(No Model.) 2 Sheets—Sheet 1.

C. H. EMERSON.

BOOMERANG.

No. 477,748. Patented June 28, 1892.

Fig. 1.

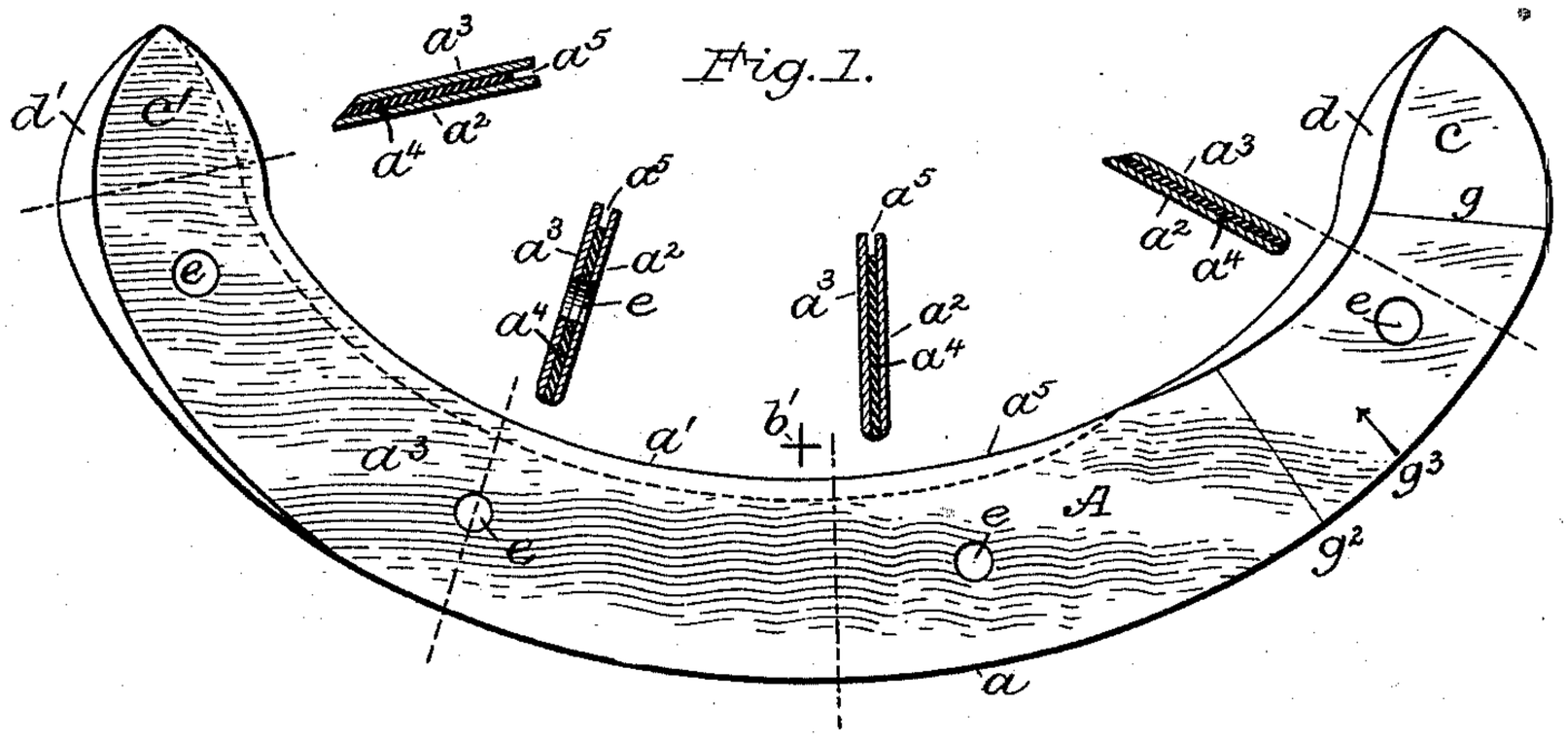


Fig. 2.

