

(No Model.)

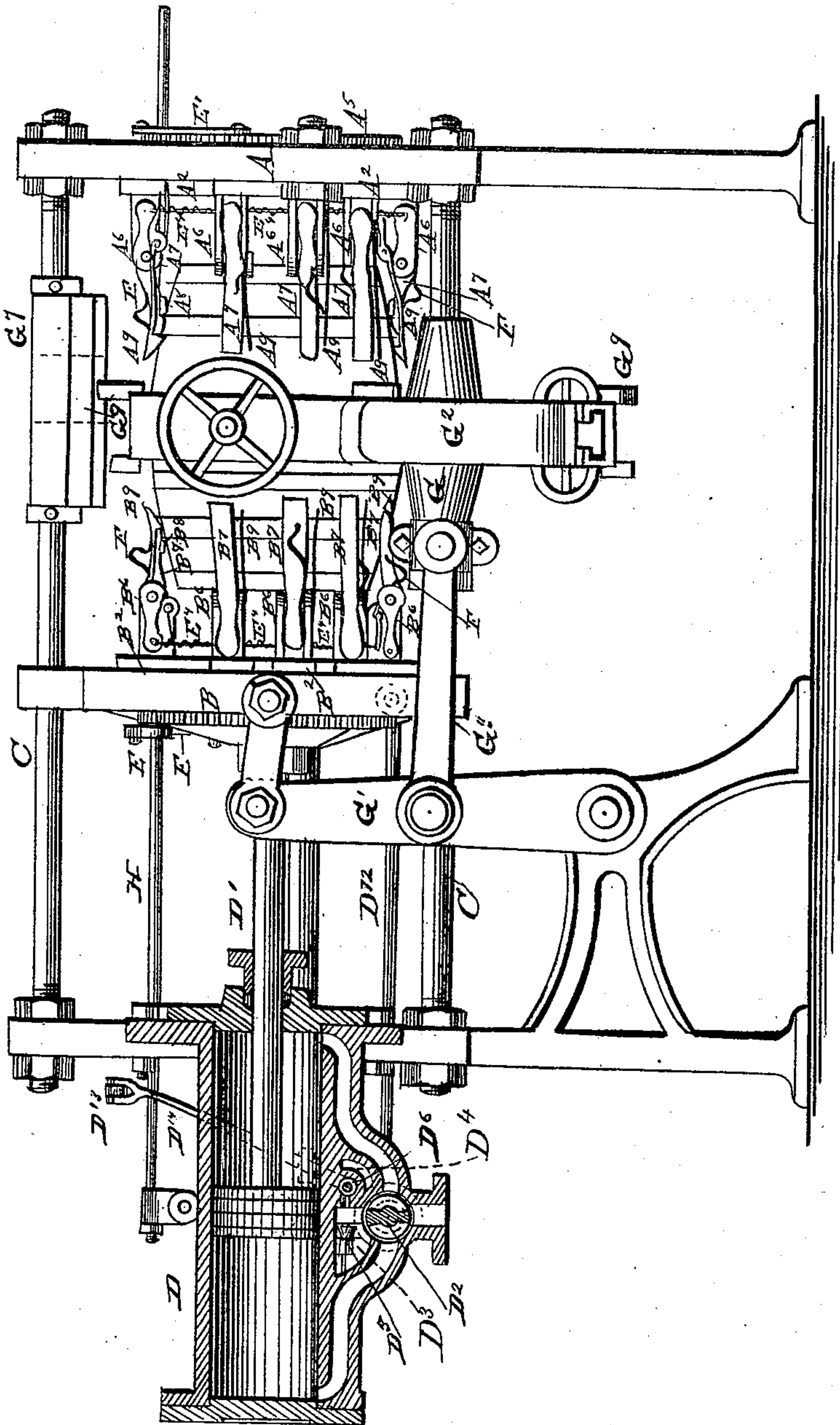
6 Sheets—Sheet 1.

S. L. WIEGAND.  
HOOP DRIVING MACHINE.

No. 437,409.

Patented Sept. 30, 1890.

Fig. 1.



WITNESSES:

*Phil C. Fortnaich.*  
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INVENTOR

