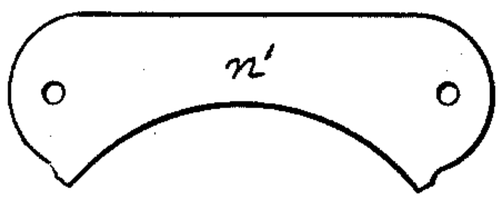
(No Model.) 2 Sheets—Sheet 1.

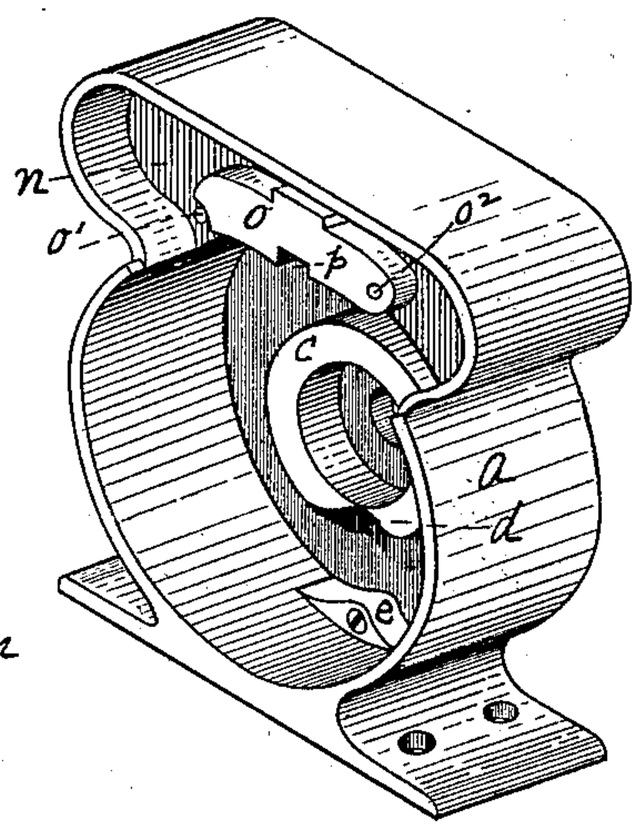
# J. STUBBE.

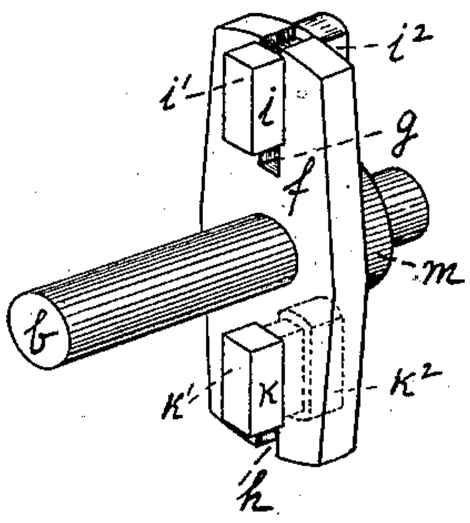
## DEVICE FOR CONVERTING MOTION.

No. 312,773. Patented Feb. 24, 1885.

Fig. 1.



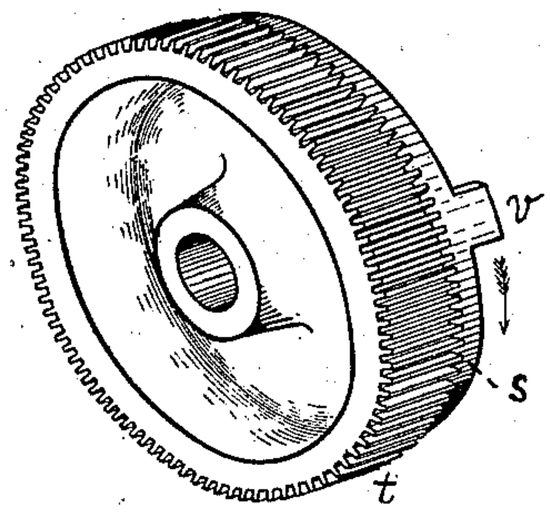




Fig. 2.

