(No Model.)

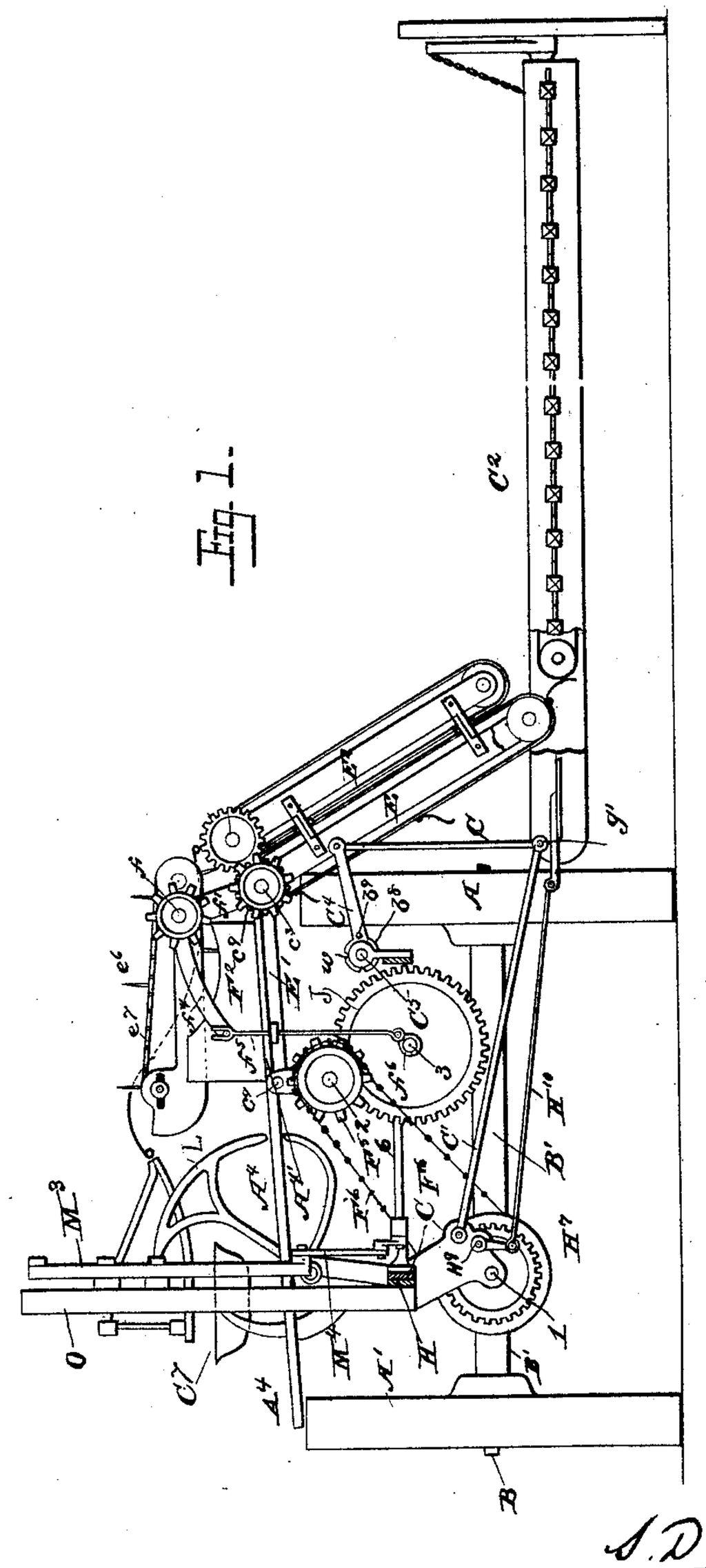
10 Sheets—Sheet 1.

S. D. MADDIN.

GRAIN BINDER.

No. 410,424. Patented Sept. 3, 1889.

Fig. 1.



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10 Sheets—Sheet 2.

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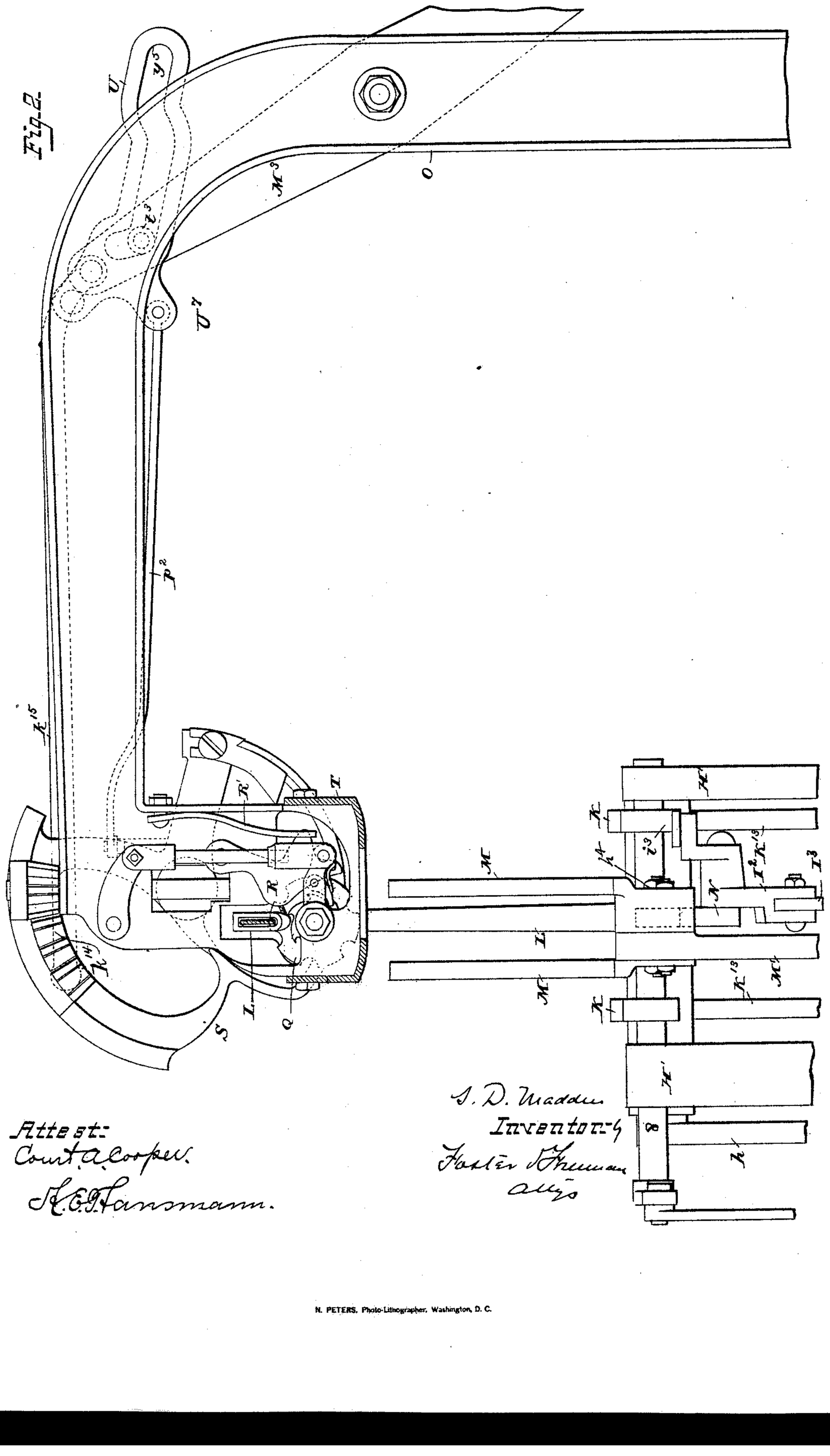
GRAIN BINDER.

No. 410,424. Patented Sept. 3, 1889.

Fig. 2.



