No. 755,517. PATENTED MAR. 22, 1904.

W. C. MITCHELL.

REVERSING MEANS FOR MACHINE TOOLS, &c.

APPLICATION FILED JUNE 22, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

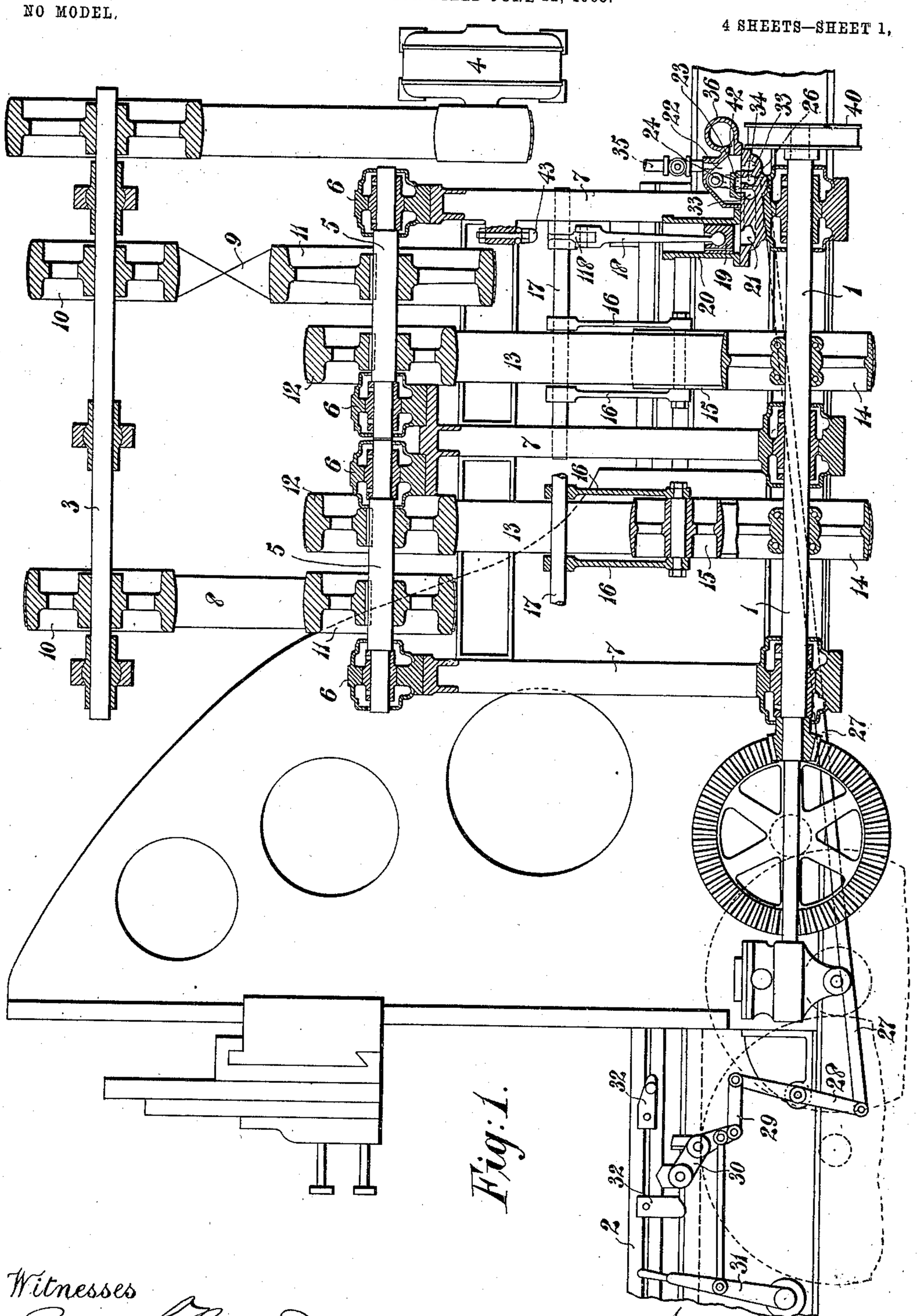

Fig. 1.

