

(No Model.)

2 Sheets—Sheet 1.

N. YAGN.

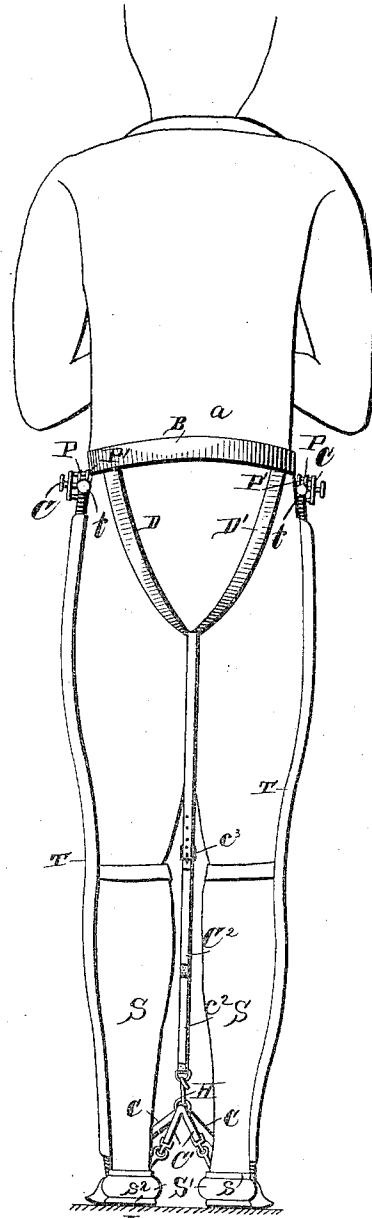
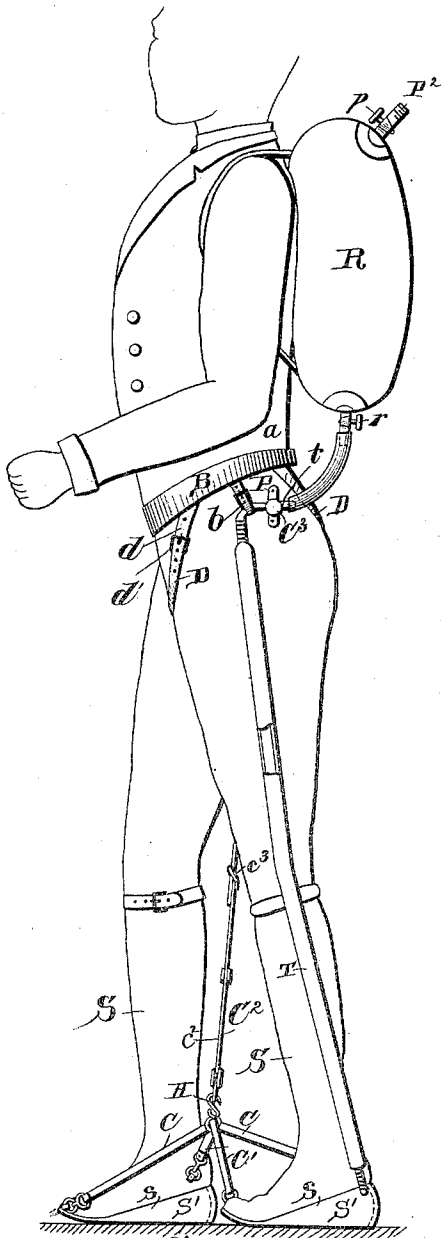
APPARATUS FOR FACILITATING WALKING, RUNNING, AND JUMPING.

No. 440,684.

Patented Nov. 18, 1890.

Fig. 1.

Fig. 2.



Witnesses: *S<sup>1</sup> S<sup>2</sup>*  
*Henry S. Dieterich*  
*J. Thomson Cross*

Inventor:  
*Nicholas Yagn.*  
 per. *Henry M. M.*  
 Attorney:

(No Model.)

