July 1, 1941. F. T. BROOKE 2,247,649

ARCHERY BOW

Filed Dec. 7, 1939

Fig. 1.

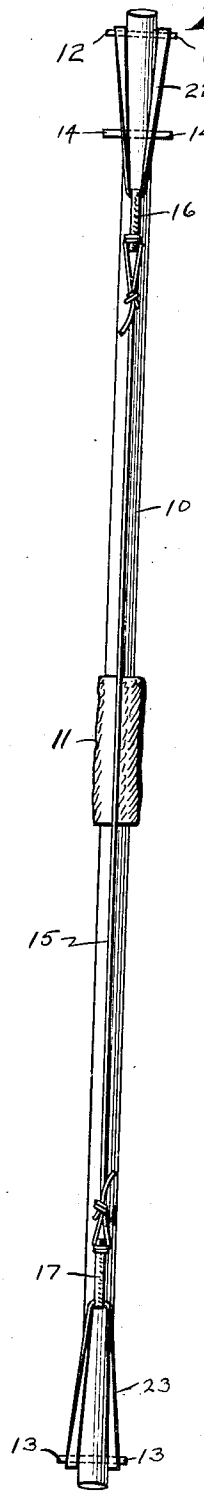


Fig. 2.

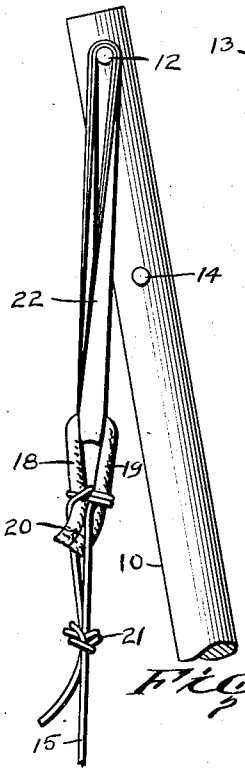


Fig. 3.

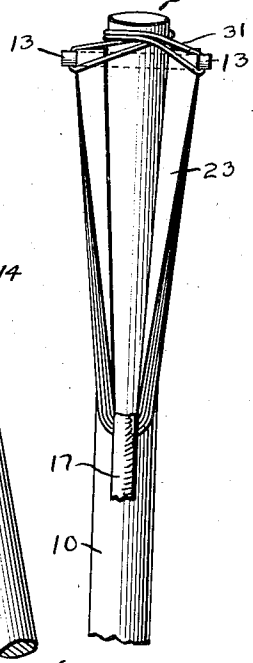


Fig. 4.

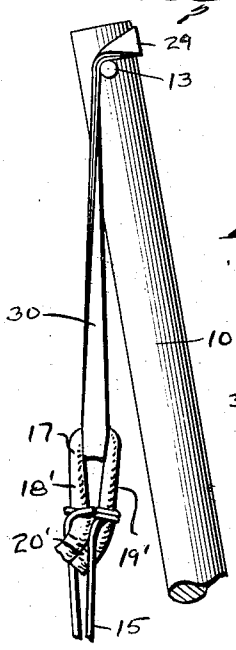


Fig. 7.

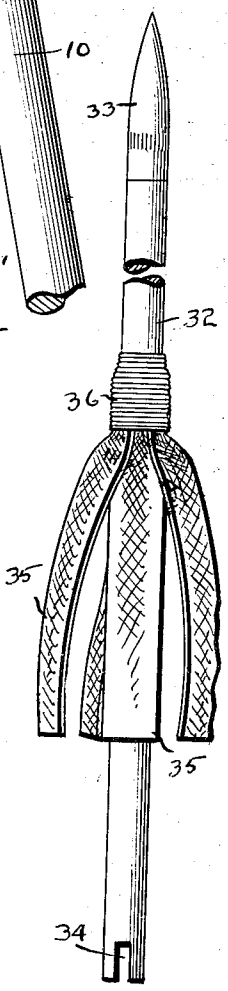


Fig. 5.

