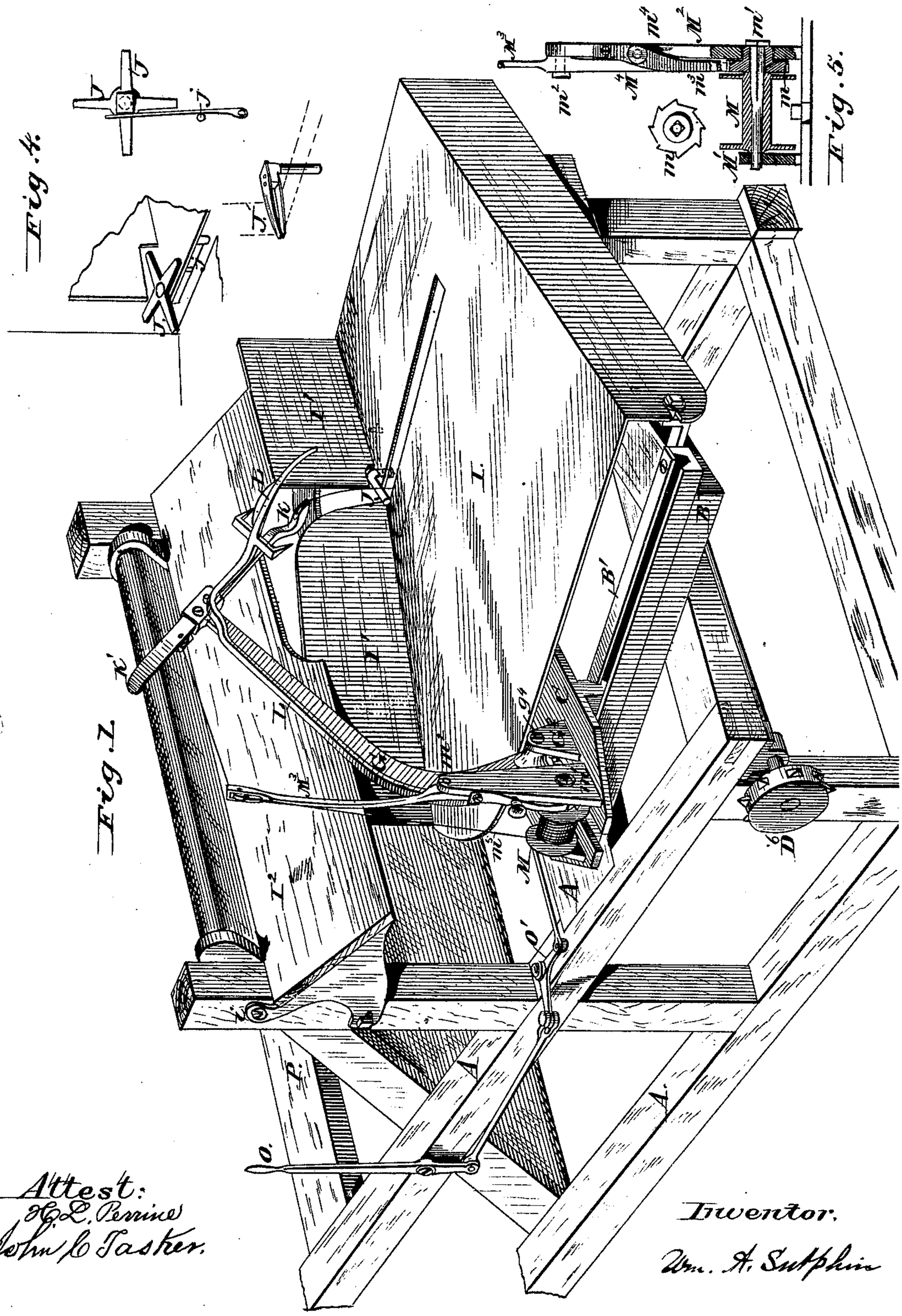
2 Sheets—Sheet 1.

W. A. SUTPHIN.

Grain-Binder.

No. 197,182. Patented Nov. 13, 1877.



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Inventor.
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2 Sheets—Sheet 2.

W. A. SUTPHIN.

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Fig. 2.

