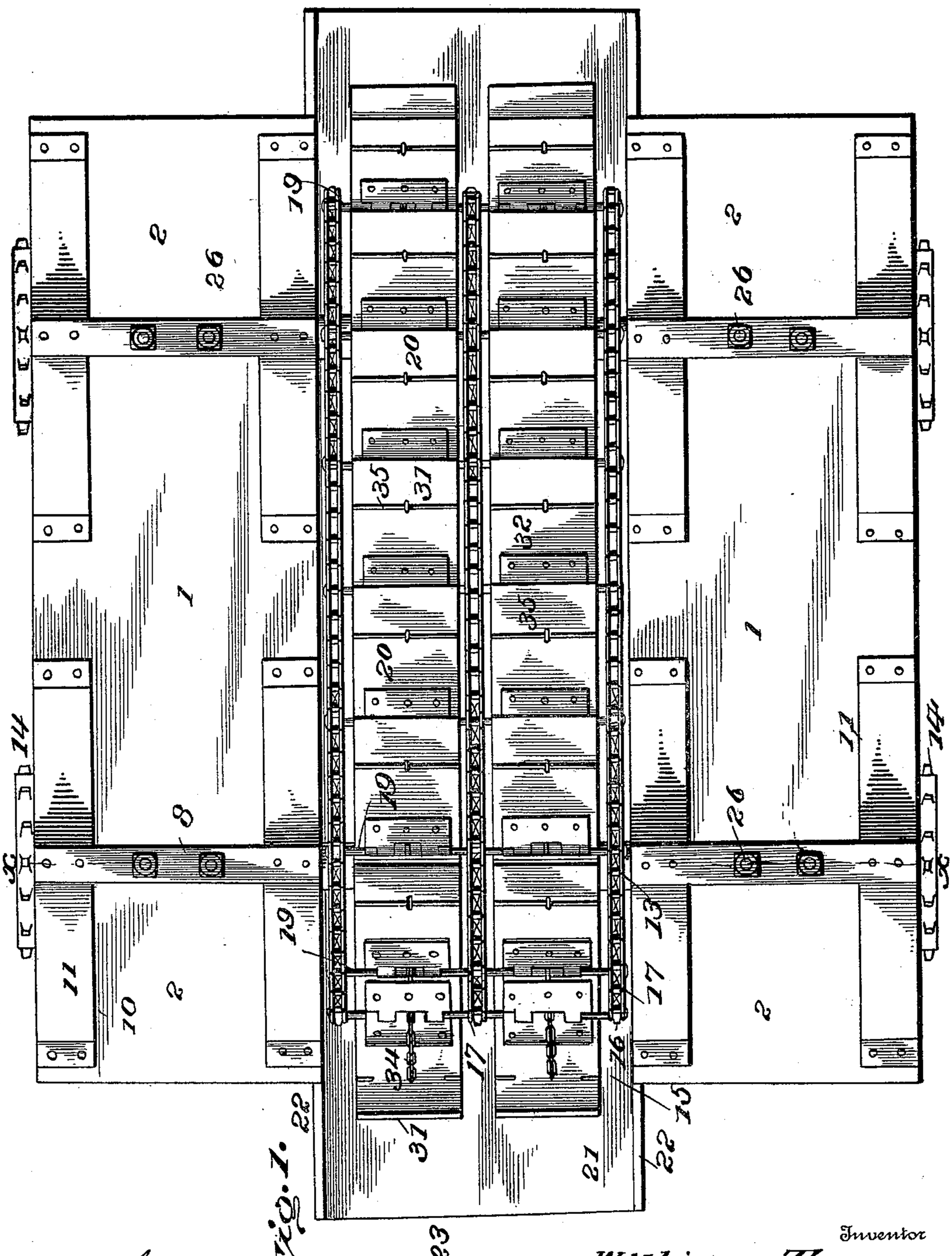
No. 635,208. Patented Oct. 17, 1899.

W. TURNER.

CURRENT MOTOR.

(Application filed June 17, 1898.)

