C. B. KING, C. S. JOHNSON & B. JACOBY.

CLUTCH AND LOCKING DEVICE.

APPLICATION FILED JULY 21, 1916.

1,298,056.

Patented Mar. 25, 1919.

4 SHEETS—SHEET 1.

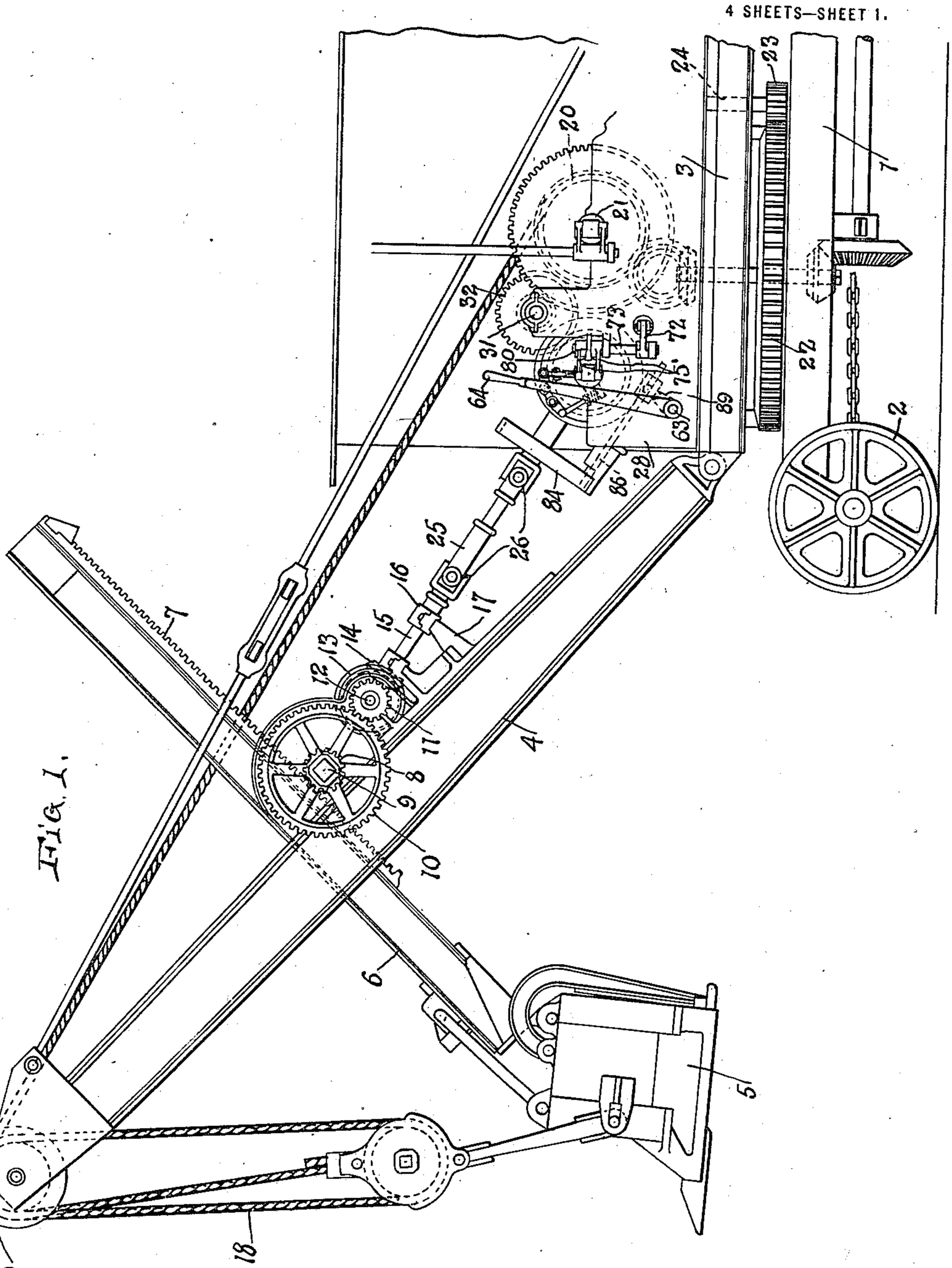

FIG. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

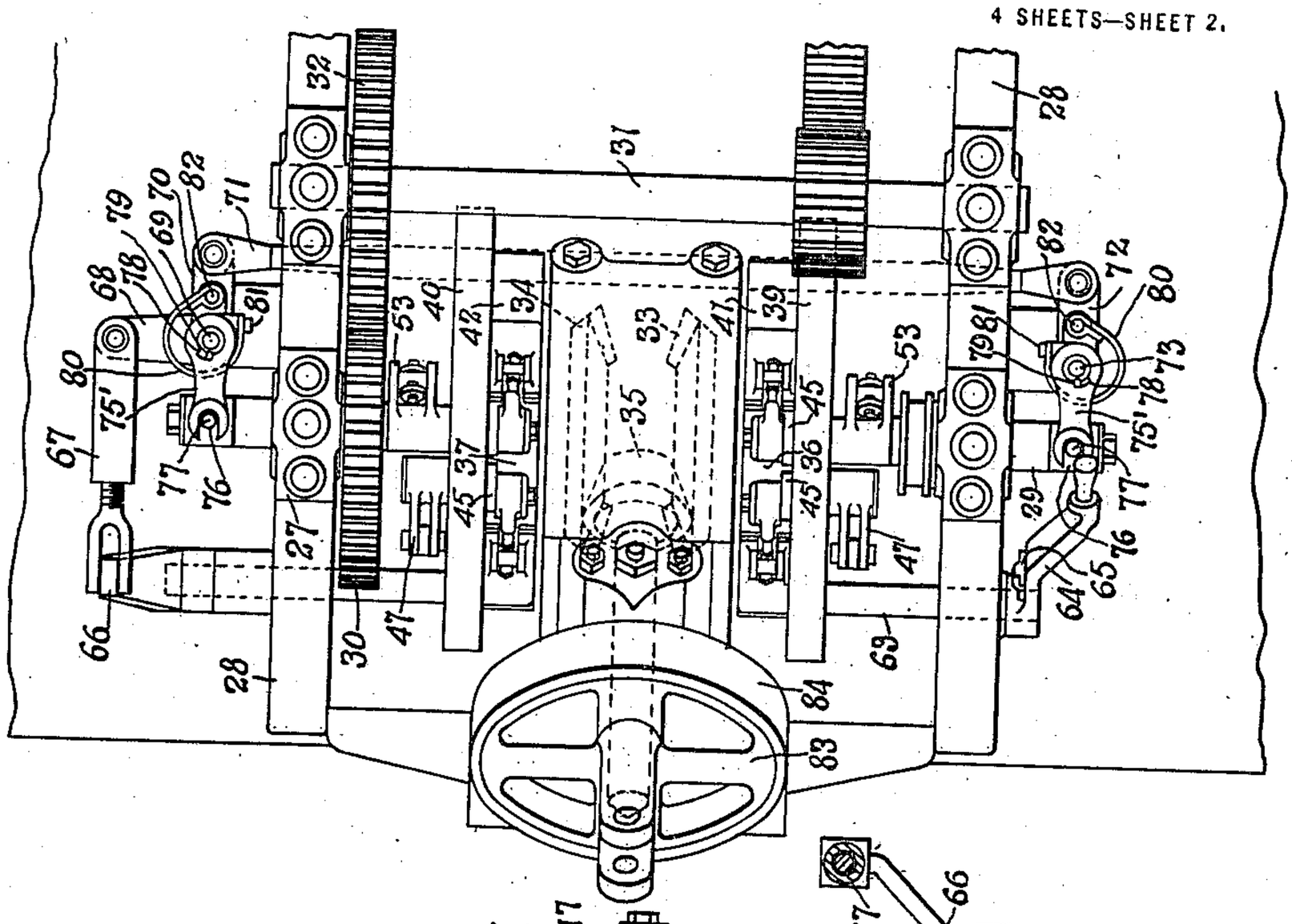
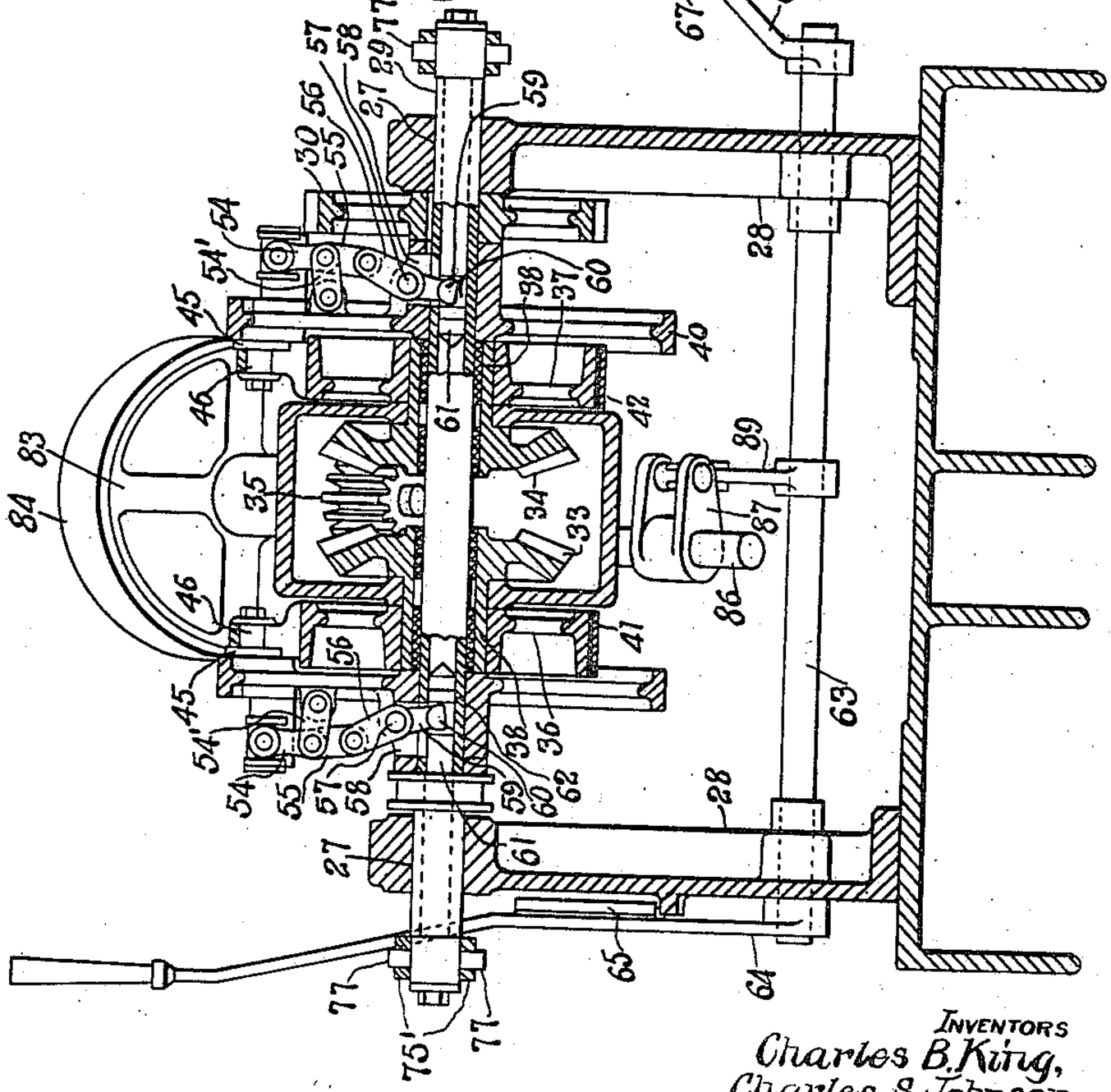


Fig. 3.