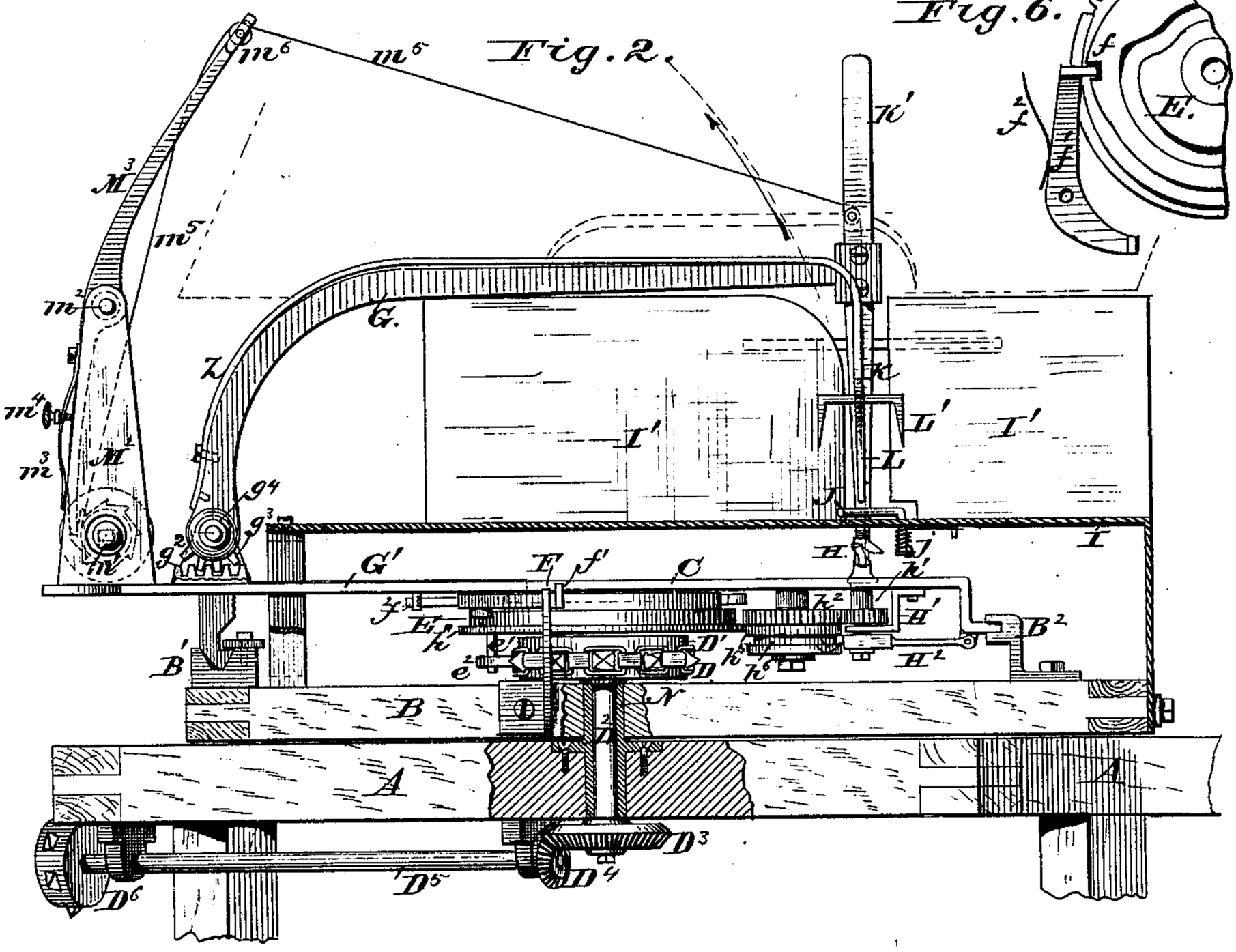
