Sept. 6, 1927. 1,641,370

C. E. BERKDOLL

TIMER DISTRIBUTOR MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed July 11, 1924 2 Sheets-Sheet 1

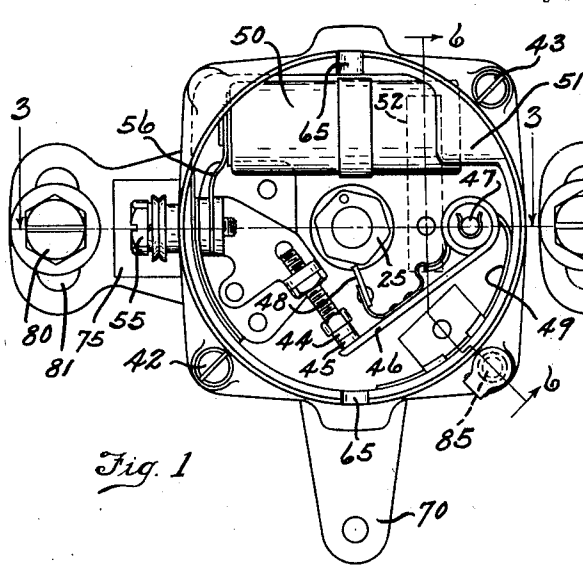


Fig. 1

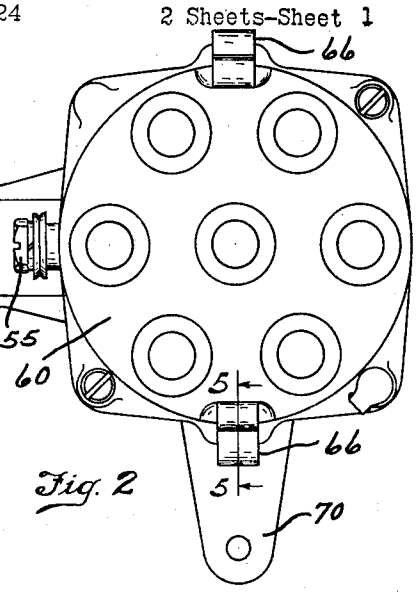


Fig. 2

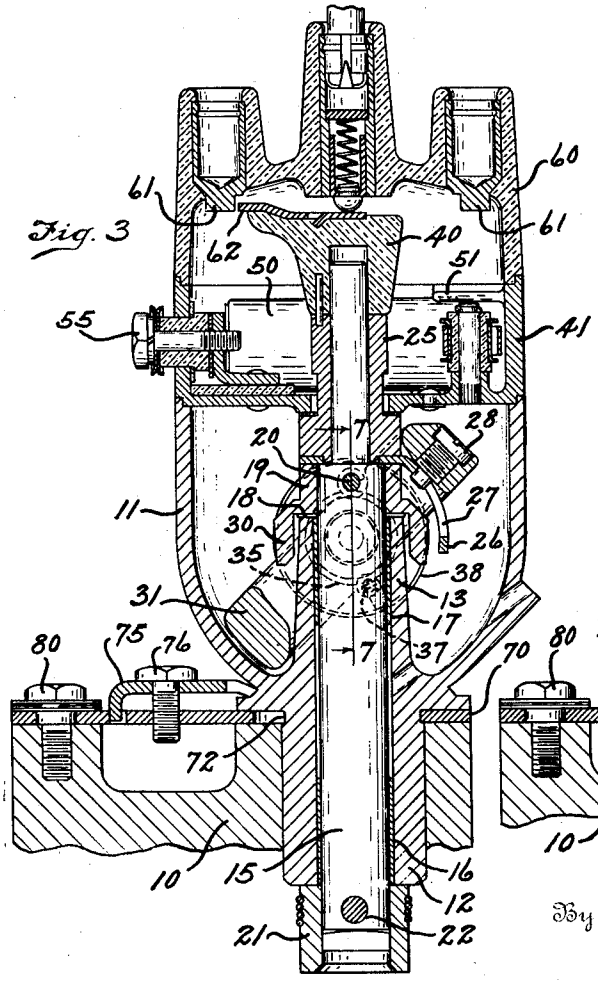


Fig. 3

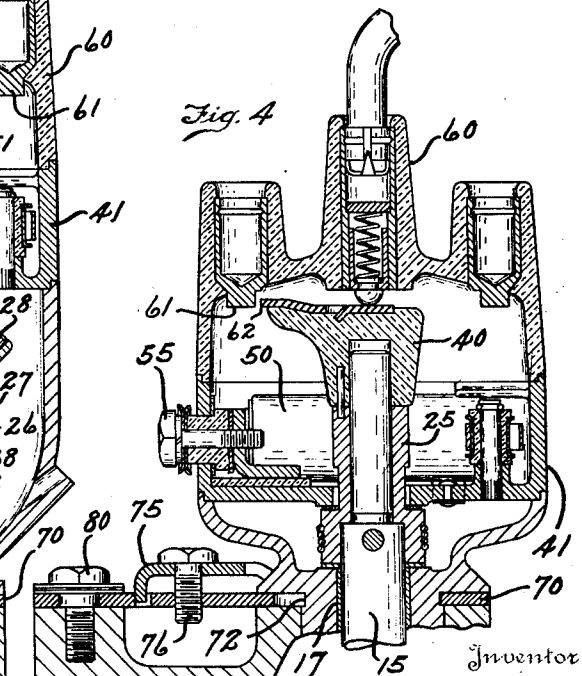


Fig. 4

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TIMER DISTRIBUTOR MECHANISM FOR INTERNAL COMBUSTION ENGINES

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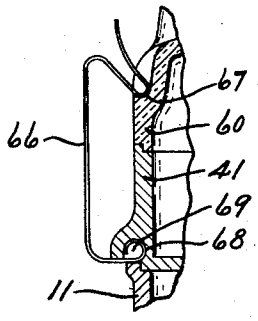


