(No Model.) 2 Sheets—Sheet 1.

F. M. METCALF.

MODE OF CONSTRUCTING SPRING PACKING RINGS.

No. 410,426. Patented Sept. 3, 1889.

Fig. III.

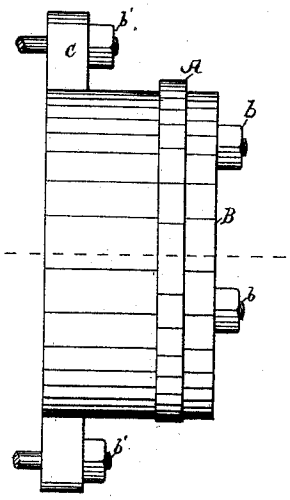


Fig. I.

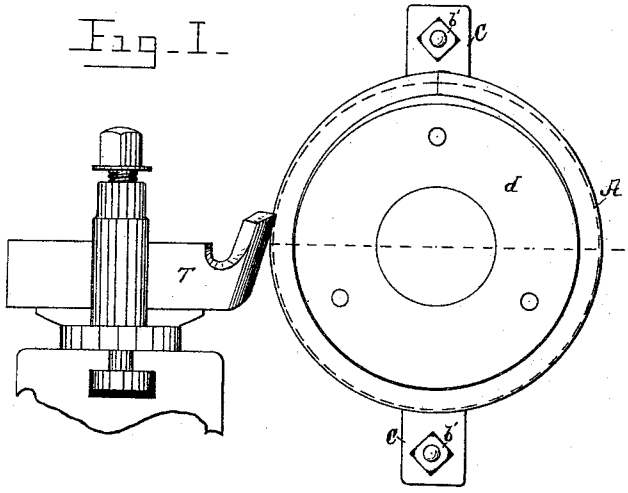


Fig. II.

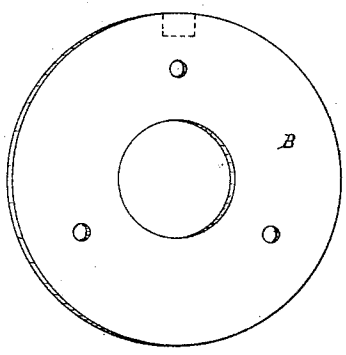
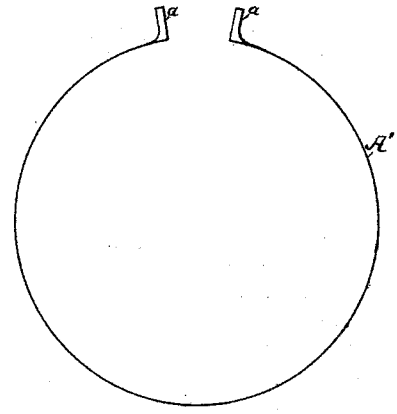


Fig. V.



WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. IV.

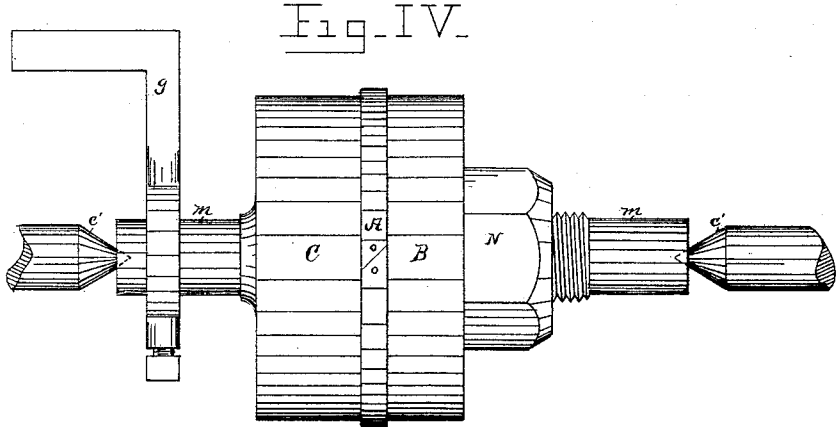


Fig. VII.

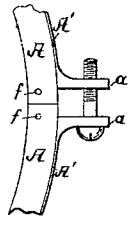
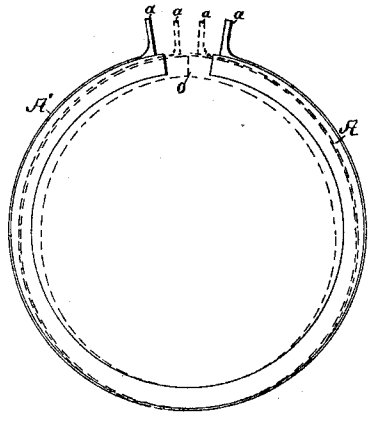


Fig. VI.



