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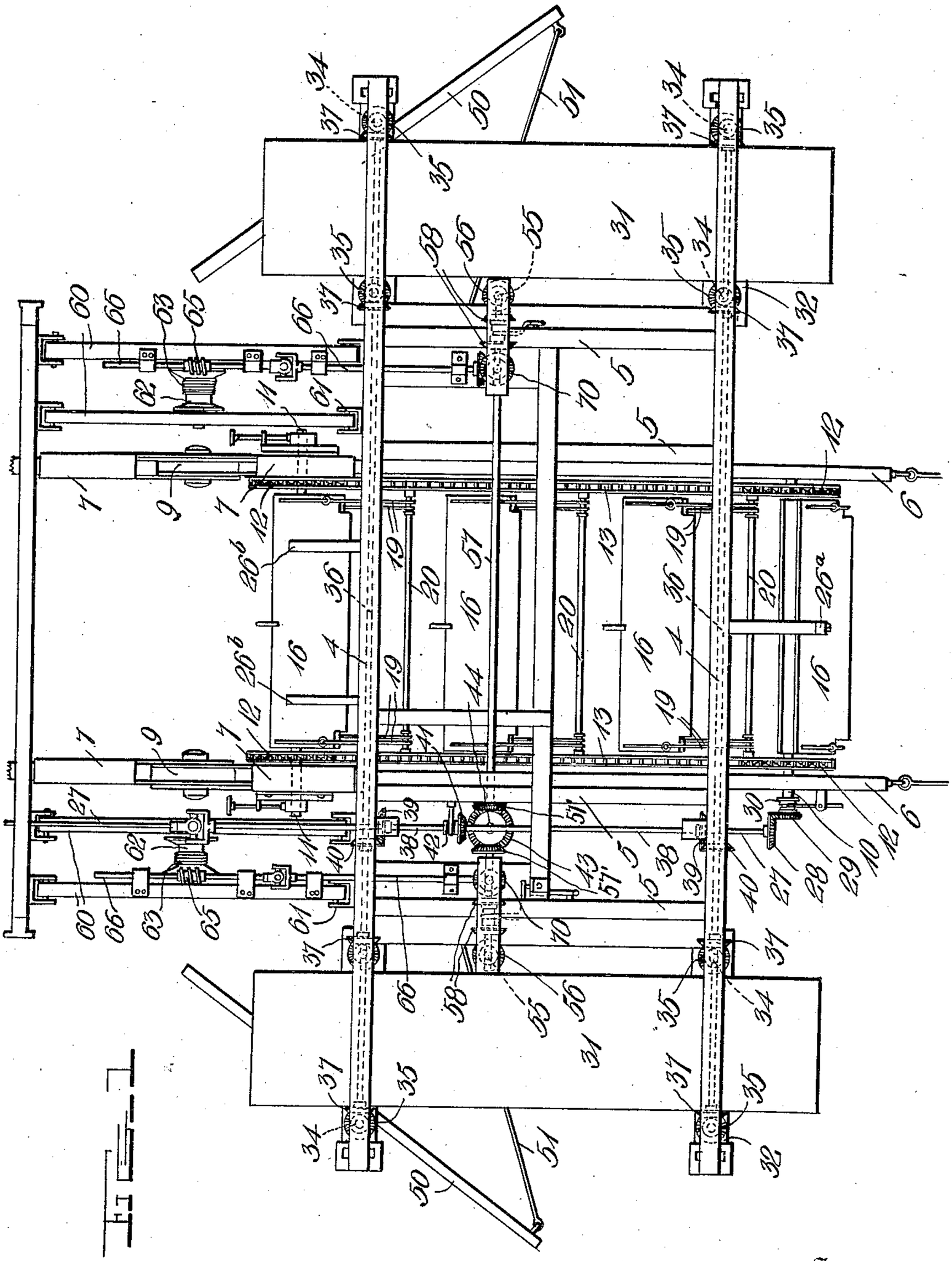
CURRENT MOTOR.

APPLICATION FILED SEPT. 9, 1909.

966,041.

Patented Aug. 2, 1910.

7 SHEETS—SHEET 1.



Witnesses

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7 SHEETS—SHEET 2.

