

(Model.)

D. R. PRATT.  
Spring Washer.

No. 236,624.

Patented Jan. 11, 1881.

Fig. 1.

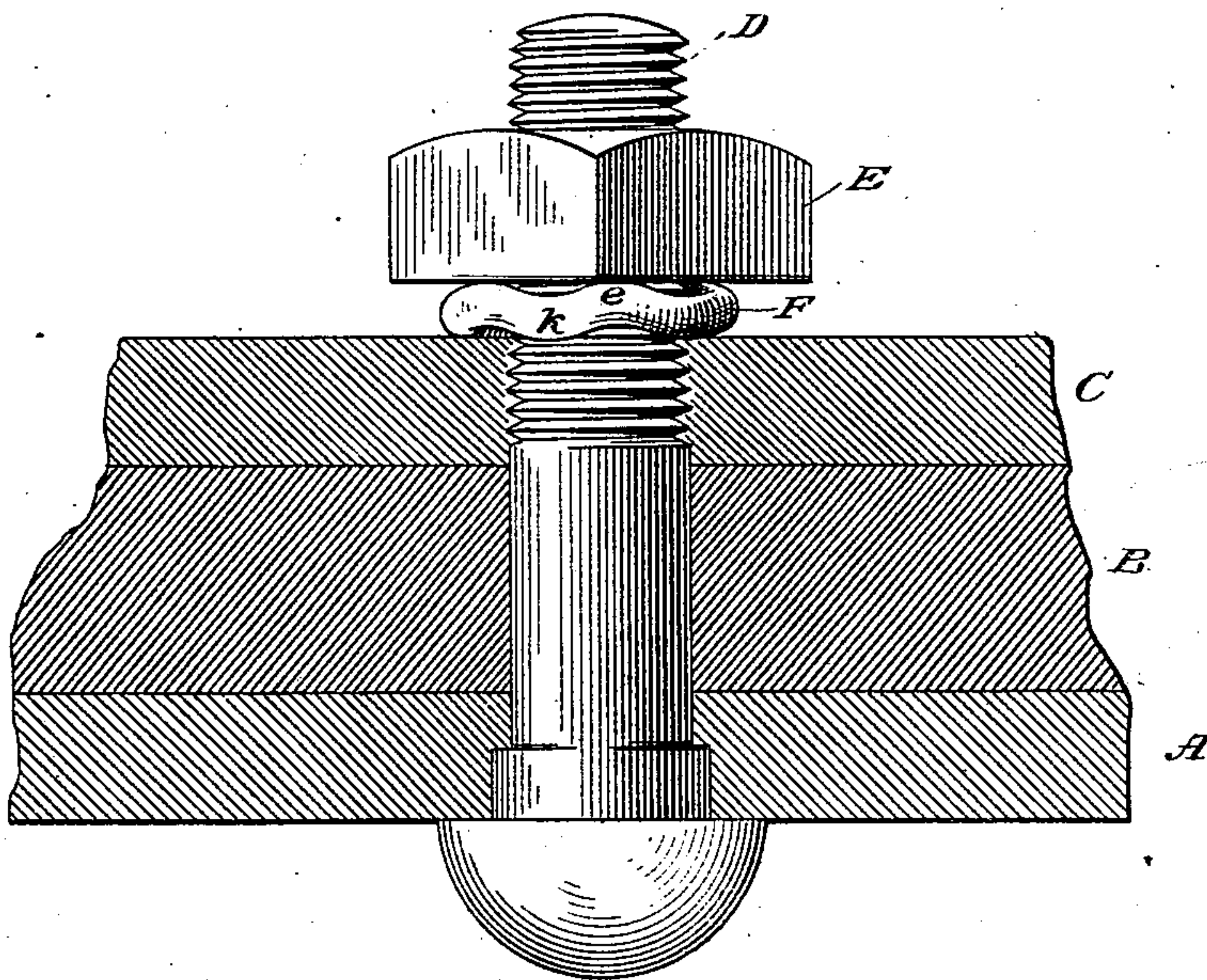


Fig. 2.