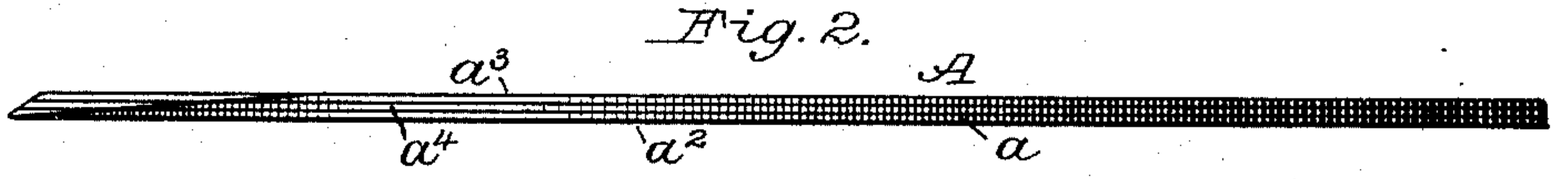


Fig. 3.

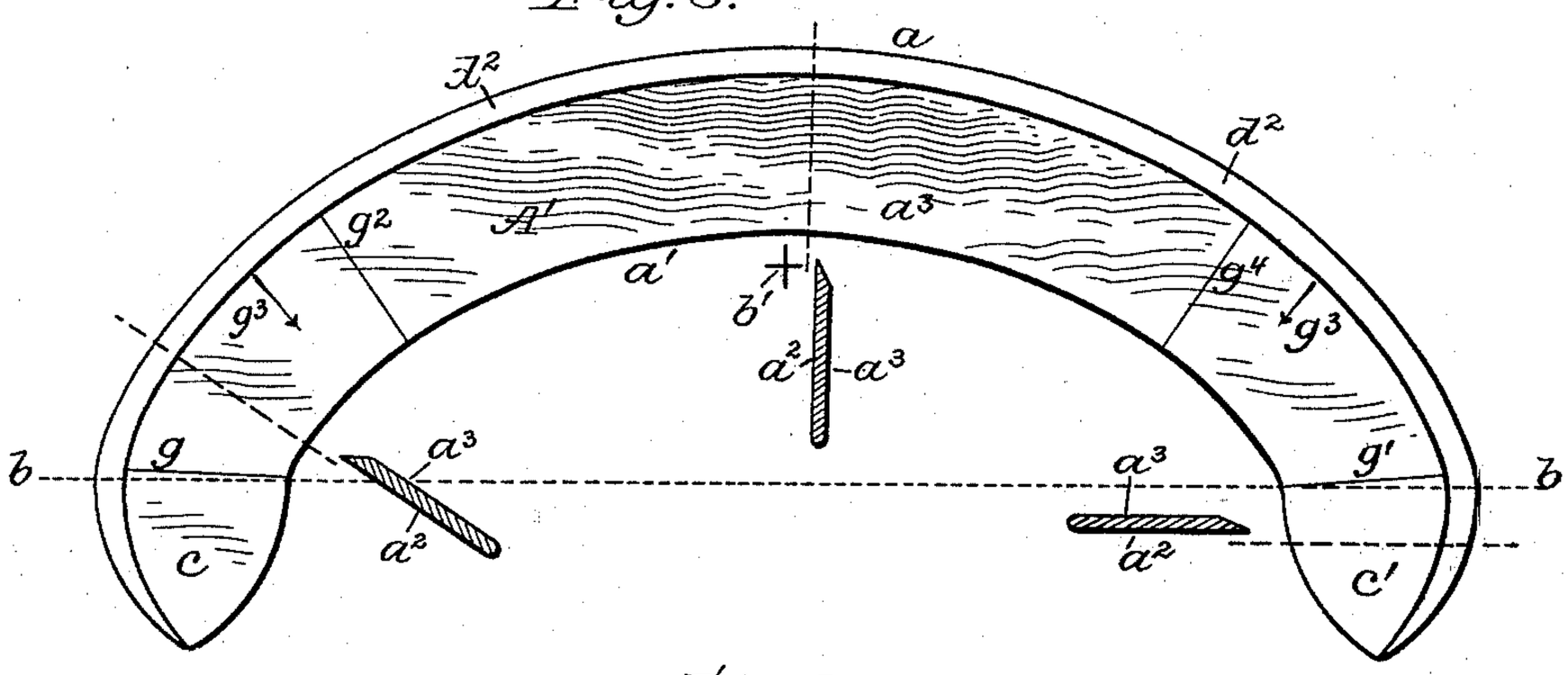
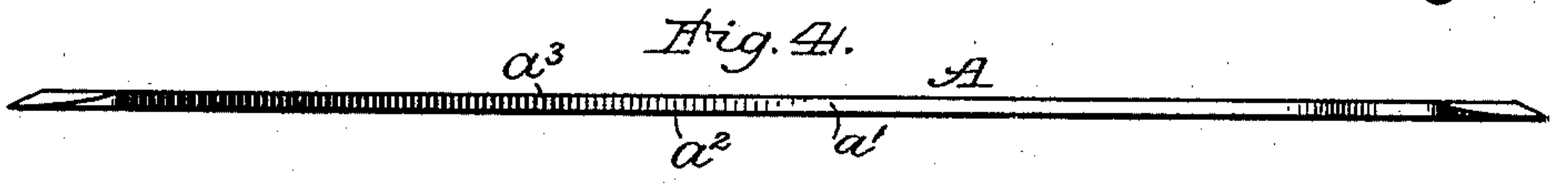


