July 20, 1943. A. DE RENTIIS 2,324,496

RESIZING AND SHAVING DIE SET

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Fig. 1.

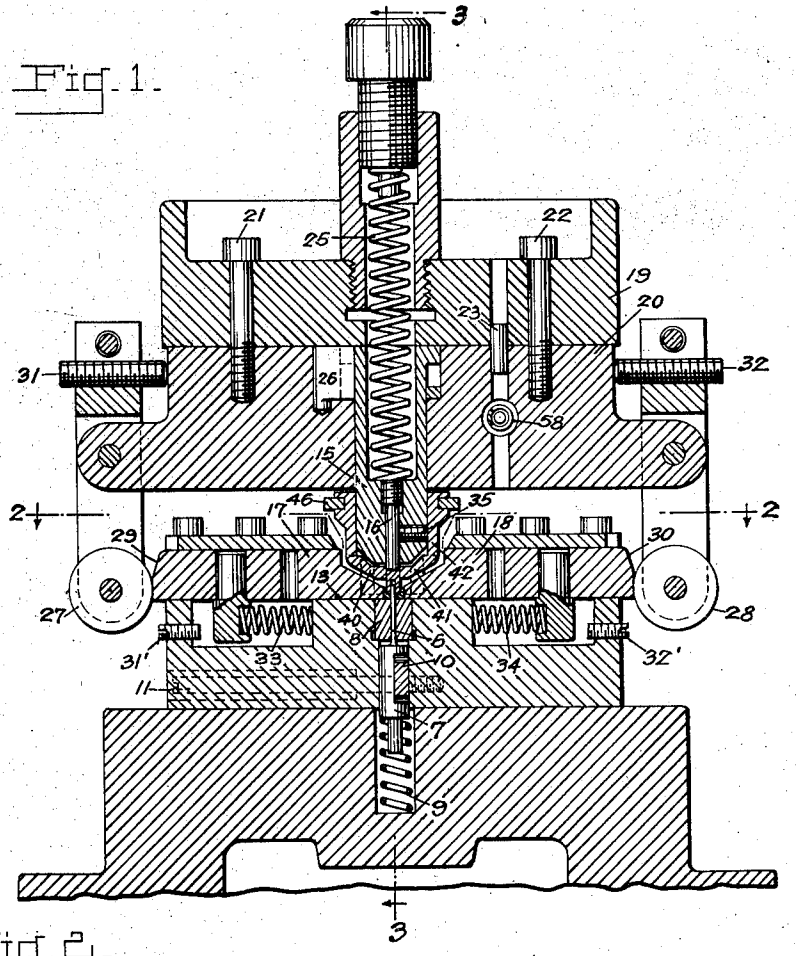
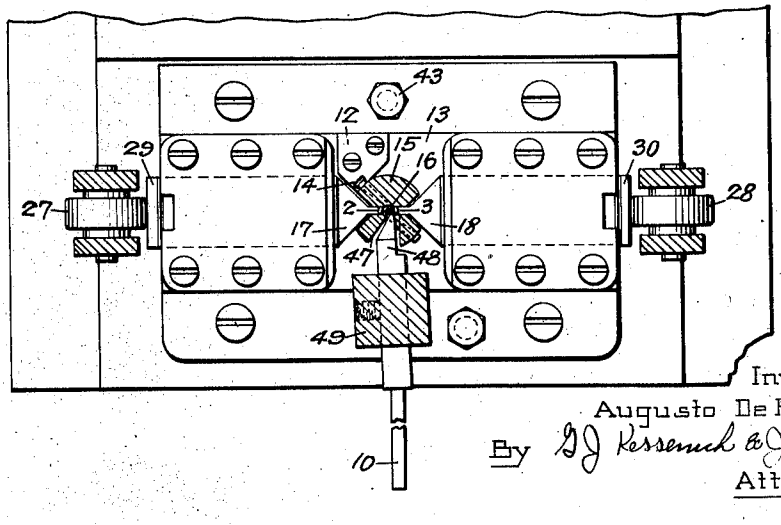



Fig. 2.




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Fig. 3.

