

(No Model.)

2 Sheets—Sheet 1.

E. G. H. STEIN.  
SPRING OPERATED MOTOR OR APPARATUS.

No. 542,839.

Patented July 16, 1895.

Fig. 1.

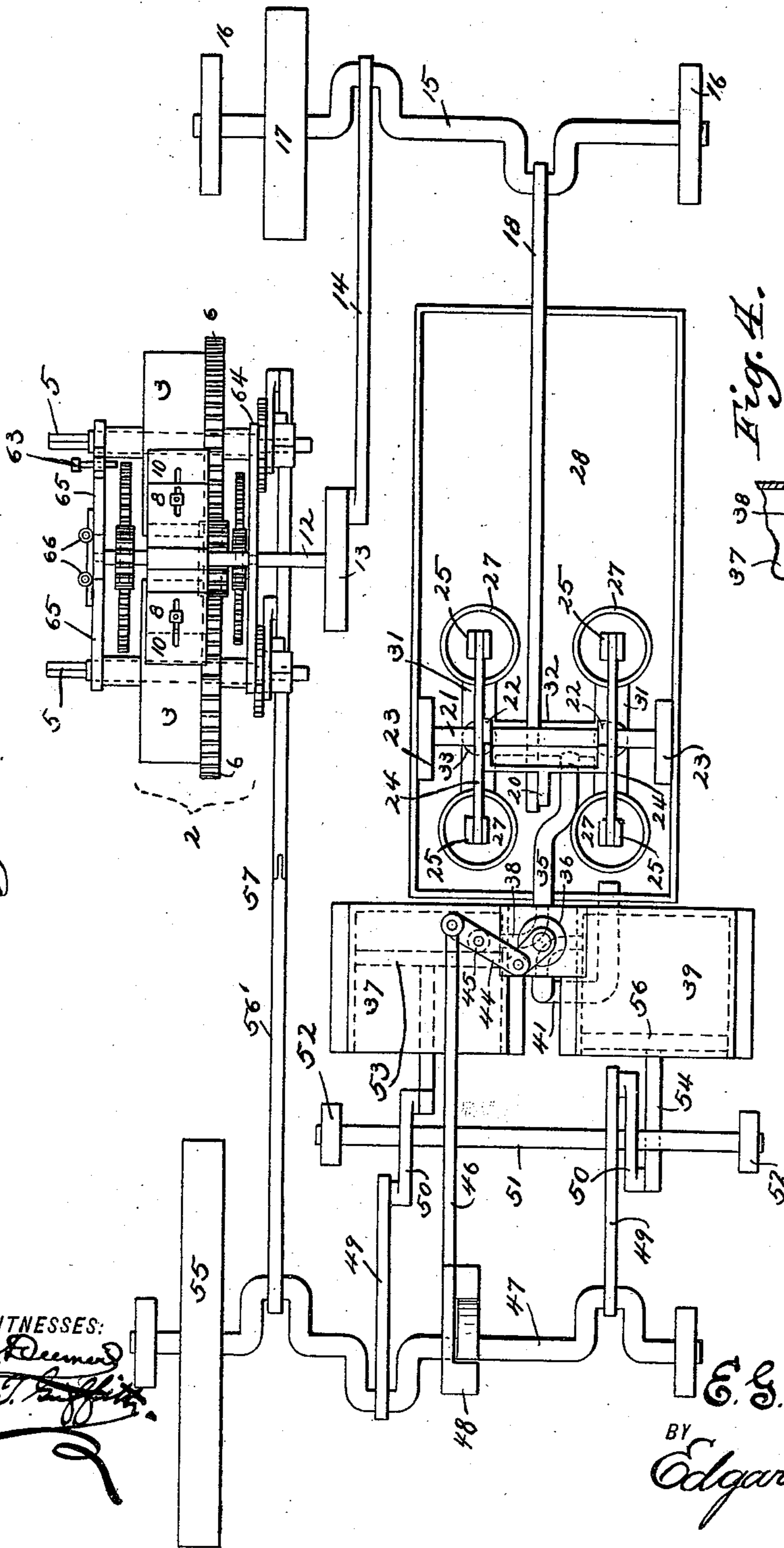


Fig. 4.