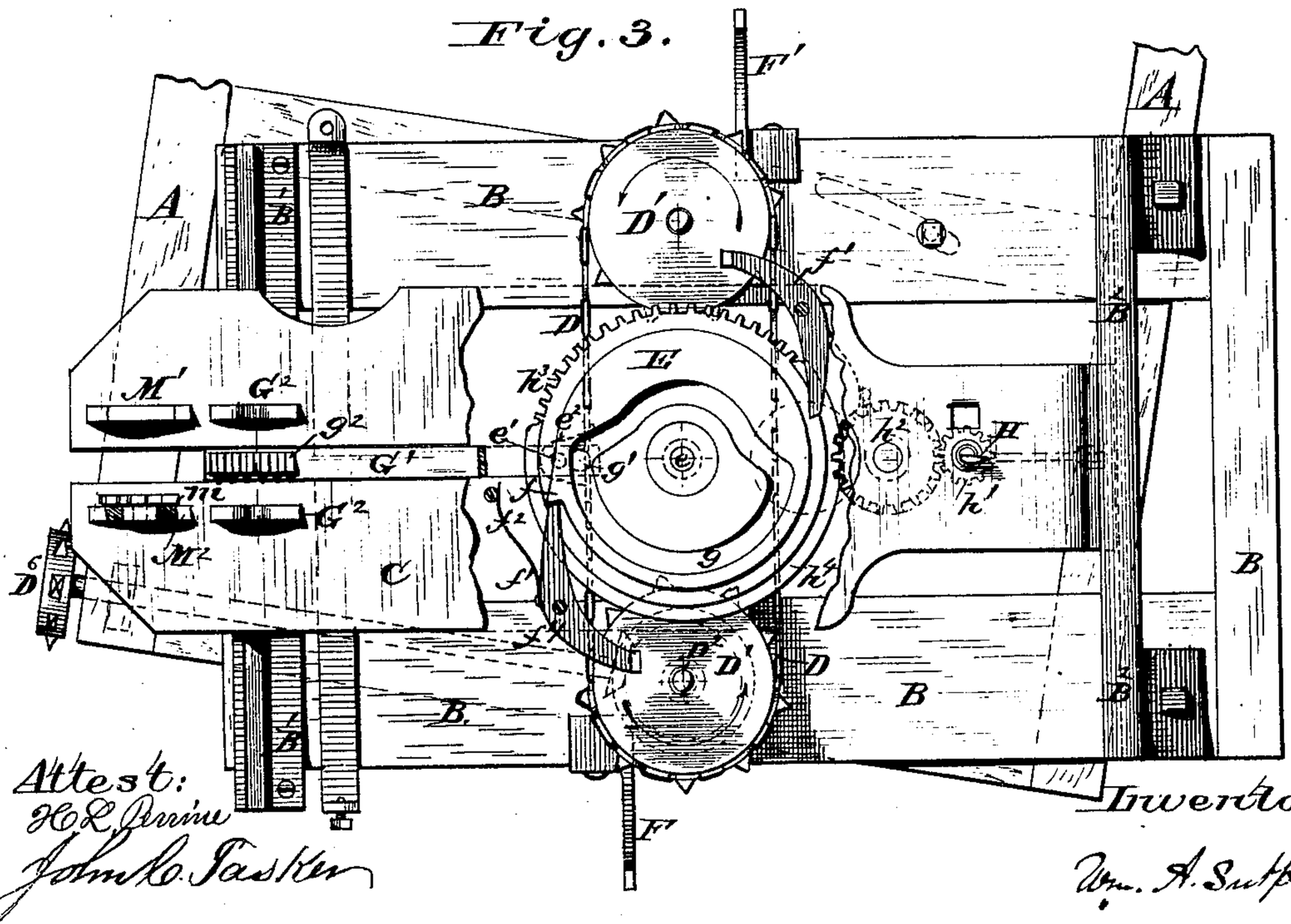


