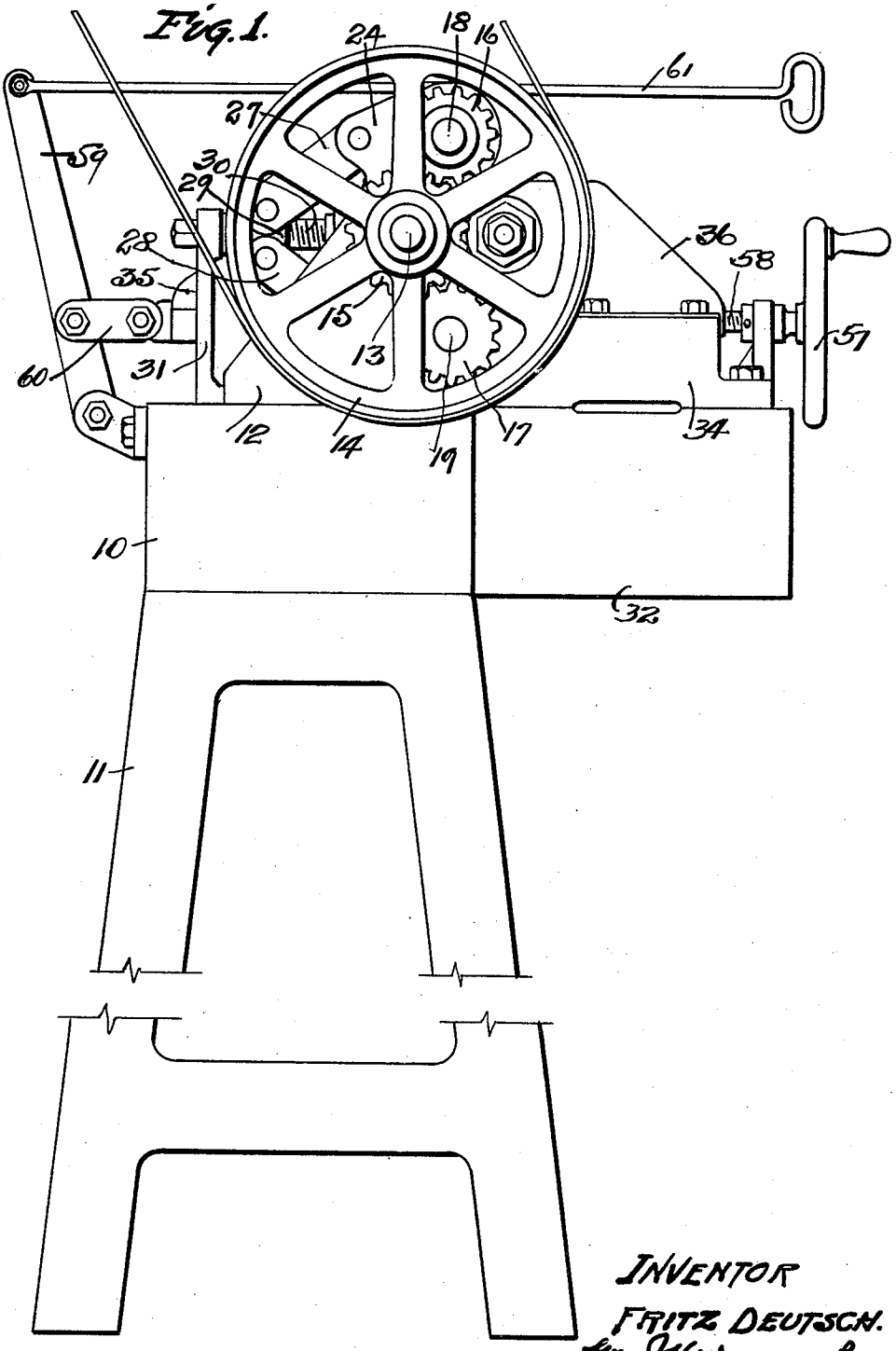
Oct. 4, 1932. F. DEUTSCH 1,880,875

RING SPLITTING MACHINE

Filed March 11, 1929 3 Sheets-Sheet 1

Fig. 1.



INVENTOR
FRITZ DEUTSCH.
by J. H. Washington
ATTORNEY.

