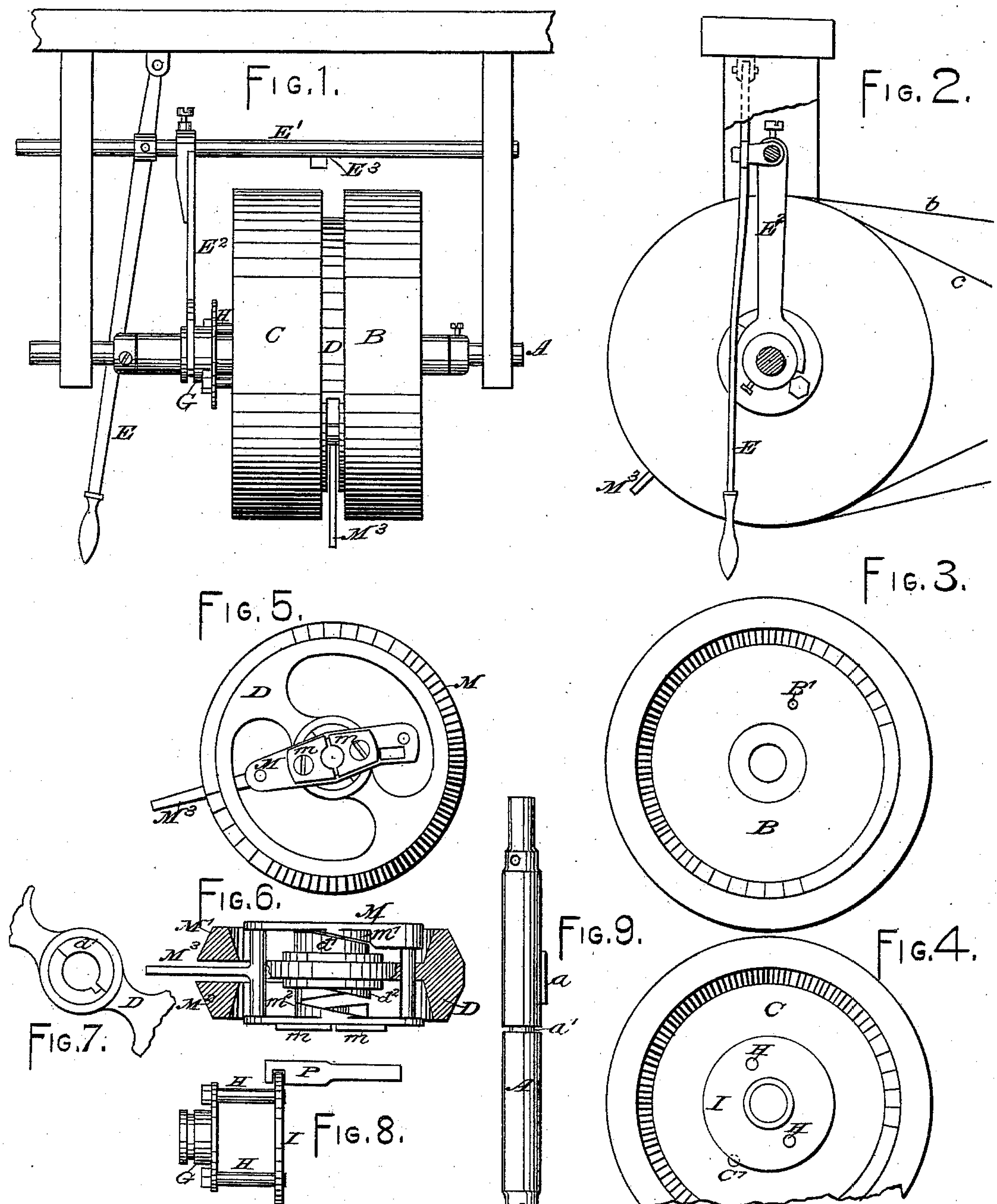
2 Sheets—Sheet 1.