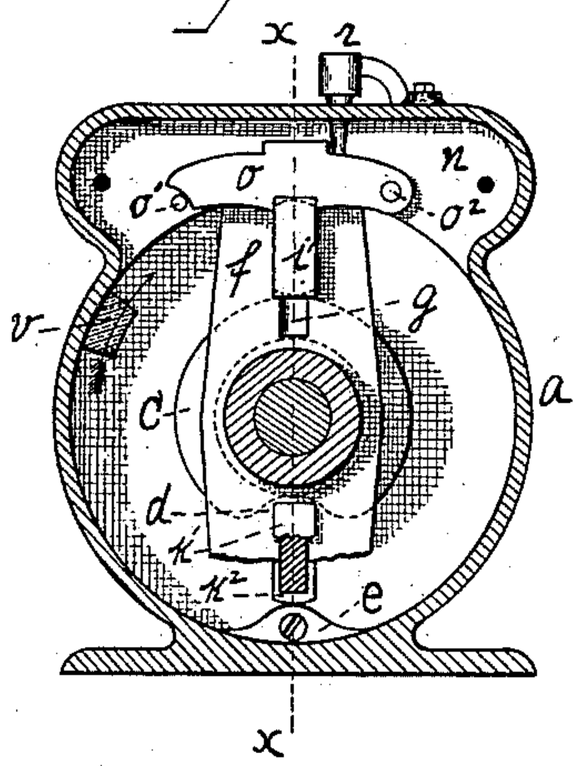



Fig. 3.

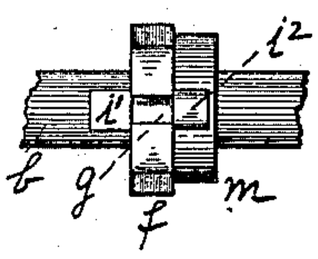



Fig. 4.

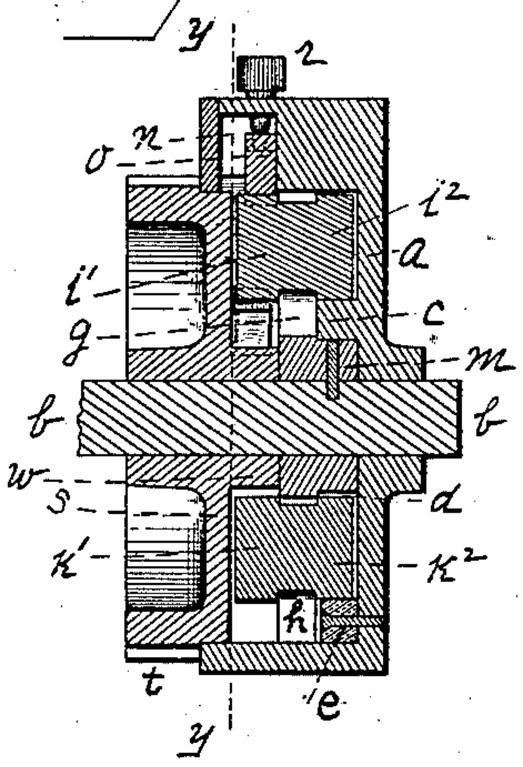



Fig. 5

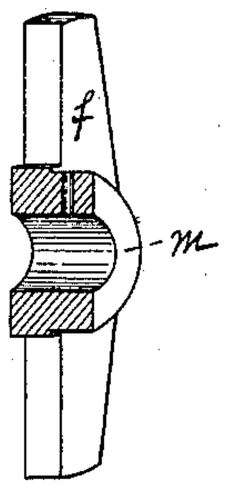
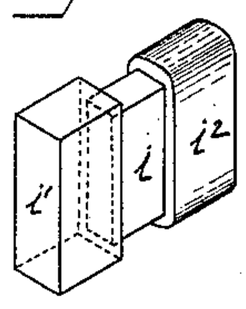



Fig. 6.




Witnesses.
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his Attorneys

(No Model.) 2 Sheets—Sheet 2.

# J. STUBBE.

## DEVICE FOR CONVERTING MOTION.

No. 312,773. Patented Feb. 24, 1885.

Fig. 7.