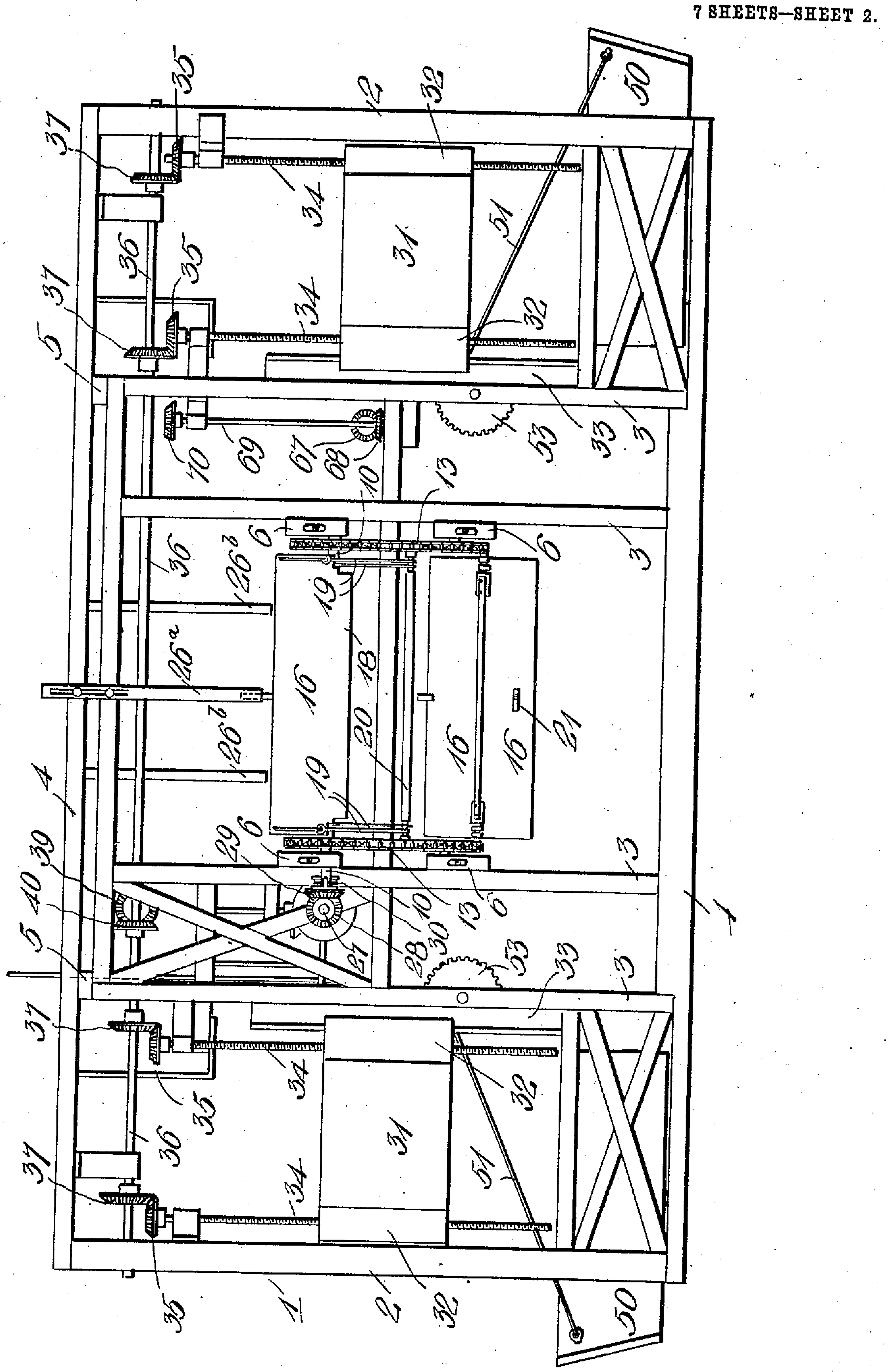

Fig. 2

Witnesses

E. [illegible]

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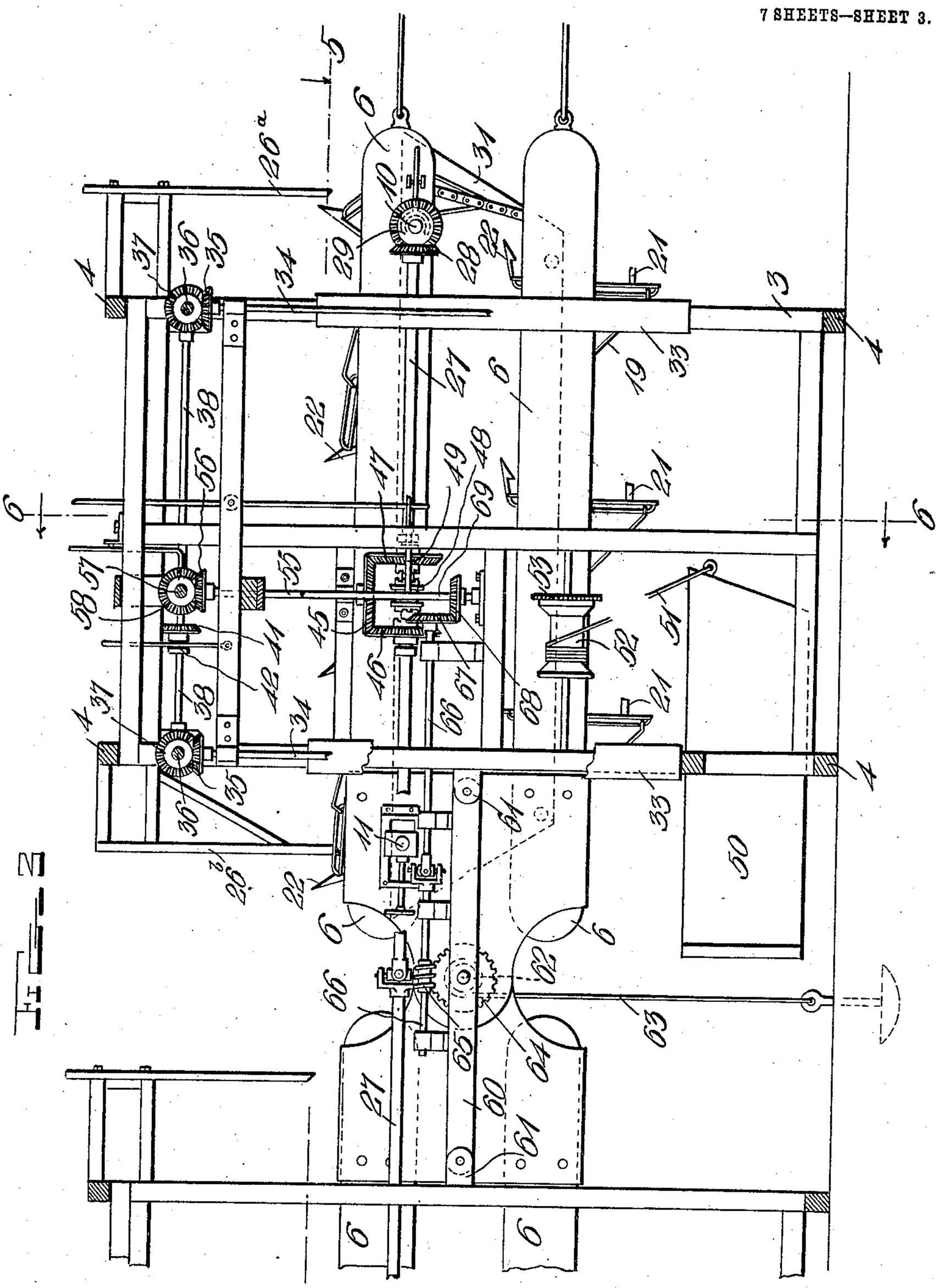
7 SHEETS—SHEET 3.