G. R. CLARKE.
Friction-Clutch.

No. 218,931. **Patented Aug. 26, 1879.**



WITNESSES:

E. B. Bolton
Chas. C. Stetson

INVENTOR:

Geo R Clarke
by his attorney
Thomas D. Stetson

2 Sheets—Sheet 2.

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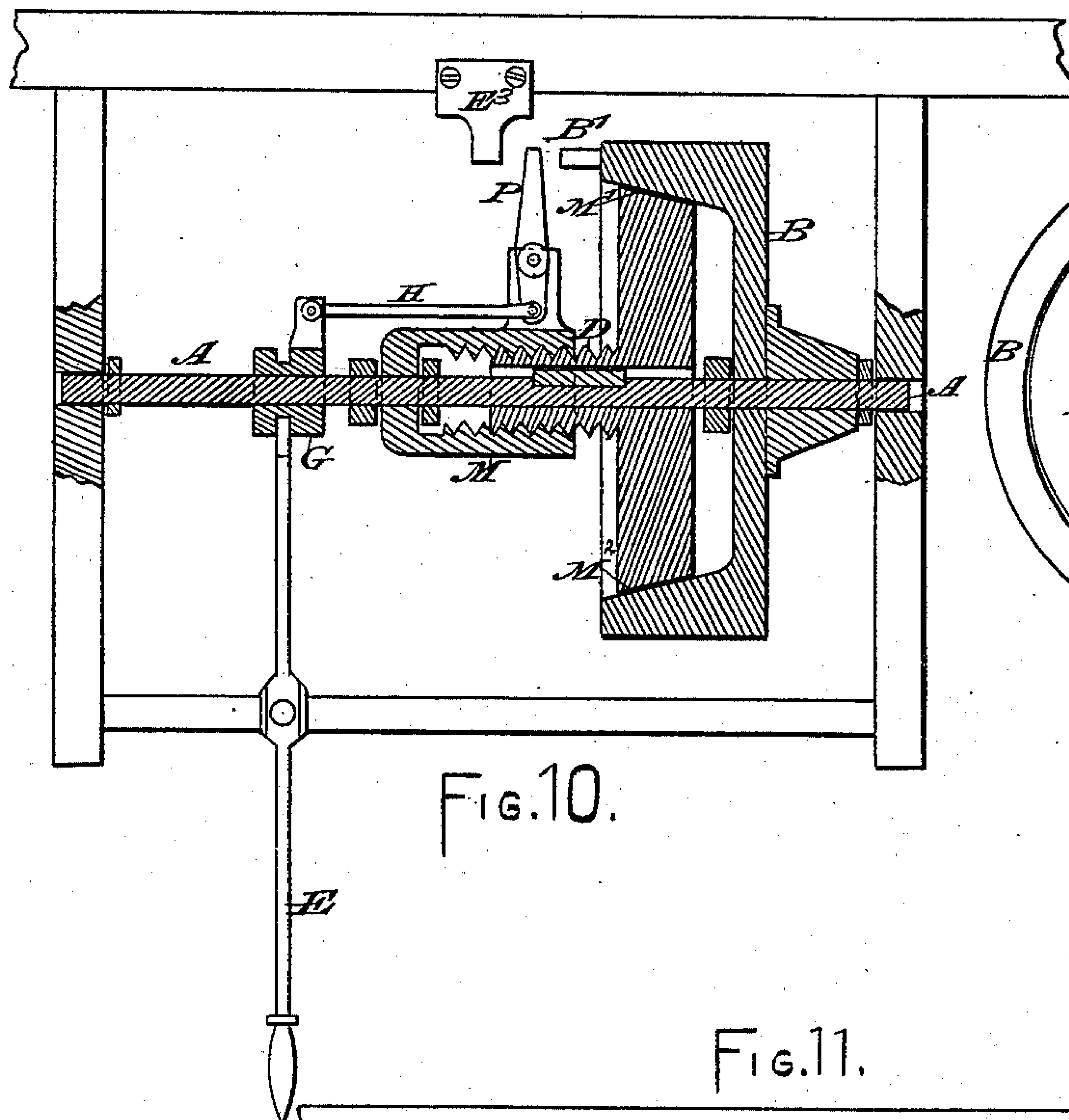


Fig. 10.