*S. L. Wiegand*

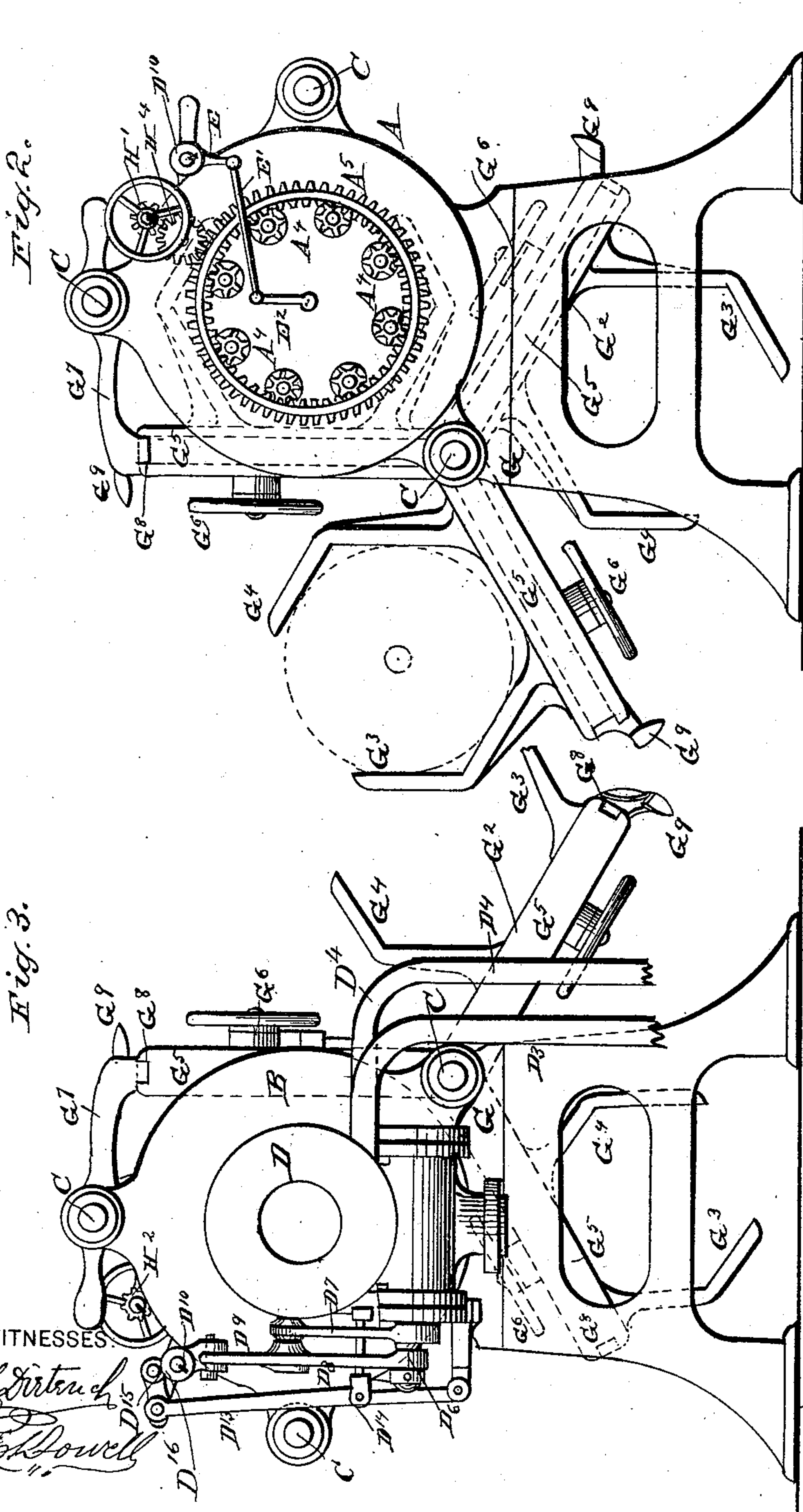
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S. L. WIEGAND.  
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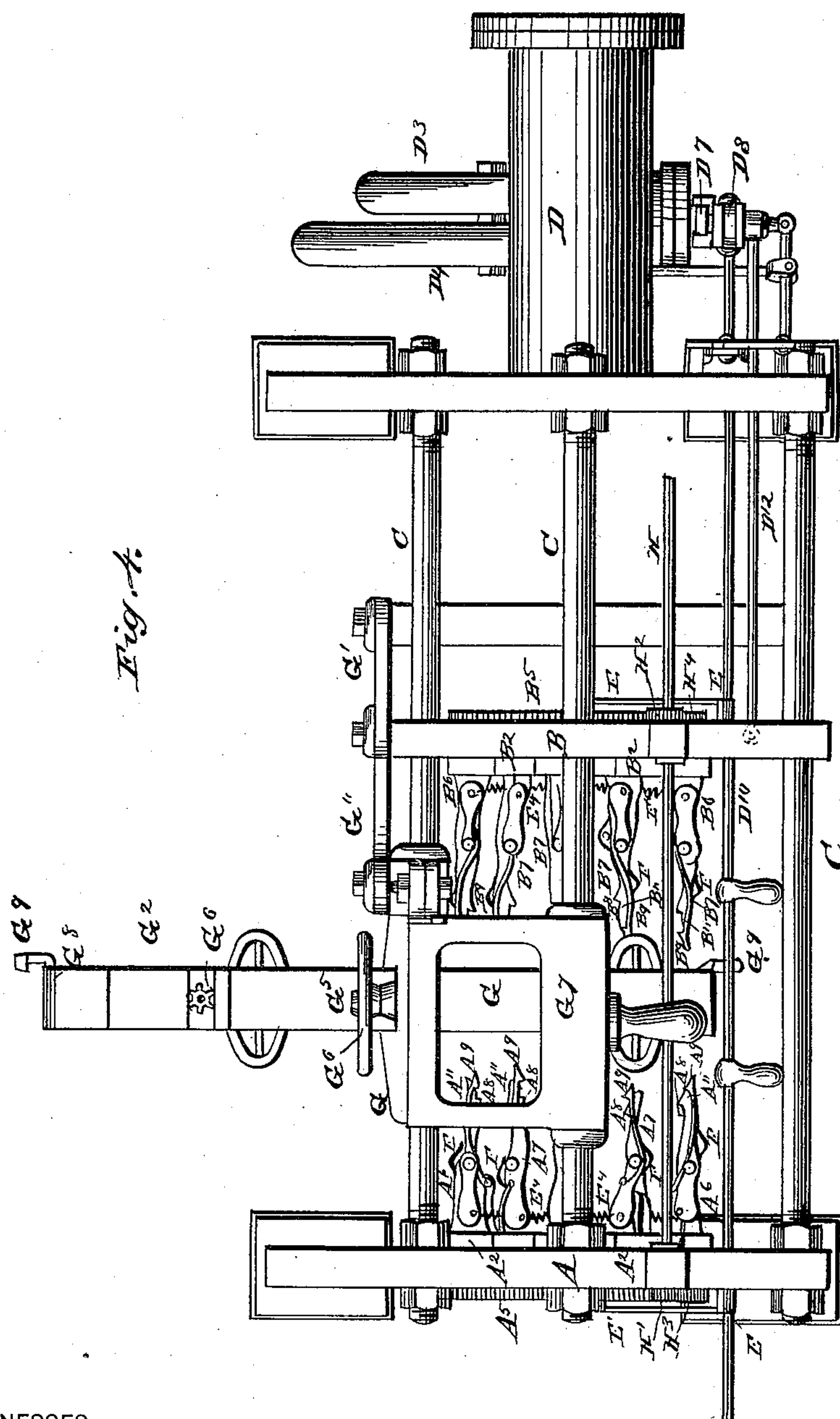
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S. L. WIEGAND.  
HOOP DRIVING MACHINE.

No. 437,409.

Patented Sept. 30, 1890.



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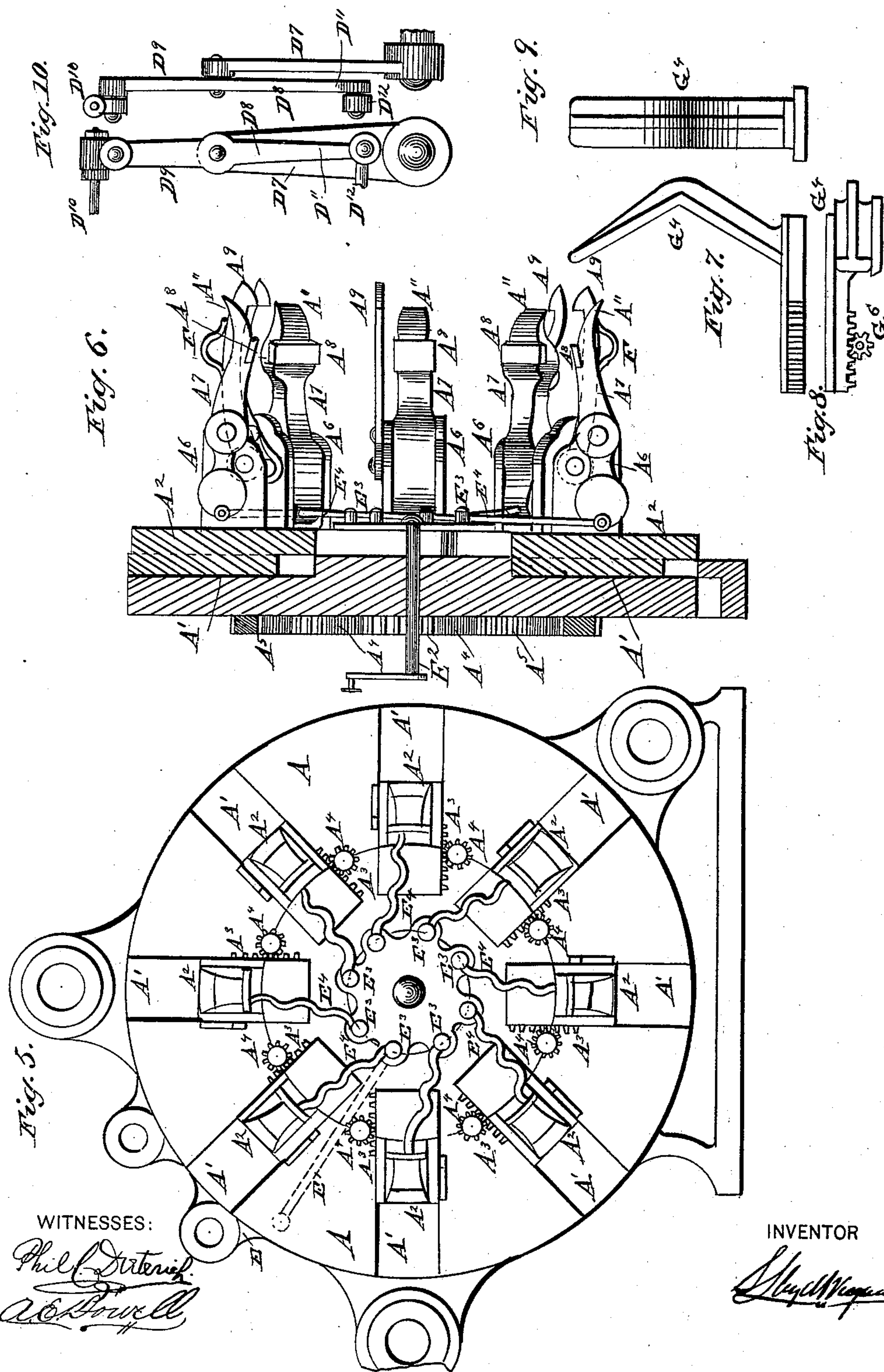
(No Model.)

