6 Sheets—Sheet 1.

M. A. KELLER.

Gleaning and Grain Binding Machine.

No. 221,922. **Patented Nov. 25, 1879.**

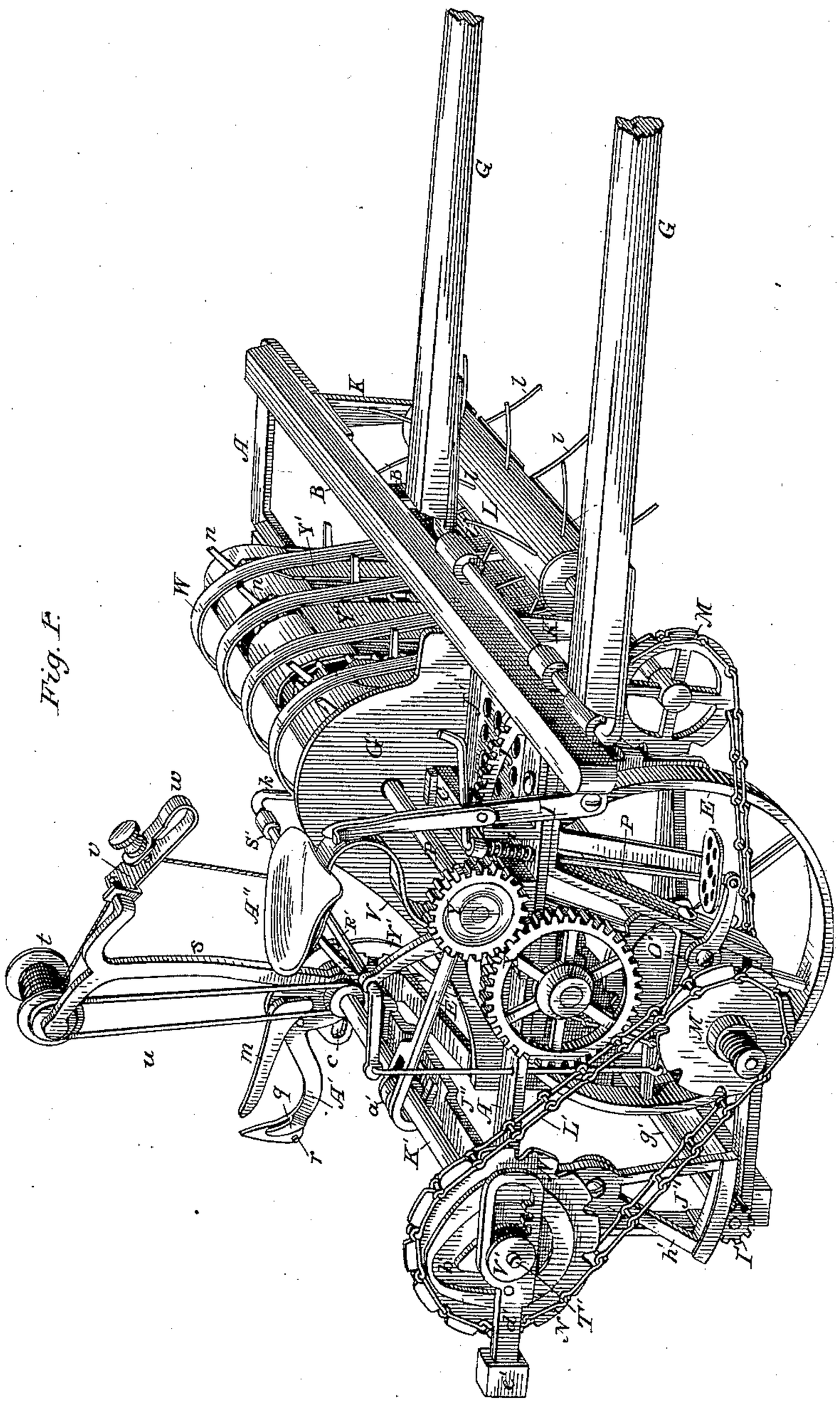

Fig. 1.

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Inventor:

Moses A. Keller
By his Atty
R. D. O. Smith

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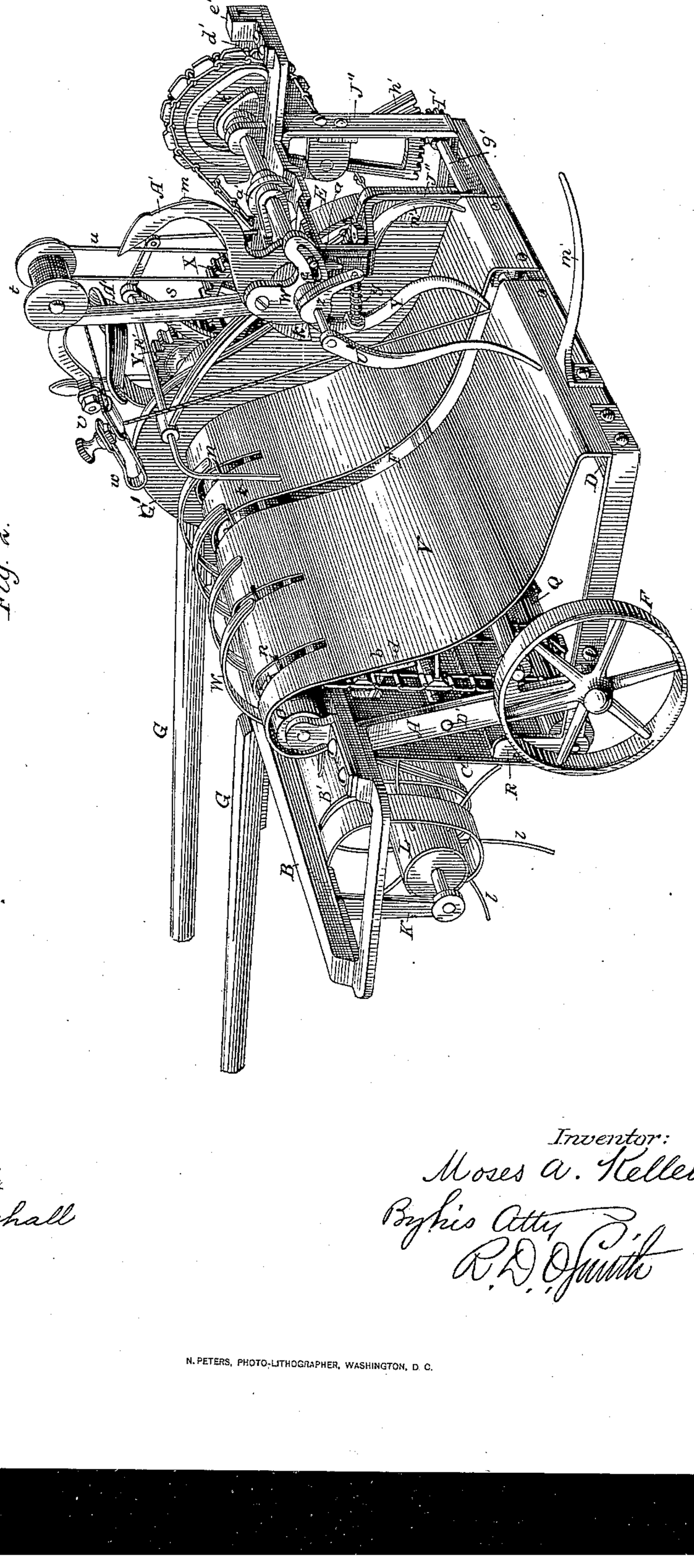