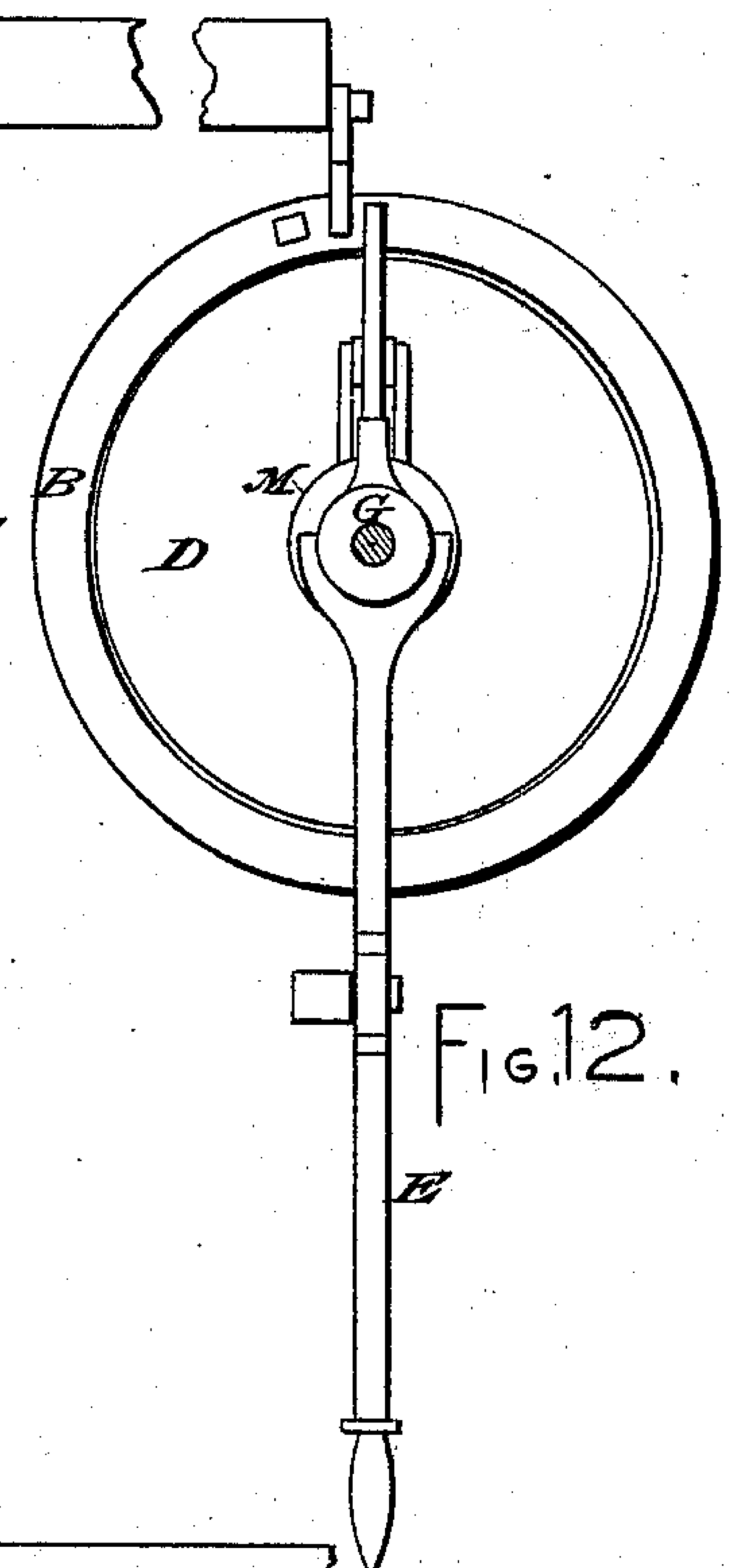