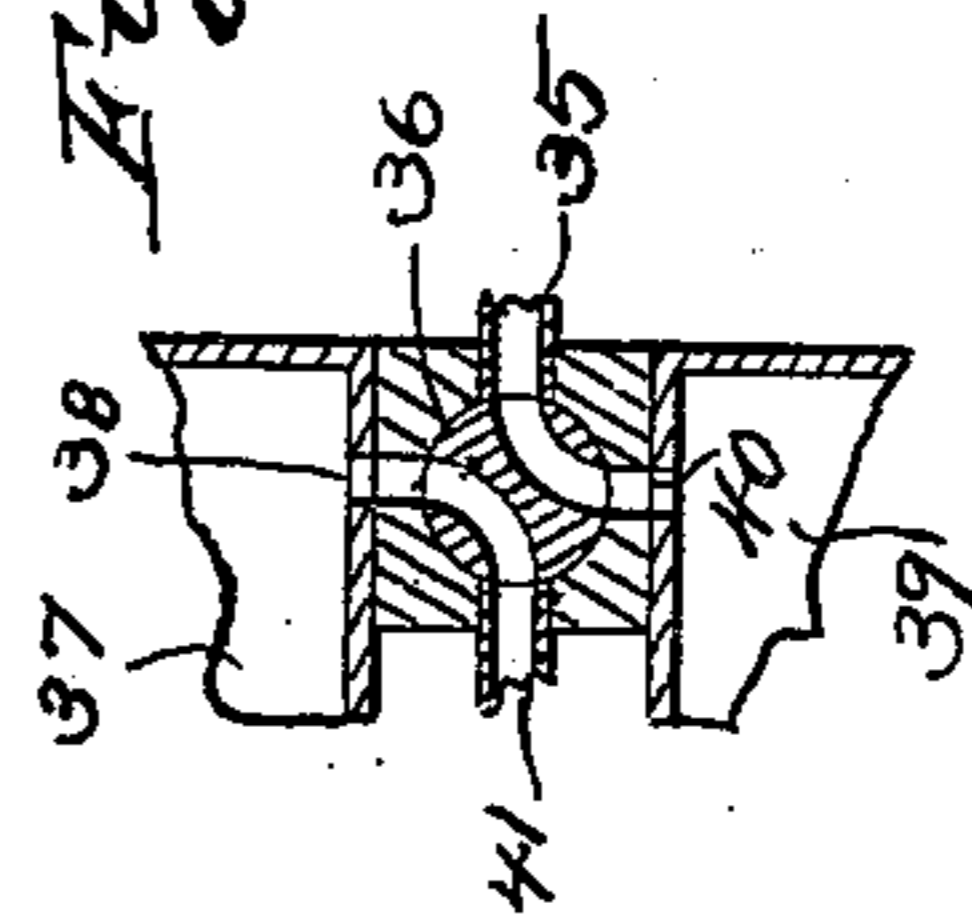
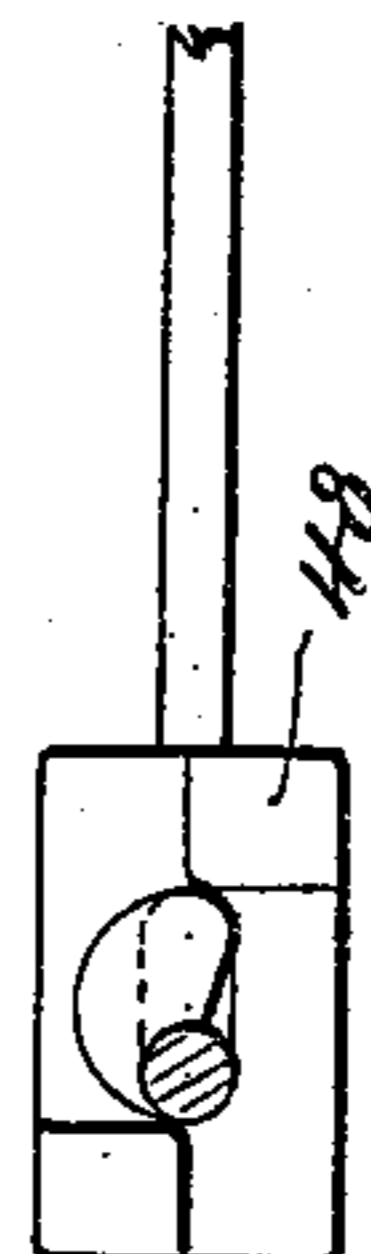


Fig. 3.