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4 SHEETS—SHEET 3.

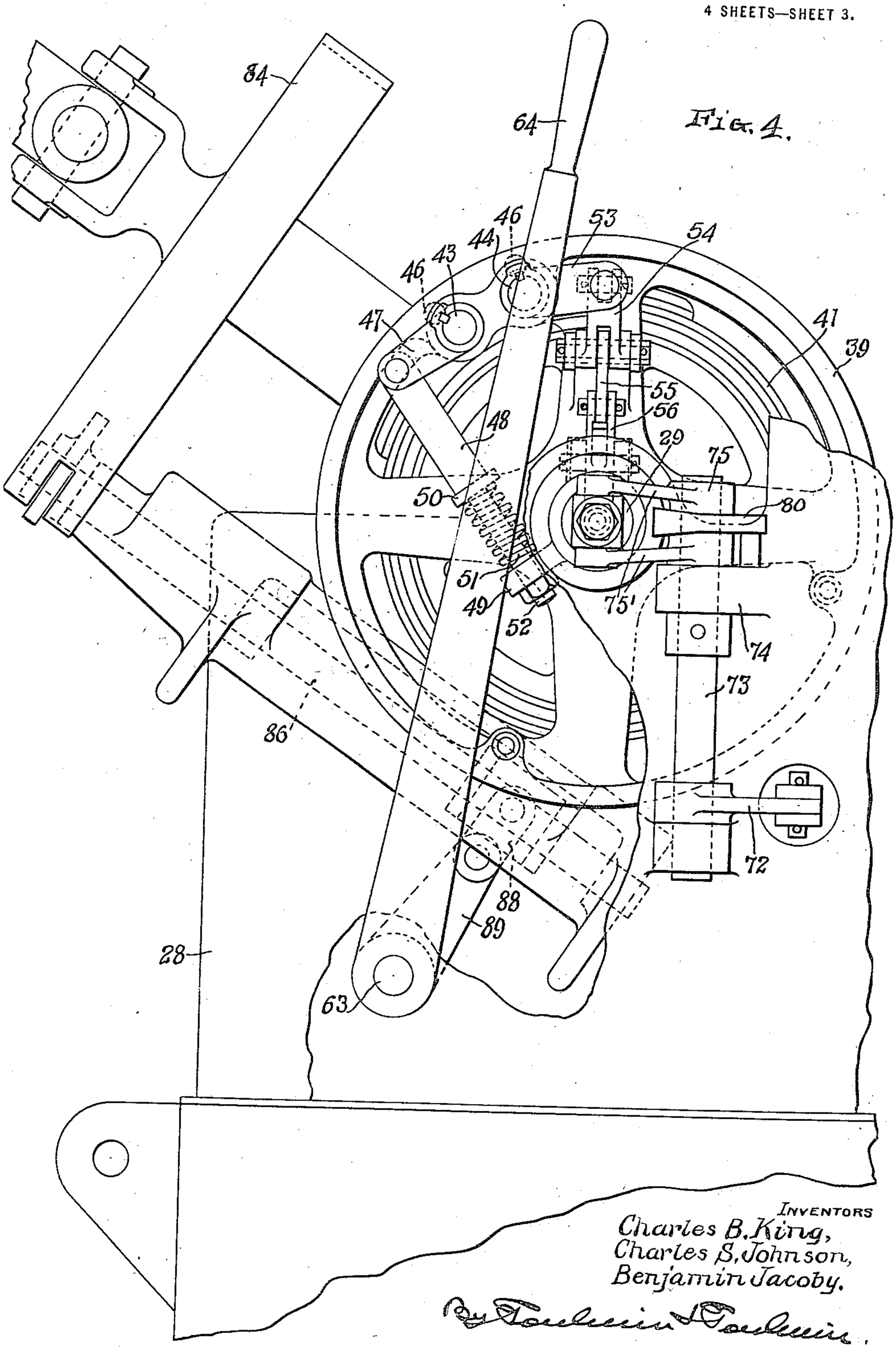

Fig. 4.

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4 SHEETS—SHEET 4.

Fig. 7.

