

July 11, 1933.

P. E. KLOPSTEG

1,917,847

SPARK APPARATUS

Filed May 22, 1929

Fig. 3

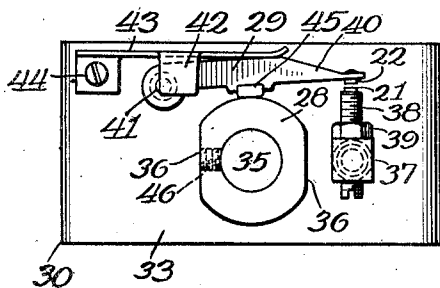
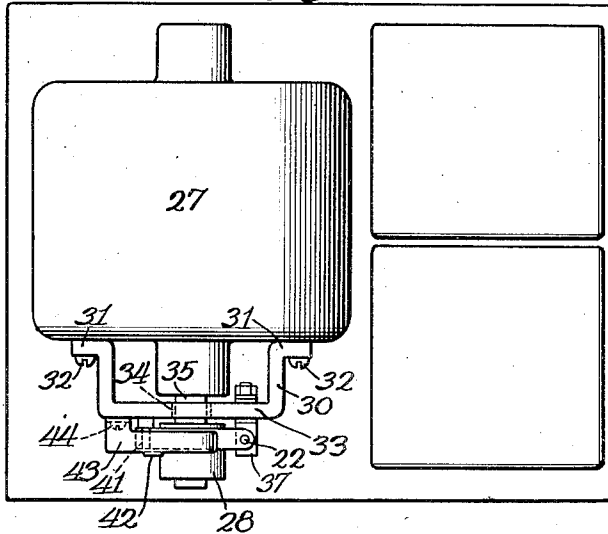


Fig. 4

Fig. 2

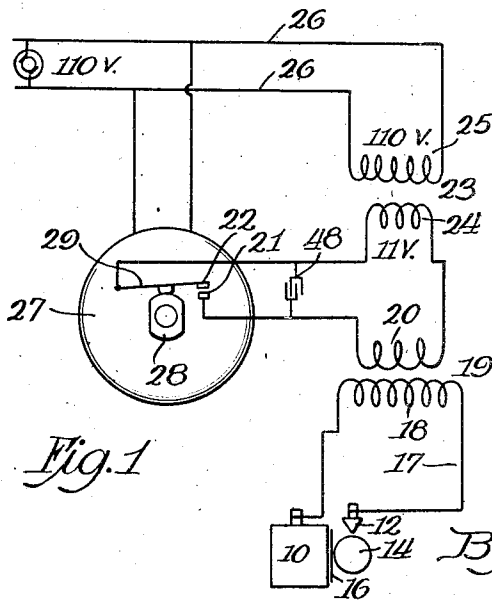
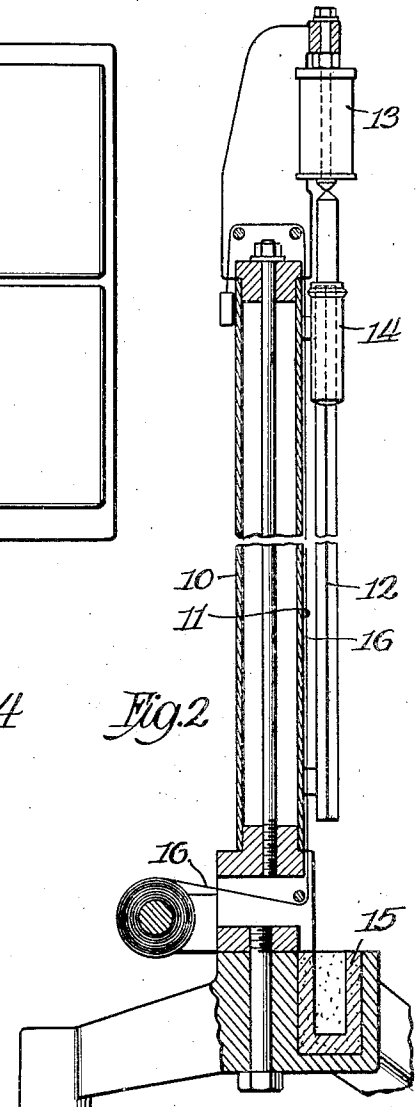


Fig. 1

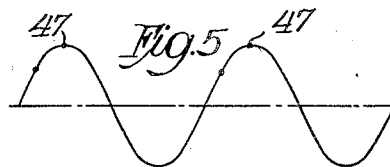


Fig. 5

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SPARK APPARATUS

Application filed May 22, 1929. Serial No. 365,156.

The principal objects of this invention are to provide simple apparatus for delivering electrical sparks at equal intervals, especially adapted for spark recording in acceleration experiments, to eliminate the uses of brushes in the circuit to be interrupted, and to give a wide selection of timed sparks with a circuit controlled by a synchronous motor.

Further objects and advantages of the invention will be revealed as the disclosure proceeds and the description is read in connection with the accompanying drawing in which

Fig. 1 is a diagrammatic view illustrating the apparatus embodying the invention as applied to free fall apparatus invented by Leo Behr;

Fig. 2 is a vertical section of the Behr apparatus;

Fig. 3 is a plan view of a unit including a synchronous motor, a transformer and a spark coil, as illustrated in the diagram of Fig. 1;

Fig. 4 is an elevation of the circuit breaking apparatus, and

Fig. 5 is a diagram of alternating current corresponding to one revolution of a four pole synchronous motor used in the circuit breaker.