Fig. 2.

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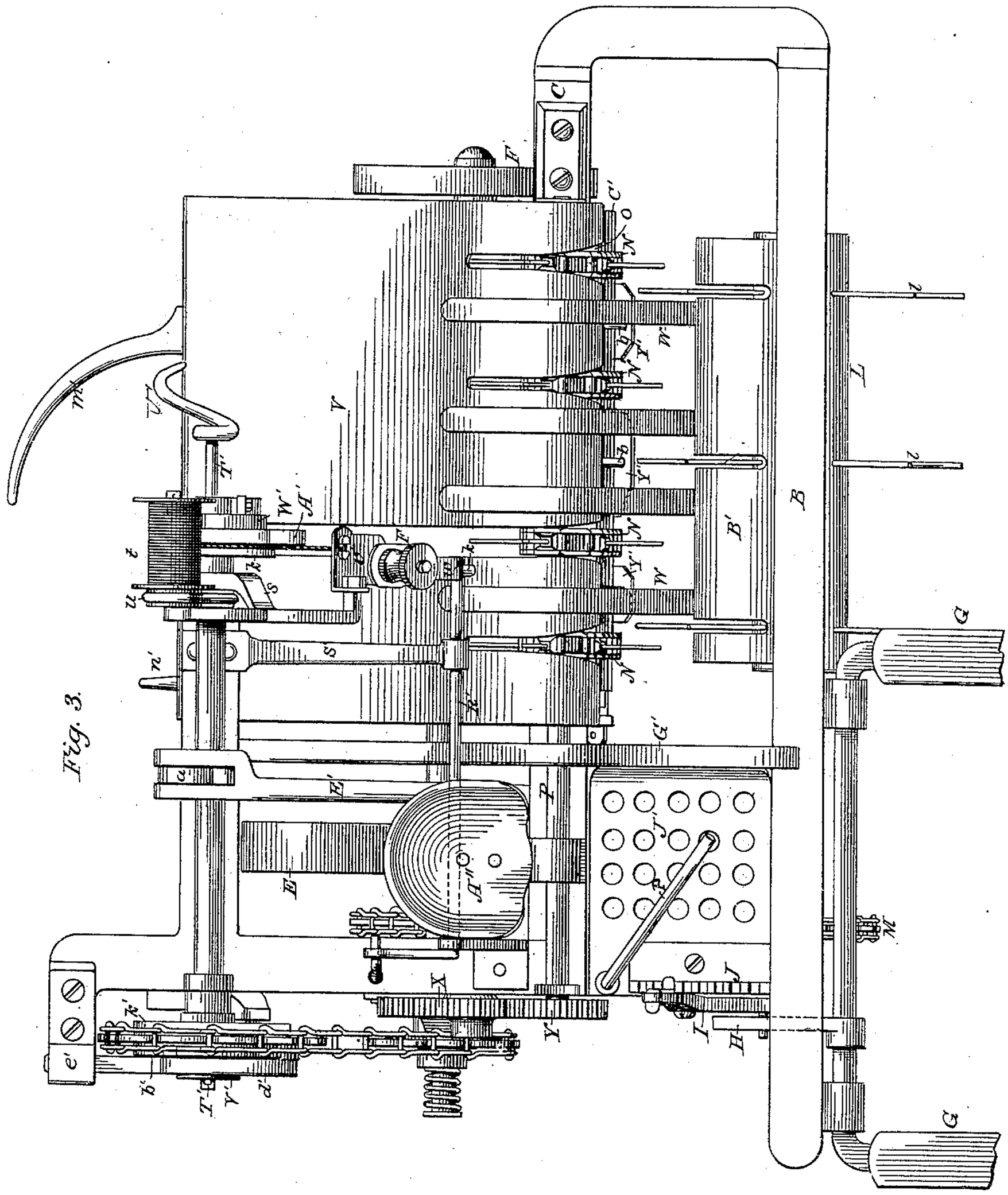

Fig. 3.

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Fig. 4.