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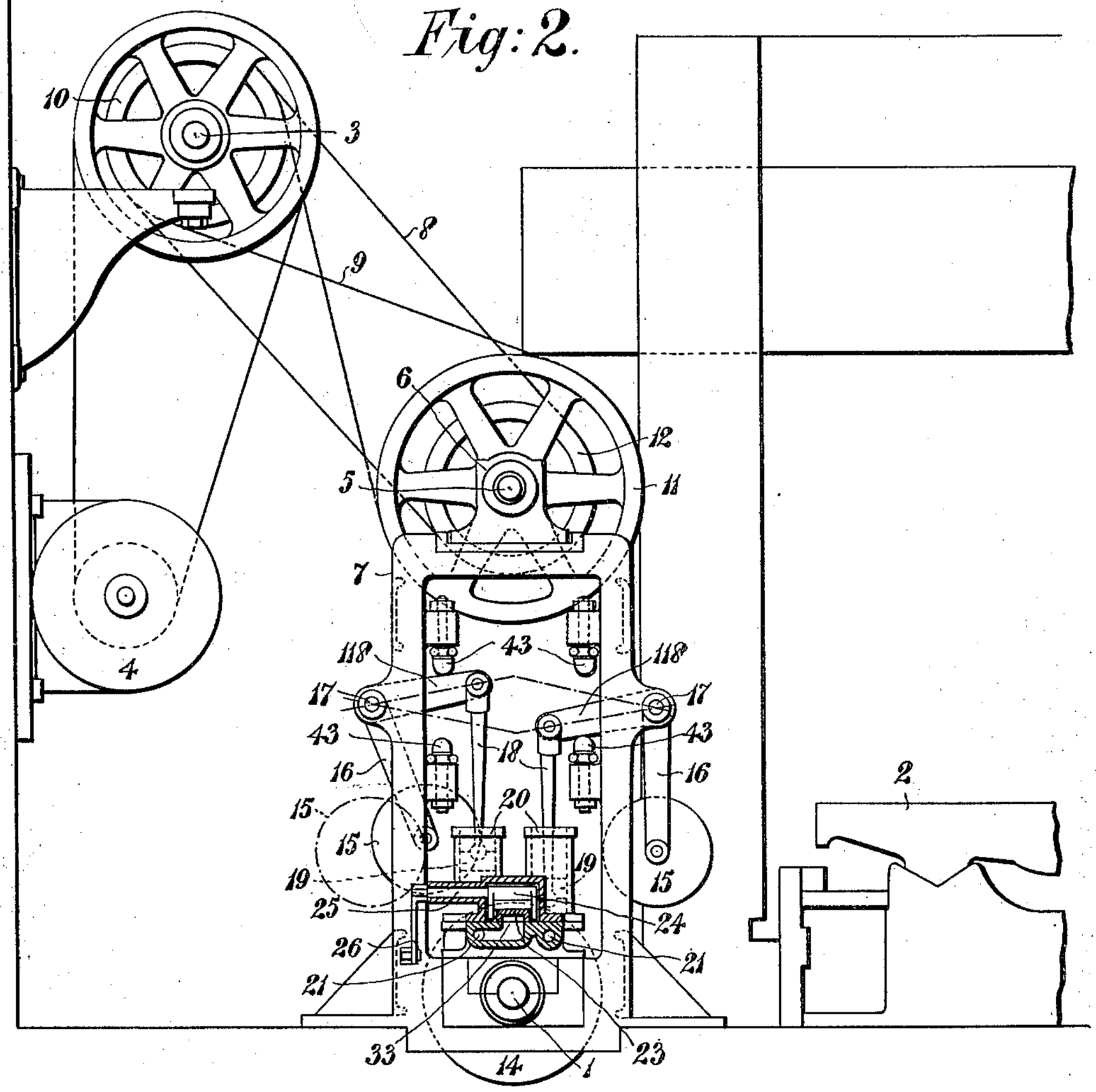
NO MODEL. 4 SHEETS—SHEET 2.

Fig: 2.