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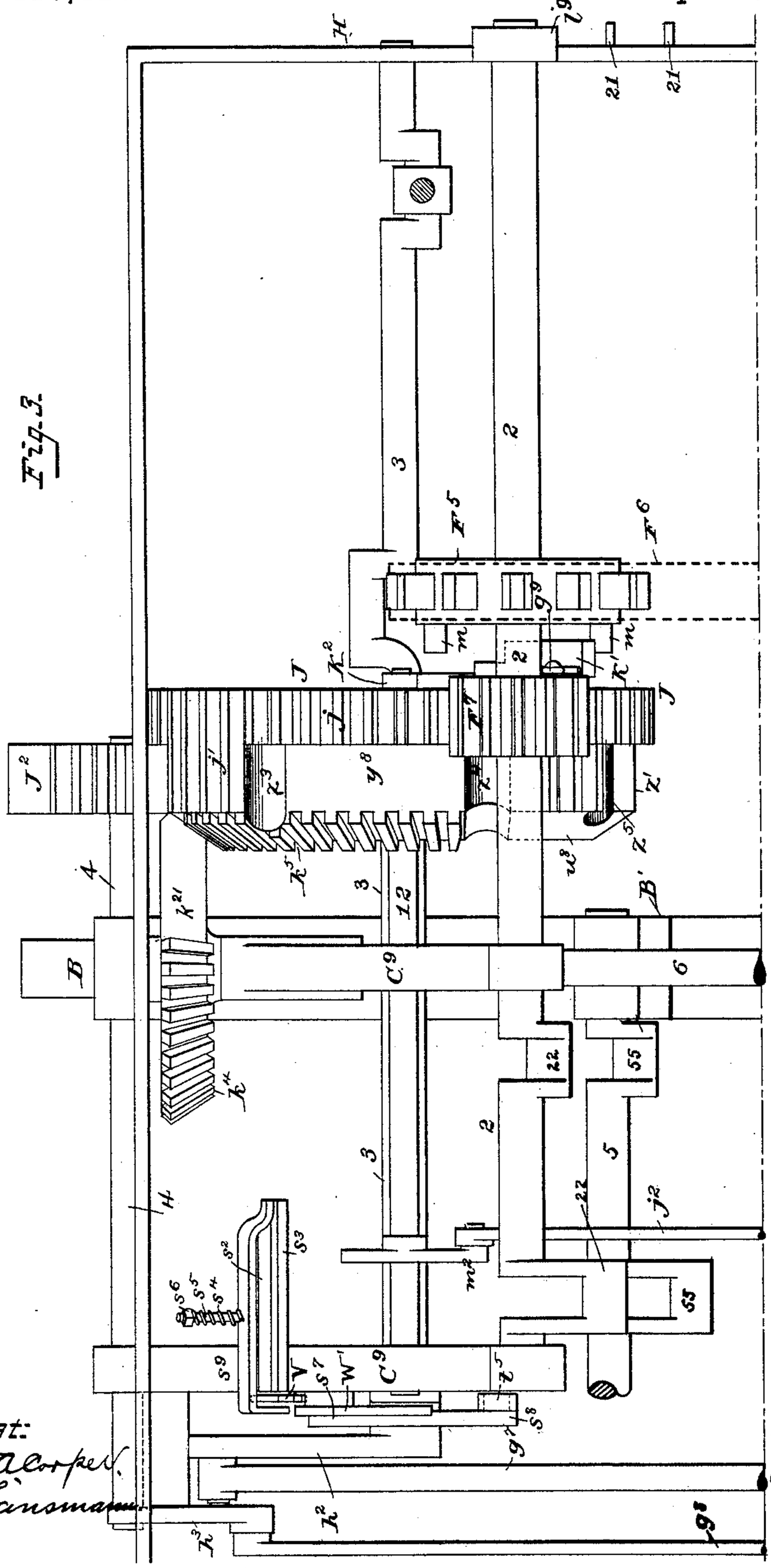
GRAIN BINDER.

No. 410,424. Patented Sept. 3, 1889.

Fig. 3.



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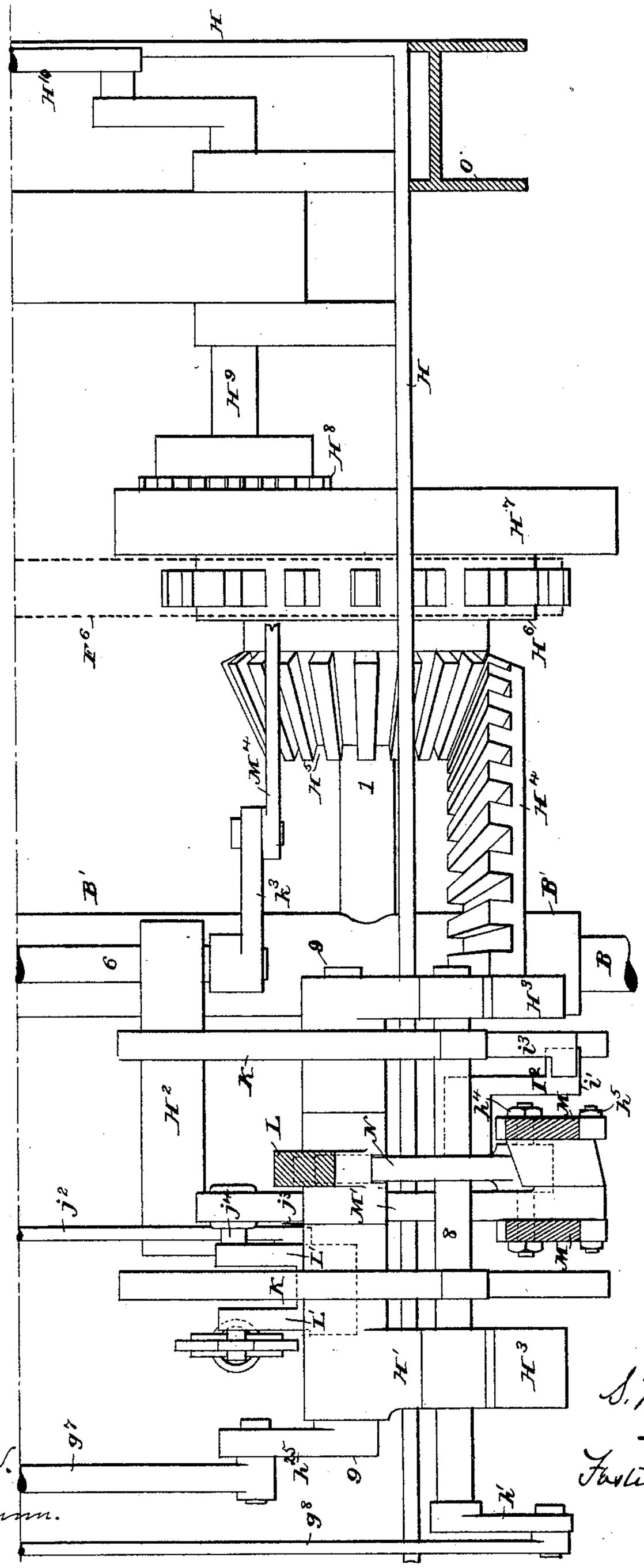
GRAIN BINDER.

No. 410,424. Patented Sept. 3, 1889.

Fig. 4.



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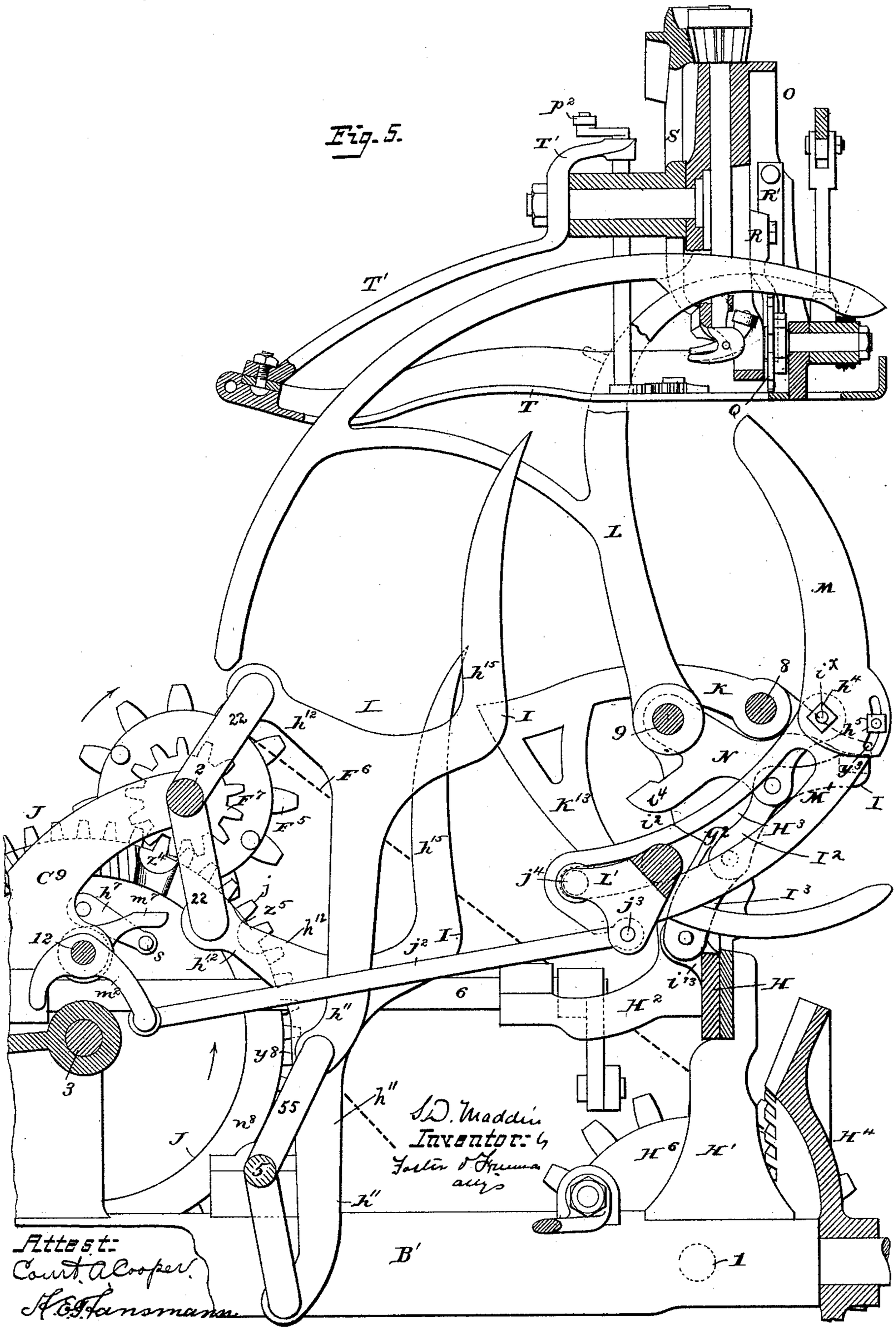
GRAIN BINDER.