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(No Model.)

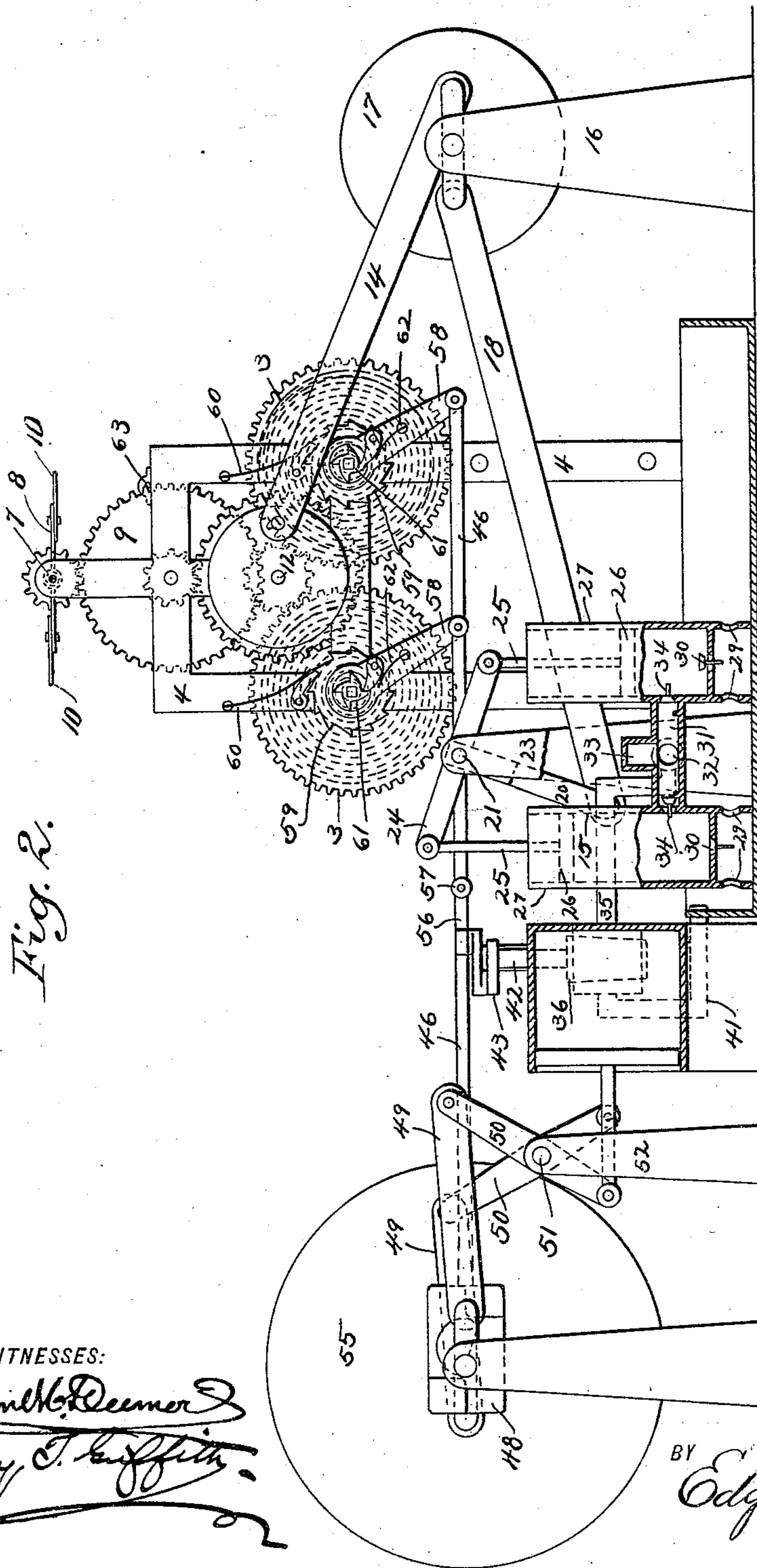
2 Sheets—Sheet 2.