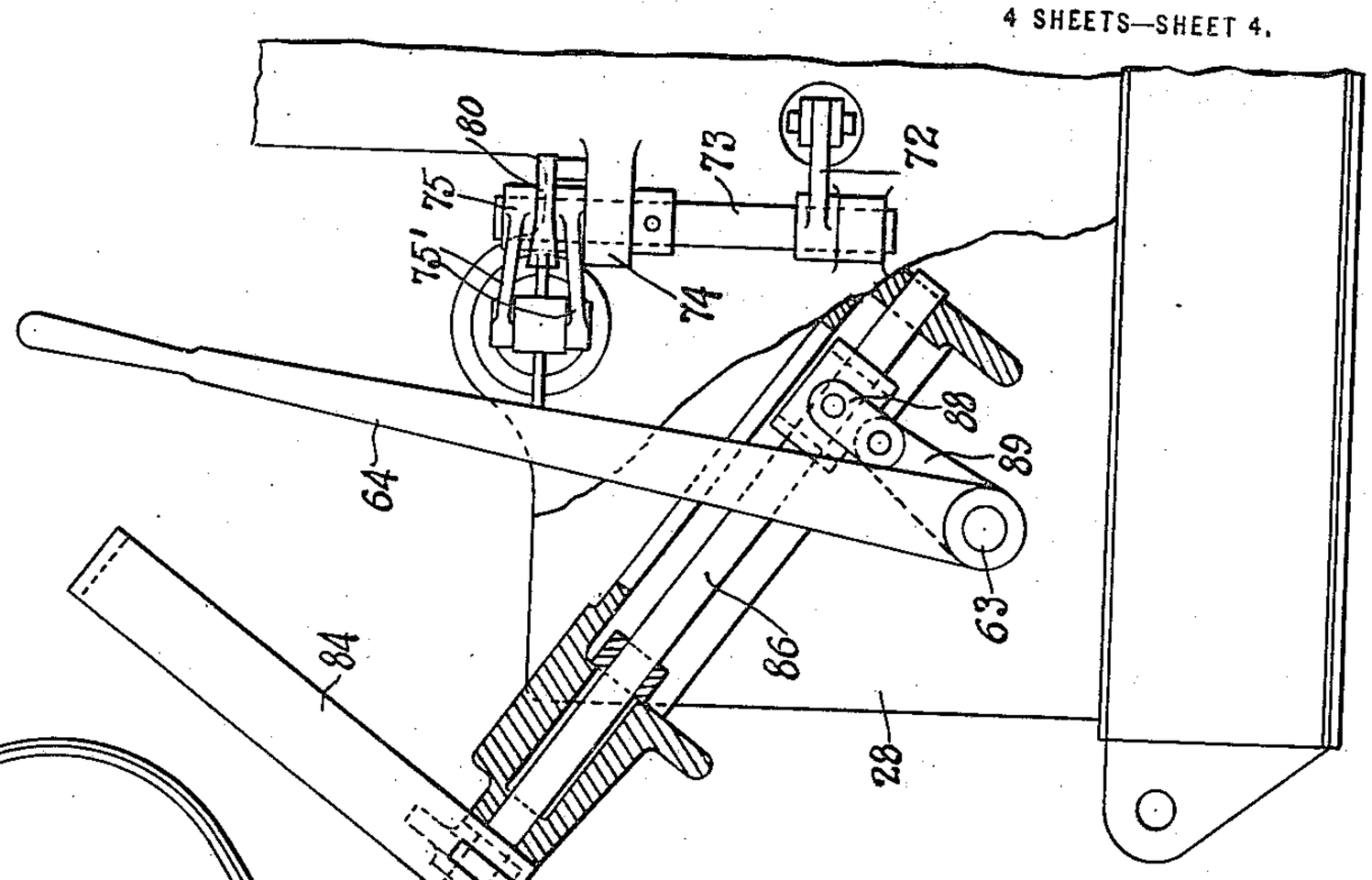


Fig. 6

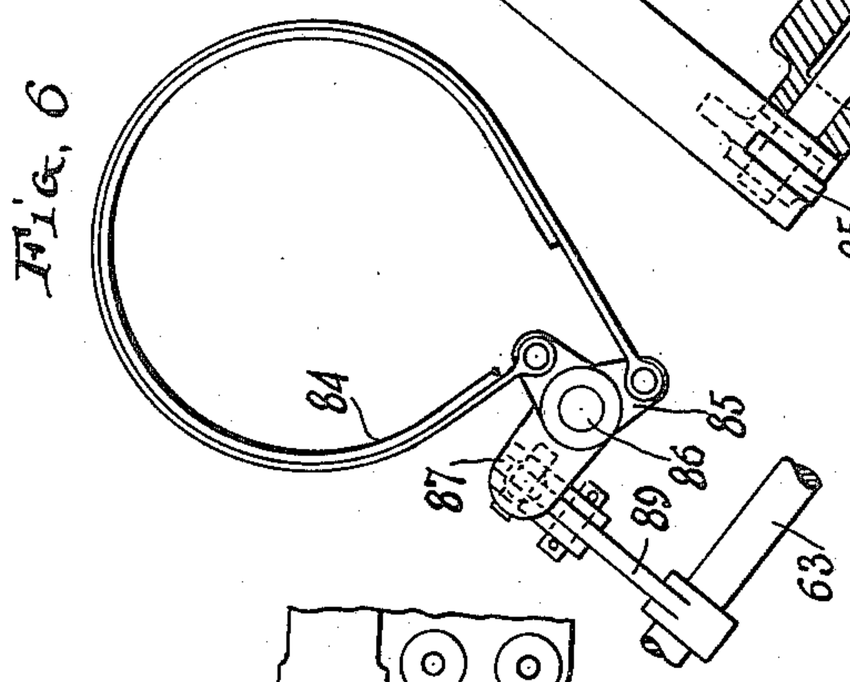
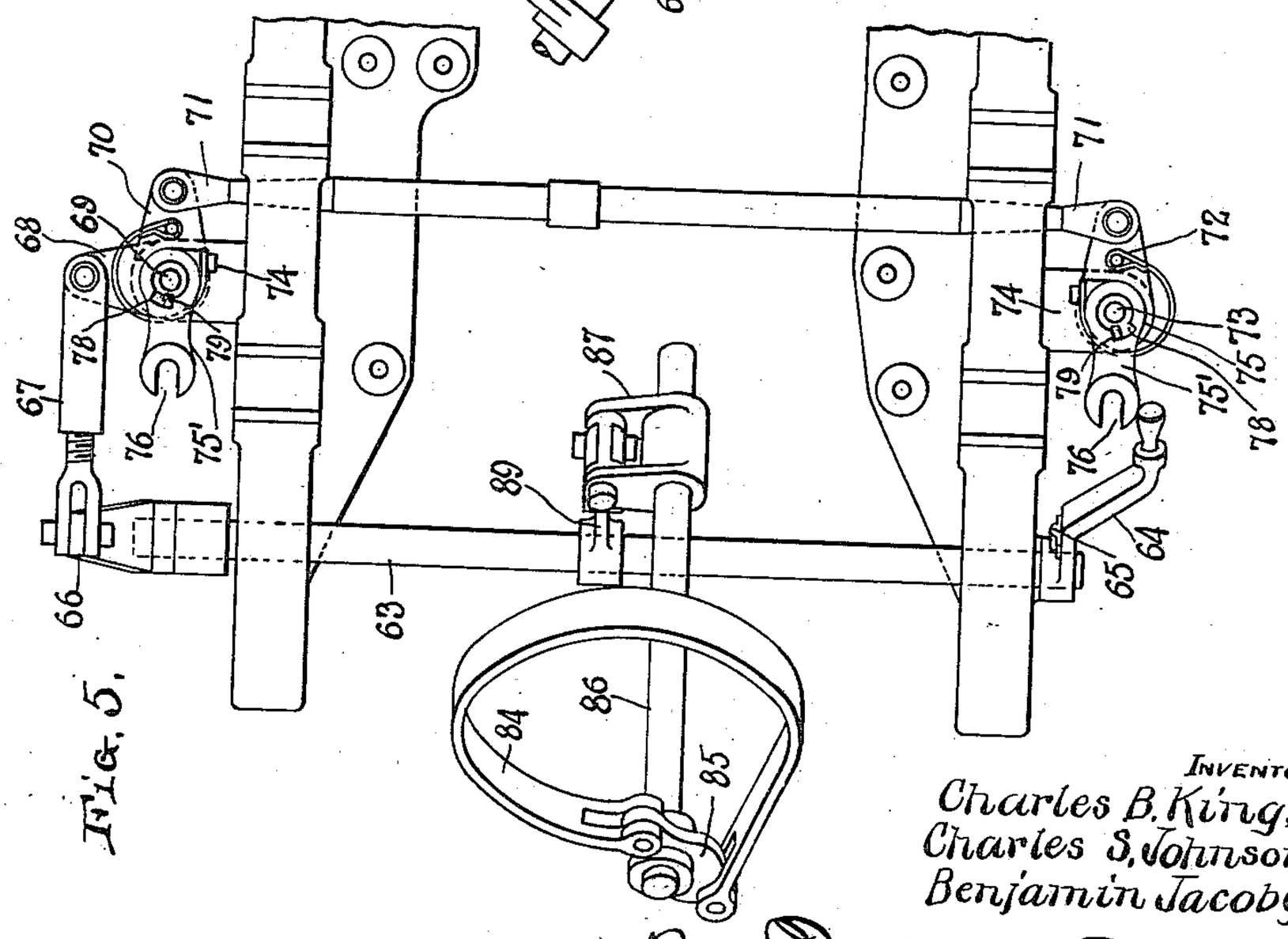


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES B. KING, CHARLES S. JOHNSON, AND BENJAMIN JACOBY, OF MARION, OHIO, ASSIGNORS TO THE MARION STEAM SHOVEL COMPANY, OF MARION, OHIO, A CORPORATION OF OHIO.

CLUTCH AND LOCKING DEVICE.

1,298,056. Specification of Letters Patent. Patented Mar. 25, 1919.

Original application filed September 25, 1915, Serial No. 52,546. Divided and this application filed July 21, 1916. Serial No. 110,432.

To all whom it may concern:

Be it known that we, CHARLES B. KING, CHARLES S. JOHNSON, and BENJAMIN JACOBY, citizens of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Clutch and Locking Devices, of which the following is a specification, reference being had therein to the accompanyinig drawing.

This invention relates to clutch and locking devices.

An embodiment of the invention is fully shown and described in an application filed by us September 25, 1915, Ser. No. 52,546, of which this application is a division. Application, Serial No. 52,546, has eventuated into Patent No. 1,196,957, dated Sept. 5, 1916.

The object of this invention is to provide means for automatically locking driven or transmission devices against movement except when positively driven from the source of power.

The invention contemplates the use of an operating device for controlling reversing mechanism and a lock, the several parts being so arranged that when the power is cut off the lock will be in operative position and when the power is on the lock will be in inopative position irrespective of the direction of rotation.

The invention is especially applicable to excavating machines where it is necessary to control the crowding mechanism to move the dipper up and down and to prevent the downward movement of the dipper under the influence of gravity when the power is cut off.

In the accompanying drawings we have illustrated one embodiment of the invention in which Figure 1 is a side elevation of a portion of an excavating machine illustrating the application of our invention thereto; Fig. 2 is a top plan view of such a mechanism with the boom removed; Fig. 3 is a sectional elevation of the parts shown in Fig. 2 looking in the direction of the brake drum and band; Fig. 4 is an enlarged detail side elevation of the clutch and lock operating mechanism as shown in Fig. 1 with parts broken away for the sake of clearness; Fig. 5 is a plan view showing the controlling mechanism for the reversing mechanism and lock; Fig. 6 is a detail view showing in front elevation, the brake band of Fig. 5, and Fig. 7 is a side view, partly in section, of the mechanism shown in Fig. 5.

