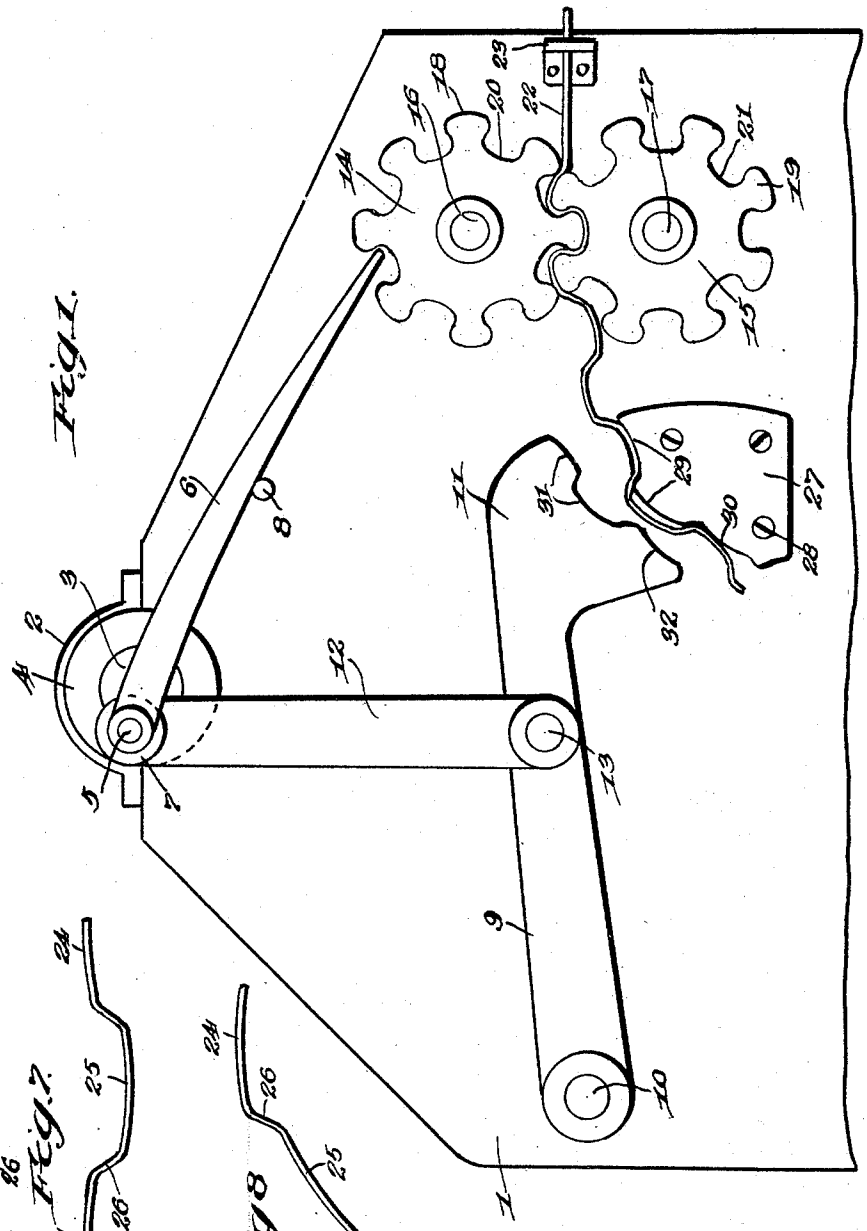
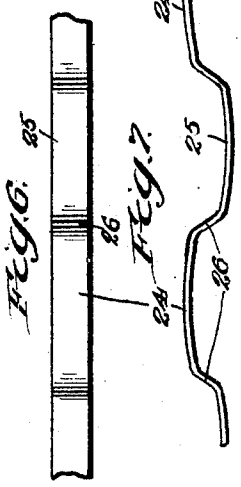
Dec. 31, 1929. G. C. BECK 1,741,905

MACHINE FOR MAKING EXPANDER STEEL

Filed March 18, 1927 2 Sheets-Sheet 1





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Fig. 2.

