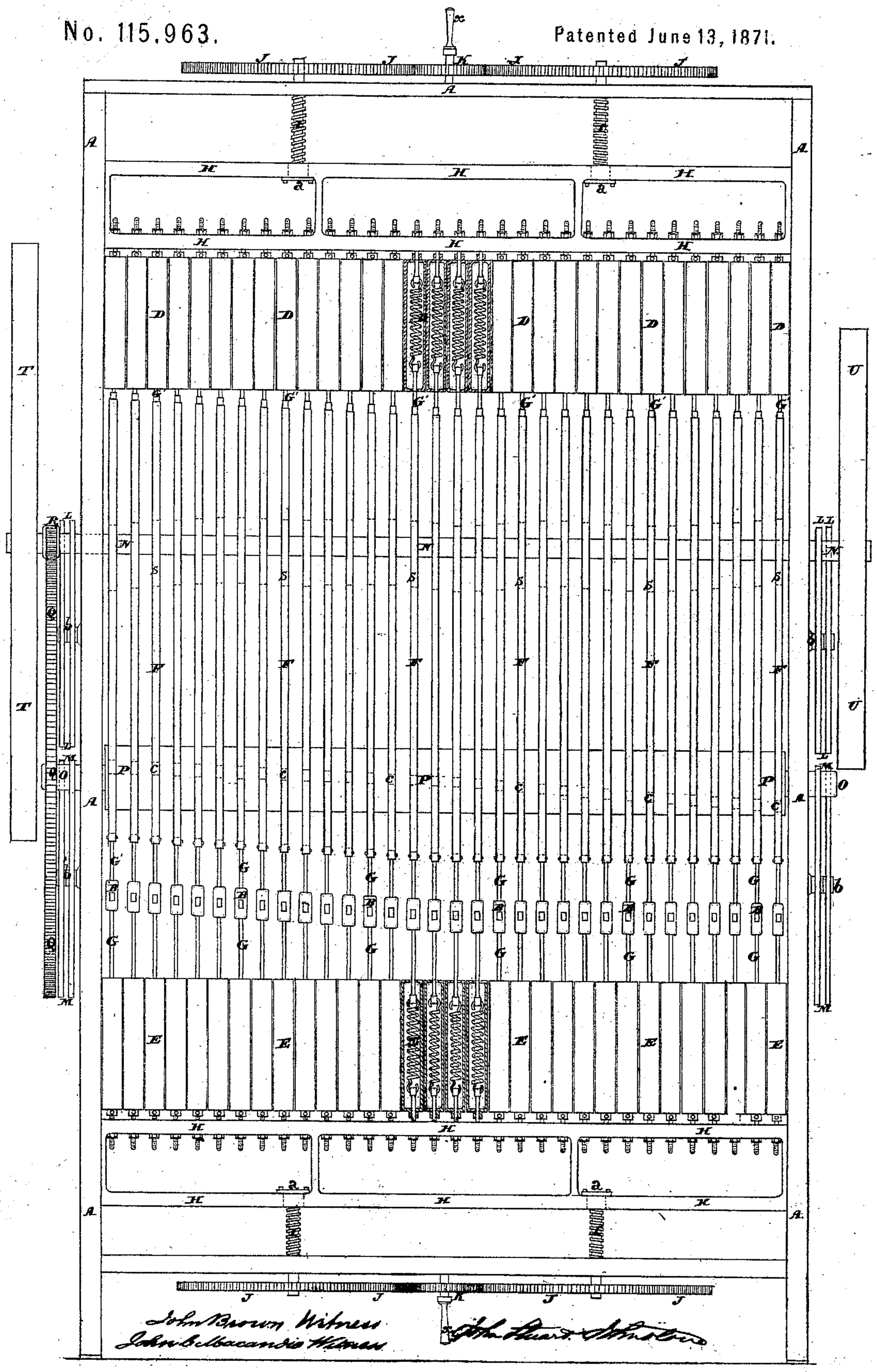
2 Sheets--Sheet 1.

JOHN S. JOHNSTONE.

Improvement in Motive Power Engines.

No. 115,963. Patented June 13, 1871.