This specific illustration and the correspondingly specific description are used for the purpose of disclosure only, and it is realized that the invention may be embodied in other forms and put to other uses.

The Behr free fall apparatus is disclosed on pages 12 and 13 of Supplement to Catalog F, No. 123, Central Scientific Company, Chicago, Illinois, copyright 1927, and is now too well known to make a specific description desirable.

The apparatus includes a column 10 of conducting material having an insulating coating, except for a narrow strip 11; a triangular conductor 12 supported upon, but insulated from, the column 10; a magnet 13 supported from the top of the column; a drop 14 adapted to be supported by the magnet and released to fall along the conductors to a receiving butt 15; and a record sheet 16 extending along the face of the column 10 and adapted to be

perforated at equal intervals of time as the drop passes from the magnet to the butt.

The column 10 and the bar 12 are connected in a high potential circuit, generally indicated by 17 in Fig. 1, and including the secondary 18 of a spark coil 19.

As constructed according to Behr, the primary 20 of the spark coil was connected in a circuit including a condenser which was alternately charged and discharged by the action of a rotating switch operated by a synchronous motor. According to this invention the primary 20 is in a circuit including a source of alternating current and two contacts 21 and 22, which are closed and opened at suitable points in the phase to cause the sparks to pass from the bar 12 to the drop 14 and from the latter to the column 10.

In the diagram shown in Fig. 1, it is assumed that no coil 19 capable of taking 110 volts, or other commercial A. C. current, is available, and for that reason a step-down transformer 23 has its secondary 24 in circuit with the primary 20 of the spark coil, and its primary 25 connected across the line 26. Of course, where a suitable spark coil and supply of the current are available, the transformer will be eliminated.

The contact points 21 and 22 are here controlled by a circuit breaker including a synchronous four-pole motor 27, driving a cam 28, which cooperates with a pivoted switch lever 29.

The preferred physical form of circuit breaker is best illustrated in Figs. 3 and 4. A yoke-shaped bracket 30 has its flanges 31 bolted at 32 to the casing of the motor 27. The intermediate portion of the bar 33 of the bracket is perforated at 34 to receive the shaft 35 of the motor. And the shaft projects through the perforation a sufficient distance to accommodate a cam 28, here illustrated as having two flat surfaces 36. A post 37 fixed to the bracket 30 has a screw 38 bearing the contact 21 and locked in adjusted position by a nut 39. The contact 22 is carried by the free end 40 of the switch lever 29 which is fulcrumed on a pin 41 projecting from the bracket 30 and is held in place by the flange 42 on the leaf spring 43, fixed

to the bracket at 44. The lever is provided with a wear surface of vulcanized fiber 45 adapted to bear on the cam 28, which latter is adjustably fixed to the shaft 35 by a screw 46.

5 By adjusting the screw 38 the contacts can be set so as to be separated each time the rounded face of the cam bears on the wear surface 45 of the lever, and to be closed when a flat surface 36 is turned towards the wear
10 surface 45 and the spring 43 forces the lever downwardly in Fig. 4. And by adjusting the cam 28 on the shaft 35 the circuit can be broken at the peak of the wave 47, as illustrated in the diagram, Fig. 5, and thereby get
15 the maximum potential in the circuit 17.

With the four-pole motor and the cam having two flat faces, as illustrated in Figs. 3 and 4, a spark period suitable for certain acceleration experiments will be had. By
20 changing the number of faces on the cam and the number of poles to the motor a variety of periods may be had.

With the spark points adjusted substantially as illustrated in Fig. 4, and the apparatus
25 connected as illustrated in Figs. 1 and 2, the magnet 13 is energized, the drop 14 is placed in the position shown in Fig. 2, the motor 27 is started and sparks begin jumping, first from the bar 12 to the drop 14, and then from
30 the drop 14 to the column 10 at the uninsulated strip. The magnet 13 is then de-energized and the drop 14 falls to the butt 15, while the sparks continue to pass, as stated,

whereby a series of perforations is made in the record strip 16 from which the desired numerical data can be obtained.

In order to protect the contacts 21 and 22 from burning, a condenser 48 may be connected, as shown in Fig. 1. 70

The apparatus eliminates the rotating switch and the charging and discharging of the condenser as used in the Behr apparatus, and substitutes therefor a simpler and more
75 advantageous manner of operating the spark coil.

I claim as my invention:—

In a device of the class described, a pair of spaced vertical conductors, a drop, means to support the drop in a position to fall when released, alongside the conductors, and means for creating a high potential difference between the conductors at equal intervals of time comprising a spark coil having its secondary connected with the vertical conductors, a low potential circuit including the primary of the spark coil and a switch, and means for controlling the circuit including a synchronous motor and an angularly adjustable cam driven by the motor and cooperating with the switch to break the low potential circuit at the peak of the wave, the synchronous motor and the primary of the spark coil being energized from a common source of alternating current. 80 85 90 95

In testimony whereof I affix my signature.
PAUL E. KLOPSTEG.

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