Fig. 4.



Attest:
Philip F. Larner.
Lowell Bentley.

Inventor:
Charles H. Emerson.
By McCormick
Attorney.

(No Model.) 2 Sheets—Sheet 2.

C. H. EMERSON.

BOOMERANG.

No. 477,748. Patented June 28, 1892.

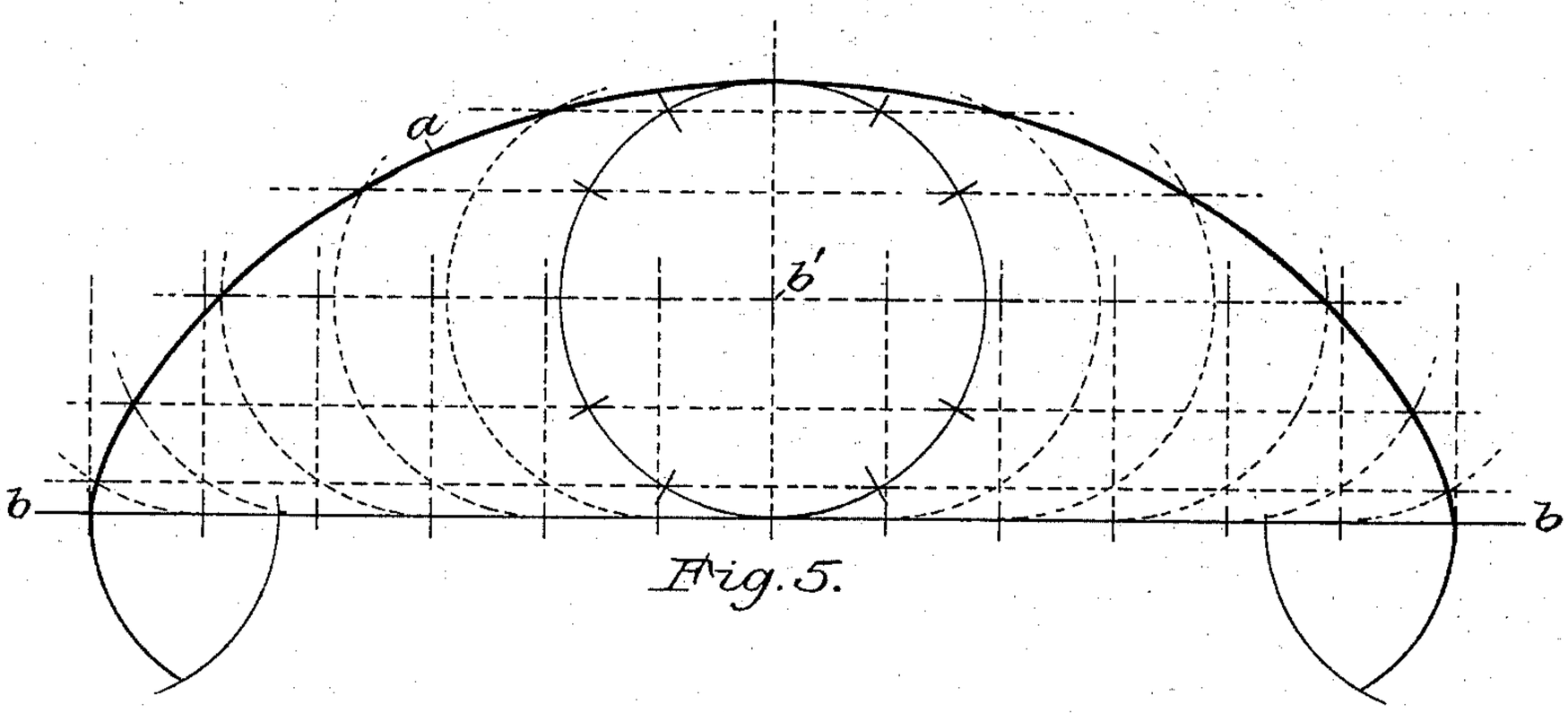


Fig. 5.

Fig. 6.