(No Model.) 4 Sheets—Sheet 1.



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(No Model.) 4 Sheets—Sheet 2.

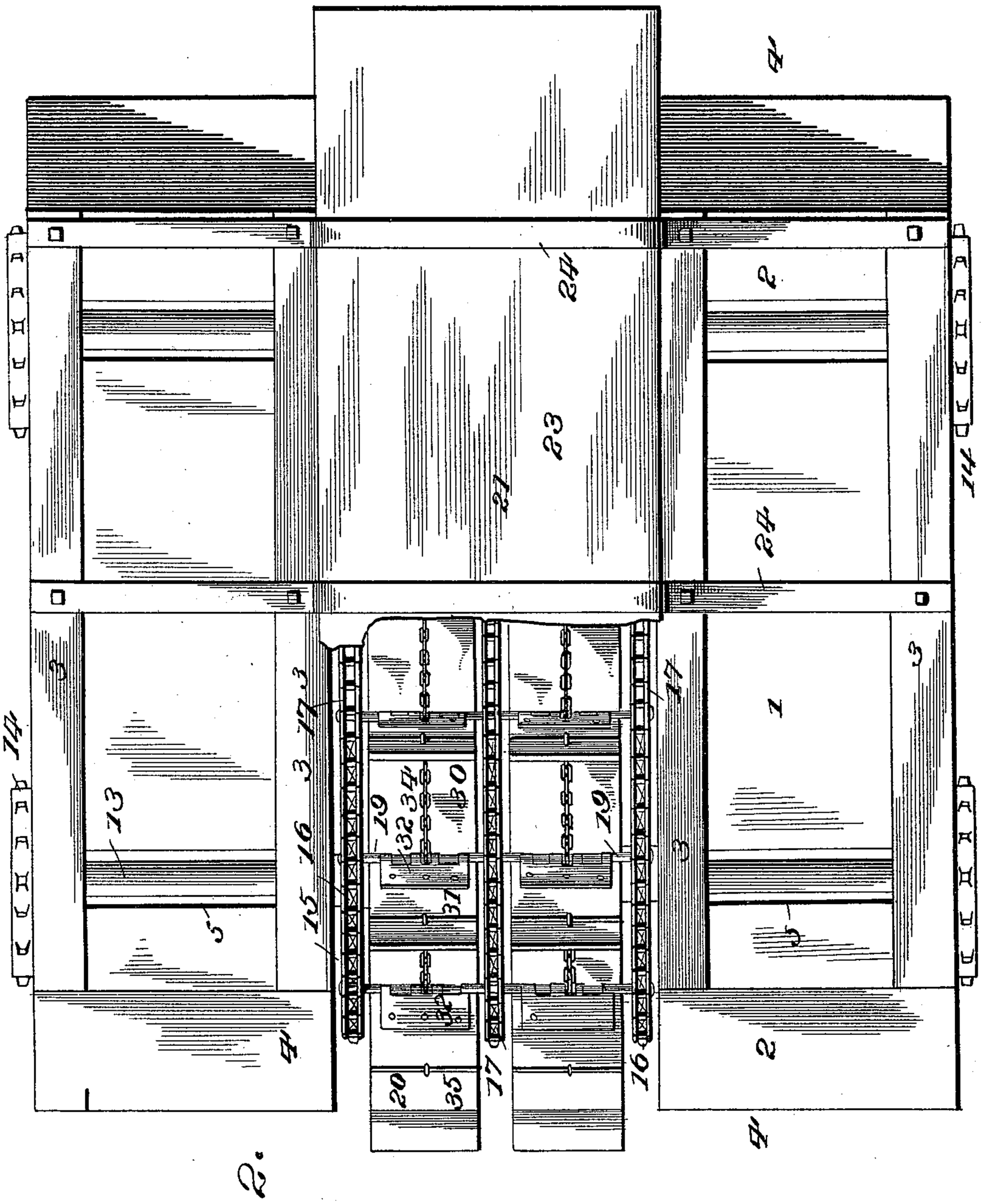

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

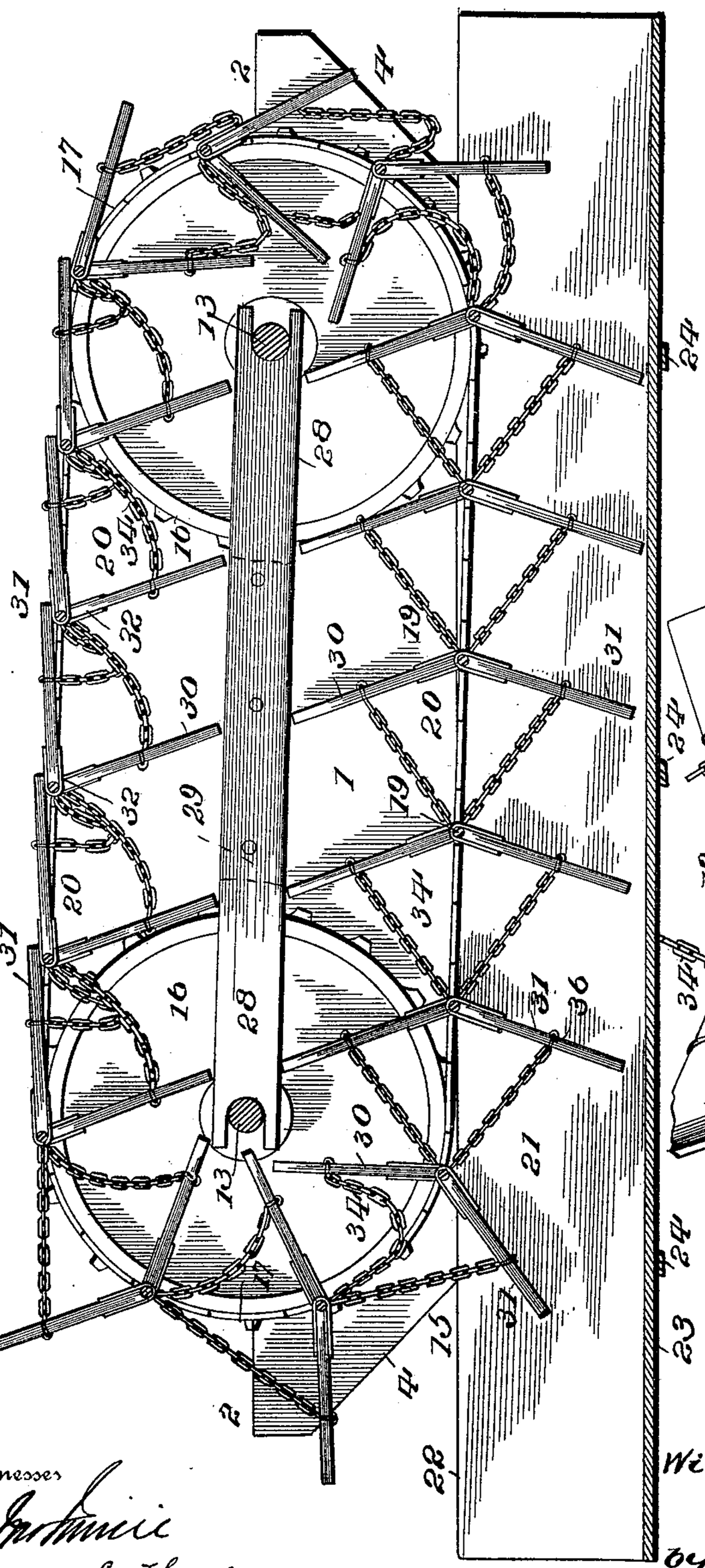

Fig. 3.