In these drawings we have illustrated the invention as applied to a power shovel of a well known type. The general features of this power shovel are in the main old, and comprise a truck having a base 1, and suitable supporting wheels 2. Rotatably mounted upon this truck is a platform 3 at the forward end of which is pivotally mounted a boom 4 carrying the excavating device, which in the present instance is in the form of a dipper 5 carried by handle 6 extending transversely of the boom, between the two members thereof and provided on its rear edge with a toothed rack 7 which meshes with the pinion 8 on a shipper shaft 9, journaled on the boom. This shipper shaft is provided with gears 10 meshing with pinions 11 carried by a counter shaft 12 on which is mounted a bevel gear 13 meshing with the bevel pinion 14 carried by one end of the shaft 15 extending lengthwise of the boom and journaled in suitable bearings 16 which are here shown as formed in brackets 17. This mechanism comprises a crowding mechanism for the dipper and serves to impart longitudinal movement to the dipper handle whereby the dipper is moved toward or away from the work. The dipper is elevated to fill the same by means of the cable 18 which extends about sheaves 19 on the end of the boom and passes lengthwise of the boom to a hoisting drum 20 mounted on a shaft 21 on the platform. In order to bring the dipper into proper position with relation to the work that it may be filled, and to then convey the dipper to the point at which it is to be dumped, the platform is revolved about its axis. This is accomplished by providing the base of the truck with a fixed gear or annular rack 22 with which meshes the pinion 23 mounted on a short shaft 24 which is driven from any suitable source of power, not shown as it forms no particular part of the invention. The shaft 15 is formed in two parts which are provided with a telescoping connection, as shown at 25, whereby the shaft can expand and contract longitudinally to accom-

modate itself to any movement of the boom relative to the platform about the horizontal axis of the boom. Further on each side of the telescoping connection the shaft is provided with a universal joint 26 which enables the telescoping connection to remain in a line and also to take care of any lateral displacement of the boom. Mounted in suitable bearings 27 of the side members 28 is a transversally extending crowding shaft 29 located adjacent the lower end of the shaft 15. This shaft has fixed to it a gear 30 to which power is transmitted from the shaft 31 parallel with the crowding shaft through the gear 32 thereof. Loosely mounted on the crowding shaft are two bevel gears 33 and 34 meshing with the bevel pinion 35 secured to the lower end of the shaft 15, which actuates the shipper shaft on the boom or other mechanism. The gears 33 and 34 are provided with suitable clutch devices by means of which either of them may be secured to the shaft and actuated. These clutch devices, as herein shown, comprise two friction drums 36 and 37 mounted upon and rigidly secured to elongated hubs 38 forming part of the respective gears 33 and 34. Rigidly secured to the shaft adjacent the friction drums are two supports 39 and 40 here shown in the form of wheels or spiders. Carried by these supports are friction bands 41 and 42 which extend about the respective friction drums 36 and 37 and are secured at their ends to their respective supports. Means are provided on each support for tightening or loosening the band about the friction drum and to this end one or both of the ends of the friction band are adjustably connected with the support. In the present construction two studs or short shafts 43 and 44, (Fig. 4), are rotatably mounted on each support and each shaft is provided on its inner end with a crank arm 45, having a pin or trunnion 46 to which the ends of the friction band are connected. Fig. 3 shows the crank arm 45 and pin 46 in connection with the stud 44. The arrangement is the same on the stud 43. Crank shaft 43 is held normally against movement and this end is provided with a crank arm 47 having connected to its outer end one end of a rod 48, the other end of which is slidably mounted in an apertured lug 49 secured to the support 39 or 40. Confined between the lug 49 and the shoulder 50 on the rod 48 is a spring 51 of such strength that it will normally hold the crank arm 47 and the shaft 43 against movement in one direction, the rod being held against movement in the other direction by a nut 52. Means are provided for manipulating the other crank arm and shaft to tighten or loosen, as may be desired, the friction band. As here shown this other crank shaft 44 is also provided with a crank arm 53 to the outer end of which is connected the link 54, the opposite end of which is pivotally connected to two other links, one of which, the link 54′ is pivotally connected to a fixed part of the support as to one of the spokes thereof. The second link 55 forms a part of a toggle and is pivotally connected with a link 56 which forms the other part of the toggle and which is pivotally mounted at 57 upon the hub of the support. Rigidly secured to the inner link 56 of the toggle and extending through a slot 58 in the hub of the support is an arm 59, the inner end of which extends into an opening or slot 60 formed in the plunger or slide rod 61 which is slidably mounted in an axial opening 62 formed in one end of the crowding shaft and slidable therein. Obviously the reciprocation of the plunger will break or straighten the toggle, thus rocking the crank shaft and tightening or loosening the brake band. When the toggle is in its extended or straightened position the brake band will be in its tightened condition and will be held very rigidly in that position because the several axes of the toggle are in alinement, or preferably the central axis will have been moved slightly beyond the axes of the ends of the toggle. There are of course, two of these plungers, one mounted in each end of the shaft, and the two plungers are preferably operated successively, the one to straighten its toggle and tighten its clutch band and the other to break its toggle and release its clutch band. For so operating the plungers they are connected one to the other and an operative connection is established between the one plunger and an operating lever. For this purpose we have provided a shaft 63 rotatably mounted in the frame below and in front of the crowding shaft. The outer end of the shaft 63 is provided at one side with a suitable actuating or controlling lever 64 which may be held in a suitable adjusted position by means of the lock 65. The shaft 63 is provided at that end opposite the lever with an arm 66 which is connected by a link 67 with an arm 68 which is rigidly secured to a vertical shaft 69 forming a part of the clutch controlling mechanism for the crowding shaft. This vertical shaft is connected by means of an arm 70, rod 71 and arm 72 with a second vertical shaft 73 of said clutch controlling mechanism. The shafts 69 and 73 are mounted in suitable bearings 74 near the ends of the crowding shaft. Each of the vertical shafts is provided at its upper end with an arm 75 comprising a pair of members 75′ having in their ends slots 76 adapted to receive trunnions 77 projecting from the outer ends of the respective plungers, thereby establishing an operative connection between the controlling lever and the two plungers.

