March 8, 1932. R. H. COWDERY 1,848,768

BOW FOR ARCHERY

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FIG. 1.

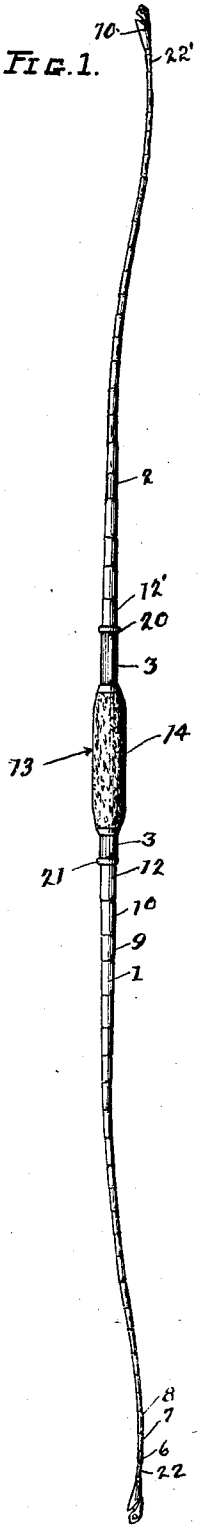


FIG. 2.

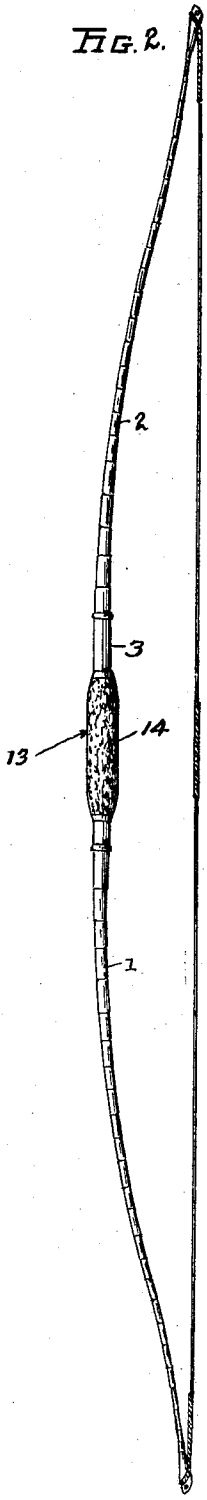
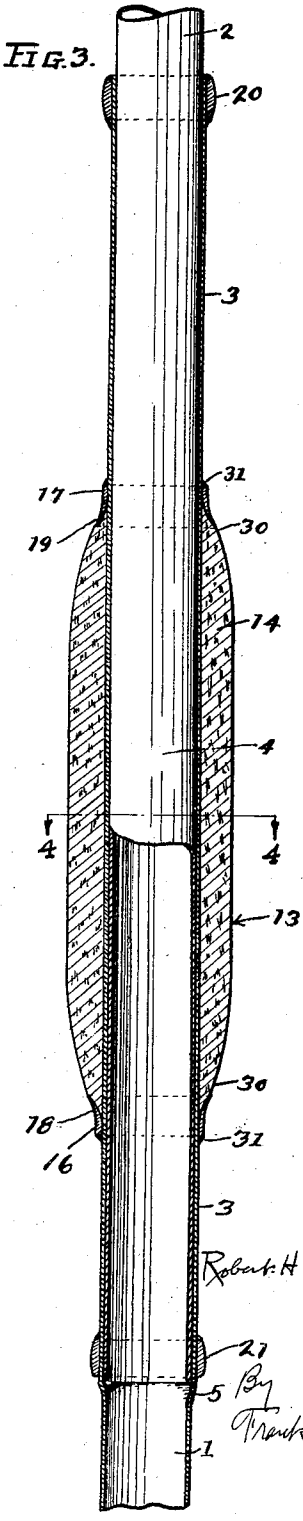


FIG. 3.



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FIG. 5.