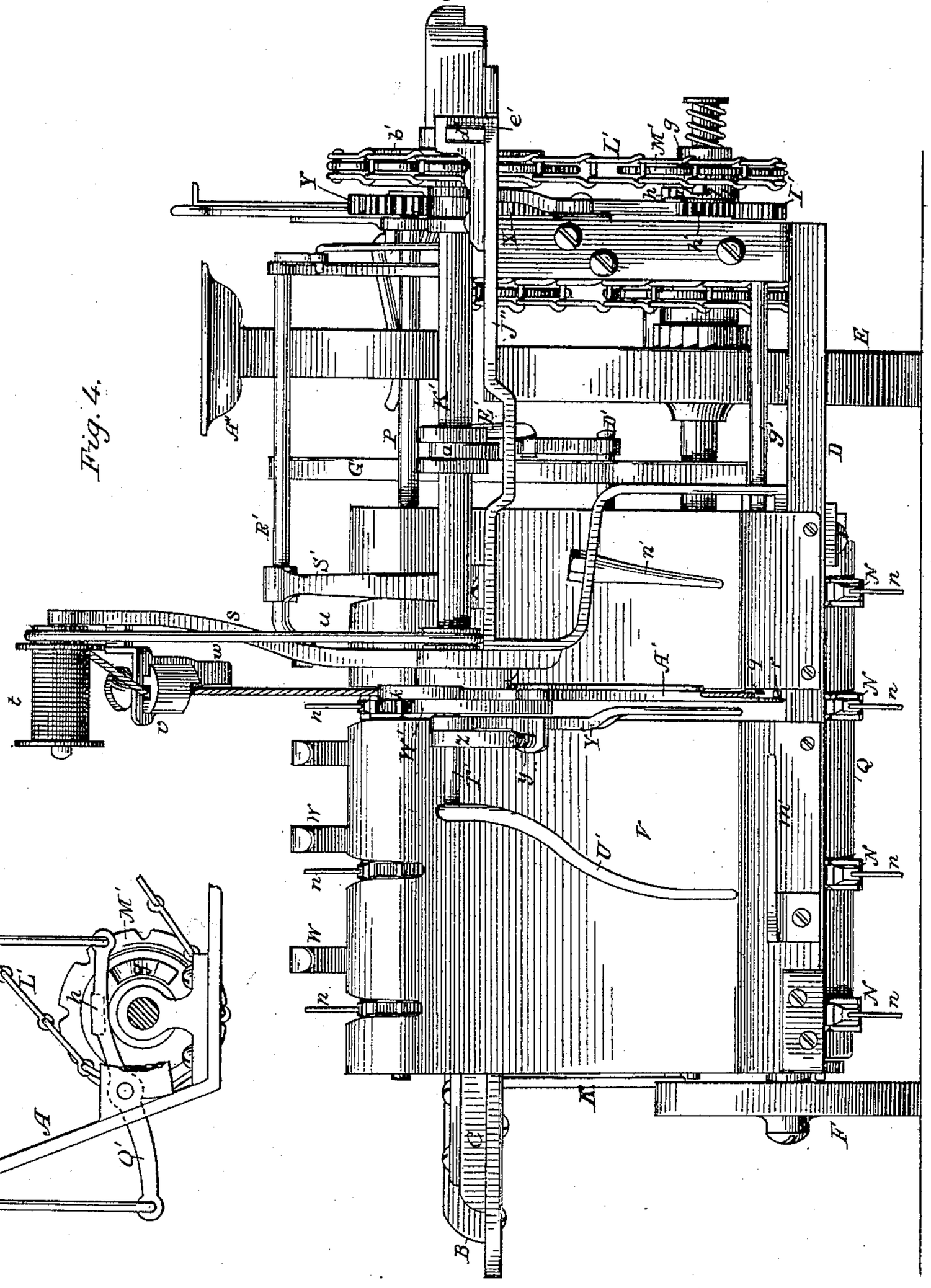

Fig. 5.

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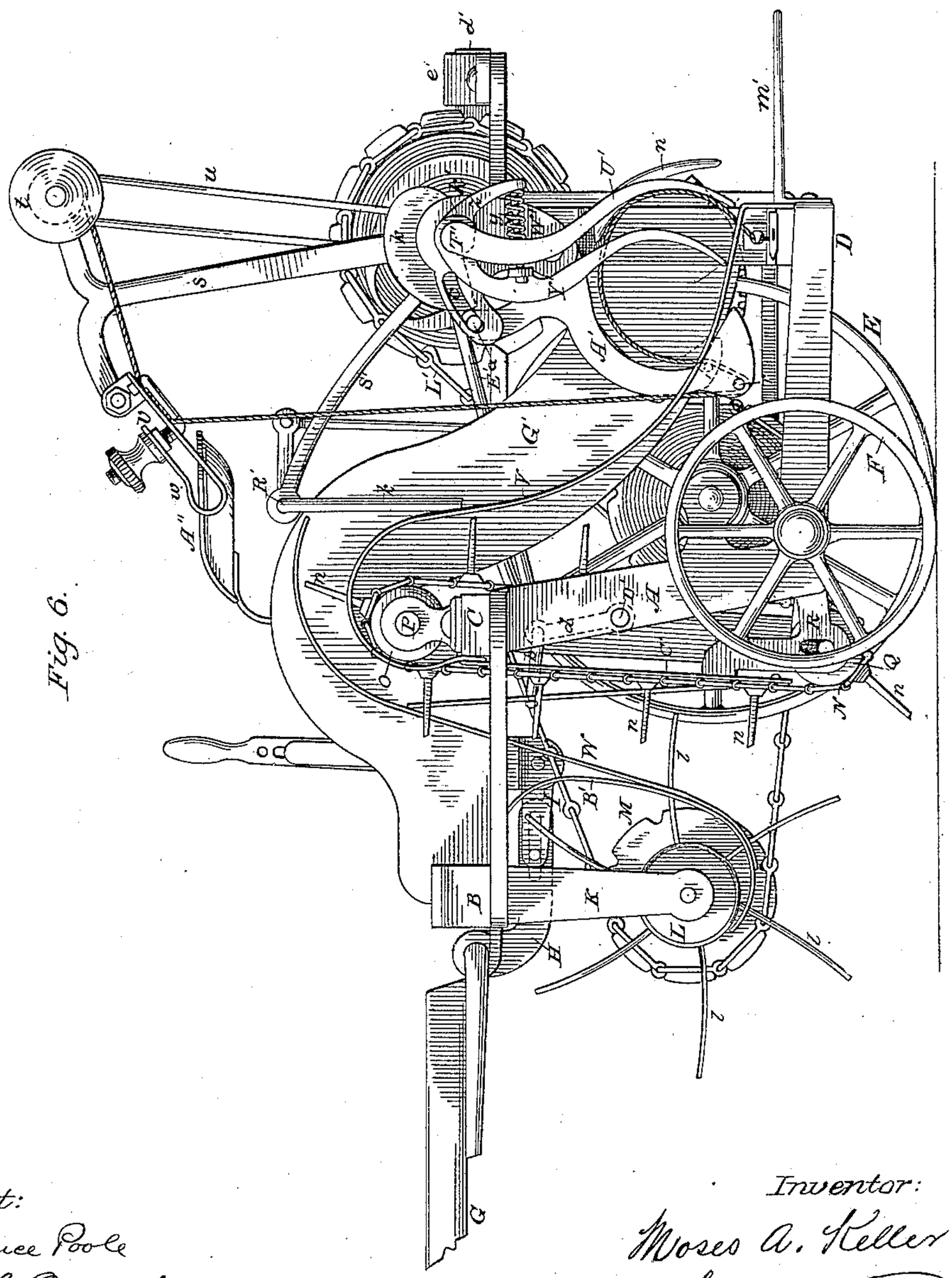