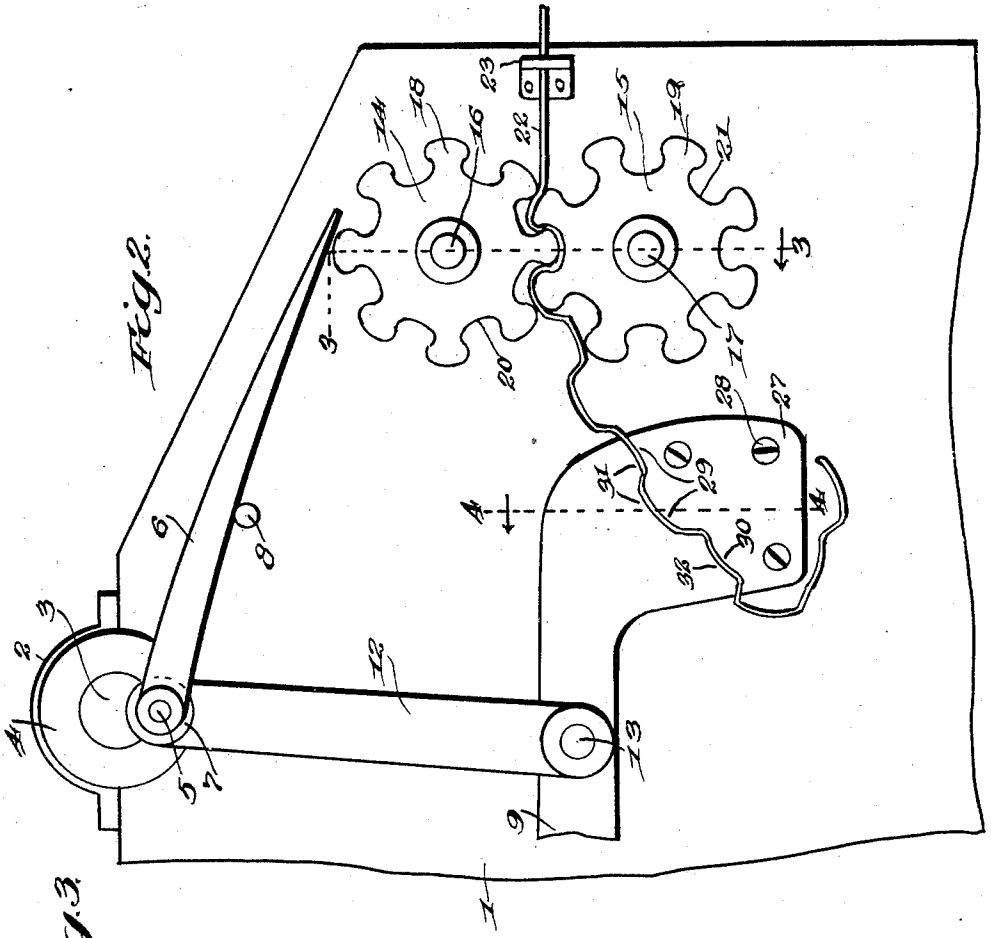


Fig. 3.

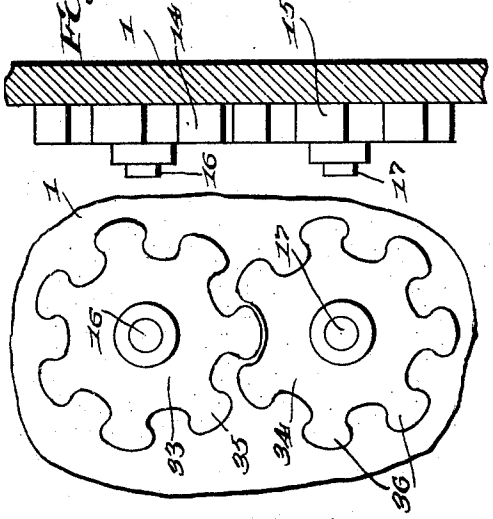


Fig. 4.

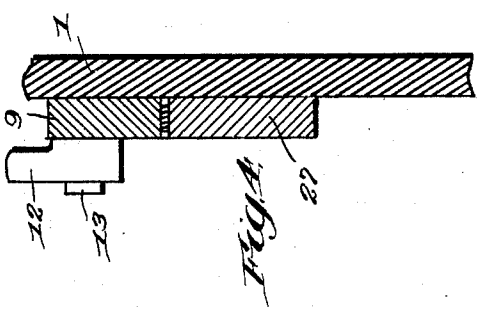


Fig. 5.

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UNITED STATES PATENT OFFICE

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MACHINE FOR MAKING EXPANDER STEEL

Application filed March 18, 1927. Serial No. 176,562.

The object of this invention is to provide a novel machine for corrugating spring steel strips into various contours desirable to render them effective as piston ring expanders.

A further object of the improved machine is to cause the formed steel to assume a curved contour, whereby an article of manufacture results.