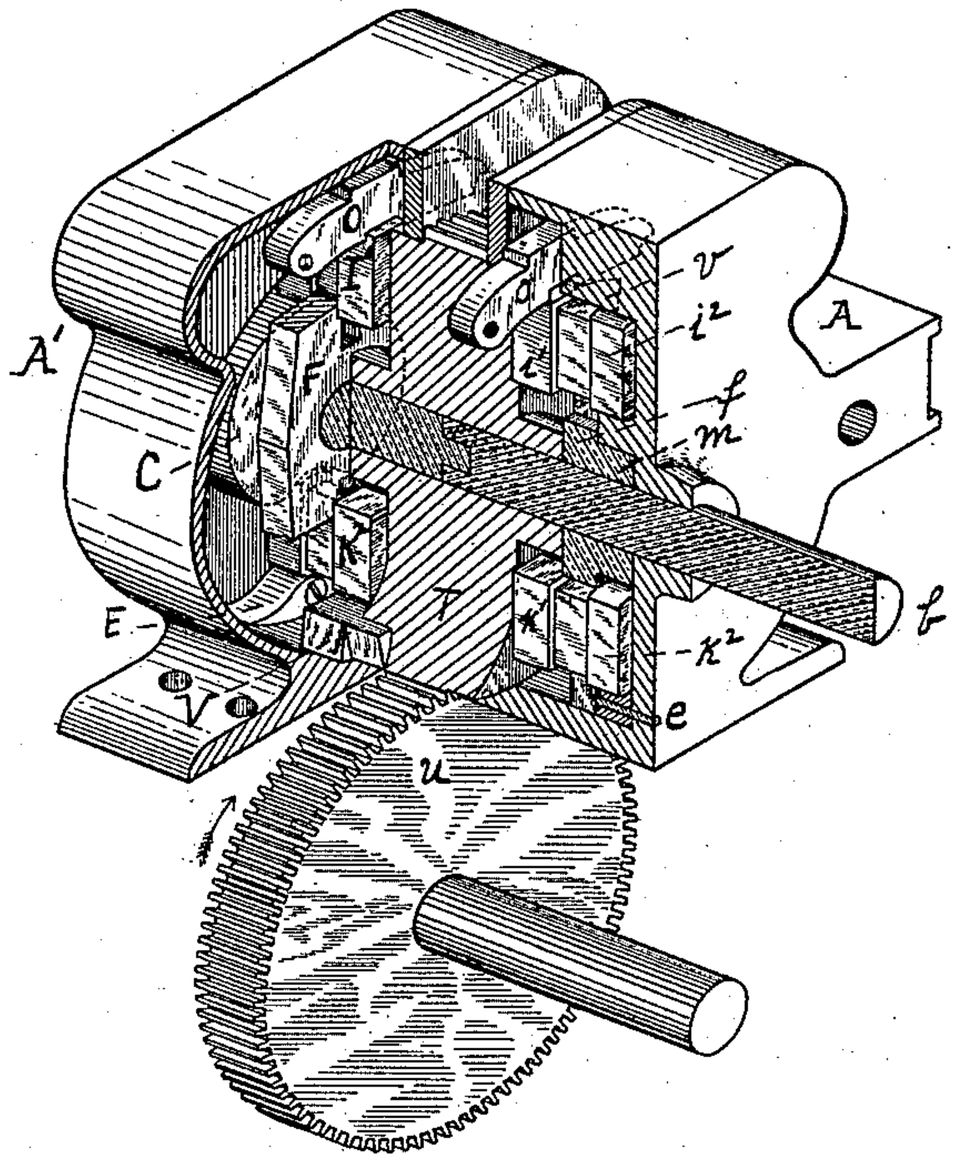



Fig. 8.

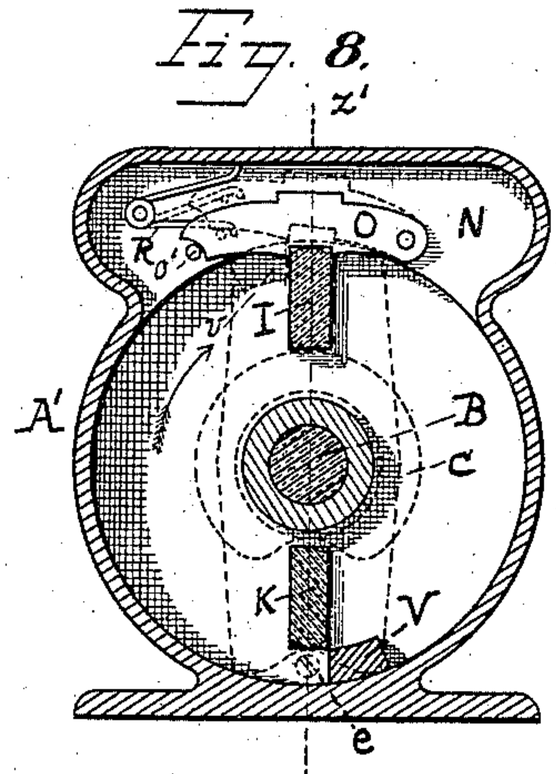



Fig. 9.