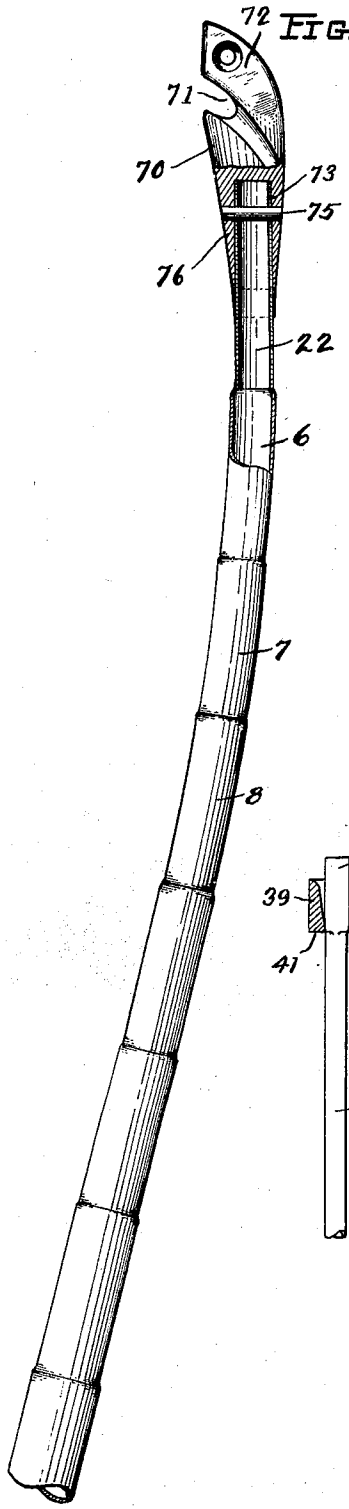


FIG. 4.

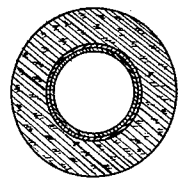


FIG. 6.

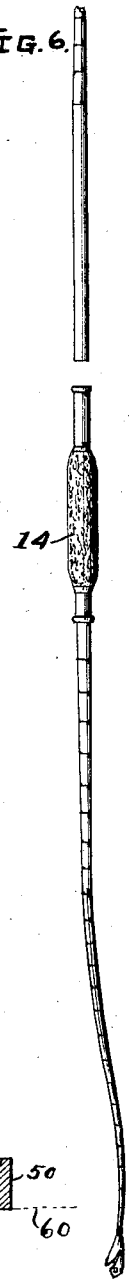
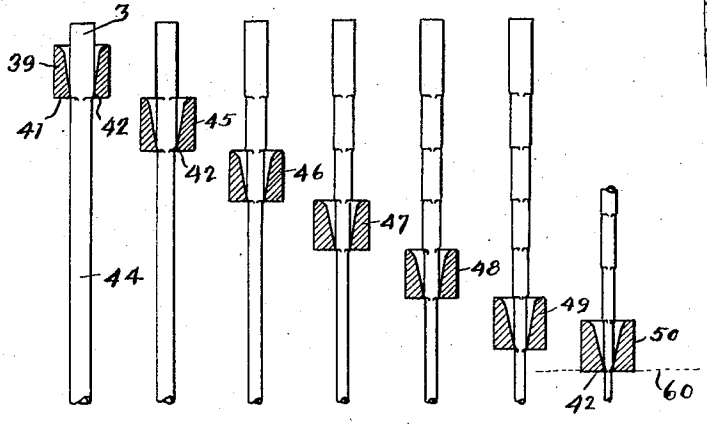


FIG. 7.



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UNITED STATES PATENT OFFICE

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BOW FOR ARCHERY

Application filed August 8, 1927. Serial No. 211,326.

My invention relates to bows for archery, and methods of making the same.

The art of archery is doubtless one of the oldest practiced by man, but from the earliest use of the bow and arrow until my invention, bows for archery have been made of reed, wood or horn, and from medieval times bowyers have commonly made bows of yew, although in Oriental countries bows have been and still are commonly made of bamboo.

Bows of metallic material have sometimes been proposed for use and have been used, but so far as I am aware, their use has not been attained with any considerable degree of success, since, commonly, such bows are of undue weight and usually the different portions of the bow are not relatively properly proportioned as to flexure and weight.

An object of my invention, therefore, is to provide a bow, possessing to a very high degree the property of resiliency sufficiently distributed throughout its length but which will not be of undue weight.

Another object of my invention is to provide a bow wherein the weight of the bow will be distributed in a most efficient manner, being greater at the center than toward the ends, the bow being of metallic material and not as readily subject to breakage as are the ordinary wood bows commonly employed.

Another object of my invention is to accomplish the production of bows in quantities at reasonable cost and which will be uniformly efficient and in which the responsiveness of the two ends of the bow will be uniform.

Another object of my invention is to accomplish the production of a bow of superior qualities, which may be readily disassembled into two approximately equal parts for ease in transporting the same during periods of non-use.

Another object of my invention is to produce a bow which will not be subject to the deleterious effects of heat or moisture which destroy the efficiency of ordinary wood bows.