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S. L. WIEGAND.  
HOOP DRIVING MACHINE.

No. 437,409.

Patented Sept. 30, 1890.



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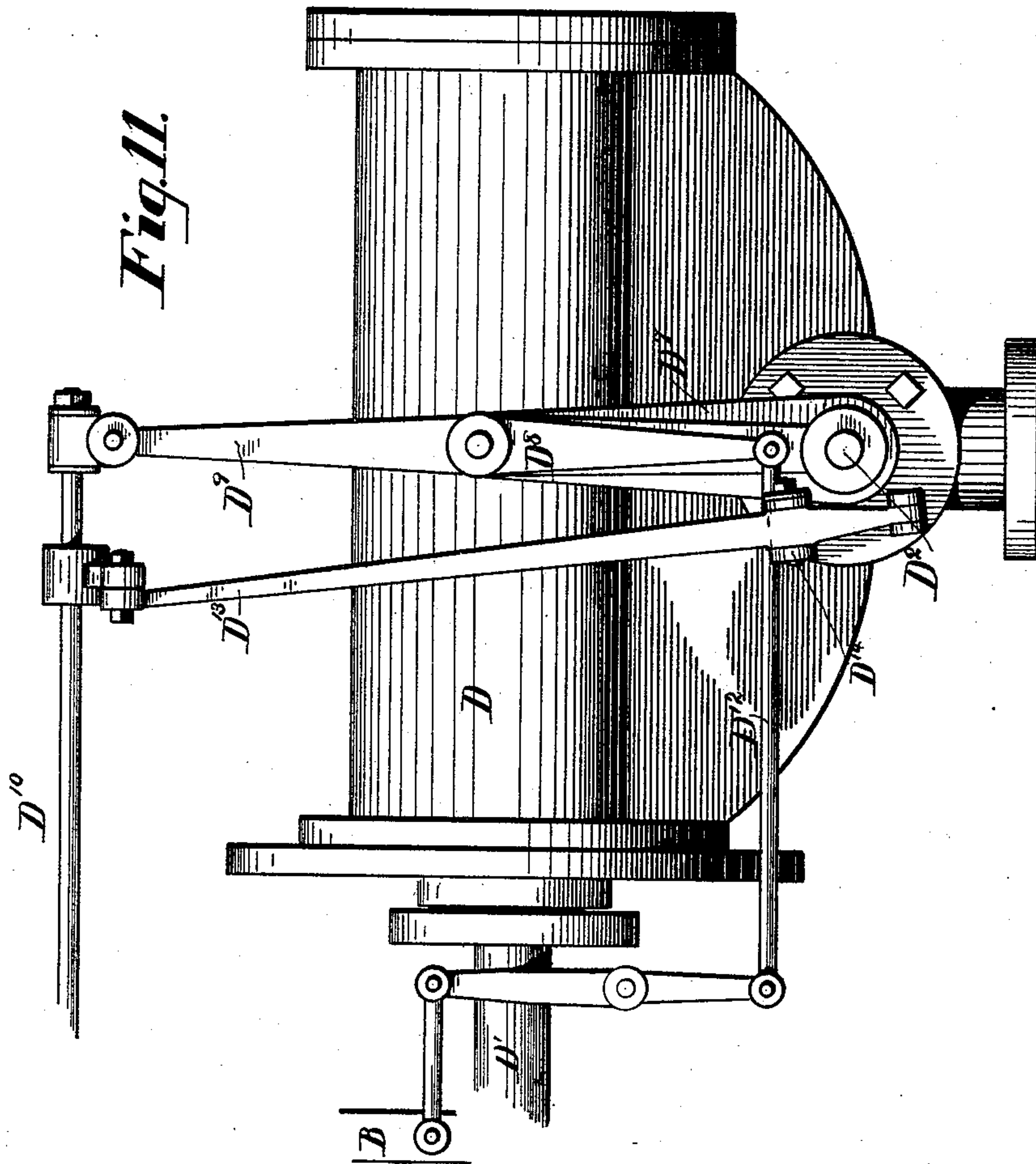
(No Model.)

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S. L. WIEGAND.  
HOOP DRIVING MACHINE.

No. 437,409.

Patented Sept. 30, 1890.



WITNESSES:  
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INVENTOR

INVENTOR  
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(No Model.)

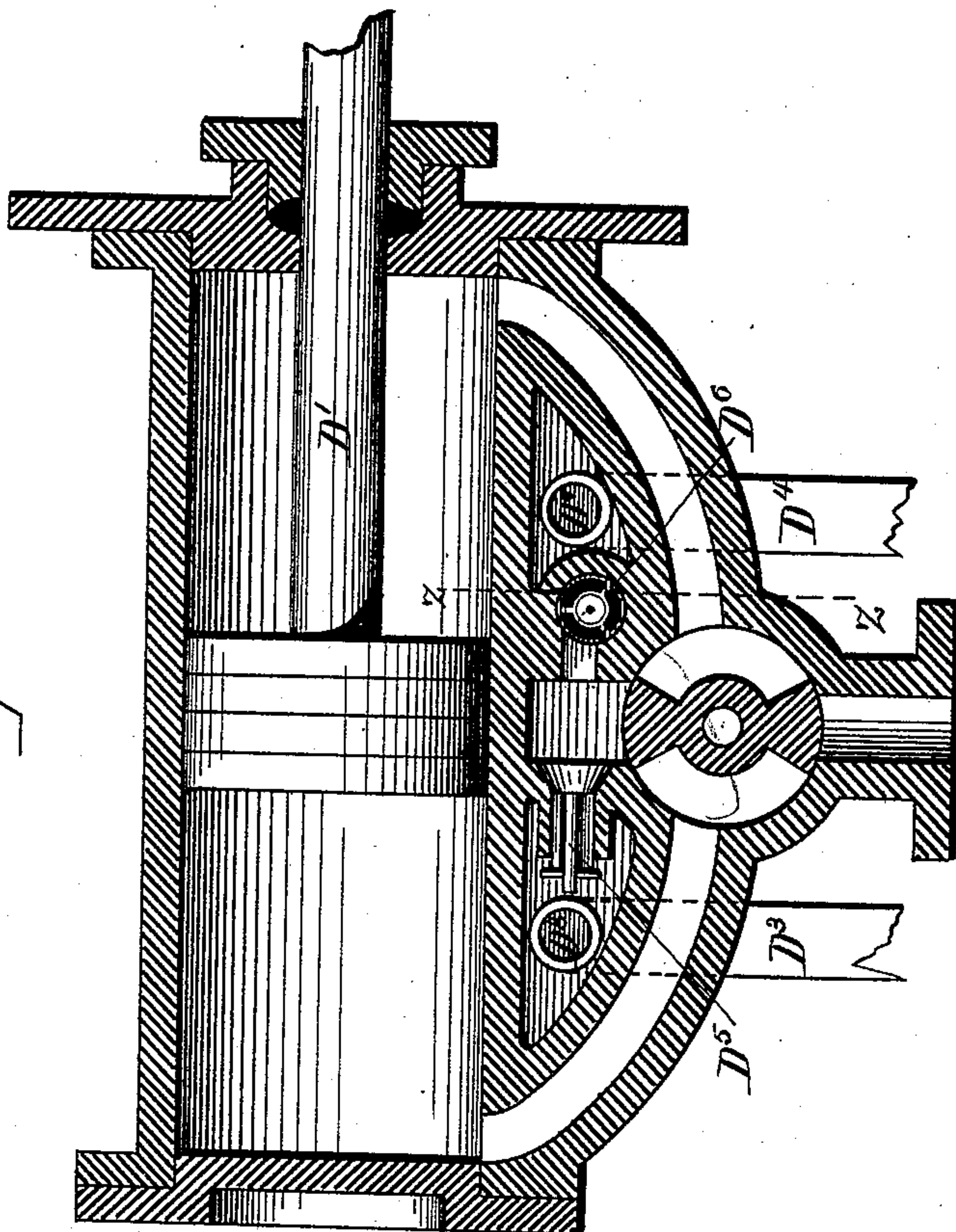
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S. L. WIEGAND.  
HOOP DRIVING MACHINE.

