No. 651,828. Patented June 19, 1900.

A. W. COPLAND.

MECHANICAL MOVEMENT.

(Application filed Nov. 6, 1899.)

(No Model.)

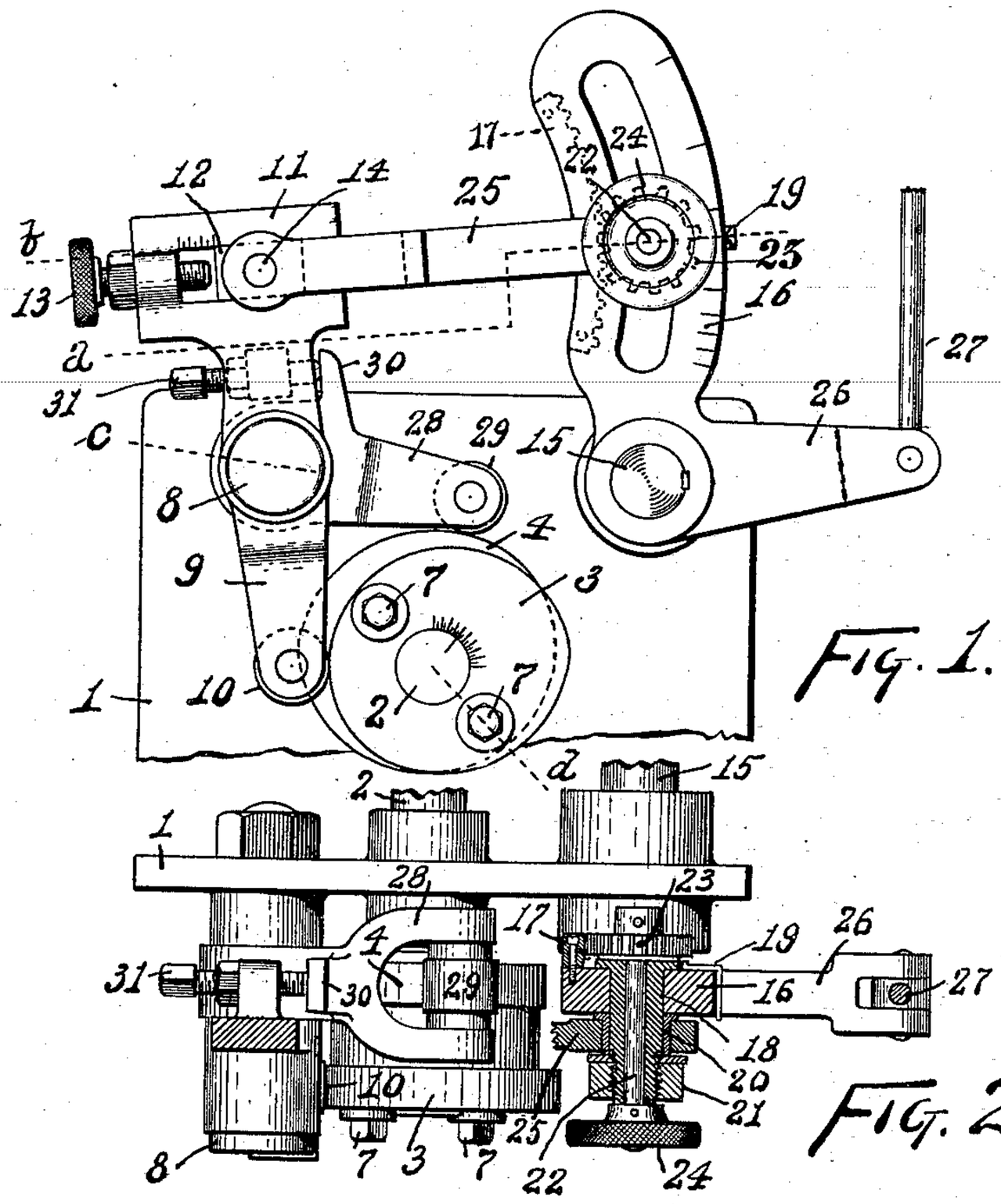

FIG. 1.

