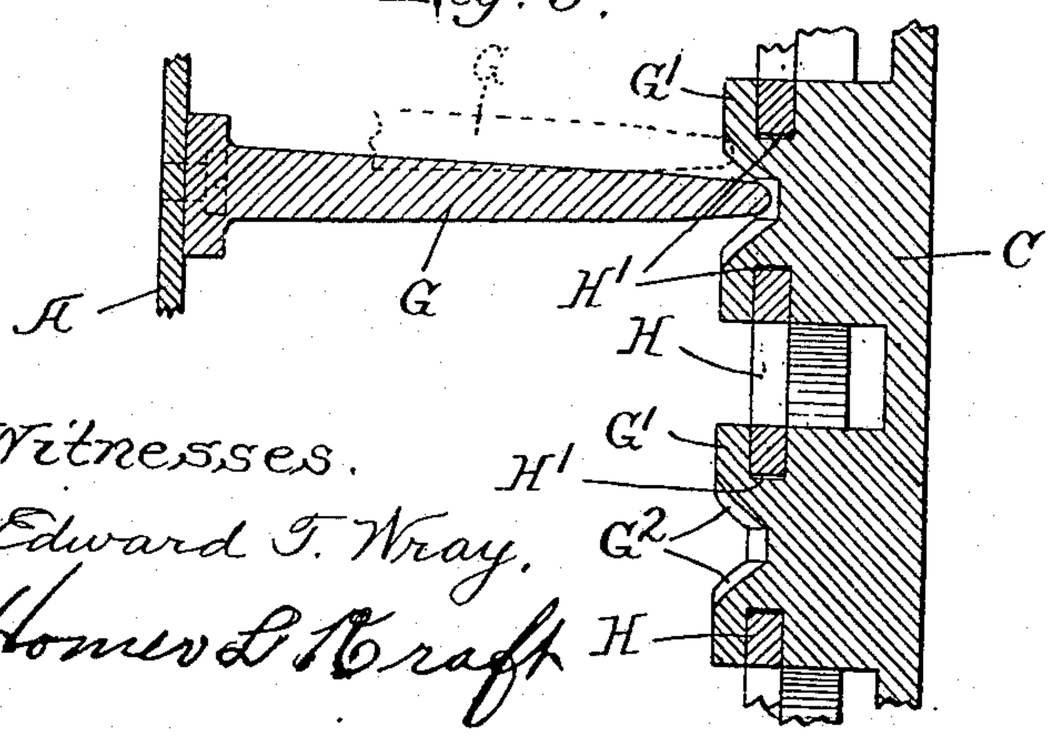


Fig. 5.



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5 SHEETS—SHEET 5.

Fig. 9.

Fig. 10.

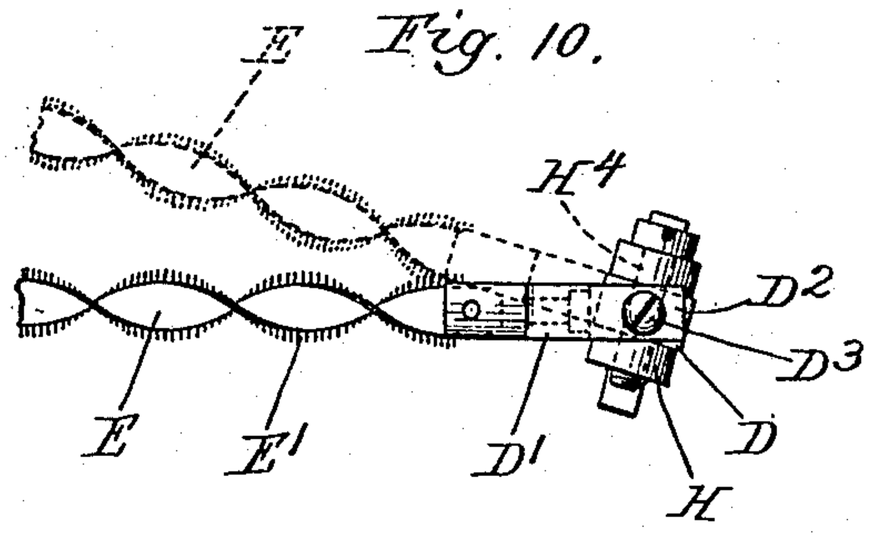

Fig. 11.