Fig. 6.

Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM A. SUTPHIN, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **197,182,** dated November 13, 1877; application filed November 8, 1877.

To all whom it may concern:

Be it known that I, WILLIAM A. SUTPHIN, of Washington city, District of Columbia, have invented a new and useful Improvement in Grain-Binders, of which the following is a specification:

The object of my invention is to furnish a machine that will bind the straw or stalks of grain in bundles; and it consists in the devices and combinations of devices, as hereinafter set forth.

In the accompanying drawings, Figure 1 represents a view, in perspective, of my improved binder in working position, the binding or wire-carrying arm being in an elevated position, ready to descend to encircle the gavel with the binding-wire, and deliver said wire to the twister. Fig. 2 is a view, in elevation, of the binder from the stubble side of the machine, with the table or grain receiver and supporting and binder frames in section to show the working parts. Fig. 3 is a plan view with the grain-receiver or binder-platform removed, and the reciprocating frame broken away, to show the operating mechanism. Fig. 4 represents a modification of the pivoted wire-receiving arm or dummy-gavel; Fig. 5, a section of the wire-spool and its controlling devices, showing their construction and mode of operation; and Fig. 6 sets forth a section of the wheel which operates the binding-arm and twister, and a modification of the pawls and ratchet which govern said wheel.

I have shown my binder as applied to that class of harvesters which elevate the cut grain over the driving-wheel and deliver it in a suitable receptacle on the stubble side of the machine; but it is equally applicable to machines of other construction.

The ordinary harvester-frame A is extended on the stubble side of the machine to form the necessary support for the binder. The binding mechanism is mounted upon and supported by the frame B, to which are attached suitable ways or slides B^1 B^2, which may be of any ordinary or preferred construction. The reciprocating carriage or frame C, which supports and carries all the binding mechanism, moves in said ways. The carriage C is reciprocated by the chain D, which has imparted to it a continuous motion in one direction by the sprocket-wheels D^1 D^1. The connection between the carriage C and chain D is a wheel, E, (or may be an arm,) journaled at *e* to said frame, and connected to the chain by a wrist-pin e^1, journaled in an eye, e^2, on the chain, (thus the chain and wheel have a fixed relation to each other,) and the wheel E is provided with a ratchet or notch, *f*, which engages alternately with pawls f^1 f^1, pivoted to the carriage C, on opposite sides thereof, and serves to move said carriage in either direction. As the carriage C is moving outward to deliver the bound bundle, the pawl f^1 comes in contact with the stop F, attached to the binder-frame, which releases said pawl from the notch *f*, and allows the wheel E to turn on its journal and make one-half of a revolution, when the ratchet will engage with the pawl on the opposite side of said carriage, and form a fixed relation between the driving-chain and carriage C, until the pawl is again released by the stop F′ on the opposite side of the binder-frame. The pawls f^1 are held in position to engage with the ratchet or notch on the wheel E by the springs f^2. The pawl and notch may be constructed so as to form a lock to the wheel E, as represented in Fig. 6.

The wrist-pin e^1 on the wheel E is the same distance from the center of said wheel as the eye on the chain is from the center of the sprocket-wheels, so that the engagement of the driving parts is always complete, or has a fixed relation, whether the carriage C is being reciprocated, or whether said carriage is standing, and the wheel E, with its pin e^1, is being turned one-half of a revolution on its journal around either of the sprocket-wheels. The driving-chain moves the carriage alternately back and forth the distance from center to center of the sprocket-wheels, and allows said frame or carriage to stop at each end of its reciprocation the length of time required for the chain to carry the wrist-pin one-half of a revolution of the sprocket-wheels.

To operate the binding or wire-carrying arm G, which is hinged or pivoted in the lugs or ears G^2 G^2 on the carriage C, I provide the wheel E with a cam-groove, *g*, which gives a reciprocating motion to the rack-bar G^1, through the medium of the pin or anti-friction roller

g^1, secured to said bar, and working in the cam-groove. The rack-bar is provided at its rear end with teeth or cogs g^2, engaging with a segmental rack, g^3, on the end of the binding-arm, near the pivot g^4, on which the arm swings as it is raised and lowered to receive the gavel and apply the band thereto.

Any known or preferred twister may be used with this machine. I have, however, shown in the drawing the band twister and cutter invented by me, and patented November 6, 1877, No. 196,949.

The band-twister H is operated by the wheel E, while the reciprocating carriage C is at rest, during the passage of the wrist-pin e^1 around the sprocket-wheel from one side to the other. The twister H has a pinion, h^1, on its shank, which engages with the intermediate pinion h^2, which, in turn, engages with the segmental rack h^3 on the wheel E. To retain the twister in a fixed position during the disengagement of the pinion h^2 and segmental rack h^3, the wheel E is provided with a flange, h^4, which, as the teeth of the segment and pinion disengage, falls into a corresponding recess in the flange h^5 on the pinion h^2, thus locking the twister, and preventing any rotation thereof until the rack is again brought in contact with the pinion.

The twister is journaled in the carriage C and bracket H^1, fixed to said carriage. To give the necessary movement to the twister and cutter, as described in my aforesaid patent, I provide the pinion h^2 with a cam-groove, h^6, in which the anti-friction roller on the bar H^2 travels, giving said bar a short down-and-up movement at the end to which it is attached to the twister at each revolution of the pinion h^2. The pinion h^2 may be dispensed with, and the twister and cutter operated directly from the wheel E. Thus the semi-rotation of the wheel E operates the arm G to carry the band to the twister, and the twister and cutter to twist and sever the band.