The connections between the plungers and

the controlling lever are such that the movement of the lever from its neutral position in one direction will actuate the selected plunger only and will allow the other plunger to remain idle, and further, this connection is such that when the lever is released the plunger will be automatically moved in a direction to release its clutch band. To this end, each of the arms 75 is rotatably mounted on its shaft and is provided with a slot or key-way 78 to receive a key 79 rigidly secured to the shaft. The key-way is of a length greater than the thickness of the key, thereby allowing a certain amount of lost motion, and, consequently, the shaft can have movement relatively to its arm, a spring 80 being provided for each pair of members to move the same independently of the shaft. There is one of these springs arranged about the hub of each pair of members and the spring is secured at one end to the hub, as shown at 81, and at the other end to a pin 82 rigidly secured to a fixed part adjacent to the hub of the members.

On account of the construction of the key-ways in these arms and vertical shafts, there is in reality no connection between these parts in certain positions and the springs are counted on to impart the movement to the arms. When the arms are in their neutral positions, as shown, the movement of the connecting rod 71 in one direction will cause one of the keys to immediately engage with the side of its key-way in the arm on its shaft, the arm turning with the shaft and of course setting the friction. At the same time the other shaft will rotate but no motion will be given its arm as in this position, the key in this shaft has no contact with its arm. After the first arm has been moved to its "in" position and it is desired to release the same, the connecting rod is moved in the opposite direction, but as there is then no contact between the key and the arm on the shaft, the spring must impart the motion to the arm and throw out the clutch. In case the arm should stick for some reason, then after the key has rotated through the full width of the key-way in the arm, it would engage the side of the key-way and give the arm a start; the spring throwing it out the remainder of the way. This feature of having the spring do the throwing out permits of the arms having but half the travel that would be necessary in case the arms were keyed solidly to the shaft. If the arms were keyed solidly to the shaft then it would be necessary to provide sufficient throw to allow one side to be completely thrown out before the other side was commencing to throw in, but with the present arrangement the two arms act independent of each other, that is with the arms in neutral position no motion is imparted to the right hand arm while the left hand arm is being thrown either in or out, or vice versa. This is on account of the long key-way in the arms, as the amount of travel necessary to throw the arm of one shaft to "in" position is no greater than the amount of travel of the other shaft before it strikes the opposite side of the key-way in the hub of its arm. With the arms on the first mentioned shaft thrown to "in" position, the key would engage the side of the key-way, as shown, then in throwing this arm out the spring would cause the arm to follow the key until the arm reaches the "out" position, when the arm would stop, but if the motion of the shaft was continued in the same direction which would be the case in setting the arm on the other shaft, the key in the shaft would simply turn through the key-way until it reached the opposite side thereof, by which time the other clutch would be in "in" position. After the spring has moved the arm to "out" position the travel of the plunger will prevent any further movement thereof.

In connection with the clutch controlling mechanism we have provided means for locking the driven mechanism, or as here shown, the crowding mechanism, against movement when the controlling lever is in its normal or intermediate position. To this end the shaft 15 is provided with a brake drum 83 to which extends a brake band 84. The ends of this brake band 84 are connected to the opposite ends of a bell crank lever 85 which is mounted on the upper end of a shaft 86 extending substantially parallel with the shaft 15 and provided at its lower end with a crank arm 87 which is here shown as a double arm. Connected with the arm 87 is one arm 88 of a toggle, the other arm 89 of which is rigidly secured to an intermediate portion of the shaft 63 on which the controlling lever 64 is mounted. The arrangement of the toggle with relation to the lever is such that when the latter is in its normal condition the toggle will be straight and the brake band 84 will be drawn snugly about the brake drum 83 locking the shaft 15 against rotation. When the lever is moved in either direction from a normal or neutral position, the toggle is broken and the brake band released. When the controlling lever is in neutral position the toggle of the locking brake band for the shaft 15 will be straight and the brake band will be in operative or locking position. At the same time both of the clutches will be in an "out" position. As the controlling lever is moved from its neutral position either to one side or the other, the transversely extending shaft 63 will be rotated to break the toggle joint and cause the inward movement of either one plunger or the other to set the corresponding brake band of the clutch mechanism, the other brake band re-

maining in unclutched position. The controlling lever can now be locked in this position if desired. If the movement of the lever is continued through neutral position to the other side, the other clutch will be thrown in.

While we have shown and described one embodiment of the invention it will be understood that this has been chosen for the purpose of illustration only, and that we do not desire to be limited to the details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. In a mechanism of the character described, the combination, with a driving shaft and a driven shaft, of means for clutching said shafts together comprising a plunger and friction drums, a hand lever for operating said clutching means, a brake for said driven shaft, and connections for operating said brake, the connections including a toggle having one member connected to said brake and the other member connected to said hand lever, said toggle being positioned to be straightened to apply said brake by movement of said lever to unclutching position.