Fig. 6.

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M. A. KELLER.

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No. 221,922. Patented Nov. 25, 1879.

Fig. 7.

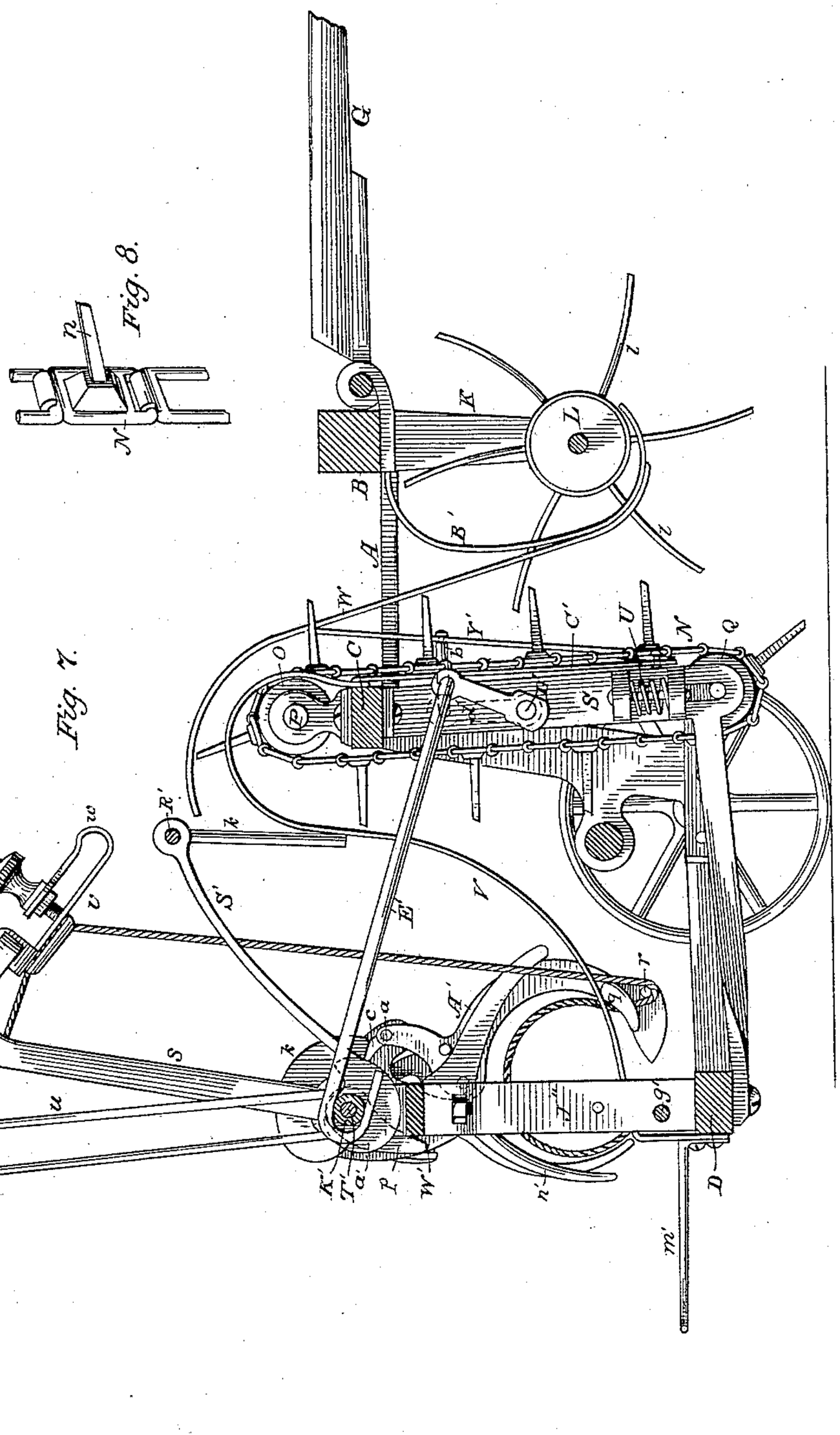

Fig. 8.

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L. H. Marshall

Inventor:

Moses A. Keller
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R. D. O. Smith

UNITED STATES PATENT OFFICE.

MOSES A. KELLER, OF BROCKPORT, NEW YORK.

IMPROVEMENT IN GLEANING AND GRAIN-BINDING MACHINES.

Specification forming part of Letters Patent No. **221,922**, dated November 25, 1879; application filed April 4, 1879.