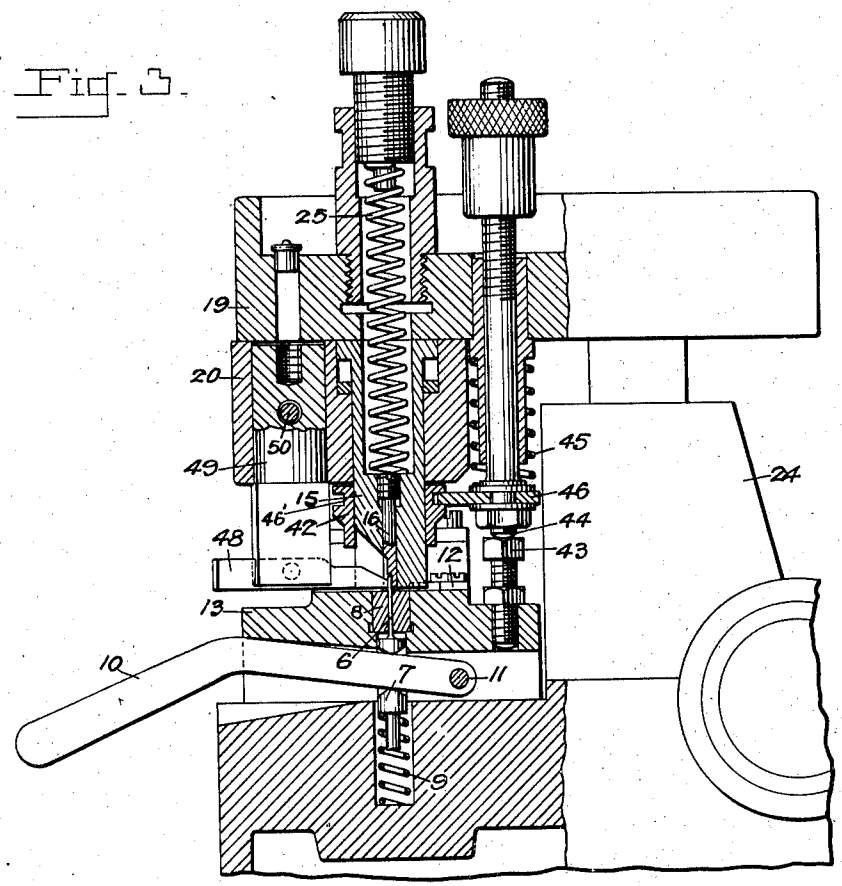
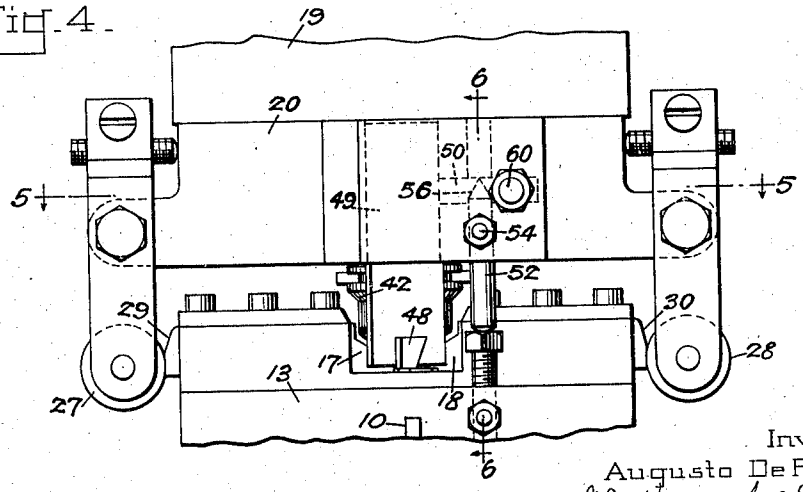



Fig. 4.




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Fig. 5.

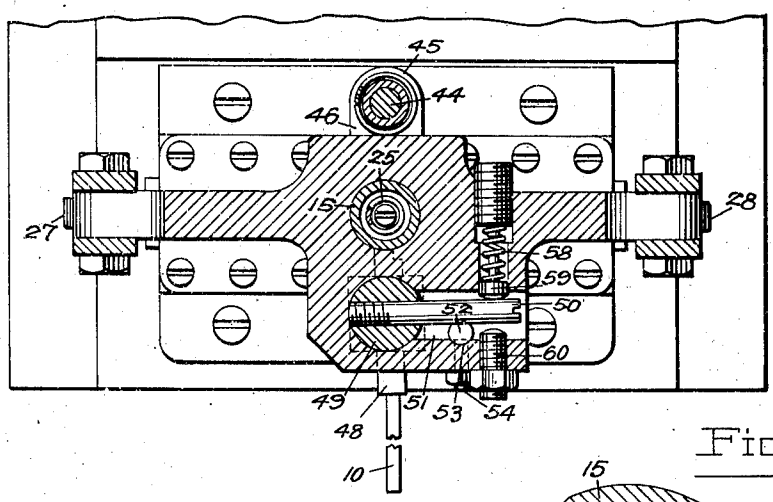



Fig. 7.