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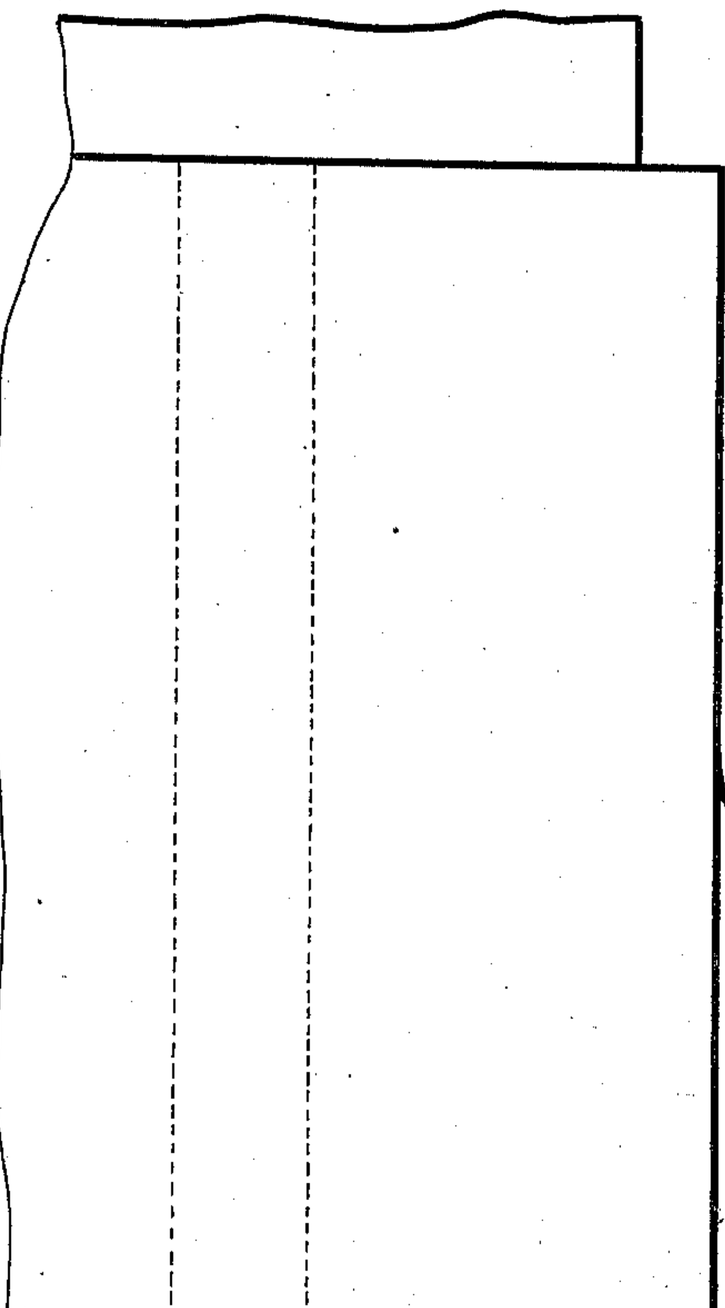
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