FIG. 2.

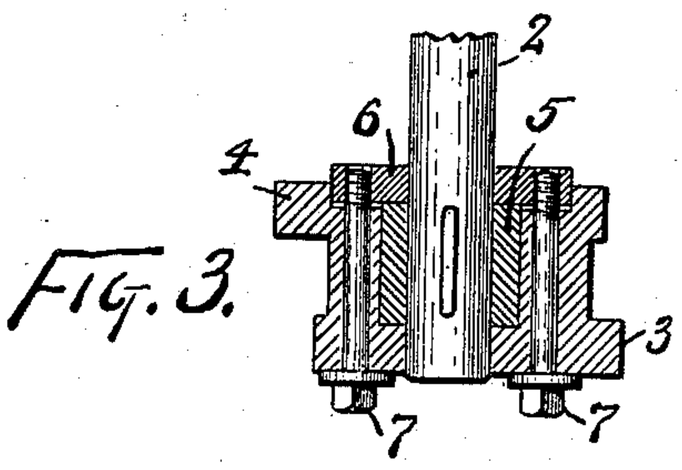

FIG. 3.

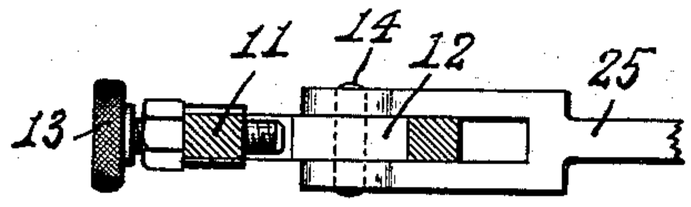

FIG. 4.

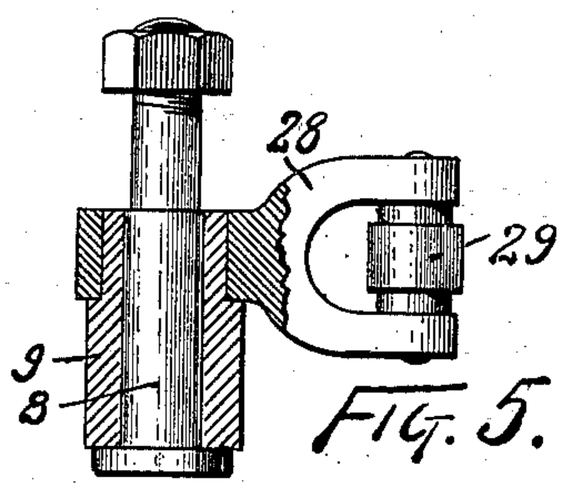

FIG. 5.

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UNITED STATES PATENT OFFICE.

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MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 651,828, dated June 19, 1900.

Application filed November 6, 1899. Serial No. 735,896. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER W. COPLAND, a citizen of the United States, residing at Boston, Suffolk county, Massachusetts, (post-office address 252 Massachusetts avenue,) have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

This invention pertains to improvements in mechanical movements having a variety of capacities, but intended principally for the conversion of continuous rotary motion into intermittent reciprocating motion at varying speed. An exemplifying utilization of the movement may be found in connection with cake and confection machines in which it is desirable to operate reciprocating valve-rods, plungers, or other parts at stated times and at varying speeds, the motion being derived from a continuously-rotating shaft.

My invention will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a device embodying my invention; Fig. 2, a plan thereof, parts appearing in horizontal section in the plane of line *a* of Fig. 1; Fig. 3, a diametrical section of the compound cam and its clamp in the plane of line *d* of Fig. 1; Fig. 4, a horizontal section of the main cam-arm in the plane of line *b* of Fig. 1, and Fig. 5 a horizontal section of the main cam-arm and supplementary cam-arm in the plane of line *c* of Fig. 1.