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Fig. 2.

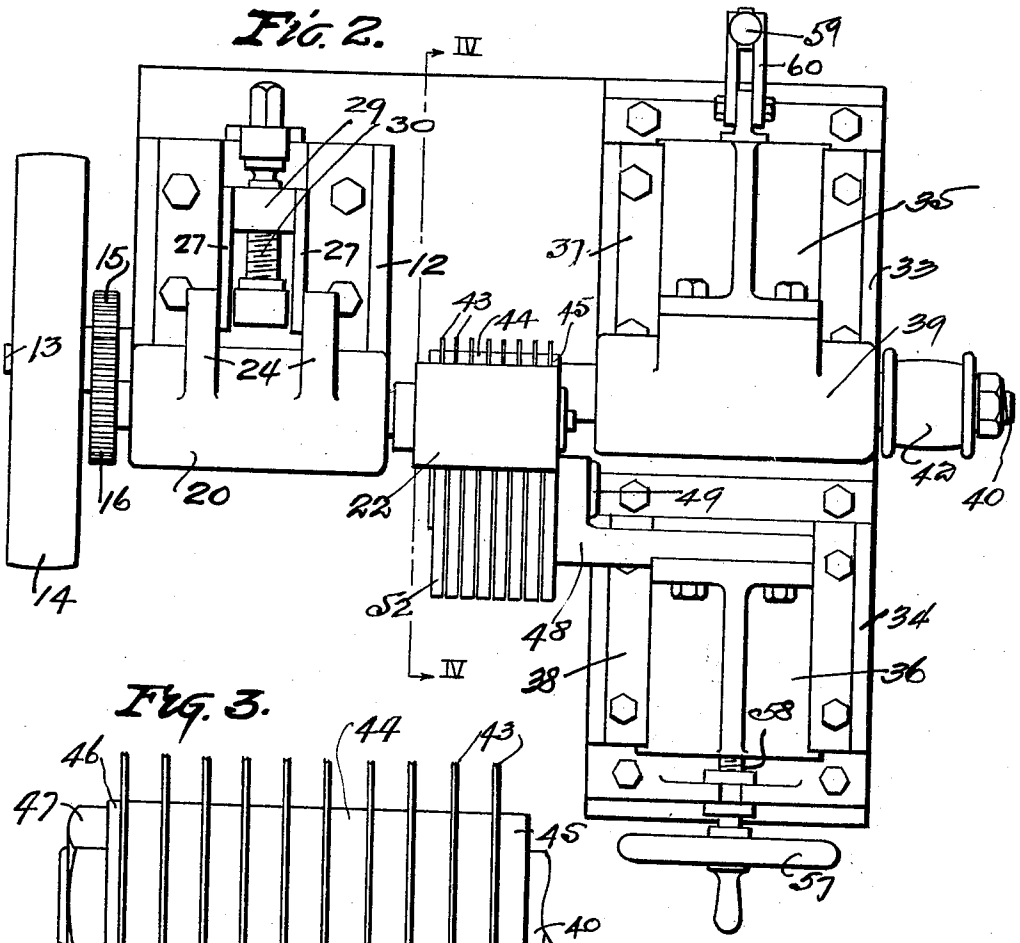
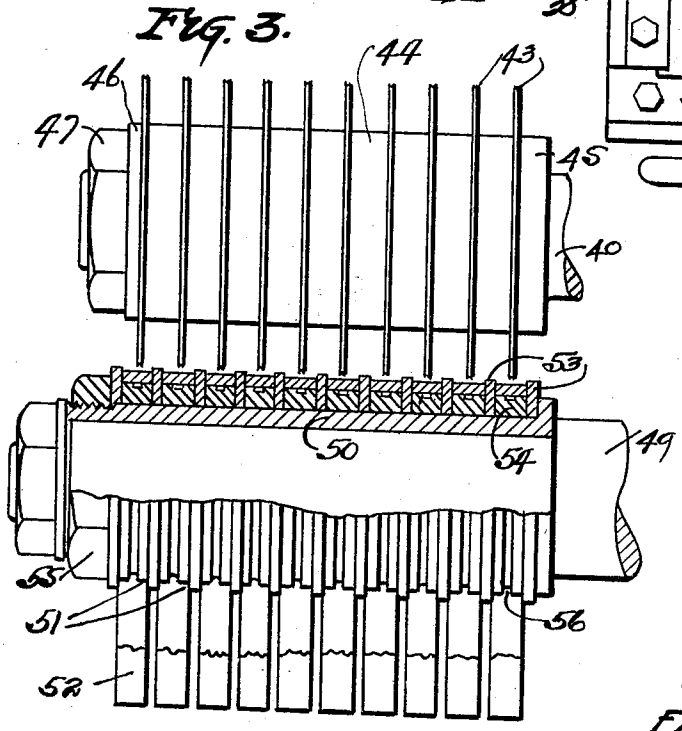