Fig. 5

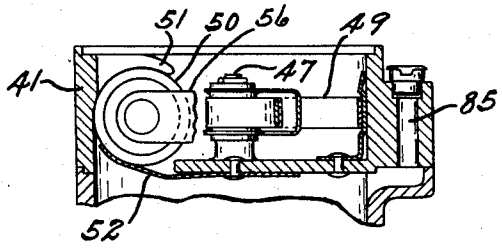


Fig. 6

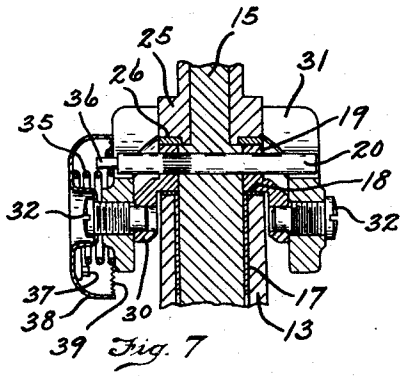


Fig. 7

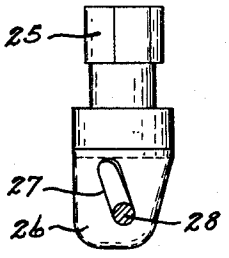


Fig. 8

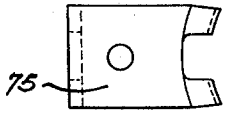


Fig. 11

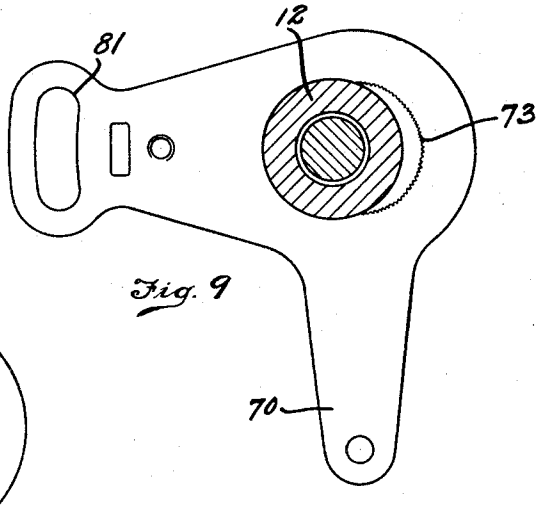


Fig. 9

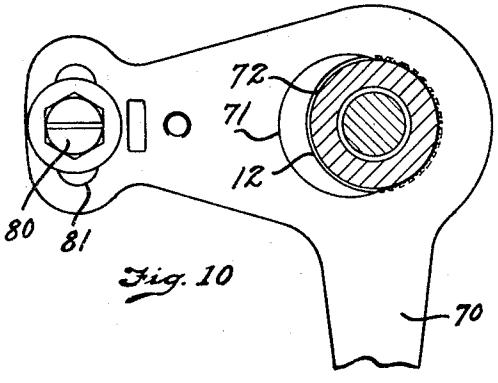


Fig. 10

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Patented Sept. 6, 1927. 1,641,370

UNITED STATES PATENT OFFICE.

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TIMER DISTRIBUTOR MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 11, 1924. Serial No. 725,513.

This invention relates to the timer distributor mechanism for the ignition system of an internal combustion engine.

One of the objects of this invention is to provide a very simple and efficient form of automatic spark advance mechanism, which is economical to manufacture and assemble, occupies a minimum of space, and is quickly adjustable to give varying degrees of spark advance for a predetermined engine speed. Another important feature of this automatic advance mechanism is its overlapping relation with the supporting bearing for the drive shaft which drives the timer cam. This design permits the timer cam to be mounted upon the drive shaft quite close to the supporting bearing. By thus reducing the amount of overhang between the bearing and cam the tendency toward lateral vibration or "wobble" of the cam is overcome. Of course for uniform operation of the primary circuit interrupter at all speeds it is necessary that there be no vibration in the timer cam.

Another object of the invention is to provide an improved means for assembling and clamping the manual lever to the timer housing in any desired position.

Another object is to provide improved quickly releasable mounting means for mounting the condenser within the timer housing.

Another object is to provide improved and simplified means for anchoring in place the lower end of the spring clips used for detachably holding the distributor head on the timer housing.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of a timer distributor mechanism built according to this invention but with the distributor head and rotor removed.