2 Sheets--Sheet 2.

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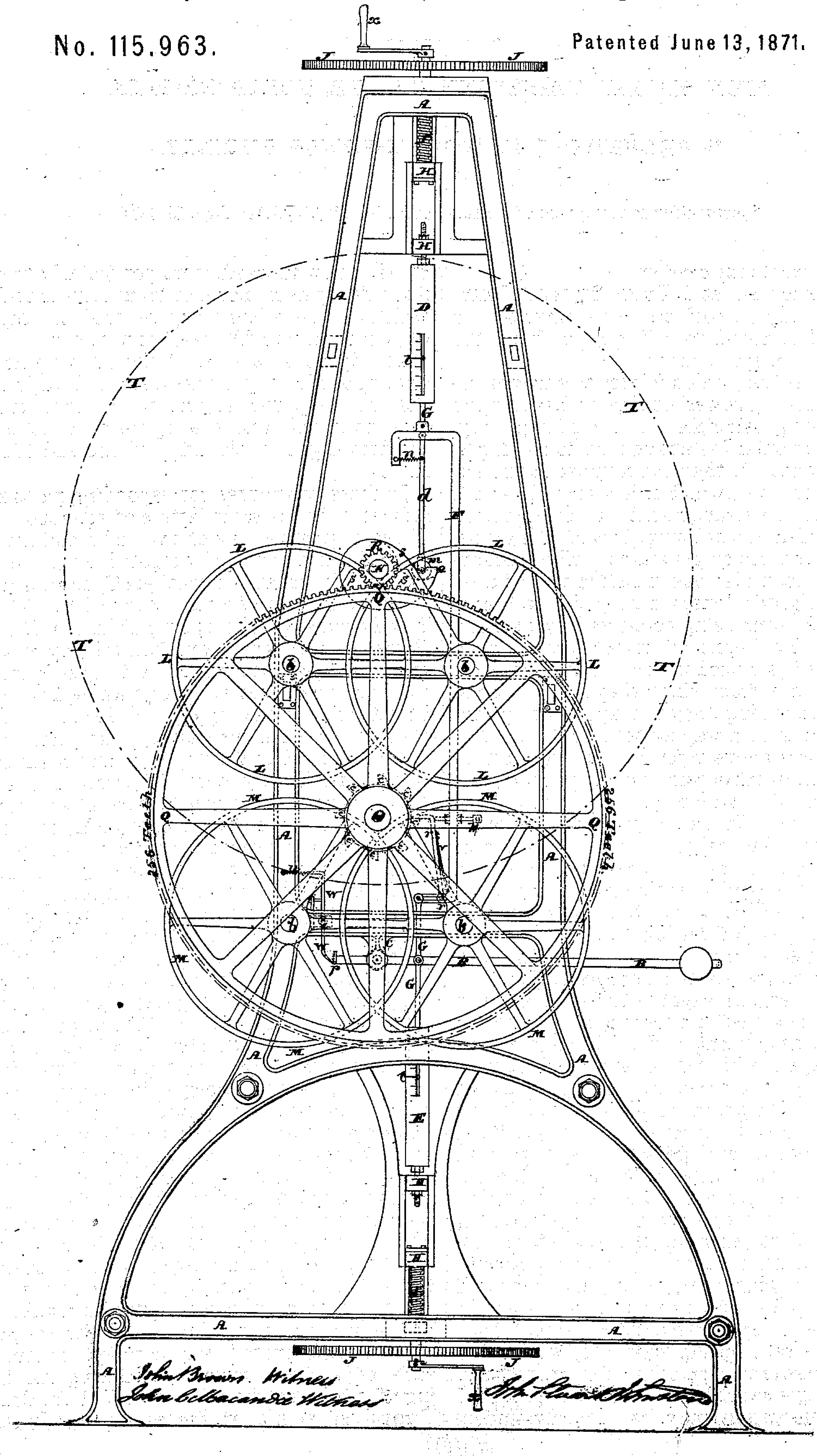

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115,963

UNITED STATES PATENT OFFICE.

JOHN STUART JOHNSTONE, OF AYR, NORTH BRITAIN.

IMPROVEMENT IN MOTIVE-POWER ENGINES.

Specification forming part of Letters Patent No. 115,963, dated June 13, 1871.