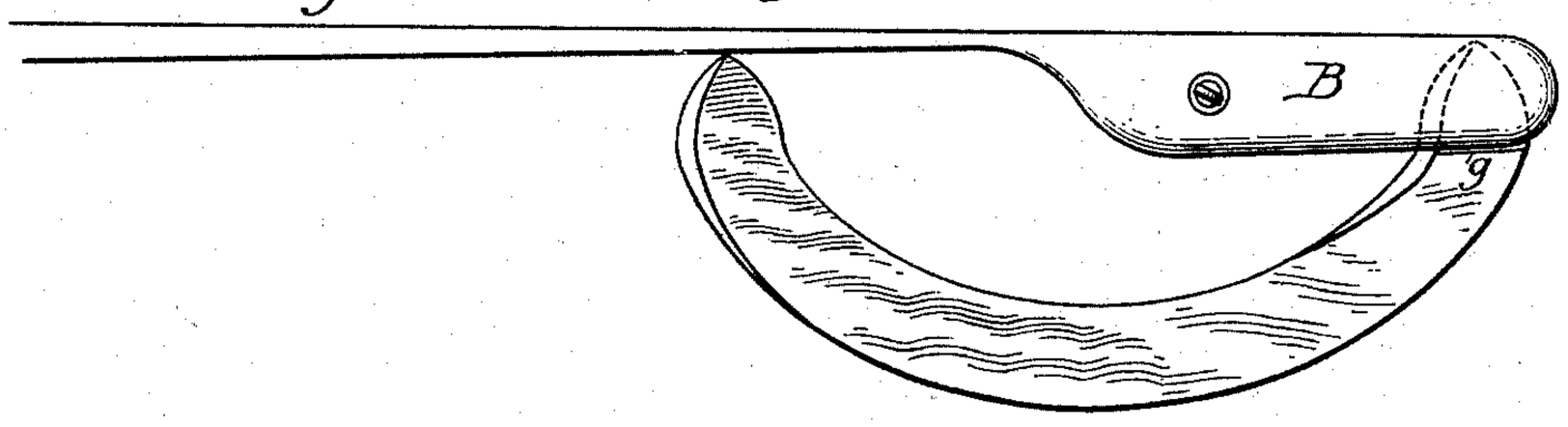
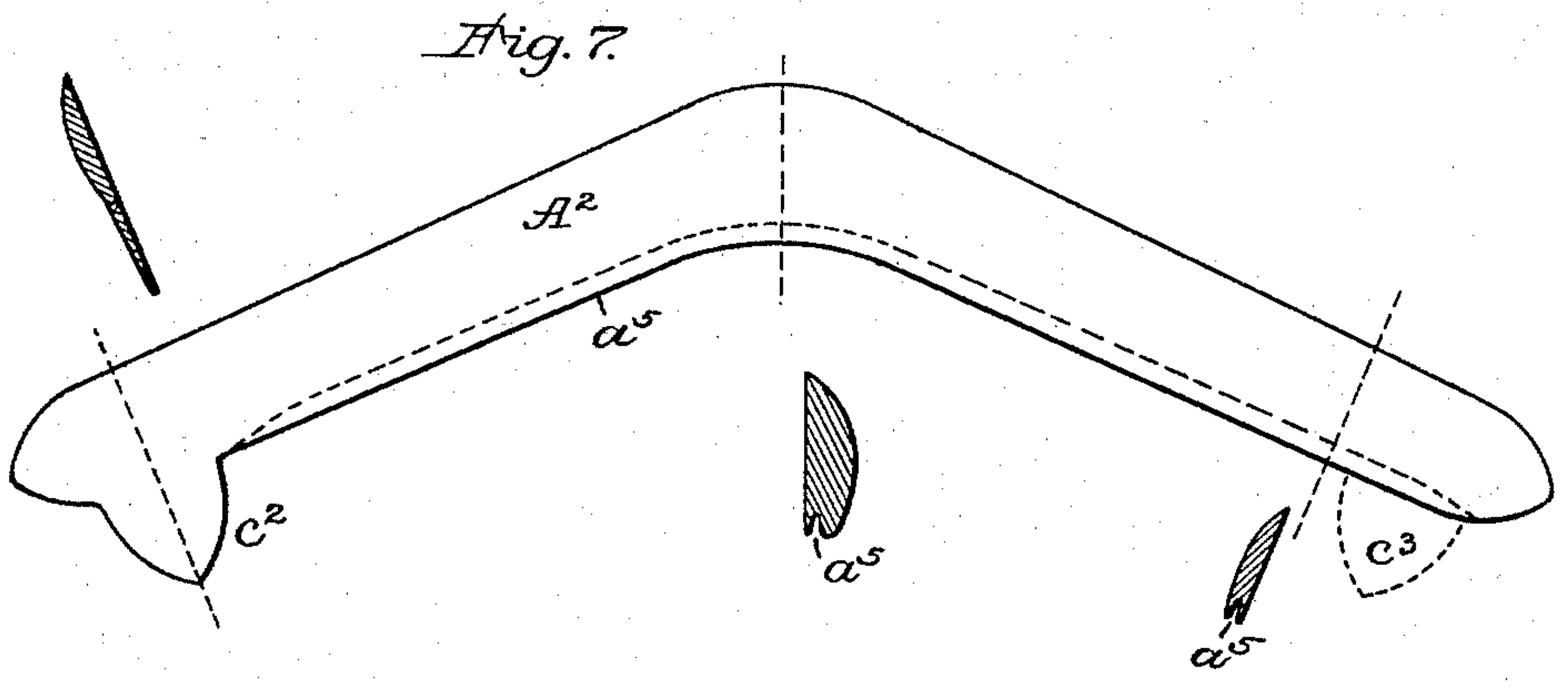


Fig. 7.



Attest:
Philip F. Larner.
Howell Battle

Inventor:
Charles H. Emerson.
By Munn & Co.
Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES H. EMERSON, OF YONKERS, NEW YORK.