Fig. 2 is a view similar to Fig. 1 but with the distributor head in position and held by the two diametrically disposed spring clamps.

Fig. 3 is a vertical section on line 3—3 of Fig. 1 and shows in particular the automatic spark advance mechanism for advancing the position of the timer cam relative to its drive shaft according to the engine speed.

Fig. 4 is a view similar to Fig. 3, but shows a modification wherein the automatic spark advance mechanism is omitted. A comparison of Figs. 3 and 4 shows the slight increase in the amount of overhang between the top drive shaft bearing and the timer cam due to the addition of the automatic advance mechanism.

Fig. 5 is a detail view showing the simplified means for anchoring in place the lower end of the spring clips for holding the distributor head in place.

Fig. 6 is a section on line 6—6 of Fig. 1 and shows in particular the means for clamping the condenser in place in the timer housing.

Fig. 7 is a section on line 7—7 of Fig. 3 and shows the means for adjusting the degree of spark advance for a predetermined engine speed.

Fig. 8 is a detail view of the timer cam unit having rigidly secured thereto the depending advance cam member which coacts with the centrifugal ring to advance the timer cam.

Figs. 9, 10 and 11 are views showing the manual advance lever and means for assembling it upon the timer housing and clamping it rigidly thereto in any desired position. Fig. 9 shows how the enlarged aperture in the manual lever may be slipped over the lower end of the housing to its proper place at the annular groove in the housing; Fig. 10 illustrates the manual lever moved laterally in the annular groove in the housing so that the serrations on one side of the aperture in the lever engage the housing; and Fig. 11 is a detail of the clamping member which is screwed to the manual lever as clearly shown in Fig. 3 to hold the serrated portion of said lever in tight engagement with the housing.

In the drawings similar reference characters refer to similar parts throughout the several views.