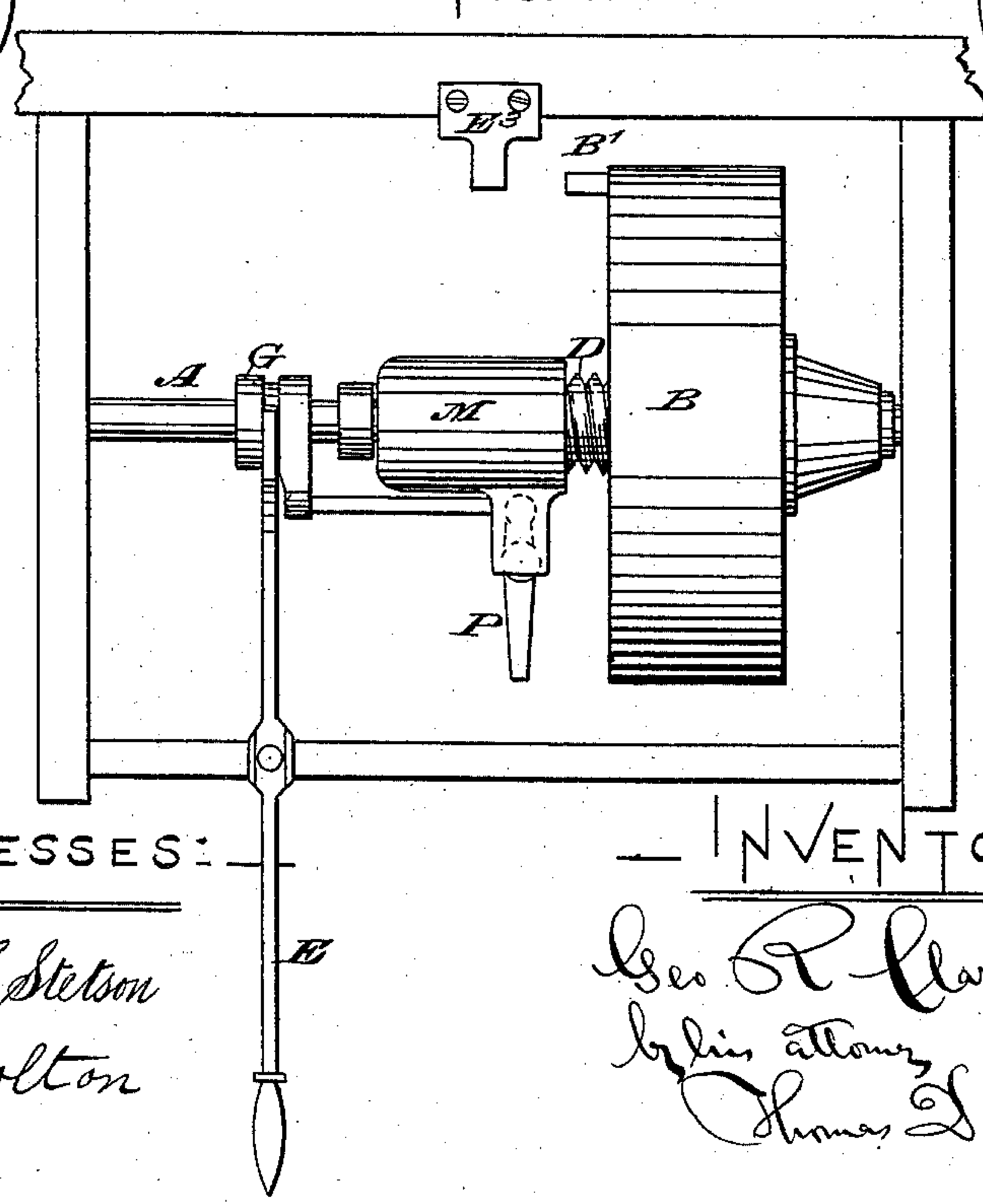