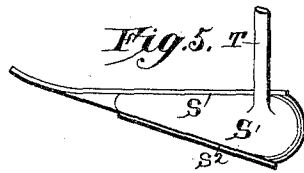
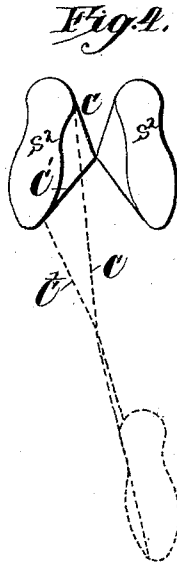
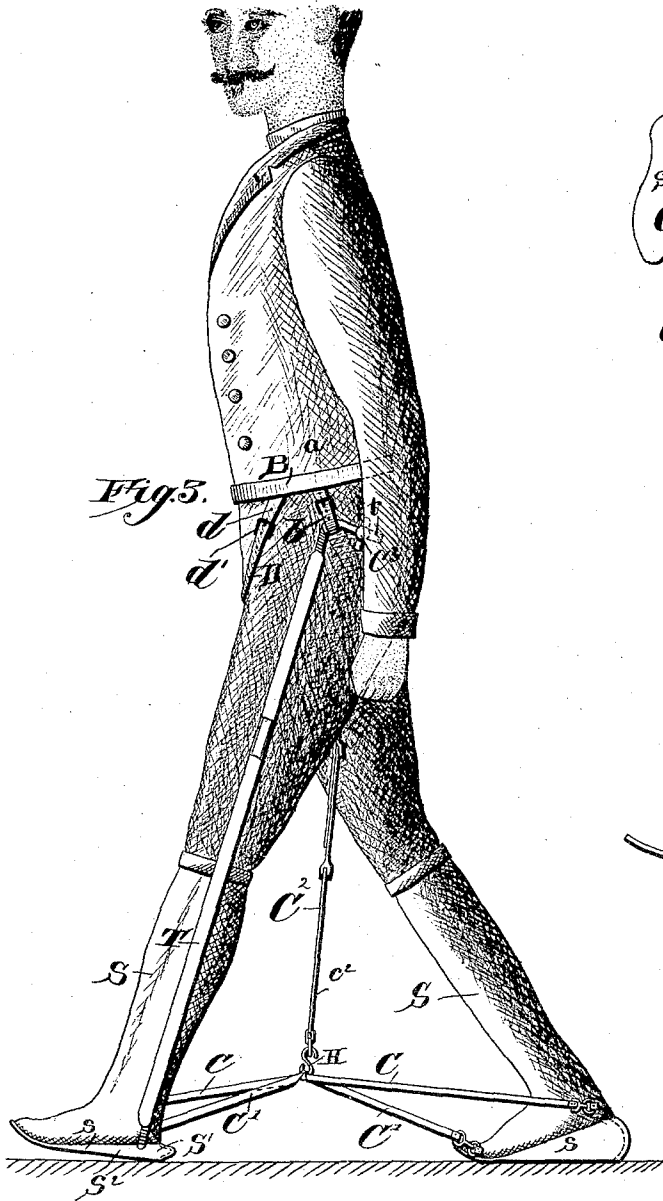
2 Sheets—Sheet 2.

N. YAGN.

APPARATUS FOR FACILITATING WALKING, RUNNING, AND JUMPING.

No. 440,684.

Patented Nov. 18, 1890.



Witnesses:

*Henry G. Dieterich*  
*J. Thompson Cross*

Inventor:  
*Nicholas Yagn.*  
 per. *Gury O'By*  
 Attorney.

# UNITED STATES PATENT OFFICE.

NICHOLAS YAGN, OF ST. PETERSBURG, RUSSIA.

APPARATUS FOR FACILITATING WALKING, RUNNING, AND JUMPING.

SPECIFICATION forming part of Letters Patent No. 440,684, dated November 18, 1890.

Application filed February 11, 1890. Serial No. 340,022. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS YAGN, mechanical engineer, a subject of the Emperor of Russia, residing at St. Petersburg, Russia, have invented certain new and useful Improvements in Apparatus for Facilitating Walking, Running, and Jumping; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, and in which—

Figures 1 and 2 are side and rear elevations of my improved apparatus, showing the same as applied to the body. Fig. 3 is a side elevation illustrating the operation of the apparatus in walking. Fig. 4 is a diagrammatic view illustrating the operation of the foot-connection in walking; and Figs. 5 and 6 are longitudinal and transverse sections, respectively, of the shoe.