No. 410,424.

Patented Sept. 3, 1889.

Fig. 5.



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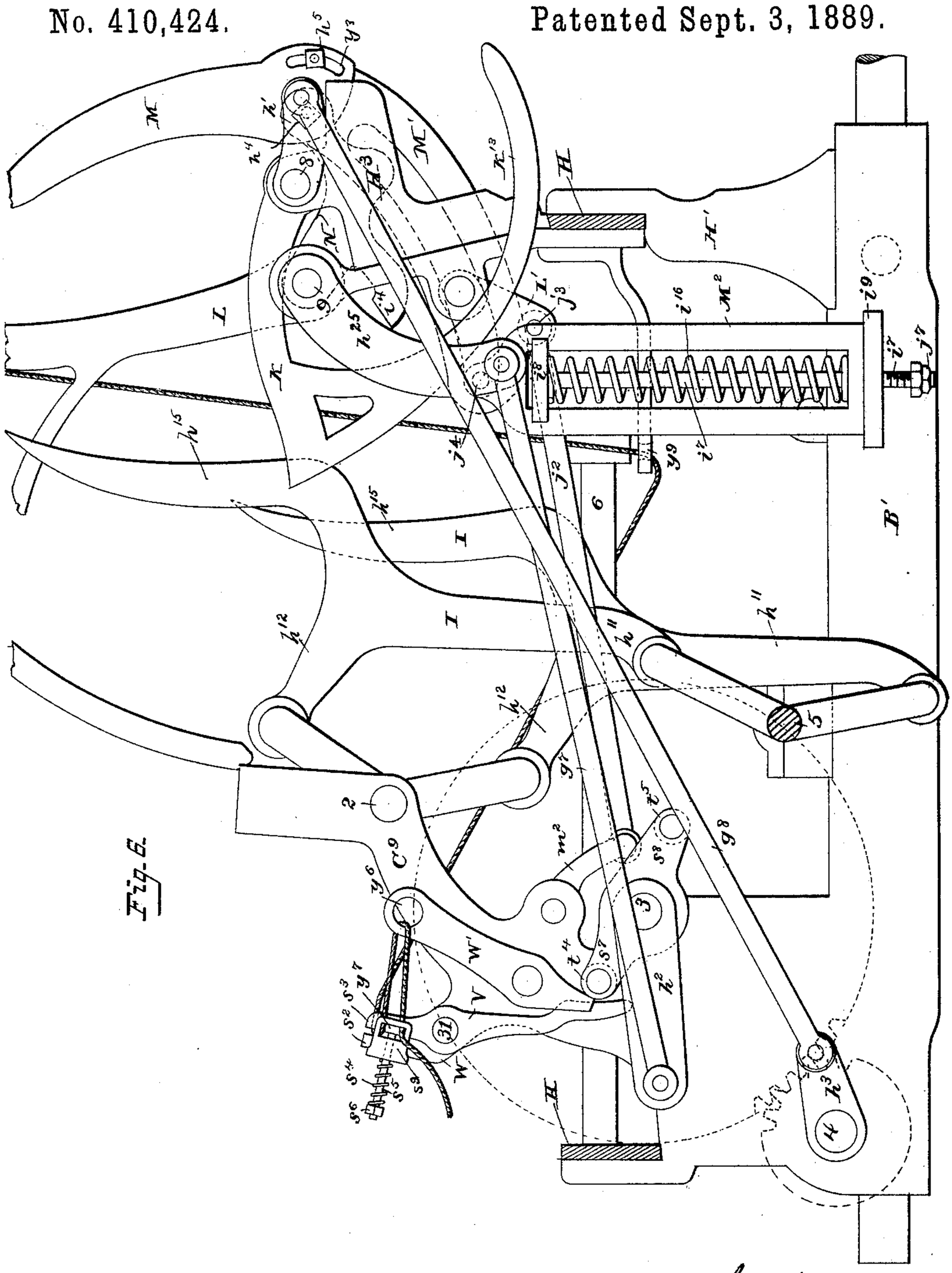

Fig. 6.

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GRAIN BINDER.

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Fig. 8.

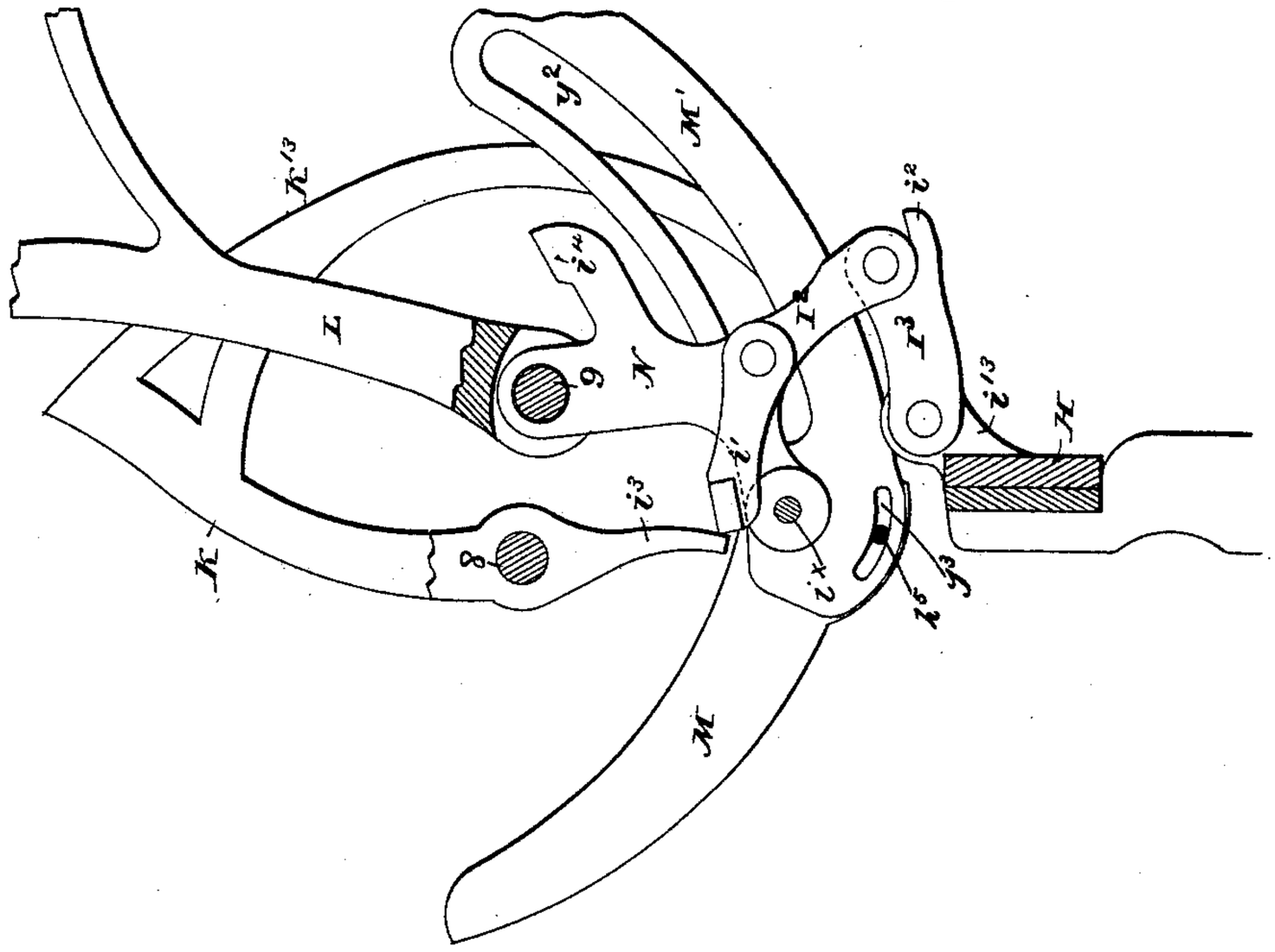
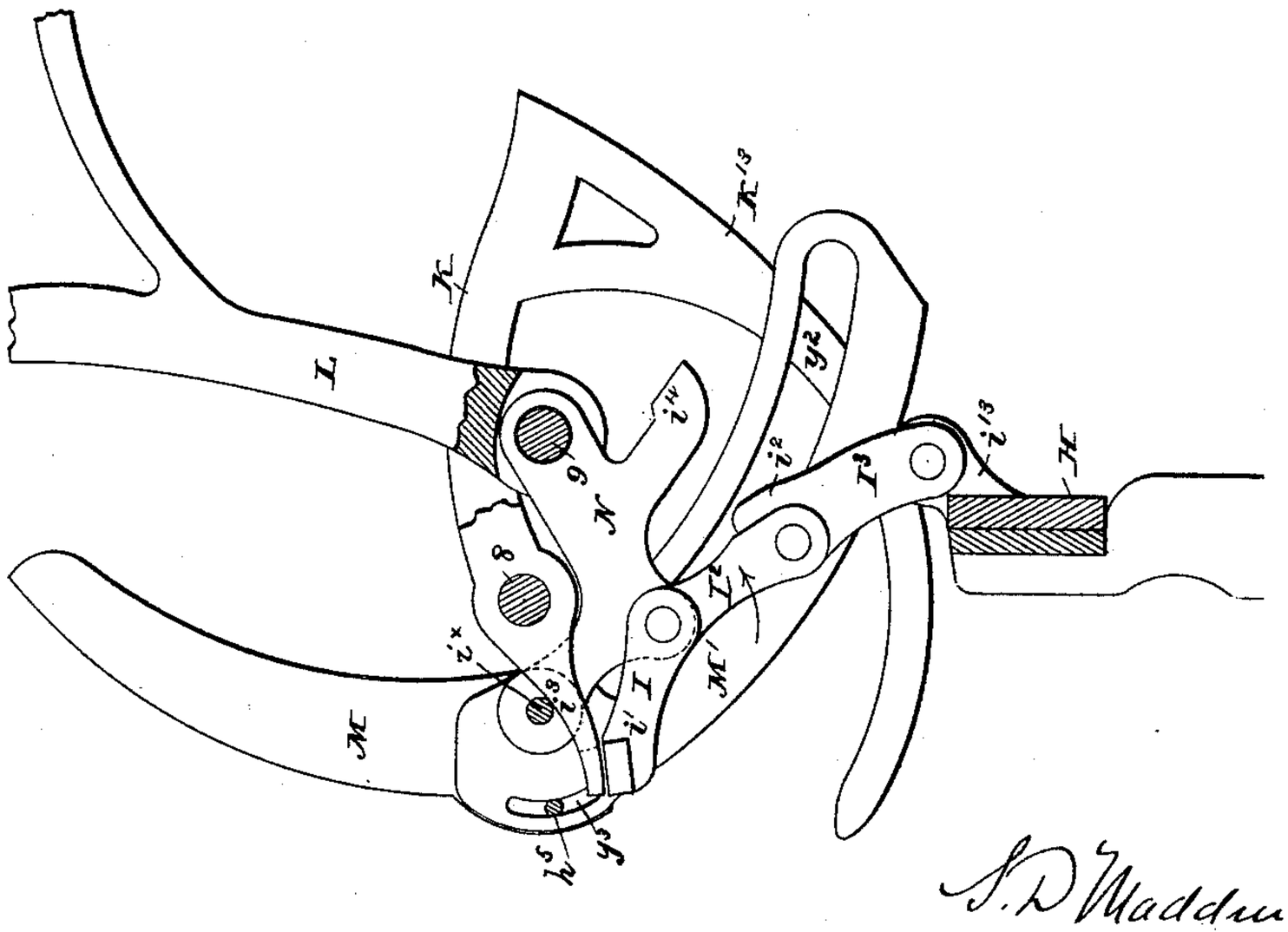