In the drawings, 1 indicates a fixed frame part; 2, a cam-shaft journaled therein and designed to have continuous rotary motion; 3, a peripheral cam secured to the cam-shaft, the peripheral contour of the cam being determined by the nature of the motion to be produced, as hereinafter more fully explained; 4, a second peripheral cam also secured to the cam-shaft alongside cam 3, the two cams forming together a compound cam and being preferably formed in one piece, as seen in Fig. 3, and adjustably secured to the cam-shaft, as will be explained; 5, a collar fast on the cam-shaft 2 and disposed within a counterbore in the compound cam, the fit of the compound cam upon the shaft and collar being such that the cam may turn upon the cam-shaft; 6, a clamp-collar loose upon the cam-shaft to the rear of collar 5, the front face of collar 6 impinging against the rear end of collar 5; 7, clamp-screws passing through the compound cam and screwing to clamp-collar 6 and serving as means by which collar 5 may be pinched between clamp-collar 6 and the front wall of the compound cam, thus clamping the cam rigidly to the cam-shaft in adjusted angular relationship; 8, a pivot with its axis parallel to that of the cam-shaft; 9, a cam-arm swinging on the pivot 8; 10, a roller carried by cam-arm 9 and engaging the periphery of cam 3; 11, an upward extension of cam-arm 9, horizontally slotted for the reception of a sliding block; 12, a block adapted to slide in the slot of extension 11; 13, an adjusting-screw in extension 11 at one end of the slot therein and adapted to limit or entirely restrict the sliding motion of block 12 in its slot; 14, a pivot carried by sliding block 12; 15, a pivot-shaft with its axis parallel to that of cam-shaft 2; 16, an arm mounted on pivot-shaft 15 and having a curved slot; 17, a toothed segment secured to the rear face of slotted arm 16, to one side of the slot therein; 18, a sleeve passing through the slot in arm 16 and having at its rear end a flange engaging against the rear face of the arm, the forward end of this sleeve projecting some distance forward of arm 16; 19, a pointer secured to the flange of sleeve 18 and projecting outwardly and forwardly to the front face of the arm to serve in indexing the position of the sleeve lengthwise in the slot; 20, a sleeve loose on the forward portion of sleeve 18, its rear end impinging against the front face of arm 16; 21, a nut screwed upon the front end of sleeve 18 and adapted to force sleeve 20 against arm 16, and thereby clamp sleeve 18 to the arm; 22, a spindle axially journaled in sleeve 18; 23, a pinion fast on the rear end of spindle 22 and gearing with toothed segment 17; 24, a handle on the forward end of spindle 22 to serve in turning the spindle and pinion; 25, a link pivoted at one end to pivot 14 of sliding block 12 and at the other end pivoted on sleeve 20; 26, an arm projecting from the hub of slotted arm 16; 27, a rod pivoted to the extremity of arm 16, this rod being the exemplifying element to which reciprocating motion is to be im-

parted; 28, a second cam-arm pivoted on the hub of cam-arm 9 and projecting substantially at right angles from cam-arm 9; 29, a roller mounted in the extremity of cam-arm 28 and engaging the periphery of cam 4; 30, a spur projecting upwardly from cam-arm 28; and 31 a set-screw engaging through a lug upon the rear face of cam-arm 9, its point impinging against spur 30.

