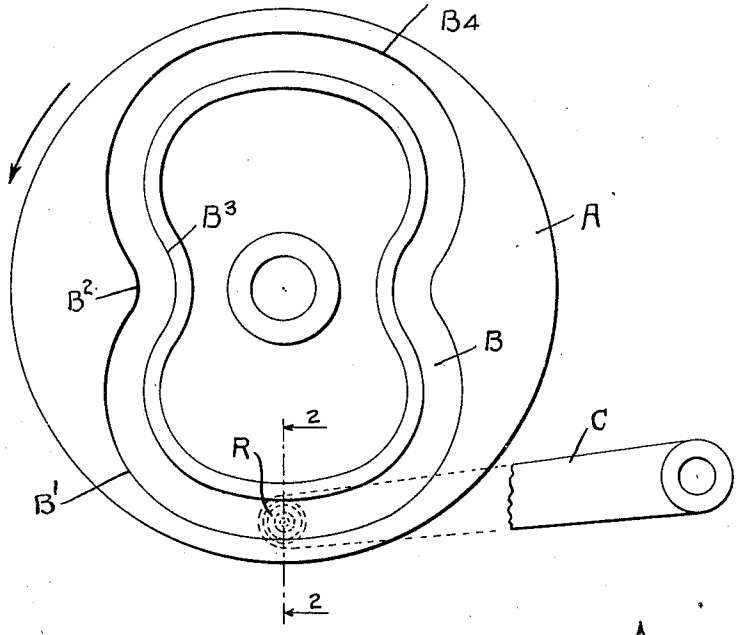
H. HARTT.

CAM.

APPLICATION FILED APR. 15, 1907.

916,702. Patented Mar. 30, 1909.

FIG. 1.



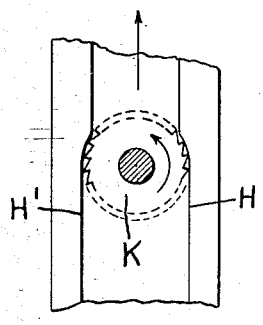


FIG. 3.

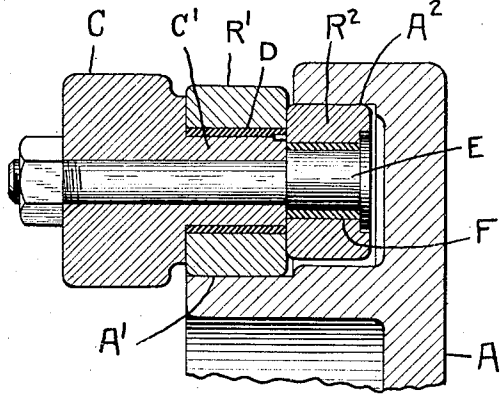


FIG. 2.

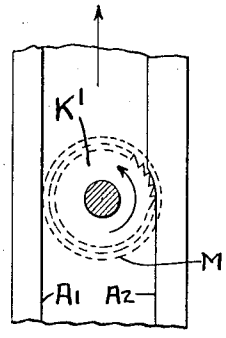


FIG. 4.

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CAM.

No. 916,702. Specification of Letters Patent. Patented March 30, 1909.

Application filed April 15, 1907. Serial No. 368,284.

To all whom it may concern:

Be it known that I, HENRY HARTT, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Cams, of which the following is a specification.

My invention relates to cams and has for its object improvements in the same.

In the accompanying drawings—Figure 1 is an elevation of an ordinary grooved cam operating upon a rock-arm; Fig. 2 is a section on line 2—2 of Fig. 1 showing the construction of the cam groove and rolls; Fig. 3 shows the ordinary method of milling the groove of a cam, the purpose of which is to illustrate one of the defects which I overcome; and Fig. 4 is the method which I employ of making the cut which is defective in the ordinary process.

In the said drawings A is an ordinary rotating body moving in the direction of the arrow of Fig. 1, and having a cam-groove B in which operates the roll R on the rock arm C. The real object of my invention will be better understood by a preliminary discussion of the defects of the devices of Fig. 1 as ordinarily made.

In machinery requiring a comparatively high degree of accuracy, cam-grooves like B of Fig. 1 are milled by a templet so that both faces are finished, and the roll R is a comparatively close fit in the groove. With the cam moving in the direction of the arrow the strain is along the curve B^1. Owing to the rolling action there is comparatively little wear along the curve B^1, but when the point B^2 arrives at the roll R the said roll is thrown from the outer surface of the cam-groove to the inner surface, striking the inner surface at the point B^3. The force of this blow depends upon the abruptness of the change in the curve of the cam, the speed at which the cam moves, and the weight which is driven by the vibrations of the roll R. This causes a wear to occur at the point B^3 and at similar points adjacent to each reversal of motion. It also causes wear on the roll R. Another and more serious cause of wear on both roll and cam comes as a result of the reversal of the rotary motion of the roll when shifting from one side to the other of the cam groove. While moving along the curve B^1 the roll turns in a contra-clockwise direction but when it strikes at B^3 it is reversed to a clockwise rotation.