Fig. 7.



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GRAIN BINDER.

No. 410,424.

Patented Sept. 3, 1889.

Fig. 11.

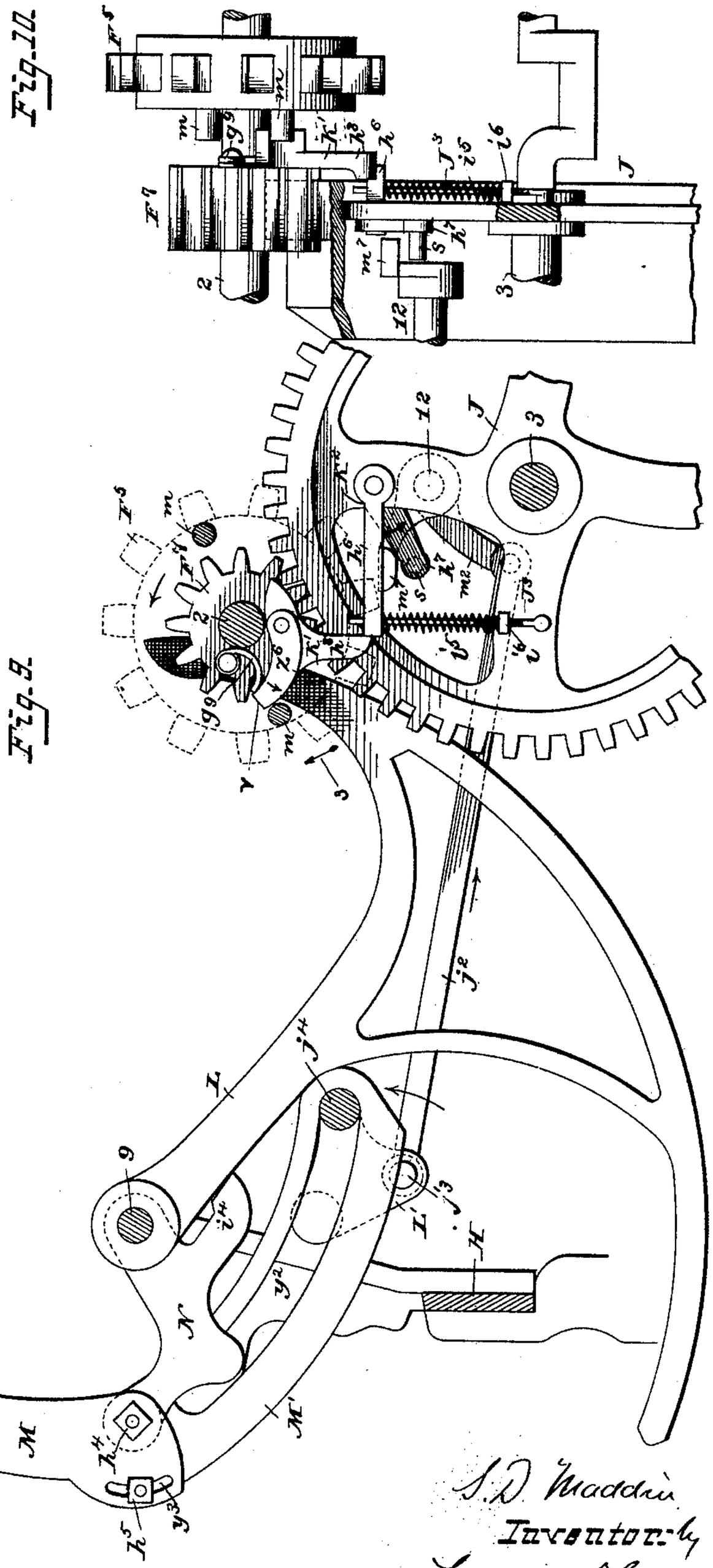

Fig. 2.

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(No Model.) 10 Sheets—Sheet 9.

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GRAIN BINDER.

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Fig 11.