2. In a mechanism of the character described, the combination, with a driving shaft and a driven shaft, of means for clutching said shafts together comprising a plunger and friction drums, a hand lever for operating said clutching means, a friction brake for said driven shaft comprising a drum carried by said shaft and a band around said drum, and connections from said hand lever for applying and releasing said brake band from its drum, said connections including a toggle, one member of which is connected to said band, and the other member of which is connected to said hand lever, the construction being such that the toggle is straightened to apply said brake band by movement of said hand lever to unclutching position.

3. In a mechanism of the character described, transmission means operatively connected to a source of power, a device for locking said means against movement comprising a friction drum and a friction band extending about said drum, a device for disconnecting said means from the source of power and connecting the same to the source of power to move the same in opposite directions, and means for operating the locking device when the device for connecting and disconnecting the source of power is operated, said last-mentioned means comprising a lever and an operative connection between said band and said lever, said connection comprising a toggle so arranged that when said lever is in position to disconnect the said transmission means from the source of power, said toggle will be in its extended position and said friction band will be in operative engagement with the friction drum.

4. In a mechanism of the character described, a transmission shaft, said shaft being operatively connected to a source of power, a pinion secured to an end of said shaft, a second shaft extending transversely of the first-mentioned shaft, gears loosely mounted on said second shaft and meshing with the pinion on said first-mentioned shaft, clutch devices to connect either of said gears with said second shaft, a lever to control said clutch devices, and means controlled by said lever to hold said first-mentioned shaft against rotation when both gears are disconnected from said second-mentioned shaft.

5. In a mechanism of the character described, a rotatable member provided with a friction drum, a friction band mounted about said friction drum, clutch mechanism for connecting and disconnecting said rotatable member with a source of power and reversing the direction of rotation thereof, a controlling lever movable into a neutral position to disconnect said rotatable member from the source of power and movable in either direction from said neutral position to connect said member with the source of power for rotation in different directions, a supplemental shaft operatively connected with said friction band, a toggle connected at one end with said supplemental shaft to actuate said friction band and connected at its opposite end with said lever, the arrangement of said toggle with relation to said lever and said friction band being such that the friction band will be in operative engagement with said friction drum when said lever is in its neutral position and will be disengaged from said friction drum when said lever has been moved out of its neutral position.

6. In a mechanism of the character described, a rotatable member, connecting devices to connect the rotatable member with a source of power for rotation in either direction or to disconnect the same therefrom, a controlling lever movable into a neutral position to disconnect said rotatable member from the source of power and movable in either direction from said neutral position to connect the same to the source of power for rotation in opposite directions, a friction drum for said rotatable member, a friction band mounted about said friction drum, a supplemental shaft having at one end arms connected with said friction band, said shaft having a second arm arranged at a point remote from said friction band, a shaft extending transversely to said supplemental

shaft and connected to said lever, a toggle extending between said last-mentioned shaft and the arm of said supplemental shaft, the connection between said supplemental shaft and said friction band being such that when said toggle is in its extended position said band will operatively engage said drum, and said toggle being so arranged with relation to said lever that it will be in its extended position when said lever is in its neutral position.

7. In a mechanism of the character described, a rotatable member, a pinion secured to said rotatable member, a second rotatable member, gears loosely mounted on said second rotatable member and meshing with said pinion, clutches to separately connect said gears with said second rotatable member, a friction drum associated with said first-mentioned rotatable member, a friction band extending about said drum, and actuating device for said friction band comprising a supplemental shaft, an actuating shaft, a toggle interposed between said actuating shaft and said supplemental shaft, a lever secured to said actuating shaft, and an operative connection between said actuating shaft and the clutches.

8. In a mechanism of the character described, a rotatable member, a friction drum associated with said rotatable member, a friction band extending about said drum, a source of power, clutches to separately connect and disconnect said rotatable member with a source of power and to cause said member to rotate in either direction, an actuating device for said friction band comprising a supplemental shaft, an actuating shaft, a toggle interposed between said actuating shaft and said supplemental shaft, a lever secured to said actuating shaft, and an operative connection between said actuating shaft and said clutches, whereby said lever will actuate both the clutches and said friction band.

9. A mechanism of the character described, a rotatable member provided with a friction drum and a friction band therefor, said rotatable member being operatively connected with a source of power, a reversing mechanism interposed between said rotatable member and the source of power, said reversing mechanism comprising a pair of friction drums, a friction band extending about each of the drums, a shaft upon which the drums are mounted, gears connected with respective drums, said shaft being provided with a guideway in each end thereof, rods slidably mounted in said guideways, operative connections between said rods and the respective friction bands, whereby the reciprocation of said rods will control said bands, a lever operatively connected with both of said slide rods and with the first-mentioned band, whereby said lever will control the three friction bands.

10. In a mechanism of the character described, a rotatable member provided with a drum and band, said rotatable member being operatively connected with a source of power, reversing mechanism for said rotatable member, said reversing mechanism comprising a pair of drums provided with bands, said bands being provided with common operating means arranged so that no two of them can simultaneously engage their drums.

11. In a mechanism of the character described, a shaft, provided with a pinion, a second shaft provided with a pair of gears loosely mounted thereon and meshing with the pinion on opposite sides of its axis, a friction drum connected with each of said gears, a friction band extending about each of said friction drums, said second shaft having a guideway in each end thereof, rods slidably mounted in said guideways, operative connections between said rods and the respective friction bands, whereby the reciprocation of said rods will control said bands, a locking device for said first-mentioned shaft comprising a friction drum and friction band, an actuating shaft operatively connected with said last-mentioned friction band, a lever connected with said shaft, and an operative connection between said actuating shaft and both of said slide rods, whereby said lever will control the three friction bands, the connections between said actuating shaft and said friction bands being so arranged that no two friction bands can engage their drums at the same time.

In testimony whereof, we affix our signatures.

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