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WITNESSES:

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# UNITED STATES PATENT OFFICE.

EMIL GUSTAV HERMANN STEIN, OF NEW YORK, N. Y.

## SPRING-OPERATED MOTOR OR APPARATUS.

SPECIFICATION forming part of Letters Patent No. 542,839, dated July 16, 1895.

Application filed February 14, 1895. Serial No. 538,346. (No model.)

*To all whom it may concern:*

Be it known that I, EMIL GUSTAV HERMANN STEIN, a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in a Spring-Operated Motor or Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof, in which similar figures of reference indicate corresponding parts in all the figures.

My invention relates to motors, and the object is to produce a simple and effective device of this class, which shall be economical in construction and operation and practical in all cases where great power is not required, which object I accomplish by means of the construction and combination of elements set forth in the following specification, of which the accompanying drawings form a part, and in which—

Figure 1 is a top plan view of my improved motor; Fig. 2, a side elevation thereof with certain parts broken away to better show certain features of the construction, and Figs. 3 and 4 represent certain details.

The construction of my device involves the combination of spring mechanism and pumping apparatus, the former constituting the initial force for putting the motor in operation, after which the parts operate jointly to maintain the operation and produce the required power.

Referring to the drawings, the numeral 2 designates the spring mechanism employed by me, which in itself involves no invention, being similar, in fact, to the works of any ordinary clock, having two springs of the requisite power and provided with alterations and attachments necessary to the purposes of this invention.

The two springs 3 of the spring mechanism, which is mounted on a frame 4, are provided with the usual shafts or axes 5 and gear-wheels 6, and mounted centrally of said frame, at the top thereof, is a shaft 7, provided with a regulator 8, by means of which the speed of the movement of the spring mechanism is controlled, through the agency of a gear-wheel 9 in connection by intermediate gearing with the main gear-wheels on the spring-shaft. This regulator is formed by

connecting with the ends of a central plate 8, secured to the shaft 7 and adapted to revolve therewith, two end plates 10 by means of longitudinal slots in said plates, and a bolt or bolts passing through said slots, (see Figs. 1 and 2,) whereby the end plates may be adjusted toward or from the shaft, by which means the movement of said shaft will be increased or decreased by the increase or decrease of the air-pressure on the blades of the regulator. Secured to a shaft 12, which is also in connection with the spring-shafts by means of intermediate gearings, is a crank-wheel 13, with which is pivotally and eccentrically connected a bar 14, which is connected with a crank-shaft 15 mounted on supports 16, on which is mounted a fly-wheel 17. Connected also with the crank-shaft 15, centrally thereof, is a bar 18, which at its other end is pivotally connected with the lower end 19 of a branched lever 20, the upper ends of which are rigidly connected with a shaft 21, as shown at 22, supported by standards 23. Rigidly connected with the shaft 21, at each end thereof, are walking-beams 24, with the ends of which are connected piston-bars 25, provided with pistons 26 operating in cylinders 27, arranged in pairs on the opposite sides of a water chamber or vessel 28, as clearly shown in Fig. 1. The lower ends of these cylinders are in communication with the water-chamber by means of openings or passages 29 and the usual valves 30 in the lower ends of the cylinders proper. Each of the cylinders on one side is connected by a pipe 31, which pipes are in turn placed in communication with each other by means of a pipe 32, and at each end of the pipe 32 are the usual air-chambers 33. The cylinders of each pair are provided with valves 34, which control the communication with the pipe 31, and said valves are so constructed that one will be open when the other is closed. This is also true of the valves in the bottom of the cylinders.

The pipe 32 is in communication with a pipe 35, which connects with a four-way valve 36, (see Figs. 1 and 4,) and this valve is in communication with a cylinder 37 by means of a passage 38, and with a cylinder 39 by a passage 40, and also with the water-vessel 28 by a pipe 41, Figs. 1 and 4.