The invention relates to apparatus for facilitating walking, running, or jumping, and has for its object certain improvements on similar apparatus, for which I have obtained Letters Patent of the United States of America, dated July 2, 1889, No. 406,328, and January 28, 1890, Nos. 420,178 and 420,179, respectively.

In the apparatus described in the aforesaid patents the *vis viva* of the dead-weight of the body or trunk is made available to facilitate walking, running, and jumping, springs being used to take up and accumulate the power, said springs being so arranged as to apply the power stored or accumulated at the seat, waist, or under the arms, respectively.

The present improvement has for its object not only to utilize the *vis viva*, but also the dead-weight of the entire body.

In an application for patent of even date with this, Serial No. 340,021, I have described an apparatus designed to carry out the object of this invention, the power-accumulator consisting, essentially, of a number of springs adapted to support the weight of the entire body and store and accumulate the power exerted thereby, together with the power ex-

erted by the momentum of such dead-weight when in motion. The apparatus shown and described in said application for patent, although answering all the purposes for which it was designed, is, however, more or less cumbersome and weighty. I have found that by substituting a compressed-fluid accumulator for the spring-accumulator I can construct the same so as to relieve it of the objectionable features referred to and obtain an equally-efficient accumulator.

To these ends the invention consists in a compressed-fluid accumulator adapted to be applied to the feet and to support and take up the entire weight of the body, or approximately so, as well as the power due to the momentum when the body is in motion; also, in the combination, with the accumulator, of a storage-reservoir adapted to be carried on the person, in which a fluid is stored under pressure; also, in constructive features and combinations of parts, as will now be fully described, reference being had to the accompanying drawings.

S indicates a stocking that is provided with a wooden or with a sheet-metal sole *s*, the toe end of which is preferably bent upward for convenience and comfort. To this sole *s* is secured a gas-tight receiver or holder constructed of a flexible material, so as to adapt it to be expanded and collapsed under internal and external pressure, as hereinafter more fully described, the said receiver forming, so to say, an intermediate sole *S'*, and has connected to it the outer sole *S*<sup>2</sup>. In longitudinal vertical section the gas-holder *S'* is wedge or bellows shaped, or substantially so, when inflated, its greatest depth being at the heel end, as shown.

To the holder is connected a flexible gas-tight tube *T*, that extends to near the waist, at which point it is of smaller diameter and is secured in a looped strap *b*, depending from the waist-belt *B*. The smaller end of the pipe may be provided with a stop-cock for closing the same, or the end *t* of the tube *T* may be inserted between two clamping-plates *P* and *P'*, of which one is movable toward or from the other, between which plates the end of the pipe or tube is clamped by means of the clamping-screw *C*<sup>3</sup> to close the pipe against

the escape of gas. It will be observed that when the holder S' is fully expanded by the admission thereto of a gas under pressure it will form an elastic or resilient bearing for the body and perform the function of a power-accumulator under the weight of such body, the resilient power being materially increased by the column of gas in the tube T'. The tendency of this resilient force due to a further compression of the gas under the weight of the body or the momentum of such weight is naturally to lift the feet, so that this lifting requires substantially no exertion on the part of the wearer, while in running or jumping, when the momentum is greater, there is a rebound of the foot as it comes down on the ground that accelerates the motion without increasing the exertion; nor is it necessary to bend or flex the legs to attenuate the shock in running or jumping, since this is taken up by the cushion of compressed gas, so that the strain upon the muscles due to the flexure of the legs and the raising or lifting of the body is also avoided.