Fig. 3.



INVENTOR
FRITZ DEUTSCH
by J. H. Westerford
ATTORNEY.

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RING SPLITTING MACHINE

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Fig. 4.

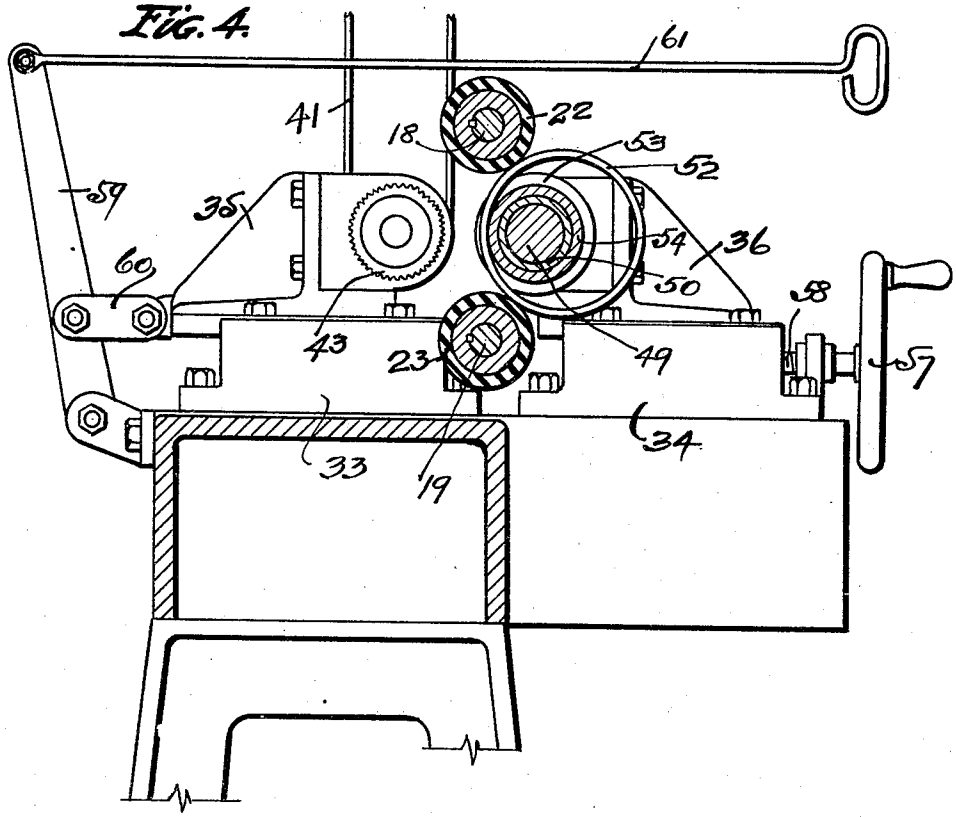
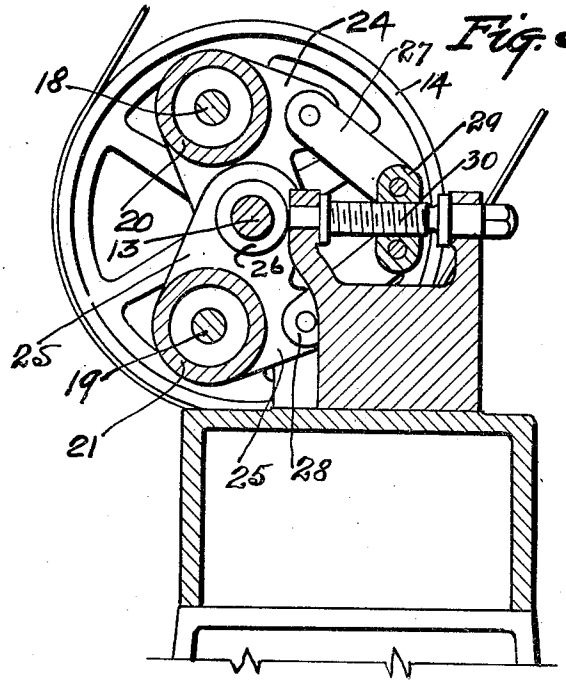


Fig. 5.