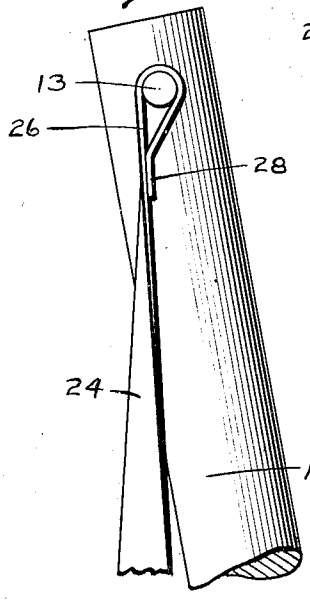
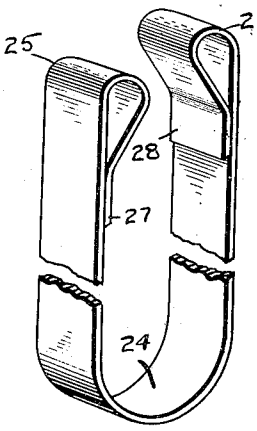


Fig. 6.



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UNITED STATES PATENT OFFICE

2,247,649

ARCHERY BOW

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Application December 7, 1939, Serial No. 307,947

4 Claims. (Cl. 124—23)

My invention relates to the art of archery, and particularly concerns a bow and arrow construction for use in the practice of archery.

An object of my invention, therefore, is to produce a durable, sturdy, efficient and readily marketable bow, having excellent shooting qualities, with high accuracy capable of duplication, in ready and highly practicable manner, at a minimum of investment of equipment and materials, and at a minimum requirement of skilled labor; which bow is characterized by its long useful life and by the great ease, rapidity and absence of effort with which the string tension of the bow can be adjusted, so that a single bow of given overall length can be adjusted to a tension suitable to any archer. Another object is to produce a bow for use in archery in which it is possible to hold the bow string assembly in positive manner on the bow stave, in which parts subjected to wear or breakage can be replaced instantly, without appreciable disturbance to the remaining parts of the bow, and in the use of which it is unnecessary for the archer to employ a wrist guard.

A further object of my invention is to produce a bow for use in archery in which the bow string has a long useful life, which bow string can be satisfactorily made of inexpensive, ordinary and strong cord, woven without especial precautions, and which bow requires a string of a minimum of strength and cost for a given flight distance.

Still another object is to produce a bow string for archery in which the bow string is so mounted as to be protected against abrasion and chafing, in which a durable and thoroughly practical connection is provided for readily and easily attaching a bow string to means imparting elasticity to the bow string; in which great elasticity is imparted to the bow string relative to the bow stave, the string being adjustable relative to the bow stave in any of numerous easy and readily available manners; to provide a minimum of strain on the bow string for a given flight distance of the arrow; and to provide a method for the complete and ready removal and installation of the string, at a minimum of time and effort.

Yet another object is to produce an arrow for use in connection with the aforesaid bow, characterized by its extremely low cost and its comparatively high degree of accuracy.

Other objects will be obvious in part, and in part pointed out hereinafter.

My invention accordingly consists in the several elements, features of construction, and operational steps, and in the combination of each of the same with one or more of the others, the scope of the application of which is indicated in the claims at the end of the specification.

For a more ready comprehension of my invention, reference may be had to the accompanying drawing, wherein Figure 1 is a front elevation, illustrating a preferred embodiment of my invention; Figures 2, 4 and 5 are fragmentary side elevations, and Figure 3 is a fragmentary front elevation, illustrating details of various possible embodiments following my invention; Figure 6 is a broken perspective view of a rubber band designed for imparting elasticity to the bow string in accordance with my invention; while Figure 7 is a broken elevation, depicting an arrow designed for use in connection with my bow. Figure 2 is a view of one end of my new bow, while Figures 3 through 5 illustrate the other end thereof.

As conducive to a more thorough understanding of my invention, it may be noted at this time that while there is at present an awakening interest in archery throughout the country, nevertheless the number of participants is materially curtailed because of the comparatively high costs of the necessary equipment. Standard high quality bows, made largely through costly hand operations, are in particular an item of considerable investment. Furthermore, a bow of a given size or poundage, that is, requiring a pull of a given number of pounds to launch the arrow on its flight, cannot be readily changed as to power. Hence such a bow cannot be used for archers other than those requiring a bow of that particular power. Furthermore, according to present practice it is necessary for the archer, if he desires variation in the power of the bow, as is desirable dependent upon the physical strength of the archer and the distance at which he is shooting, to have on hand a number of bows of different sizes. Since as has already been pointed out, a high grade bow of required accuracy is a costly item, the outlay in bows alone is an item of material expense. Additionally, it is found in the use of such bows, particularly those of high power, that it is necessary to protect that hand and wrist of the archer with which he holds the bow, against the blow of the string when the latter is released to launch the arrow on its flight. An object of my invention, therefore, is to produce a single, inexpensive bow, capable of accurate shooting and of production in mass quantities, which can readily be adjusted to any power requirements of the archer, and in the use of

which no hand or wrist guard is required by the archer.

