

No. 784,047.

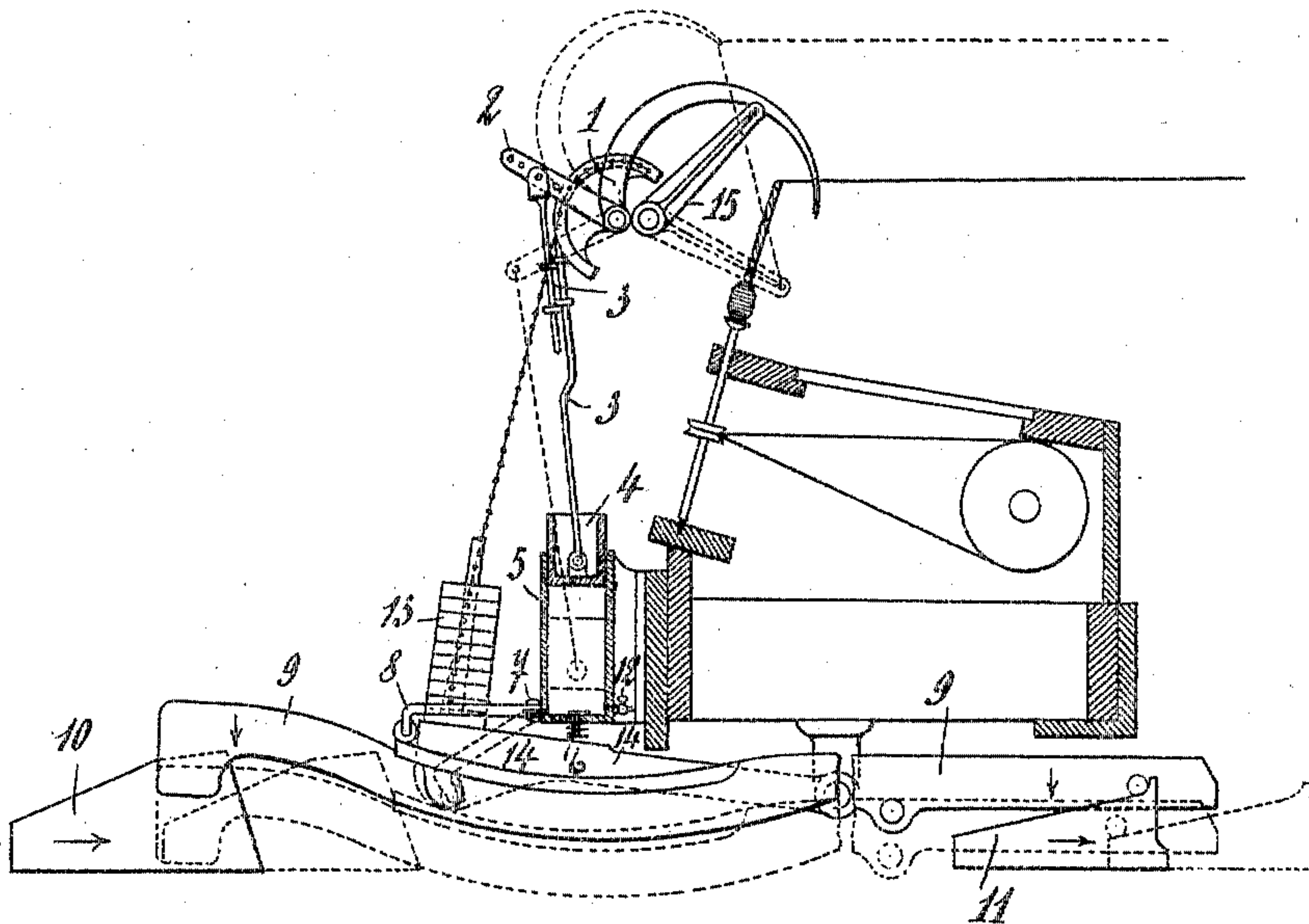
PATENTED MAR. 7, 1905.

F. HOUGET.  
SELF ACTING MULE.

APPLICATION FILED JUNE 1, 1904.