Numeral 10 designates a stationary part of the engine which serves as a rigid support and bearing for the entire timer distributor unit. This unit is divided in three parts, namely, the automatic advance mechanism unit, the timer unit, and the distributor

unit. The housing 11 houses the automatic advance unit and is provided at its lower portion with a journal 12 which is guided and supported by the bearing 10, as clearly shown in Fig. 3. This journal 12 is provided with a central bore within which the drive shaft 15 is mounted upon the upper and lower bearings 16 and 17 respectively. The upper bearing 17 is formed on a boss 13 projecting within the housing 11, the upper end surface of said boss 13 forming a step bearing 18 for supporting the shaft 15 and the parts attached thereto. A collar 19 rigidly secured to shaft 15 by pin 20 coacts with the step bearing 18 to support shaft 15. The lower end of the journal 12 engages a collar 21 rigidly secured to shaft 15 by a pin 22 to hold shaft 15 against vertical movement in bearings 16 and 17.

The timer cam 25 is rotatably mounted upon the upper reduced portion of shaft 15 and has rigidly fixed thereto a depending cam member 26 (see Figs. 3 and 8), the purpose of which will appear hereinbelow. The collar 19 is provided with a depending portion 30 which telescopes or overlaps the boss 13. The centrifugal ring 31 is pivotally mounted upon the depending portion 30 on the pivot screws 32 (see Fig. 7). It is thus seen that the centrifugal ring 31 is driven by the drive shaft 15 but is pivotally mounted upon an axis located below the top edge of boss 13. The ring 31 has its internal aperture so shaped that the boss 13 does not interfere with its swinging motion about pivots 32. A coil spring 35 has one end attached to the projecting end 36 of pin 20 and the other end thereof attached to the lug 37 on the small cup 38 which is rigidly secured to the centrifugal ring 31 by the pivot screw 32 (see Fig. 7). This coil spring 35 is tensioned to normally hold ring 31 inclined to the axis of shaft 15 as shown in Fig. 3 and to yieldably resist the tendency of ring 31 to take a position perpendicular to shaft 15 due to centrifugal force when the shaft 15 is rotated. By adjusting the tension on coil spring 35 the ring 31 may be made to assume any desired position for any given speed of rotation of shaft 15. Such an adjustment is easily accomplished with this invention simply by loosening the pivot screw 32 and rotating the cup 38 in the desired direction and again tightening screw 32. The teeth or serrations 39 on the edge of cup 38 are adapted to tightly engage the ring 31 and thus aid in firmly holding cup 38 rigidly clamped to the ring 31. The cam member 26 rigidly attached to the timer cam 25 is preferably arcuate in form with the pivot axis of ring 31 at its center. This member 26 is provided with a spiral cam slot 27 within which the reduced end portion of screw 28 engages. This cam slot 27 is long enough to permit the full swinging movement of ring 31. It will be obvious that as the ring 31 swings to different angles according to the speed of rotation of shaft 15 the pin 28 coacting with the cam slot 27 will cause the timer cam 25 to rotate relative to the shaft 15. The shape of the cam slot 27 is such that the position of cam 25 relative to the shaft 15 is advanced or retarded according to the desired degree of advance or retard for the ignition spark. The distributor rotor 40 is fixed relative to the timer cam 25 and is of course advanced or retarded therewith in a manner well known in the art.

The housing 41 contains the various parts of the timer unit and fits upon the top of the lower housing 11 and is secured thereto by the two screws 42 and 43 which pass through suitable ears provided therefor in the metal of the two housings 11 and 41. This timer unit contains a stationary insulated contact point 44, and a movable contact point 45 mounted upon the arm 46 pivoted upon pin 47. The cam follower 48 rubbing upon the timer cam 45 operates the movable contact 45 in a manner well known and which forms no part of the present invention. The movable contact 45 is grounded to the housing 41 by the spring 49 or by any other suitable means. The cylindrical condenser unit 50 is held clamped in place between the upper arcuate flange 51 integral with the housing 41 and the lower leaf spring 52 which is riveted to the under side of the bottom wall of housing 41 as clearly shown in Fig. 6. These clamping connections ground the cylindrical casing which serves as one terminal of the condenser 50. The insulated terminal of the condenser is connected to the insulated terminal post 55 by means of the metal strap 56. This metal strap also aids in supporting and holding in place one end of condenser 50. It will be obvious that when the end of strap 56 is disconnected from the terminal post 55 the condenser 50 may be readily slipped from under the arcuate lug 51 and thus removed, or it may be easily replaced in its proper position and securely held there simply by pressing it downward upon the leaf spring 52 until it passes under the overhanging point of the arcuate lug 51.