In these expensive bows hitherto employed, breakage of the cord resulted in tedious replacement of this costly item. As contrasted with this requirement, applicant's construction is such that ready replacement of broken parts is possible, at a minimum of expense.

In seeking to avoid the expense hitherto necessarily attendant upon the practice of archery, suggestion has been made to augment the power of the bow, and to vary the maximum power output or "poundage," by interposing springs at each end of the bow string, between the string and the bow stave. Such expedient has been found impractical, however, due not only to the first cost of such springs, but as well to the tendency of such metal parts to rust under exposure to the elements, and to the rapid wear of the bow string resulting from chafing against the metal parts of the bow. Additionally, considerable hazard is evidently attendant upon breakage of the spring, and it is apparent that such spring will not produce the same power per unit of weight as will the rubber bands. Another object of my invention therefore is to produce a bow in which the power of the bow stave is augmented by the resilient suspension of the bow string from the bow stave, the suspension being of such type and of such construction that it is not materially damaged by exposure to the elements and that there is a substantial absence of frictional wear of the bow string.

In the conventional practice of archery, not only is the bow ordinarily an item of appreciable cost, but the arrow itself requires expensive hand work, to ensure that it is turned, headed, and balanced properly, that tufting of just the right kind of feathers is disposed precisely the proper distance from the end of the shank of the arrow, and that the feathers are disposed in proper geometrical pattern about the circumference of the shank. Each arrow is thus seen to involve appreciable investment, and when it is considered that the archer is equipped with a sheave or quiver of arrows, it is readily appreciated that the cost of arrows alone has hitherto been material. Particularly is this true where the archer is a novice, in which case breakage is comparatively high, so that the material investment is rapidly dissipated. A further object of my invention accordingly is to produce an arrow which while it can be shot with a satisfactory degree of accuracy, is simple in construction, and extremely inexpensive in production, and which possesses the long life required for practical utilization.

Referring now more particularly to the drawing, and having reference particularly to Figure 1, a bow stave **10** is provided, about the center of which is placed a suitable grip **11**, of length, diameter and material to which the hand of the archer can conveniently be adapted. In a typical instance, this grip may comprise several neatly rolled turns of cloth, suitably lashed by a wrapping of small gauge cord, the grip then being varnished or otherwise treated to provide a smooth, continuous surface which will not be disarranged in the course of repeated usage. This grip of course may consist at least in part of smooth or suitably contoured rubber sleeves, if so desired. The bow stave **10** may be either straight or slightly bent. The bent condition of the bow stave is clearly indicated in Figures 2, 4 and 5. Unlike the expensive bows hitherto known, it is unnecessary to turn the bow stave to a high degree of smoothness, and I have encountered commercial success and have obtained effects pleasing to the eye by burning or scorching the bow stave, sanding it down, and then varnishing it, the natural wood knots showing up in pleasing manner. Because the power of the bow is increased by the use of elastic means, it is unnecessary to make the bow stave as long for a given power rating as has hitherto been necessary in the case of a conventional bow. For example, a bow stave of about five feet length can be strung according to my invention so as to have as much as a sixty pound pull. While I find it preferable to form the bow stave stem of wood, it of course may be formed of other materials, more or less suitable for such purposes, such for an example as stainless steel. It is within the compass of my invention to make the bow stave rigid, and to depend entirely on the rubber bands or the other elastic material for the propelling power for the arrow.