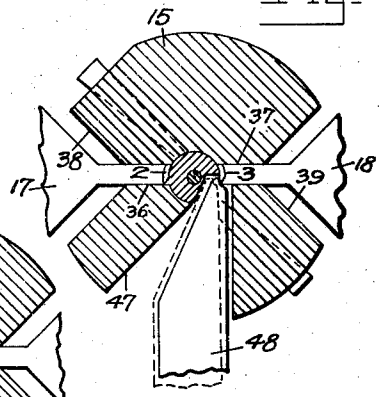



Fig. 6.

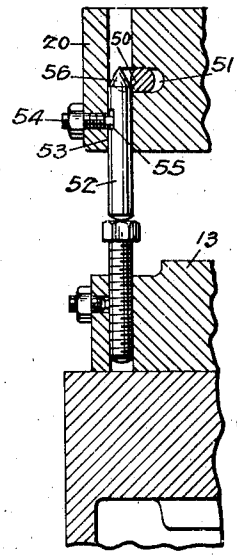



Fig. 8.

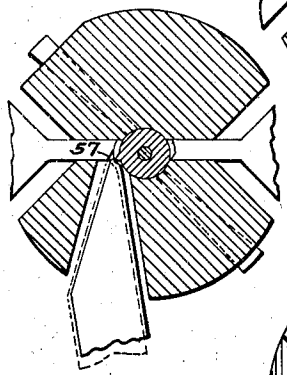



Fig. 9.

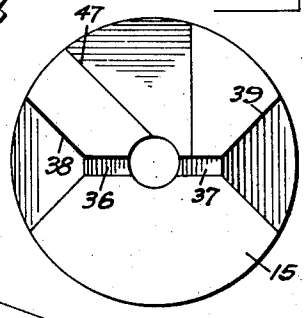
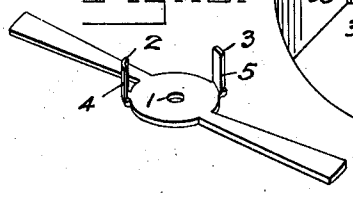



Fig. 10.




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Patented July 20, 1943 2,324,496

# UNITED STATES PATENT OFFICE

2,324,496

## RESIZING AND SHAVING DIE SET

Augusto De Rentiis, Prospect Park, Pa.

Application September 13, 1940, Serial No. 356,630

10 Claims. (Cl. 29—33)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention concerns the manufacture of oscillating levers for escapements in clockwork fuses and a method of finishing the same.

Such levers may consist of two symmetrical inertia arms which determine the period of oscillation, and two pallets bent inward from the plane of the arms near the center thereof which pallets are to engage the escapement wheel. These pallets are fashioned in a knife edge at the points of engagement with the escapement wheel. During manufacture the formation of these edges leaves burrs, and since the distance between the knife edges is a vital factor in the timing, it is necessary to remove such ragged edges. The present invention is concerned with a manner of truing up such edges.

The distance between the knife edges may also be affected by distortion of the pallets due to handling, for instance, nesting of the pallets in piling after fabrication. This problem is dealt with by reforming the pallets prior to assembly, as set forth and claimed in copending application Serial No. 356,629 filed Sept. 13, 1940, which has matured into Patent No. 2,309,632 of Feb. 2, 1943. The method of the present invention includes this reforming step in conjunction with the step of smoothing the knife edge.

It is, therefore, an object of this invention to produce a method and means of smoothing the knife edges of pallets of escapement levers.

It is a further object of this invention to produce a method and means of simultaneously reforming the escapement lever and smoothing the knife edge.

In a preferred embodiment of the invention, these objects are accomplished by means of machinery, including forming dies and a shaving tool, as illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation in section of the machine with the escapement lever in place, showing the reforming step completed;

Fig. 2 is a plan view on the line 2—2 of Fig. 1;

Fig. 3 is a partial sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a fragment of a front elevation;

Fig. 5 is a section taken along the line 5—5 of Fig. 4;

Fig. 6 is a section taken along the line 6—6 of Fig. 4;

Fig. 7 is an enlarged view of a detail of Fig. 2;

Fig. 8 is similar to Fig. 7, showing a modification;

Fig. 9 is an enlarged bottom view of one of the dies;

Fig. 10 is a view in perspective of the escapement lever.