To all whom it may concern:

Be it known that I, MOSES AARON KELLER, of Brockport, in the county of Monroe, in the State of New York, have invented a new and useful Improvement in Gleaning and Grain-Binding Machines, of which the following is a full and exact description, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of my machine from the right-hand side in front. Fig. 2 is a perspective view of the same from the left-hand side in the rear. Fig. 3 is a plan of the same. Fig. 4 is a rear elevation of the same. Fig. 5 is a side elevation, showing the tripping mechanism, whereby the binder is set in motion. Fig. 6 is an end elevation from the left-hand side. Fig. 7 is a longitudinal section. Fig. 8 is a perspective detail of the elevator-chain.

The main frame is composed of the end pieces, A, of wrought-iron, and the sill-pieces B, C, and D, which may be of wood. The main frame is rectangular in shape, and in two parts, the parts composed of the sill B and C being lifted above the wheels, and that part which is comprised between the sills C and D being partly vertical and partly horizontal, substantially on a level with the axis of the wheels.

The end pieces, A, are preferably composed of single pieces of wrought-iron, bent to the required shape, as shown, and securely bolted to the sill-pieces B, C, and D.

All of the operative mechanism of the machine is mounted upon this frame, which is supported upon the wheels E and F, wheel E being the driving-wheel, mounted upon the shaft, which should extend the whole length of the main frame, and has its bearings upon suitable brackets mounted upon the end. Said wheel is loose upon said shaft, but is caused to engage therewith by a ratchet and pawl, which, when in gear, permits said wheel to revolve backward freely, and causes it to engage with the shaft when the machine is advanced. F is the grain-wheel.

The horses necessary to propel this machine are attached by means of a tongue or thills, G, which are secured to the front sill, B, of the main frame.

In the operation of this machine it is sometimes desirable to tilt the front end upward or downward, so that the gathering devices shall run farther away from or nearer to the surface of the ground, and I therefore prefer to hinge the tongue or thills G to the front sill, B, as shown in Fig. 1. Thence from said thills or tongue a slotted arm, H, is extended backward along the side of the end frame A, and is there connected with the bell-crank lever I, which is provided with a latch and a segment-rack, J, whereby the frame may be tilted at the will of the driver and locked in any desired position.

Two brackets, K, are attached to the under side of the front sill, B, and depend therefrom, as shown, and at their lower ends they have the bearings for the cylinder L, which is provided with a series of curved projecting teeth, *l*. This cylinder L has imparted to it a rotation in the direction of the forward movement of the machine, and the teeth *l* gather the grain as it lies upon the ground, move it backward toward the elevating device a little, and thereby have an effect to straighten the straws which lie obliquely, rendering them all more nearly parallel, and in a more favorable position to be taken up and elevated.

The cylinder L is provided at one end of its shaft with the wheel M, which is, preferably, a sprocket-wheel, and is driven by a chain from a similar wheel on the axis of the main driving-wheel E. I prefer to give this cylinder L about two revolutions to each revolution of said driving-wheel, although that particular speed is not essential.

There is attached to the sill B a slotted apron, B′, which depends therefrom, and the lower end is turned forward beneath the cylinder L. The teeth *l* pass through the slots of the same.

The endless elevator is composed of a series of belts or chains, N N, which above pass over a roller, O, the shaft P of which is mounted in bearings, supported by the sill C. Below said belts or chains pass over a similar roller, Q, which is supported at one end by a bracket, R, projecting from an end of frame A, and at the other end by a bracket, S, which is pendent from the sill C. The shaft of said roller Q is mounted in movable boxes attached to said bracket, and said boxes are retained in position

by springs U, or equivalent devices, whereby the roller Q is continually depressed and the belts N kept tight. At the same time the roller Q is capable of being elevated when in the progress of the machine it comes in contact with some obstruction over which it is necessary to pass. Thereby the breaking of some part of the machine will be avoided.

The elevator belts or chains N N are each provided with a series of projecting fingers, *n*, whereby the grain is taken up from the ground and carried upward and above the upper roller, O, and delivered to the receptacle V, whereon it is bound.

In practice I prefer to use chains composed of square links similar to those shown in Fig. 8, a portion of said links being provided with the fingers *n*, as shown. By the use of said chains I am enabled to employ sprocket-wheels upon the shafts P Q instead of rollers; and I have the further advantage of always keeping said chains in exact position, no slipping being possible. The teeth thereof are all in line and act uniformly in lifting the grain.

Above the elevator, and extending down in front of the same, there is a series of yielding grain-compressors, W, which extend down, and at their lower ends are attached to the lower edge of the apron B′, and act as guards to retain the grain in contact with the fingers *n* as it is being elevated. The elevator chains or belts move upward with a speed about equal to the revolution of the cylinder L, so that the gathering-teeth *l* and the fingers *n* upon the elevator, on their proximate sides, move with the same speed, and therefore cooperate in raising all the grain from the ground and lifting it to a point behind the guards W. The elevator is conveniently driven by the same chain which passes over the wheel M to drive the cylinder L; but in order to change the direction of the rotation for the elevator, said chain does not pass over a wheel upon the shaft P, but a wheel attached to the gear X, which is in turn geared to the wheel Y upon the end of the shaft P, so that the cylinder L and the elevator are driven at uniform speeds, but in opposite directions.

The elevator, moving in a direction opposite to the rotation of the main wheel E, causes the teeth *n* in their movement around the roller Q to move along the ground in the direction of the machine's forward movement, and thereby prevents the escape of any grain lying upon the ground in the path of the machine.

In machines of this kind it is necessary to provide for the elevation of straw having great inequality of length; but it is not necessary that the entire elevating device should in width be equal to the length of the longest straw. I therefore extend the main frame laterally beyond the limit of the elevating device a sufficient distance to enable the longest straw to pass up between the sills B and C and within the end frame, A, on the grain side of the machine, as shown in the figures.