These ring expanders are made of relatively thin steel and the operation of corrugating the steel strips is carried on without heating the strips, hence, it is a cold method.

The machine of my invention involves means for forming the corrugations, of whatever form is desired, and after the corrugations are formed, the machine involves a separate operation on the strip, as formed, with a view of causing the formed strip to assume a curved contour, and in the present case, this latter feature is carried out by slightly altering one of the corrugated integers.

It is a feature of my invention to provide means whereby corrugated integers of the formed strip are securely held, without changing the form thereof, in such a manner that the strip cannot move while the process of altering other corrugated integers is being carried out.

The invention will be more fully described in connection with the accompanying drawings and will be more particularly pointed out in and by the appended claims.

In the drawings;

Fig. 1, is a view in side elevation of the forming means and illustrating the shaping means retracting from the formed strip.

Fig. 2, is a view similar to Fig. 1, showing the shaping means functioning to shape an integer of the formed strip.

Fig. 3, is a sectional view on line 3—3 of Fig. 2, with the forming wheels in elevation.

Fig. 4, is a sectional view on line 4—4 of Fig. 2, showing the shaping means in a functioning position.

Fig. 5, is a view of a set of forming wheels for making a longer bend or corrugation.

Fig. 6, is an enlarged plan view of a portion of the formed strip before the same is shaped.

Fig. 7 is an enlarged edge view thereof.

Fig. 8 is an enlarged edge view of the strip showing an integer thereof shaped to cause the strip to assume a curved contour.

Like characters of reference designate similar parts throughout the different figures of the drawings.

In the following description, and as shown in the drawings, the machine will be referred to as being designed to make substantially the type of corrugation shown in my U. S. Patent No. 1,534,490, issued April 21, 1925. However, it will be clear that by merely changing the shape of the forming means and the shaping means, the invention is equally adapted for the manufacture of expander spring steel strips with other shapes of corrugations, hence, in this respect, I do not wish to be limited in all respects to the exact and specific form of the invention herein shown.

I have shown a frame which may consist of side walls 1 having suitable journals 2, in which a power driven shaft 3 bears, only one wall and journal being shown. On shaft 3, is suitably mounted any form of crank which may be a disc 4, as shown, the same being concentrically mounted on said shaft. A crank pin 5, is eccentrically mounted on disc 4 and I connect thereto one end of a forming wheel actuating pawl 6, as shown at 7. A guiding stud 8, guides said pawl 6 in a manner to intermittently actuate the forming wheels, to be later described. I have shown a presser head arm 9, pivoted to the frame 1, at 10, and having a presser or shaper head 11, to be later described. Said arm 9 is actuated to be moved upwardly and downwardly by a power link 12, the lower end of which is pivoted at 13, to said arm, and the upper end of which is connected on said pin 5.

Reference will next be made to the improved forming means.

My improved forming means involves a set of wheels 14 and 15, which are rotatable on studs 16 and 17, respectively, which studs may be mounted on frame 1. Said wheels 14 and 15 have intermeshing teeth 18 and 19, respectively, which are strip forming portions or elements, the spaces 20 and 21, respectively, between said teeth being also forming elements. This mesh relation of the

wheels 14 and 15, insures their rotation in unison, the lower one being operated by the upper one thereof. As shown, the right hand end of pawl 6, engages the uppermost teeth of wheel 14, and every time the disc 4, makes a half revolution in a clockwise direction, viewing Fig. 1, the wheels 14 and 15 will be rotated the extent of one tooth, and will form one corrugated integer of the strip. On the remainder of the revolution of disc 4, the pawl 6 will be retracted to the position shown in Fig. 1. The stud 8, is so located that when the wheel 14 has been rotated the extent of one tooth thereof, the pawl 6 will be raised out of engagement with the wheel. The strip, in blank, is indicated in edge elevation at 22, and passes through any suitable guide 23, secured to the frame 1.

I will next describe the form of expander shown in Figs. 6 to 8.

This expander is formed with alternately and oppositely disposed bearing sections, and intermediate supporting sections. I will term those sections which are disposed radially outwardly in the piston groove, the outer sections, and will indicate them at 24, each comprising one integer of the formed strip. It will be noted that sections 24 are convexedly formed so that when tensioned against the piston ring, they will be slightly flattened by reason of the fact that they are arched on a smaller radius than the radius of the piston ring with which they coact. Likewise, when the inner sections 25, leave the forming rolls 14 and 15, they are convexly arched radially inwardly toward the base of the piston ring groove which they are designed to engage. I will designate the intermediate supporting sections as 26, and it will be seen that these sections are disposed nearly radial so that they will support or stiffen the sections 24 and 25. The teeth of the wheels 14 and 15, are shaped to form a strip having these elongated outer and inner sections 24 and 25, and the intermediate supporting sections 26, as will now be clear, and I will refer to each bend or section as an integer of the formed strip.