Fig. 12.

Fig. 11.



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by his attorney

Thomas D. Stetson

UNITED STATES PATENT OFFICE.

GEORGE R. CLARKE, OF BROOKLYN, NEW YORK, ASSIGNOR TO CHARLES CRANSTON AND EZRA J. STERLING, OF SAME PLACE.

IMPROVEMENT IN FRICTION-CLUTCHES.

Specification forming part of Letters Patent No. **218,931**, dated August 26, 1879; application filed January 15, 1879.

To all whom it may concern:

Be it known that I, GEORGE R. CLARKE, of Brooklyn, county of Kings, in the State of New York, have invented certain new and useful Improvements relating to Friction-Clutches, of which the following is a specification.

My improvement is adapted to apply on single clutches, by which I mean alternating from rest to a motion in one direction only, or on double clutches, where the motion may be changed at will from rest to a motion either in one direction or in the opposite direction.

I will describe the invention as applied to a double clutch.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a front view of my complete clutch. Fig. 2 is a side view of the same from the side on which the hand-lever is placed. Fig. 3 represents the interior of one of my pulleys loose on the shaft. Fig. 4 represents the interior of the opposite pulley, the one nearest to the adjusting-lever. Fig. 5 is a side view of the movable double-coned feathered pulley and connections, which transmits the motion from either of the revolving pulleys to the shaft. Fig. 6 represents the interior mechanism of the double-coned pulley. Fig. 7 is a side view of the hub of the pulley, showing the groove which engages with the feather on the shaft to transmit the motion thereto. Fig. 8 is a side view of the parts which transmit the motion to the double-coned clutch, and thereby determine the motion of the shaft. Fig. 9 is a view of the shaft, showing the engaging feather and slot. Figs. 10, 11, and 12 represent a modification in which there is only one friction-clutch, Fig. 10 being a longitudinal section, Fig. 11 a side view, and Fig. 12 an end view.

Similar letters of reference indicate like parts in all the figures.

A is the shaft to which the clutch is to communicate motion, and which, it will be understood, is supported in suitable stationary bearings, and communicates motion to any mechanism which it is desired to operate.

B and C are pulleys running loosely on the shaft A at a proper distance apart, and are driven, respectively, by an open belt, *b*, and a cross-belt, *c*, impelled by any suitable power. D is a double-coned piece mounted between the pulleys B and C, and free to be moved endwise on the shaft while it is engaged, by the feather *a*, with the shaft, so that the two must revolve alike. The inner faces of the pulleys B and C are beveled and adapted each to make the proper frictional contact, and communicate its motion to the shaft according as the piece D is moved endwise.

H H are sliding rods fitted in holes in the pulley C, fixed at their outer ends to the grooved ring G, which is engaged by the forked arm E^2, connected with the sliding rod E^1, which is guided in fixed bearings and controlled by the hand-lever E. The rods H are fixed to a disk, I, within the clutch, and thus the working of the hand-lever E moves the disk I to the right or left at will.

The central portion of the axial moving piece D is made open or skeleton-like to allow room for as much motion as may be to the yoke-piece M, which is free to turn around the shaft A, but is prevented from being moved endwise thereon by the locking-pieces or partial rings *m*, which present each an extended surface to partially or entirely embrace the shaft, and are strongly engaged in the groove a', so as to afford a broad bearing and resist end motion. These pieces *m* are applied after the piece M is in place, and are bolted on the piece M.