When a machine of this description is used to gather and bind grain immediately in the rear of the reaping-machine, so that the grain is gathered and bound as rapidly as it is cut, the position of the grain-wheel in respect to the remainder of the machine is not material; but when, as is frequently desirable, grain is suffered to lie upon the ground for several days after being reaped, it is necessary that the grain-wheel of the gathering and binding machine shall be so placed with respect to the machine that on each succeeding round said wheel shall not travel upon grain that has been cut and left lying upon the field. To accomplish this I place the grain-wheel F close to or in rear of the outer end of the elevating device and at some distance within the outer limit or end of the main frame, as shown.

The elevators N, acting continuously, would deliver a continuous stream of grain to the receptacle V, and the binding-arm would be obliged to pass through this continuous stream of grain—an operation which has always been attended with difficulty; and to avoid this difficulty I have employed a cut-off in front of the elevator, which is in effect to arrest the upward movement of the grain before it passes over the principal roller, and thereby divide the stream into gavels suitable for binding. This cut-off is composed of a series of slats or plates, Y′, which are jointed at their lower ends to the lower edge of the apron C′. Behind said apron, and having its bearings at one end in frame A and at the other end at the bracket S, there is a rock-shaft, D′, having crank-arms *d* projected therefrom, and each of said arms connected with one of the slats Y′ by a link, *b*, which passes through the apron C′. When said rock-shaft is partly rotated the plates Y′ are turned forward against the guard-slats or yielding grain-compressors W sufficiently far to press said guard-slats back beyond the points of the fingers *n*, so that the grain is stripped therefrom as said fingers pass upward; and as the grain continues to accumulate between said cut-off slats Y′ and said guard-slats W these arrest the flow and divide the natural stream of the grain into gavels for the convenience of the binding-arm. Said rock-shaft is actuated by a crank at one of its ends, and a connecting-rod, E′, driven by a cam upon the binder-arm shaft.

The receptacle V is preferably made of two pieces of sheet metal, the front edge being secured to the front side of the sill C, and slotted to permit the passage of the fingers *n*, and the rear edge being secured to the sill D. The space F′ is left between the two pieces which constitute said receptacle, so that the head of the binding-arm may pass below the surface of the said receptacle in gathering the gavel and pressing and binding the same. The wind or guard board G′ is placed along the inner end

of the elevator and receptacle, for the purpose of limiting the movement of the butts of the grain toward the driving mechanism, and to prevent the wind from disturbing the same as it passes into the receptacle from the elevator.

The driver's seat A′ is located upon a suitable support fastened to the sill C, above the driving-wheel E, or thereabout, so that the weight of the driver will not interfere with the balance of the machine on the main axle; and in front of said seat a foot-board, J′, is placed between the sills C and D.

The binding devices are rotary in character, and are supported upon suitable brackets J″, which are mounted upon the rear sill, D.

K′ is the principal shaft of the binding apparatus. It is mounted in boxes supported upon and above the rear sill, D, as above stated, and is driven by an open chain or belt, L′, which passes over suitable wheels M′ N′, the former upon the main axle and the latter upon the shaft K′. It is desirable, however, that that the shaft K′ and the operative mechanism driven by it shall have an intermittent motion, so that the frequency of action shall be properly adjusted to the thickness of the grain—that is to say, when the crop is heavy bundles must be bound more frequently than when the grain is sparse and thin. I therefore mount the wheel M′ loosely upon its shaft, and place on one of its faces a ratchet or other clutch, whereby it may be thrown into or out of engagement at will.

In the drawings I show for this purpose an ordinary ratchet-clutch which will permit the main wheel E to revolve backward without rotating the wheel M′, but will engage and rotate said wheel when the driver E revolves forward.

A lever, O′, is pivoted to the frame A, and is provided with a shoulder or stop, *h*, so located that a cam, *g*, upon one face of the wheel M′ will engage with said shoulder or other part of the lever O′ and force the ratchet-clutch out of engagement. A movement of said lever upon its pivot will disengage said cam, and permit the wheel M′ to re-engage with its clutch and set the binding mechanism in motion. A foot-rod is connected with said lever, so that the driver can, at will, cause said disengagement to start the binder. A spring, *i*, imparts a reverse motion to cause a re-engagement of said lever and cam and a disengagement of the wheel M′ from its driver.

The lever O′ may also be actuated automatically and periodically by the operation of some proper part of the driving mechanism by application of well-known devices; or it may be automatically actuated by the passage of the gavel when the same is received in that way, either by reason of its having been left in that way by the reaper or by the action of the cut-off, heretofore described. The latter mode I prefer, and as a convenient method I have connected the lever O′ to the crank-arm at one end of a rock-shaft, R′, a crank arm or lever, *k*, at the other end of which rests upon the receptacle V near its upper end, or upon the elevator, so that it is raised up by the passage of a mass of grain beneath it.

The upper end of the rock-shaft R′ is supported in a bracket, S′, the foot of which is bolted to the bracket J″. The shaft K′ is tubular, and the shaft T′ extends through it, having upon one end the compressing-arm U′, and upon the other end a pinion, V′. The shaft K′ has upon its inner end an arm, W′, to which the binding-arm A′ is pivoted at some little distance from the axis of said shaft K′. The arm A′ has a vibrating movement upon said pivot, which movement is limited by a pin, *a*, upon said arm, moving within the curved slot *c* in the arm W′. The vibratory movements of the arm A′ are determined by a cam, *k*, which is fixed to the bracket J″. There is also pivoted to the side of the arm A′ a secondary arm, *m*, which at the proper time is caused to be thrown forward by a cam, *p*, and thereby the bundle is thrown forward clear of the binding-arm and discharged from the machine.