Following is a detailed description of the drawings and of the manner in which the invention is to be practiced:

In Fig. 10 which shows an oscillating escapement lever, 1 is the central hole in which the bearing pivot is to be fastened, 2 and 3 are the pallets with knife edges 4 and 5, respectively, for engagement with an escapement wheel.

Referring to Fig. 1, the end of rod 6 on piston 7 is maintained above the level of anvil 8 by the pressure of spring 9. Rod 6 is a centering device for the work; in this case, for receiving the central hole 1 of the lever. For removing the work, rod 6 is withdrawn by action of hand lever 10, pivoted about bolt 11.

Plate 12 serves to hold the escapement lever in its proper clock-angle orientation on the bed plate 13 by means of notch 14.

Four dies are employed in the reforming operations, two vertical dies 15 and 16 which will be referred to as the upper outer die and upper inner die, respectively, and two side dies 17, 18.

The press head for the dies consists of two parts 19 and 20 joined by bolts 21, 22. 23 is a dowel. The thrust is transmitted from auxiliary machinery (shown generally at 24) through the head and thence to the upper dies by means of a spring 25. The upper outer die has a sliding fit in head 20 and is held against rotation by key 26. The downward motion of head 19, 20 also impels the side dies 17, 18 inward by the action of rollers 27, 28 on cam surfaces 29, 30 respectively. The travel of the side dies is regulated by set screws 31, 32. On raising the press head, the side dies are returned by springs 33, 34, the motion being limited by set screws 31', 32'.

The upper inner die 16 is clamped within the upper outer die 15 by means of a set screw 35 and the two dies move as a unit. The inner die moves to a position within the pallets and serves as a mandrel for the pressing or reforming operation of the side dies. The upper outer die 15 is brought down on the arms of the escapement lever and holds them flat on the bed plate during the reforming operation. This outer die (Figs. 7 and 9) has slots 36, 37 and sectors 38, 39 to accommodate the pallets, side dies and stripper fingers. The latter are shown at 40 and 41 in Fig. 1.

The stripper 42 is a sleeve surrounding outer die 15 and underslinging it by means of fingers 40, 41. These fingers are designed to engage the tops of pallets 2, 3 and remove them from the upper dies in case they adhere. The fingers are prevented from contacting the pallets by the adjustment of stop 43. On the down stroke of the press, rod 44 engages the stop and spring 45 is slightly compressed. The stripper 42 is connected to rod 44 by means of a yoke 46 engaging in a necked portion 46' of the stripper and is therefore brought to a stop with rod 44. On ascent of the dies, spring 45 will cause stripper 42 to lag behind the press head and come into engagement with pallets 2, 3 in case they have adhered to the upper dies, and will thus remove them therefrom.

The upper dies are connected to the press head by spring 25 because they must be brought into position over the escapement lever in advance of the contact with the pallets by the side dies, otherwise a jamming action would occur.

The operation is as follows: Hole 1 of the escapement lever is slipped over rod 6 and one arm of the lever is slipped into notch 14. The upper dies are brought down into contact with the work and at the same time, side dies 17, 18 move in and press the pallets 2, 3 into their proper position, in this case perpendicular, with respect to the plane of the lever arms. It may be necessary to make the upper inner die of a diameter somewhat smaller than the inner diameter of the pallet sectors and also to shape the pressure area of the side dies so that the top part thereof contacts the pallets in advance of the lower part in order that the pallets will assume the desired final position after their natural resilient restoring force has expended itself following the reforming operation.

On the up stroke of the press the side dies retract. If the work has adhered to the upper dies it is removed therefrom by the stripper. Lever 10 is pressed down and the work is easily brushed from the bed plate. Lever 10 is released and another piece of work inserted on rod 6 to commence another cycle.

The upper outer die 15 also has a sector 47 cut out to accommodate the shaving tool 48. The shaving tool is held by cylinder 49 which is slidably and rotatably held in the press head 20. Extending from and rigid with cylinder 49 is a rod 50 mounted for angular displacement in groove 51. Pin 52 is mounted in vertical bore 53 in head 20 and its sliding movement therein limited by set screw 54 engaging in slot 55 of pin 52. At the end of the shaving stroke of tool 48 on the knife edge of the pallet, conical head 56 of pin 52 engages rod 50 and thrusts it to one side thus rotating cylinder 49 and tool 48, as shown by the dotted lines in Figs. 7 and 8, through a small angle and brushing the shaving from the pallet. For shaving the opposite pallet, the upper outer die will be formed to accommodate the shaving tool as shown in Fig. 8 and the side die engaging that pallet will have a portion removed, as at 57 to afford clearance for the shaving tool. The shaving tool will be returned to its shaving position on ascent of the press head by action of spring 58 on rod 50 through plunger 59. The shaving tool is adjusted to working position by lock screw 60.