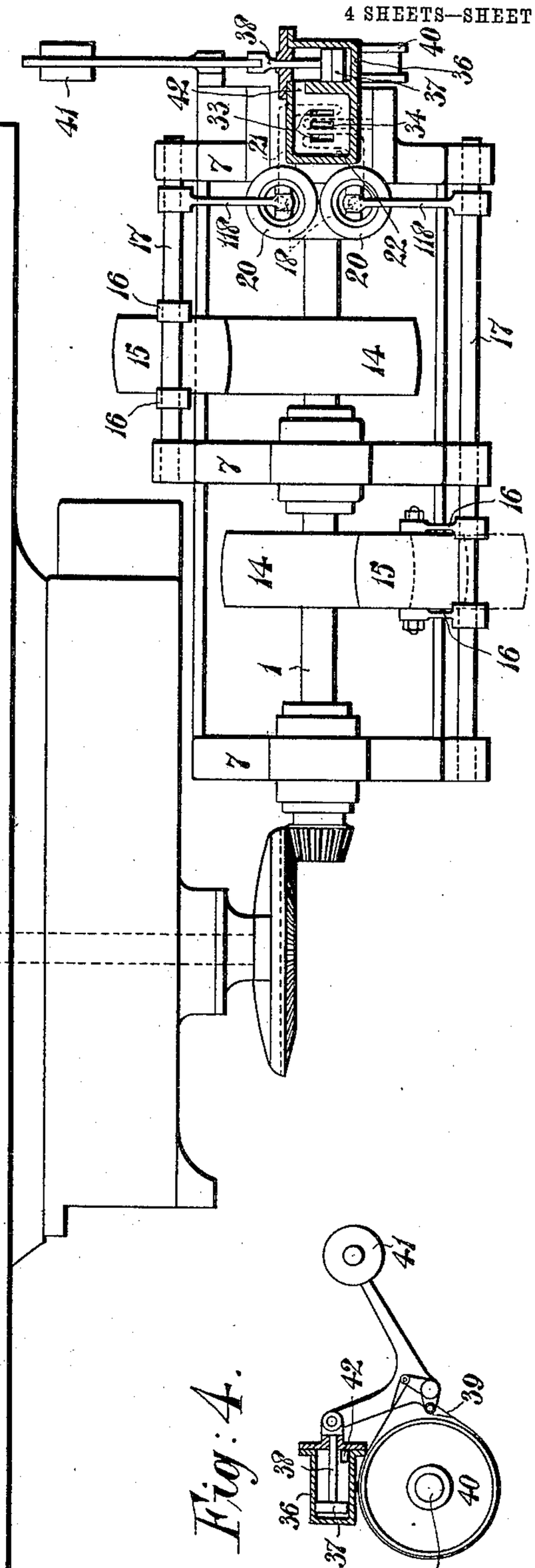


Fig. 4.

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NO MODEL. 4 SHEETS—SHEET 4.