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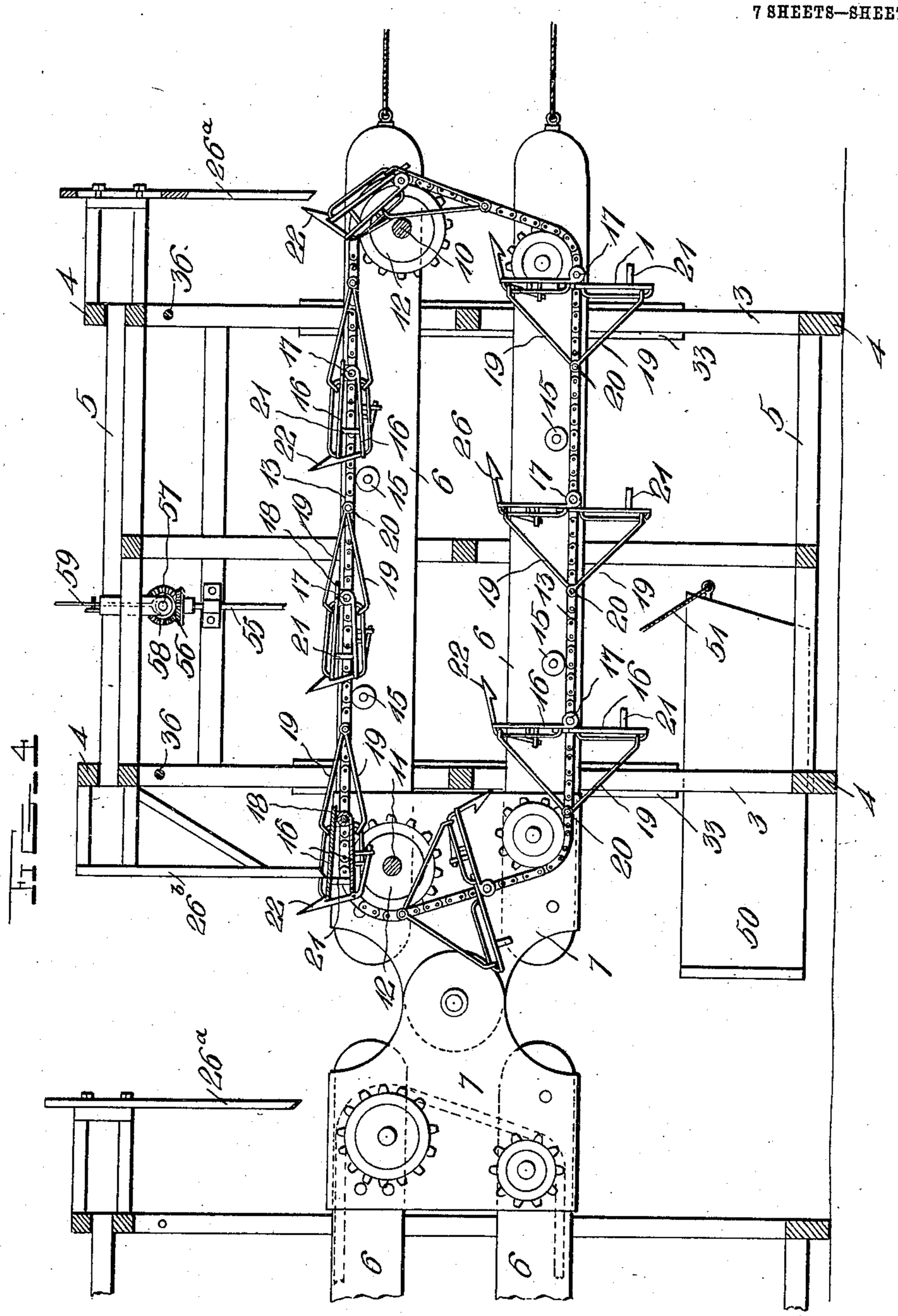
7 SHEETS—SHEET 4.



Witnesses

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7 SHEETS—SHEET 5.

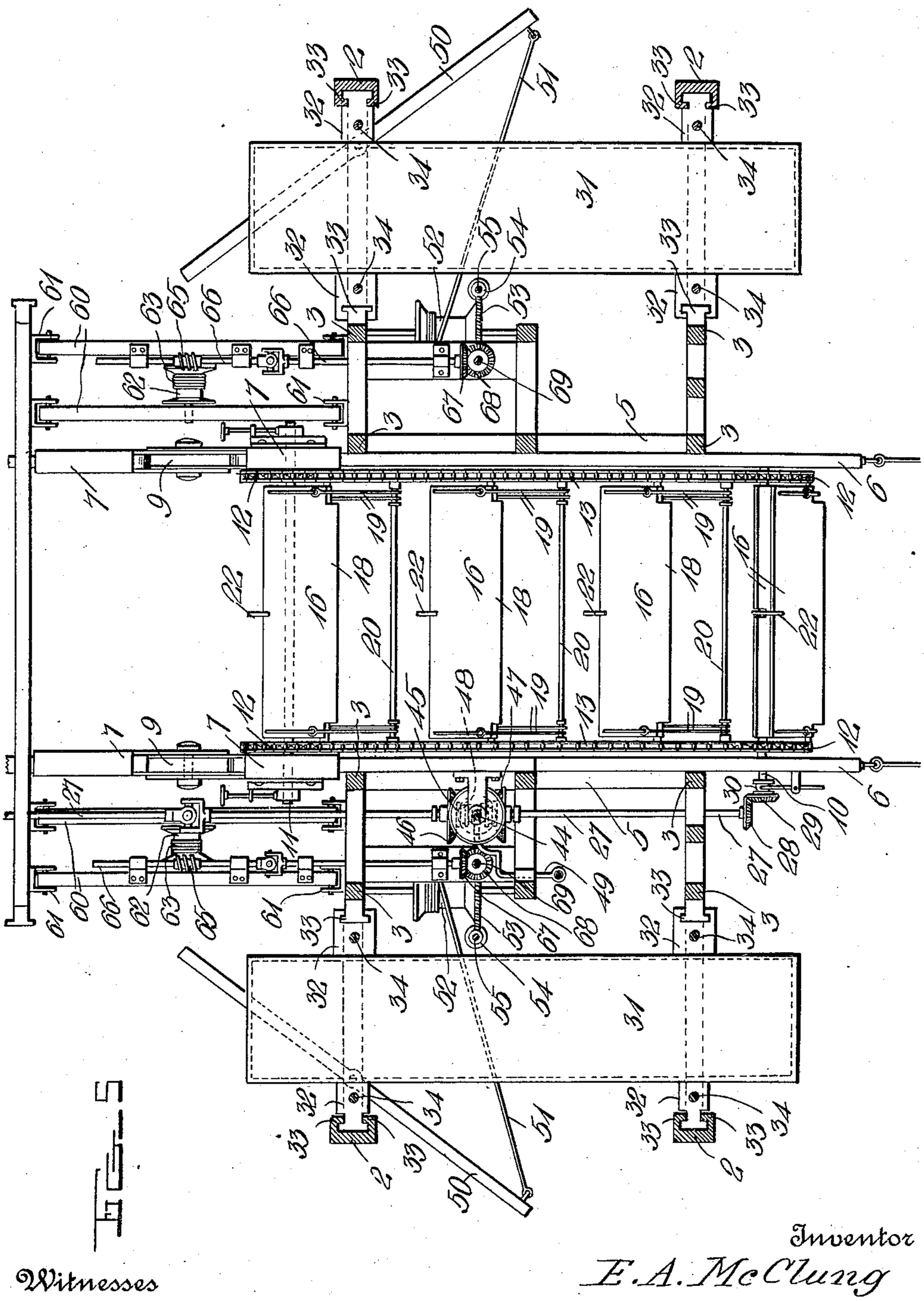

FIG. 5

Witnesses

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APPLICATION FILED SEPT. 9, 1909.