Another object of my invention is to produce a bow in which the degree of flexure of portions of the bow varies commensurate with the degree of taper in the same.

Another object of my invention is to produce a bow having a paradox of a relatively small outside diameter, thus enabling the bow to be rigidly gripped, increasing its efficiency and insuring the handling of the bow in a more facile manner.

Another object of my invention is to produce a bow which is relatively "non-tiring", that is to say, one which is substantially unlike wooden bows, which are commonly said to be "90 percent broken" when subjected to a full arrow pull.

Another object of my invention is to provide a novel method of making bows from steel to be applicable to the efficient production of bows of superiority, uniform qualities in quantities.

Other objects of my invention and the invention itself will become apparent by reference to the following description of an embodiment of my invention and in which description reference will be had to the accompanying drawings illustrating the said embodiments.

Referring to the drawings:

Fig. 1 is a side elevational view of an embodiment of my invention prior to stringing the same;

Fig. 2 is a side elevational view of the foregoing embodiment after the same has been strung;

Fig. 3 is a fragmentary, longitudinal, medial sectional view of the paradox of the foregoing embodiment drawn more nearly to scale as may actually be used; and illustrating a portion of each of the bow arms adjacent the paradox, mostly in section;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a view of a fragment of the foregoing embodiment illustrating the tip, the view being drawn to a scale substantially the actual size of the said embodiment, and a portion of the same being broken away and shown in section;

Fig. 6 is a side elevational view of an embodiment of my invention illustrating the bow halves separated, a fragment of one being shown; and

Fig. 7 is a diagrammatic view illustrating the various steps of drawing the tube through

successively smaller and smaller dies to taper a tube in the formation of the foregoing embodiments.

Referring now to the above figures of drawings, in all of which like parts are designated by like reference characters, at 1 and 2, I show a pair of stepped tapered tubular bow halves joined together at their large ends, preferably by the telescoping of the end section 3 of the bow-half 1 over the largest section 4 of the bow-half 2. Each bow-half is substantially of the same length and are alike except in their largest sections, adapted for the joining of the bow-halves together to make a complete bow as illustrated.

However, in order to make a strong reinforced joint between the halves of the bow, I find it highly desirable to telescope a considerable length 4 of the half 2 in the end section 3 of the half 1, the section 4 being of such a size that it may be so telescoped, and be close fitting, and is brought into engagement with the internal shoulder at the junction of the first two sections of the bow-half 1. The section 3 of the bow half 1 is encompassed at its ends by a pair of rings 20 and 21 soldered or otherwise rigidly secured to its exterior surface, accomplishing partly an ornamental, and partly a reenforcing effect.

Each bow-half is preferably formed from a metallic tube of tempered steel of substantially cylindrical form, prior to bending the same into the desired shape and prior to tempering the same, which are each operated upon by being forced successively through successively smaller die-openings to successively less and less depths. This operation is best illustrated in Fig. 7, wherein there is illustrated a plurality of successive positions of the tube, the first, counting from the left, being taken to illustrate diagrammatically the projecting of the cylindrical tube to a distance indicated by the bottom 41 of the die 39, wherein only the relatively large section 3 remains above the die opening 42 and alone is of the normal diameter of the non-compressed tube, the portion 44 of the tube below the die opening 42 of the die 39 having been compressed to a lightly reduced diameter; similarly to the right of the die 39, but each progressively nearer the line 60, are disposed a plurality of dies 45 and 50, inclusive, each having die-openings 42 of progressively smaller and smaller diameters, the lowermost die having the smallest die-opening, the tube being successively passed through the die openings 42, but after each operation only a smaller portion of the end of the shaft is projected through the succeeding die opening of slightly less diameter. The result of these successive compressive operations on the tube is to accomplish the production of a substantially straight tube having cylindrical sections near its largest end of greater diameter than sections relatively more remote therefrom.

The tube as formed by the successive compressive effects of the successively smaller die-openings is then placed in a suitable bending machine and bent to have the proper form desired for the bow in iron bending forms. This form may be varied, some bowyers preferring a form such as that illustrated in the drawings, which I personally prefer, as accomplishing a quick lively cast of the arrow, which is so much to be desired in bows used for shooting as a target. A more regular flatter curve in the mid-portion of the bow without so much of the reversely turned ends accomplishes a softer pleasant shooting bow, one which gives very good results for distance shooting. A form, such as illustrated, I find to give very good results, although my invention is not limited as to the form of the curve given to the bow, nor in its broadest aspects is it limited to any particular relation as to the varying diameters given the different sections, a tubular bow, such as that herein described, being susceptible to varying degrees of taper in its various portions.