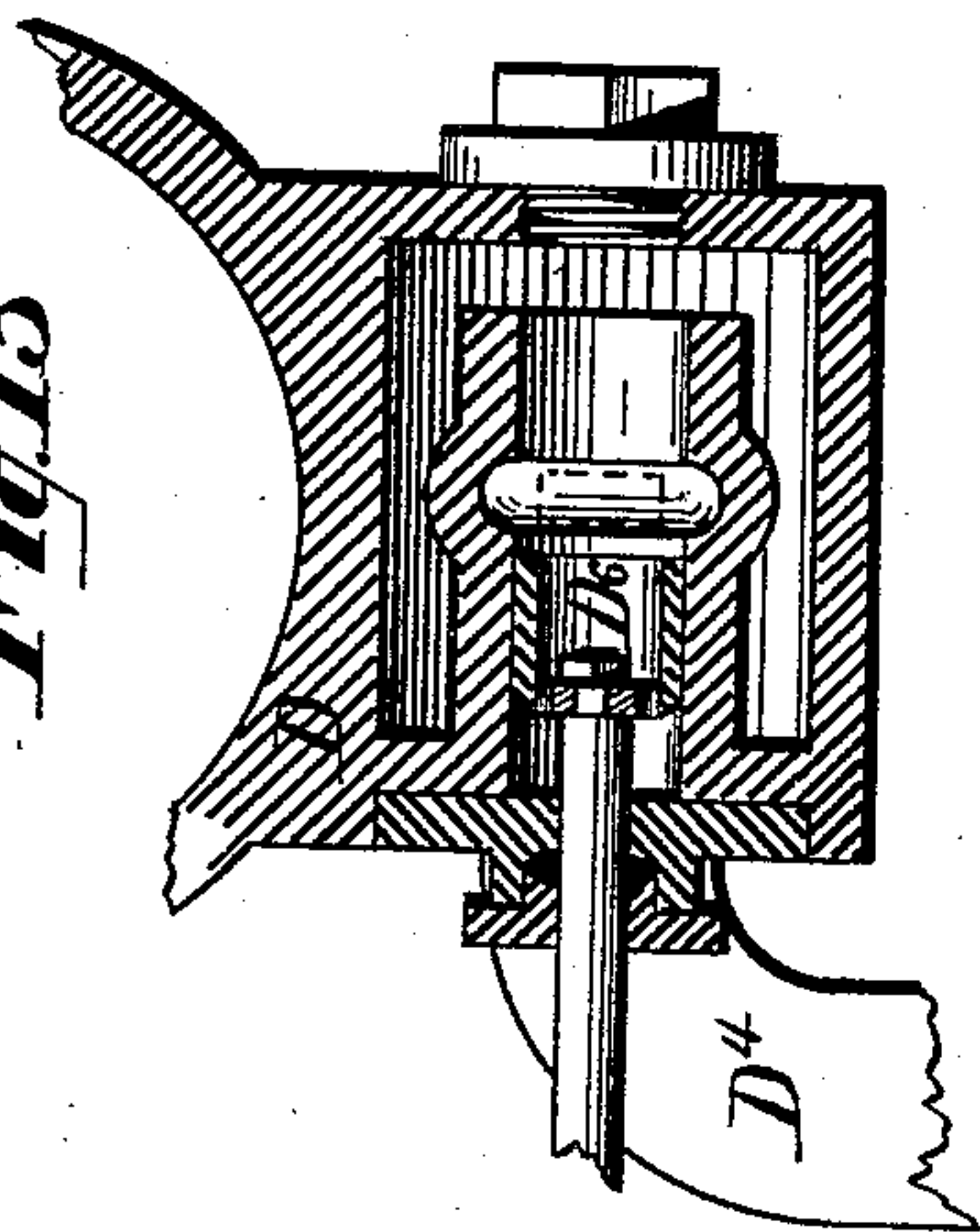
No. 437,409.

Patented Sept. 30, 1890.

*Fig. 12.*



*Fig. 13*



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

S. LLOYD WIEGAND, OF PHILADELPHIA, PENNSYLVANIA.

## HOOP-DRIVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 437,409, dated September 30, 1890.

Application filed September 1, 1883. Renewed April 2, 1886. Again renewed May 17, 1888. Serial No. 274,169. (No model.)

*To all whom it may concern:*

Be it known that I, S. LLOYD WIEGAND, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hoop-Driving Machines; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to that class of machines wherein the hoops are forced on the barrel, either when first made or afterward, for the purpose of tightening them, and has for its object an economy of driving-power, greater facility and celerity of action, and more ready and complete control of its motions by the attendant, a provision for protection against accidental excesses of motion, and a facility of introducing and adjusting hoops on the cask to be hooped without delay or inconvenience from the discharge of the casks already hooped.

To effect these ends the invention consists of a stationary head or abutment bearing jointed driving-arms, preferably made radially adjustable, and also a series of retracting-arms for removing truss-hoops; a hydraulic cylinder braced to the stationary abutment and provided with a plunger or piston arranged to reciprocate toward and from the stationary abutment; a traveling head, also provided with driving and retracting arms, the motion of the said piston and head being effected by the pressure of fluid stored in accumulators at different pressures, the flow of which fluid is directed and so controlled by a valve or valves moved partly by the plunger or piston and partly by the attendant that the head can be expeditiously moved to definite positions and there automatically arrests its own motion, or can have a further motion with great force at the option of the operator. A reel containing a series of saddles or clamps and each having a centering adjustment in radial direction is also reciprocated by the piston or plunger to a less extent than the said plunger, and at intervals rotated partially, so as to discharge the hooped cask and present the next cask to the operation of the machine. The several series of driving and re-

tracting arms are made expansible, so as to adapt them to casks of different diameters, and to permit them to apply themselves easily to any deviations of the hoops from circular form.

