No. 632,725. Patented Sept. 12, 1899.

C. L. KLINE & C. L. KLINE, JR.

MECHANICAL MOVEMENT.

(Application filed Nov. 28, 1898.)

(No Model.) 3 Sheets—Sheet 1.

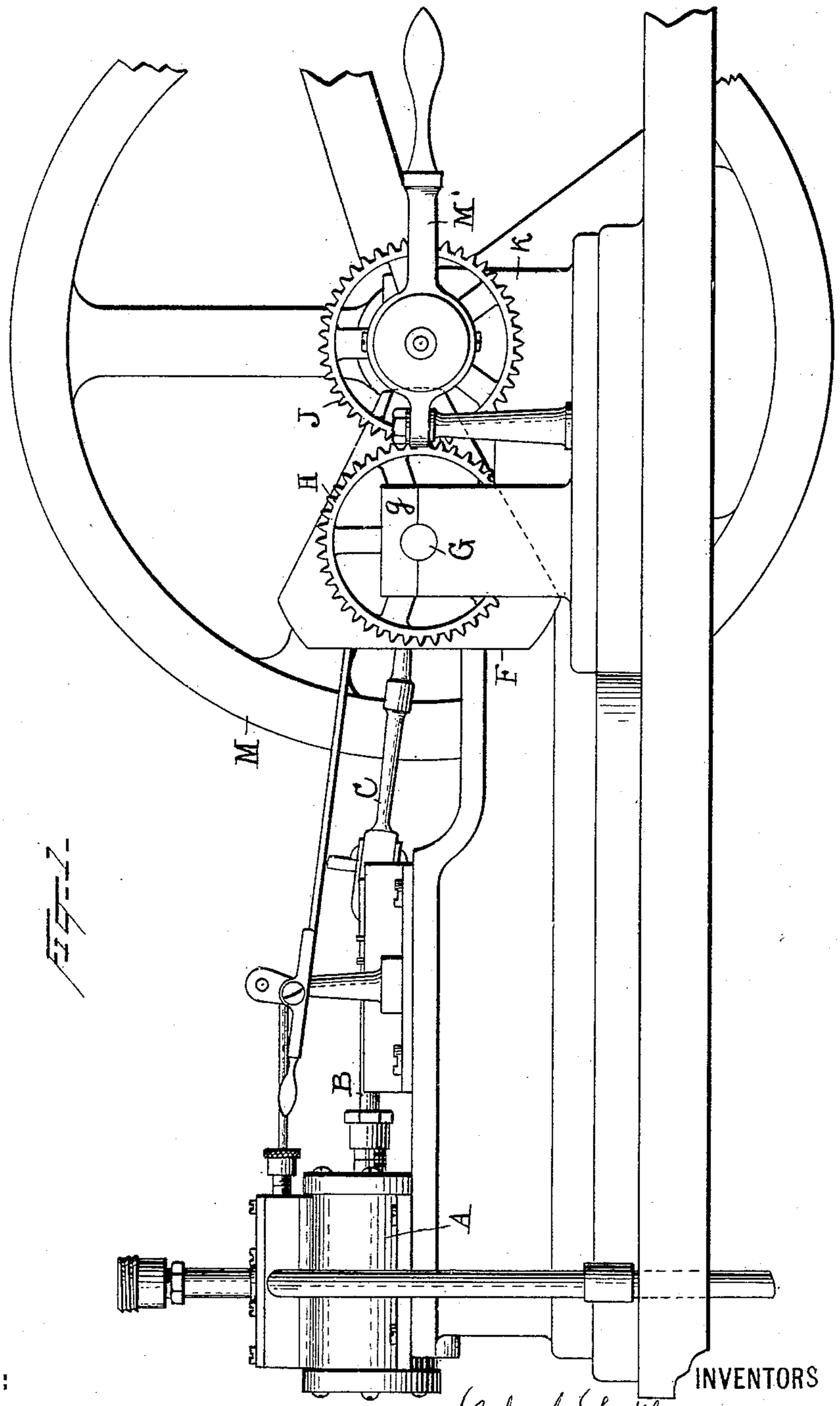

Fig. 1.