To all whom it may concern:

Be it known that I, JOHN STUART JOHNSTONE, of Ayr, Scotland, have invented an Improved Motive-Power Engine, of which the following is a specification:

This invention, which relates to a new or improved motive-power engine, is based upon the following principle: That a falling body, at any particular instant of time, is moving at a velocity greater than the number of units of distance through which it has passed; and it consists in the arrangement and construction of mechanism for utilizing, as a motive agent, the surplus force so generated. The mechanism consists, under one modification, of a series of weighted levers arranged in a framework, each lever being connected by a spring-balance. By means of suitable mechanism the levers are raised in succession through a certain height, from which they are allowed to fall, and in falling they act upon the spring-balance in such a way as to depress it. The surplus force above referred to is transmitted so as to lift or raise corresponding levers, and also to act upon stop-wheels for driving a revolving shaft. There being a series of levers and spring-balances, the operations hereinbefore referred to are performed in succession throughout the series, so that a certain amount of the momentum generated by the falling weights is used for raising the other weights of the series to the height from which they originally fell, while the surplus of force remaining after the weights have again been raised is employed in overcoming the friction of the moving parts, and in driving the revolving shaft with machinery which it is or may be employed to actuate. For the purpose of gathering up the momentum of the falling weights, a second revolving shaft provided with a fly-wheel, and geared by spur-gearing with the first revolving shaft, hereinbefore referred to, is employed. In place of arranging the engines with one set of spring-balances, as hereinbefore described, it may, under a second modification, be arranged with a second set of spring-balances, which, by means of connection, are caused to act in opposition to the first set of spring-balances, so that both sets of the said spring-balances, while thus acting opposite to each other, also operate one and the same set of levers. And in order that my said invention may be properly understood, I now proceed more particularly to set forth the system, mode, or manner in or under which the same is or may be used or practically carried into effect—that is to say:

The figure on sheet 1 of the drawing hereunto appended represents a front elevation of the motive-power engine which constitutes this invention; and the figure on sheet 2 of the drawing is an elevation of one end of the same.

In these two figures corresponding parts are indicated by the same letters of reference.

The engine consists of two end framings, A A, to which a series of weighted levers, B, is attached by means of brackets C, as shown in end elevation on sheet 2. Each of the levers B is attached to two spring-balances, D and E, respectively, above and below it, by means of the link F and rods G, and these spring-balances are supported by adjustable framings H, attached to the upper and lower ends of the main frame A, as shown. The position of the framings H and the spring-balances D and E is adjustable by means of screws I, one of the ends of each of which is screwed into a block, *a*, placed in the framings H, and the other ends are provided with spur-wheels J, which are rotated by an attendant actuating the intermediate spur-pinions K through the intervention of the handles *x*. By means of this arrangement of mechanism the tension on the springs in the spring-balances D and E, and, consequently, the power transmitted through the machine, may be regulated as required, such tension being indicated by the pointers *t*, shown on sheet 2. On studs *b b*, fixed at each end of the framing A, two pairs of anti-friction wheels, L and M, respectively, are placed, as more particularly shown on the end elevation on sheet 2; and these wheels act as bearings for the revolving shafts N and O. On the shaft O a drum, P, is placed, provided with a series of cams or tappets, *c*, hereinafter termed tappets to distinguish them from other cams, S, which are placed on the shaft N, as shown. The tappets *c* are arranged spirally around the drum, as shown in dotted lines on sheet 1, and the number of these tappets is regulated by the number of weighted levers in the machine, eight tappets being provided to actuate each lever, one of which acts during one lifting of the lever, the other seven, as the drum P revolves, acting on the same lever in suc-

cession. In place of arranging all of the tappets *c* on one drum, each of such set of tappets may be carried on a separate drum. On one end of the said shaft O a spur-wheel, Q, is fixed, which gears with and is actuated by a corresponding pinion, R, placed upon the corresponding end of the revolving shaft N, which is situated immediately above the shaft O, as shown. On the shaft N a series of cams, S, is placed, the number of which is also regulated by the number of levers B, a cam being provided for each lever, and on the example shown on the two explanatory sheets of drawing hereunto annexed, thirty-two such levers, B, cams S, and sets of tappets *c*, and other details of mechanism connected with the levers B, are employed. The shaft N is also provided with a fly-wheel, T, and stop-wheel U, as shown on sheet 1, and from the wheel U, or its equivalent, motion is transmitted to any apparatus which the motive-power engine may be employed to actuate. The spur-wheel Q and corresponding pinion R are so constructed that, for every revolution of the pinion, the wheel Q moves through one-sixteenth part of a revolution, and, as the pinion R is caused to revolve sixteen times by the continuous action of the thirty-two levers, as is hereinafter made more particularly apparent, the spur-wheel Q, revolving the shaft O and tappet-drum P attached thereto, makes, during that period, one revolution, thereby rendering the action of the weighted levers continuous.