I will now proceed to particularly describe the mode of making and operating the said machine, referring, in so doing, to the drawings annexed and the letters of reference marked thereon.

Figure 1 shows a front elevation of the machine; Fig. 2, an elevation of the left end thereof; Fig. 3, an elevation of the right end thereof; Fig. 4, a plan; Fig. 5, an enlarged view of the inner side of the stationary head and its connected hoop-forcing mechanism; Fig. 6, an enlarged section of the parts shown in Fig. 5, made in a perpendicular plane through the center of Fig. 5; Figs. 7, 8, and 9, views in three positions of one of the jaws for gripping or clamping the casks. Fig. 10 shows two enlarged views of levers forming portions of the valve-operating mechanism; Fig. 11, an enlarged side view of the valve-operating mechanism as it appears on the back of the machine or to an observer stationed to the left side of Fig. 3; Fig. 12, an enlarged view of the valve and valve-chamber and the connected parts, and Fig. 13 a section in the axis of the valve D<sup>6</sup>.

The same letters of reference apply to the same parts in the several figures.

A represents a stationary head or abutment having equidistant radial slots A' therein, in which slide blocks A<sup>2</sup>, which have racks A<sup>3</sup> formed on them, and are moved by pinions A<sup>4</sup>, operated by a wheel A<sup>5</sup>. Upon each of the blocks A<sup>2</sup> is formed a fulcrum-block A<sup>6</sup>, upon which driving-arms A<sup>7</sup> are placed so that they are balanced. One end A'' of the arm A<sup>7</sup> is made curved, so as to spread open and pass readily over a cask-hoop. Near this curved portion is a shoulder or projection A<sup>8</sup>, which is of a form adapted to rest upon the edge of a cask-hoop and drive the same on the cask. Between the arms A<sup>6</sup>, or working through slots therein near the ends A'', is a series of hooked arms A<sup>9</sup>, also jointed to the fulcrum-blocks A<sup>6</sup>, which hooked arms are adapted to engage on the cask-hoops so as to pull them off, and they also serve to hold the hoops in position preliminary to driving



them. The hooks  $A^9$  and the driving-arms  $A^7$  are attached to the fulcrum-blocks  $A^6$ , so that the driving-arms  $A^7$  incline and bear inwardly against the cask and hoops during the driving operation, and the hooks  $A^9$  bear inwardly against the cask in the retracting operation. This is effected by placing the center of motion of the hooks  $A^9$  on the fulcrums  $A^6$  inside of a circle equal in diameter to the hoop and the center of motion of the driving-arms  $A^7$  outside of such circle.

B is a second head, similar to the head A, having the similar attachments of blocks, fulcrums, arms, and hooks, which in the drawings are referred to by the letter B, with similar accompanying numerals, as in the case of the like parts on the head A. The head B is not, like the head A, stationary, but movable, reciprocating on guiding-rods C, which also form the frame-work of the machine, fastening the head A to a cylinder D. The reciprocating motion of the head B is imparted to it by a piston or plunger  $D'$ , operated by fluid-pressure in the cylinder D.

The piston  $D'$  is reciprocated in the cylinder D by fluid under pressure, admitted through a valve or four-way cock  $D^2$ , similar in construction to the valves employed in high-pressure steam-engines for receiving steam from the boiler, distributing it to the opposite ends of the cylinder, and liberating the steam from opposite ends of the cylinder to the exhaust-pipe.

There are four ports in the valve-seat in which the valve  $D^2$  turns. The upper or one above it (see Fig. 1) is the inlet from which fluid under pressure is received alternately from pipes  $D^3$  and  $D^4$  (see Figs. 1 and 12) in a manner hereinafter explained. The port to the left in Fig. 1 opens into a channel leading to the back of the piston, the port to the right opens into a channel leading to the front of the piston, and the port underneath opens to an exhaust or discharge pipe.

The valve  $D^2$  is provided with a lever  $D^7$ , by which it is turned in its seat. When it is in the position shown in Fig. 1, the inlet and outlet ports are closed, and the fluid in both ends of the cylinder D is retained and the piston  $D'$  is immovable. When the upper end of the lever  $D^7$  is moved toward the driving-head B, fluid entering the upper port flows through the left port, and thence by the channel to the back of the piston, and at the same time fluid escapes through the right channel and the bottom port, and the piston and connected parts move to the right. When the lever  $D^7$  is moved to the left or reverse motion by similar means results.

The valve-lever  $D^7$  is connected at its upper end to the center of a lever  $D^8$ , the lower arm  $D^{11}$  of which lever is connected with the driving-head B through an intermediate lever, which reverses the direction of the motion, and a rod  $D^{12}$ . This mechanism closes the valve  $D^2$  over the inlet and outlet ports.

The upper arm  $D^9$  of the lever  $D^8$  is pivot-

ally connected with a rod  $D^{10}$ , susceptible of rotation upon its axis and sliding through supports in the frame of the machine, which rod extends through the length of the machine and is provided with handles, by which an attendant may either turn it to and fro on its axis or slide it lengthwise, and thereby open the valve  $D^2$  in either direction to any desired extent, the motion of the piston and connected parts closing the valve  $D^2$ . The direction and extent of the motion which the piston may make are determined and regulated by the direction and distance through which the attendant slides the rod  $D^{10}$ .

Between the inlet-port of the valve  $D^2$  and the pipe  $D^3$  is placed a check-valve  $D^5$ , permitting fluid to flow from the pipe  $D^3$ , supplying low-pressure fluid toward the valve  $D^2$  and preventing any fluid from returning to the pipe  $D^3$ .

The advantage of the arrangement of the check-valve  $D^5$  between the high and low pressure fluid-supplying pipes  $D^3$  and  $D^4$ , combined with the valve  $D^6$  for alternatively applying the high or low pressure, is that a continuous pressure is maintained during the change from one pressure to the other, which could not be the case with a three-branched or two-way cock or valve, which from its construction would necessitate the closing of the opening leading from one pipe before opening that leading from the other, and other constructions of the two-way or three-branched cock or valve would permit the flow of high-pressure fluid into the low-pressure reservoir during the turning of such valve or cock.

Between pipe  $D^4$ , supplying high-pressure fluid, and the valve  $D^2$  is a balanced valve  $D^6$ , or, in other words, a valve not liable to be held closed by pressure upon it, which valve is operated by a link  $D^{14}$  and a lever  $D^{13}$ , worked by a link  $D^{15}$ , connecting its upper end to a lever  $D^{16}$ , fitting upon a splined portion of the rod  $D^{10}$ , so that while the rod  $D^{10}$  turns the lever  $D^{16}$  with it the rod  $D^{10}$  slides lengthwise freely through the lever  $D^{16}$ . The effect of opening the valve  $D^6$  is to admit high-pressure fluid from the pipe  $D^4$  and close the check-valve  $D^5$  and also exclude low-pressure fluid from the pipe  $D^3$ , and thus impart a great force to the piston  $D'$  and driving-head B and its connected driving-arms  $A^7$ .

The fitting of the connections from the lever  $D^{13}$ , through the link  $D^{14}$  to the valve  $D^6$ , is made loose, so that after the valve  $D^6$  has closed the rod  $D^{10}$  may be turned farther in the same direction, and so that the valve only opens after the slack or lost motion has been taken up by movement in the opposite direction.