If the formed strip, as shown in Fig. 7, was in no way treated after leaving wheels 14 and 15, it would be a straight strip, and it would be necessary to bend a cut portion thereof to fit a piston groove. This is considered such a defect that specially bent and previously cut expander steel is now being sold. Besides this defect, it is usually found best to roll the formed steel on a spool in order to get it in convenient and compact shape for the market and shipment. Thus, when a mechanic gets ready to use it, and releases the roll of spring steel, the latter instantly seeks to straighten out, much the same as a clock spring when released from a tensioned condition.

Now it is the object of my invention to make a completely formed corrugated strip of piston expanding spring steel in such a manner that the finished steel will take a curved contour so that when a length is cut off for a piston groove, this length will readily fit in the groove. In fact, the curve of the finished steel may be on such a short radius that a length cut off, will actually "hug" the groove when once placed therein, thereby leaving the mechanic free to spread the ring over the piston without also having to hold the steel in the groove.

I will next refer to that portion of the invention which performs this function.

What I will term an anvil, is designated at 27, and is removably secured to frame 1, by screws 28. This anvil 27, has what I will term a holding portion 29, which, as will be seen from Fig. 2, is shaped to correspond and receive one integer 24, and a part of integer 25, together with an intermediate integer 26. Of course, this holding portion may be extended to receive more of the formed strip than is herein shown but the important thing is that the holding portion 29 is shaped to receive the strip without changing the shape of the strip portion engaged thereby. In other words, the portion 29, functions solely as a holding portion. Contiguous with this holding portion 29, is a shaping portion 30, and the latter is so positioned that when the integers 24 to 26 are disposed upon the holding portion 29, the next endmost adjacent integer 25, will engage the shaping portion 30, as in accordance with this specific form of the invention, I concentrate the shaping operation only on sections or integers 25, which, as will be seen, are the inner sections of the strip shown. Now it will be seen that the inner sections or integers 25, when the formed strip leaves the wheels 14 and 15, are convexed radially inwardly, as will be seen from Fig. 7. The shaping portion 30, is convex, with a view of changing the shape of sections 25 from the inwardly convex form shown in Fig. 7, to the outwardly convex form shown in Fig. 8. The coacting or companion element of the shaping means is the presser head 11, which is provided with holding portion 31, complemental to the holding portion 29 of the anvil, to securely hold a portion of the strip while the latter is being reshaped. The head 11, is also provided with a shaping portion 32, which coacts with the shaping portion 30.

From the foregoing, it will now be clear that by reversing the convexity of the sections 25, I cause the strip to assume a curved form when it leaves the shaping means, as generally indicated in Fig. 2. The extent and character of the reshaping may be varied as desired, either as regards the form of strip shown, or as regards other strips, or strips of other form. In the present instance, the reverse convexity of sections 25, is made on

a radius greater than the radius of the piston groove so that the inner sections will be flexed when engaged by the base of the piston ring groove, thereby enhancing the expanding resiliency of the strip and avoiding sharp bends or corners. In other words, the sections 25, while shaped toward the "round" of the surface with which they are to coact, still, they are not so nearly concentric therewith but that they will be put under tension when engaged therewith. I find in actual practice, that I can curve the formed strip by only modifying alternate sections thereof and that it is not necessary to modify each and every section.

It will now be clear that when a mechanic starts to use my improved curved strip, it will not unwind and expand, but will readily facilitate its own insertion into the piston ring groove. It will also be clear, that by means of this improved method and mechanism, the strip may be severed into definite lengths and be sold as "cut strips," or "cut steel." However, I claim it is novel, to form an expander steel strip and cause the formed strip to assume a curved form for any indefinite length.

At the present time, it is the practice to provide spring steel of this character in widths of one quarter inch, three sixteenths and one eighth inch, and personally, I make each width in "light," "medium," and "heavy" tempered steel. Thus, I require nine varieties of raw material. To reduce the variety of raw material necessary, it is a feature of this invention to provide means for relatively lengthening or shortening the sections 24 and 25, to get a different, or a variety of different tensioned strip material out of a greatly decreased variety of raw material.