2 SHEETS—SHEET 1.

*Fig. 1.*



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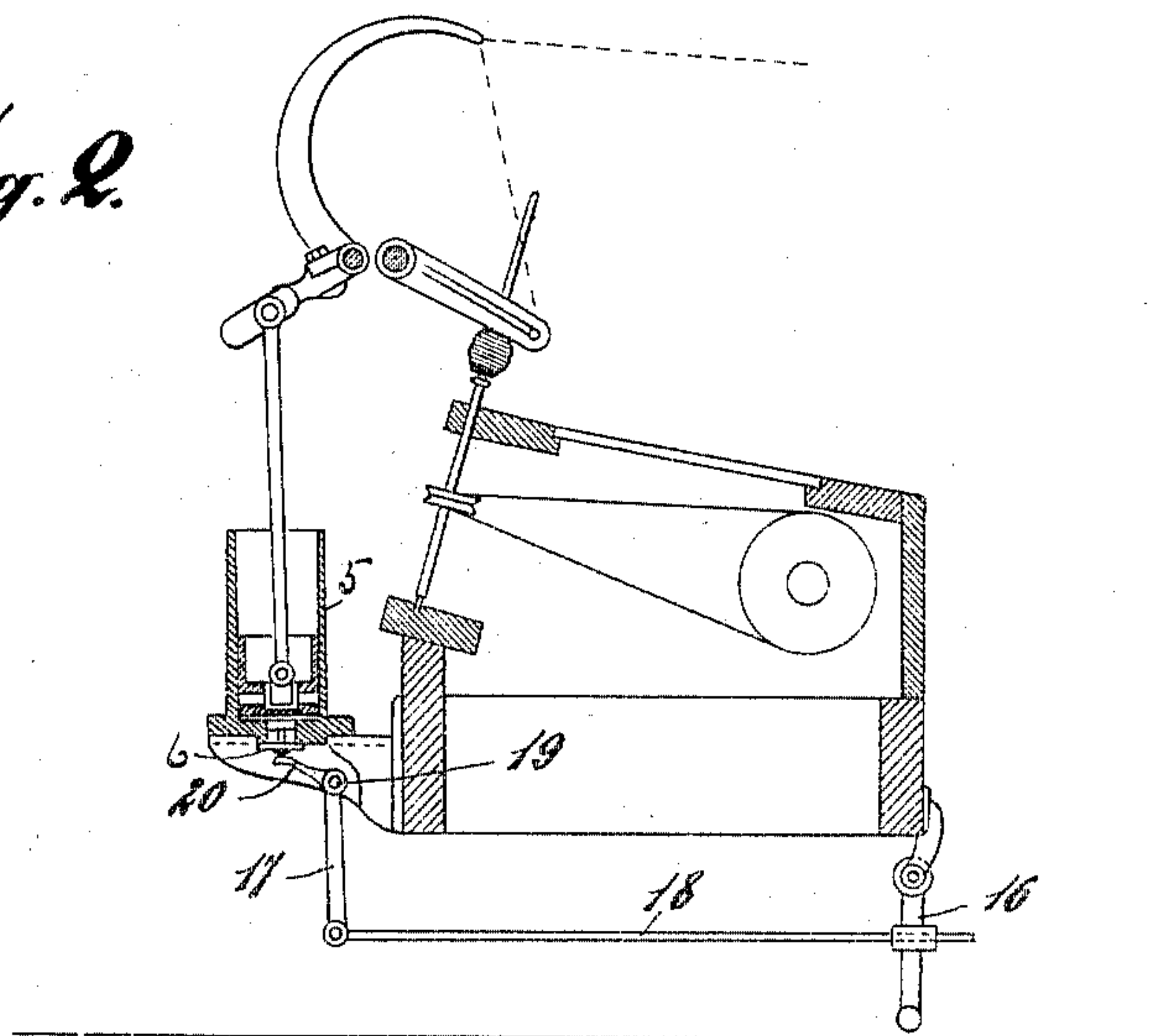
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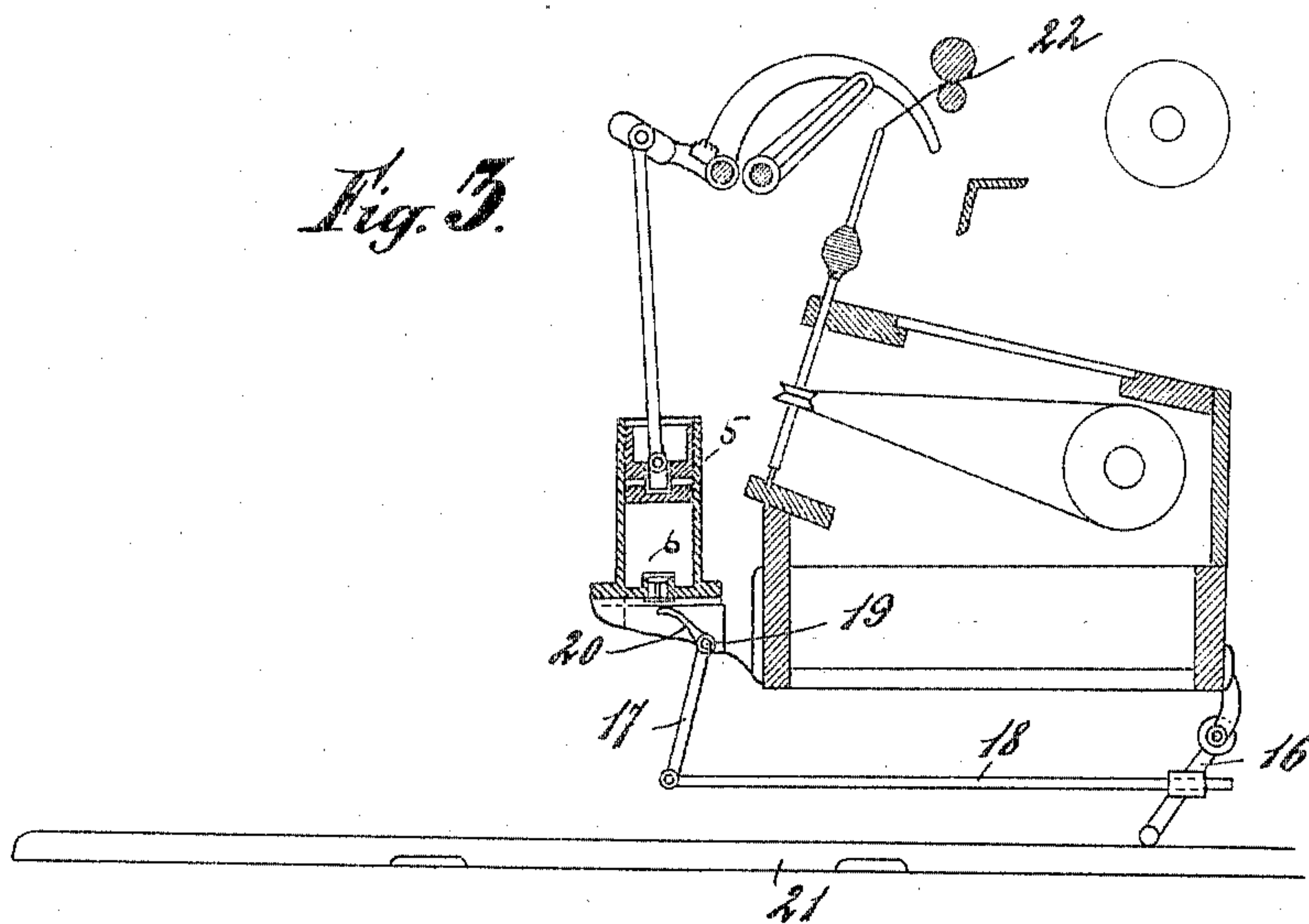
APPLICATION FILED JUNE 1, 1904.