INVENTOR
FRITZ DEUTSCH.
by J. H. Weatherford
ATTORNEY.

Patented Oct. 4, 1932 1,880,875

UNITED STATES PATENT OFFICE

FRITZ DEUTSCH, OF MEMPHIS, TENNESSEE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SPARTA FOUNDRY COMPANY, OF SPARTA, MICHIGAN, A CORPORATION OF MICHIGAN

RING SPLITTING MACHINE

Application filed March 11, 1929. Serial No. 346,227.

This invention relates to improvements in machines for dividing piston rings into two or possibly more rings of substantially equal width. The machine shown is primarily designed for the purpose of taking a precast piston ring and dividing it into two rings. It may be used to split either cylindrical rings or slightly oval or elliptical rings.

In present practice individual rings are cast and these are later trued up on both the inner and outer surfaces and on both ends. So long as these rings had a thickness of more than an eighth of an inch and a width of one-fourth inch or more it was comparatively easy to obtain satisfactory castings. More recent practice however is to cut the ring width substantially in half so that many of the rings at the present time approximate one-eighth of an inch thick and one-eighth of an inch wide. Foundries have found it extremely difficult to make castings of such dimensions and rejects are so frequent that the smaller rings are as expensive if not more so, than the wider ones. In addition to this the finishers of the rings find it much more difficult to initially true up the first ring end.

I have found that it is possible to take a ring of slightly more than double the desired ring width, and cut it into two rings each of which will have one substantially true end, whereby chucking the ring on the ordinary magnetic plate chuck is easily accomplished and the opposite end readily trued up.

The principal object of the present invention is to provide means for splitting a ring into two rings of necessarily less width. Further objects of the invention are:

(*a*) To provide means for spacing a plurality of rings whereby all of such rings may be split at the same time;

(*b*) To provide spacing means effective at the point where the cut is being made;

(*c*) To provide means for holding and rotating the rings during the cutting operation;

(*d*) To provide means for handling rings of varying diameter;

(*e*) To provide means for splitting rings of various widths; and

(*f*) To generally improve the design and construction of such a machine.

The means by which the foregoing and other objects are accomplished and the manner of their accomplishment will readily be understood from the following specification on reference to the accompanying drawings, in which:

Fig. 1 is an end elevation of the machine;

Fig. 2 is a plan view of the machine;

Fig. 3 is an enlarged detail plan showing the preferred form of anvil and splitting saws;

Fig. 4 is a sectional elevation taken on the line IV—IV of Fig. 2, looking in the direction of the arrow and in the same direction as Fig. 1;

Fig. 5 is a sectional elevation of the upper portion of the machine taken on the line V—V of Fig. 2, looking in the direction of the arrow.

Referring now to the drawings in which the various parts are indicated by numerals, the machine comprises a bed 10, which preferably is supported by legs 11. Extending upward from the bed 10 are brackets 12 in which brackets a driving shaft 13 is journalled. 14 is a belt pulley keyed or otherwise suitably secured to this driving shaft, and 15 a gear likewise secured to the same shaft.

Meshing with the gear 15 are a pair of gears 16, 17 respectively, which gears are of the same size, though not necessarily of equal size with the gear 15. These gears are mounted on and secured to shafts 18 and 19 respectively, which shafts are journalled in bearings 20, 21, and extend through and beyond the bearings and carry cylindrical rollers 22, 23

respectively. These rollers are identical in size and are driven at equal speeds. The exterior cylindrical surfaces of these rollers 22 and 23 are of elastic material such as rubber, and are the means for rotating or driving the rings, which are to be split. By virtue of the elastic facing they permit any uneven part of the rings rough from the foundry or any local excrescences thereon, to momentarily embed in the rollers during such driving.