Near each end of the bow stave **10**, a pin **12**, **12** and **13**, **13** is provided. This pin may comprise wooden doweling, fibre pins, metal bolts, either headed or unheaded, and the like. Conveniently, the pins may be of say ¼ inch diameter, and may extend approximately an inch beyond each side of the bow stave, at a distance of approximately one inch inwardly from the ends of the bow stave. Similarly, near one or both ends of the bow stave, a pin **14**, **14** is provided. The pin **14**, **14** is disposed more closely to the center of the bow stave than is the pin **12**, **12**. It is of course equally feasible to construct these pins as single units, projecting completely through the bow stave, or as a pair of two separate, coaxial pins, seated in said bow stave on diametrically opposite sides thereof, but not extending completely therethrough. For convenience, therefore, I have referred in the claims to pairs of pins, by which I intend either a single pin projecting at each end beyond said bow stave, or a pair of pins, disposed as described hereinbefore. The purpose of these pins will be fully pointed out at a later point in this specification.

It has been stated in the foregoing that it is a purpose of my invention to increase the power of the bow by increasing the elasticity of the bow string. The general manner of accomplishing this aim will now be described. A bow string **15** is employed, formed of any suitable inexpensive cord of proper thickness. The strength of this cord, because of the absence of friction or wear, as will be pointed out more fully hereinafter, may be considerably less than is required for the bow string of a bow of corresponding power, but of conventional construction. Accordingly, it is not necessary that the cord be woven in any especial manner, or of any especial materials. Ordinary cord, such as will be found in the conventional hardware store or the like, has been found to yield excellent results.

At the ends of the bow string **15**, loops **16**, **17** are provided, formed of strong, soft and non-abrasive material. In a preferred embodiment, I prefer to form the loops of a roll of cotton or wool fabric, but it is obvious that other woven, molded or pressed fibrous or other suitable material may conveniently be employed for the production of such loops. Reference to Figures 2 and 4 will show that loops **16** and **17**, respectively, in a preferred embodiment, are formed by bend-

ing the lengths of fabric near their midpoints, to form adjacent legs 18, 19 and 18' and 19', respectively, which said legs are joined together in any suitable manner at 20, 20', respectively, as by sewing.

While the bow string 15 may be secured to loops 16, 17 in any desired manner, it is my desire to fasten the string to the loops in such manner that there will be a minimum of direct shearing action on the string itself, at its joints with the loops. Accordingly, in a preferred embodiment, as shown in Figures 2 and 4, I lash the end of the string first several times about one leg of the loop, say the leg 19, and then about the second leg of the loop, say the leg 18. Preferably, I arrange to have that end of the bow string 15 which extends to the loop disposed on a side of the loop opposite to that on which the free end of the string extends away from the loop. In this manner, substantially all possibility of frictional wear resulting from chafing or abrasion of one part of the cord comprising the bow string against another part thereof is avoided. As has been stated heretofore, this constitutes one reason why a cord of less strength than hitherto used, can be employed satisfactorily. The free end of the cord is then knotted or otherwise conveniently secured to the principal length of the bow string 15, at 21 (Figure 2). It will be understood that the manner of lashing the bow string about the lengths of the loops tends to distribute the tension of the bowstring with reasonable uniformity over the lengths of the loops, so that danger is minimized of applying undue strain at the ends of the loop which are sewn or otherwise secured together at 20.

Through the loops 16 and 17 I thread strips of elastic material such as rubber bands 22, 23, which bands are in turn strung about pins 12, 12 and 13, 13. If rubber bands are employed, they may comprise endless loops, as in Figures 1 through 4; or they may comprise a single strip 24, as in Figures 5 and 6, having loops 25, 26 at the ends thereof, the loops preferably comprising turned-over portions secured at 27, 28 to the main length of strip 24 in any convenient manner, as by cementing, vulcanizing, sewing or the like. When the bands 22, 23, of rubber or other material possessing suitable elasticity, are strung through loops 16, 17 and are in place about the pairs of pins 12, 12 and 13, 13, the bow is ready for use.

An important feature of my invention, as already stated in general, is the comparative ease with which the pull tension or power of the bow may be quickly and readily varied. This is accomplished simply by varying the size or dimensions, or the number of the rubber bands or other elastic medium employed, or both. To illustrate, a single rubber band is illustrated at each end of the bow in Figure 1, and again in Figure 4. To increase or decrease the power of the bow, the length or width of the rubber band may be varied, or both; or as shown in Figures 2 and 3, this change in the pull strength or shooting-power of the bow may be accomplished by providing two or more rubber bands or the like. Thus the power of the bow may be readily varied within wide limits. It is to be noted that the elastic band can be replaced in an instant, simply by slipping a band out of the loops 16, 17 and mounting another in its place.