For various practical reasons rolls are made comparatively heavy and the reversal of their rotation is not instantaneous, and the result is that the surface of the roll rubs and grinds at the point B^3. The amount of this grinding action depends largely upon the velocity with which the roll R rotates and this increases with the radius of the cam-groove. At the point B^4 the grinding action is greater and the pounding action is less than at B^3. As a result of these actions cam-grooves and rolls soon lose the accuracy of their fits, and when wear is once fairly started it grows with increasing rapidity. I overcome this pounding action and the grinding action due to the reversal of the roll rotation by the construction shown in Fig. 2. In this case the rock-arm C carries two rolls R^1 and R^2, which are preferably of different diameters, and the groove surfaces A^1 and A^2 are on different planes to match the rolls R^1 and R^2. The roll R^1 preferably rotates upon a fixed sleeve or bushing D secured to a hub C^1 formed solid with the rock-arm C. The roll R^2 rotates upon a pin E and may or may not have a loose bushing F. The object of the boss or hub C^1 is so that the pin E will not have too great an overhang from the arm C, and the object of the sleeve or bushing D is to prevent wear on the hub C^1. When wear occurs on the bushing D it may be removed and another substituted without requiring a new rock-arm, which would be the case if wear occurred directly upon the hub C^1.

In cutting ordinary cam-grooves, the rough casting is secured in position and the travel of the rotary cutter with respect thereto is determined by a previously constructed templet. The manner in which a cutter K cuts one of these cam-grooves is illustrated in Fig. 3. It is a well known principle in mechanics that for a cutter to leave a finely finished surface the cutter must "cut against the feed." To cut with the feed causes the cutter to chatter and leave a wavy or uneven surface. When a cutter cuts both sides of a groove at once it is obvious that it can run in the proper direction with respect to only one of those sides. Thus, in Fig. 3, the cutter K rotating in the direction of the curved arrow and moving in the slot in the direction of the straight arrow, runs correctly with respect to the surface H but incorrectly with respect to the surface H^1. The result is that the cutter chatters on the surface H^1 causing that surface to be uneven, and by action through the

cutter, causing the surface H to also be uneven.

When cams are cut according to my invention, I cut the surface A^1 (Figs. 2 and 4) first, the cutter being guided by the ordinary templet, and the cutter being rotated in the proper direction. After this is done I cut the surface A^2, rotating the cutter in the opposite direction. In making this last cut I use a roll M (shown in dotted lines in Fig. 4) which rolls on the surface A^1, thus causing the surface A^1 to be a templet for cutting the surface A^2. When thus made, both surfaces are more even and finely finished than they are when cut in the ordinary method. When a roll operates alternately on opposite sides of a cam-groove, the roll must be loose in the groove so that when it operates on one side it will not rub or touch the other side. This preliminary looseness is the starting point of wear, and wear progresses in proportion to the amount of looseness. When each surface has its independent roll, as shown in Fig. 2, these rolls may fit snugly enough to cause each roll to be in rolling contact with its respective surface at all times. This removes the pounding action before mentioned and leaves only variations of pressure at different points on the cam curve. It also removes the grinding action due to reversing the rotation of the roll two or more times for each rotation of the cam.

What I claim is:—

1. The combination with a cam providing two cam surfaces, and a body provided with a hub and arranged to be moved by said cam, of a roller mounted upon said hub and so located as to engage one cam surface, a pin extending centrally through said hub, and a second roller mounted upon said pin and so located as to engage the other cam surface.

2. The combination with a cam providing two cam surfaces, and a body provided with hub and arranged to be moved by said cam, of a sleeve fixed upon said hub, a cam-roller mounted to rotate upon said sleeve, a pin passing centrally through said hub, and a second cam roller mounted upon said pin, said rollers being arranged so as to each act solely upon one cam surface, substantially as described.

3. The combination with a cam providing two cam surfaces, an arm to be moved by said cam, and a pin extending through a hub on said arm, of two rollers mounted upon a common axis, one of said rollers being mounted on said hub and the other roller mounted upon said pin.

4. The combination with a cam having the faces of its groove in different planes, a body to be moved by said cam, and a pin secured to said body, of independently rotatable rollers, one for each surface, one of the rollers being mounted upon a hub integral with the body to be moved and the other roller mounted upon said pin.

Signed at Chicago, Ill., this 4th day of April 1907.

HENRY HARTT.

Witnesses:
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