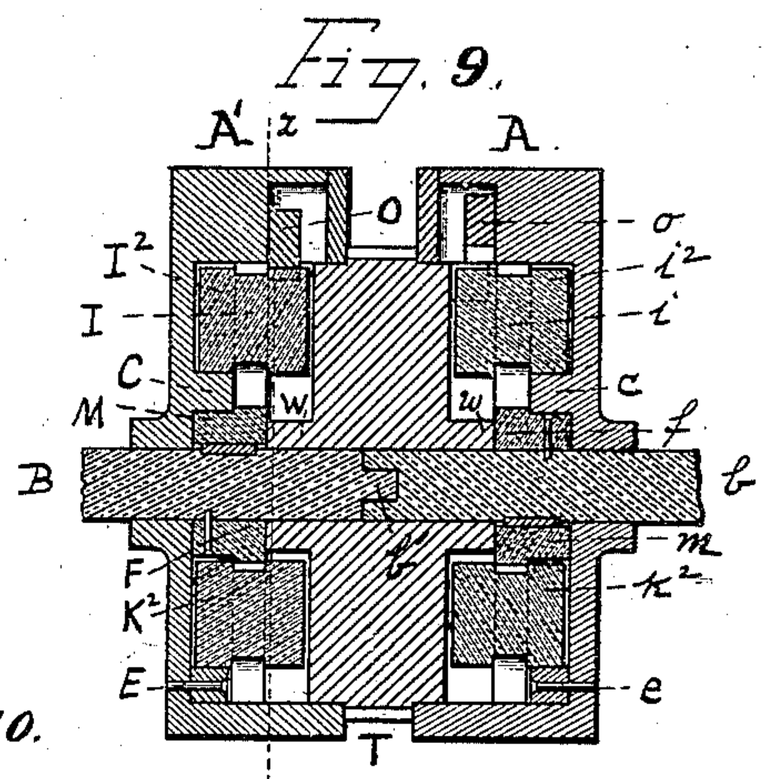
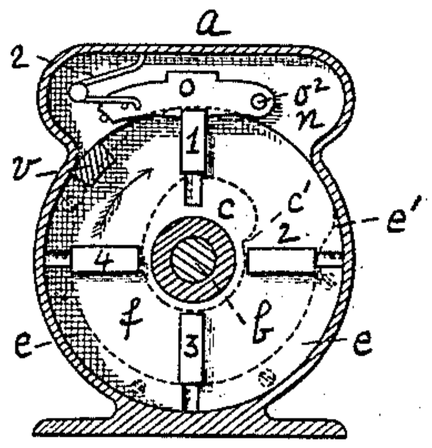



Fig. 10.




Witnesses.
J. A. Burns.
Harry L. Gill.

Inventor.
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his attorneys

# UNITED STATES PATENT OFFICE.

JOHN STUBBE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO H. B. SCUTT & CO., (LIMITED,) OF SAME PLACE.

## DEVICE FOR CONVERTING MOTION.

SPECIFICATION forming part of Letters Patent No. 312,773, dated February 24, 1885.

Application filed January 8, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN STUBBE, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Devices for Converting Motion; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the parts of my improved device when separated to show their construction and relative adjustment. Fig. 2 is a side elevation of the interior of the casing which contains the parts of my improvement, and a section on the line *y y* of Fig. 4. Fig. 3 is an end view of a part. Fig. 4 is a vertical axial section of the complete device on the line *x x* of Fig. 2. Fig. 5 is a vertical sectional view of the part marked *f* in Fig. 1. Fig. 6 is a perspective of one of the two blocks which are shown movably mounted in slots in the part *f*. Fig. 7 is a perspective view, partly in section, of a modification. Fig. 8 is a vertical cross-section of one of the parts of the same on the line *z z* of Fig. 9. Fig. 9 is a vertical axial section of the modification corresponding to the section shown in Fig. 4. Fig. 10 is a vertical cross-section of a further modification.

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

The object of my improvement is to provide a device for producing an intermittent mechanical motion of that kind in which the driven parts have alternate periods of motion and rest of determined frequency and duration, and, further, to provide means for locking the driven parts at the termination of their periods of motion, so as to overcome their impetus and to stop them immediately.