I have found it convenient simply to thread or slip the rubber band or other strip of elastic material through the corresponding loop of soft material until the rubber band extends about equally on both sides of the loop. Thus two loop portions are formed in the rubber band, and one of these loop portions is slipped over the corresponding one of the pair of pins 12, 12 or 13, 13, all as will fully appear from an examination of say, Figure 1 of the drawing. The soft material from which loops 16, 17 are formed ensures that there is a substantial absence of frictional or abrasive wear on the rubber bands or strips of elastic material at the regions where they bear against the loops, while a minimum of frictional wear occurs at the pins. However, to remove still further the possibility of frictional wear, the pins 12, 12 and 13, 13 may be either covered or formed of soft or hard rubber, polished metal such as chromium, or the like.

A further possible and thoroughly practical manner of stringing the rubber bands or the like about the pins, having reference to Figure 4, is to string the bands through the loops 16, 17 as in the manner previously discussed, and then to join together the loops in the bands thus formed and slip them about the end of the bow stave 10, resting them on and over the pins 12, 12. Thus, having reference to one end of the bow stave, a semi-circular portion 29 of the loops of the rubber bands fits about the end of the bow stave, and passes over the pins 13, 13 before extending downwardly on approximately parallel portions 30, 30 to the loop 17.

In Figures 5 and 6, the strip 24 passes through the corresponding loop of soft material 16, 17, and then the looped ends 25, 26 are fitted over pins 12, 12 or 13, 13, as the case may be.

It is of course possible to slip the bands directly over the bow stave and to hold them in position by nocks as in conventional bows, but I have found this scheme to be not nearly so simple nor nearly so practical as the use of pins which I have described hereinbefore.

If desired, and to ensure against the extremely remote possibility of the bands or strips of elastic material slipping off the pins, after usage over an extended period of time, the loops of elastic material may be suitably lashed to the pins. Such a lashing is illustrated in Figure 3 as constituting simply a rubber band 31, reversely twisted so as to fit snugly and firmly about the end of the bow stave 10 and pins 13, 13, over the loops of elastic material.

Preferably, but not necessarily, the strips of elastic material at each end of the bow string are of substantially the same power. It is also advantageous to have them of the same size and number. It is to be noted that proper tension of the bow string is important. This tension is governed by the length of the string and the strength of the rubber bands or similar strips of elastic material employed. I have found that when changing from a high to a medium power, for example, or to the use of a single band, it usually becomes necessary, in order to obtain perfect results, to shorten the string somewhat.

Another important feature of my new bow is that it can be safely employed, even when strung for high shooting power, without the use of the conventional hand guard so essential where the conventional bow is employed. Even when drawn to great poundage, the string when released will not strike the hand by which the archer holds the bow. A hand guard is unnec-

essary. I am by no means certain as to the correct explanation of this phenomenon, and am not to be bound by the following suggestion. It is probable, however, in the case of the conventional bow, where the power comes almost entirely from the bow stave itself, through the amount of bend imparted thereto by the pull on the bow string, that when the string is released, the bow stave and string tend to return instantly to their normal, comparatively unstrained positions. Due to the restoring movement of the bow stave and bow string in opposite directions, with consequent dissipation of considerable energy over an extremely small interval of time, the bow stave and bow string tend to come smartly together, striking a severe blow on the hand by which the archer holds the bow.

With my new bow, on the contrary, the restoring moment of the bow stave is itself not nearly so great for a given poundage of pull, for the rubber bands or strips of similar elastic material, when tensioned, supply an appreciable part of the power of the bow. Now, when the bow string is first tensioned and then released, then during the first part of its restoring movement, it travels with considerable rapidity, as do the rubber bands. These rubber bands absorb and tend to dampen the energy transmitted therethrough, according to my present understanding of the matter, as perhaps by collision between transmitted and reflected energy waves. Thus, as the rubber bands lose some of their elongation, the restoring moment is absorbed somewhat by the bands themselves, and the increment of restoring movement per unit of time is diminished very considerably. At the end of the restoring movement, the unit restoring movement is extremely small, and this, coupled with the dampening effect of reactance vibrations in the rubber band, serve to kill off the tendency of the bow string to continue beyond its rest position, towards the bow stave. The bow stave itself, not loaded so heavily as in the conventional bow, tends to remain in its rest position, once it has returned thereto. Thus, if a slight bow or bend is imparted to the bow stave in its normal or rest position, danger of striking the hand of the archer is eliminated for all practical purposes.

