No. 810,353. PATENTED JAN. 16, 1906.

B. SALZER & G. WALTHER.

VARIABLE CAM.

APPLICATION FILED NOV. 11, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

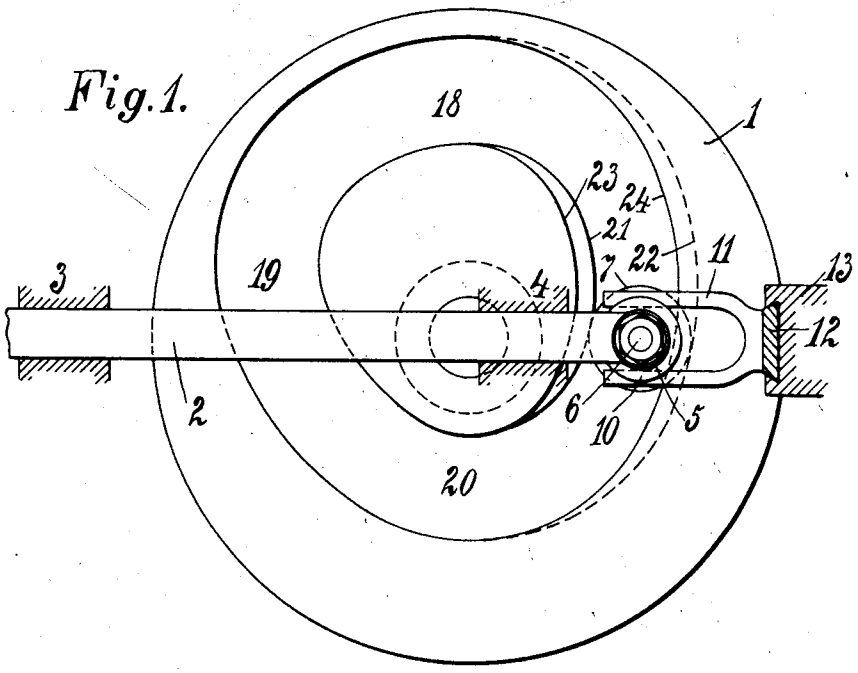


Fig. 2.

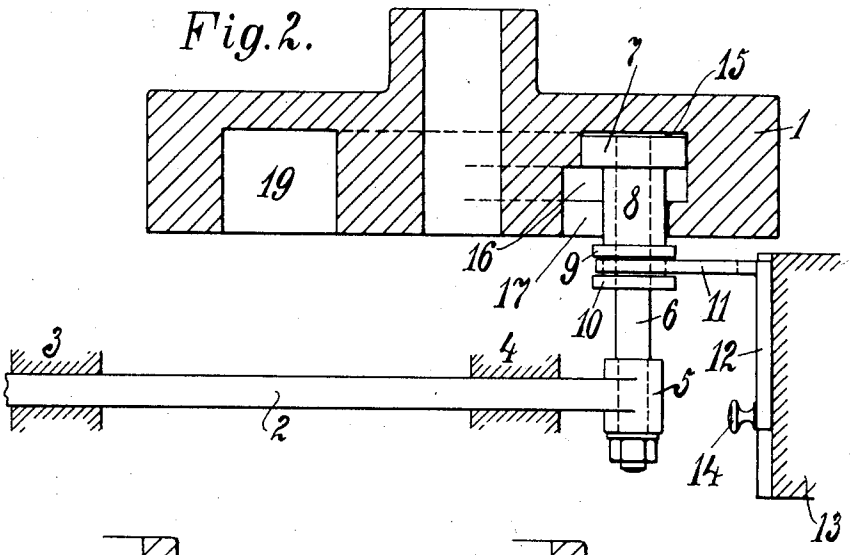


Fig. 3.

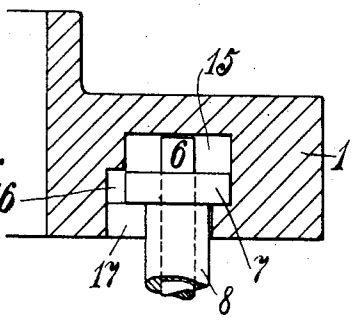
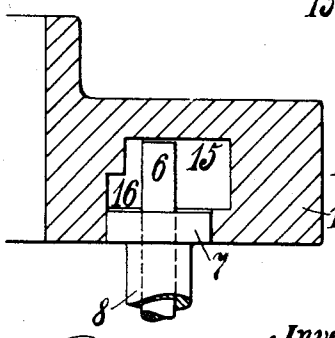


Fig. 4.



Witnesses.

F. Heere

Inventors

Bruno Salzer and
Gustav Walther
by B. Singer Atty.