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UNITED STATES PATENT OFFICE.

NATHANIEL BOWDITCH, OF AURORA, ILLINOIS.

COTTON-HARVESTING MACHINE.

No. 827,288. Specification of Letters Patent. Patented July 31, 1906.

Application filed March 31, 1900. Serial No. 10,870.

To all whom it may concern:

Be it known that I, NATHANIEL BOWDITCH, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented a certain new and useful Improvement in Cotton-Harvesting Machines, of which the following is a specification.

My invention relates to cotton-harvesting machines, and has for its object to provide a new and improved machine of this description.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a front elevation of a device embodying my invention. Fig. 2 is a vertical section through one of the wheels. Fig. 3 is an enlarged sectional view on line 3 3, Fig. 2. Fig. 4 is an exterior face view with parts broken away of one of the wheels. Fig. 5 is an enlarged sectional view on line 5 5, Fig. 2. Fig. 6 is an enlarged sectional view through one of the cotton-pickers and the guiding device or tubes through which it passes. Fig. 7 is an end view of the inner tube through which the cotton-picker passes. Fig. 8 is a perspective view of the device shown in Fig. 7. Fig. 9 is a sectional view with parts omitted on line 9 9, Fig. 2. Fig. 10 is an end view of one of the bars carrying the pickers when in a horizontal position. Fig. 11 is a view showing the elevator.

Like letters refer to like parts throughout the several figures.

The difficulties attending the harvesting or gathering of cotton by other means than by hand have been such that harvesting-machines constructed on the plan of machines for harvesting other material could not be used or even utilized in the cotton industry. A radical departure from the devices used in other arts must therefore be made, and a harvesting-machine to be commercially successful must be able to meet the peculiar conditions attending the harvesting of cotton.

In carrying out my invention I provide a machine mounted upon suitable supporting-wheels, said wheels having a series of cotton-pickers associated directly therewith, the machine so constructed that it may be moved along a row of cotton-plants, so that the pickers will engage the cotton and remove it from the plants. In the form of machine shown in the drawings I provide two supporting-wheels A A, mounted upon a suitable axle B. These wheels are free to rotate on the axle. Associated with each supporting-wheel is an inclined wheel C, rotatably mounted upon the axle. Any desired means for making the wheel inclined may be used and, as herein shown, I have provided a sleeve or collar C′, having an inclined hole bored therethrough, the collar being connected with the shaft and forming the bearing-face for the wheel. Connected with each inclined wheel there are a series of bars D, each carrying a series of pickers E, adapted to be passed through the body of the supporting-wheel. These pickers, as illustrated, are formed in the shape of a spiral and are provided with a series of engaging points or devices E′. These pickers may be constructed in any desired manner and, as herein shown, consist of two strips of metal fastened together with a piece of haircloth between them, the whole being formed into a spiral. Each supporting-wheel carries a series of tubes or guides for the pickers. These guides may be constructed in any desired manner and, as herein shown, consist of two tubes, an outer tube E^2 (see Fig. 6) and an inner tube E^3. The outer tube may be attached to the wheel in any desired manner—as, for example, by being screw-threaded and engaging screw-threads in suitable openings in the wheel. This outer tube may be provided with an outer end piece E^4, having an elongated slot E^5, through which the picker passes The inner tube E^3 is preferably provided at one end with the inclined faces E^6, the ends of which are in proximity to each other, forming the slot E^7. The end piece E^4 of the tube E^3 may be omitted, if desired, the pickers simply projecting through the slot E^7 and engaging the inclined faces E^6. If, however, the end piece E^4 is used, the edges of the inclined faces or parts E^6 may be made to project therethrough, as shown in Fig. 6. The other end of this tube is preferably provided with an end piece E^8, formed with a slot E^9, through which the picker projects. The tube E^3 is preferably slotted throughout its length, as shown at E^{10}, Fig. 8, the slot communicating with the end slot E^9. By this construction the tube may be compressed or inserted in the tube E^2, and its elasticity or tendency to expand will cause it to engage the inner face of the tube E^2, so as to be held in place. These tubes E^2 are also preferably supported at their outer ends by means of the supporting device or plate F, having holes into which the tubes are received.