It should be observed that the pressure from the high-pressure fluid is never desirable when the arms  $A^7$ , hooks  $A^9$ , and arms  $B^7$  and hooks  $B^9$  are opened. The continued turning motion of the rod  $D^{10}$  in the direction for closing the valve turns with it levers marked E, (shown in Fig. 2,) connected, as hereinafter



ter described, to the arms A<sup>7</sup> and B<sup>7</sup> and hooks A<sup>9</sup> and B<sup>9</sup>. These levers E are fitted upon the rod D<sup>10</sup>, so that the rod D<sup>10</sup> can slide through them; but they are compelled to turn with the rod D<sup>10</sup> by keys or feathers secured in them and fitting so as to slide in a groove or spline made lengthwise of the rod D<sup>10</sup>. This provision for longitudinal motion of the rod D<sup>10</sup> is necessary to permit it to operate the levers D<sup>7</sup> and D<sup>9</sup>, moving the reversing or four-way valve D<sup>2</sup>, and the motion of the levers E, after the valve D<sup>6</sup> has closed, opens the arms A<sup>7</sup> and B<sup>7</sup> and hooks A<sup>9</sup> and B<sup>9</sup>, and by this combination of motions derived from the rod D<sup>10</sup> it becomes impossible to open the high-pressure fluid-supply into the cylinder when the arms A<sup>7</sup> and B<sup>7</sup> and hooks A<sup>9</sup> and B<sup>9</sup> are opened or expanded away from the cask, and they must be closed before the valve D<sup>6</sup> can be opened.

The requisite lost motion between the rod D<sup>10</sup> and valve D<sup>6</sup> is secured by slotting the holes in the links D<sup>14</sup> most conveniently; but the same effect may be produced by constructing the valve D<sup>6</sup> of such length relatively to the port or opening that it covers as to permit a considerable extent of movement while closed.

The elasticity of the links E<sup>4</sup> permits motion of the rod D<sup>10</sup> and the studs E<sup>3</sup> and levers E after the arms A<sup>7</sup> and B<sup>7</sup> have closed upon the hoops, which continued motion of the rod demands but little exertion on the part of the operator when the parts are in such position, because then the levers E and links E<sup>4</sup> are nearly in a right line, as are also the pivotal points of studs E<sup>3</sup> and links E<sup>4</sup>, affording a great extent of turning motion in the rod D<sup>10</sup> with but small force, and being attended with but little motion and great force in the closing motion of the connected arms A<sup>7</sup> and B<sup>7</sup>, in this respect operating like the well-known toggle-levers of hand printing-presses.

A lever E by a link E<sup>4</sup> is connected to the lever E<sup>2</sup>, provided with a shaft extending centrally through the head and bearing a wrist-plate provided with pivots, forming arms E<sup>3</sup>, from which by elastic links E<sup>4</sup> the several arms A<sup>7</sup> and B<sup>7</sup> and A<sup>9</sup> and B<sup>9</sup> are opened and closed. The links E<sup>4</sup> by their elasticity adapt the several arms A<sup>7</sup> and B<sup>7</sup> to any irregularities or deviations from circular form in the cask and hoops, and the links A<sup>9</sup> and B<sup>9</sup> receive motion from a connection by springs F, connecting each of the hooks A<sup>9</sup> and B<sup>9</sup> with each of the adjoining arms A<sup>7</sup> and B<sup>7</sup>.

The opening and motion of the arms A<sup>7</sup> and B<sup>7</sup> may be made derivative from the hooks A<sup>9</sup> and B<sup>9</sup> by attaching the links E<sup>4</sup> to the hooks A<sup>9</sup> and B<sup>9</sup>, instead of the arms A<sup>7</sup> and B<sup>7</sup>; but it is thought preferable to connect them in the manner first stated.

Springs F elastically connect the arms A<sup>7</sup> with the arms or hooks A<sup>9</sup> and also the arms B<sup>7</sup> with the arms or hooks B<sup>9</sup>.

When the hoops are driven on the arms A<sup>7</sup>

and B<sup>7</sup>, hooks A<sup>9</sup> and B<sup>9</sup> are opened, so that the hooks clear the hoops; but when for any reason it is desired to draw a hoop off, the hooks A<sup>9</sup> and B<sup>9</sup> are permitted to rest upon the cask and engage in the hoops.

The casks during the operation of driving hoops on or retracting hoops from them are held by a series of clamps G<sup>2</sup>, arranged in a circle, so as to form a frame or reel G, constructed both to slide and to turn on a brace C. The hub of the reel G is provided with collars, between which a box pivotally attached to the link G<sup>1</sup> is fitted, so as to permit the reel to turn in the box. The sliding movement of the reel G on the bar or brace C is derived from the reciprocating motion of the head B and is of one-half the extent of the motion of said head B, the reduction of motion being effected by a lever G<sup>1</sup>, the longer arm of which is connected with the head B and the shorter arm with the reel-hub G.

The reel-clamps G<sup>2</sup> are each made of V-shaped jaws G<sup>3</sup> and G<sup>4</sup>, sliding radially upon arms G<sup>5</sup>, the inner jaws G<sup>3</sup> moving outward from the center at the same time that the outer jaws G<sup>4</sup> move inward, so that any cask placed between them is grasped in the same position as to its axis irrespective of its diameter, and is presented to the action of the driving mechanism in proper central position, the motion of each pair of the jaws G<sup>3</sup> and G<sup>4</sup> being effected by a pinion G<sup>6</sup>, engaging in racks formed on the jaws and moving with them.

The cask is held by its center between the middle hoops and the reel turned toward the center of the driving mechanism until the reel rests against a pawl G<sup>7</sup>, engaging in notches in a plate G<sup>8</sup>, turning with the reel. After the hoops have been driven upon a cask and the head B retracted so that the cask is clear of the arms A<sup>7</sup> and B<sup>7</sup> the pawl G<sup>7</sup> is raised and the reel turns so as to discharge the hooped cask and to present the next clamp G<sup>2</sup> with its inclosed cask to the driving mechanism. Cams G<sup>9</sup> are used upon the reel G to turn with it and compel the pawl G<sup>7</sup> to engage in the next notch of the plate G<sup>8</sup>. The pawl G<sup>7</sup> is held in the notches of the plate G<sup>8</sup> by its weight, and is disengaged therefrom by the operator depressing the handle (shown in Fig. 4 of the drawings) upon the front side of it.

The pawl G<sup>7</sup>, when not engaged in the notch of the reel, is prevented from falling below the circle of action of the cams G<sup>9</sup> by projections on the sides of the collars, confining the pawl G<sup>7</sup> lengthwise on the shaft or brace C, engaging in somewhat larger cavities than the projections on the collar on the sides of the pawl G<sup>7</sup>, and thus limiting the motion of the pawl G<sup>7</sup>. By adjusting and securing these collars on the brace C by means of the set-screws therein the limit of motion of the pawl in both directions can be varied and adjusted.

The radial adjustment of the blocks A<sup>2</sup> and B<sup>2</sup> on the heads A and B is effected by a splined shaft H, having pinions H<sup>1</sup> and H<sup>2</sup> engaging



in toothed wheels  $H^3$  and  $H^4$ , attached to heads A and B and turning the wheels  $A^5$  and  $B^5$ , the shaft H being provided with a hand-wheel to be turned by the operator. In very large  
 5 sizes of these machines the motion of the shaft H may be imparted to it by a pinion turned by a rack attached to a piston working in a cylinder by fluid under pressure and controlled by a valve mechanism similar to that  
 10 described for working the piston  $D'$ ; but for small sizes this is not deemed requisite.