The bearings 20 and 21 are each carried by pairs of arms 24, 25 respectively, which arms may be turned about the exterior surfaces of the hubs 26 in which the bearings for the shaft 13 are formed. The arms 24, (see Fig. 5) are connected by links 27, and the arms 25 by links 28, with a yoke 29, which yoke may be reciprocated toward or away from the shaft 13 by a screw 30, so that when the yoke 29 is shifted toward the shaft 13 the bearings 20, and 21 are swung about the shaft and come closer together, thus bringing the rubber faced driving rollers closer together and at the same time retaining the gears 16 and 17 in mesh with the driving gear 15, and conversely, when the yoke 29 is moved away from the shaft 13, these rollers are drawn further apart but the gears are still retained in mesh. 31 is a supporting bracket secured to the base 10 and carrying the screw 30.

At the opposite end, the bed 10 is provided with a laterally extending portion 32 to increase the bed width. Oppositely disposed on this end of the bed are brackets 33, 34 in which brackets heads 35, 36 are transversely slidable suitable ways and gibs 37, 38 being respectively provided therefor. Attached to the head 35 is a longitudinally disposed bearing 39 in which is journalled a shaft 40 which is driven by a belt 41 through a pulley 42. The opposite end of this shaft is used as a saw mandrel on which are disposed a number of circular, metal saws 43, which saws are spaced by annular collars 44, and are tightly clamped between an annular flange 45 and washer 46, which in turn is held in place by a nut 47.

The bracket 36 carries an extension 48 from which a pin 49 extends longitudinally. It will be especially noted that the axes of the rollers 22 and 23 the saw mandrel 40 and the pin 49 are all parallel and preferably that the axes of both the saw mandrel 40 and the pin 49 are disposed in the median plane between the two rollers and are moved forward and backward in such plane. Journalled on the pin 49 is an annular sleeve 50 which sleeve is provided with a number of shallow rectangular grooves 51 of equal width and spacing in which rings 52 may be disposed for splitting, that is, cutting into two rings. The grooved sleeve 50 may be made up by disposing around the exterior of a smooth annular collar 50, annular flanges 53 between which are disposed wider collars 54 of less diameter than the flange diameter. All of the flanges are made of equal thickness and substantially equal diameter and all of the intermediate collars are of equal width and equal diameter. Both collars and flanges are bored out to fit the exterior of the sleeve 50, on which they preferably are clamped as by a nut 55.

56 are circumferential grooves in the exterior surfaces of the collars, which grooves relieve the saws as the cut is being completed. The width of the collars 54 is made equal to the width of the rings which are to be split into two, and the center spacing of these collars is made identical with the center spacing of the saws.

The head 35 is moved inward and outward by a hand wheel 57 acting through the screw 58, so that it may be moved into place and so left during the cutting or splitting operation. Preferably the head 36 may be moved inward and outward by a lever 59 which is connected to the head by a link or links 60. In order that the entire operation may be controlled from one point the lever 59 may be provided with an extension handle 61.

In operating the machine, rings are placed over the grooved roller or anvil 50, the anvil moved inward toward the center, and the elastic faced rollers 22 and 23 adjusted if desired. Ordinarily each of the grooves of the anvil is supplied with a ring which is to be split. The hand wheel 57 is turned and the rings are brought into driving contact with the elastic rollers which have previously been set in rotation. These rollers hold the ring in the grooves of the anvil and firmly thereagainst and at the same time rotate the rings. The saws are now set in motion and the head 35 is pulled inward bringing the rapidly revolving saws into cutting contact with the rings. These contacts with the rings are made where the roller behind the ring acts as a solid abutment or anvil, while the cut is being made. Ordinarily the rings making a number of turns before the cuts are completed. It will be especially noted that the flanges between the grooves support the rings against longitudinal movement along the roller and that this support is immediately in line with and on each side of each of the saws. Preferably the depth of the groove formed is somewhat greater than the thickness of the ring, so that the ring will be supported peripherally somewhat beyond the cutting action of the saws.

When the rings come from the foundry if they are not entirely too rough they may be put on the machine and spit into two parts, or even three in some cases. Ordinarily however, the rings are first ground inside and out and are there split in two and thereafter finished by grinding in usual manner.