966,041.

Patented Aug. 2, 1910.

7 SHEETS—SHEET 6.

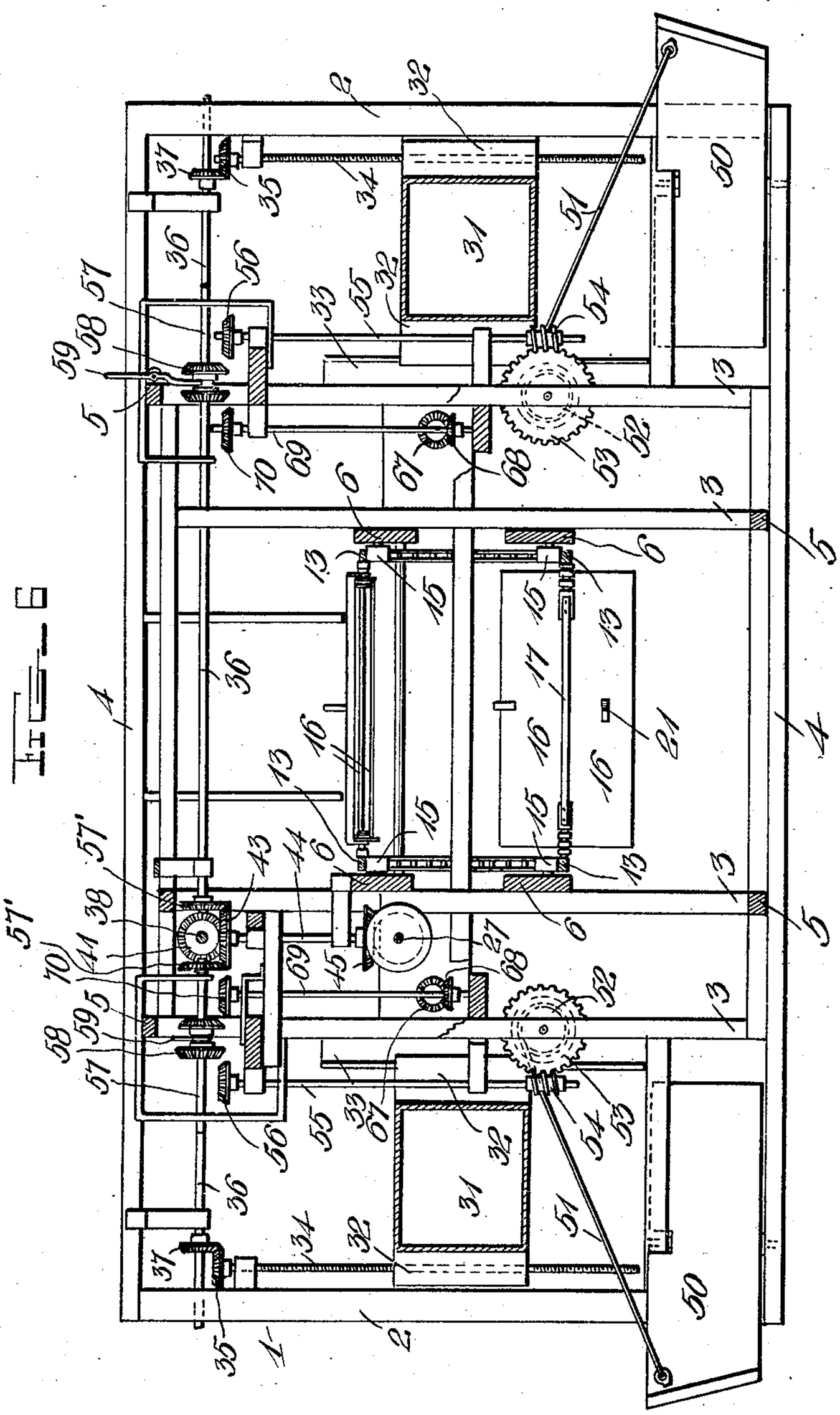

Fig. 6.

Witnesses

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APPLICATION FILED SEPT. 9, 1909.

966,041.

Patented Aug. 2, 1910.