The valve 36 is operated by an upwardly-

extending rod 42, provided with a crank 43, to which is pivoted an arm 44, pivotally supported by a rod 45, and to the opposite end of which is pivotally connected an arm or lever 5 46, which is connected with a crank or power shaft 47; through the agency of a cam-block 48, as shown in Figs. 1 and 3. To this crank-shaft 47 are connected arms or bars 49, to each of which is pivotally connected a lever 10 50, each of which is mounted on a rod or shaft 51, supported by standards 52, and the lower end of one of these levers 50 is pivotally connected with a piston-shaft 52, connected with a piston 53, operating in cylinder 37, and the 15 lower end of the other with a piston-shaft 54, connected with a piston 56 operating in cylinder 39.

On one end of the crank-shaft 47 is mounted in the usual manner a wheel or pulley 55, by 20 which power from the motor may be transmitted through the agency of a belt in the usual manner; and to this shaft is also connected a bar or arm 56', provided with a joint 57, and to which is pivotally connected two 25 cranks 58, one of which is pivotally mounted on each of the spring-shafts of the spring mechanism, and provided with the following operative connections: A ratchet 59 is rigidly connected with each of said shafts, and 30 a pawl 60, attached to the frame 4, operates in connection therewith to prevent a reverse or unwinding movement of said shaft. A second ratchet-wheel 61 is also mounted on each of said shafts, and a pawl 62 on each of the 35 cranks 58 operates, in connection with the shafts, to wind up the springs when the shafts are moved backward; but to enable said cranks to move forward without revolving the shafts, by which construction it will be seen 40 that whenever the cranks 58 are moved backward or in the direction of the power-wheel 55, the spring-shafts will be turned in a direction to wind up the springs, and that when said cranks are moved forward they will re- 45 volve or oscillate on said shafts without turning them.

The operation is as follows: The spring mechanism being wound up in the usual manner the wheel 13 will be set in motion, oper- 50 ating, as it revolves, the arm 14 and revolving the crank-shaft 15, which will in turn operate the lever 20, through which motion will be given to the beam 24, by which the pistons in each pair of cylinders 27 will be operated in the 55 usual manner. It will be observed that these pumps operate alternately, one of each pair on opposite sides operating to force water through the valve 36 into one or the other of the cylinders 37 and 39. In the position 60 shown in Fig. 1 the water is about to be forced into the cylinder 37. This, of course, would drive back the piston 53, the motion of which, being transmitted through the piston-shaft 52, lever 56, and arm 59 to the crank-shaft 47, 65 revolves said shaft, the motion of which, being transmitted through the bar 49, lever 50,

and piston-shaft 54 to the piston located in the chamber 39, this piston is forced forward and the water driven from said chamber into the water-vessel 28 through the pipe 47, when 70 the operation is again reversed by means of the crank shaft or lever 44 and rod 46, through its cam-connection 48 with the crank-shaft 47, and this process is repeated as long as the apparatus is in operation. The revolution of 75 the crank-shaft 47 operates the arm 56, which oscillates or moves back and forth the crank 58, each of which is pivoted thereto, as hereinbefore described, and one of which is connected with each of the spring-shafts of the 80 spring mechanism. The oscillatory movement of these cranks operates, as hereinbefore described, to wind up said spring mechanism, and this, as will be seen, will be repeated as long as the operation of the machine 85 is continued.

If it is desired to stop the machine, a pin or bolt 63, connected with the frame of the spring mechanism, as shown in Fig. 1, can be pushed forward to engage the wheel 9, which will, of 90 course, operate to put a stop to the further movement of the spring mechanism, and it is evident that said spring mechanism may be wound up by hand in the usual manner if at any time it should become necessary in the 95 operation of the motor.

In the construction of the spring mechanism, the side frames of which consist of plates 64 and 65, I divide the rear plate 65 centrally, each part being hinged as indicated at 66. 100 The object of this is to provide means of getting at the spring mechanism to repair it in case of injury or for other purposes, and for inserting new springs when necessary. It will also be seen that the pin or bolt 63 for 105 stopping the movement of the spring mechanism, as hereinbefore indicated, is connected with one of these hinged doors or plates.