In the drawings, *a* represents the cylindriform drum or casing which contains the parts of my improved device. In the modification shown in Fig. 1 it is closed at one end and open at the other, and is traversed by a rotatory shaft, *b*, to which the intermittent motion is transmitted, and which imparts it to the other parts the machine to which my improvement may be applied. On the inside of the casing, and on the shell which forms its end, is an annular collar, *c*, surrounding and concentric with the central hole through which the shaft *b* passes. The annulus *c* is provided with a circumferential recess, *d*, of small extent, and having curved or inclined sides. There is thus constituted a fixed cam, of which I shall denominate the recess *d* to be the "concentric" portion, and the remaining part of the periphery to be the "eccentric" part. The recess *d* is preferably situate at the lower end of a vertical diameter of the annular cam, and on the bottom of the casing, directly opposite to the recess, is a fixed convex cam, *e*, whose apex is opposite the deepest part of the recess, and whose sides taper thence correspondingly to the inclined sides of the recess.

Affixed to the rotatory shaft *b*, in a plane at right angles to the axis thereof, is a plate, *f*, which consists of a circular disk or of a segment of a disk, as shown in the drawings. The plate *f* is provided with two radial slots, *h g*, situate in the same diametrical line, and within each of them is mounted a block (shown in Fig. 6) which is movable in its slot toward and away from the axis of the plate. Each of the blocks *i k* projects from both sides of the plate, the projections forming lugs $i'$ $i^2$ and $k'$ $k^2$. The preferable form of these blocks is that shown in the drawings, and consists of a substantially rectangular piece of metal having transverse grooves on each side. The neck formed by these grooves fits within the radial slot in the plate *f* and prevents displacement of the block. The plate *f* is provided with an annular collar, *m*, of the same external diameter as the internal diameter of the cam *c*. The shaft *b* and its rigid plate *f* are so mounted within the casing *a* that the collar *m* fits and has its bearings with the cam-annulus *c*. This will cause the end of the latter to abut against the side of the plate *f*, and the inner end of each of the inwardly-projecting lugs $i^2$ $k^2$ of the blocks *i* and *k* to rest upon the periphery of the cam *c*. The corners of the lugs $i^2$ and $k^2$ are preferably rounded, so that they may be easily acted upon by the parts against which they come in contact. There is a recess, *n*, at the upper side of the drum *a*, and pivoted within it, as at $o^2$, is a spring catch or arm, *o*, which is situate on the outer side of the plate *f* and tangentially to the path of revolution of the lugs $i'$ and $k'$.

On the inner side of the spring-catch *o*, and diametrically opposite to the line of the apex of the fixed cam *e*, is a notch, *p*, which is designed to seize and confine the lugs *i'* and *k'* of the blocks *i* and *k* as the latter come into opposition to it. The spring-arm *o* is confined within the recess *n* by a fixed pin, *o'*, placed so as to limit the inward movement of the spring-arm, while it allows it to rest in a position in the path of revolution of the lugs on the blocks *i* and *k*. A suitable spring, *r*, exerts a constant pressure upon the spring-arm and keeps it normally against its seat on the pin *o'*.