7 SHEETS—SHEET 7.

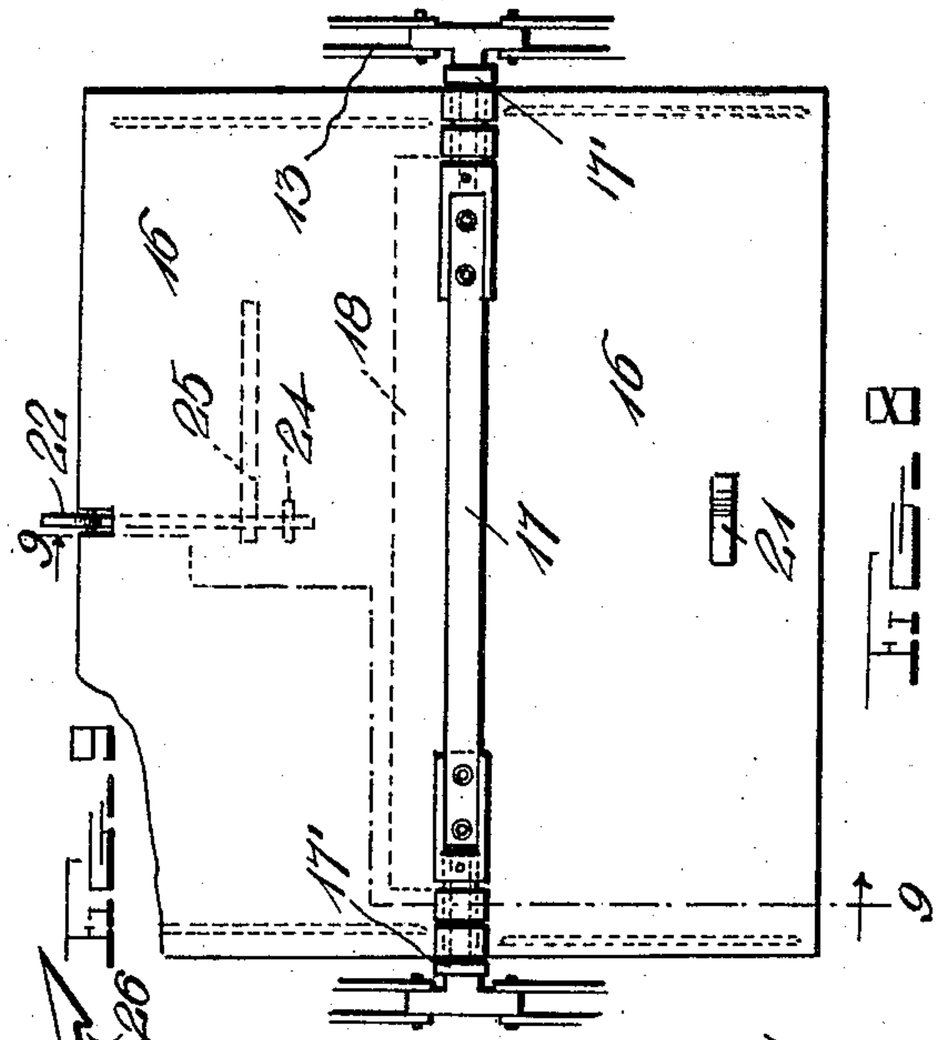

FIG. 8.

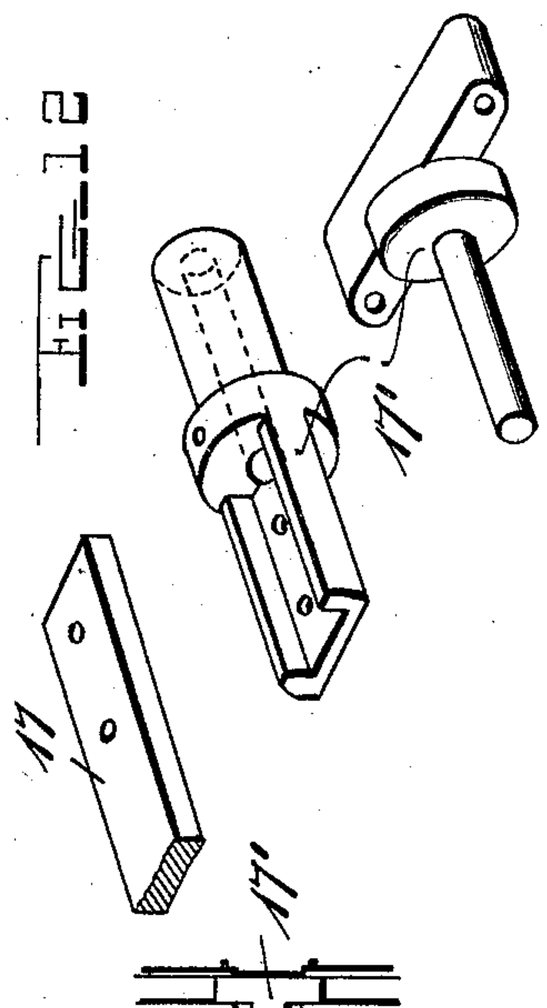

FIG. 12.

FIG. 5.

FIG. 7.

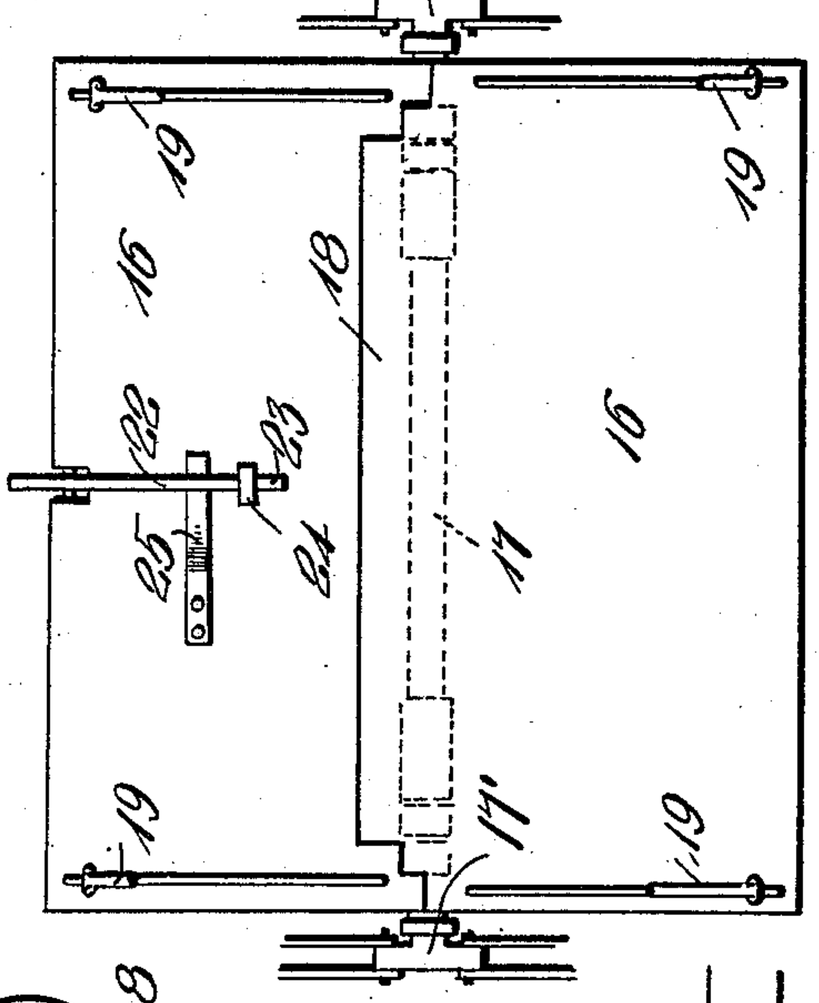

FIG. 10.