Subsequent to formation of the stepped sections of the bow-halves and subsequent to bending them to the desired form in a cast iron bending die, I heat treat the same, properly temper it to render each bow-half flexible to increase their durability in use whereby they will be returned to normal unstressed position upon a full arrow pull after the arrow has been shot. After the bow-halves have been properly tempered, I may then coat the exposed surfaces with a lacquer or the like which forms a protective coating, which protects it against rusting.

Prior to stringing the bow, the degree of curvature of the bow-halves is less adjacent the paradox, the degree of curvature towards the tips to a point intermediate the ends of the bow-halves approximately at 80, at which point the curvature is reversed on a relatively small radius to the tips.

Each bow-half so made, comprises a plurality of like substantially integrally joined tubular sections having substantially parallel side walls which are of successively increased diameter from the end sections 22 and 22′ of the bow-halves 1 and 2, respectively, which make a telescoped joint with each other, as previously described. The construction is substantially the same for both halves of the bow.

In order to compensate for the difference in diameters of the largest sections of the respective bow-halves 1 and 2, as illustrated at 3 and 4, I make the second largest section 12 for the bow half 1, the second largest section 12′, for the bow-half 2, each of like diameters, there being, in the case of the bow-half 1, twice as great an increase in diameter between

the section 12 and the end section 3 thereof, as is the case between the section 12′ of the bow-half 2 and the telescoped end section 4 thereof. The object of this construction is to achieve, as near as practicable, equal responsiveness, as to flexure, for each of the bow-halves to equal forces applied at their ends.

A sleeve 14 of the cork, leather or other preferably non-metallic material is telescoped over the larger end of the bow-half 3 to provide an efficient hand grip in use. The outside diameter of the grip may be varied but by virtue of the bow construction described, a hand grip having an outside diameter of not more than 1¼ inches, which is easily possible and enables an archer to shoot an arrow more accurately than would be the case were the grip of larger diameter. The sleeve 14 is preferably secured to the section 3 by ferrules 16 and 17 soldered to it having flaring portions 18 and 19 fitting over the reduced ends 30 of the sleeve.

I contemplate accomplishing varying degrees of responsiveness in different portions of the bow-halves by making differently disposed sections relatively longer or shorter according to the individual preference of the user.

I find that a bow having the following dimensions of sections proceeding from the paradox to the tips gives very good results for bow for ordinary target uses to which bows are put, being dimensions of a bow which has been made and which embodies the principles of my invention:

In this bow the telescoped portions are approximately 10 inches long with an outside diameter of about ¾ inch, the wall thickness being about .016 inch. The wall thickness of the tip sections is about .028 inch. The outside diameters of all succeeding sections are each about 1/64 inch less than the diameter of the next largest preceding section. The lengths, in inches, of the sections of one of the halves, in order from the handle to the tip sections, exclusive in this particular embodiment, are about as follows: 1⅛, $1\frac{1}{16}$, 1, 1¼, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$, 1⅜, $1\frac{5}{16}$, $1\frac{5}{16}$, 1¼, 1⅛, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$, 1¼, 1¼, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$, $1\frac{5}{16}$.

As has been before explained, the bow construction of my invention is peculiarly adapted for the predetermination of any desired diameter in any portion of the bow, relative to any other portion of the bow. This results in the ability of the manufacturer to deliver to users a bow having qualities of flexure and resiliency distributed to the different portions of the bow according to his particular preference.

Intermediate the different sections of the bow, such as between the sections 7 and 8, or 6 and 22, Fig. 5, and the sections 3 and 1, Fig. 3, are disposed rounded shoulders for the sections of relatively larger diameters which merge into the wall of the adjacent section of smaller diameter. The formation being such that a smooth rounded step is had at these joining shoulders, whereby flexing stresses will not be localized adjacent the junctions between sections to cause breakage of the bow at the junctions. These junctions are made so strong that they have a reenforcing effect. Also, the presence of so many of these stiffened, arched junctions subdues the vibrational tendency of the bow whereby otherwise it might have a more pronounced metallic "ring" when the arrow is loosed for flight. This metallic ringing sound is quite objectionable to the ear of the experienced archer, as being harsh and foreign to the traditions of the art and is substantially eliminated in the construction of bow herein described by virtue of the many junctions, which destroy the tendency of the bow to efficiently transmit mechanical high pitched vibrations.