The apparatus as described answers all ordinary purposes; but when it is desired to walk or run at greater than a moderate speed another factor of fatigue is to be taken into consideration—namely, that which is due to the greater rapidity of the movement of the legs. Although the legs can be oscillated or vibrated like a pendulum without any great muscular exertion, yet the rapidity of the vibrations under such conditions is limited, usually not exceeding two oscillations per second. When this speed of oscillation or vibration is increased, the muscular exertions exceed in proportion very materially the increase in the speed of the vibration, so as to produce fatigue much sooner than when the legs are vibrated at a normal or ordinary speed. In order to facilitate the increase in speed of the motion of the legs without materially increasing the muscular exertion, I connect the feet by means of elastic straps or cords C C', the toe of one foot being connected with the heel of the other foot, the two straps C C' crossing each other; or four straps may be used, if desired, united as shown in Fig. 3, a hook H being provided at the point of junction or crossing of the straps. To this hook is secured a strap C<sup>2</sup>, that is adjustable, it being formed in two parts, of which one is provided with a buckle c<sup>2</sup>, Fig. 2. The upper end of the strap C<sup>2</sup> is connected to two straps D and D', secured to the waist-belt B, said straps passing between the legs and are adjustably secured by means of buckles d' to short straps d, also secured to waist-belt B, as shown in Figs. 1 and 3. The strap C<sup>2</sup> serves to support the straps C and C', to prevent the feet from becoming entangled therein. As one leg—as, for instance, the right leg—is advanced or swung forward, the straps are distended, as more clearly shown in Fig. 4, thereby tending to draw the left leg along, so that as soon as said left leg is lifted from the

ground it will be drawn forward by the accumulated power in the distended straps. In practice the lower half c<sup>2</sup> of strap C<sup>2</sup> is also an elastic strap, so as to yield to the motion of the legs, the tendency being to lift the legs in the act of walking.

In starting to walk and when the speed is a normal one these straps will slightly inconvenience the wearer; but as the speed is increased the speed of the vibrations of the legs as well as the amplitude of said vibrations automatically increase without any material increase in muscular exertions to four vibrations per second, or double the number of vibrations in ordinary walking.

For convenience of charging or inflating the gas-holder with compressed gas I provide a storage-reservoir R, adapted to be strapped to the back and having a discharge-tube provided with a stop-cock r, said discharge-tube being adapted to be connected with the pipe or tube T. The storage-reservoir is further provided with a short pipe P<sup>2</sup>, having a stop-cock p for connection with a fluid-compressor or with a storage-tank containing a fluid under pressure. Any suitable fluid may be used—such as compressed air, for instance.

Any suitable or well-known material or materials may be employed in the construction of the compressed-fluid-power accumulator, the pipe-connection, and the storage-reservoir, so as to render them impermeable to a fluid under pressure.

I have described the power-accumulator as applied to a stocking. It will, however, be understood that I do not limit myself to such application, as it may equally as well be applied to a shoe or slipper.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet, so as to support the weight of the body, as described.

2. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a shoe or stocking the sole of which consists of a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, as and for the purposes specified.

3. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet to support the weight of the body, in combination with a tube connected with said holder and adapted to be supported from a waist-belt, said tube being provided with means, such as described, for closing the outer end thereof, substantially as and for the purposes specified.

4. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a bellows-shaped gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet, so as to support the weight of the body, as described.

5. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet to support the weight of the body, in combination with resilient connections for connecting the toe of one foot with the heel of the other, substantially as and for the purposes specified.

6. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet to support the weight of the body, in combination with resilient connections for connecting the toe of one foot with the heel of the other and a support for said connections, adapted to be attached thereto and to the body, substantially as and for the purposes specified.

7. In an apparatus for facilitating walking, running, and jumping, a power-accumulator

comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet to support the weight of the body, in combination with resilient connections for connecting the toe of one foot with the heel of the other and an adjustable support for said connections, adapted to be attached thereto and to the body, substantially as and for the purposes specified.

8. In an apparatus for facilitating walking, running, and jumping, a power-accumulator comprising a gas-holder adapted to be expanded and collapsed under internal and external pressures, respectively, and constructed for application to the feet to support the weight of the body, and a tube connected with the holder and adapted to be supported from a waist-belt, in combination with a gas-holder constructed of a flexible material and provided with a discharge-pipe and coupling for connection with the tube, said holder being adapted to be carried on the back, substantially as and for the purposes specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NICHOLAS YAGN.

Witnesses:

N. TSCHEXALOFF,  
F. BLAU.