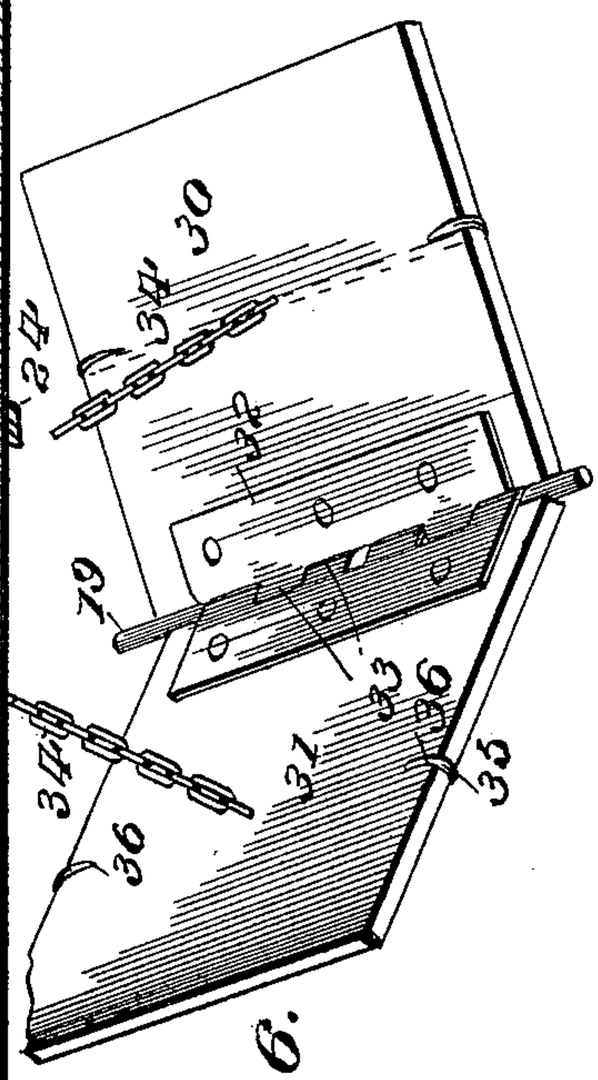

Fig. 6.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