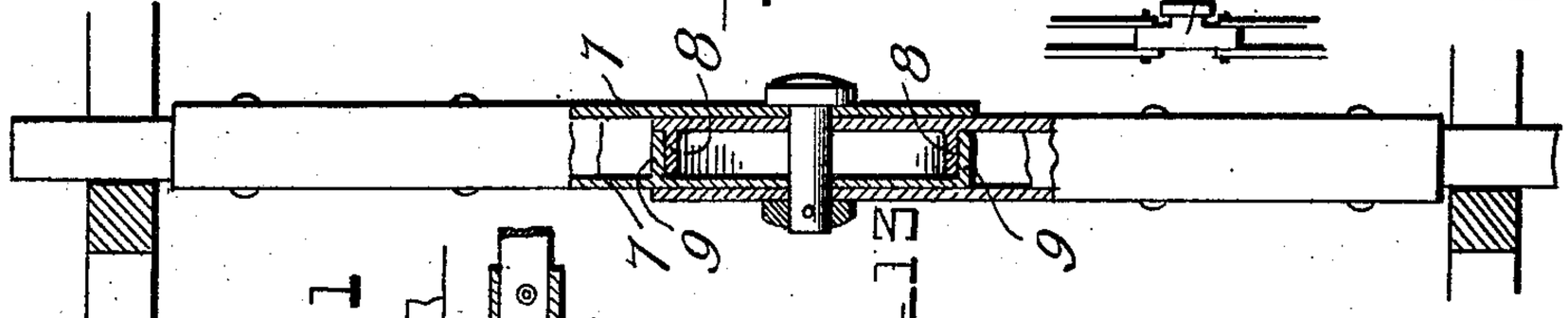

FIG. 6.

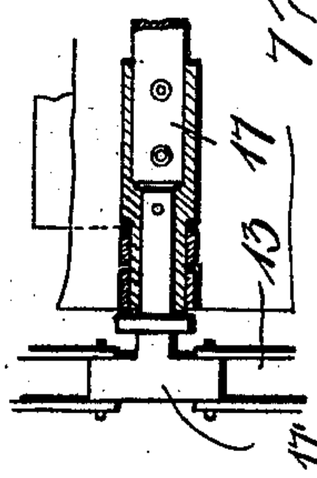

FIG. 11.

Witnesses

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UNITED STATES PATENT OFFICE.

EDGAR A. McCLUNG, OF DAYTON, WASHINGTON.

CURRENT-MOTOR.

966,041. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed September 9, 1909. Serial No. 516,858.

To all whom it may concern:

Be it known that I, EDGAR A. McCLUNG, a citizen of the United States, residing at Dayton, in the county of Columbia and State of Washington, have invented certain new and useful Improvements in Current-Motors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in endless chain current motors.

One object of the invention is to provide a machine of this character which may be arranged to operate in an open stream or in connection with a water-fall.

Another object is to provide a current motor in which the blades on the upper stretch of the drive chain will be automatically opened by the pressure of the water and will be automatically closed in the same manner on the return stretch of the chain.

Still another object is to provide a motor of this character which may be constructed in a plurality of hingedly connected sections, each of which is provided with an independent current operated driving mechanism geared to a common power shaft which is formed in jointed sections and extends throughout all of the motor sections.

With the foregoing and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view of the machine; Fig. 2 is a front elevation of the same; Fig. 3 is a side elevation, with parts broken away; Fig. 4 is a central longitudinal section; Fig. 5 is a horizontal section on the line 5—5 of Fig. 3; Fig. 6 is a vertical section on the line 6—6 of Fig. 3; Fig. 7 is a side view of a portion of the drive chain and one of the current blades, showing the latter in open or operative position; Fig. 8 is a front view of the same; Fig. 9 is a vertical section on the line 9—9 of Fig. 8; Fig. 10 is a rear view of the blade as shown in Fig. 8; Fig. 11 is a detail fragmentary sectional view of a portion of one end of the blades, showing the manner in which the sections thereof are hingedly connected to the drive chain; Fig. 12 is a detail perspective view of one of the links of the drive chain; and one of the coupling members for connecting the blades to the links of the chain; Fig. 13 is a fragmentary sectional view of one of the hinge connections between two sections of the motor.

In the embodiment of the invention here shown, I provide a main supporting frame 1 comprising a series of vertically disposed outer side bars or standards 2 and intermediate bars or standards 3, said bars being connected at their upper and lower ends by upper and lower cross bars 4. The intermediate bars 3 are preferably arranged in pairs and are connected together at their upper and lower ends by longitudinal connecting bars 5. The pairs of intermediate bars 3 are spaced apart at the center of the frame to form a space or passage in which is arranged a driving mechanism, hereinafter described. The intermediate bars or standards 3 at the opposite sides of the space or passage at the center of the machine are connected together by pairs of longitudinally disposed side plates 6 which are preferably spaced apart, as shown.

The motor when arranged for use, is preferably formed of a plurality of sections, each of which comprises a frame constructed as just described and said sections are hingedly connected together by means of pairs of hinged plates 7 secured to the adjacent ends of the side plates 6 of the adjoining sections. The plates 7 overlap and on the inner plates of one of the sections is formed annular bosses 8 which are engaged by annular flanges 9 formed on the inner plate of the opposite section and said plates when thus engaged are provided with a pivot bolt whereby they are pivotally or hingedly secured together.

In one end of the upper side plates 6 of the sections, is revolubly mounted a drive shaft 10, while in the opposite end of said plates is revolubly mounted a chain adjusting and supporting shaft 11. On the opposite ends of the shafts 10 and 11 are fixedly mounted sprocket gears 12 with which are operatively engaged the sections of an endless drive chain 13. The upper and lower stretches of the chain sections are held in operative position between the gears 12 by a series of idle rollers 15 which are revolubly mounted on stub shafts secured to the inner sides of

the upper and lower side plates 6. On the chain 13 is secured a series of current engaging blades 16, each of which is formed of folding sections, said sections being hingedly connected at their inner edges to a supporting shaft 17 which is arranged between and secured to specially formed links 17′ constructed as shown in Fig. 12 and arranged in the opposite sections of the drive chain between which the sections of the blades are adapted to open and close. One of the sections of the blades is formed at its inner edge with an extension 18 which is adapted to overlap the adjacent edge of the opposite section, when said sections are in open or extended position. Slidably engaged with the rear side of the sections of the blades are brace bars 19, the opposite ends of which are pivotally secured to studs 20 arranged in the links of the chain, whereby when said blades are in an open or extended position, the brace bars will hold and brace the same against the pressure of the water on the opposite side of the blades. On the forward or front side of one of the blades is formed a stop 21 which is adapted to be engaged by the opposite sections of the blades when the sections are brought together in folded or closed position. On one section of the blades is pivotally mounted a latch 22 which is provided with an angularly formed operating arm 23, the end of which is engaged with a suitable guide 24 arranged on the rear side of said section and said arm is engaged by an operating spring 25, also secured to said section of the blade. The latch is provided with a locking notch 26 and a beveled outer end, whereby when the opposite section of the blades is folded inwardly into engagement with said beveled end of the latch, the latter will be sprung outwardly to engage the notch 26 with the edge of said section thereby holding the sections of the blades in folded or inoperative position.