It will be seen that when the inclined wheel

C is used the pickers will be projected from the wheel A at the bottom and will be withdrawn beyond the inner face of the wheel at the top, there being a continuous reciprocating motion given to the pickers. This reciprocating motion causes the pickers to rotate because of the engagement of the pickers with the edges of the slots in the tubes or guides through which they pass. Said pickers are therefore rotatably connected with the bars D in any desired manner. Each inclined wheel C must be rotated in unison with the wheel A, associated therewith, so as to keep the pickers always in proper relation to the guides on the wheel A, and in order to get the proper reciprocating motion of said pickers, so that they will project at the bottom and engage the cotton on the plants and then be retracted at the top beyond the face of the wheel, so as to remove the cotton therefrom, this inclined wheel must always rotate in the same plane—that is, a plane inclined to the plane of the wheel A. This means that the collar C′ must be stationary and that the inclined wheel must be rotated by some suitable connection with the wheel A. The pickers make it necessary to have a varying connection between the two wheels. This connection is obtained, as herein shown, by means of a series of arms or teeth G, connected to the web of the wheel A and adapted to engage the inclined wheel C. These teeth are arranged in a circle and engage suitable teeth or projections G′ on the inclined wheel C. As this latter wheel is inclined, it will be seen that these teeth will only engage it at a point near the bottom. It will also be seen that since this wheel is inclined the circle formed by the teeth G′ thereon will be greater than the circle formed by the teeth G, the diameter of said latter circle being, as it were, the short diameter of the ellipse which forms the projection of the circle of teeth G′ on the vertical plane constituting the web of the wheel A. It will thus be seen that since the engaging teeth of the wheel C are disposed in a larger circle than the teeth G some means must be provided for counteracting this difference, for there must be the same number of teeth on each wheel. It will also be seen that the wheel C must be moved continuously and regularly, so that each picker will always be held directly opposite the opening in the guide through which it passes. I have overcome this difficulty by forming the teeth G′ with comparatively wide spaces between them, the edges of the teeth being beveled, as shown at G^2, Fig. 5. As the two wheels come together at an angle, on account of the inclination of the wheel C any tooth G when it first engages the wheel will engage the upper edge of one of the beveled faces G^2, as shown in dotted lines, Fig. 5. As the motion proceeds said tooth will move farther into the space between the teeth and on account of the bevel at the side will move the wheel C forward. When any tooth G reaches the center of the space between the teeth G′, it ceases to do work, because the parts are so arranged that when this occurs the next forward tooth has just begun to engage the upper edge of the inclined face G^2. Since the circle of teeth G′ is greater in diameter than the circle of teeth G, the two sets of teeth do not move in unison; but the set G′ must move somewhat faster, as each tooth G′ moves through a greater distance in a given time than the corresponding tooth G. Means must therefore be provided for permitting this relatively faster movement while the teeth are in contact. The construction herein shown permits this result and at the same time insures a continuous forward movement of the wheel C.

It will be seen that as the pickers pass through guides in the wheel A they should be directly opposite these guides, so as to pass in and out freely, for if the position of the outer end is varied with relation to the axis of the guide the pickers will be bent out of line and cannot be operated. It will further be seen that since the wheel C rotates and is inclined at an angle to the wheel A the projection of the periphery of said inclined wheel on the wheel A will not be a circle, but will be of an elliptical shape, being smaller in diameter from the bottom to the top than the diameter of the wheel C and being substantially the same in diameter in a horizontal direction as the said inclined wheel. This eccentricity may be readily observed by referring to the drawings. In looking at Fig. 2, which is a vertical section through the inclined wheel, we see that the pickers at the bottom are projected into the guides the maximum amount, while the pickers at the top are retracted the maximum amount. It will further be seen that each picker passes from one extreme position to the other during a half-revolution and passes through a whole cycle forward and back during a complete revolution.