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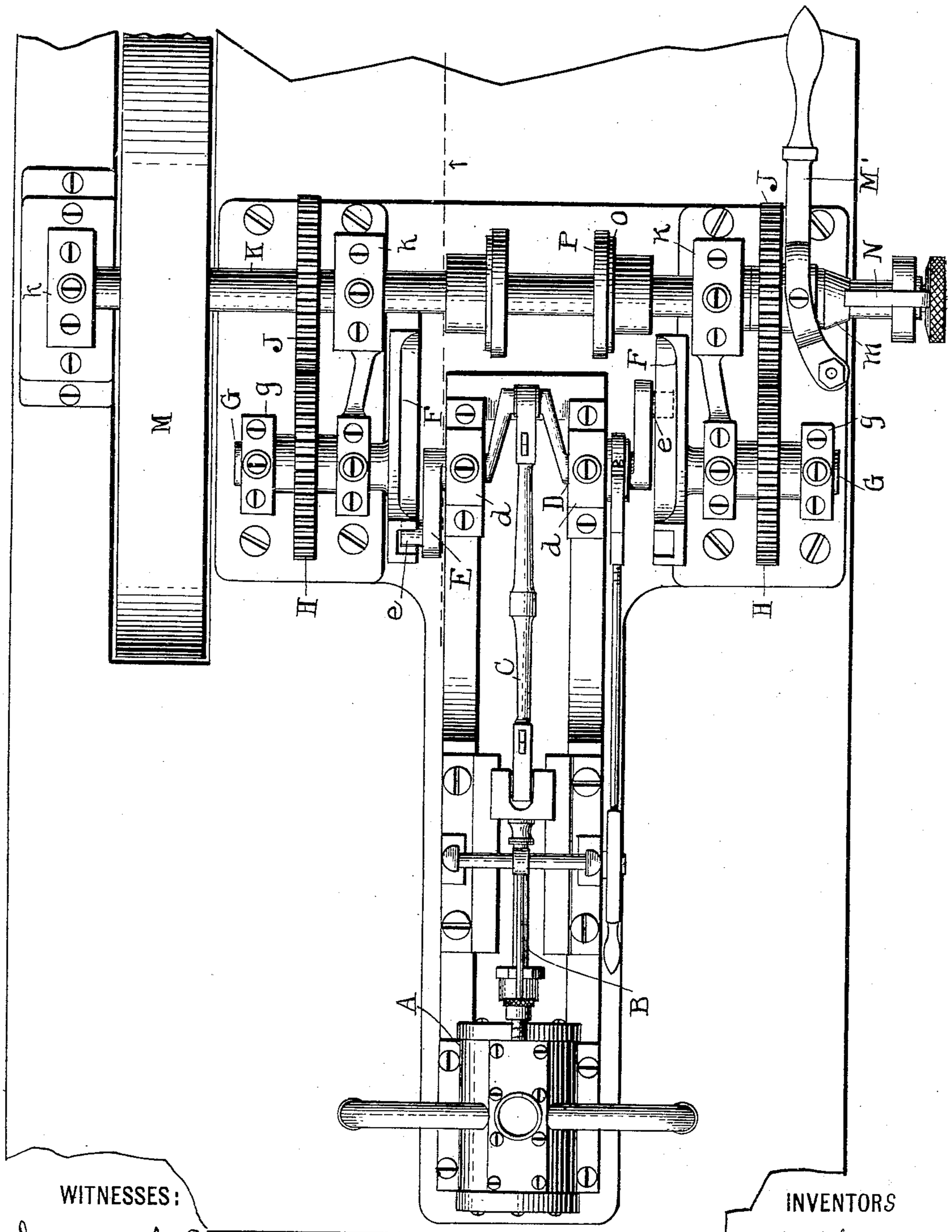