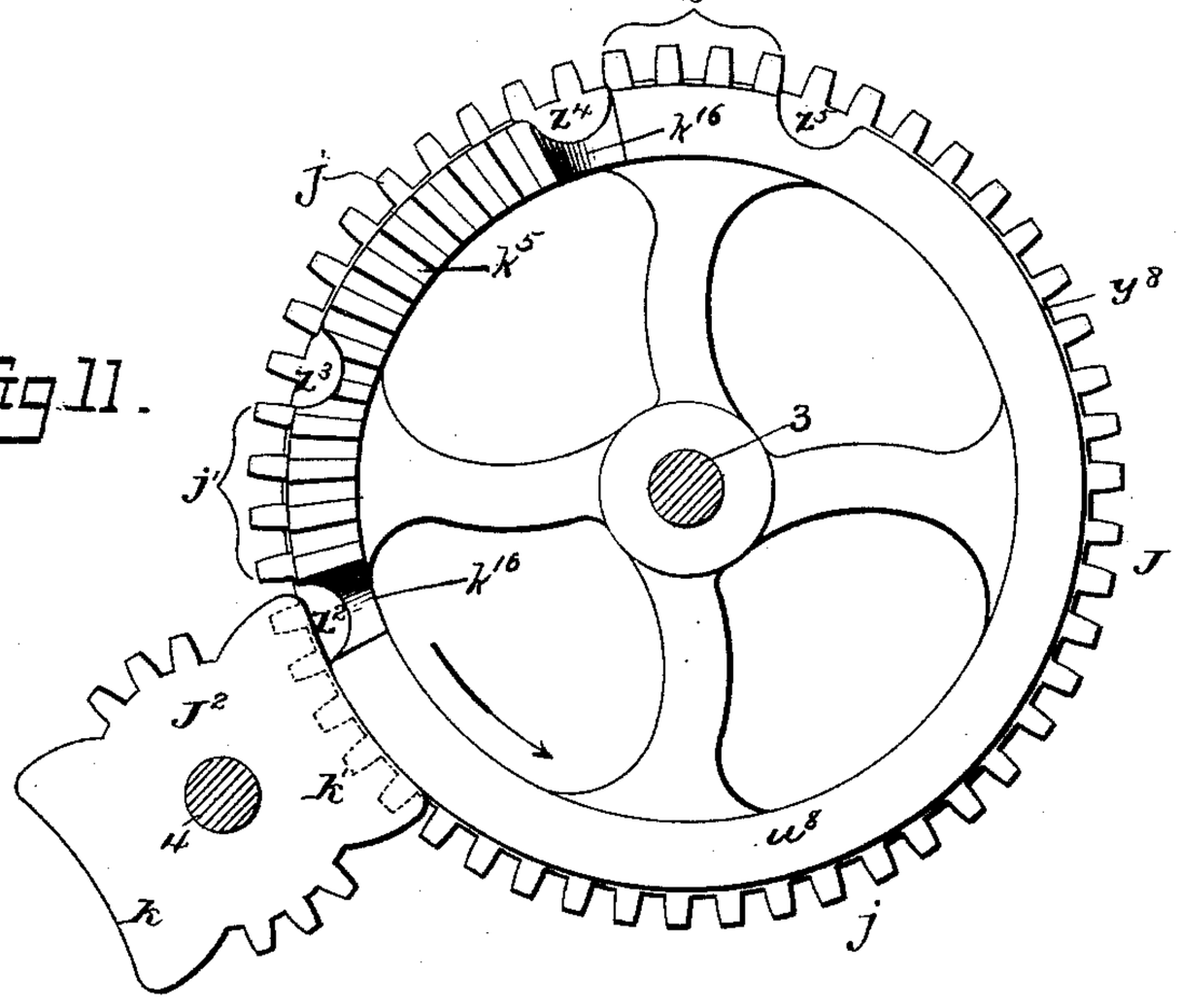
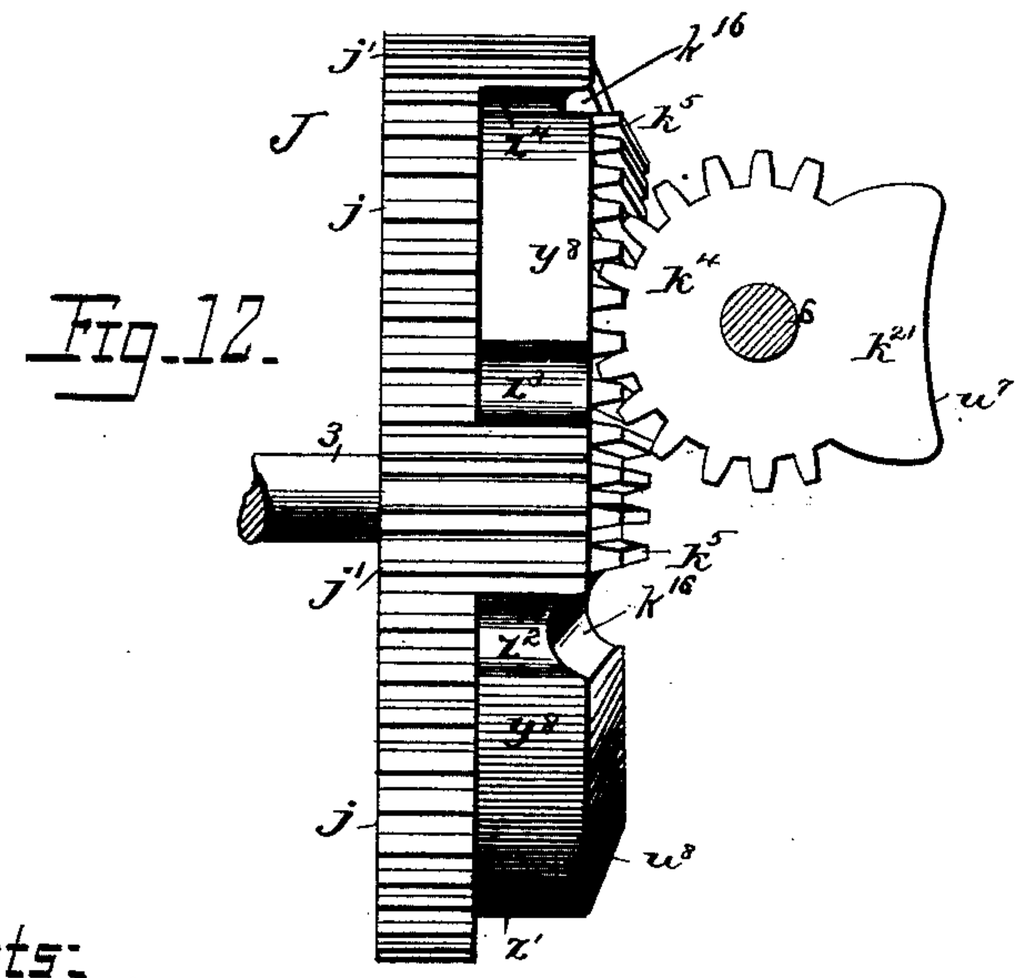


Fig 12.



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(No Model.) 10 Sheets—Sheet 10.

S. D. MADDIN.

GRAIN BINDER.

No. 410,424. Patented Sept. 3, 1889.

Fig 14.

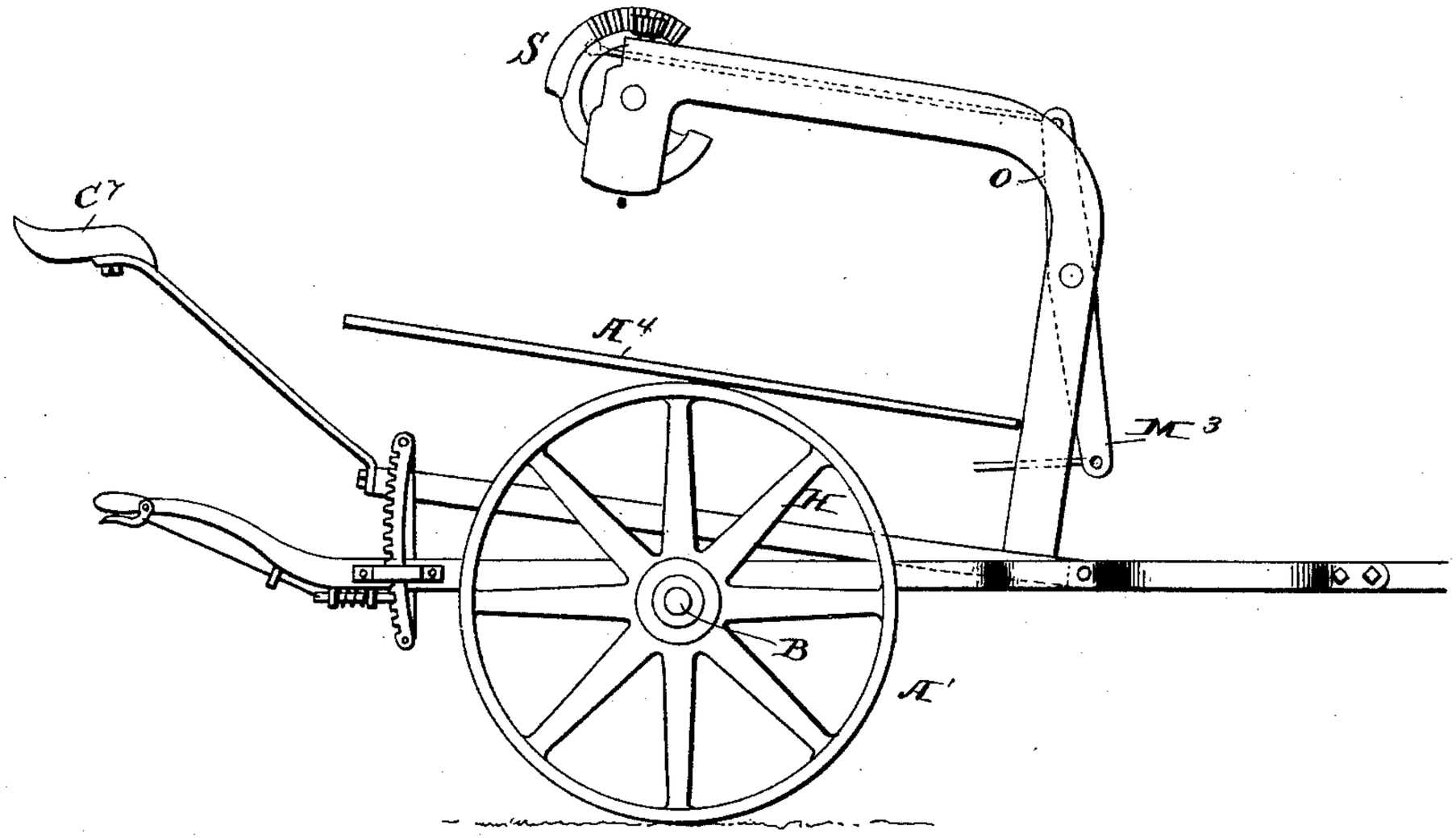
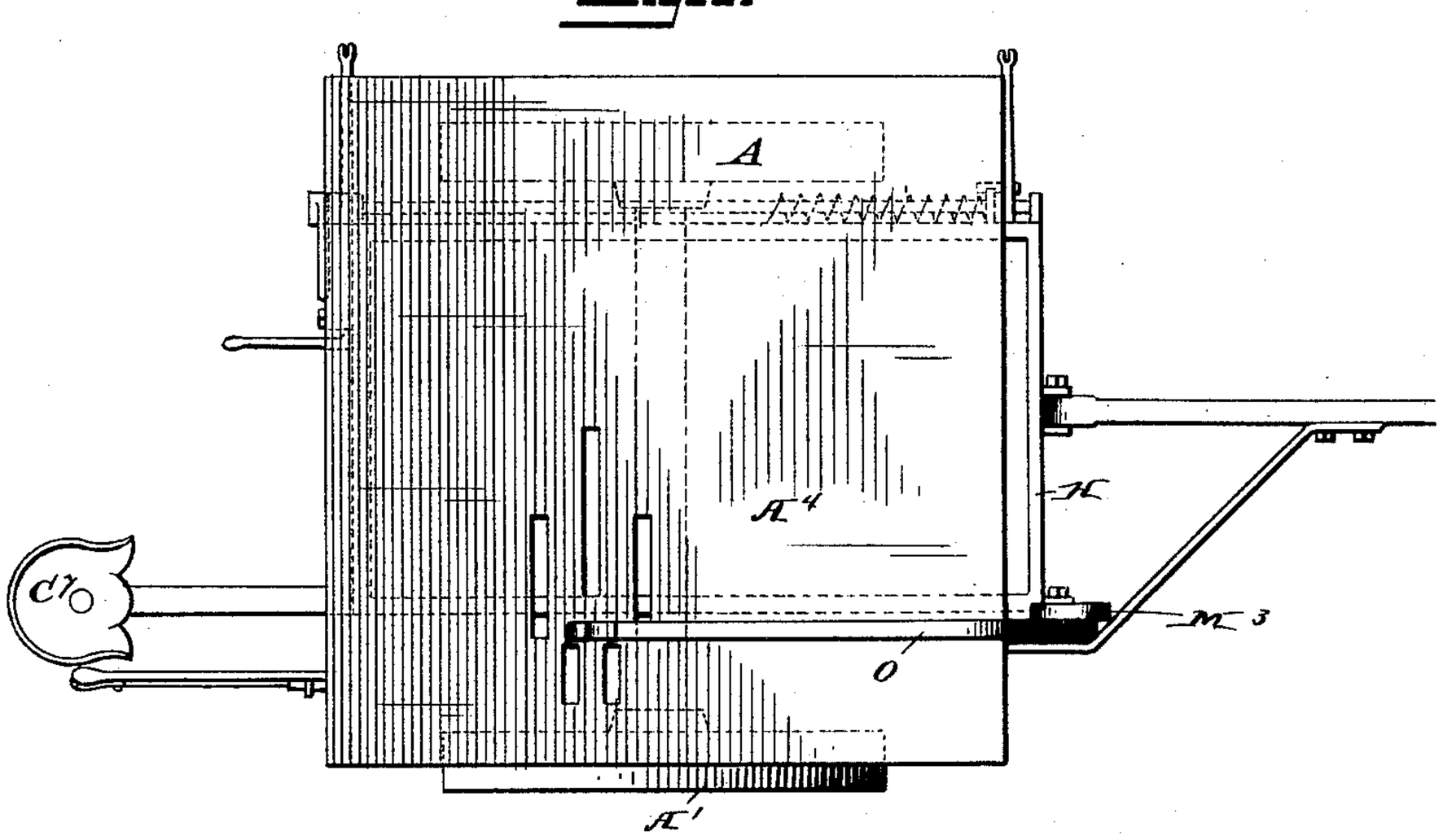