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2 SHEETS—SHEET 2.

Fig. 5.

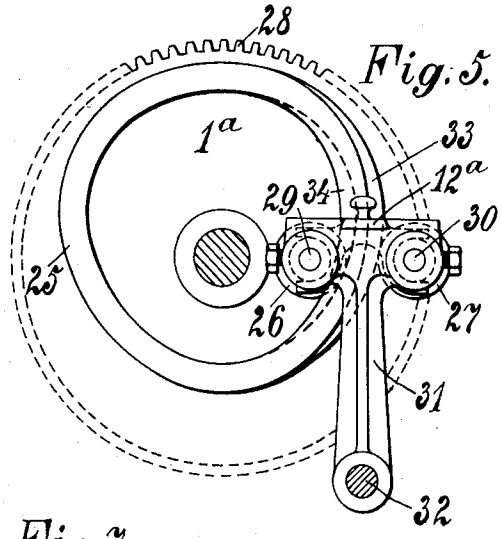


Fig. 6.

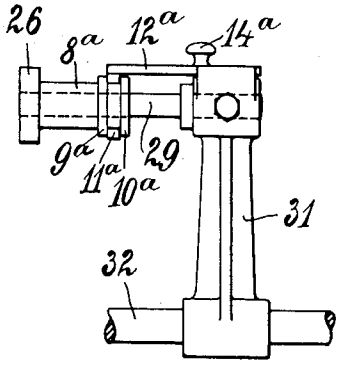


Fig. 7.

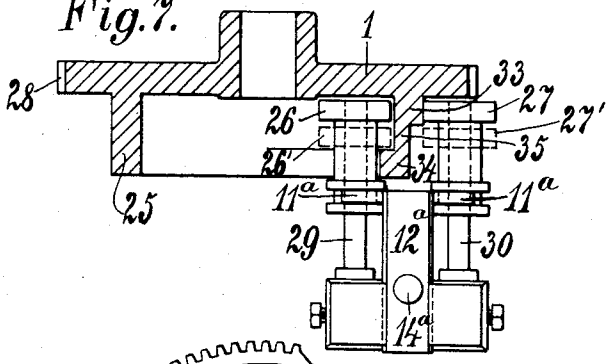


Fig. 8.

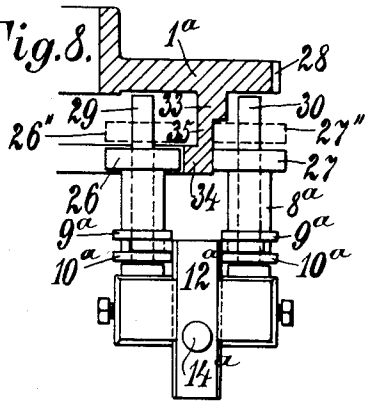


Fig. 9.

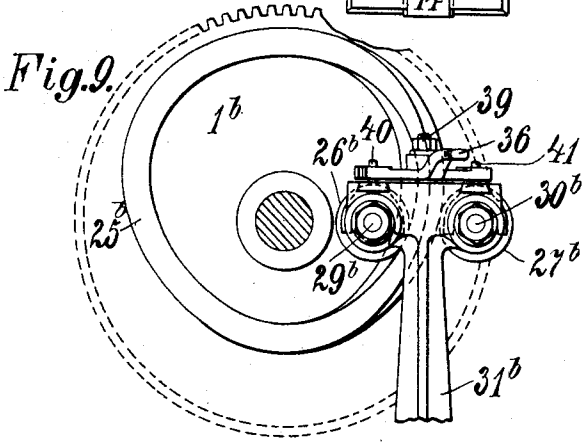


Fig. 10.

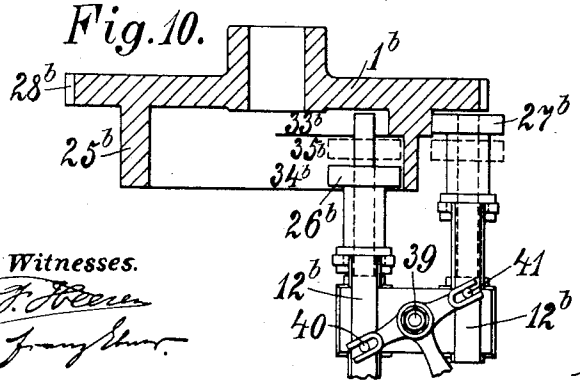
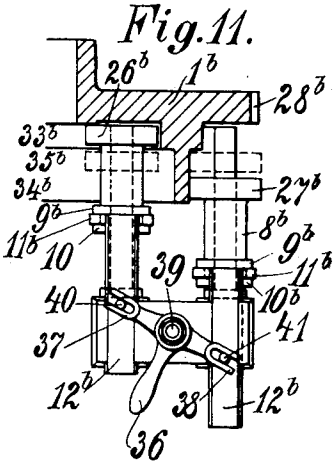


Fig. 11.