Referring now to Fig. 9, which is a section through the wheel C in a horizontal plane, it will be seen that the face of the wheel C on the line where this section is made is substantially parallel with the face of the wheel A. The distance from the axis of the wheel A to the periphery of the wheel C—that is, the distance in a plane parallel to the web of the wheel A—will be the greatest on the line where the section of Fig. 9 is made and will be equal to the radius of the wheel C. As we move from this position—say toward the top of the wheel C along its periphery—it will be seen that the distance from the axis of the wheel A in this plane parallel to the web of the wheel A decreases and is a minimum at the top of the wheel, being considerably less than the radius of said wheel C. As we go on

around the wheel this distance increases until the horizontal position is reached and then begins to decrease again. It will thus be seen that if the bars D were connected directly to the periphery of the wheel C the ends of the pickers connected with said bars would be continually varying as the wheel rotated, and hence said pickers would be bent out of line. In order to avoid this and provide means for keeping the pickers always in line, some suitable construction for compensating for this change in distance from the axle B to the pickers in a plane parallel to the web of the wheel A must be provided. As shown in the drawings, the bars D instead of being directly connected with the wheels C are each connected with a movable or reciprocating picker-support H. These picker-supports are connected with the wheel C so as to rotate therewith; but the connection is such as to permit them to move longitudinally or in a radial direction, so as to project more and more beyond the periphery of the wheel as they move away from the horizontal position and shorten as they move toward the horizontal position. This result may be obtained by confining the picker-supports H in suitable guides H′, associated with the wheel C. These picker-supports may be connected to the wheel by some connecting device, such as screws H^2, there being provided suitable slots H^3, so that the picker-supports may be free to reciprocate. Some suitable mechanism is associated with these picker-supports so as to give them the proper compensating movement. I have shown in the drawings one construction for this purpose. This construction consists of what may be called an "inclined cam" I, fixed to the axle. This cam is provided with a guiding device, which, as illustrated, consists of the groove I′. The picker-supports are provided with a suitable engaging device, which engages the guiding device so that the picker-supports may be moved with relation to the wheel C in a predetermined manner. As herein illustrated, these engaging devices consist of rollers I^2, which work in the groove I′. The guiding device or groove on the cam I is shaped so as to move the picker-supports H in or out to counteract the shortening or lengthening of the distance from the axle to the pickers in the plane of the wheel A, due to the inclination of the wheel C. This can be easily ascertained in any given machine and of course would vary as the inclination of the wheel C varies. It will thus be seen that with this arrangement when the picker-supports H are in a horizontal position their distance from the center of the wheel will be a minimum and that as they move toward the vertical position they are slid outwardly, their distance from the center being a maximum in the vertical position. This is readily seen by referring to Fig. 3. The bars D are pivotally connected with the picker-supports H at the points H^4, and said picker-supports and the wheel C are provided with slots, so that the ends of the bars may project therethrough, thus permitting the bars to be held always in substantially vertical planes—that is, planes parallel to the web of the wheel A.

As shown in Fig. 2, the bar at the bottom is practically outside of the body of the wheel C. As this bar moves up toward the horizontal it will be seen that it comes within the boundary of the wheel C and as it moves up to the top the lower end must project through the wheel C. The inclination of the wheel C produces another condition which would pull the pickers out of line and prevent their operation. When the bar D is in its vertical position—say at the top of the wheel—the pickers will be in line with the axes of the guides. As this bar is now moved toward the horizontal position there is a twist given the bar D, which twists the pickers out of line. This twist is at a maximum in the horizontal position. This will readily be seen by referring to the drawings, Figs. 1 and 10. If the pickers are connected directly to the bars D, it will be seen that when the bars reach the horizontal position the pickers would project at substantially right angles from the face of the wheel C, as shown in dotted lines in Fig. 10, and hence would not be perpendicular to the face of the wheel A—that is, would not be in line with the axes of the guides through which they pass. In order to remedy this defect, I connect the ends of the pickers with the compensating bar D′, which is pivotally connected with the bar D, so that it can swing around to compensate for this twisting movement. As shown in the drawings, this compensating bar is bent over at the end, as shown at D^2, and is pivotally connected to the bar D by means of screws D^3. Any other construction may be used for this purpose. This permits the compensating bar D′ to swing with relation to the bar D as the said bars move from the vertical to the horizontal position, said compensating bar taking the position shown in full lines in Fig. 10 when the horizontal position or position of maximum twist is reached.