Fig 13.



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Inventor
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UNITED STATES PATENT OFFICE.

SAMUEL D. MADDIN, OF MIAMISBURG, OHIO, ASSIGNOR TO MARY MADDIN, OF SARNIA, ONTARIO, CANADA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 410,424, dated September 3, 1889.

Application filed July 10, 1885. Serial No. 171,222. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL D. MADDIN, a citizen of the United States, residing at Miamisburg, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Grain-Binders, of which the following is a specification.

My invention consists in certain improvements in grain-binders, illustrated in the accompanying drawings, and fully described hereinafter, and having for their objects to secure increased certainty in the binding operations, to simplify the construction of the operating devices, and generally increase the efficiency of the implement.

In the drawings, Figure 1 is a front elevation of a harvesting-machine, illustrating the general arrangement of the parts in connection with my improved binder, and drawn to a smaller scale than the remaining views. Fig. 2 is a side view, in part section, showing the overhanging arm and parts supported thereby, and needle, compressor, and discharge-arms with some of their connections. Figs. 3 and 4 are views which together constitute a plan in part section illustrating part of the devices below the grain platform or table. Fig. 5 is a side elevation, in part section, of the knotter devices, needle, packers, compressor, discharge-arms, and their supports and connections. Fig. 6 is a side view of the parts below the grain-table. Figs. 7 and 8 are detached views, in part section, illustrating the arrangement of the needle, compressor, discharge-arms, and compressor-supports. Fig. 9 is a side view, in part section, of the stopping and starting device, compressor, and intermediate parts. Fig. 10 is an edge view of the parts shown in Fig. 9. Fig. 11 is a side view illustrating two of the gears of the machine. Fig. 12 is an edge view illustrating two of the gears of the machine. Fig. 13 is a plan view showing only so much of the machine as is necessary to illustrate the relations of the binder-platform, the draft devices, the knotting devices, and the driver's seat. Fig. 14 is a view of the same from the stubble side of the machine.

The base of the binder consists of a rectangular frame H and a cross-bar B′, perforated for the passage of the axle B, upon which turn the wheels A A′, supporting both the binder and one end of the platform-frame. Above the frame is supported a table A^4, one end of which extends over the outer wheel. Upon the frame are supported standards C^9 C^9, Fig. 3, near the inner side, and a standard H′ near the outer side, and from the standard H′ extend arms H^2 and H^3 H^3.

The axle B constitutes the driving-shaft and carries a bevel gear-wheel H^4, which gears with a pinion H^5 upon the shaft 1, which turns in suitable bearings beneath the outer side of the frame H and at right angles to the axle. The shaft 1 also carries a sprocket-wheel H^6 and a flanged wheel H^7, having an internal gear that engages with a pinion H^8 upon a crank-shaft H^9, to the crank of which is connected the pitman H^{10}.

In the standards C^9 C^9 revolves a double-crank shaft 2, upon which is secured a sprocket-wheel F^5, from which a chain F^6 passes to the wheel H^6, and upon the shaft 2 turns freely a pinion F^7, which gears with the teeth of a wheel J, secured to a shaft 3, turning in bearings supported by the frame and arranged parallel to the crank-shaft 2.

Each packer I is provided with a packer-arm h^{15}, and a downwardly-projecting arm h^{11}, and a rearwardly-projecting arm h^{12}, the latter being adapted to receive the crank-pin of one of the cranks 22 of the shaft 2, while the end of each arm h^{11} is perforated for the passage of the crank-pin of one of the cranks 55 of a double-crank shaft 5, that turns in bearings upon the cross-bar B′.

The needle L is secured to a shaft 9, rocking in bearings upon the standard H′ and having at the end a crank h^{25}, and the ejector-arms K K are mounted upon a rock-shaft 8, supported in bearings in the arms H^3, and has at the end a crank h'. Reciprocating motion is imparted to the needle L from the rotating shaft 3 through a crank-arm h^2, which is connected by a rod g^7 to the crank h^{25}, and the rocking motion of the shaft 8, carrying the ejector-arms K, is effected from the revolution of a shaft 4, Fig. 6, a crank-arm h^3 upon which is connected by a rod g^8 to the crank h' of the shaft 8. The ejector-shaft 8, which,

with the needle-shaft 9, lies below the binder-platform, is parallel to said shaft and outside thereof, so that when the ejectors are down they lie over the needle-shaft. This enables me to use a shorter ejector-arm than is ordinarily employed, besides making a more compact arrangement of driving parts. Each ejector-arm is provided with an inwardly-extending guard-finger K^{13}, preferably curved, as shown, which operates to catch any grain which may be thrown thereon by the packers and prevents its falling in between the ejectors and the binder-platform, as it otherwise might. The rotations of the shafts 1 and 2 are continuous, so that the motion of the packer-arms is uninterrupted, the said motion being derived from the rotation of the crank-shaft 2.

It will be seen on examining the drawings, Fig. 5, that the cranks 22 of the shaft 2, instead of being upon the same plane are at an angle to each other; that the cranks 55 of the shaft 5 are of equal length with and arranged in the same manner as those of the shaft 2, and that the arms h^{11} and h^{12} of the packers connect said cranks 22 and 55 together. I have found that by this means I am enabled to impart the requisite rotation to the shaft 5 from the shaft 2 through the medium of the packers while maintaining the proper relative arrangement of all the parts, this effect resulting from giving a slight lead to one of the cranks in respect to the other, so that as one of the packers is being drawn upward the strain upon the lower shaft draws downward the other packer, while any tendency of the lower arm of either packer to swing out of position is counteracted by the other packer connected with the same shaft, as will be readily understood from the fact that the cranks of the lower shaft are set at an angle, and as each is turned part of a revolution by its connected packer the shaft is completely reversed. This continued movement avoids jerks and friction.

There are two compressor-arms M M, between which is clamped, by a bolt h^4, a curved supporting-arm M′, having a slot y^2, and a second bolt h^5 passes through the arm M′ and through slots y^3 in the hubs of the compressor-arms, so that the latter may be set to any desired angle in respect to the arm M′ and then clamped fixedly thereto. The compressor-arms are hung loosely at $i^{\times}$, Fig. 7, to a link N, which extends into the slotted hub of the needle L and is hung therein loosely to the needle-shaft 9. The weight of the arms M M and link N would tend to cause these parts to swing downward upon the shaft 9, to carry the compressor-arms below the table, as in Fig. 8. I therefore provide means for locking the parts in an elevated position during the time the grain is being forwarded or the bundle is packed.