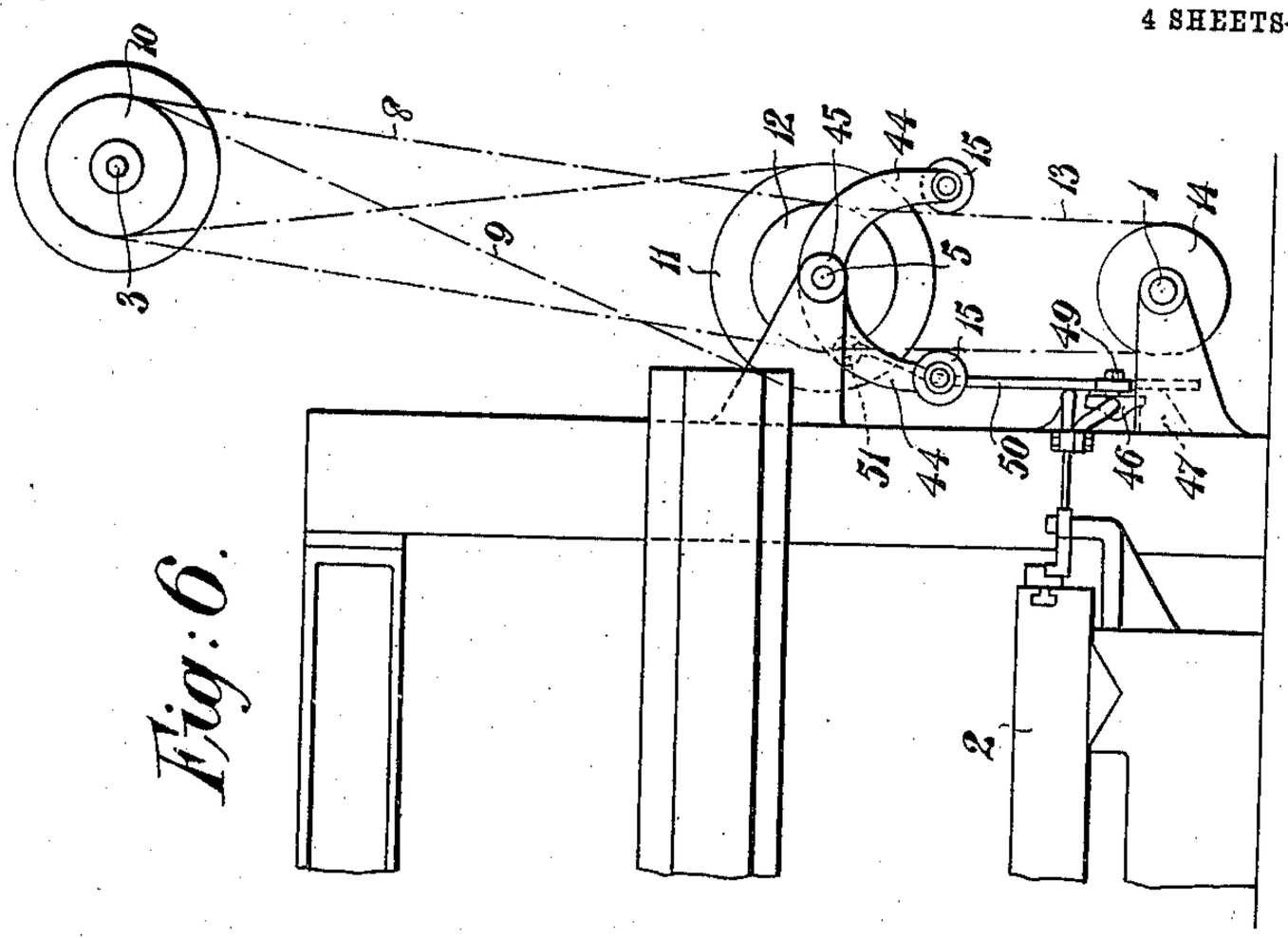

Fig. 6.

Fig. 5.

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No. 755,517. Patented March 22, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM CLARK MITCHELL, OF MANCHESTER, ENGLAND.

REVERSING MEANS FOR MACHINE-TOOLS, &c.

SPECIFICATION forming part of Letters Patent No. 755,517, dated March 22, 1904.

Application filed June 22, 1903. Serial No. 162,661. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CLARK MITCHELL, a citizen of the United States, residing at Westinghouse Works, Trafford Park, Manchester, in the county of Lancaster, England, have invented a new and Improved Reversing Means for Machine-Tools and the Like, of which the following is a specification.

This invention relates to reversing means for machine-tools and other belt-driven mechanisms. Hitherto it has been customary to drive such machines from a main shaft by open and crossed belts, which can be shifted at will onto fixed and loose pulleys, depending upon whether the machine is to run in one direction or the other or remain idle. When, however, the machines are of large capacity, the driving-belts have to be increased in width to such an extent that it becomes difficult to shift the same onto the different pulleys to effect the required drive, while a further disadvantage exists in the amount of wear and tear entailed by thus moving the belts.

My invention has for its object to overcome entirely the necessity of shifting the belt sidewise, whereby the consequent disadvantages referred to are obviated, and this I effect by employing counter-shafts between the main and machine shafts driven continuously in reverse directions from the former and transmitting power to the latter by belts which normally run so loosely upon pulleys thereon that the machine-shaft is rendered idle. These belts are adapted to be tightened as required by pressure derived from jockey-pulleys the movement of which is controlled by hand or from a reciprocating part of the machine. The movement may be effected through the medium of fluid-pressure operating mechanism or directly, as may be desired.

In the accompanying drawings, Figure 1 is a side elevation, Fig. 2 an end elevation, and Fig. 3 a plan, illustrating one form of my invention applied to a planing-machine, the latter being indicated somewhat diagrammatically and parts of the former being broken away or shown in section. Fig. 4 is an end view of a portion of the apparatus. Figs. 5 and 6 are views similar to Figs. 1 and 2, illustrating another way of carrying out the invention.