It is desirable to release the tension on the bow when it is not in use. At the same time, the practice is to be avoided, if possible, of entirely dismantling the bow to accomplish that end. It is here where the pins **14**, **14** are of utility. To relieve the tension from the bow, it is necessary only to slip the loops of the rubber band **22** off the pins **12**, **12** and onto the pins **14**, **14**. This can be done quickly and readily. At no time is the bow string dismantled from the bow stave when it is desired to remove tension from the bow. The pins **14**, **14** are in a preferred instance, disposed about four or five inches from one or both ends of the bow stave. Thus, these rest pins **14**, **14** may be provided at both ends of the bow stave, if desired.

Surprisingly good results have been encountered in the use of my improved bow with a simple and inexpensive arrow designed for use in conjunction therewith. This arrow, shown in Figure 7, comprises a properly turned shaft **32** of light wood, metal, or the like, having a circular cross-section. The head end of the arrow preferably is provided with a pointed head **33**, which conveniently may be of metal. The tail end may be notched as at **34** for fitting about the bow string. Narrow strips of cloth or other suitable material **35** are lashed at **36** about the shaft **32**, near the tail end thereof. Where I use the term "cloth" hereinafter in the specification and claims, I intend to cover both cloth and other suitable material satisfactory for such purposes. These strips of cloth are lashed about the periphery of said shaft, and have a length several times their width. They extend rearwardly of said lashing in the direction of said shaft. The strips of cloth tend to hold the arrow on its course during flight, and to prevent swerving or wobbling. Such an arrow is extremely inexpensive, and gives surprisingly good accuracy.

It is at once evident, from a careful consideration of the foregoing, that I have produced a new form of bow which can be readily adapted to different bowmen of wide range of skill and strength, and which compared to conventional bows of high cost, are characterized by both their low first cost and their low maintenance costs, as well as by their sturdiness and durability. They can be repaired, should repairs become necessary, in short order and at a minimum of inconvenience. The arrows for use in connection therewith are likewise characterized by their extremely low first cost, and their comparative accuracy in flight.

As many possible embodiments and variations may be made in my invention, and as changes may be made in the embodiments hereinbefore set forth, it will be understood that all matter described herein, or shown in the accompanying drawing, is to be interpreted as illustrative, and not in a limiting sense.

I claim:

1. A bow for use in archery, comprising a bow stave having the periphery of its cross-section in the form of a continuous curve, a pair of pins having rounded peripheries, projecting substantially diametrically and laterally outward from said bow stave near each end thereof, strips of elastic material strung about said pins, loops of soft material of substantial thickness carried by said strips and through which said elastic strips are strung, and a bow string strung between and secured to said loops.

2. A bow for use in archery, comprising a bow stave having the periphery of its cross-section in the form of a continuous curve, a pair of pins having rounded peripheries, projecting substantially diametrically and laterally outward from said bow stave near each end thereof, strips of rubber strung about said pins, loops of soft material, of substantial thickness, carried by said strips and through which said strips of rubber are strung, a bow string strung between and secured to said loops, and a second pair of pins at at least one end of said bow stave, disposed more closely to the center of the bow stave than the adjacent first pair of pins, for receiving thereabout the corresponding strip of rubber, to remove tension from the bow without dismantling the same, when it is not in use.

3. A bow for use in archery, comprising a bow stave, a pair of pins projecting substantially diametrically and laterally outward from said bow stave near each end thereof, strips of elastic material strung about said pins, loops of soft material carried by said strips and through which said elastic strips are strung, a bow string strung between and secured to said loops, and readily removable means for securely lashing said strips of elastic material to said pins.

4. A bow for use in archery, comprising a bow stave having the periphery of its cross-section in the form of a continuous curve, a pair of pins having rounded peripheries projecting substantially diametrically and laterally outward from said bow stave near each end thereof, a bow string, loops of soft material of substantial thickness secured at each end to said bow string, and endless rubber bands passed through said loops, to form two loop portions of equal lengths, said loop portions being joined together and looped over the ends of said bow stave, and resting on and passing over the outer sides of said pins.

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