

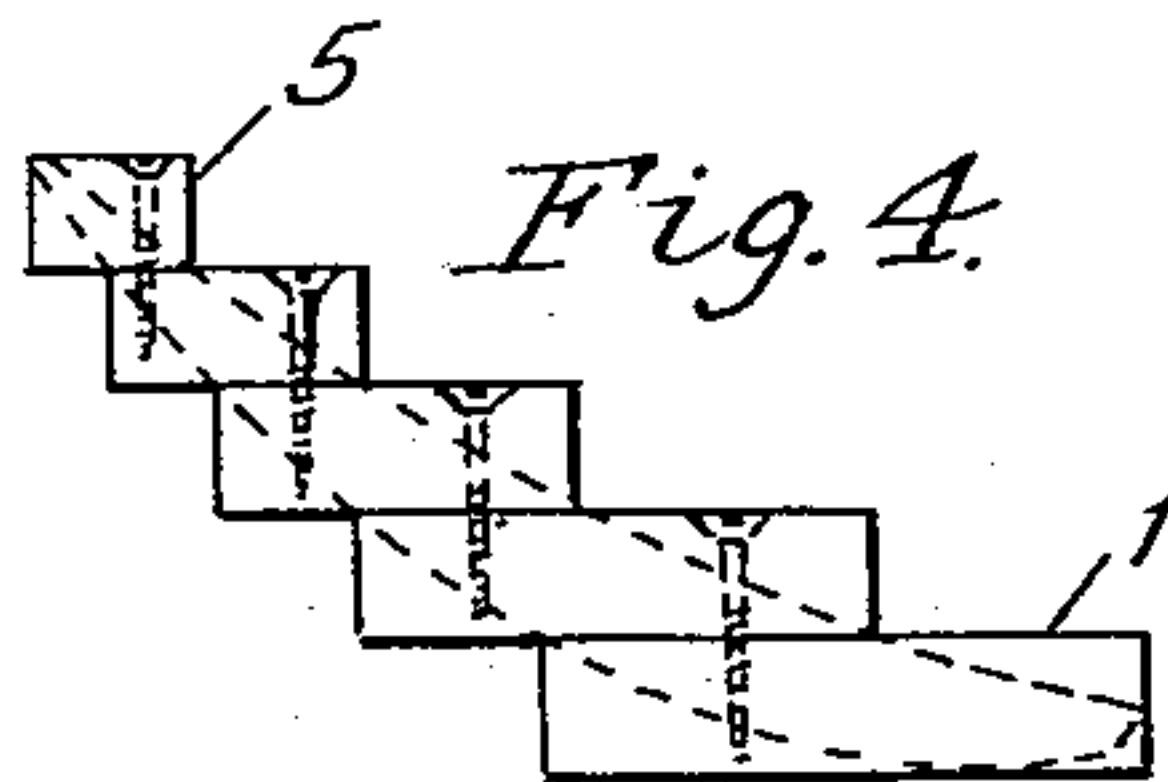
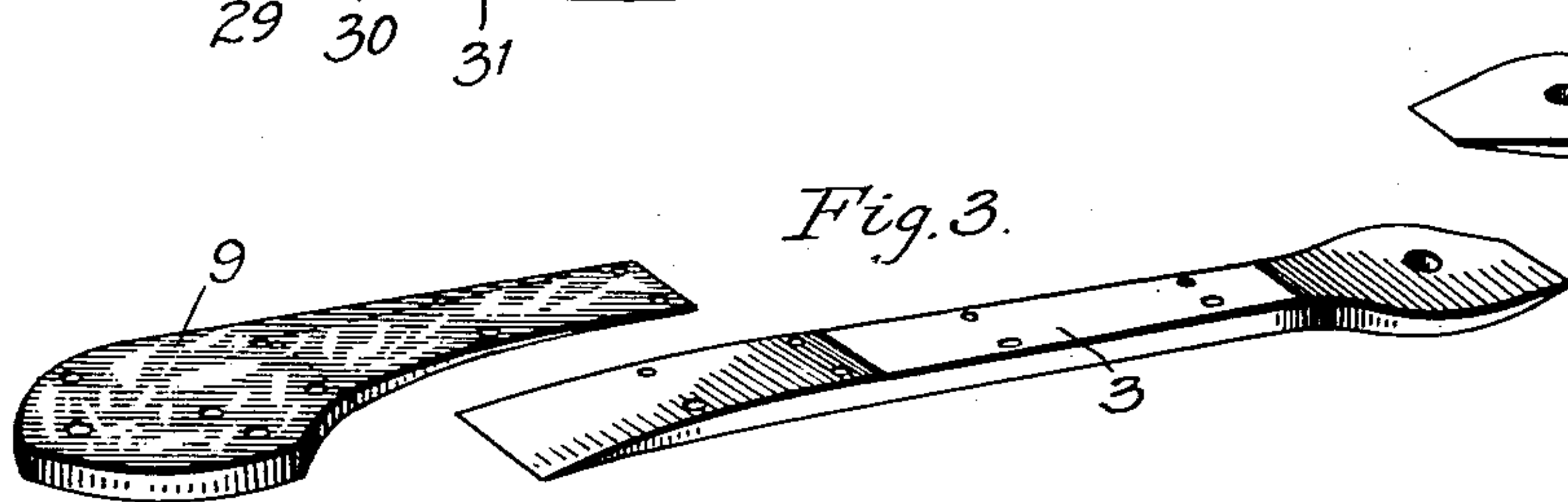