It will thus be seen that the construction I have herein shown is provided with compensating devices which compensate for the irregularities or eccentricities due to the inclination of the wheel C and insures the pickers being held in the proper position so that they will always be in line with the axes of the guides through which they pass.

It will be seen that I have here a construction having an inclined wheel and a supporting-wheel in different planes, the inclined wheel being operatively connected to the supporting-wheel, so as to be driven thereby.

A suitable device is located between the wheels A for taking care of the cotton after it

is picked. Any suitable construction may be used, and, as herein shown, I provide an elevator L, carried by the axle B. A suitable hopper L′ is associated with the elevator, the cotton being dropped into this hopper, so as to be brought within the reach of the endless carrier L^2, contained in the elevator. The elevator is provided with a suitable discharge end L^3, so that the cotton can be deposited in any suitable receptacle, such as a sack or the like, attached to this discharge end.

For purposes of illustration I have shown one construction embodying my invention; but I wish it to be understood that I do not limit myself to this construction, for I may add to the device parts not herein shown, and I may also use some of the parts illustrated in connection with other parts I have not described. It will also be necessary to make variations in accordance with the conditions to be met, and as these variations will be obvious to those versed in the art I have not attempted to describe them in detail.

The use and operation of my invention are as follows: When it is desired to use the machine herein shown, it is moved by any desired means along a row of cotton-plants, said cotton-plants being between the two supporting-wheels. When the wheels A are rotated, the teeth G engage the teeth G′ of the wheels C. These teeth first engage one of the inclined faces G^2, the motion being imparted to the wheel C by the travel of the teeth along this inclined face. The inclined face and the teeth are preferably so related that one tooth will always be engaging an inclined face, so that the movement of the wheel C will be regular and continuous. As the inclined wheels C rotate the pickers move in and out through the guides in the wheels A. The pickers at the top of the wheel, for example, are withdrawn into the guides. As the wheels rotate these pickers, on account of the inclination of the wheel C, are gradually moved through the webs of the wheels, so as to project inwardly between them, the pickers being simultaneously rotated by their engagement with the guides. These pickers as they approach the ground engage the cotton-plants, and the cotton becomes entangled with the engaging points on the pickers. When the pickers have reached their lowest position, they begin to retract, the rotation being kept up, and it will thus be seen that the cotton is engaged by them and wrapped about them. When the pickers are being retracted, the cotton engages the face of the wheel or the mouths of the guides or any suitable device provided for that purpose, and the pickers are withdrawn through the cotton, leaving the cotton on the outside. When the pickers reach the top of the wheel, where they are completely withdrawn, it will be seen that the cotton becomes disengaged and falls down into the hopper L′. The cotton is then engaged by the endless carrier of the elevator and is moved to the discharge end, where it is deposited in some suitable receptacle provided for that purpose. As the supporting-wheels and the inclined wheels C rotate the picker-supports H are slid in and out by the engagement of the rollers I^2 with the grooves I′, so as to compensate for the eccentricity due to these inclined wheels. It will be seen that these picker-supports are therefore continually moving with relation to the inclined wheels, so that the ends of said supports form an elliptical figure of such dimensions and proportions that its projection on the vertical web of the wheel A is a circle. It will also be seen that the compensating bars D′ are continually moving with relation to the bars D by means of their pivotal connection and that these several compensating devices keep the pickers opposite the guides, so that they will not bind, but will work freely therein.