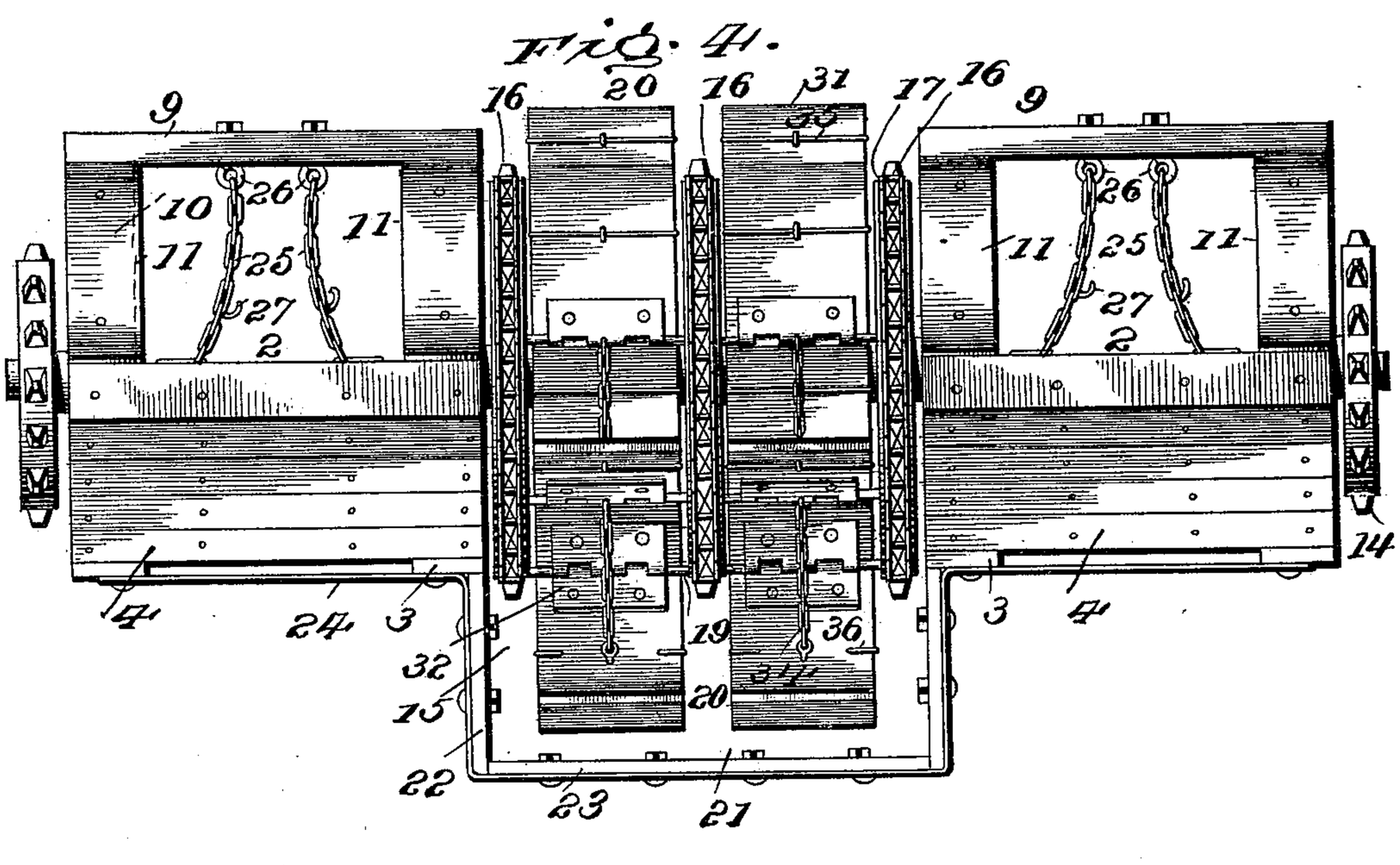
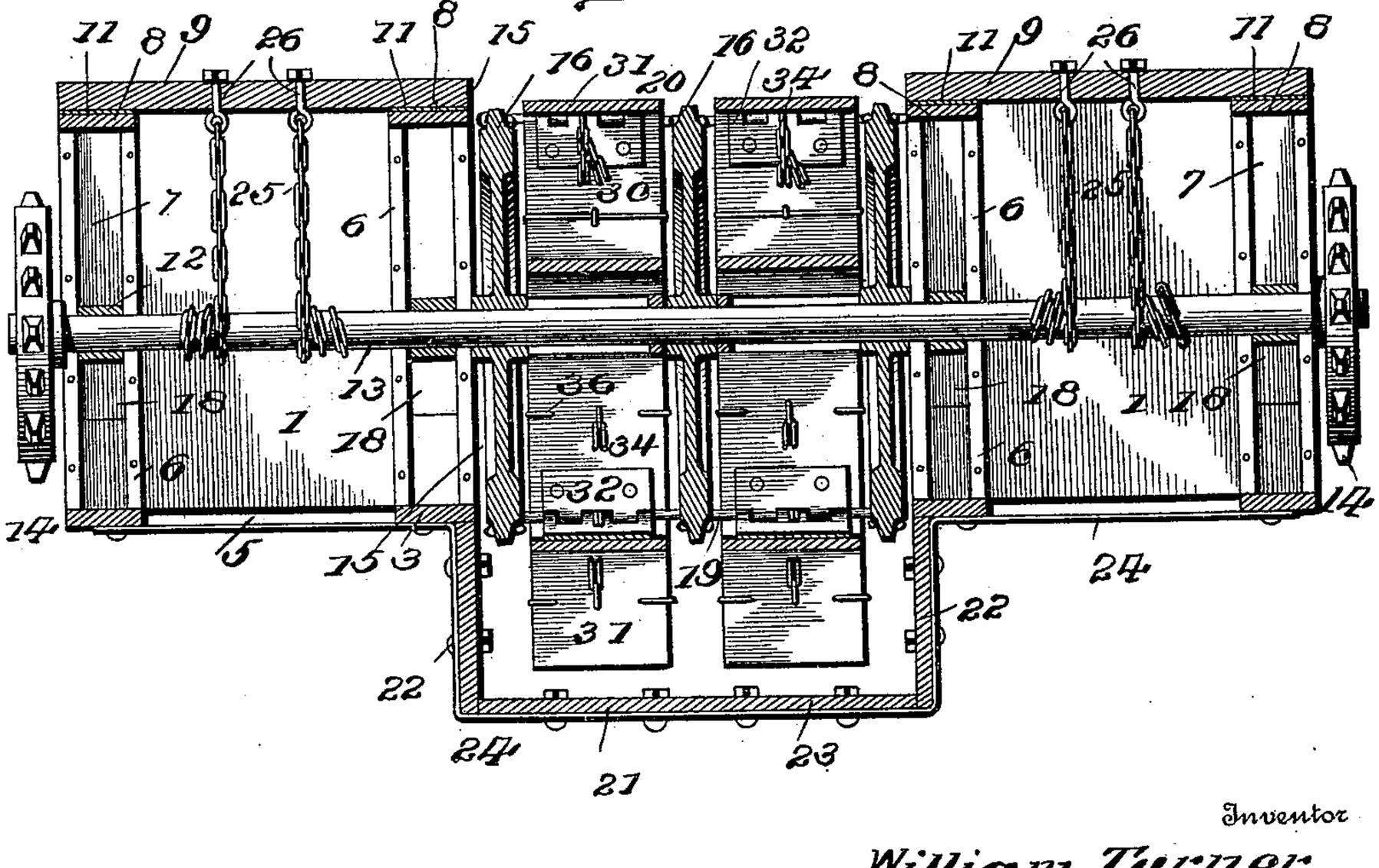