To each of the tip sections 22 and 22′ of the bow-halves is rigidly secured a tip 70, as best shown in Fig. 5, which I preferably make of aluminum alloy material, giving them generally the form illustrated in the drawings, having the diagonally grooved nock 71 to hold the string, and the classic overhanging helmet-formed tip 72 which, as illustrated, is bored for the reception of the sections 22 and 22′ of the bow-halves. The tips and end sections are provided with aligned apertures into which is placed a transverse rivet pin 75 being secured there by upsetting its ends to hold the tip in place.

Preferably, the bow-halves are substantially symmetrical, it being desirable that the lower bow-half be equally as stiff as the upper bow-half, it being found that, in practice, the two bow-halves are required to withstand substantially the same stresses.

The tips 70 are more rigidly secured to the ends of the bow-halves by soldering the same thereon. The ends 3 and 4 of the bow arms being closely fitted, one within the other, the interior of the bow is sealed against the possibility of moisture entering the same and thus the possibility of the same rusting from the interior wall outwardly is eliminated.

Having thus described my invention in one embodiment, I am aware that numerous and extensive departures may be made from the embodiment herein illustrated and described without departing from the spirit of my invention.

I claim:

1. A bow for archery comprising a pair of tempered metallic tubular tapered sections joined together at their larger ends.

2. A bow for archery, comprising a pair of tempered metallic tubes, each formed of a plurality of integrally joined stepped sections of successively smaller diameter to-

wards an end, said tubes being joined together at their ends of largest diameter.

3. A bow for archery, formed of a tempered metallic tube, having sections of successively smaller diameter proceeding from the handle portion of the bow towards the tip, integrally joined together.

4. A bow for archery, comprising a tempered metallic tube, said tube being formed of cylindrical integrally joined portions, those disposed in the varying portions of the bow within which such sections are disposed, varying in length inversely according to the rate of decrease of diameter of such bow portions.

5. A bow for archery formed of a pair of tempered metallic tubes telescoped together at one end to form a paradox, said tubes each comprising sections integrally joined together of successively smaller diameter disposed in stepped relation proceeding from the paradox towards the tips.

6. A bow for archery comprising a tempered metallic tube having integrally joined sections of successively smaller diameter proceeding from the handle portion of the bow towards the tip, each of said sections being of substantially the same cross-sectional area throughout its length.

7. The method of producing a metallic bow for archery comprising the forcing of each of a pair of substantially cylindrical straight tubes successively through a plurality of successively smaller die openings, each successive die being telescoped over successively less lengths of the tubes, to form a pair of tubes each comprising integrally joined sections of progressively less and less diameter, and in then bending the tubes to the desired bow shape and heat treating to temper the same after bending and joining the tubes together at their larger ends.

8. A bow for archery comprising a pair of tempered metallic tubular bow limb sections, and hand grip means joining the sections together at an end of each section, said sections being of successively smaller diameter toward their other ends.

9. In an archer's bow, the combination of a tubular bow member, a handle provided substantially medially thereon, and a string joining opposite ends of said bow member.

10. In an archer's bow, the combination of a metallic tubular bow member tapering from the center toward the ends thereof, a handle provided substantially medially thereon, and a string joining opposite ends of said bow member.

11. In an archer's bow, an intermediate handle portion and a tubular, metal limb extending from each of the opposite ends of said handle portion.

12. In an archer's bow, the combination of a tubular bow member tapering from the center toward the ends thereof, a handle provided substantially medially thereon; and a string joining opposite ends of said bow member.

13. In a bow for archery, the combination with a pair of oppositely extending tubular tapered metallic limbs, the limbs provided with ends adapted to be relatively telescoped to secure the limbs together.

14. In a bow for archery, the combination with a pair of oppositely extending tubular tapered metallic limbs, the limbs provided with ends adapted to be relatively telescoped to secure the limbs together, and a hand grip permanently secured on to the exterior surface of the exterior one of the two telescoped limb ends.

15. In an archer's bow, the combination of a tubular bow member tapering from the center towards the ends thereof, and consisting medially of a plurality of relatively telescoped reinforcing tubular elements, a handle provided substantially medially over the said telecoped elements, and a string for joining opposite reduced ends of said bow member.

16. In an archer's bow, the combination of a tubular bow member comprising a pair of tubular elements each tapering from an end towards its opposite end, the larger ends of the two elements being relatively telescoped, a handle provided substantially medially thereon, and a string for joining opposite ends of said bow member.

In testimony whereof I hereunto affix my signature this second day of August, 1927.

ROBERT H. COWDERY.