I claim—

1. A cotton-harvesting machine, comprising one or more supporting-wheels, a series of guides carried thereby, a series of cotton-pickers working in said guides, an inclined wheel associated with each supporting-wheel, a connection between said pickers and said inclined wheel, means for rotating the inclined wheel in unison with the supporting-wheel and suitable compensating devices for keeping the pickers in proper position with relation to the guides.

2. A cotton-harvesting machine, comprising a wheel carrying a series of guides, a series of cotton-pickers working in said guides, an inclined wheel carrying a series of picker-supporting parts, means for moving said picker-supporting parts in and out with relation to the center of the wheel and an operative connection between said two wheels.

3. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides carried thereby, a series of cotton-pickers working in said guides, an inclined wheel associated with the supporting-wheel, a series of picker-supporting devices connecting said pickers with said inclined wheel, a guiding device associated with the inclined wheel and engaging said picker-supporting devices so as to move them as the wheel is rotated.

4. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides carried thereby, a series of cotton-pickers adapted to work in said guides, an inclined wheel associated with the supporting-wheel and carrying a series of picker-supporting devices connected with said pickers, a series of teeth on the supporting-wheel and a series of engaging parts on the inclined wheel which engage said teeth at predetermined points, so that the two wheels are rotated in unison.

5. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides car-

ried thereby, a series of cotton-pickers working in said guides, an inclined wheel associated with the supporting-wheel and carrying a series of picker-supporting devices connected with said pickers, a series of teeth on the supporting-wheel and a series of opposed teeth on the inclined wheel, the teeth on the inclined wheel being formed with beveled faces adapted to be engaged by the teeth on the supporting-wheel, the parts arranged to permit the teeth on the inclined wheel to move at a greater speed than the teeth on the supporting-wheel.

6. The combination in a cotton-harvesting machine of two wheels mounted upon a suitable axle or shaft, one of the wheels being inclined, a series of teeth or engaging parts on each wheel adapted to engage each other, so that one wheel may be operated from the other, and a compensating means for causing the teeth on the inclined wheel to travel at a greater speed than the teeth on the other wheel, and a series of cotton-picking devices operatively connected with said inclined wheel.

7. A cotton-harvesting machine, comprising a supporting-wheel mounted upon a suitable axle, a series of guides carried thereby, a series of spiral cotton-pickers working in said guides and adapted to be rotated when reciprocated in said guides, a sleeve provided with an inclined hole and fixed to said axle, a wheel rotatably mounted on said sleeve so as to be inclined with relation to the supporting-wheel, a series of picker-supporting devices movably connected with the inclined wheel, and means for moving said picker-supporting devices so as to compensate for the eccentricities due to the inclination of said wheel.

8. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides carried thereby, a series of spiral cotton-pickers working in said guides, an inclined wheel connected with said pickers and adapted to be rotated in a plane inclined with relation to the supporting-wheel, so as to reciprocate said pickers and move them in and out through said guides, and an operative connection between the supporting-wheel and the inclined wheel so that the inclined wheel is driven from the supporting-wheel.

9. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides carried thereby, a series of spiral cotton-pickers adapted to be reciprocated in said guides, engaging devices in the guides adapted to rotate the pickers when said pickers are reciprocated, a series of compensating bars to which said pickers are rotatably connected, a series of carrying-bars upon which said compensating bars are movably supported, an inclined wheel carrying a series of movable picker-supports, said picker-supports being connected with the carrying-bars, and a suitable device associated with the inclined wheel and adapted to engage each of said picker-supports so as to move it with relation to the inclined wheel as said wheel is rotated.

10. A cotton-harvesting machine, comprising a wheel carrying a series of guides, a series of pickers adapted to be reciprocated in said guides, an inclined wheel connected with said pickers, a series of teeth on said inclined wheel provided with beveled faces, a series of teeth on the wheel carrying the guides, said latter teeth adapted to engage the beveled faces of the teeth on the inclined wheel and move said inclined wheel, substantially as described.