Suppose, now, the parts to be arranged as just described, and in the position shown in Fig. 2, the block *i* resting on the eccentric part of the cam *c* and raised by it in its slot *g*, so that the lug *i'* of the block is confined by the spring-arm *o*, while the lug *k'* of the other block, *k*, is also resting on the periphery of the cam, the latter block moved inwardly in its slot *h*, and having the outer end of its lug $k^2$ resting on the apex of the fixed cam *e*. If, now, the spring-catch *o* be raised far enough to release the block *i*, and a rotary motion in the direction of the arrow be given to the plate *f*, the lug $k^2$ of the block *k*, bearing against the inclined sides of the recess *d*, will rise thereout in its slot *h* onto the eccentric part of the cam-collar *c*, and the two blocks will continue to travel upon this cam for a semi-revolution. At that time the lug *k'* of the block *k*, coming into contact with the free end of the spring-catch *o*, will raise it until the lug *k'* is in opposition to the notch *p*, when the spring-catch will fall upon this lug, and will confine and hold the block, thereby stopping the rotation of the plate *f*. At the same time the outer end of the lug $i^2$ of the opposite block, *i*, will have engaged the side of the fixed convex cam *e*, and, as the plate moves, will be raised on the incline of this cam, thereby pushing the block *i* inward in its slot *g* and into the recess *d* on the cam-collar *c*. The locking of the one block by the spring-arm *o* and the arrival of its opposite upon the apex of the cam *e* are simultaneous. When the block has been thus locked, it is obvious that its further rotation is impossible without first disengaging the spring-catch. The rotation of the slotted plate *f* is accomplished by means of a disk, *s*. (Shown in Figs. 1 and 4.) This disk is loosely mounted upon the shaft *b*, outside of and next to the face of the plate *f*. It has on its inner side a stud, *v*, which is at a proper distance from the center of the disk to be capable of engaging the lugs *i'* and *k'* of the blocks *i* and *k* when the latter are raised in their slots upon the eccentricity of the cam *c*, but so that when the blocks are moved in their slots into the recess *d* of the cam they may be out of the path of rotation of the stud. The disk *s* is made integral with a gear-wheel, *t*, which projects outside of the casing *a*, and is continuously rotated by a pinion, *u;* or the disk may be actuated in any other convenient and suitable manner. The disk *s* is held away from the plate *f* at the proper distance to allow the stud *v* to operate the lugs *i'* and *k'* of the blocks by means of an annular sleeve, *w*, which, affixed to the disk and surrounding the shaft *b*, abuts against the outer face of the plate *f*. The stud *v* on the disk is so arranged relatively to the spring-arm *o* that, as the disk rotates, the stud engages this spring-arm and raises it upon its pivot. So constructed, the annular cam *c*, the convex cam *e*, and the lugs $k^2$ $i^2$ of the movable blocks are in one vertical plane on the inner side of the plate *f*, these lugs being capable of being acted upon by the cams, while the lugs *i' k'*, the stud *v*, and the spring-arm *p* are in a different parallel plane on the outer side of the plate, and in a position to be acted upon the one by the other, as will hereinafter appear.

Suppose the parts to be in the respective positions before described, the disk *s* to be revolving, and its stud *v* to have passed the fixed cam *e* on the bottom of the casing. It will revolve freely until it reaches the spring-arm *o*, which it will then raise on its pivot and release the lug *i'* of the block *i* therefrom. Having engaged this lug of the block *i*, the further revolution of the stud will carry the block *i* with it, thereby causing the plate *f* and its shaft *b* to rotate. A semi-revolution of these parts brings the lug $i^2$ of the block *i* into contact with the side of the cam *e*, and the lug *k'* of the block *k* into contact with the under side of the spring-arm *o*. The cam *e* will thus cause the block *i* to move inward in its slot *g* into the recess *d* of the annular cam *e* and raise the lug *i'* out of the path of the stud *v*, which will continue to rotate, but independently of the lug *i'*. At the same instant the block *k* will slip into the notch in the spring-arm *o*, and will be confined by it. The latter operation locks the plate *f* and its shaft *b* instantly, as before described. During the next semi-revolution of the disk *s* it rotates freely from the point *e* to the notch *p*. When it reaches the latter point and has raised the spring-arm *o*, it will engage the block *k* and rotate the plate and shaft for another semi-revolution, as before. This operation is continued indefinitely, each alternate semi-revolution of the disk *s* producing a semi-revolution of the plate *f* and causing it to be locked during the other semi-revolution of the disk. The shaft *b* drives the parts of a machine to which an intermittent motion is desired to be imparted, and produces in them alternate periods of motion and rest corresponding to the intermittent motions of the plate *f*.

It will be observed from the foregoing description that the function of the so-called "plate" *f* is to act as lever-arms for turning the shaft *b*, to which they are fixed, and that the purpose of the blocks *i* and *k*, movable in slots in these lever-arms, is to afford means for alternately engaging the latter with continuously-rotating mechanism and disengaging them therefrom. It is evident, therefore, that

the exact form of these parts is immaterial and does not constitute the essence of my invention. The disk *s* closes the front end of the casing *a*, except the recess *n*, and to cover this I employ a separate cap, *n'*. All the parts of the mechanism are thus inclosed and kept from the clogging action of dust and dirt.

The modification shown in Figs. 7, 8, and 9 is yet to be described. It consists, essentially, of a duplication of the mechanism shown in the preceding figures; and its object is to produce regular and equal periods of rest and motion on two different shafts, the period of rest of the one shaft exactly corresponding in time and duration with the period of motion of the other, respectively.