The machine is actuated in the manner now about to be set forth. When it is desired to set the engine in motion, the weighted end of one of the levers B is depressed below the horizontal position. This has the effect of depressing the link F, to which the said lever is coupled, and consequently of extending the spring in the upper spring-balance D, the upper end of the link F being connected thereto by the rod G. The extension of the spring and depression of the link causes the roller *m* on the rod *d* to come in contact with the cam S, which is provided for that lever B, and depresses the said cam with sufficient force to cause the shaft N to move through a portion of a revolution. At the same time the tappet-drum P, being caused to revolve by the spur-pinion R and wheel Q, the tappet *c*, which actuates the next lever of the series, comes in contact with the heel of the lever *r*, as shown on sheet 2, one end of which lever is attached to one of the links F, the lower end of the link being made by preference forked to receive it, and, by the tappet *c* raising the lever *r* and link F, it elevates the weighted end of the lever B, attached thereto by the link G, and thereby distends the spring in the balance E attached to the lower end of that lever. At the same time this action permits of the recoil of the spring in the corresponding balance D at the upper part of the framing, and immediately the tappet *c* passes out of contact with the heel of the lever *r*.

The spring in the balance E is allowed to recoil by the falling of the weighted lever B, which at the same time distends the spring in the balance D and brings the roller *m* of that lever B into contact with its cam, and thereby continues the motion throughout the whole series of levers.

The operations above described being performed in succession throughout the series, a certain amount of the momentum generated by the falling weight of one lever is employed in raising the weighted end of the next lever of the series to a fraction of the height from which it originally fell, while the surplus of force remaining after the weights have been again raised is employed in overcoming the friction of the moving parts and in driving the revolving shaft N, from which motion is imparted to any machinery which it may be employed to actuate, as hereinbefore set forth.

The cams S are so arranged on the shaft N that each of them will come into the proper position for being acted upon by their respective rollers *m* at the required instant of time, and they are provided with cheeks *s* in a hollow, between which cheeks the bearings of the roller *m* rest during that portion of the revolution in which they are caused to act by the falling of the weighted lever B, as shown in end elevation on sheet 2.

The rods *d*, which support the various tappet-disks, are hinged to the links F by pins or pivot-joints, as shown, so that as the parts of greater radiuses of the cams S come in contact with the rollers *m*, the suspending rod thereof is thrown at an angle from its vertical position, and the point *o* of the cam, seen on sheet 2, is allowed to pass, and immediately thereafter the rod is brought back to its vertical position by means of the spiral spring *n*, at which instant of time its weighted lever B falls and again brings the tappet into contact with the cam S.

Each of the levers *r* is adjustable in a horizontal direction, so that the tappets on the drum P may have a greater or lesser hold on them, as required; and this is accomplished by providing the levers with plate-springs *v*, as shown on sheet 2, the tendency of which spring is to bring the levers closer to the links F, and the springs are counteracted by screws *k*, tapped through the links and acting against the backs of the levers, so that they may at any time be adjusted to any required position.

As each of the weighted levers B is raised to its highest position, it is retained therein (until relieved by its tappet on the drum P) by the catch W, the point of which enters into one of the notches of a rack, *p*, formed for that purpose on the end of the lever B, as shown on sheet 2. Each catch W is attached to the framing A by a universal joint, as shown at *l*, sheet 2, so that it may move backward and forward, and also with a sideward movement; and the point thereof is formed with a small pin (not shown on the drawing) projecting at right angles therefrom, which presses against one side of the lever as it is falling, and against

the other side as it is being raised, thereby preventing the point of the catch from entering the notch until the lever is at the height required, at which time the point of the catch is thrown forward by the action of the spiral spring *u* on the other end of the catch, and the lever B is retained in that position until relieved by the action of the tappet *c* on the lever *r;* or the levers may be retained by any other suitable contrivance, it being understood that I do not confine myself to the particular arrangement or construction of mechanism hereinbefore described and shown on the two sheets of drawing hereunto appended, as such mechanism may be considerably modified; nor do I confine myself to employing any number of weighted levers and the other details of mechanism connected therewith, as the machine may be actuated by any other suitable number of the said levers, the other working parts being correspondingly modified; and in lieu of employing two spring-balances in connection with each weighted lever, as hereinbefore described and shown, the lower set of such spring-balances may be dispensed with.

Claim.

The arrangement and construction of motive-power engines, wherein the motive force employed is that due to the surplus units of velocity of a falling weight over and above the unit of distance through which it has fallen in any given time, and caused to act upon spring-balances, which, in turn, effect the reactions hereinbefore described.

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

JOHN STUART JOHNSTONE.

Witnesses:

JOHN BROWN,

JOHN C. MACANDIE.