This machine is used in the following manner: The operator, by moving the rod  $D^{10}$  to the left, causes the head B and reel G to re-  
 15 cede from the head A. He then places the cask with the end or chine hoops placed on it into a clamp  $G^2$  and turns the reel G so as to bring the cask in center line with the heads A and B, the pawl  $G^7$  engaging in a  
 20 notch in the plate  $G^8$ , holding it in position. He then moves the rod  $D^{10}$  to the right far enough to cause the head B and reel G to move to the right until the resistance of the  
 25 hoops on the cask stops further progress of the head B. Then he turns the rod so that the valve  $D^6$  opens communication with the high-pressure pipe  $D^4$  and the hoops are forced home to their place on the cask. The  
 30 operator then closes the valve  $D^6$  by a reverse turning movement of the rod  $D^{10}$  and opens the arms  $A^7$  and  $B^7$  and hooks  $A^9$  and  $B^9$  and causes the hooks  $A^9$  and  $B^9$  to hook over the  
 35 truss-hoops, which are withdrawn by moving the rod  $D^{10}$  to the left, and the other hoops are applied to the cask in the same manner as the chine or end hoops, and the operation of  
 pressing them on repeated, as before. When all of the hoops are placed on, another cask  
 40 having been clamped in the next clamp of the reel G, the head B and reel G are again retracted from the head A and the pawl  $G^7$  raised and the reel turned so as to discharge the cask already hooped and bring the next  
 45 cask into its place. The hooped cask being unclamped rolls out from the clamp  $G^2$  when it is opened, and the weight of the descending  
 casks that have been hooped turns the reel so as to bring succeeding casks into position.

Instead of retracting the truss-hoops in the  
 50 machine, they may in small casks be removed by hand after placing the chine or end hoops on, and the other hoops be put on loosely by hand before putting the casks into the machine, thus saving time.

55 Instead of a valve  $D^2$ , operated by a double lever, a valve of like form operated by hand only may be used, working in a valve-seat moved by a connection from the head B; but the form previously described is thought to  
 60 be preferable on account of its simplicity.

A single set of driving-arms and hooks may be used in cheap machines without length-  
 wise motion of the reel; but the double set will accomplish more work with the same la-  
 65 bor.

Having described my invention, what I claim is—

1. In a hoop-driving machine, the combination of a longitudinally-movable head and stationary head, both having driving-arms at-  
 75 tached thereto, with a series of clamps for simultaneously receiving, holding, and discharging casks arranged to rotate around a common center or axis and connected with  
 75 the moving head by a lever or equivalent mechanism, so as to move lengthwise with one-half the velocity of the moving head and distribute the driving effect equally upon the  
 hoops on opposite ends of a cask, and at the same time receive and discharge casks, sub-  
 80 stantially as and for the purpose set forth.

2. In a machine for driving hoops upon casks, the combination of a driving-head constructed and arranged so as to be horizontally  
 85 reciprocated with a stationary abutment or head, each head provided with a series of driving-arms attached thereto, each arm being pivotally supported by a fulcrum so as  
 to be balanced and unaffected by gravitation in its opening and closing movement, and pro-  
 90 vided with a spring arranged to press the same inwardly and connected with an opening mechanism, whereby all of the arms are opened simultaneously, substantially as and  
 95 for the purpose set forth.

3. In a machine for forcing hoops on casks, operated by hydraulic pressure, the combination of a valve controlling the flow of fluid  
 under pressure to and from the working-cylinder containing the piston moving the driv-  
 100 ing-head, with a lever or equivalent mechanism for working said valve, which lever is operated by a second lever pivotally connected therewith, one point of which second lever is  
 105 operated by the hand of an attendant, and another point is operated by a connection with the driving-head or piston for the purpose of limiting and controlling the motion of  
 the piston and driving-head, substantially as  
 110 and for the purpose set forth.

4. In a machine for driving hoops on casks by heads, or a reciprocating head and an abutment provided with arms and operated by a  
 piston reciprocated by hydraulic pressure, the combination of a cylinder and a piston con-  
 115 nected to the driving-head and having a valve for admitting fluid to and discharging fluid from either side of the piston, with two supplying reservoirs of fluid under pressure, one  
 120 of which reservoirs is under higher pressure than the other, and both reservoirs connected by suitable pipes with said valve and having a valve placed in the high-pressure  
 125 pipe arranged to admit fluid from the high-pressure reservoir, and a check-valve in the low-pressure pipe arranged to prevent high-pressure fluid from flowing into the low-pressure  
 reservoir, substantially as shown and described.

5. In a machine for horizontally forcing hoops on casks, the combination of balanced  
 130 driving-arms, each arm provided with a spring adapted to close the same with a series of elastic links, each link connecting a driving-arm to a lever-arm or stud  $E^3$  on the lever  $E^2$



for simultaneously opening and closing the driving-arms each to a variable extent, so as to adapt them to variations or imperfections in the form of the casks and hoops, substantially as and for the purpose set forth.

6. In a machine for horizontally forcing hoops on casks, the combination of one or more series of driving-arms, each arm balanced upon its fulcrum so as to be unaffected by gravitation, with a series of elastic links  $E^4$  connecting the said driving-arms with a series of studs  $E^3$ , arranged to turn upon a common axis by mechanism connecting said studs to the rod  $D^{10}$ , substantially as and for the purpose set forth.

7. In a machine for forcing hoops on casks, the combination of one or more series of balanced driving-arms pivotally supported upon fulcrums  $A^6$  in a circle of greater radius than the driving-shoulders  $A^8$  of said arms, with one or more series of retracting-hooks, also pivotally attached to said fulcrums in a circle of less radius than the hooks as engaged on a hoop, said hooks being elastically connected with and arranged to be operated by said driving-arms, substantially as and for the purpose set forth.

8. In a machine for forcing hoops on casks, the combination of the hereinbefore-described expansible series of hoop-driving arms with a series of two or more clamps, each of said clamps having converging jaws, and an opening and closing mechanism adapted to centrally receive and hold casks and successively present the said casks to the hoop-driving mechanism, and the series of clamps arranged to turn upon an axis equidistant from the axes of the casks, the clamps having notches formed therein engaging a pawl interrupting at intervals the rotary motion of the series of clamps, substantially as shown and described.

9. In a machine for forcing hoops on casks, operated by fluids at different pressures, the combination of a valve or valves with a valve-operating mechanism or handle susceptible of two motions, a longitudinal and a partially-rotative, one of which motions operates the valve determining the flow or distribution of fluid to and from the opposite ends of the cylinder, and the other motion controls the valve, admitting or excluding fluid under high pressure to and from the valve chest and cylinder, substantially as set forth.

10. In a machine operated by fluids under different pressures for forcing hoops upon casks, the rod  $D^{10}$ , having two motions, one in the direction of its axis and the other of partial rotation on its axis, in combination with the levers  $E$ , for opening and closing the driving-arms, and with two valves  $D^2$  and  $D^6$  and an intermediate operating mechanism, one of which valves is operated by one motion of the rod and controls the distribution to and release of fluid from the cylinder and thus governs the motion of the driving-piston, and the other valve is operated by the other motion of the rod in one extreme of its motion

and admits or excludes fluid of higher pressure, and the said rod in the opposite extreme of its motion opens the driving-arms, substantially as shown and in the manner set forth.