11. A cotton-harvesting machine, comprising two supporting-wheels each carrying a series of guides, a series of cotton-pickers adapted to be reciprocated in said guides, an inclined wheel associated with each supporting-wheel, a series of picker-supporting devices movably connected with each inclined wheel, means associated with each inclined wheel for moving said picker-supporting devices radially as the wheel is rotated, and a cotton-elevating device located between said wheels and adapted to convey the picked cotton to a predetermined point.

12. A cotton-harvesting machine, comprising two supporting-wheels, an elevator located between said wheels and adapted to handle the cotton after it has been picked, a series of guides associated with each supporting-wheel, a series of spiral cotton-pickers adapted to be reciprocated in said guides so as to project into the space between the wheels at predetermined points, engaging devices in said guides which engage the pickers so as to rotate them when reciprocated, an inclined wheel associated with each supporting-wheel, said cotton-pickers being connected with said inclined wheels, a series of teeth on each inclined wheel and a series of opposed engaging teeth on each supporting-wheel, whereby the inclined wheels are rotated from the supporting-wheels, and a compensating arrangement for compensating for the difference in diameter of the circles of the teeth on the inclined wheels and the supporting-wheels.

13. A cotton-harvesting machine, comprising a supporting-wheel, a series of guides carried thereby, a series of spiral cotton-pickers adapted to be reciprocated in said guides, engaging devices in the guides adapted to rotate the pickers when said pickers are reciprocated, a series of compensating bars to which said pickers are rotatably connected, a series of carrying-bars to which said compensating bars are movably attached, a sleeve having an inclined hole therethrough and attached to the axle of the supporting-wheel so as to be in an inclined position, an inclined wheel rotatably mounted upon said sleeve, a series of movable picker-supports mounted upon said inclined wheel and connected with said carrying-bars, a device associated with

said inclined wheel and engaging said picker-supports so as to move them as the inclined wheel is rotated and means for rotating said inclined wheel when the supporting-wheel is rotated.

14. A cotton-harvesting machine, comprising a wheel, a series of guides associated with said wheel, a series of cotton-pickers adapted to be reciprocated in said guides, an inclined wheel in proximity to the wheel carrying the guides and adapted to be rotated while in its inclined position, a series of picker-supporting devices movably mounted upon said inclined wheel and connected with said pickers, an elliptical guiding device associated with said inclined wheel and a series of engaging devices on said picker-supporting devices adapted to engage said elliptical guiding device so as to move the picker-supporting devices when the inclined wheel is rotated.

15. A cotton-harvesting machine, comprising a wheel, a series of guides associated therewith, a series of reciprocating cotton-picking devices mounted in said guides, an inclined wheel rotatably mounted in proximity to said first-mentioned wheel, a series of picker-supports mounted in grooves in said inclined wheel, an actuating device for moving said picker-supports when the inclined wheel is rotated, a series of bars each carrying a series of pickers, said bars pivotally connected with said picker-supports.

16. In a cotton-harvesting machine, the combination of a rotatable wheel inclined with relation to the axle about which it rotates and carrying a series of movable parts with an elliptical guiding device adapted to engage said movable parts, or some part associated therewith, when the wheel is rotated, and move them in a predetermined manner to obviate the effect due to the inclination of said wheel and means for causing said inclined wheel to rotate in a plane fixed with relation to said axle.

17. In a cotton-harvesting machine, the combination of a rotatable wheel inclined with relation to the axle about which it rotates and carrying a series of radially-movable parts, with a non-circular device having an operative connection with said movable parts, whereby the position of said movable parts is varied with relation to the inclined wheel as said wheel is rotated to obviate the effect due to the inclination of said wheel and means for causing said inclined wheel to rotate in a plane fixed with relation to said axle.

18. A supporting-wheel for cotton-harvesters, upon which the harvester is carried, and comprising a wheel-web, a series of guides in said web, a series of rotatably-mounted cotton-pickers, the operative parts of the pickers engaging said guides so as to be rotated thereby when moved in the direction of their length.

Signed at Chicago, Illinois, this 29th day of March, A. D. 1900.

NATHANIEL BOWDITCH.

Witnesses:
DONALD M. CARTER,
HOMER L. KRAFT.