BOOMERANG.

SPECIFICATION forming part of Letters Patent No. 477,748, dated June 28, 1892.

Application filed April 14, 1891. Serial No. 388,892. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. EMERSON, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Boomerangs; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a true, clear, and complete description of my invention.

My said improvements have been devised with a view to the production of what may be termed a "scientific toy," which will afford pleasure to people in general and be of special interest to those persons who have given more or less attention to the scientific features of the boomerang.

It is well known that boomerangs were originated by the natives of Australia, and that the earliest publications relating thereto were written during the latter portion of the last century. For upward of fifty years the boomerang has been deemed worthy of much scientific investigation and discussion with a view to determining the principles involved in what may be termed its "return flight." After considerable investigation and experiment on my own part, while following, mainly, the views of prior investigators, and adhering to the use of boomerangs in the primitive forms as produced by Australians, my attention was directed to the devising of means whereby a boomerang might be projected many times in succession under practically uniform conditions, as from a gun, and said means have been disclosed by me in a separate application for patent, Serial No. 388,071, filed April 8, 1891. By the use of my said projector or gun I found that the flights of a boomerang could be so controlled that many flights in succession would be quite alike, both as to direction and distance, and also as to the terminal point of the return flights, and I therefore satisfied myself that those prior investigators were in error who had declared that the boomerang must of necessity be erratic in its operation, inasmuch as I had established the fact that boomerangs could, as a rule, be made to return to the point of departure and to strike within an exceedingly-restricted area. Having so far succeeded, I then sought to secure long outward flights and decrease the proportion of inaccurate return flights or failures by improving the form and construction of the boomerang. In the matter of outline I have found that cycloidal curves afford much better results than the parabolic curves or the nearly-angular outlines common to boomerangs; also, that the end of the boomerang should be extended beyond the base-line of the cycloidal curve to form what I will term "spurs," each being pointed and having its edges circularly curved; also, that said spurs should be peculiarly chamfered, making the boomerangs "rights" or "lefts," the inner edge of one spur and the outer edge of the other being chamfered, and this chamfering feature is of value with the parabolic boomerang; also that the boomerang should be substantially uniform in thickness and flat on both sides, instead of being flat on one side and rounded on the other, and thicker at the middle than at the two ends, and involving a "twist" or torsional formation, as in prior boomerangs, and, still further, that the interior curved edge of the boomerang when grooved affords specially-desirable results. Each of these four recited features of construction possesses value, in that the cycloidal curve is conducive to a minimum of resistance by the air during the flight of the boomerang, and hence it results in long outward flights and quick returns. The spurs being pointed and chamfered are still further conducive to long outward flights and quick returns, because of their capacity for penetrating or parting and for leaving the air behind them with a minimum of friction. The uniformity in thickness is conducive to a minimum disturbance of the air and a consequent less resistance, coupled with an extensive area of bearing-surface with a minimum of weight. The groove at the interior curved edge operates upon the air with what may be termed a "threading" effect, a small body of air being embraced within the groove during the gyratory movement of the boomerang and contributing to steadiness in flight.

With such a boomerang I have succeeded in consecutively securing for the first time, as I believe, long outward flights in a direct line from the point of departure and return flights on substantially the same line, this result being in radical variance from the operation of boomerangs of former types, which

invariably move in circular lines both during their outward and their return flights.

For securing desirable strength and lightness I construct some of my boomerangs of two or more thicknesses of such materials as wood, veneer, paper, cloth, &c. For securing the uniform application of the boomerang to a suitable gun or projector the boomerang is provided with certain gage-marks, which enable it to be accurately placed in position in a suitable holder preparatory to the application thereto of the projecting force. I have also provided my boomerang with one or more perforations, which cause it to whistle or sing during its flights.