Having fully described my invention, the construction and operation, I claim, and de- 110 sire to secure by Letters Patent, the following:

1. In a motor, the combination of a spring-mechanism, adapted to be wound through the medium of the spindles 5, a pumping mechanism, a power-shaft, and operative connections 115 between the spring mechanism and pumping apparatus operated by said mechanism, and means connecting the power shaft and pumping mechanism for operating said power shaft by said pumping mechanism, substantially as 120 shown and described.

2. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, means for operating the 125 pump by the spring mechanism, means for operating the power shaft by the pumping mechanism, and a connection between the power shaft and spring mechanism for winding the latter, substantially as shown and de- 130 scribed.

3. In a motor, the combination of a spring

mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, means for operating said pumping apparatus by the spring mechanism, means for operating the power shaft by the pumping mechanism, and a governor for regulating the movement of the spring mechanism, substantially as shown and described.

4. In a motor, the combination of a spring mechanism adapted to be wound through the medium of the spindles 5, with a series of pumps arranged in pairs, a series of cylinders in communication with said pumps, a power shaft in communication with each of said cylinders, and means for operating said pumps alternately, whereby the power thereof is transmitted through said cylinders to the power shaft, substantially as shown and described.

5. In a motor, the combination, with a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, of a series of cylinders in communication with said pumping apparatus, a series of pistons, one of which is located in each of said cylinders and connected with the power shaft, and means for operating said pumps and transmitting the power thereof through said cylinders to said power shaft, substantially as shown and described.

6. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus consisting of a series of pumps arranged in pairs, a series of cylinders in communication with said pumps, a piston located in each of said cylinders and connected with said power shaft, and means for transmitting motion from the spring mechanism to the pumps, substantially as shown and described.

7. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and power shaft, said parts being in operative connection and adapted to be operated by the spring mechanism, and means for winding the spring mechanism, connected with the power shaft, substantially as shown and described.

8. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus operatively connected with the said spring mechanism and adapted to be operated thereby, a power shaft operatively connected with said pumping apparatus and adapted to be operated thereby, means for winding the spring mechanism, connected with and operated by the power shaft, and a governor for said spring mechanism, substantially as shown and described.

9. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, each of said parts

being in operative connection and adapted to be operated by the spring mechanism, and means for winding up the springs during the operation of the motor, said means consisting of a pivoted rod or arm in connection with the power shaft and provided with pivoted cranks, one of which is revolubly connected with each spring shaft of the spring mechanism, and a ratchet and pawl mechanism connected with each shaft and crank, whereby the spring mechanism is wound during the operation of the motor, substantially as shown and described.

10. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus consisting of a series of pumps arranged in pairs in operative connection with the spring mechanism, and adapted to be alternately operated thereby, a series of water cylinders provided with pistons and in communication with said pumping apparatus by means of a four-way valve, said pistons being in operative connection with the power-shaft, and a bar pivotally connected with said valve for operating the same and with said power shaft, substantially as shown and described.

11. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, two water cylinders in communication with said pumping apparatus by means of a four-way valve, pistons located in said cylinders in operative connection with said power shaft, and a valve controlling the communication between said pumping apparatus and said cylinders, operated by said power shaft, substantially as shown and described.

12. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus, and a power shaft, two water cylinders in communication with said pumping apparatus by means of a four-way valve, pistons located in said cylinders in operative connection with said power shaft, a valve controlling the communication between said pumping apparatus and said cylinders, operated by said power shaft, and winding devices for the spring mechanism in operative connection with the power shaft, substantially as shown and described.

13. In a motor, the combination of a spring mechanism, adapted to be wound through the medium of the spindles 5, a pumping apparatus and a power shaft, the pumping device consisting of a series of pumps arranged in pairs and adapted to be operated by the spring mechanism, two water cylinders in communication with said pumping mechanism, said communication being controlled by a valve provided with operative connections with the power shaft, each of said water cylinders being also provided with a piston having

operative connections with said power shaft,  
winding devices for the spring mechanism  
connected with the power shaft and operated  
thereby, and a governor for said spring mech-  
5 anism, substantially as shown and described.

In testimony that I claim the foregoing as  
my invention I have signed my name, in pres-

ence of two witnesses, this 13th day of Febru-  
ary, 1895.

EMIL GUSTAV HERMANN STEIN.

Witnesses:

PERCY T. GRIFFITH,  
A. M. CUSACK.