On the forward end of the frame and in the path of movement of the beveled end of the latch 22 is an adjustable trip finger 26ª having a beveled lower end which is adapted to be engaged by the beveled end of the latch 22 as the blades pass the same, thereby releasing the latch and permitting the blades to be opened by the action of the current. The trip finger 26ª is adjustably secured in the frame by means of a set screw or other suitable fastening. When it is desired to throw the machine out of operation, the finger 26ª is retracted and secured by its fastening device out of the path of movement of the latch 22 so that the latter will not be tripped by said finger and the blades will consequently be held in folded position so that when passing around, the force of the current will not act on the blades. On the opposite end of the frame is secured parallel depending blade closing arms 26ᵇ which are adapted to engage the blades 10 as they are brought around by the chain 13 and to fold said blades together to an inoperative position in which they are held by the latch 22. The blades when thus folded, do not, on their return stroke, offer any resistance to the force of the current and consequently do not act to operate the motor until released by the engagement of the latch 22 with the finger 26ª arranged on the forward end of the frame. By arranging the blades as herein shown and described, the blades on the lower stretch of the chain will be forced open to an operative position by the pressure of the current and will thereby operate the drive chain and through the latter will utilize the power or pressure of the current to the drive shaft 10.

Journaled in suitable bearings in one side of the frame is a power shaft 27, the shaft of each section of the motor being connected together between the same by a universal joint connection, as shown. On one end of the shaft 27 is mounted a bevel gear 28 which is adapted to be engaged by a similar gear 29 on the drive shaft 10. The gear 29 is loosely mounted on the drive shaft and is operatively connected thereto by means of a suitable clutch 30, whereby the drive shaft may be thrown into and out of gear with the power shaft when desired.

Slidably mounted between the pairs of intermediate standards 3 and the outer side standards are hollow floats 31, said floats being provided with guide blocks 32 which are slidably engaged with vertically disposed guide tracks 33 secured to or arranged on the outer side standards and the adjacent intermediate standards of the frame. The guide blocks 32 are provided with threaded passages with which are engaged the lower threaded ends of float adjusting rods 34 mounted in suitable bearing brackets on the frame and provided on their upper ends with bevel operating gears 35. Revolubly mounted in the upper ends of the standards or supporting bars 2 and 3 are front and rear float operating shafts 36 on which are fixedly mounted a series of bevel gears 37 which are operatively engaged with the bevel gears 35, on the upper ends of the float adjusting rods 34. The shafts 36 at the opposite ends of the machine are operatively connected together to move in unison and thereby simultaneously operate all of the float adjusting rods 34, by a connecting shaft 38 on the opposite ends of which are mounted bevel gears 39 which engage similar gears 40 on the float operating shafts 36. Slidably keyed on the shaft 38 is a bevel gear 41, said gear being shifted into operative engagement with a bevel gear 43 by a lever 42. The bevel gear 43 engaged by the gear 41 is arranged on the upper end of a vertically disposed power transmitting shaft 44 which

is revolubly mounted in suitable bearings on the frame of the machine and has fixedly mounted on its lower end a bevel gear 45. The gear 45 engages bevel gears 46 and 47 loosely mounted on the power shaft 27. The gears 46 and 47 are adapted to be separately locked into operative engagement with the power shaft by a double reversing clutch 48 arranged on said shaft whereby the motion of said shaft is imparted to the power transmitting shaft to drive the power shaft in one direction or the other. The clutch 48 has connected thereto a shifting lever 49, to which is connected an operating rod extending to the upper end of the machine, whereby said lever is actuated to shift the clutch and thereby reverse the power transmitting shaft from the top of the machine.

Pivotally mounted in the frame of the machine, below the floats 31, are current deflecting blades 50, which are adjusted by means of cables 51 connected to the forward ends of the blades and to winding drums 52 which are revolubly mounted in the frame of the machine, as shown. On one end of the drums 52 are arranged worm gears 53 which are operatively engaged by worms 54 on the lower ends of vertically disposed drum operating shafts 55 which are mounted in suitable bearings on the frame 1 and are provided on their upper ends with bevel gears 56.

Revolubly mounted in suitable bearings in the upper portion of the frame, is a second power transmitting shaft 57 which is formed in two sections each having gears 57′ engaged with and driven by the gear 43 on the first power transmitting shaft 44 and on said shaft 57, adjacent to each end of the same, is slidably mounted a double bevel gear 58, said double gears 58 being slidably keyed to the shaft 57 and connected with said gears are shifting lever 59 whereby the gears are moved or shifted on the shaft 57 to bring one side of the gears into operative engagement with the bevel gears 56 on the upper ends of the drum operating shafts 55, whereby said shafts are driven to operate the winding drums in the desired direction.

Between the sections of the motor and adjacent to the outer sides of the hinged connections thereof are pairs of connecting bars 60, the opposite ends of which are hingedly connected to the adjacent ends of the motor sections by clips 61 or other suitable fastening devices. Between the bars 60 are revolubly mounted cable winding drums 62 to which are connected and on which are adapted to be wound anchoring cables 63, the opposite ends of which are secured to suitable anchors in the bottom of the stream. The drums 62 are provided on one end with worm gears 64 with which are operatively engaged worms 65 formed on drum operating shafts 66. The shafts 66 are preferably formed in jointed sections to permit the free movement of the adjoining motor sections and on the inner end of said shafts are fixedly mounted bevel gears 67 which are operatively engaged with similar gears 68 on the lower ends of vertically disposed shafts 69, on the upper ends of which are fixedly mounted bevel gears 70 which are adapted to be engaged by the adjacent face of the double bevel gears 58 on the second power transmitting shaft 57, when said gears are shifted in the proper direction by their shifting levers 59. By thus connecting the drums 62, motion is imparted thereto from the power shaft through the connecting gears and shafts to operate the same in the desired direction.