Referring first to Figs. 1, 2, and 3 of the drawings, 1 is the machine-shaft which it is desired to revolve alternately in different directions to effect the to-and-fro motion of the work-carrying table 2. 3 is the main shaft, which is rotated continuously by a belt and pulleys in the usual way from a motor 4. 5 5 are two counter-shafts mounted in bearings 6 6, secured at the upper ends of columns 7 7 and rotated in opposite directions by a straight or open belt 8 and cross-belt 9, working upon pulleys 10 10 and 11 11. Secured upon the said shafts 5 5 are two pulleys 12 12, which transmit power by belts 13 13 to similar pulleys 14 14, secured upon the machine-shaft 1. 15 15 are idler or jockey pulleys adapted to coact with the belts 13 13 and each carried between the ends of a pair of arms 16 16, keyed upon a shaft 17, which can be rocked by arms 118, connected by rods 18 with pistons 19, working within cylinders 20. The lower end of each cylinder 20 communicates by a passage 21 with a valve-chamber 22, wherein is mounted a slide-valve 23, adapted to be moved by an arm 24, which is secured to a spindle 25, rocked by an arm 26 through the connections 27, 28, 29, and 30, either directly by the hand-lever 31 or automatically by the adjustable stops 32, at each end of the travel of the table in the usual way. 33 33 are ports communicating with the passages 21, leading to the cylinders 20, while 34 is a port constituting an exhaust. 35 is a pipe supplying fluid-pressure to the valve-chamber 22, which conveniently may be compressed air. 36 is a cylinder containing a piston 37 and rod 38 for the operation of a band-brake 39, the disk 40 upon which it acts being secured to one end of the machine-shaft 1. 41 is a weight for applying and varying the effectiveness of the band-brake, and 42 is a port by which communication is established between the cylinder 36 and the valve-casing 22, this part of the apparatus being clearly shown in Fig. 4. 43 represents buffers or stops disposed to limit the movement of the arms 118 and likewise to absorb the concussion due to said movement.

The operation of the foregoing is as follows: When the valve 23 is in a position such that it covers both ports 33, the pistons 19,

due to their own weight and connections, remain in their lowest position within the cylinders 20 and the idler or jockey pulleys are withdrawn sufficiently far to reduce the tension of the belts 13 to allow the latter to ride over the pulleys 14 14 without operating the machine. If, however, the hand-lever 31 be moved to cause the valve 23 to uncover one or other of the ports 33, the piston 19 in the corresponding cylinder 20 will be raised by the entering fluid-pressure, causing its jockey-pulley to advance into engagement with its corresponding belt and increase the tension sufficiently to allow the machine-shaft 1 to be rotated. The advance of the table 2 then causes one or other of the adjustable stops 32 to operate the connections 27, 28, 29, and 30 to reverse the valve 23, thus establishing communication between the cylinder which was formerly supplied with fluid with the exhaust and uncovering the port 33, leading to the other cylinder 20, this causing the other oppositely-running belt 13 to be brought into action to reverse the drive, while the former runs inactively.

During the foregoing operations fluid under pressure has been continuously supplied to the cylinder 36, which in consequence acts upon the piston 37 and relieves the brake of the pressure which would otherwise be exerted upon it by the weight 41. If, however, the table 2 should overrun the desired limit of its travel in either direction, increased movement is imparted to the connections 27, 28, 29, and 30, which thus move the valve 24 to a correspondingly greater extent sufficient to open the exhaust-port 34 to the chamber 22, whereby the pressure in the latter is reduced, and with it the pressure in the cylinder 36, which thus allows the weight 41 to descend and apply the brake.

It is to be understood that the slide-valve is provided with sufficient lap to allow the belt which is in use to become out of tension before the second cylinder brings the second belt into action, and in order to overcome the resistance introduced, due to the alternate stopping and starting of the table and parts of the machine which move backward and forward, I preferably construct the pulleys 11 and 12 with very heavy rims, so that they may be utilized as fly-wheels and their momentum be utilized for the purpose specified.

It is obvious that the lever 28 may be operated by hand instead of automatically by the movement of the table 2, if and when desired.

Referring now to Figs. 5 and 6, this is an example in which the idler or jockey pulleys 15 are moved without the intervention of fluid-operating means. As shown, the pulleys 15 are mounted at the ends of a double-armed yoke 44, which is pivoted at 45 upon the inner protruding ends of the oppositely-running shafts 5. 46 is a plate mounted in guides 47 in such a manner that it can be reciprocated by a rod 54, either directly by hand or automatically by stops, upon the table 2 or other moving part. The said yoke 44 is adapted to be rotated by means of a rod 50, pivoted thereto at 51. As shown in the drawings, the rod 50 is provided with a bowl or pin 49, moving in a cam-groove 48, provided in a plate 46. The plate is arranged to be reciprocated in guides 47 by means of a projection 32 on the table 2, which engages a projection 53 on a rod 54, connected with the plate 46. The operation of this arrangement is as follows: When the said rod 50 is in the position indicated in Fig. 5, the jockey-pulleys 15 render both belts 13 inactive; but when the plate 46 is moved in one direction or the other by movement of the table 2, communicated to the rod 54, it either raises or lowers the rod or link 50, and so causes the yoke 44 to rock and tighten the belts alternately. The rod 50 may also be operated by hand directly or through a suitable mechanical linkwork, if desired.