Witnesses.

F. Weeren

Inventors

Bruno Salzer and

Gustav Walther

by B. Singer Atty.

UNITED STATES PATENT OFFICE.

BRUNO SALZER AND GUSTAV WALTHER, OF CHEMNITZ, GERMANY.

VARIABLE CAM.

No. 810,353. Specification of Letters Patent. Patented Jan. 16, 1906.

Application filed November 11, 1904. Serial No. 232,316.

To all whom it may concern:

Be it known that we, BRUNO SALZER and GUSTAV WALTHER, subjects of the German Emperor, residing at Chemnitz, in the Kingdom of Saxony and Empire of Germany, have invented certain new and useful Improvements in Variable Cams, of which the following is a specification.

This invention relates to a variable cam for converting a rotary motion into a variable alternate motion.

In the annexed drawings three forms of construction are represented, Figures 1 to 4 illustrating the first form, Figs. 5 to 8 the second one, and Figs. 9 to 11 the third one. Fig. 1 is a front view of the cam with the motive mechanism. Fig. 2 is a top view thereof, representing a section through the center of the cam-shaft. Figs. 3 and 4 are repetitions of a part of Fig. 2 at other positions of operation. Fig. 5 is a front view of another cam with the motive mechanism. Fig. 6 is a side view of the motive mechanism seen from the left—to wit, without the cam. Fig. 7 is a horizontal section through the center of the cam-shaft. Fig. 8 is a repetition in another position of operation. Fig. 9 is a front view of the cam with the motive mechanism. Fig. 10 is a horizontal section through the center of the cam-shaft; and Fig. 11 is a horizontal section of the parts shown in Fig. 5, taken through the rollers.

In Figs. 1 to 4, 1 is the improved cam, the other parts representing the motive mechanism being well known. The cam 1 is keyed to a shaft continuously rotated by means of a motor or the like. (Not shown in the drawings.) 2 is a slide journaled in the bearings 3 4, adapted to be moved to and fro. At its end at 5 this slide 2 is rigidly attached to the cylindrical rod 6, provided with a roller 7, adapted to rotate and move to and fro thereon, integral with the neck 8 and two shoulders 9 10. Fixed to said slide 2 is a fork 11, engaging between the shoulders 9 10. The slide 2 is arranged in the fixed machine-frame adapted to be moved to and fro and provided with a knob 14 for moving the slide 2 and fork 11 by hand to and fro. The cam 1 is provided with three grooves 15 16 17, partly covering each other, so that they appear as a single groove of threefold depth. In Fig. 1 this part of the groove is marked 18 19 20. The remaining part of these grooves is different, and at 18 and 20 they commence to deviate from one another. The hindmost groove 15 is limited by the two curves 21 22, the center one, 16, by the curves 23 22, and the foremost groove by the curves 23 24.

The curves 15 and 17 are the real operating-curves serving for the purpose of providing the slide 2 with a fixed alternate motion. As long as the roller 7 is adjusted as shown in Fig. 2 the movements of the slide 2 are regulated by the form of the curve 15. However, when the roller 7 is moved by hand so far as to occupy the position in Fig. 4 the movements of the slide 2 must take place in a way regulated by the form of the curve 17.

In former mechanism applied for the same purpose the cam 1 was formed in such a manner that the groove 17 was situated next to the groove 15, while the groove 16 was omitted altogether. In consequence thereof fractures were apt to occur when the roller 7 was to be moved from one curve into the other by means of the knob 14. This danger only then was unable to occur on the removal of the roller 7 being effected at a moment when it was at that part of the grooves in Fig. 1 marked 18 19 20, for in this part the grooves coincide completely and the roller may be moved to and fro at lease. However, the danger referred to at all means would turn up every time the roller was removed at the moment the spot 18 or the spot 20 of the two grooves was moved past the roller 7, for in this case the roller 7 was in some respect caught in a similar manner as between a pair of scissors, and in consequence thereof the machine was forced to stand still or a fracture was to take place.

For the purpose of doing away with this frequent danger we have inserted or provided a third groove 16 between the two operating-grooves 15 and 17. This third groove we designate as the "neutral zone," and it has no real operating purpose, but serves only for providing a safe place for the roller 7 till it may be completely moved over into the other operating-curve.

As is to be clearly seen from Fig. 2, it is also possible to move the roller 7 in this position, Fig. 2, from the operating-groove 15 into the neutral zone 16. This movement is represented in Fig. 3. When the cam 1 has revolved so far that perhaps the spot 17 of the groove is above the roller 7, the latter may be completely moved over into the groove 17.