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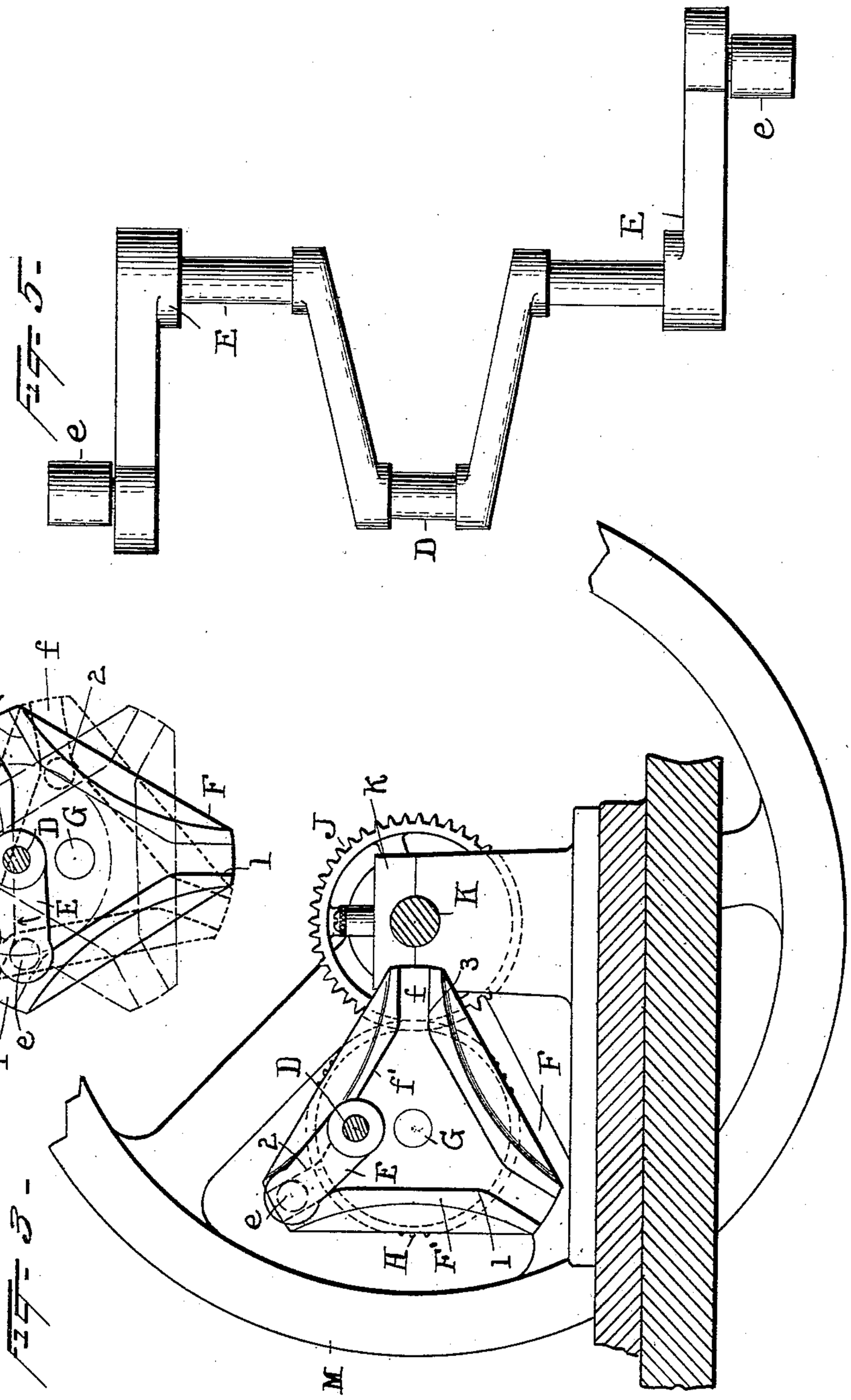

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UNITED STATES PATENT OFFICE.

CHARLES L. KLINE AND CHARLES L. KLINE, JR., OF NEW YORK, N. Y.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 632,725, dated September 12, 1899.

Application filed November 28, 1898. Serial No. 697,664. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. KLINE, Sr., and CHARLES L. KLINE, Jr., citizens of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Mechanical Movements; and we do 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 the letters and figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in machines in which heat is employed to do mechanical work—as, for example, by the expansion of water-vapor in steam-engines or the expansion of hot air or burned mixture of air and gas in hot-air or gas engines, or to engines used in producing electric light or power; and the object of our invention is to provide attachments for engines of the kind set forth simple in construction, comparatively inexpensive to manufacture, that operate smoothly and steadily in practical use, and which change horizontal or rectilinear motion to rotary motion.

To attain the desired end, this, our invention, consists in the construction, arrangements, and operation of parts herein set forth.

In the drawings which accompany and form a part of the specification, Figure 1 represents a side elevation, and Fig. 2 a plan view, of our engine; Figs. 3, 4, and 5 are views in detail of the parts of our cam-disks.

Like letters and figures of reference indicate like parts in all the views.

In order to explain our invention, we have shown the same as applied to an engine of the type in which the mechanical force arises from the elasticity and expansive action of steam, although manifestly our device for increasing force may be applied to any machines using an axle or shaft.