The rotation of the compound cam will obviously impart positive oscillating motion to the cam-arms 9 and 28 and to extension 11 of cam-arm 9. Assuming set-screw 13 to be adjusted to entirely restrict the sliding motion of block 12, then it is obvious that the full motion of extension 11 will be imparted to arm 16 and corresponding reciprocating motion be imparted to rod 27: By loosening nut 21 and turning handle 24 the pivot at the right-hand end of link 25 may be adjusted to various radial distances from the center of shaft 15, thus permitting of an adjustment of the degree of stroke of rod 27 relative to the degree of motion produced by the cams. This adjustment also varies the degree of oscillation of arm 16, and the adjustment may be availed of, if desired, in determining the degree of rotatory motion imparted to pivot-shaft 15 in case that shaft is utilized for purposes other than that of a mere pivot for arm 16. If set-screw 13 be so adjusted as to permit more or less sliding motion of block 12 in the slot of extension 11, then the motion transmitted to arm 16 will be a corresponding degree less than the motion of extension 11 and intervals of rest will occur at the end of each swing of arm 16, and consequently at each end of each stroke of rod 27. By loosening bolts 7 the compound cam may be turned upon cam-shaft 2 and then reclamped, thus providing for the adjustment of the time of motion of the parts actuated by the cams relative to the time of motion of any other device which may happen to derive its motion from cam-shaft 2.

Such contour is to be given to cam 3 as will impart the desired outward motion to cam-arm 9. The contour of this cam 3 may be produced in any manner desired and modified as desired. After the contour of cam 3 is satisfactory then the contour of cam 4 must be made reciprocal to it—that is to say, for every position of roller 10 as produced by the rotation of cam 3 roller 29 must find a bearing-point upon cam 4, whose contour must be formed accordingly. Set-screw 31 serves as a means for adjusting roller 29 relative to roller 10 so as to avoid lost motion. The contour of cam 3 having been produced satisfactorily, the giving of cam 4 a reciprocal contour involves an exceedingly-simple process. The compound cam, the contour of cam 3 being finished and the contour of cam 4 being unfinished, is mounted for rotation and equipped with the cam-arms and roller 10, the latter engaging the periphery of cam 3. A milling-cutter is put in the place of roller 29. Rotary cutting motion being given to the milling-cutter and rotary feeding motion being given to the compound cam, the periphery of cam 4 becomes milled in reciprocal correspondence with that of cam 3.

I claim as my invention—

1. In a mechanical movement, the combination, substantially as set forth, of a rotary cam-shaft, a cam thereon, a pivot with its axis parallel with the cam-shaft, a cam-arm mounted on said pivot and engaging said cam and provided with a slot, a block adapted to slide in said slot as the cam-arm rocks, a pivot carried by said block, and a link connected with said pivot.

2. In a mechanical movement, the combination, substantially as set forth, of a rotary cam-shaft, a cam thereon, a pivot with its axis parallel with the cam-shaft, a cam-arm mounted on said pivot and engaging said cam and provided with a slot, a block adapted to slide in said slot as the cam-arm rocks, a pivot carried by said block, a link connected with said pivot, and a set-screw in said cam-arm at one end of the slot therein adapted to adjustably limit the sliding motion of the block in the slot.

3. In a mechanical movement, the combination, substantially as set forth, of a rotary cam-shaft, a cam thereon, a pivot with its axis parallel with the cam-shaft, a cam-arm mounted on said pivot and engaging said cam, a second pivot with its axis parallel with the cam-shaft, an arm mounted on said second pivot and provided with a curved slot, a toothed segment secured to said slotted arm, a hollow pivot engaging said curved slot, a clamp-nut upon said hollow pivot for clamping said pivot in selected position in said slotted arm, a spindle journaled in said hollow pivot, a pinion mounted on said spindle and engaging said toothed segment, means for turning said spindle, and a link connecting said hollow pivot and said cam-arm.

4. In a mechanical movement, the combination, substantially as set forth, of a rotary cam-shaft, a compound peripheral cam, as described, secured thereon, a pivot with its axis parallel with the cam-shaft, a pair of united cam-arms mounted on said pivot and engaging said cams respectively and having a slot, a block fitted for sliding motion in said slot as the cam-arm rocks, a pivot carried by said block, a screw in said cam-arm at one end of said slot for limiting the sliding motion of the block in the slot, a second pivot with its axis parallel with the cam-shaft, an arm mounted on said second pivot and having a curved slot, a pivot adjustable in said curved slot, and a link connecting said last-mentioned pivot and the pivot carried by the sliding block.

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