The binding-arm A′ is pointed at its outer end, so as to easily pass through the flowing stream of grain, if required to do so; and upon the side near the head a smaller finger or arm, *q*, is rigidly secured, the position of which is parallel to the side of the head. Its purpose is to catch the binding-cord as the arm revolves and carry it down through the slot in the receptacle V around the bundle of grain, and deliver it to the knotting devices, which are located beneath said receptacle and immediately over the sill D. There is also on the head of the binding-arm, and radially more distant from the center of motion than the finger *q*, a roller, *r*, over which the binding-cord also passes, and in the action of the binding-head conveying said cord to the knotting mechanism said knotting mechanism passes between the finger *q* and the roller *r*, and the cord is thereby conveyed positively into the knotting-hook. The standard *s* is also mounted upon an outer end of the bracket J″, to support the cord-spool and tension device at a sufficient elevation to be above the orbit of the binding-arm A′. The cord-spool *t* may be removed and replaced at pleasure, and is supported upon a spindle projecting from the side of the standard *s*. Said spool may be subjected to any proper tension device to prevent undue discharge of the cord therefrom; but the device for this purpose which I prefer is a belt, *u*, which passes over a pulley on the end of said spool, or connected therewith, and over a similar pulley upon the shaft K′, the belt *u* being adjusted to give a backward revolution to the spool when it is being actuated by the revolution of the shaft K′, and thereby a proper tension upon said spool is secured, because, when the cord is being withdrawn from the same, said spool is caused to slip within the belt *u*, the belt being at that time moving in one direction and the spool in an opposite direction; or the belt *u* will be obliged

to slip upon the pulley on the shaft K′, which will accomplish the same purpose. The slipping of the belt *u* will likewise take place at all times except when, during the action of the binding mechanism, the binding-cord is slack, at which time the belt will cause the spool to revolve backward and take up the slack, and thereby restore the tension upon the binding-cord.

It is necessary, however, to provide a still further tension upon the binding-cord to enable a binding-arm to draw the same around the bundle with sufficient tightness, because if the entire tension-pressure were placed upon the belt *u*, which is constantly in action, the wear upon the same would be greater than desirable. I therefore place also upon the standard *s*, and in front of the spool *t*, the tension device *v*. which consists of two plates, between which the cord is required to pass, and between which it is compressed with as much force as is desirable to give the requisite tension, said tension, however, being elastic and and produced by a spring, *w*, through which a stud from one of said plates passes, and the plate is thereby pressed with the power of said spring against the opposite plate, and the cord is thereby compressed between them.

To adjust the pressure of said spring, I place upon said stud a screw-nut, whereby said spring may be more or less compressed, and its tension thereby varied.

In order to prevent the accidental turning of said nut and the unintentional variation of said pressure, I make its lower end square, and through the end of the spring a corresponding square orifice, so that the fitting of said spring upon said square will restrain and prevent the turning of the nut from any accidental cause. When it is desired to vary the tension of said spring this may readily be done by compressing the same at the end until it is free from the square described, when the nut may be turned either forward or backward, and may again be locked when the spring is released.

Upon the end of the rod T′ there are two compressing-arms, U′ and Y′, the former being fixed upon said rod, and the other movable, but restrained and held in position by a spring, *y*, which has its bearing upon a short arm, *z*, also fixed to said rod. These arms U′ and Y′ are the compressors, against which the binding-arm A′ forces the gavel while the binding is being performed, and compresses the same without strain upon the binding-cord; and the spring *y* is useful in making said compression, to a certain degree, yielding, so that there is no danger of breaking any of the parts when the bundle is larger than desired. When the binding has been completed the arms U′ and Y′ are caused to travel back by the turning of the rod T′ in its bearings within the tubular shaft K′, so as to release the bundle, which is thereupon discharged by the advance of the binding-arm A′.

Upon the shaft K′ (and represented about midway thereof) there is a cam, *a′*, and the connecting-rod E′, which actuates the cut-off Y, is forked and bent in the form of a hook at its outer end, so as to partly surround said shaft and embrace said cam *a′*, so that periodically during the revolution of said shaft K′ the connecting-rod E′ is thrown forward and the cut-off is actuated, as heretofore described. Upon the outer face of the wheel N′ there is a cam, *b′*, which is represented as a groove, though that form is not essential; and transversely in front of said wheel there is also a slide-arm, *d′*, one end of which is supported and guided in the stationary box *e′*, fitted to the bracket J″. The other end of said arm is provided with a large slot, sufficient to embrace the pinion V′. Along one side of said slot there is a series of gear-teeth, which mesh with the teeth of said pinion, so that the said arm, as it is reciprocated back and forth, imparts to said pinion a vibratory rotation. A pin or stud projecting from the side of said bar *d′* engages with the cam *b′*, so that as the wheel N′ revolves the bar *d′* is caused to reciprocate back and forth in its bearings. The outline of the cam *b′* is such that it imparts to said bar *d′* an intermittent reciprocation with intervening intervals of rest, and the pinion V′ has a corresponding intermittent vibratory rotation, with corresponding periods of rest, and the compressors U′ and Y′ are thereby held rigidly in position while the bundle is being bound, and are caused to recede at the proper time for the bundle to be discharged.

The mechanism applied for the purpose of knotting the binding-cord may be of any approved description, and is located upon the sill D, beneath the receptacle V, with its knotting devices projecting into the slot F′, so that the binding-cord is properly carried thereto by the binding-head. I prefer for this purpose devices which have a vibratory rotation, but do not design to be restricted herein to devices of any particular character. Supposing, however, that a knotting device having a vibratory rotation had to be employed, I place the shaft *g′* in proper bearings above the sill D, whereby said knotting devices may be actuated, and the requisite vibration of said shaft *g′* may be effected by a vibrating rack, *h′*, in mesh with the pinion I′ upon the end of the shaft *g′*. Said rack is pivoted to the end frame, A, or to a suitable bracket projecting therefrom, and is caused to reciprocate at the proper times by a cam, *k′*, placed upon the side of the wheel N′ said cam being similar in configuration to the cam *b′*, but adapted to the position of the arm from the vibrating rack which engages with said cam *k′*.