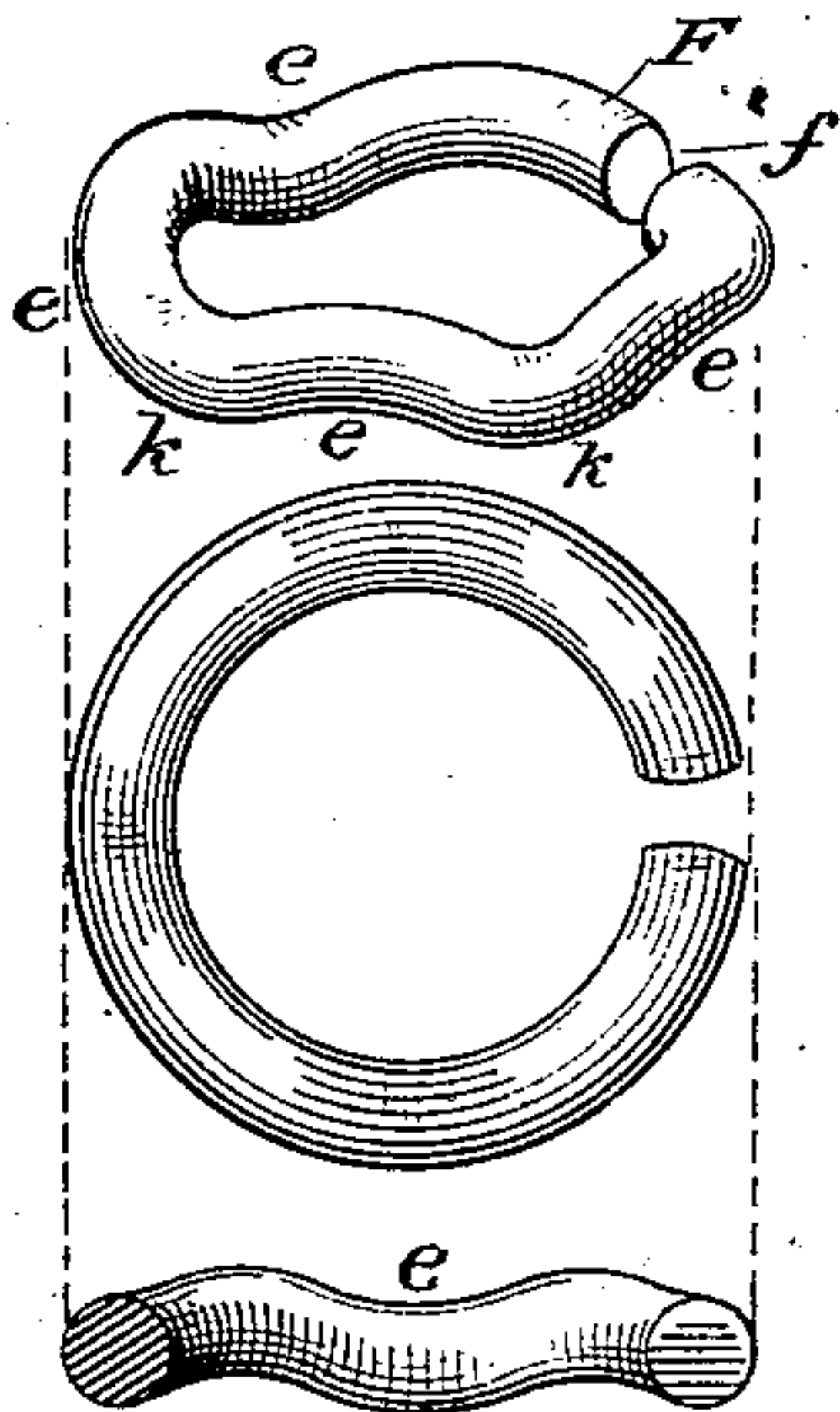


Fig. 3.