In connection with my motors herein shown and described, I preferably employ a series of fastening cables and adjustable fastening mechanism such as shown and described in my application for Letters-Patent on improvement in rotary current motors filed September 21, 1909, Serial Number 518,823. In connection with the present form of motor, I also employ the form of drift guards also shown in the above mentioned application.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention, as defined in the appended claims.

Having thus described my invention, what I claim is:

1. In a current motor, a supporting frame, a current operated power generating mechanism operatively mounted in said frame, a power shaft driven by said power generating mechanism, adjustable floats arranged in said frame, and a float adjusting mechanism operated by said power shaft to raise and lower the floats.

2. In a current motor, a supporting frame, a current operated power generating chain arranged in said frame, a series of blades mounted on said chain, a power shaft driven by the movement of the chain, adjustable floats arranged in each side of the frame, threaded adjusting rods operatively engaged with said floats, adjusting gears fixedly mounted on said rods, float adjusting shafts, a series of gears on said shafts to engage the gears on said rods, a connecting shaft geared to said float operating shafts, a power transmitting shaft geared to said connecting shaft and said power shaft, whereby the movement of the latter is imparted to the connecting shaft, and a re-

versing mechanism whereby said power transmitting shaft is driven in one direction or the other.

3. In a current motor, a supporting frame, a current operated power generating chain, mounted in said frame, a power shaft driven by the movement of said chain, a power transmitting shaft geared to said power shaft, a reversing mechanism whereby said power transmitting shaft is driven in one direction or the other, current deflecting blades pivotally mounted in said frame, cable winding drums revolubly mounted in the frame, blade adjusting cables connected to said current deflecting blades and adapted to be wound on and off said drums whereby said blades are adjusted, and a series of operating shafts and gears to connect said drums with said power transmitting shaft whereby motion is imparted to the drums to turn the same in one direction or the other.

4. In a current motor, a supporting frame, a drive shaft revolubly mounted in one end of said frame, sprocket gears fixedly mounted on said shaft, a chain adjusting shaft mounted in the opposite end of the frame, sprocket gears fixedly mounted on said adjusting shaft, a power generating chain engaged with the sprocket wheels on said shaft, a series of pulleys to hold said chain in position, a series of current operated blades secured to said chain, said blades being constructed in hingedly connected folding sections adapted to be automatically opened by the action of the current to an operative position on the working stretch of the chain and to be similarly closed on the return stretch of the chain, means to limit the outward swinging movement of the blades, means whereby the blades are secured in folded or inoperative position, means to release said last mentioned means, and a power shaft geared to the drive shaft.

5. A current motor consisting of a series of motor sections, each of which comprises a supporting frame, means to hingedly connect said frames together, said means comprising pairs of hinged plates secured to the adjacent ends of the frames, and having an overlapping engagement with each other, an annular boss formed on the inner plate of one of said frames, an annular flange formed on the inner plate of the opposite frame and adapted to engage said boss, pivot bolts arranged through said plates and boss whereby said plates are held in operative engagement to pivotally connect the motor sections together, a current operated power generating chain operatively mounted in the frames of said motor sections, current operated blades on said chains, a power shaft operated by the movement of said chain, a universal joint connection between the shafts of said motor sections, connecting bars arranged between said sections and pivotally connected at their opposite ends to the adjacent ends of the frames, whereby said motor sections have a limited independent movement, floats adjustably mounted in said frames, a series of guide tracks, guide blocks secured to the floats and slidably engaged with said tracks, a raising and lowering mechanism connected with said floats, and means whereby said raising and lowering mechanism is operated by said power shaft.

6. In a current motor, a supporting frame, a current-operated power generating mechanism mounted in said frame, a power shaft driven by said power generating mechanism, adjustable floats in said frame, a float adjusting mechanism operated by said power shaft to raise and lower the floats, a power transmitting shaft, and a reversing mechanism whereby said power-transmitting shaft is driven in one direction or the other.

7. In a current motor, a supporting frame, a current operated power generating chain arranged in said frame, a series of blades mounted on said chain, a power shaft driven by the movement of the chain, adjustable floats arranged in each side of the frame, threaded adjusting rods operatively engaged with said floats, adjusting gears fixedly mounted on said rods, float adjusting shafts, a series of gears on said shafts to engage the gears on said rods, a connecting shaft geared to said float operating shafts, a power transmitting shaft geared to said connecting shaft and said power shaft, whereby the movement of the latter is imparted to the connecting shaft.

8. In a current motor, a supporting frame, a current operated power generating chain, mounted in said frame, a power shaft driven by the movement of said chain, a power transmitting shaft geared to said power shaft, a reversing mechanism whereby said power transmitting shaft is driven in one direction or the other, current deflecting blades pivotally mounted in said frame, cable winding drums revolubly mounted in the frame, blade-adjusting cables connected to said current deflecting blades and adapted to be wound on and off said drums whereby said blades are adjusted, and means to connect said drums with said power transmitting shaft whereby motion is imparted to turn the same in one direction or the other.

9. In a current motor, a supporting frame, a current operated power generating chain arranged in said frame, a series of blades carried by said chain, a power shaft driven by the movement of the chain, adjustable blades arranged in each side of the frame and a float adjusting mechanism operated by said power shaft to raise and lower the floats.

10. In a current motor, a supporting

frame, a current operated power generating chain arranged in said frame, a series of blades carried by said chain, a power shaft driven by the movement of the chain, adjustable floats arranged in each side of the frame and a float adjusting mechanism operated by said power shaft to raise and lower the floats, a power-transmitting shaft geared to said power shaft and a reversing mechanism whereby said power transmitting shaft is driven in one direction or the other.

11. In a current motor, a supporting frame, an endless power generating chain mounted therein, a series of folding blades carried by said chain and adapted to automatically open to an operative position by the action of the current on the working stretch of the chain, means to limit the outward swinging movement of the blades, means whereby the blades are held in folded or inoperative position during the return movement of the blades, means to release said blades when at the end of said return movement and a power shaft driven by the power generating chain.

12. In a current motor, a supporting frame, an endless power generating chain mounted therein, a series of folding blades carried by said chain and adapted to be automatically opened to an operative position on the working stretch of the chain by the action of the current, means to limit the outward swinging movement of the blades, latch devices whereby the blades are held in folded or inoperative position during the return movement of the blades and a trip device mounted in the supporting frame to release said latch devices in order to permit said blades to swing into open or opposite position when at the end of the return movement of the blades, and a power shaft driven by the power generating chain.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDGAR A. McCLUNG.

Witnesses:
W. E. Cahill,
J. E. Stephenson.