2 SHEETS—SHEET 2.

*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

FERNAND HOUGET, OF VERVIERS, BELGIUM.

## SELF-ACTING MULE.

SPECIFICATION forming part of Letters Patent No. 784,047, dated March 7, 1905.

Application filed June 1, 1904. Serial No. 210,626.

*To all whom it may concern:*

Be it known that I, FERNAND HOUGET, manufacturer, a subject of the King of Belgium, residing at Verviers, in the Kingdom of Belgium, have invented certain new and useful Improvements in Self-Acting Mules, of which the following is a specification.

In alternative or self-acting mules at the commencement of the inward traverse of the carriage and immediately after backing off the faller descends to guide the yarn onto the cone of the cop for winding, while simultaneously the counter-faller ascends to stretch the yarn which is to be wound. The counter-faller being freed and acting under the weight on the lever rises with accelerated speed and only stops when it encounters the yarn, to which it gives a shock more or less violent, according to the weight upon the lever. This violent shock which the yarn has to resist causes a considerable tension to be put upon the threads, which results in breaking a certain number of them. The operative is obliged, to avoid loss, to somewhat reduce the weight on the lever and as a result to produce a cop not so tight and compact as might be and containing a less weight of yarn than would otherwise be possible. To avoid this inconvenience known to all spinners, several different forms of apparatus have been designed; but these, owing to their complication and the amount of regulation required, have been found difficult to work in practice.

This invention is designed to avoid these inconveniences, being characterized by its simplicity and regulating itself automatically.

It consists, essentially, of a cylinder, provided with a piston connected by a link or rod to the counter-faller shaft, this cylinder being provided with regulating cocks or valves, opening either automatically or by hand, permitting of the utilization of the resistance of the air compressed in the cylinder by the descent of the piston during the raising of the counter-faller to deaden the shock which the counter-faller gives to the yarn on rising.