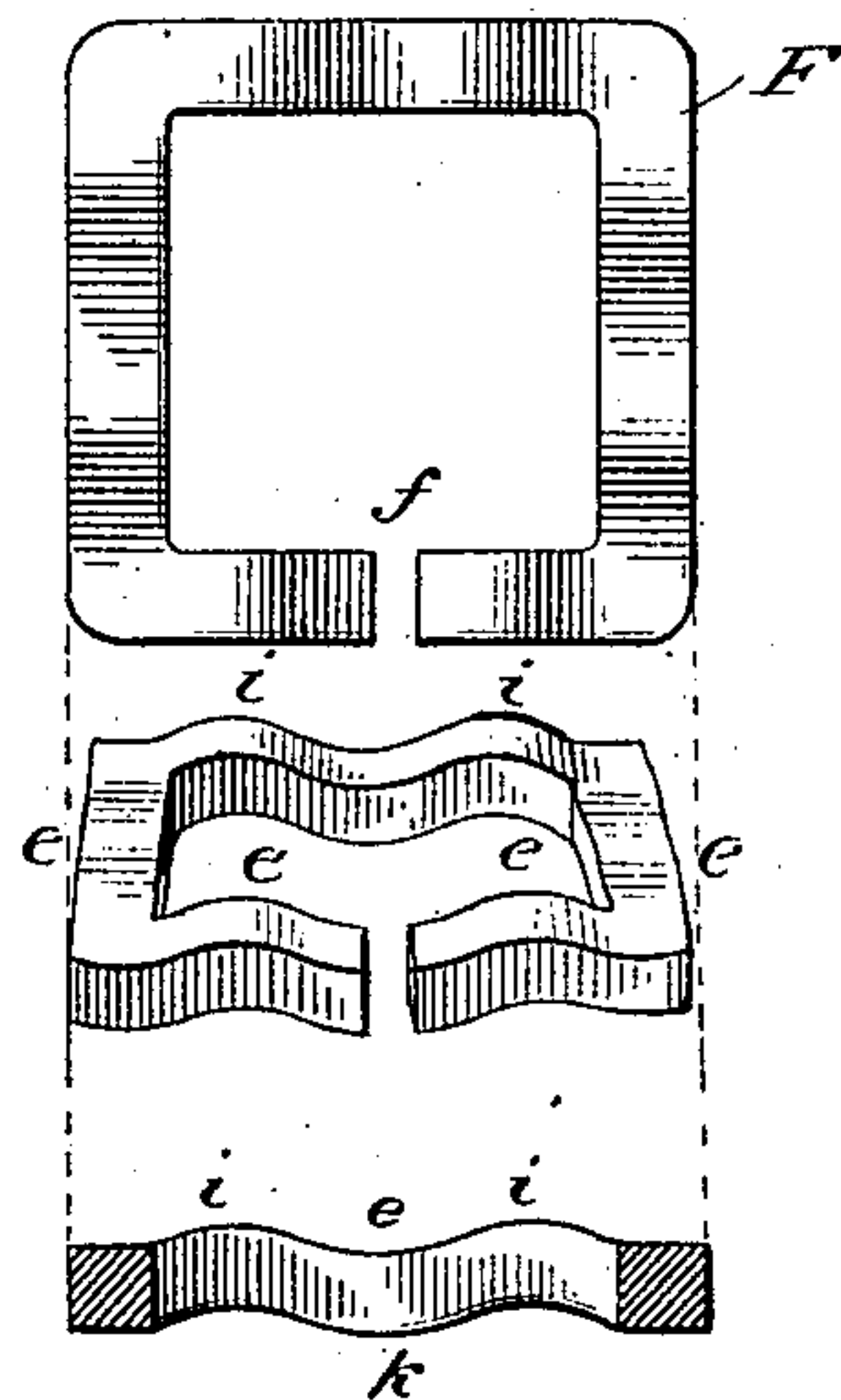


Fig. 4.



Attest:

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# UNITED STATES PATENT OFFICE.

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OF SAME PLACE.

## SPRING-WASHER.

SPECIFICATION forming part of Letters Patent No. 236,624, dated January 11, 1881.

Application filed October 23, 1880. (Model.)

*To all whom it may concern:*

Be it known that I, DANIEL R. PRATT, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Tension-Springs for use with Nuts and Bolts; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

In the drawings, Figure 1 is an elevation of a bolt and nut, showing the application of my improved tension-spring. Fig. 2 shows a perspective, a plan, and a sectional view of the tensional spring made from round wire or rod. Fig. 3 shows like views of the spring made from square bar or wire and of rectangular form. Fig. 4 is a sectional view of the spring as made of oval wire or bar.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of that class of devices employed for insuring the tension of bolts used in securing articles or structures, and has for its object to compensate for any slack arising from wear of the nut or bolt-head and contiguous surfaces or by the unscrewing or displacement of the nut. This class of devices are in general termed "nut-locks," though in the special class to which my devices belong no means is employed to prevent the turning of the nut other than the jamming of the nut from the pressure of the spring.

To accomplish the object in view various forms of elastic or spring washers have been devised—as, for instance, washers of rubber, cupped as well as cupped and corrugated metallic spring-washers, corrugated metal disks, and spirally-coiled metallic springs. Of such devices those most nearly approaching my present invention are the corrugated metal disks and the spirally-coiled spring-washer. The first of these is usually made by first striking or stamping an annular disk from a sheet of steel or other suitable metal, and, secondly,

subjecting the annular disk to dies which set up or corrugate the same. The objection to this class of washer is, first, if made of light material it will not have sufficient spring power or tension to be of practical service, and, secondly, as the fiber is in part coincident with the corrugations, there is an increased tendency of the washer to snap or break when compressed by the nut.