I claim:

1. A machine for reforming and finishing escapement levers for clockwork fuses, said levers having pallets bent at an angle to the plane of the lever proper, and said pallets having knife edges, said machine comprising a bed for the reception of the lever and a ram movable to and from said bed to hold said lever for work operations, dies movable crosswise of the direction of travel of the ram to engage said pallets in pressing engagement to reform the same at their proper angle, and a tool movable in the direction of the ram for motion along one of said knife edges to remove burrs and otherwise smooth said edges.

2. In a machine as in claim 1, means converting motion of the ram into motion of the dies and means converting motion of the ram into motion of the tool, said converted motions taking place after engagement of the ram with the work.

3. In a machine as set forth in claim 1, means for moving the tool away from the knife edge at the end of its shaving stroke so as to remove the shaved material from the knife edge.

4. A machine for reforming and shaving escapement levers for clockwork fuses, said levers having pallets bent at an angle to the lever proper and having knife edges, said machine comprising a ram movable reciprocally to and from work holding position, dies movable reciprocally in a direction transverse to the direction of motion of the ram to reform the pallets to their proper angle, shaving means connected with and for motion in the same direction as the ram, and means for transmitting the motion of the ram to cause the motion of the dies.

5. A machine as set forth in claim 4, comprising means for moving said shaving means in a direction transverse to the direction of its shaving motion at the end of its stroke.

6. A machine for reforming and finishing escapement levers for clockwork fuses, said levers having pallets bent at an angle to the plane of the lever proper, said pallets having knife edges, said machine comprising a bed for reception of the lever, a slotted member on the bed to receive one arm of the lever to position the same, a head member bearing a vertical ram for pressing on the face of said lever, transverse dies on said bed to engage said pallets for reforming the same to their proper angle, cam means on said transverse dies, cooperating means on said head member to transmit its motion to the transverse dies through said cam means, and a shaving tool unit carried by said head member to contact one of said knife edges for removal of burrs and otherwise smoothing the edges.

7. In a machine as in claim 6, a sliding fit of limited motion between said head member and said vertical ram, and resilient means normally holding said vertical ram in an advanced position with respect to the motion of said head member.

8. In a machine as in claim 6, stripper means carried by said head member and resiliently held for limited motion adjacent said vertical ram for removing adhering work pieces therefrom.

9. A machine as in claim 6 wherein said shaving tool unit comprises a horizontally rotatable member carried by said head member, a shaving tool carried by said unit for motion along one of said knife edges, and cam means operating by contact between a portion of said head member and said bed to turn said rotatable unit and move said shaving tool away from the knife edge at the end of its stroke.

10. A machine for reforming and finishing escapement levers for clockwork fuses, said levers having pallets bent at an angle to the plane

of the lever proper, and said pallets having knife edges, said machine comprising a bed to receive the lever, a spindle mounted in said bed for reciprocal motion into and out of engagement with a central hole in said lever and spring means to hold the spindle in said engagement, manual means for operating said spindle, receiving means on the bed for a portion of said lever to hold the same in proper orientation, a press head for reciprocal motion to and from said bed, a vertical ram in said press head for engaging said lever to hold the same against the bed, said ram being mounted in said head for limited reciprocal motion, spring means above said ram to hold the same normally extended, a collar around said ram and slidable thereon, fingers on said collar positioned to sweep the end of the ram to remove adhering levers therefrom, a shaft slidable within limits in said press head and carrying said collar, spring means holding said shaft normally extended, stop means on said bed to engage said shaft and thus raise the collar on the ram above the end of the ram when the head is lowered, transverse die members slidable on said plate against spring pressure to engage said pallets in pressing engagement, means on the ram fitting within the pallets to form a mandrel for the pressure of the transverse dies, cam means on said transverse dies, depending legs on said press head and means on said legs to engage said cam means and actuate the transverse dies, rotating means on said press head on a vertical axis, a shaving tool carried by said rotating means for motion along one of said knife edges, spring means to bias said rotating means and tool in shaving position, cam means in said head to rotate said rotating means and tool at the end of a stroke, and stop means on said bed to actuate said cam means in said head.

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