To the grain-receiver or binder-platform I, I attach a spring-arm or dummy-gavel, J, in such position that as the carriage C moves up to receive a gavel the twister will be under or slightly back of said arm, and thus protected from the grain during the twisting of the band, and the band which is carried with the twister and binding-arm or needle will be on the outside of the gavel and said spring-arm, and as the binding-arm descends to encircle the gavel with the band the spring-arm will also be gathered and bound with the grain, and as the carriage moves back to deliver the bundle the pivoted arm, which is retained in working position by the spring j, will be moved to one side of the path of the binder-arm and drawn out of the bundle, and resume its former or normal position. Should the binder be in operation, and no grain delivered thereto, the pivoted spring-arm or dummy-gavel will receive the band and hold the same during the process of securing together the ends thereof, and insure the regular operation of the machine, without knotting or breaking the wire or freeing the end from the twister.

The dummy-gavel is also applicable to binders which twist the band during the backward movement of the carriage and twister, by pivoting it to the binder-carriage, and giving it a partial rotation by the reciprocation of the carriage.

The arms of the dummy-gavel may be made of solid pieces of metal, or they may be composed of light spring-pieces, as represented at J′, which will allow them to yield as the band is twisted around it.

The binder-platform I is provided with a back or upright portion, I^1, against which the gavel is compressed, and behind which the binding-arm descends to carry the band to the twister. Said back and table are slotted for the passage of the needle-arm as it delivers the bound bundle. The grain-board I^2 extends over the back I^1, and is hinged at i to allow of the removal or adjustment of the binder-table. The needle K is provided with a portion, K′, extending above the arm G, to form a cut-off to the flowing grain on the board I^2 while the bundle is being bound.

To compress the gavel preparatory to binding, I apply a spring-compressor, L, to the heel of the binding-arm, near its pivot-pin g^4, and extend it as far forward as the band-carrying needle, and so shape and locate it that as the binder-arm descends to deliver the band to the twister the compressor will compress the gavel, whether large or small, according to the power of the spring.

The compressor may be made entirely separate from the binding-arm, and have motion imparted to it similar to that of the binding-arm.

To the spring-compressor I affix a fork or prongs, L′ L′, which, as the binding-arm descends, are forced into the bundle, and hold it in a fixed relation to the binder-arm and carriage, and not allowed to turn or twist as it is carried back to be delivered.

The band-spool M is supported in brackets or journal-bearings M^1 M^2, attached to the rear end of the carriage C. In the bracket M^2 is journaled a ratchet-wheel, m, having a square central opening to receive the pin m^1, which is made square at one end, and the band-spool is also provided with a square opening at one end, so that as pin m^1 is inserted into the opening in the ratchet-wheel, spool, and bracket, the spool and ratchet-wheel will be locked to turn together, and the rotation of the spool will be on the journal of the ratchet-wheel, and the end of the pin in the bracket M^1.

The bracket M^2 is extended a sufficient height to form a support for the pivoted band-guide M^3, the lower end of which is formed into a pawl, M^4. The guide and pawl swing on the pin m^2. The pawl M^4 is held in contact with the ratchet-wheel m by the spring m^3, secured to the bracket M^2, and exerting its force against the end of the pawl. The tension of the spring

may be varied by adjusting the screw m^4, which has a bearing in the bracket M^2. Thus the tension of the band, as it is applied to the gavel to compress and bind the same, may be varied as found most desirable.

The wire m^5 from the spool is carried over or around the pulley m^6 on the guide M^3, then to the needle or binding arm, by which means it is delivered to the twister.

From the above-described construction it will be seen that the band cannot be drawn from the spool until the tension on said band is sufficient to overcome the tension of the spring on the pawl. The spool is positively locked or prevented from turning, so that no wire will be let off, until the strain on the wire becomes greater than the predetermined compression to be given to the bundle, when the pawl will be disengaged from the ratchet-wheel, and the spool left free to give off the band without any tension, until the slack in the band allows the pawl to engage with the ratchet-wheel.

By this construction the letting off of the band is positively controlled, without regard to the weight of the spool, or whether it is filled or almost empty.