The second class of devices are formed either by first striking out an annular washer, then cutting it across, and finally giving it a spiral twist to secure teeth or projecting points, or from a short bar by giving the same a spiral coil by means of suitable machinery. The objection to this last washer is, first, that there are but two bearing-points, and these are of a character calculated to channel or groove the under surface of the nut and the surface against which the spring-washer bears, and this in course of time tends to increase rather than overcome the play or slack of the bolt and nut. To overcome these difficulties it is essential, first, that the spring should be very powerful or of great tension, and this with the least amount of metal; and this I accomplish by forming it from steel wire or rods drawn or rolled so as to preserve intact the skin, which adds to the strength and resiliency of the metal, and which in the cut or stamped washer is broken; secondly, that it should be of a character to yield readily and react promptly, and this I accomplish by giving the spring the form of an open corrugated ring, so as to obtain a series of springs; and, thirdly, that it should have a series of bearing-surfaces which are not in the form of acute angles or cutting-edges, and this I also accomplish by corrugating the ring, and, if found necessary, by beveling the edges of the cut or opening of the ring.

My invention therefore consists in a spring-washer or tension device to be used with nuts and bolts, formed of drawn or rolled steel wire bent to surround the bolt and corrugated, the free ends of the wire being in substantially the same plane, so as to allow the top and bottom projections of the spring to come in contact with the nut and bearing-surface, and to avoid the wearing or cutting of either



the nut or bearing-surface, as will hereinafter more fully appear.

It will be apparent that, while several of the devices heretofore referred to as already existing contain one or more of the essential features set forth, none exhibit all the characteristics of my device, and no claim is herein made to any tension-spring for nuts and bolts which does not contain all the essentials recited.

I will now proceed to describe my invention more specifically, so that others skilled in the art to which it appertains may apply the same.

A, B, and C indicate parts of a structure which are to be clamped or held by bolting the same together, while D indicates a bolt, and E a nut, all of the class commonly employed.

In all structures, jars, expansion and contraction, wear, and other causes result in course of time in loosening the nut and permitting play of the bolt, unless a compensating-spring is employed. In the drawings, F indicates my improved device for said purpose. Its exact outline is not material. An open annulus, Figs. 1 and 2, in some respects is preferable, because more easily formed; but a hollow square, Fig. 3, or polygon, cut as at *f*, will answer, or any form which will inclose the bolt. The material is essential, and should be drawn or rolled steel wire whereon the skin is preserved intact so as to enhance its strength, and so that when the metal is corrugated the fiber shall not coincide with the corrugations; but as far as the general form is concerned the wire may be round, square, or oval in cross-section, as preferred, so that no cutting-edges are presented to the bearing-surface of the nut or to bearing-surface C.

In manufacturing the spring F, I first take a piece of drawn or rolled steel wire or rod, preferably of one-quarter ( $\frac{1}{4}$ ) inch diameter or under, and of suitable length, and bend the same to form an open annulus or polygon, F, the free ends being brought as nearly as possible into the same plane, so as to present no cutting-edges or projections, and sufficiently close together to securely inclose the bolt and yet permit the extension of the ends when the spring expands. This annulus I submit to dies which corrugate it at several points, as indicated by *e e*, so as to produce multiple bearing-faces *i i* and *k k* on both surfaces.

In the operations specified the wire or rod is annealed very soft before bending and cor-

rugating, and is carefully tempered after being corrugated. As the annulus is open, the corrugating thereof converts it into a multiple spring of great power. In corrugating the annulus care should be had not to cause the cut ends at *f* to project, as they would then be likely to groove either the nut or the surface C, according to the position of the spring; and in case they are found to project they should be beveled off. The number of corrugations should not exceed three or four, else the spring will be too stiff to give the best results.

The advantages derived from my invention are, first, that I obtain a spring of great power with the use of the least amount of metal; secondly, that I have no cutting-edges to groove or wear the nut or other surface against which the spring bears; and, thirdly, that it can be cheaply manufactured.

I am aware that a spring-washer having radial corrugations and a radial slit or opening is not new, and do not claim the same, for the reason that such washers are formed of sheet metal, the fiber of the steel is in part coincident with the corrugations, and the skin of the metal broken, which renders the device liable to break when compressed and detracts from its power, whereas by employing rolled or drawn steel wire I am enabled to preserve intact the skin of the metal, thus increasing its strength and resiliency; and I also avoid having the fiber of the metal coincident with the corrugations of the washer. I obtain a very powerful spring with the least amount of metal.

Having thus described my invention and particularly pointed out wherein it differs essentially from what has preceded it, I claim as my invention and desire to secure by Letters Patent—

A spring-washer or tension device to be used with nuts and bolts, consisting of a spring formed of drawn or rolled steel wire, bent to the shape of an open annulus or polygon and corrugated, the free ends of the wire being in substantially the same plane, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

DANIEL R. PRATT.

Witnesses:

F. W. RITTER, Jr.,  
H. B. MOULTON.