Different locking means will suggest themselves to those familiar with the art; but I have shown those which I have found to be most effective, the same consisting of two toggle-links I^2 I^3, Figs. 7 and 8, the former or which is pivoted to the side of the link N and is provided with a finger i', extending beyond the pivot, while the latter is pivoted to the link I^2 and also to a stud i^{13} upon the frame H, and is provided with a lug i^2, which when the arms M are elevated bears upon the link I^2 and tends to keep the two in line with each other, so that they will serve as a brace to hold the parts in their upward position.

In connection with the movable support for the compressors just described I combine a trip which is independent of the needle, arranged to move said support and permit the compressors to be carried below the platform by gravity, and which trip I will now describe. The shaft 8 or ejector-arm K upon the same is provided with a finger i^3, which extends over the finger i', Figs. 4 and 7, which, when the ejector-arms are raised is brought into contact with the finger i', so as to swing the link I^2 in the direction of its arrow, Fig. 7, carrying the links I^2 I^3 out of alignment when they will no longer serve as a brace, and the compressor-arms will fall below the table to the position shown in Fig. 8. The ejector-arms are thus made the means of unlocking the compressor-arms. The link N is provided with a finger i^4, which is struck by the shank of the needle L as the latter nearly reaches its lower position, so that the link and the compressor-arms are then lifted by the further downward movement of the needle-arm until the links I^2 I^3 fall into alignment and lock the compressor-arms in place. It is of course necessary that the compressor-arms shall be held in their elevated position and that the ejector-arms K and needle L shall be maintained in their lowest position until sufficient grain to form a sheave or gavel has been packed against the compressor-arm, after which the needle should rise, and after the bundle is bound the compressor-arms should fall and the ejector-arms should rise. I effect these movements from the mutilated gear-wheel J, which is constructed in a peculiar manner, which I will now describe. I provide the periphery of the wheel J with gear-teeth J, which engage the teeth of the pinion F^7 of the shaft 2, and I prolong a portion of said gear-teeth to form two series of longer gear-teeth j', a part of which latter are formed upon the periphery y^8 of an annular rib z', forming a part of the wheel J. The gear-teeth j', above the rib z', engage with gear-teeth formed upon the opposite side of a mutilated gear-wheel J^2, which is mounted upon a shaft 4 and is provided between its teeth with curved delay-shoes k k', which engage the periphery of the rib z' between the gear-teeth j'. To permit the rotation of the mutilated gear-wheel J^2 at the proper moment I provide the rib z' at opposite sides of the teeth series j' with recesses or notches z^2 z^3 z^4 z^5, to receive the corners of the delay-shoes. The notched rib z', in connection with the

mutilated pinion J^2, serves as a means of imparting an intermittent rotation to the shaft 4. Thus as the wheel J is driven in the direction of its arrow by the rotation of the pinion F^7, gearing with the short teeth j, the delay-surface k or k', resting upon the face y^8 of the rib z', serves to lock the pinion J^2 and prevent its rotation until the notch z^2 of said rib is brought opposite the upper corner of said delay-surface k', and the first tooth j' against said corner, when the pinion J^2 will begin to rotate, and the teeth upon one side thereof will engage with the long teeth j' until the corner of the delay-surface k enters the next succeeding notch z^3, when the said delay-surface k will engage the face y^8, and will hold the pinion in place and prevent its rotation until the opposite corner of the delay-surface k enters the next notch z^4, after which the opposite teeth of the gear-wheel will engage with the next series of long teeth j', and the wheel rotated until the lower corner of the delay-surface k' enters the notch z^5 and said surface is brought against the face y^8, when the pinion J^2 will again be locked and prevented from turning. As the pinion J^2 is connected to the shaft 4, the latter is rotated intermittently, so as to first lift the ejector-arms k, (thereby unlocking and causing the depression of the compressor-arms, as before described,) then to hold the ejector-arms in position until the compressor-arms are again elevated, so that the discharge of the bundle is absolutely insured, and then to carry the ejector-arms back to their normal position below the table, these operations being all effected by a single pair of gears. The vibration of the needle is of course dependent upon the rotation of the shaft 3, so that it is necessary to arrest and start the motion of the wheel J upon said shaft, according as it is required to move and arrest the needle. This I effect by combining a clutch and a clutch-operating device with the loose pinion F^7, which gears with the wheel J, and connecting the clutch-operating device with the compressor to be operated thereby. Any suitable friction or other clutch may be employed, the kind of clutch determining in a large degree the style or kind of clutch-operating device to be used. I prefer, however, to use the clutch device illustrated in the drawings. To the pinion F^7 is pivoted an L-shaped dog K′, against which bears a spring g^9, tending to throw the dog outward, so that an arm h^8 thereof will strike an arm h^6 of a double-armed dog K^2, pivoted to the wheel J, the other arm h^7 of the said dog being upon the opposite side of the wheel from the arm h^6. The dog K′ is provided with a projecting rib forming a shoulder z^6. (See Figs. 9 and 10.) A rod J^3, pivoted at one end to the wheel J, passes through an opening in the arm h^6 of the dog K^2, and a spiral spring i^5 upon said rod is confined between a nut i^6 and the arm h^6, and tends to throw the latter out into the path of the dog K′, carried by the pinion F^7, which, when the wheel J is in the position shown in Fig. 9, will strike the said dog and cause it to swing in the direction of the arrow 3. Upon the inner face of the sprocket-wheel F^5 are two lugs $m\,m$, which, when the dog K′ is thrown inward by contact with the dog K^2, pass beneath the shoulder z^6 of the said dog K′, so that the rotation of the sprocket-wheel and its shaft 2 has no effect upon the pinion F^7; but when the dog K^2 is swung in the direction of its arrow to carry the arm h^6 away from the dog K′, the latter will be thrown outward by its spring into the path of the lugs m, one of which will strike the end v of the dog and cause the pinion F^7 to travel with the sprocket-wheel and to rotate thereby the wheel J in the direction of its arrow. The rotation of the wheel J is continued until the needle is carried down below the platform, the wheel making a complete revolution in lifting and depressing the needle, when the dog K′ will again be brought in contact with the dog K^2, and the former will be turned to throw the end v inward, so that the lug m will pass beneath the shoulder z^6, when the sprocket-wheel F^5 will revolve, while the pinion F^7 remains stationary, as before described. It is desirable not only to lift the dog K′ away from the lug m sufficiently to permit the latter to pass, but also to carry its projection or shoulder z^6 wholly inside the path of said lug, as shown in Fig. 9; otherwise the contact of the two would result in a disagreeable rattling noise. I effect this by extending the arm h^8 of the dog K′ beyond the periphery of the pinion F^7, so that the circle described by the end of said arm h^8 is greater than that described by the ends of the teeth of the pinion, whereby said arm travels faster than the periphery of the wheel J, which moves with the same circumferential speed as does the wheel F^7, so that its movement is obstructed by contact with the end of the dog K^2, although that is moving with the wheel J and in the same direction as the dog K′, and is thus swung sufficiently upon being brought in contact with the end of the dog K^2 to throw the shoulder z^6 wholly within the path of the lug m. The dog K^2 should remain in contact with the dog K′, so as to keep the needle below the table until a sufficient quantity of grain has been packed against the arms M to form a bundle; and in order that the dog K^2 may then be withdrawn to release the dog K′ and permit the needle to rise I connect the compressor-arms and the dog K^2 in such manner that the pressure upon said arms is made the means of moving the dog. Different connections suitable for this purpose will occur to any skilled mechanic. Those which I have found to be most effective I will now describe, referring to Figs. 5, 9, and 10. A shaft 12, turning in bearings upon the frame, carries at one end an arm m^7, which extends over a lug s, projecting laterally from the arm h^7 of the dog K^2, and another arm m^2, projecting from the shaft 12, is connected by a rod j^2

to a pin j^3 upon a triangular block or lever L′, pivoted to the standard H′, and that carries a laterally-projecting pin j^4, which extends into the slot y^2 of the arm M′. So long as the amount of grain between the packer-arms and the compressor-arms is not sufficient to form a bundle of the desired size, the parts will remain in the position shown in Fig. 9, the dog K^2 in contact with the dog K′; but when the amount of grain is such that the action of the packer-arms forces it beyond a predetermined pressure against the arm M the latter will swing outward, the arm M′ connected thereto will be lifted and the lever L′ will be rocked in the direction of its arrow, Fig. 9, and will, through the rod j^2, rock the shaft 12 and carry downward the arm m^7 upon the lug s, so as to vibrate the dog K^2 and carry its arm h^6 away from the arm h^8 of the dog K′, when the latter will be thrown into the path of the lugs m, whereby the pinion F^7 will be rotated and the wheel J will be carried with it.

The degree of pressure necessary to swing the dog K^2 so as to effect the above-described operation may be regulated by turning the nut i^6, so as to compress, to a greater or less extent, the spring i^5. The adjustment of the said nut therefore may be made the means of determining the density to which the bundles shall be packed. The size of the bundles may be regulated by adjusting the arm M′ in respect to the arms M, the nuts upon the bolt h^5 being loosened to permit the compressor-arms to be thrown outward or inward to any desired extent to vary the distance from the packers, after which the parts are again clamped fixedly together.