The binder-frame B is adjustable on the main frame by swinging horizontally on a tubular pivot, N, which is secured to the main frame A, and said tubular pivot forms the journal-bearing for the shaft D^2 of the sprocket-wheel D^1. The shaft D^2 has secured to its lower end a bevel-gear wheel, D^3. Engaging with said wheel is a bevel-pinion, D^4, on the shaft D^5, which has bearings on the main frame.

Motion is communicated to the sprocket-wheel D^6 from any convenient driving part of the machine, and through it to the pinion D^4 and shaft D^2. The operating parts of the binder all derive their moving-power from the shaft D^2 and sprocket-wheel D^1, as hereinbefore described.

With this construction the relation of the driving-power and the binding mechanism always remains the same, whatever may be the adjustment of the binder-frame.

For convenience in adjusting the binder to the length of the grain, I place a hand-lever, O, having the necessary detent-latch, in convenient reach of the driver, whose seat is located on the seat-frame P. To the lever O is connected a link extending to the bell-crank lever O′, which, in turn, is connected to the binder-frame, so that the attendant, at will, while the machine is in motion, may make the necessary adjustment of the binder.

It is evident that this binding mechanism is applicable to tables having a straight sliding adjustment.

I claim as my invention—

1. A frame or carriage having a wheel and pawls pivoted thereto, in combination with a driving-chain traveling continuously in one direction over suitable pulleys, and connected to said wheel by a wrist-pin, substantially as described, whereby a reciprocating movement is imparted to the sliding carriage and a semi-rotation given to the wheel at each interval of rest of the carriage at the ends of its movement in reciprocating.

2. The combination of a carriage, driving-chain, wheel, and pawls on the carriage, and fixed stops on the binder-frame, substantially as described, whereby the pawls will be automatically disengaged from the ratchet or stop on the wheel, and the movement of the carriage limited.

3. The combination, substantially as hereinbefore set forth, of a reciprocating carriage, a wheel, provided with a cam-groove, journaled thereto, a sliding bar, and a binding or wire-carrying arm, whereby, as the wheel is given a semi-rotation, the binder-arm will be vibrated, or its needle end caused to rise and fall.

4. The combination of a reciprocating carriage, a wheel provided with a segmental rack, journaled thereto, and a twister, substantially as described, whereby a rotary motion is imparted to said twister by the semi-rotation of the wheel during the interval of rest of the carriage.

5. The combination of a carriage having a wheel and pawls pivoted thereto, a driving-chain connected to said wheel by a wrist-pin, a binding-arm, and a twister, substantially as described, so that by the continuous motion in one direction of the driving-chain the carriage will be reciprocated with an interval of rest at each end of its movement, the binder-arm vibrated, and the twister rotated.

6. The combination of a grain-receptacle, a reciprocating binding-carriage having an interval of rest at the ends of its movement, a wheel journaled to said carriage, a binding or wire-carrying arm and twister, substantially as described, whereby the grain in the receptacle is gathered into a gavel, encircled with the band, and during the interval of rest of the carriage the binding of the bundle completed.

7. The combination of a reciprocating binder-carriage having intervals of rest at the ends of the reciprocation, a binder-arm, and a twister automatically operated to twist the wire during said intervals, substantially as described.

8. The combination of a binding or wire-carrying arm and a spring-compressor attached to said arm at or near the pivot on which it vibrates, and substantially longitudinal thereto, substantially as described.

9. The combination of the band-carrying arm with a fork or prongs, substantially as described, whereby the bundle will be held in a fixed relation to the binding-arm during the delivery of said bundle.

10. The combination of a spool and ratchet-wheel with a pawl controlled by the band, substantially as described.

11. The combination of a spool, a pawl and band-guide, a binding-arm, and a band drawn

from the spool over the guide by the binding-arm, substantially as described.

12. A dummy-gavel, substantially as hereinbefore set forth.

13. The combination, substantially as hereinbefore set forth, of a twister, a dummy-gavel, and a binding-arm, whereby, during the absence of a gavel of grain, the band will be received by the dummy-gavel and the regular movements of the binder continued without liability of knotting the band or breaking the end thereof away from the twister.

14. A binding mechanism supported on a horizontally-vibrating binder-frame, in combination with a driving-shaft, D^2, concentric with the tubular journal on which the binder is adjusted, substantially as described.

WM. A. SUTPHIN.

Witnesses:
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