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UNITED STATES PATENT OFFICE.

FOSTER M. METCALF, OF BATTLE CREEK, MICHIGAN, ASSIGNOR OF ONE-HALF TO WILLIAMS ANDRUS, OF SAME PLACE.

MODE OF CONSTRUCTING SPRING PACKING-RINGS.

SPECIFICATION forming part of Letters Patent No. 410,426, dated September 3, 1889.

Application filed June 19, 1889. Serial No. 314,874. (No model.)

To all whom it may concern:

Be it known that I, FOSTER M. METCALF, a citizen of the United States, residing at Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in the Manufacture of Spring Packing-Rings for Cylinders of Engines, Pump-Pistons, and kindred Machines, of which the following is a specification, reference being had to the accompanying drawings, in which similar letters and figures of reference designate corresponding parts in all the views.

My invention relates to an improved process and novel devices for making spring packing-rings for use in the cylinders of engines, pumps, and analogous machines, and has for its object the providing of practically, as well as theoretically, perfectly concentric spring packing-rings, fit for use everywhere, in place of the more or less imperfectly-fitting rings heretofore employed.

It has been found hitherto impossible to provide a spring packing-ring that will fit every part and work in constant and concentric contact with the inside of the engine-cylinder by any known method or process of manufacture. This well-known difficulty has arisen partly from the oval form of the packing-ring when forced into the cylinder, as made according to the old processes, but is more especially due to the differing degrees of density or elasticity of the metal substance composing the various parts of the ring itself.

A more recent improver has suggested that if the ring is sprung together and while so held is truly bored on its inside and trued on its outer surface to fit the bore of the cylinder it will be "as nearly a perfect fit as the present arts of construction will permit." Whether or not the suggestion (wholly unknown to the present inventor at the time of conception and reduction to practical form of his perfected process, by means of which a perfect fit without fault or failure is at all times secured) is practical depends upon how and by what means the two ends of the spring-ring are brought together, as will presently appear. It is precisely at this point of failure by previous processes that the present invention finds successful application, as follows, to wit: I provide a perfectly pliable and flexible band or embracing clasp, of suitable width and length to reach nearly around the outside of the previously-prepared ring, the extreme outwardly-projecting ends of the clasp being re-enforced to provide convenient handles or arms, by means of which the flexible band is closed around the spring-ring, and by which its ends are firmly held in close contact while being clamped in the lathe-chuck, and held securely while its outer surface is turned and trued to the exact bore of the cylinder in which it is to be used. (See Figures 1, 3, 4, 5, and 6.) For small light work—such as "snap-rings" for use in pumps, steam-actuated valves, and the like—I prefer pinching the flexible clasp and ring together with the fingers; but for heavy work a bolt or lever and eccentric are better.

Referring now more particularly to the drawings illustrating and explanatory of my new process, &c., Fig. 1 represents a face view of the spring packing-ring A as made by old methods, but adjusted in proper position on the face of the lathe-chuck C for the purpose of finishing in accordance with my invention, with the outer clamping-plate B removed, Fig. 2. The outer clamping-plate B is secured to the chuck C by bolts *b*, which pass through corresponding holes, with which the central disk *d* is provided, while bolts *b'* secure the chuck C to the face-plate of the lathe. The office of the disk *d* is one of convenience only in centrally adjusting the spring-ring for finishing by means of the turning-tool T. (See dotted lines.) The dimensions of the central disk *d* must be somewhat less than the thickness and inner diameter of the ring A. Fig. 2 is a perspective view of the ring-clamping plate B detached. Fig. 3 shows the lathe-chuck with the spring-ring secured in position for finishing, clamped between the face of the chuck C and plate B at a right angle to the view presented by Fig. 1. Fig. 4 is a modified form of lathe-chuck which I think preferable for quick light work, with a ring in its grasp for finishing. Fig. 5, which

comprises the essential feature of my invention, is a thin band of metal or other perfectly pliable and flexible material, and of equally sensitive flexibility throughout, except at its ends, where it is re-enforced for purposes already pointed out. Fig. 6 represents the metallic band or flexible ring-embracing clasp A′, provided with its convenient outwardly-projecting ends or lugs *a a* for forcing the open ends of the ring together, as shown by dotted lines; and Fig. 7 is a modified form of the flexible clasp arms or lugs provided with a screw-bolt, preferable for heavy work, or a lever and eccentric may be employed instead.