The distributor head 60 is molded from some suitable insulating material, as bakelite, and preferably has the distributor segments 61 molded in place and freely projecting a suitable distance beyond the interior surface of the wall. The high tension current jumps the small air gap between the distributor arm 62 and the segments 61 in a manner now well known. Heretofore the sides of the segments 61 have been covered with insulating material, leaving only the surface adjacent the distributor arm 62 free. The high tension spark may then pass over a small part of the insulation immediately

adjacent the segment 61 and thus begin to burn away the insulating material. This burning when once started progresses continuously over quite a distance and may even burn a conducting pathway from one segment 61 to another and thus obviously destroy the proper operation of the distributor. This conducting pathway is apparently caused by a carbon deposit left when the insulating material is decomposed by the high tension spark. According to this invention the insulating material at the sides of segments 61 is omitted (as clearly shown in Fig. 3) and thus the above described difficulties are prevented.

The distributor head 60 is designed to nest upon the top periphery of the timer housing 41 and is located in its proper position thereon by two small depending lugs (not shown) which fit within the recesses 65 (see Fig. 1). Two spring clips 66 engage in suitable notches 67 on top of the head 60 to hold the same down upon the timer housing 41 (see Fig. 5). The bottom end of the spring clip 66 is rolled up to form an enlarged rounded end 68 as clearly shown in Fig. 5. The timer housing 41 is provided with a suitable recess 69 to receive the enlarged end 68, the bottom side of the recess 69 being sufficiently closed by the housing 11 to prevent the removal of the enlarged head 68 but yet to permit a small pivotal movement of spring 66 about the head 68 as a pivot. It is thus seen that the clips 66 have their lower ends loosely anchored in place and permit the quick and easy removal or replacement of the distributor head 60. The clips 66 may be removed by loosening screws 42, 43 and raising the timer housing 41 a slight distance from the housing 11, as will be obvious from the structure shown in Fig. 5.

The manual lever 70 for the manual adjustment of the spark is rigidly attached to the housing member 11 for rotating the same and thereby rotate all the parts of the breaker mechanism relative to the timer cam 25. A feature of this invention is the simplified means for assembling the lever 70 upon the housing 11 and rigidly clamping it thereto in any desired position. This lever 70 is provided with an aperture 71 large enough to permit the lower end 12 of housing 11 to pass therethrough (see Fig. 9). An annular groove 72 is provided in the member 11 of a width substantially equal to the thickness of the lever 70 (see Fig. 3). Intercepting the large aperture 71 is a semi-circular aperture 73 of a radius substantially equal to that of the annular groove 72. It will now be clear that the lever 70 may be moved to the position shown in Fig. 10 wherein the semi-circular aperture 73 is in engagement with the housing 11 at the annular groove 72. The parts being in this position, the slightly arched clamping member 75 is attached to lever 70 by the screw 76 (see Fig. 3). It is obvious that the clamp 75 will hold the lever 70 in tight engagement with the member 11 and thus permit the turning thereof by lever 70. Preferably the periphery of aperture 73 is provided with teeth or serrations, as shown in Fig. 10, to give a better driving engagement between the lever 70 and housing 11. The lever 70 is held down and its range of movement determined by the screw 80 moving in the arcuate slot 81, as will be obvious from Figs. 3 and 10. An advantage of this adjustable means for securing lever 70 to housing 11 lies in the fact that the entire non-rotating mechanism of the timer distributor unit may be set in any one of six different positions in the case of a six cylinder engine distributor (in order to place the primary circuit terminal 55 and the oiling hole 85, in the most convenient positions) and then the lever 70 may be rigidly secured thereto in the above described manner. Also this adjustable means permits the accurate location of the segments 61 relative to the position of the distributor arm 62 both at the time of first assembly and at any later time when the parts may get out of accurate location due to wear in the driving mechanism of the distributor arm 62.