Near the center both faces of the double-coned piece D are formed helically—that is to say, it has a large hub, both faces, d^1 d^2, of which are spirally inclined like the blades of a screw-propeller. The adjacent inner faces, m^1 m^2, of the yoke M are correspondingly formed. By giving the piece M a partial rotation around the shaft A in one direction or the other, its spiral faces m^1 m^2 will act on the pulley D, and compel it to move strongly endwise into contact with one of the pulleys, B or C, and out of contact with the other—that is to say, a partial revolution of the piece M in one direction carries the pulley D strongly into contact with the revolving pulley B. So soon as a fair and sufficient bearing has been established against the conical surface on the interior of the pulley C, a corresponding motion is imparted to the piece M, and, consequently, to the shaft A, which is compelled to revolve therewith. The rotation will continue so long as the parts remain thus adjusted, the piece M revolving with the pulley D.

If, while thus conditioned, the piece M is stopped, or by any means caused to move backward relatively to the motion of the other parts, it will, by the action of its spiral faces m^1 m^2, compel the pulley D to move out of contact with the pulley C, thus setting it and the shaft A free; and if the turning of the part M relatively to the pulley D is carried a little farther, the action of the spiral faces will carry the pulley D into firm frictional contact with the pulley B, and a motion in the opposite direction will be at once inaugurated and will continue indefinitely, the piece M, of course, turning therewith so soon as the motion is fully established.

The compulsory turning of the piece M in correspondence with the pulley D so soon as the latter is firmly set in contact with either of the revolving pulleys B or C follows necessarily from the relation of the spiral faces. When any force is applied, as will be explained below, to turn the part M relatively to the pulley D, it first compels an endwise or axial motion to the latter, and so long as that can progress the part M may continue turning relatively thereto; but so soon as the endwise motion of the pulley D is forcibly stopped by its firm engagement with either of the revolving pulleys between which it is caged, the piece M can no longer turn within it, and is necessarily compelled by the friction of its incline m^1 or m^2 to turn therewith.

P is a sliding piece working in close fitting bearings in the piece M, and protruding considerably at each end. This piece performs important functions. It is engaged by a notch, as shown, with the smooth circular periphery of the disk I. Working the hand-lever E moves the slide P endwise.

There is a stop, B′, on the inner face of the pulley B, and a corresponding stop, C′, on the inner face of the pulley C. As the slide P is moved endwise in one direction or the other it presents itself in the path of one or the other of these stops. So soon as the piece P is struck by either stop it compels it to partake of its rotatory motion around the shaft A, and thus gives a corresponding motion to the piece M. The piece M, therefore, can be turned, to a limited extent, one way or the other at will by simply moving the hand-lever E in one direction or the other, and causing the slide P to move endwise. If it moves into engagement with the stop B′ it turns the piece M in the corresponding direction, with a corresponding movement of the double-coned pulley D into frictional contact with the corresponding pulley B. The action is rapid. The frictional contact becomes more intimate as the stop B′ turns the piece M farther and farther within the pulley D, and in practice, as in theory, before the piece M has made more than a small fraction of a revolution within the pulley D it has brought the latter into so strong contact with the pulley B as to compel it to move therewith. So soon as this condition obtains there is no further motion between the parts M and D, and although the slide P remains in contact with the stop B′, it performs no further function. The whole duty of transmitting the motion from the pulley B to the shaft A is performed by the frictional engagement of their conical surfaces near the periphery.

The same result ensues when, by the movement of the hand-lever E and the train of connections, the slide P is moved endwise. It first moves out of contact with the stop B′, and if simply stopped in that middle position no change results. The engagement of the pulleys B and D remains firm, and all continues as before. But so soon as a further motion of the hand-lever E brings the other end of the slide P into engagement with the stop C′ there follows instantly an arrest of the motion of the part M, and a motion of the latter in the opposite direction. In quick-running machinery the result which ensues is rapid, but still sufficiently gentle. The part M, by its rapid partial revolution in the opposite direction to that of the pulley D, acts, by its inclined faces m^1 m^2, to compel the latter to move promptly endwise, and to forcibly disengage itself from the pulley B and engage itself with the pulley C. The small weight and momentum of the pulley D makes it easy for the friction in the new engagement to rapidly destroy the motion in one direction, and to initiate the same motion in the opposite direction. This takes place within a fraction of a revolution, and now the parts are working again as before, except that they turn in the opposite direction. The slide P remains in contact with the stop C′, but without performing any function. The power is transmitted, as before, through the strong friction of the conical surfaces near the periphery.