Referring particularly to the drawings, A denotes the cylinder of an ordinary steam-engine, and B the piston-rod, and C the connecting-rod or pitman, thereof.

The horizontal crank or primary driving-shaft D is journaled in boxes *d* and carries at opposite ends of same a crank-arm E, at the extremity of which is a preferably rotary crank-wrist or roller *e*.

Our vertically-disposed cam-disks F consist of a triangular-shaped base-piece and superimposed plates F′, provided with inclined bearing edges *f*′, which form interior channels or ways *f*, in which one of our wrists *e* works. These cams are mounted on two concentric secondary driving-shafts G, which lie parallel with but considerably out of line with and preferably lower than the shaft D and are journaled in boxes G. The shafts G also carry gear-wheels H, which mesh with gear-wheels J, mounted on the power-shaft K, running in boxes *k* and carrying the balance or fly-wheel M.

It is manifest that various omissions of some particulars could be made without materially affecting the essential features of our invention or the operations of the remaining parts.

Obviously the elements of the structure described may be located at an angle to the plane in which they are shown. We accordingly use the words "horizontal," "vertical," and the like in a relative sense.

In operation one of the crank-wrists *e*, Fig. 4, upon being rotated in the direction of the arrow will ride up the inclined plate 2, approximately one-half the length of the plate, going to the end of the channel or way *f*, as shown in thin broken lines, and then traveling back to the commencement of the same, as represented in thick dotted lines, and then leaving the same take a short circuit or route across to a point on the edge *l* of the next plate near the beginning of another channel or way F. The wrist *e* rides to the end of the plate 1, and then travels back to about the medium point of the plate, after which it leaves the plate and goes to the edge 3 of the next plate. In like manner the other crank-wrist *e*, which lies in the same plane with the first one, but which extends in an opposite direction from the shaft D, travels (while the first wrist *e* is taking its short circuit from the plate 2 to the plate 1) upward and back again through a channel or way *f* of the opposite cam, and then when it is about to make a short circuit across the said cam the crank-wrist *e* of the first cam will have reached the

plate 1 and will then travel up its new channel or way. Thus for a period both wrists are in engagement with their respective plates of the opposite cams at the time when the crank-arms are at or around their dead-centers.

It will be observed that our wrists *e* pass along the channels or ways *f* alternately, but the shafts G have a continuous forward motion, and that said wrists can never get out of the interior channels or ways formed by the bearing edges *f'* of the plates F'.

Our cam-disks are provided with open centers and have bearing edges or faces forming an equilateral triangle and are also provided with straight channels or ways leading from the points of the triangle.

One of the principal advantages of this invention is that for a certain period or time both crank-wrists *e e* are in engagement with their respective plates of the opposite cams. Another advantage is that the shafts G are set on a lower plane than is the shaft D, thus giving additional leverage to the force exerted on the connecting-rod, which leverage varies according to the angularity of the crank D and is greatest when said crank D is at and around the ninety-degree point—its greatest point of efficiency.

In cases where our engine is used in producing electric light or power we use a belt or other engaging means to connect the balance or fly wheel M with the pulley of a dynamo.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a machine, a crank-shaft provided with rotary crank-wrists lying in the same plane, in combination with two cams provided with a plurality of bearing edges of certain inclination, and interior channels or ways; the arms of said crank-wrists being provided with rollers engaging the interior channels.

2. A cam-disk having interior bearing edges or faces forming an equilateral triangle and provided with straight channels or ways leading from the points of the triangle.

3. A cam-disk having interior bearing edges or faces forming an equilateral triangle and provided with straight channels or ways leading from the points of the triangle, in combination with a crank-shaft provided with a rotary crank-wrist.

4. In a machine, a crank-shaft provided with two crank-wrists located at opposite ends of the shaft, in combination with two cams constructed and arranged to engage said crank-wrists.

5. In combination, a crank-shaft provided with two crank-wrists, located at opposite ends of the shaft and two cams constructed and arranged to engage said crank-wrists, the shafts of the cams being out of line with the crank-shaft.

6. In combination, a crank-shaft, and two oppositely-disposed crank-arms provided with rotary wrists, and cam-disks provided with a plurality of bearing edges or faces, the radii of the crank-arms and the cam-disks being of unequal lengths, whereby the leverage of the cams varies according to the angularity of the crank-arms.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES L. KLINE.
CHARLES L. KLINE, JR.

Witnesses:
M. E. STODDART,
CHARLES A. BURNS.