In carrying out the invention the cylinder in which the piston for deadening the movements of the counter-faller slides is provided with a non-return valve permitting the rapid

inlet of air into the cylinder, but preventing its exit, and one of the cocks or valves governing the escape of the air from the cylinder is actuated automatically by a lever which follows the movements of the coping-rail in such a manner that when the coping-rail descends according as the cop is built up this cock or valve closes little by little and the counter-faller ascends less and less before becoming stationary, and thus follows automatically the decreasing length of yarn produced in backing off.

The invention will be fully described with reference to the accompanying drawings.

Figure 1 is a sectional elevation of the carriage of a self-acting mule; Fig. 2, sectional elevation of carriage, showing a modification, the position of the several parts being that taken when the carriage is at the outer end of its traverse and commencing to run in; Fig. 3, similar view of same, carriage being at inner end of traverse.

On the counter-faller shaft 1 is fixed a lever 2, to which is pivotally attached one end of a link or connecting-rod 3, the other end of which carries a piston 4, which enters the cylinder 5, fixed to the carriage. The link or connecting-rod 3 may be made in two pieces, telescoping with each other to a limited extent or sliding upon each other, as shown in Fig. 1, to give greater liberty to the counter-faller during winding. The bottom of the cylinder is provided with a non-return valve 6, permitting the rapid entry of air into the cylinder, while it prevents it escaping therefrom. The bottom of the cylinder is also provided with a cock or valve 7, the plug of which is governed by a lever 8, the end of which rests on the coping-rail 9 and follows its rising and falling movements as the coping-plates 10 and 11 move toward the right to cause the rail to descend. The position of the orifice of the plug of the cock 7 with regard to the lever 8 is regulated in such a manner that when the coping-rail occupies its highest position at the commencement of the building of the cop the lever holds the cock completely open and that as the coping-rail descends the lever 8 gradually closes the valve or cock 7.



A second cock or valve 12, governed by hand, is also provided at the bottom of each cylinder 5. This cock or valve 12 is opened or shut more or less, according to the number of weights 13 placed upon the lever 14. This arrangement acts in the following manner: Supposing the mule to be working and the "stretch" or "draw" to have been completed, the rotation of the spindles is reversed for backing off. Supposing, then, that the operative commences his cop, the coping-rail 9 is in its highest position. (Shown in full in the drawings. See Fig. 1.) The cock or valve 7 is completely opened by the lever 8, resting on the coping-rail. Under these circumstances—that is to say, at the commencement of the building of the cop—the length of yarn set free in backing off is at its maximum, and as a result the counter-faller to stretch or tighten the yarn must also rise its maximum distance. At the moment described the different parts of the mechanism are in the position shown in full lines in Fig. 1. As soon as the lever of the winding-faller 15 descends, and the counter-faller 1 is liberated to the action of the weight 13 on the lever 14, it ascends with a speed accelerated according to the law of gravity. The lever 2, fixed to the counter-faller shaft 1, follows this movement descending, and by means of the rod or link 3 causes the piston 4 to enter the cylinder 5 quickly. The air contained in the cylinder under the pressure of the piston commences to be compressed and to escape by the cocks or valves 7 and 12.

The cock or valve 12, appropriately regulated according to circumstances, sufficiently chokes the outlet of the air, so that the effort which the piston has to make to expel it from the cylinder arrests the speed of the lever, carrying the counter-faller weights a little before the counter-faller acts upon the yarn to stretch it. The shock of the counter-faller is thus absorbed by the piston 4, which is arrested almost completely; but as the air continues to escape by the cocks or valves 7 and 12 the piston continues to descend slowly until the counter-faller wire, gently encountering the yarn, stretches it without any shock and counterbalances the weights 13 and levers 14.

The carriage then makes its inward traverse and winds the yarn in the usual manner. Toward the end of the traverse the winding-faller 15 ascends and the counter-faller 1 descends, causing the piston to return to its original position. At this moment the valve 6 opens and allows the air to enter freely into the cylinder to facilitate this movement.

In proportion to the building up of the cop the coping-rail 9 is lowered, the cock or valve 7 closes itself little by little, and the piston is arrested in the cylinder slightly earlier in its stroke each traverse. As a result of this the counter-faller rises less and less each time before being arrested, and thus follows auto-

matically the decrease in length of yarn liberated in backing off. The cop having been completed, the operative puts the coping-rail back into its original position, as usual, and returns, solely by this means, the automatic apparatus to its original position.