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM TURNER, OF WENATCHEE, WASHINGTON.

CURRENT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 635,208, dated October 17, 1899.

Application filed June 17, 1898. Serial No. 683,724. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM TURNER, a citizen of the United States, residing at Wenatchee, in the county of Kittitas and State of Washington, have invented certain new and useful Improvements in Current-Motors; and I do hereby 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 current-motors; and it consists of the construction and arrangement of parts hereinafter more fully described and claimed.

The object of the invention is to arrange the parts of a current-motor in such manner that the paddles will be positioned to most effectively receive the force of a current and equally concentrate the generated power on opposite drive-shafts without irregularity or variation and with a force proportionate to the speed of the current.

In the accompanying drawings, Figure 1 is a top plan view of a motor embodying the invention. Fig. 2 is a bottom plan view of the same broken away in part. Fig. 3 is a central longitudinal vertical section. Fig. 4 is a front end elevation. Fig. 5 is a section on the line *x x*, Fig. 1. Fig. 6 is a detail perspective view of one of the paddles.

Referring to the drawings, wherein similar numerals of reference are employed to indicate corresponding parts in the several views, the numeral 1 designates the opposite box-floats, to which are connected front and rear head-floats 2 by means of tie-sills 3, attached to the bottom inner and outer portions of the said floats. The head-floats 2 are of considerably smaller dimensions than the floats 1 and have the under outer portion of each beveled or inclined, as at 4, as clearly shown in Figs. 3 and 4, and the inner portions of the said head-floats stand away from the adjacent ends of the said floats 1 to form ways 5, at the inner and outer portions of which vertical guides 6 are mounted, arranged in pairs, with inner opposite grooved faces 7. These guides project above the level of the floats and are connected at the top by caps 8, on which rest cross-beams 9, said guides being also supported by inclined braces 10, over which metal strengthening-straps 11 are secured. The tie-sills 3 extend across the lower portions of the ways 5; but the opposite ends of said ways are clear, and in the inner grooved faces of the guides 6 sliding journal-boxes 12 are movably mounted to provide adjustable bearings for opposite end shafts 13, on the outer ends of which sprocket-wheels 14 are keyed. The shafts 13 extend entirely through the opposite ends of the motor and through a central open space 15 between the floats 1 and 2. On the portions of the said shafts which are located in the central open space 15 a series of three sprocket-wheels 16 are keyed, the same number being employed at each end, and engaging the said sprocket-wheels are drive chain belts 17. The front journal-boxes 12 are limited in their downward movement by stops 18; but the rear devices of a similar character are unimpeded in their adjustment and can move the full distance permitted by the guides 6. This arrangement provides for adjusting the rear shaft 13 deeper than the front shaft, so that the chain belts will run with a rearward declination without requiring an unequal depression of the floats 1 and 2, for a purpose which will be presently set forth.