To prevent the breaking of the parts should too great an amount of grain be thrown between the packers and the compressor, I arrange a spring-tension device, as the spring i^{16}, Fig. 6, in such manner as to resist the outward movement of the compressor-arms and yet permit them to yield under destructive pressure, and preferably having a certain amount of lost motion, for a purpose to be described. The spring i^{16} may be arranged in any suitable manner and may be of any suitable character. As shown, it is a coiled spring inclosing a rod i^7, and arranged between a cross-plate i^8 at the top of the rod and the lower cross-bar of a frame M^2, sliding upon the rod, the upper end of the frame being connected to the stud j^4 upon the lever L′, so that when the said lever is vibrated as the compressor-arms swing outward the frame M^2 will be raised against the pressure of the spring, but when the toggle-levers I^2 I^3 are thrown out of line the compressor-arm can swing downward without acting upon the spring, inasmuch as the slotted arm M′ slides freely upon its pin j^4. It is not desirable, however, that there should be any resistance to such an outward motion of the compressor-arms as is sufficient to rock the shaft 12 and release the wheel J. I therefore provide for a limited movement of the frame M^2 without compressing the spring by extending the rod i^7 through at stationary lug i^9, Fig. 6, and providing the rod below the lug with an adjustable nut j^7. This permits the rod i^7 and the spring to slide upward without resisting the movement of the lever L′ until the nut j^7 strikes the lower side of the lug i^9, after which any further motion of the lever L′ and the compressor-arms will result in the compression of the spring. It will be seen that the needle L and the ejector-arms K derive their movements from the rotation of the mutilated gear-wheel J, so that they work in absolute unison without the liability to derangement which is apt to ensue when these two parts derive their movement from widely-separated devices. By hanging the compressors to a link N, I am enabled to hold them firmly in position during the packing operation, but without interfering with their instant withdrawal when the bundle is to be discharged. This results partly from the fact that the pressure upon the compressor-arms has but little tendency to swing them downward, but is mainly in line parallel with the table.

The knotter devices are supported at the end of an L-shaped arm O, overhanging the table, and having its standard nearest the horses connected between lugs 21 21, Fig. 3, so that the knotter devices shall be directly in line between the driver's seat C^7 and the horses, so that the driver, without withdrawing necessary attention from the animals, is enabled to maintain a constant watch upon the packing operations and instantly observe the breaking of the cord or any improper action of the parts. Heretofore the knotter, when above the table, has been generally rotated from a shaft carried by the overhanging arm or frame and driven by gears or otherwise from a shaft below the table. This arrangement has resulted in considerable friction and lost motion, and necessitates heavy gearing, all of which I avoid by transmitting the power through the medium of a lever M^3, hung to the side of the arm O, and connected at the lower end by means of a rod M^4 to a crank k^3 upon the end of the shaft 6. (See Figs. 1, 2, 3, and 4.) The upper end of the lever M^3 is connected by the rod k^{15} with the rack k^{14}, which rack may be a portion of a wheel or a reciprocating slide or bar, the back-and-forth movement of the rack in either case resulting in the operation of the knot-forming devices.

I do not in this application claim nor consider it necessary to describe in detail the peculiar knot-forming devices which are shown in the drawings, since such devices form the subject-matter of another application, Serial No. 292,130, filed November 28, 1888, as a division of this case.

To prevent the turning of the shaft 6, which is driven from the gear-wheel J by the rack k^4 engaging therewith, when it should be at rest the mutilated pinion k^4 has a delay-shoe k^{21} at one side with a curved face u^7,

which is brought opposite a plane face w^8 of the wheel J after the rack passes from the pinion, and which prevents the turning of the pinion until the other end of the rack is brought in position to engage with the teeth of the pinion. I provide the delay-surface w^8 of the wheel J at opposite sides of the gear-segment k^5 with recesses k^{16} to receive the corners of the delay-shoe k^{21}, that the pinion k^4 may be rotated. The usual notched disk Q is arranged at the side of the knotter P, in position to permit the end of the needle to pass above the same, so as to lay the cord in one of its notches.

In order to secure a proper tension upon the cord, it is carried between a stationary jaw s^2, Figs. 3 and 6, upon a standard W of the frame and a movable jaw s^3 upon a lever V, pivoted at 31 to the standard W, the two jaws being brought together by a spring s^4, encircling a screw-rod s^5, which extends from the jaw s^3 through a hole in the jaw s^2, and the spring s^4 is confined between the outside of the jaw s^2 and a nut s^6 upon the rod.

In order to relieve the tension at proper intervals, which occur twice in the formation of each bundle, I provide the shaft 3 with two arms s^7 s^8, carrying lugs t^4 t^5, which are brought in succession against the lower end of the lever V, and for a moment vibrate the lever to carry the jaw s^3 away from the jaw s^2.

In order to prevent the drag upon the cord which sometimes occurs when it should be loose from resistance within the ball as the cord is being drawn therefrom, I use a cord-extractor or take-up consisting of a lever W′, pivoted to the bracket W, adjacent to the lever V, and provided with an eye y^6 for the passage of the cord, which is conducted through an eye y^7 in a plate s^9 through the eye y^6 between the jaws, and thence through an eye y^9 to the needle. The lever W′ is so arranged that its lower end will be struck by each of the lugs t^4 i^5 while the jaws s^2 s^3 are closed and will swing back and drag from the ball sufficient cord to form the knot or supply the bundle, each lug as it escapes the end of the lever W′ then striking the end of the lever V, so that the cord drawn out by the lever W′ may pass freely to the needle, the lever W′ swinging loosely until struck by the next lug.

It will be evident that while I have shown one form of knotter and knotting devices different mechanism may be employed for making and severing the knot in connection with other of the improved devices and arrangement of devices which I have described, and that some of said improvements may be used separately from the others.

It will of course be evident that the knotter devices may be supported by any suitable frame extending over the platform of the binder instead of by the overhanging L-shaped arm O.

In different parts of my improved machine I have used and described connections which, while effective to communicate motion between certain parts, may be replaced by other connecting devices. I therefore do not limit myself to those shown, as different forms will occur to any one skilled in the art. For instance, the link N, carrying the loose compressor-arm, may be combined with any suitable removable support and may be pivoted adjacent to the shaft of the needle instead of hanging directly thereon, and the compressor may consist of one or two arms, and any suitable clamping device for connecting the compressor to the plate M′ adjustably may be used. Other connections than those described may communicate movement from the plate or arm M′ to the stopping and starting device. A friction-clutch may be used instead of the clutch described, and any suitable vibrating arm or cord-carrier may be used with like effect instead of the vibrating plate W′.

I do not here claim the arrangement of binder, supporting-wheels, cutter-bar frame, and elevators shown in Fig. 1, as this constitutes a separate application for Letters Patent, Serial No. 171,135, filed July 9, 1885.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. The combination of the needle, the swinging link on the needle-shaft, the compressor adjustable on the link, a toggle-brace for supporting the compressor in its elevated position, a set-off mechanism operated by the accumulated gavel, and a positively-operated ejector having a projection which contacts with the said toggle-brace and breaks the same to permit the descent of the compressor, substantially as set forth.

2. The combination, with the compressor carried by an arm or link suspended from a shaft, of a movable support for holding the arm or link in its elevated position, and an ejector carrying a projection in line with said support, arranged to make contact therewith to displace the same as the ejector is raised, substantially as described.

3. The combination, with the compressor carried by an arm swinging upon the shaft, of toggle-levers arranged to support the arm or link in its elevated position, and ejector-arms provided with a projecting finger arranged to make contact with one of said levers as the discharge-arms are raised, substantially as described.

4. The combination of the lever L′, pivoted to the frame of the binder, the longitudinally-slotted compressor-arm connected therewith, a stopping and starting mechanism also connected therewith and including a spring-clutch device, and a spring connected with the lever and with a fixed part of the binder and arranged to resist by its tension the movement of the compressor beyond a certain point, substantially as set forth.

5. The combination, with a compressor having a longitudinally-slotted arm and the stop-

ping and starting mechanism, of the lever L′, pivoted to the binder-frame and engaging with the slotted arm of the compressor and connected with the stopping and starting mechanism, the frame M², hung from the said lever, provided with a cross-bar, a headed rod supported in a bearing on the binder-frame and extending into the frame M², and a spring arranged between the head of the said rod and the cross-bar of the frame M², and arranged to resist by its tension the movement of the compressor beyond a certain point, the said headed rod having a limited sliding movement in its bearing prior to the compression of the spring, substantially as described.

6. The combination of the compressor having the slotted arm M′, the lever L′, the frame suspended from said lever, a headed rod i^7, passing through a fixed lug i^9, and provided with a stop j^7 beyond said lug to permit a limited amount of lost motion, and a spring interposed between the head of the rod and the frame, and the tripping mechanism connected with the lever L′, substantially as described.

7. The combination of the ejector, the shaft supporting the same, a mutilated gear-pinion driving said shaft having two series of gear-teeth separated by intervening delay-shoes, and the wheel J, having two series of gear-teeth j j', and intervening delay-surfaces, whereby the ejector is first raised to discharge the bundle, is then held in its elevated position, and is then returned to its normal position below the binder-table, substantially as and for the purpose set forth.

8. The combination, in a tension device of a grain-binder, of the cord-clamp, the vibrating cord-drawing lever arranged in proximity to the clamp, and an arm which vibrates the lever to draw the cord and which subsequently opens the clamp, substantially as set forth.

9. The combination of the stationary cord-clamping jaw, movable jaw, pivoted lever V, carrying the movable jaw, spring arranged to close the jaws, cord-drawing lever W′, and revolving arm arranged to strike first the lever W′, and the lever V, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL D. MADDIN.

Witnesses:
AMOS K. CLAY,
S. M. UMBENHAUER.