In the construction above described the piston moving with the counter-faller compresses the air in the cylinder, once at the time of backing off and a second time when the winding-faller rises in the middle of the inward traverse. This second formation of the cushion of air counteracts part of the tension put upon the yarn by the counter-weights and sometimes may be detrimental, because it thus diminishes the tightness of the winding of the bobbin. To avoid this and to enable the working of the apparatus to be without defect it is therefore necessary to avoid in certain cases the formation of a cushion of air under the piston on the second ascent of the counter-faller.

Figs. 2 and 3 show an arrangement employed for this purpose. This arrangement is illustrated separately by itself to avoid the complication of Fig. 1.

As shown in Figs. 2 and 3, from the bottom of the carriage is suspended a small lever 16, connected to another lever, 17, by a connecting-rod or link 18. The lever 17 is capable of movement about the pivot 19 and acts, through the arm 20, upon the valve 6. On the ground is fixed a rail 21 of suitable length to regulate, according to requirement, the moment of the opening of the valve 6.

It will be easily seen that when the carriage approaches the drawing-rollers 22 during winding the small lever 16, engaging the rail 21, oscillates into the position shown in Fig. 3, and by means of the connecting-rod or link 18 causes the lever 17 also to oscillate, which opens by the arm 20 the valve 6, placed in the bottom of the cylinder 5. The piston can thus move freely in the cylinder and follow the movement of the counter-faller 1 without impeding it. On the outward traverse of the carriage when the lever 16 has passed the end of the rail 21 it returns to its vertical position under the action of gravity, drawing with it the lever 17, with its arm 20, and thus allows the valve 6 to fall again onto its seat in such a manner that at this moment the apparatus returns to its normal working position, permitting the formation of a cushion of air under the piston 4 at the time backing off takes place.

It is to be understood that the air compressed in the cylinder 5 can when more convenient be replaced by any other appropriate body—for example, by any soft or elastic material, liquid or other—serving to deaden the shock and which would be expelled from the cylinder 5 at each descent of the piston and forced into any convenient receptacle from



which it can be drawn anew into the cylinder on the following ascent of the piston. It would also be possible without difficulty to modify the mechanism in such a manner as to offer resistance to the shock of the weight-levers by utilizing resistance to a vacuum in the cylinder 5 instead of resistance to compression. Similar modifications would naturally in no way change the nature of the invention.

What I claim is—

1. In a self-acting mule, in combination with the carriage and with the counter-faller, a cylinder, a piston in said cylinder and a connection between the piston and the counter-faller, said piston acting to deaden the shock of the counter-faller upon the yarn, substantially as described.

2. In a self-acting mule in combination with the carriage and with the counter-faller, a cylinder, a piston in said cylinder and a connection between the piston and the counter-faller, said piston acting on an elastic body in the cylinder to deaden the shock of the counter-faller upon the yarn, substantially as described.

3. In a self-acting mule in combination with the carriage and with the counter-faller, a cylinder, a piston in said cylinder, a connection between the piston and the counter-faller and means to control the action of the piston in the cylinder at the raising of the counter-faller to deaden the shock of the counter-faller upon the yarn, substantially as described.

4. In a self-acting mule in combination with the carriage and with the counter-faller, a cylinder, a piston in said cylinder, a connection between the piston and the counter-faller and regulating cocks and valves provided on the cylinder to use the resistance of the air compressed in the cylinder by the descent of the piston during the raising of the counter-

faller to deaden the shock of the counter-faller upon the yarn, substantially as described.

5. In a self-acting mule in combination with the carriage, the counter-faller and the coping-rail, a cylinder on the carriage, a piston in said cylinder, a connection between the piston and the counter-faller, a cock governing the escape of the air from the cylinder, means for controlling the position of the cock through the coping-rail and a non-return valve controlling the inlet of air into the cylinder, substantially as described and for the purpose set forth.

6. In a self-acting mule in combination with the carriage, the counter-faller and the coping-rail, a cylinder on the carriage, a piston in said cylinder, a connection between the piston and the counter-faller, a cock governing the escape of the air from the cylinder, a lever actuating said cock, the said lever following the movements of the coping-rail, a non-return valve controlling the inlet of air into the cylinder and means actuating said valve substantially as described and for the purpose set forth.

7. In a self-acting mule, in combination with the carriage and the counter-faller, a cylinder on the carriage, a piston in said cylinder, a connection between the piston and the counter-faller, cocks and valves provided on the cylinder to control the action of the piston in the cylinder and on the counter-faller at the time of backing off and means to avoid the action of the piston on the second ascent of the counter-faller, substantially as described and for the purpose set forth.

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

FERNAND HOUGET.

Witnesses:

T. F. LE COSS,

L. VILZ.