There being three sprocket-wheels 16 on each shaft 13, a similar number of drive chain belts 17 are used, and at regular intervals therein rods 19 are mounted, each of which passes through a portion of the three belts, and thereto are movably secured opposite pairs of paddles 20. The paddles 20 are mounted between the chain belts—that is, the outermost belts are on the outside of the paddles and the intermediate belt between the opposite pairs—and by this means, together with the rods, the paddles are held positively against a swaying or undue loose movement and successively pass between the sprocket-wheels on the shafts.

A trough or chute 21 is secured to the bottom portion of the motor and located directly under the central space 15. The said chute has closed sides 22 and bottom 23 and is held in position by supporting-straps 24, surrounding the same and attached at opposite ends to the bottom portions of the floats and directly to the sills 3. The bottom 23 of the said trough or chute is located a suitable distance below the greatest depressive extent of

the paddles 20, and between the opposite edges of the paddles and the sides 22 a suitable space is left clear, as well as between the inner edges of the said paddles, which is owing to the positions of the sprocket-wheels on the shafts 13 and the drive chain belts 17, as previously described. The said trough or chute materially increases the forceful impact of the current by confining it within a predetermined space at the point of engagement with the paddles and preventing a lateral wash or outthrow, which would ensue if the closed sides were lacking.

The elevation or depression of the shafts 13 to change the depth of penetration of the blades can be accomplished in an automatic manner while the motor is in operation through the medium of chains 25, connected at their upper ends to bolts 26, mounted in the cross-beams 9 over the guides 6. In applying chains 25 for the purpose stated the lower ends thereof are started around adjacent opposite portions of the shafts and wind thereon in reverse directions toward the center, the winding operation being attained by the revolution of the shafts themselves. The said chains are manually applied to the shafts in the positions stated. The winding operation, however, is intended to take place only when it is desired to clear the paddles from the effects of the current and to stop the rotation of the shafts; but the depression of the said shafts can be made regulable by looping or winding the lower free ends of the chains about or around the shafts and engaging said free ends with the links of the upper supporting portions of the chains by means of hooks 27, provided for the purpose. The chains 25 are sufficiently long to permit the formation of supporting-loops and also for primary winding around the shafts to raise the latter to the desired elevation. When the shafts are depressed to their normal lowermost working positions, the chains 25 hang free and slack; but when the shafts are elevated in the manner first stated the counteracting gripping or biting action of the links of the reversely-wound portions of the chains thereon effectually prevents the shafts from casually slipping or working down. In releasing the chains the ends thereof may be easily unwound by hand to remove the resistance of the links, and the shafts will then drop down by gravity to their normal positions. The operation of the motor, however, is not dependent on the use of the chains 25, as set forth, as the shafts may be allowed to run continuously, and shifting means of well-known form applied to the driven mechanism operated by the sprocket-wheels could be used to throw the propelling power of the motor out of gear from the said driven mechanism.

While the motor will operate effectually without being depressed at one end a greater distance than at the opposite end, it will be found beneficial at times to have the entire motor and trough or chute arranged at an angle of inclination with the highest portion at the end receiving the current, so that the paddles will be gradually influenced in succession by a power increasing toward the rear and in accordance with the greater penetration of the said paddles, which is acquired by the inclined position of the motor. By the said inclination of the motor as an entirety or by the unequal adjustment of the shafts alone the paddles may be caused to have their surfaces at the front, but partially submerged, and the submergence gradually increased toward the rear until the entire surface of each paddle is wholly covered. This mode of positioning the paddles may be found necessary in fluctuating or variable currents and also to regulate the speed of the shafts 13.