To more particularly describe my invention, I will refer to the accompanying drawings, in which—

Figures 1 and 2, in side and edge views and numerous sections, illustrate one of my boomerangs in its best form and embodying all of the several features hereinbefore referred to and adapted to operate as a right-hand boomerang, the latter when right side up having the inner edge of the right-hand spur and the outer edge of the left-hand spur chamfered, as shown. Figs. 3 and 4 illustrate one of my boomerangs in side and edge views and in several sections, which can be used either as a right-hand or a left-hand boomerang, its entire outer edge being chamfered. Fig. 5 is a diagrammatic illustration of the development of the outline of my boomerang in its best form. Fig. 6 illustrates a boomerang applied to the holder or jaw of one form of gun or projector. Fig. 7 illustrates in several views a boomerang of the usual form, but having certain features of my invention applied thereto.

I will first refer to the longitudinal outlines of the boomerangs A and A′. (Illustrated in Figs. 1 and 3.) It will be seen that the outer edge a is curved on cycloidal lines developed as illustrated in Fig. 5, wherein the base-line b is clearly indicated. The inner edge a' is curved in conformity with the outer edge, the width of the body of the boomerang being uniform throughout its length. The base-line b is also shown in Fig. 3, and the ends of the boomerang which extend below said line I will call the "spurs" c c', each being pointed and having its edges reversely curved in the arcs of circles, having their centers, respectively, at the junctions of the base-line with the outer and inner edges a and a'. The gyratory movement of the boomerang during its flight is around its center of gravity, this being located outside of the body of the boomerang and between its inner edge a' and the said base-line b, as indicated at b'.

The boomerang, Fig. 1, is of the "right-hand" variety, and has its right-hand spur c chamfered on its inner edge, as shown at d, and the left-hand spur c' has its outer edge similarly chamfered, as at d'.

Referring to the edge views and to the several sectional views, it will be seen that the bottom surface a^2 is flat or in one plane, and the least departure therefrom should be specially avoided, because I have demonstrated to my complete satisfaction that the "twisted" or "spiraled" feature, declared by many writers to be present in all Australian boomerangs and essential to their proper operation, is, in fact, a serious detriment and always to be avoided for securing long and steady and uniform flights. The upper surface a^3 of my boomerang is also flat, absolute uniformity in thickness being specially important, except, of course, within the limited areas of the chamfered portions of the edges.

It is of course important that the boomerangs should be comparatively light and strong, and while they may be constructed solidly, as of suitable wood, as shown in Figs. 3 and 4, they are preferably composite in their structure. As shown in Figs. 1 and 2, the boomerang is in three thicknesses, the top and bottom being each composed of thin hard fine-grained wood and the middle piece a^4 being of cloth or suitable paper, the whole being glued together under pressure. When thus constructed, the air threading-groove a^5 is readily developed by having the middle layer a^4 narrower than the side pieces throughout that portion of its length which is not cut away in forming the inside chamfer d.

When the boomerang is composed of solid wood in one piece, the air threading-groove a^5 is of course formed by cutting, as with a rotary scoring or milling tool. Hard rubber is a very suitable material for boomerangs; but they could only be used in mild weather, owing to their liability to break when chilled. Some forms of vulcanized fiber may also be used with success and with less liability to breakage. Thin sheet metal, well perforated, may also be used with either hard rubber or vulcanized fiber, the metal being well embedded and wholly covered. The perforations e are small round holes through the boomerang for causing a whistling effect during a flight. Several of these holes are desirable, and when of different sizes whistling-chords may sometimes be developed.