It will be distinctly understood that the expression used in the claims "means for shifting said cutters into and out of cutting proximity to said rings" and similar expres-

sions are intended to mean either that the anvil is brought toward the cutters or that the cutters are brought toward the anvil, that is, that they are relatively shifted or approached, one toward the other.

Having described my invention, what I claim is:

1. In a ring splitting machine, a pair of elastic faced cylindrical rollers spaced apart and having parallel axes, means for adjusting the spacing of said rollers, means for driving said rollers at equal rates of speed, a cylindrically grooved anvil rotatably mounted and having its axis disposed parallel to and equidistant from said elastic faced rollers, a saw mandrel disposed with its axis parallel with said axes, means for driving said mandrel, a plurality of saws disposed on said mandrel each opposite the center of a groove on said anvil, means for moving said anvil toward said elastic faced rollers, and means for moving said saw mandrel toward said anvil.

2. In a ring splitting machine, a pair of elastic faced cylindrical rollers spaced apart and having parallel axes, means for adjusting the spacing of said rollers, means for driving said rollers at equal rates of speed, a cylindrical anvil rotatably mounted and having its axis disposed parallel to and equidistant from said elastic faced rollers, a plurality of equally spaced cylindrical flanges projecting beyond said anvil, a saw mandrel disposed with its axis parallel with said axes, means for driving said mandrel, a plurality of saws disposed on said mandrel each opposite the space between a pair of said flanges means for moving said anvil toward said elastic faced rollers, and means for moving said saw mandrel toward said anvil.

3. In a ring splitting machine, a pair of elastic faced cylindrical rollers spaced apart and having parallel axes, means for driving said rollers at equal rates of speed, a cylindrically grooved anvil rotatably mounted and having its axis disposed parallel to and equidistant from said elastic faced rollers, a saw mandrel disposed with its axis parallel with said axes, means for driving said mandrel, a plurality of saws disposed on said mandrel each opposite the center of a groove on said anvil, means for moving said anvil toward said elastic faced rollers, and means for moving saw mandrel toward said anvil.

4. In a ring splitting machine, a pair of elastic faced cylindrical rollers spaced apart and having parallel axes, means for driving one of said rollers, a cylindrically grooved anvil rotatably mounted and having its axis disposed parallel to said elastic faced rollers, a saw mandrel disposed with its axis parallel with said axes, means for driving said mandrel, a plurality of saws disposed on said mandrel each opposite the center of a groove on said anvil, means for moving said anvil toward said elastic faced rollers, and means for moving said saw mandrel toward said anvil.

5. In a ring splitting machine, a cylindrical anvil mounted to rotate about its longitudinal axis, means for spacing a plurality of rings along said anvil, driven elastic faced rollers for holding said rings against said anvil and for rotating said rings and anvil, a saw mandrel located on the same side of said mandrel as said rollers and having its axis parallel with the axis of said anvil, means for driving said mandrel, a plurality of saws spaced apart on said mandrel each in alignment with a ring, and means for moving said saw mandrel toward and away from said anvil.

6. In a ring splitting machine, a cylindrical anvil mounted to rotate about its longitudinal axis, ring spacing means carried by said anvil, driven elastic faced rollers for holding a plurality of rings against said anvil and for rotating said rings and anvil, a saw mandrel located on the same side of said mandrel as said rollers and having its axis parallel with the axis of said anvil, means for driving said mandrel, a plurality of saws spaced apart on said mandrel each to align with a ring, and means for moving said saw mandrel toward and away from said anvil.

7. In a ring splitting machine, an arbor, a sleeve, rotatably mounted thereon, a plurality of annular collars and a plurality of annular flanges of greater diameter alternately disposed on said sleeve and alternated therealong, means for securing said collars and flanges on said sleeve, means for holding rings in the grooves defined by said flanges and for rotating said rings, a plurality of rotatable saws each disposed opposite one of said grooves, means for relatively approaching said saws and arbor, and means for rotating said saws.