Fig. 4 illustrates a modified form of timer distributor unit similar to that shown in Fig. 3 except that the automatic advance mechanism has been omitted. It will be clear from a comparison of Figs. 3 and 4 that the amount of overhang between the timer cam 25 and the top drive shaft bearing 17 has been increased by the addition of the automatic advance mechanism only a very slight amount. This construction eliminates the necessity of an additional bearing placed above the automatic advance mechanism in order to hold the cam 25 in perfect alignment with the drive shaft. With the elimination of such a bearing the entire structure is greatly simplified and rendered more economical to manufacture.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An automatic spark timing device for the ignition system of an internal combustion engine, comprising in combination, a housing having an inwardly extending bearing portion; a drive shaft journalled in said bearing and extending into the housing; a breaker cam rotatably mounted on said shaft; an arcuate member provided with a spiral slot, secured to the breaker cam; a sleeve secured to the drive shaft adjacent

the end of the bearing portion, said sleeve having depending ears, oppositely disposed, and extending over and partially surrounding the end of the bearing portion; and a centrifugal member pivotally secured to the ears of the sleeve and operatively connected to the spiral slot of the arcuate member; and a spring connected between the centrifugal member and the sleeve for holding the centrifugal member normally in spark retarding position.

2. In an automatic spark advance mechanism for an internal combustion engine, in combination, a drive shaft rotatably mounted within a bearing, a weighted centrifugal ring pivotally mounted upon said shaft adjacent said bearing and yieldably restrained to lie at an acute angle with said shaft whereby said ring at least partly encompasses said bearing, a breaker cam mounted upon said drive shaft closely adjacent said bearing and having a spiral cam member extending outwardly adjacent said centrifugal ring, and a lug rigid with said centrifugal ring and engaging said spiral cam for advancing or retarding the position of the breaker cam relative to the drive shaft.

3. In an automatic spark advance mechanism for an internal combustion engine, in combination, a drive shaft having a stationary bearing, a fitting mounted upon said shaft adjacent said bearing and projecting downwardly about said bearing, a centrifugal ring pivotally mounted upon said fitting below the top edge of said bearing, a breaker cam mounted upon said shaft adjacent said fitting and having an advance cam member secured thereto and extending downwardly adjacent the centrifugal ring, and cam engaging means rigid with said ring for engaging said advancing cam for advancing or retarding the position of the breaker cam relative to the drive shaft.

4. In an automatic timer mechanism for the ignition system of an internal combustion engine, a breaker cam for interrupting the primary ignition circuit, a drive shaft for driving said breaker cam having a stationary bearing, said breaker cam being adjustably mounted upon said drive shaft relatively close to said bearing, and automatic advance mechanism attached to said drive shaft in the narrow space between said cam and bearing and overlapping said bearing, said advance mechanism coacting with said cam to adjust the position thereof according to the speed of rotation of said drive shaft.

5. In an automatic advance mechanism for the ignition system of an internal combustion engine, a drive shaft having a centrifugal member pivotally mounted thereupon on a pivot substantially perpendicular thereto, a coil spring surrounding said pivot for yieldably urging the centrifugal member toward alignment with the axis of said drive shaft, and means for adjusting the tension of said coil spring for varying the position of said centrifugal member at a predetermined speed of rotation of said drive shaft, said means comprising an adjustable fitting for securing one end of said coil spring to said centrifugal member, said fitting being held in adjusted position by said pivot.

6. In a timer mechanism for the ignition system of an internal combustion engine, a cup-shaped housing for said mechanism, a condenser having quick detachable mounting upon said housing, said mounting comprising a projection rigid with said housing extending about said condenser and spring means secured to said housing and engaging the under side of said condenser to hold the same in firm engagement with said projection.

7. In a timer distributor mechanism, a timer housing, a supporting base therefor to which said timer housing is removably secured, a distributor head fitting upon the top of said timer housing, and a spring clip for holding said distributor head in place upon said timer housing, said clip having its lower end pivotally anchored in place in a suitable recess in the wall of said timer housing, the lower side of said recess being sufficiently closed by said supporting base to prevent withdrawal of the lower end of said spring clip from said recess.

In testimony whereof I hereto affix my signature.

CHARLES E. BERKDOLL.