The casing *a* consists of two vertically-divided parts, A and A', which are mounted side by side and joined together. The shaft, which traverses the casing and is journaled loosely therein, consists, also, of two parts, B and *b*, the ends of which are connected by a swivel-joint at *b'*, so that each shaft may be rotatory independently of the other and without turning the other on its axis. On this shaft, between the two sections of the casing *a*, is a gear-wheel, T, driven by a pinion, *u*, and loosely mounted on the shaft, so as to be rotatory thereon. Each side of the gear-wheel is provided with a sleeve, W *w*, which surrounds the shaft and projects somewhat from the disk. The ends of the casing *a* on each side of the gear-wheel T are constructed similarly to the casing shown in Fig. 1, the part A' having a fixed annular cam, C, and a fixed convex cam, E, corresponding exactly to similarly-situate parts *c* and *e* at the other end in the part A.

On the shaft *b* is mounted a slotted plate, *f*, and on the shaft B, on the other side of the gear-wheel T, is a similar plate, F, each rigidly mounted on its shaft. The radial slots of these plates have movable blocks *i k* and I K, like the block shown in Fig. 6, and each section of the casing is provided with a spring-catch, *o* O, pivoted within a recess, *n* N, in the path of revolution of the inner lugs of its blocks *i k* or I K. The plates F *f* abut against their respective sides of the gear-wheel T and against their annular cams *c* C, so that the outwardly-projecting lugs $I^2$ $K^2$ and $i^2$ $k^2$ of the blocks I K and *i k* may rest upon the peripheries of their respective cams. Each side of the gear-wheel T is provided with a stud, which is situate relatively to the movable blocks in its adjacent plate, F or *f*, as the stud shown in Fig. 2 is situate. The stud *v* on one side of the gear-wheel is, however, diametrically opposite to the situation of the stud V on the other side of the wheel. The gear-wheel T revolves continuously on its axis, and it is clear that its studs V *v* will cause the mechanism of either part of the drum *a*, considered separately, to operate intermittently, as before described. Thus the stud V in the part A' will engage one of the blocks I K in the plate F at alternate semi-revolutions of the gear-wheel, and will cause the plate to revolve and to rotate its shaft B correspondingly.

In Figs. 7, 8, and 9 of the drawings the stud V is shown as having reached a point at the bottom of the drum adjacent to the fixed convex cam E, and having caused the block K to move in its slot H into the recess of the annular cam C, so as to release the stud and to lock the shaft B, as before described. At the same instant the stud *v* on the other side of the gear-wheel T, being diametrically opposite to the stud V, raises the spring-arm *o* and engages the block *i*, which has been in and confined by the notch therein. During the next semi-revolution of the disk T the stud *v* will move the plate *f* and its shaft *b*, while the stud V, having been released from its plate, will revolve freely without turning the shaft B. At the end of this semi-revolution the stud *v* will have lost its block *i* at the cam *e*, and caused the plate *f* and shaft *b* to be locked by the engaging of the spring-arm *o* with the block *k*. The stud V, however, has now raised the spring-arm O, and, having released the block I, commences again to rotate the shaft B for the next semi-revolution, at the end of which the shaft B is locked and the shaft *b* begins again to act. In this manner there is kept up a continual alternation of the rotation of the shafts *b* and B, the one moving when the other is at rest, and vice versa. This is done in an easy manner, without jar of the parts and without liability to get out of order.

The device before described, whether single or double, may be applied to a large number of mechanical movements and to large or small machines, since it can be operated at a high rate of speed with certainty and without losing its hold upon the apparatus.

The double arrangement shown in Figs. 7, 8, and 9 may be modified so as to cause one of the shafts *b* or B to commence to revolve before the other has ceased its revolution by changing the distance between the studs V *v* from a semi-circumference to a less arc. Thus if they are ninety degrees apart and the stud V be in the position shown in Fig. 7, with the stud *v* between the spring-catch *o* and the cam *e*, and engaged in rotating the shaft *b*, during the first quarter-revolution of the disk T the shaft *b* will be rotated, while the shaft B will be locked. In the next quarter-revolution both shafts will be at rest. In the next the shaft B will revolve, and in the next equal period both shafts will rotate, and at the end thereof the parts will be at the same positions as in the beginning.