The letter A represents the spring packing-ring as adjusted by my improved process preparatory to turning and finishing, as hereinbefore particularly pointed out. This ring is here represented as made by the old processes—to wit, of circular form, but of diameter enough larger than the cylinder in which it is intended to engage to presumably fill and fit the same after having the difference between its outer circumference and the inside of the cylinder cut out, as represented at *o* in Fig. 6.

As is well known to those skilled in the art, the outside and inside of a spring-ring thus made when sprung in the cylinder are of irregular oval shape and unfit for use until further fitted and trued. Various methods have been suggested, tried, and abandoned, as well as employed, for the purpose of correcting these irregularities, among which may be mentioned that of "peening" with the hammer, whereby the skilled artisan's practiced eye and hand can at great loss of valuable time approximate to a tolerable, though far from perfect, fit. Others still have sought to forcibly bring the ring ends together and while so held turning and truing first inside then on the outside, and have failed, for the following reasons—namely, because of the fact that an unequal pressure on any part of the ring's circumference, or in consequence of the varying and unequal elasticity of the substance composing the ring itself, by producing a distorted, oval, or irregular form the expansibility of the ring causes a return or tendency thereto immediately after it is released from confinement in the lathe-chuck.

By means of my improved process and novel devices, the mode of operation wherewith I will now clearly point out, the ring is embraced throughout its circumference by equal compression of the flexible clasp A′, leaving the entire periphery of the expansible ring free to assume such irregular shape before truing as its larger normal diameter and differing degrees of density or expansibility of its annular substance shall determine, precisely as would be the case were there nothing whatever in contact with its outermost circumference. Indeed, there need be nothing except for convenience of construction, because, as seen in Figs. 3 and 7, suitable apertures may be made in each end of the spring-ring A, whereby the said ring ends may be closed and the spring then clamped in the embrace of the lathe-chuck and the identical result attained. So, also, lugs may be cast on the ends of the ring itself, whereby the unequal and irregular form natural for the expansible ring to assume when forcibly closed may be secured while the ring is being placed in the lathe-clamp and temporarily so fixed, while the workman shall correct the said irregularities by turning the outside surface, and thereby removing the said lugs.

Other equivalent means may be employed embodying the essential features of my invention, as is evident, and it is not deemed necessary to further particularize on this head. Neither is it needed to more than mention the advantages accruing to the use of spring packing-rings nor my process of making them, whereby, incidentally, it is easy to make them of greater vertical thickness on the side opposite the opening, since every manufacturer of springs recognizes a gradual taper from fulcrum to point as a requisite for durability, strength, and the best results. Nevertheless, I do not confine myself to the exact form shown, nor to the continuous clasp, as a chain or belt may be employed; nor to anything which falls short of first springing the ends of the expansible ring together, while leaving its annular substance free to find that normal form which its larger diameter and unequal expansibility shall seek, and then to correct said irregularities by turning to a true circle concentric with the bore of its engaging-cylinder.

Having thus fully described my invention and illustrated its salient and novel features and explained its peculiar mode of operation, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In the manufacture of spring packing-rings for use in engines, pumps, and analogous machines, the flexible compression-clasp A′, provided with projecting end portions *a a*, whereby the ring is closed and held, while its annular substance is left free to find such irregular form as its normal diameter and differing degrees of expansibility and elasticity of its substance shall determine, irrespective of the flexible clasp, and so held while being clamped in the lathe-chuck, for the purpose of turning the outer surface of said ring to a true circle concentric with the bore of the cylinder in which it is to be used, thereby correcting said irregularities, substantially as and for the purposes set forth, illustrated, and described.

2. In the manufacture of spring packing-rings for use in the cylinders of pumps, engines, and analogous machines, a clasp or means for forcibly bringing the ends of the expansible ring together, whereby its annular substance is free to assume such oval or irregular form as the larger normal diameter

or differing degrees of elasticity thereof shall seek or determine, and so held and clamped in the lathe-chuck, while the said irregularities shall be corrected by turning the outside surface of said ring to a true circle, exactly concentric with the bore of the cylinder, substantially as set forth.

In testimony that I claim the foregoing I have hereunto affixed my name in the presence of two attesting witnesses.

FOSTER M. METCALF.

Witnesses:

FRANK W. CLAPP,

M. METCALF.