As hereinbefore stated, it is desirable in discharging the bundle to discharge it toward one side of the machine, so as to leave a clear path, into which the driving-wheel may pass on the next round, and for this purpose I have attached to the rear sill, D, a horizontal projecting and curved horn or arm, *m′*, which supports one end of the bundle as it is discharged

from the receptacle V, and prevents it from falling upon the ground. I also attach to the machine, at some convenient point, a curved arm or horn, n', for the purpose of arresting and preventing the discharge of the bundle at one end. This arm or horn may be conveniently attached to the bracket J″, which is slotted for the purpose of making the horn adjustable, though it is not essential that it should be attached to said bracket. When, therefore, the binding-arm A′ advances, after the completion of the binding of the bundle, to discharge said bundle from the machine, one end of the sheaf is arrested and held by the horn n', while the other end of said bundle rests and slides upon the horn m', and the bundle is thereby caused to swing around and fall to the ground with its length in the direction of the machine's advance, or thereabout, and its position nearly in line with that side of the machine which is toward the driving-wheel. The arms or horns m' and n' may be dispensed with if, for any reason, it is not necessary to deliver the sheaf toward one side of the machine, as described.

Having described my invention, what I claim as new is—

1. The rectangular main frame composed of the metallic end pieces, A, and sills B C D, in the form described, whereby one part of said frame is substantially on a level with the axes of the supporting-wheels, and another part is upright, and the remainder is horizontal and above the wheels and extended farther toward the grain side, for the purpose set forth.

2. A combined gleaner and binder provided with an elevator to gather the grain-stalks and carry them upward, combined with a cylinder, L, which rotates in the direction of, and at a speed greater than, the machine's advance, whereby the projecting fingers l are caused to disturb the grain-stalks upon the ground and render them substantially parallel prior to being taken up by the elevator.

3. The rectangular main frame composed of the end pieces, A, and sills B C D, in the form described, and the pending brackets K, secured to the sill B, to support the bearings for the revolving gatherer L, with a clear open space between it and the elevator.

4. The rectangular main frame composed of the side pieces, A, and the sills B C D, in the form described, provided with pendent brackets K, attached to the sill B, and the pendent apron B′, also attached at its upper edge to said sill, and at its lower edge curved beneath the gatherer L, so as to be entirely detached from and independent of the elevator-frame.

5. The endless elevator N and the revolving gatherer L, combined with the yielding grain-compressors or guard-slats W, attached at their lower ends to the lower edge of the apron B′, to guide and compress the ascending grain upon the elevator and strip the same from the teeth l.

6. In a machine for gleaning and binding grain, having a main frame mounted upon two wheels, and a revolving gatherer and endless elevator, to gather and elevate the grain from the ground, a thill or pole pivoted to said main frame, combined with a self-sustaining tilting-lever placed within reach of the driver, whereby he can, at will, elevate or lower the gatherer and elevator and lock it in the desired position, substantially as set forth.

7. In a gleaner and binder, an endless elevator to gather and elevate the grain-stalks, combined with boxes for the lower roller, movable up and down, and depressing-springs V for the same, to render said lower roller flexible, the more easily to pass obstructions, as set forth.

8. The rectangular main frame, the upper horizontal part whereof is extended laterally beyond the lower and upright part, combined with an elevating device to gather the grain upon the ground, and a grain-wheel located immediately adjacent to or in rear of the elevator and clearly within the parts cleared thereby, for the purpose set forth.

9. In a binding-machine, a revolving binding-arm, A′, combined with a fixed cam, k, to impart to said arm an irregular movement of advance and temporary pause, substantially as set forth.

10. In a binding-machine, a revolving binding-arm, A′, and a secondary arm, m, pivoted thereto, combined with a stationary cam-wheel, g, so that when the knotting of the band has been completed said arm m is caused to advance more rapidly than the arm A′, and thereby discharge the bundle in advance.

11. The revolving binding-arm A′, pivoted to the arm W′, combined with a pin, a, slot c, and cam k, whereby the irregular movements of said arm A′ in advance and pause are actuated and limited.

12. A spool, t, the spindle whereof is mounted upon a suitable supporting-standard and provided with a pulley at one end, combined with a belt, u, and a corresponding pulley on the shaft K′, said belt being adjusted to rotate said spool backward, and thereby produce a constant tension and take-up, as set forth.

13. The spool t, provided with a tension to prevent all undue discharge of the binding-cord, combined with the tension v, controlled by a spring, w, and screw-nut, the end whereof is made angular and is locked by the reactionary pressure of said spring, as set forth.

14. The tubular shaft K′, bearing at one end the revolving binding-arm A′ and its connected parts, and at its other end the pulley or sprocket-wheel N′, which receives its motion from the wheel M′, and the rod T′, which bears the compressor V′ at one end and the pinion v' at the other, combined with the cam b' and slotted rack-bar d', for the purpose of imparting to said rod T′ a vibratory rotation at the proper times, as set forth.

15. In a binder wherein the gavel is compressed, bound, and discharged from a binding table or receptacle, the horizontal horn or arm m', projecting rearward from said table

or receptacle, combined with a stationary upright horn or stop, *n'*, to arrest one end of the bundle while being discharged, whereby the discharging mechanism causes the bundle to swing around and fall upon the ground with its length in the direction of the machine's advance, or thereabout, substantially as and for the purpose set forth.

16. The rectangular main frame constructed with the end iron, A, at one end of the same, extended around over the sill D, and at a distance above it, to constitute a bracket, J'', integral with said end iron, as set forth.

17. In a machine for binding grain, the combination, with the rotating binding-arm or band-carrier, concave receptacle, and vibrating compressor secured to a shaft above the receptacle, of a supplemental arm or prong mounted on the same shaft of the compressor and partaking of the same motion, for the purpose of preventing the grain from sliding off the receptacle before the proper time, as set forth.

18. In a machine for binding grain, the combination, with a stationary tying mechanism, of a rotating binding-arm or band-carrier pivoted outside the axis of rotation to a plate, W', which is provided with a slot, *c*, and is mounted upon a rotating shaft, so that said arm, moving within the limit of the slot *c*, may come to rest or temporary pause during the operation of uniting the ends of the applied band without arresting the rotation of the binder-arm shaft, as set forth.

MOSES A. KELLER.

Witnesses:
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