11. In a machine, substantially as described and shown, operated by fluids under different pressures for forcing hoops upon casks, a rod susceptible of partially-rotative motion, in combination with a mechanism for opening and closing the driving-arms so connected with the said rod that at one extreme of said partial rotative motion the driving-arms shall be opened by the links and levers connecting said rod with the said arms, and by a turning motion of the said rod in the opposite extreme the arms shall remain closed, and a valve connected with the said rod shall admit the fluid of higher pressure to act upon the driving-piston, substantially as and for the purpose set forth.

12. In a machine for forcing hoops on casks, the combination of a stationary series of expansible hoop-driving arms, and a moving series of expansible hoop-driving arms with a series of two or more cask-holding clamps arranged around a shaft at equal central distances from the axis thereof and having their axes parallel thereto, the said clamps being fitted to turn around and slide lengthwise upon said shaft for the purpose of successively presenting casks to the action of the hoop-driving mechanism while other casks are being clamped and unclamped and for distributing the driving force of the moving series of expansible driving-arms upon the hoops of both ends of the casks, substantially as and for the purpose set forth.

13. In a machine operated by hydraulic pressure for forcing hoops upon casks, the combination of a driving-head connected with and moved by a piston worked by fluid-pressure and having expansible and contractible driving-arms, with a stationary abutment provided with expansible and contractible driving-arms, and a series of two or more clamps, each constructed and arranged to centrally hold casks irrespective of their diameter and present the same to the action of the driving-arms while other clamps are receiving or discharging casks, and the series of clamps so connected by a lever to the driving-head as to participate in the longitudinal motion thereof and to distribute the driving effect equally upon hoops at both ends of the casks, substantially as set forth.

14. In a machine for driving hoops upon casks, the combination of a piston reciprocated by fluid-pressure in a cylinder and connected with a driving-head provided with a series of expansible and contractible driving-arms, a series of self-centering clamps arranged to receive casks, and by rotating upon an axis common to all of the clamps present them centrally to the driving mechanism and to discharge one cask while another is in process of hoop-driving, a series of stationary expansible arms, and a mechanism connect-



ing the driving-piston to the cask-holding clamps and imparting a reduced motion to said clamps, substantially as set forth and described.

15. In a machine for forcing hoops upon casks, the combination of the cylinder D, braced to a stationary head A, provided with an expansible and contractible series of hoop-driving arms, said cylinder containing a double-acting piston connected to and arranged to reciprocate a head B, also provided with a series of expansible and contractible hoop-driving arms, with a valve for admitting and discharging the propelling-fluid to and from the opposite ends of said cylinder, and a mechanism for operating said valve, consisting of a link reciprocated by the said piston, connected with a lever D<sup>8</sup>, pivotally attached to a lever D<sup>7</sup>, and also pivotally attached to the rod D<sup>10</sup>, said lever D<sup>7</sup> connected with and arranged to operate the valve D<sup>2</sup>, substantially as and for the purpose set forth.

16. In a machine for forcing hoops on casks, the combination of a moving driving-head, provided with driving-arms, with a lever pivotally connected thereto at one point, another part or point of which lever is adapted to be moved by a connected sliding and partially-rotating rod having connected levers arranged to open and close the driving-arms, said rod held or controlled by an attendant, and a third part or point in the said lever pivotally connected with a lever or equivalent mechanism operating a valve controlling the flow of fluid to the opposite ends of a cylinder containing a piston attached to and moving the driving-head, whereby the lengthwise adjustment of the part of the lever connected to the rod and thereby operated by the attendant produces an opening of ports in the valve-chest, which is automatically followed by a closure of said ports by the motion of the part of the lever connected with the driving-head, thus limiting the extent of stroke by the lengthwise adjustment made of the rod, and by the partial rotation of said rod the driving-arms are opened and closed, substantially as and for the purpose set forth.

17. In a machine for forcing hoops upon casks, the combination of a cylinder and piston connected to and arranged to reciprocate a driving-head provided with driving-arms, a sliding carriage containing a rotating series of self-centering cask-holding clamps, moved at a reduced speed by a lever operated by the driving-head, a pawl and stops for limiting the rotative motion of the clamps, a stationary head or abutment provided with expansible and contractible arms, and a rod provided with means for sliding the same lengthwise and of rotation partially upon its axis, whereby the valve controlling the flow of fluid under pressure can be directed upon either side of the piston, and the source of supply of fluid from reservoirs under different pressures changed and also the opening

and closing of the expansible jaws effected, substantially as and for the purpose set forth.

18. In a machine for forcing hoops upon casks, the combination of a cylinder and piston connected to and operating a driving-head provided with driving-arms, each attached thereto by radially-adjustable fulcrums A<sup>6</sup>, provided with racks A<sup>3</sup> and pinion A<sup>4</sup>, turned simultaneously by gear-wheels A<sup>5</sup>, H', and H<sup>4</sup>, a sliding carriage containing a rotating series of self-centering cask-holding clamps, moved at a reduced speed by a lever operated by the driving-head, a pawl and stops for limiting the rotative motion of the clamps, a stationary head or abutment provided with expansible and contractible arms, each pivotally attached to the radially-adjustable fulcrums B<sup>6</sup>, operated by a rack and pinion, and a gear-wheel turning the entire series of pinions simultaneously, and a rod provided with means for sliding the same lengthwise and of rotation partially upon its axis, whereby the valve controlling the flow of fluid under pressure can be directed upon either side of the piston, and the source of supply of fluid from reservoirs under different pressures changed and also the opening and closing of the expansible jaws effected, substantially as and for the purpose set forth.

19. In a hoop-driving machine, the combination of a driving-head provided with expansible and contractible driving-arms and attached to a piston arranged to operate in a cylinder by fluid under pressure, provided with a valve connected to and adjustable by a rod worked lengthwise by an attendant and also by a connecting mechanism of links and levers attached to and operated by the piston, and two reservoirs of fluid, each under different pressures, and a second valve operated by the turning of said rod, controlling the flow of fluids from the two reservoirs to the cylinder for the purpose of moving the piston and connected driving-head to any desired position with fluid under low pressure, and of afterward applying force for driving by the admission of the fluid under high pressure, substantially as and for the purpose set forth.

20. In a machine for driving hoops upon casks, the combination of two heads, each provided with a series of balanced driving-arms pivotally connected to radially-adjustable fulcrums having racks formed thereon and pinions engaging therein, engaging in and simultaneously turned by a gear-wheel operated by pinions fitted to turn with and slide on a splined shaft H, provided with means for turning the same by the hand of an attendant, substantially as set forth.

21. In a machine for forcing hoops on casks, the combination of a double-acting cylinder and piston having attached thereto driving-heads provided with arms adapted to engage the hoops on the opposite ends of casks, two reservoirs of fluid under different pressures,



a pipe leading from the low-pressure reservoir, provided with a check-valve opening into a valve-chamber and preventing egress of fluid from the valve-chamber to the low-pressure reservoir, a pipe leading from the high-pressure reservoir into said valve-chamber, and a valve in the said valve-chamber constructed and arranged, substantially as described, in one adjustment to exclude the high-pressure fluid and admit the low-pressure fluid alternatively to the opposite ends of

the cylinder, and in another adjustment to admit high-pressure fluid, closing the check-valve and excluding low-pressure fluid, and without cessation of pressure direct the high-pressure fluid to either end of the cylinder, as and for the purpose set forth.

S. LLOYD WIEGAND.

Witnesses:

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