8. In a ring splitting machine, a rotatably mounted anvil, means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rotary driven members, said anvil being movable relative to said members to contact said rings and said members along spaced parallel lines to press said rings against said anvil to thereby rotate said rings and said anvil, and splitting means located on the same side of said anvil as said rotary members, said splitting means being movable into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

9. In a ring splitting machine, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rotary driven members, said anvil being mov-

able relative to said members to contact said rings and said members along spaced parallel lines to rotate the same and said anvil and to press said rings against said anvil along a line of contact parallel to and intermediate said spaced parallel lines, all of said lines of contact lying on the same side of a diameter of said rings, and splitting means movable into operative engagement with said rings to act against those portions of the rings that are backed by contact with said anvil.

10. In a ring splitting machine, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rotary driven members having faces of elastic material, means for moving said anvil relative to said members to contact said rings and said members along spaced parallel lines to press said rings against said anvil and to frictionally engage said rings to thereby rotate said rings and said anvil, and splitting means located on the same side of said anvil as said rotary members, said splitting means being movable into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

11. In a ring splitting machine, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rubber faced driven rollers, said anvil being movable relative to said rollers to contact said rings and said rollers along spaced parallel lines to press said rings against said anvil to thereby rotate said rings and said anvil, splitting means located on the same side of said anvil and said rollers, and means for moving said splitting means into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

12. In a ring splitting machine, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of out-of-round rings of larger diameter than said anvil, a pair of rubber faced driven rollers, said anvil being movable relative to said rollers to contact said rings and said rollers along spaced parallel lines to press said rings against said anvil and to thereby rotate said rings and said anvil, and a mandrel located on the same side of said anvil as said rollers and having a plurality of spaced saws thereon located opposite said rings and between said spacing means, said mandrel being movable to bring said saws into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

13. In a ring splitting machine, a rotatably mounted anvil including a sleeve, spaced annular flanges on said sleeve and spaced collars on said sleeve between said flanges, said flanges serving to space on said anvil a plurality of out-of-round rings, a pair of rotary driven members, means for moving said anvil relative to said members to contact said rings and said members along spaced parallel lines to press said rings against said anvil and to thereby rotate said rings and said anvil, and splitting means located on the same side of said anvil as said rotary members, said splitting means being movable into operative engagement with said rings to act against the portion of the rings which are backed by contact with said anvil.

14. In a ring splitting machine, a rotatably mounted anvil including a sleeve, spaced annular flanges on said sleeve and spaced collars on said sleeve between said flanges, said flanges serving to space a plurality of out-of-round rings on said anvil and said collars serving as abutments for said rings, a pair of rubber faced driven rollers, said anvil being movable relative to said rollers to cause the rollers to frictionally engage the outer peripheries of said rings along spaced parallel lines to press said rings against said anvil and to thereby rotate said rings and said anvil, and a mandrel located parallel to said anvil on the same side of said anvil as said rollers and having a plurality of spaced saws thereon located opposite said rings and between said flanges, said mandrel being movable to bring said saws into operative engagement with the portions of the rings which are backed by contact with said anvil.

15. In a machine for splitting rings, a rotary mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rotatably driven members, said anvil being movable relative to said members to contact said rings and said members along spaced parallel lines to press said rings against said anvil to thereby rotate said rings and said anvil, a single driving means for said driven members, means for adjusting said driven members with respect to said driving means and splitting means located parallel to said anvil on the same side of said anvil as said driven members, said splitting means being movable into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

16. In a machine for splitting rings, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of larger diameter than said anvil, a pair of rotary driven rubber faced rollers, said anvil being movable relative to said rollers to contact said rings and said rollers along spaced parallel lines, to press said rings against said anvil and to thereby rotate said rings and said anvil, a single driving means for said rollers, means for adjusting said roll-

ers with respect to said driving means and splitting means located on the same side of said anvil as said rollers, said splitting means being movable into operative engagement with said rings to act against the portions of the rings which are backed by contact with said anvil.

17. In a machine for splitting rings, a rotatably mounted anvil, annular means on said anvil for spacing thereon a plurality of rings of considerably larger diameter than said anvil, a main drive shaft, a pair of rotary members pivotal about said shaft as a common axis and driven therefrom, a common means for adjusting the position of said rotary members into contact with the rings on said anvil to rotate said rings and splitting means movable into engagement with said rings to split the same with said anvil as an abutment.

In testimony whereof I hereunto affix my signature.

FRITZ DEUTSCH.