Thus, in Fig. 5, I have shown a set of forming wheels 33 and 34, having teeth 35 and 36, respectively, which operate in the same manner as wheels 14 and 15, but the number of teeth per wheel is less, and the teeth, as will be seen, are elongated so as to form the sections 24 and 25 of greater length than do the wheels 14 and 15. I would also replace anvil 27, and head 11, for others of like nature but having holding and shaping portions of a size corresponding to the size of sections formed in the strip. Thus, by the simple expedient of changing the toothed wheels, and changing the anvil and presser head and arm, I can, in one machine, produce expander strips of a variety of tension from a greatly reduced variety of raw material.

It may be stated that I employ the same width of toothed wheels for all widths of strips.

It will now be clear that while the disc 4 is rotating clockwise, viewing Fig. 1, it is lifting the presser head 11, away from the anvil and is about to advance the wheels 14 and 15, the distance of one tooth thereof, or any desired distance dependent upon the location of the anvil and presser head and the length of the sections formed in the strip. After the wheels have been actuated, then, friction holds them in the position from which they have been released. As the pin 5 begins its downward movement, the presser head 11 is moved downwardly toward the anvil, as shown in Fig. 2, until it comes into pressure engagement therewith. As the pin 5 passes over the lower dead center, the final and maximum pressure is applied, firmly holding certain sections of the strip, and bending the remaining section. Thus, the forming means is idle when the shaping means is functioning and the shaping means is idle while the forming means is functioning.

It is believed that my invention will be fully understood from the foregoing description, and I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:

1. In a machine for making spring steel expander stock, coacting intermeshing rolls for forming a spring steel strip into oppositely disposed bearing sections, and mechanism for intermittently actuating said rolls to form and advance the formed strip and shaping the formed strip to cause the latter to assume a curved contour.

2. In a machine for making spring steel expander stock, intermeshing rolls shaped to form an interposed spring steel strip into oppositely disposed outer and inner bearing sections, a fixed anvil having an outer section holding portion and an inner section shaping portion, a pivotally mounted shaping presser head having an inner section shaping face coacting with said anvil, a driving cam, a link operatively connecting said head with said cam, and a roll actuating pawl driven by said cam.

3. In a machine for making spring steel expander stock, rotary means for forming a spring steel strip into oppositely disposed outer and inner bearing sections, and pivotally mounted mechanism for shaping the formed inner sections to cause the finished strip to assume a curved contour.

4. In a machine for making spring steel expander stock, means for corrugating a spring steel strip to form alternately and oppositely disposed elongated outer and inner bearing sections connected by intermediate supporting sections, an anvil over which the formed strip is intermittently advanced section by section, said anvil having a holding portion shaped to fit the formed sections and said anvil also having a shaping portion adapted to alter the form of said inner sections, and a presser head having a holding portion shaped to coact with the holding portion of said anvil to securely hold the strip,

and said head having a shaping portion coacting with the shaping portion of said anvil to bend said inner sections radially outwardly and thereby cause the finished strip to assume a curved contour radially inwardly with respect to said outer sections.

5. In a machine for making spring steel stock for expanding piston rings, means for corrugating a spring steel strip in a substantially straight condition to form outer bearing sections adapted for engagement with a piston ring and inwardly arched inner bearing sections adapted to engage the base of a ring groove and intermediate supporting sections, and mechanism for sufficiently reversing the arch of each inner bearing section to cause the formed strip to assume a curved contour with the outer sections disposed radially outwardly, whereby said reshaped inner sections will better fit the convex base of the ring groove.

6. In a machine for shaping spring steel stock for expanding piston rings, means for corrugating a spring steel strip into alternately disposed outer and inner bearing sections with the inner sections elongated, and mechanism for arching said inner sections outwardly on radii slightly less than the radius of the base of a piston groove and sufficiently to cause the reshaped and formed strip to assume a curved contour with the outer sections disposed radially outwardly and the inner sections disposed radially inwardly to facilitate location of a length of said strip in the groove of a piston.

7. In a machine for making expander steel, means for forming a spring steel strip into a series of outwardly disposed and outward arched and elongated ring bearing sections and into inwardly disposed elongated and inwardly arched piston groove bearing sections, and mechanism for consecutively and individually bending said inwardly disposed sections outwardly, thereby shaping said inwardly disposed section to fit the piston grooves and causing said formed strip to assume a continuously curved contour.

In witness whereof, I have hereunto set my hand.

GEORGE C. BECK.