It is not easy, if at all practicable, by this train of mechanism to leave the parts in the middle position, which is sometimes desired, to allow the shaft A to come to rest. For this purpose I make a further provision. An arm, M^3, extends outward from the piece M through a slot which extends partly around the circumference of the pulley D. This slot should extend far enough around to allow for all the motion which will ever occur between the parts M and D. The projecting end of the arm M^3 sweeps around with the velocity and in the direction of the pulley B or C which is dominant at the time. Any suitable means being applied to arrest the revolution of the arm M^3 will arrest the revolution of the part M, and compel the double-coned pulley

D to withdraw from its engagement with either pulley, and to assume the position of rest.

E^3 is a short arm mounted on a sliding rod, E^1. If the hand-lever E is stopped in the mid position, it will not only hold the slide P out of the path of both the stops B′ and C′, so as to leave the piece M at liberty to be turned, but will, by presenting the stop E^3 in the path of the arm M^3, arrest the motion of the latter. This arrest of the motion will induce the desired partial end movement of the double-coned piece D, and its arrest in the mid position out of engagement with either pulley. Thus conditioned, the pulley D and the attached shaft E come quickly to rest. In cases where, by reason of the inertia of any connected parts, the shaft is liable to make a considerable movement after it is set free, an efficient brake (not represented) must be provided to arrest the motion.

Modifications may be made. Instead of a positive stop, E^3, I can apply a frictional piece which will come into gentle contact with the revolving end of the arm M^3, or even allow it to traverse several times past it, with a constantly-increasing force, until it is gently brought to rest. I can, if desired, provide two or more of the arms M^3, and connect their extremities by a light circular rim, and effect the stopping by a gentle friction of the stop E^3, or an equivalent brake, against such rim.

I propose, in some cases, to use the clutch singly. This would, with the construction here shown, be effected by omitting the pulley B and working the device with the pulley C alone. In such case a fixed stop, either positive or frictional, should be provided to receive the end of the slide P, which is here shown as meeting the stop B′.

The spirally-inclined faces d^1 d^2 m^1 m^2 are represented as formed in two steps, like a double-threaded screw. They may be made in a greater number, or in one. One will work very well, Or I can make the corresponding faces in the form of a continuous screw-thread making several turns, the part M being the nut and the part D being the screw. This modification is more particularly applicable for single clutches.

Figs. 10, 11, and 12 represent such modification.

Various modifications may be made in the proportions and forms of the details without limit.

I claim as my invention—

1. A friction-clutch having the parts both engaged and disengaged by the direct application of the driving power, according to the position of the handle E or its equivalent, controlled at will, as specified.

2. The pulley or wheel C, carrying a stop, C′, in combination with the shaft A, cone D, turning with or operated by the shaft, the partially-turning piece M m^1 m^2, mounted in connection therewith, and the movable piece P, and suitable operating means adapted to forcibly engage the cone D with the pulley C, and to liberate it therefrom at will, as herein specified.

3. The double cone-piece D and its operating means, in combination with the two pulleys B C, with their respective stops B′ C′, adapted to promptly and forcibly remove D from one pulley and to shift it into contact with the other at will, as herein specified.

4. In combination with the pulleys B C and the corresponding double cone D and its connections, the hand-lever E, operating by the rod E^1 both the arm E^2 and its connected mechanism, and the arresting-stop E^3, so that by properly moving the lever E the motion may be strongly made in either direction, or certainly arrested, as herein specified.

In testimony whereof I have hereunto set my hand this 10th day of January, 1879, in the presence of two subscribing witnesses.

GEO. R. CLARKE.

Witnesses:

H. A. JOHNSTONE,

CHARLES C. STETSON.