What I claim as my invention, and desire to obtain by Letters Patent is—

1. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, and means for tightening one or other of said belts at will.

2. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, and means, operated by a moving part of the machine, for tightening one or other of said belts.

3. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, and means operated by a moving part of the machine for automatically and periodically tightening one or other of said belts.

4. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shaft separately with the machine-shaft, idler or jockey pulleys engaging the said belts, and means for moving said jockey pulleys to tighten one or other of said belts at will.

5. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, idler or jockey pulleys coacting with said belts, and rocking arms for advancing and retracting said idler or jockey pulleys into and out of engagement therewith.

6. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts

driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, idler or jockey pulleys engaging with said belts, and means operated by a moving part of the machine for operating said jockey-pulleys, to tighten one or other of said belts at will.

7. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, and fluid-pressure cylinders with connections for imparting motion to said rocking arms.

8. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, fluid-pressure cylinders with connections to said rocking arms and a valve for controlling the supply of fluid to the operating-cylinders.

9. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, fluid-pressure cylinders with connections to said rocking arms and a valve operated by a moving part of the machine for controlling the supply of fluid to the operating-cylinders.

10. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from said main shaft, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, fluid-pressure cylinders with connections to said rocking arms, and a brake upon the machine-shaft controlled by the fluid-supply to the arm-operating cylinders.

11. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions from the said main shaft, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, cylinders with connections to said rocking arms, a valve controlling the supply of fluid to the operating-cylinders, a brake on the machine-shaft, a brake-cylinder provided with a piston normally under fluid-pressure, and means for connecting the said brake to said piston so that the brake is normally held in the "off" position.

12. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions therefrom, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, cylinders with connections to said rocking arms, a brake on the machine-shaft, a brake-cylinder and a piston normally under fluid-pressure, means for connecting the said brake to said piston, so that the brake is normally held in the "off" position, a fluid-receiving chest common to all the cylinders, a valve for supplying the arm-operating cylinders alternately under normal working and for exhausting the brake-cylinder upon abnormal movement of a part of the machine, and means to apply the brake when the brake-cylinder is exhausted.

13. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions therefrom, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, cylinders with connections to said rocking arms, stops for limiting the travel of the latter and absorbing shock, a fluid-controlled brake upon the machine-shaft and a fluid-receiving chest and valve for controlling the supply to the arm-operating and brake cylinders.

14. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts driven in opposite directions therefrom, belts connecting said counter-shafts separately with the machine-shaft, rocking arms, idler or jockey pulleys carried by the arms, cylinders with connections to said rocking arms, a brake on the machine-shaft, a brake-cylinder and a piston normally under fluid-pressure, means for connecting the said brake to said piston, so that the brake is normally held in the "off" position, a fluid-receiving chest common to all the cylinders, a valve automatically operated by the machine for supplying the arm-operating cylinders alternately under normal working and for exhausting the brake-cylinder upon abnormal movement of a part of the machine, and means to apply the brake when the brake-cylinder is exhausted.

15. A reversing mechanism embodying a machine-shaft, a main shaft, two counter-shafts, heavy-rimmed pulleys keyed on said main and counter shafts, the momentum whereof is utilized to partially overcome starting and reversing resistance, open and crossed belts on said pulleys connecting the said main and two counter shafts, belts connecting said counter-shafts separately with the machine-shaft, and means for tightening one or the other of the said latter belts at will.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of June, 1903.

WILLIAM CLARK MITCHELL.

Witnesses:
MYLES F. DAVIES,
JAS. STEWART BROADFOOT.