My improvement may be modified so as to produce rotation of the driven shaft *b* during any desired part of the revolution of the disk *t*, instead of during the alternate semi-revolution, as I have already described it. Thus in Fig. 10 I have shown a device whereby the disk *t* acts upon the shaft *b* during a quarter of its rotation and permits the shaft to remain stationary during the other three quarters thereof. For this purpose the number of ra-

dial slots *g h* in the plate *f* is increased to four, arranged at intervals of ninety degrees from each other. Within these slots are mounted blocks 1 2 3 4, similar in construction to the blocks shown in Fig. 7. The recess *d* on the annular cam *c* is extended to nearly three-quarters of the periphery of the latter, and terminates at one end in a somewhat upright incline, *c'*, about ninety degrees from the notch *p* in the spring-catch *o*, and at the other end by a more gradual incline, having its highest point directly opposite the notch *p*. The convex cam *e* is elongated correspondingly with the recess *d*, having an abrupt inclination, *e'*, opposite the point *c'*, and extending thence around the cam *d* at a proper distance therefrom to keep the blocks within the recess *d* and out of the path of revolution of the stud *v*.

The operation is as follows: The stud *v* on the disk *t* being in the position shown in Fig. 10, revolution of the disk will cause it to push the arm *o* out of its path and to release the block 1. The stud, having thus engaged this block, will carry it forward until the latter engages the cam *e* at *e'*. It is then forced by this cam into the recess *d* of the cam *c*, out of the path of revolution of the stud *v*. At this moment the block 4, having been raised by the cam *c*, pushes back the spring-arm *o*, and is held by the notch therein, so as to hold the plate *f* stationary. The stud *v* continues then to move around the remaining two hundred and seventy degrees of its path, but without moving the plate *f* until it again reaches the spring-arm, releases the block 4, and engages it, when it will carry the block to the point *e* and give the plate *f* a quarter-turn. This operation is thus continued as long as desired, the stud *v* engaging each of the blocks in succession. The blocks which are not acted upon are kept within the elongated recess *d* and out of the path of the stud by means of the cam *e*, which bears against them. By varying the number of blocks and the length of the cam *e* according to the number of revolutions of the disk *t* desired to produce a single revolution of the shaft *b*, it is clear that my improvement may be modified still further.

In the first six figures of the drawings the spring *r* of the catch *o* is shown as made of a rubber block or stud, and in the other figures a spring-wire is shown performing the same functions. The exact construction is unessential; but I prefer the former, because it opposes a steadier resistance to the action of the spring-arm and serves as a buffer to lessen the jar of stopping the machinery when the blocks in the plate *f* come into contact with the spring-arm and are locked.

In the use of the word "disk" as designating the continuously-revolving plate which actuates the lever-arms F or *f*, I do not wish to limit myself to the precise form shown, since it may consist of any suitable segment of a disk.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. As a device for converting motion, the combination of a rotatory stud, a rotatory shaft having lever-arms, and lugs or blocks connected with said lever-arms and capable of being moved into and out of the path of revolution of the said stud, and a cam for imparting such motion to said lugs or blocks, substantially as and for the purposes described.

2. The combination, with the stud of a rotatory disk, of a rotatory shaft having lever-arms, and lugs or blocks connected with said lever-arms and capable of being moved into and out of the path of revolution of the stud, whereby the said stud is alternately engaged with and disengaged from the said lugs or blocks, and a catch for securing and locking the said lever-arms when the said stud is disengaged, substantially as and for the purposes described.

3. The combination, with the stud of a rotatory disk, of a rotatory shaft having lever-arms affixed thereto, and lugs or blocks connected with said lever-arms and capable of being moved into and out of the path of revolution of the stud, whereby the said stud is alternately engaged with and disengaged therefrom, a cam capable of engaging the said blocks during their revolution and of moving them into the path of revolution of the stud, a cam for moving the blocks out of the same, and a catch for engaging and confining one of the said blocks when the stud is disengaged, substantially as and for the purposes described.

4. The combination of two revoluble shafts, each provided with lever-arms having lugs or blocks capable of motion toward or from the axis of revolution, with an interposed driving-disk having driving-studs on each side, and cams for throwing the lugs or blocks into and out of the path of revolution of the studs, whereby an intermittent rotation is imparted to the shafts, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 31st day of December, A. D. 1884.

JOHN STUBBE.

Witnesses:
W. B. CORWIN,
THOMAS W. BAKEWELL.