Referring now to the boomerang, Fig. 3, it will be seen that its entire outer edge is chamfered, as at d^2, this form being thus adapted to operate either as a right-hand or a left-hand boomerang, or, in other words, to gyrate in either direction during a flight, according to which of its ends may have been placed in the holder of the gun employed for projecting it. In projecting a boomerang from a gun the best results will accrue upon or with an accurate preliminary adjustment of the boomerang with relation to its holder, and hence I provide my boomerangs with certain adjusting gage-marks. Inasmuch as the boomerang-holders vary in their character said gage-marks must be correspondingly varied, a boomerang restricted to operate as a right-hand missile having a gage-mark located with special reference to that fact—as, for instance the holder B,

(shown in Fig. 6,) is in the form of spring-jaws, which in a gun are located at the end of a forcibly-swung arm *f*. As here shown, the holder is adapted to operate with a right-hand boomerang, and hence the proper end or spur of the missile at its upper side has a gage-mark *g*, also shown in Fig. 1. With this marked end or spur inserted in the jaws of the holder and with its lateral line parallel with the coincident surface of the holder a correct adjustment will be assured. If the boomerang is of the left-hand variety, it will in like manner have its left-hand spur provided with a gage-mark, and if it be of the kind shown in Fig. 3 and adapted to operate either as a right-hand or as a left-hand boomerang both ends will be provided with gage-marks, as at *g* and *g'*.

The correct relations of boomerangs to holders must naturally be varied, as before indicated, in accordance not only with the varied character of the holders, but also in accordance with the application of the projecting force to the boomerang. For instance, if a striking blow is to be delivered to the outer edge of a boomerang the exact point for receiving the blow should be indicated. With a right-hand boomerang a gage-mark g^2 will, by its registering with a coincident surface of its holder, secure the proper location of the striking-point g^3, as shown in Fig. 1. The boomerang, Fig. 3, has two similar gage-marks g^2 and g^4, which are appropriately adjacent to the striking-points g^3, the projecting force or blow being applied in a direction indicated by an arrow.

I have hereinbefore referred to my boomerangs as having pointed ends or spurs; but it is to be understood that prior boomerangs have been pointed at their ends, but without the development of spurs, in accordance with that feature of my invention. With my novel cycloidal outline the pointed ends or spurs are not developed by the prolongation of either the inner or the outer curved lines, but are wholly outside of those, and below and beyond the base-line of the cycloid, and the point of the spur is on a line at right angles to the base-line.

In the application of my spurs to the old forms of boomerang they will in like manner involve departures from the original outlines, as illustrated in Fig. 7. This boomerang A^2 is substantially parabolic in its outline, and, as indicated by the sectional views, it is thickest at the middle and tapers toward its ends, which are merely pointed prolongations. A spur c^2 being applied at the inner edge at one end, as shown in solid lines, will convert it into a right-hand boomerang; but for making it a left-hand boomerang the spur would be located, as shown in dotted lines at c^3, at the inner edge at the opposite end, and for making it both right and left both spurs will be required. Although this form of boomerang is twisted, so that its flat side is in a measure spiraled, my threading-groove a^5 may be applied at its inner side, as indicated, and secure for the boomerang an increased steadiness in flight.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A boomerang longitudinally curved in cycloidal lines, substantially as and for the purposes specified.

2. A boomerang chamfered at its inner edge near one end and correspondingly chamfered at its outer edge near its other end, substantially as described.

3. A boomerang cycloidal in outline, substantially flat on both of its sides, uniform in thickness throughout its length, and free from warp or twist.

4. A boomerang cycloidal in its outline and provided with spurs at its ends, substantially as described.

5. A boomerang provided at its interior edge with a longitudinal groove, substantially as described.

6. A boomerang provided with adjusting gage-marks near its ends, substantially as described, whereby it may be accurately adjusted in the holder of a gun or projector.

7. A boomerang cycloidal in outline and constructed of layers of thin material firmly united, substantially as described.

8. A boomerang having a cycloidal outline and pointed ends or spurs.

9. A boomerang uniform in thickness and having flat sides, a cycloidal outline, and pointed ends or spurs.

10. A boomerang uniform in thickness, flat on both sides, and having a cycloidal outline, and a longitudinal groove at its inner edge, substantially as described.

CHARLES H. EMERSON.

Witnesses:
PHILIP F. LARNER,
HOWELL BARTLE.