The motor is to be held into a stream by means of suitable anchor or stay chains, and the greater depression at one end will be accomplished by tightening one side of the anchor and stay chains and slackening the other, it being understood that the anchor-chains will be secured to anchor-posts or analogous devices at points a suitable distance from the motor. The power may also be taken from the sprocket-wheels 14 by means of chain belts (not shown) extending in opposite directions and employed for various purposes, and thereby making it possible to utilize a single motor for driving independent machinery; or, if desired, the power from both shafts can be conveyed to and concentrated upon a single machine plant.

Contiguous to the opposite sides of the central sprocket-wheels 16 and at their opposite ends loosely engaging the shafts 13 are rest-bars 28, which are secured to an intermediate space-bar 29, the said bars being so situated as to form bearings for the lower edges of the paddles 20 when not working and moving upwardly over the horizontal plane of the shafts 13, and thereby sagging of the drive chain belts 17 is prevented and the weight or drag thereon is materially reduced, thus lessening the resistance which the lower paddles have to overcome when acted upon by the current. Each of the paddles 20 comprises two sections 36 and 31, (clearly illustrated by Fig. 6,) which are preferably flat boards cut to the proper size and at inner opposing edges have hinged plate-sections 32 thereon with interlocking knuckles, through which pass the rods or pintles 19, and thus movably connect the two sections. When the paddles are depressed or submerged in the water, they are thrown open, and the two sections provide an extended bearing-surface, and to make each pintle effective in propelling a limiting-chain 34 has its one end attached about centrally to each section, and the opposite ends of the two chains from the two sections composing each paddle are secured to the preceding adjacent rod or pintle 19, the said limiting-chains being long enough to permit the sections 31 and 32 to fully

open, but at the same time prevent them from being thrown beyond a predetermined perpendicular line. When the paddles are traveling or moving upwardly over the motor above the horizontal plane of the shafts 13, the upper section 31 of the several paddles drops down in horizontal position by gravity, and when again reaching the point at the front of the motor, where they come in contact with the current, they are automatically spread open as their submergence increases. By having the paddles drop down in this manner when not working in the water a wind resistance is prevented which would exist were the said paddles rigid, and this also reduces the drag and obviates an impediment to the sensitive operation of the paddles below being propelled by the force of the current. At the points where the chains 34 are attached to the sections 30 and 31 it is necessary to apply some device to prevent breakage of the said sections by the strain exerted when the chains are drawn taut, and for this purpose rods 35 extend transversely across the surfaces of the said sections 30 and 31 opposite to which the said chains extend, and the outer links of the attached ends of said chains are engaged by said rods, the latter having their ends bent over the opposite ends of said sections 30 and 31, as at 36. Through the medium of the rods 35 the strain is distributed over a larger surface and breakage of the sections is less liable to occur.

The front of the trough or chute 21 can be extended in advance of the motor any suitable distance, and by the use of this trough or chute the motor can be operated by a very narrow stream of water, which can be caused to flow through the trough or chute, and the opposite floats then serve as a rest on adjacent banks or other means of support. The trough or chute can also be beneficially employed in a raceway having a fall, and thereby establish a current artificially, and the generated power may be transmitted to a mill or other mechanism located at a distance from the said raceway.

Numerous applications will become apparent by the use of the device, and changes in the proportions, dimensions, and minor details of construction can be resorted to without departing from the nature or spirit of the invention or sacrificing any of the advantages thereof.

Having thus described the invention, what is claimed as new is—

In a current-motor, the combination with floats separated by a central space and having ways adjacent opposite ends continuing into a lower chute provided with closed sides and bottom and open ends, of inner and outer pairs of vertical guides in the ways and projecting above the floats, the foremost pairs of guides having intermediate stops therein, caps connecting the tops of said guides, a pair of chains depending loosely from each cap and carrying hooks, opposite end shafts vertically adjustable in the ways having sprocket-wheels at the center thereof and adapted to be engaged by said chains, and chain belts connected to paddles and engaging said sprocket-wheels on the shafts.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM TURNER.

Witnesses:
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JOHN LILLIS.