In the reverse case represented in Fig. 4—

to wit, when the roller 7 is in the groove 17—then it may be moved over into the neutral zone 16 at any moment, and when the cam 1 has revolved so far that the spot 19 passes over the roller 7 it may be completely moved over into the other operating-groove 15.

In the form of construction represented in Figs. 5 to 8 the cam 1^a, which may be fixed to the shaft, is not provided with a groove in which a single roller is to be moved to and fro, but with a ring 25, on the inner face of which a roller 26 and on the circumference of which a roller 27 is rotatably arranged. On the circumference of the cam 1^a teeth 28 are indicated. These teeth serve for the purpose of rotating the cam 1^a and the ring 25 by means of a second pinion. (Not shown in the drawings.) The two rollers 26 27 are loosely arranged on cylindrical pivots 29 30 and adapted to be moved to and fro thereon. These two pivots are rigidly fixed to a lever 31 at a certain distance from one another, and the lever 31 is rigidly attached to the fixed shaft 32, which may be provided with other mechanism to be moved to and fro according to the form of the ring 25. On the free end of the lever 31 and between the two pivots 29 30 a slide 12^a, provided with a handle 14^a and with a fork 11^a, is movably arranged, serving for the same purpose as the parts 11 12 14 in Figs. 1 and 2. The fork 11^a engages between the two shoulder-rings 9^a 10^a, integral with the neck 8^a and roller 6. This form of construction differs from Figs. 1 2 solely in the fact that on account of the provision of two rollers 26 27 in Figs. 5 to 8 also two forks 11^a and 11^a, integral with the slide 12, are used. Therefore if the slide 12^a is moved to and fro by means of the knob 14^a both rollers 26 and 27 also must perform a similar movement simultaneously therewith.

Like the construction in Figs. 1 to 4, where two operating-grooves 15 17 and one neutral zone were provided, two operating-rings 33 34 and one neutral zone 35 are arranged here also.

When the two rollers 26 27 have the position shown in Fig. 7, they may be easily moved into the position 26′ 27′, (indicated by dotted lines,) and when the cam has revolved so far that the part of the ring designated in Fig. 5 as 25 is between the two rollers 26 27 the latter may be completely moved over onto the other operating-ring 34.

If the two rollers 26 27 are in the position indicated in Fig. 8, they may be moved at any time into the position 26″ 27″, (indicated by dotted lines,) and when the cam 1 has revolved so far that the part 25 of the ring is between the two rollers the latter may be completely moved onto the hindmost operating-ring 33 again.

In the third form of construction, Figs. 9 to 11, the mechanism is about the same as in Figs. 5 to 8. The sole difference consists in the fact that the two rollers 26^b 27^b are not uniformly moved forward or uniformly backward, but always are changed in opposite direction—*i. e.*, when the one roller 27^b is on the back operating-ring, as indicated in Fig. 10, the other roller 26 moves on the front operating-ring 34^b, and, on the contrary, when the exterior roller 27^b is on the front operating-ring 34^b, Fig. 11, the interior roller 26^b is in the back operating-ring 33^b. However, in the neutral zone the rollers 26^b and 27^b are opposite one another, as shown in Figs. 10 and 11 in dotted lines.

For the purpose of changing the two rollers 26^b and 27^b the three-armed lever 36 37 38 is pivoted on the pin 39, which latter is fixed to the top end of the lever 31. The two lever-arms 37 38 are bifurcated and engage a pin 40 41, respectively, attached to the two slides 12^b. Consequently if the two rollers 26 27 are to be moved from one position into the other the lever 36 is seized by hand and moved from the position Fig. 11 into the position Fig. 10, or vice versa.

Having now fully described our invention, we declare that what we claim is—

1. A cam provided with offset operating-surfaces and intermediate switching-surfaces, offset and coincident with said operating-surfaces, and a member adapted for engagement with said switching-surfaces in passing from one operating-surface to the other.

2. A cam provided with offset operating-surfaces and intermediate switching-surfaces, offset and coincident with said operating-surfaces, all of said surfaces terminating in a coincident surface, and a member adapted for engagement with said switching-surfaces in passing from one operating-surface to the other.

3. A closed cam provided with offset operating-grooves and an intermediate switching-groove, offset and coincident with the operating-grooves and relatively enlarged with respect thereto, and a roller loosely coöperating with said intermediate groove in passing from one operating-groove to the other.

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

BRUNO SALZER.
GUSTAV WALTHER.

Witnesses:
MORRIS LIPMAN,
FREDERICK J. DIETZMAN.