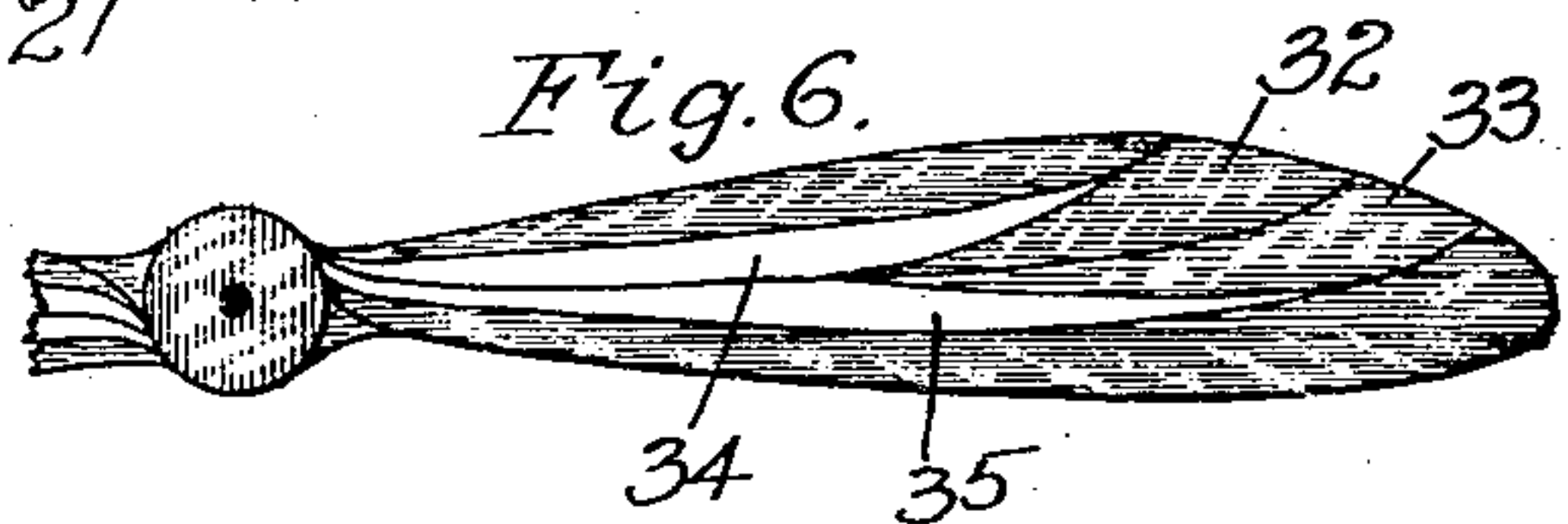
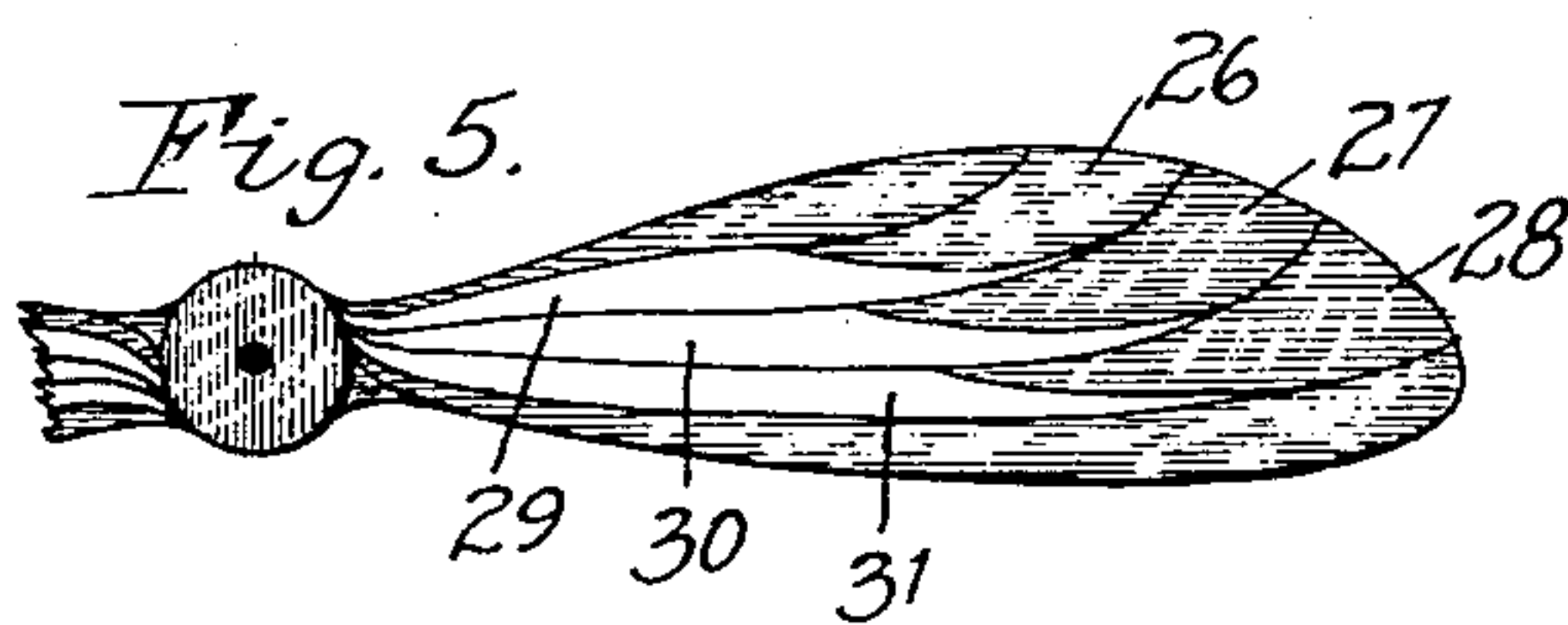
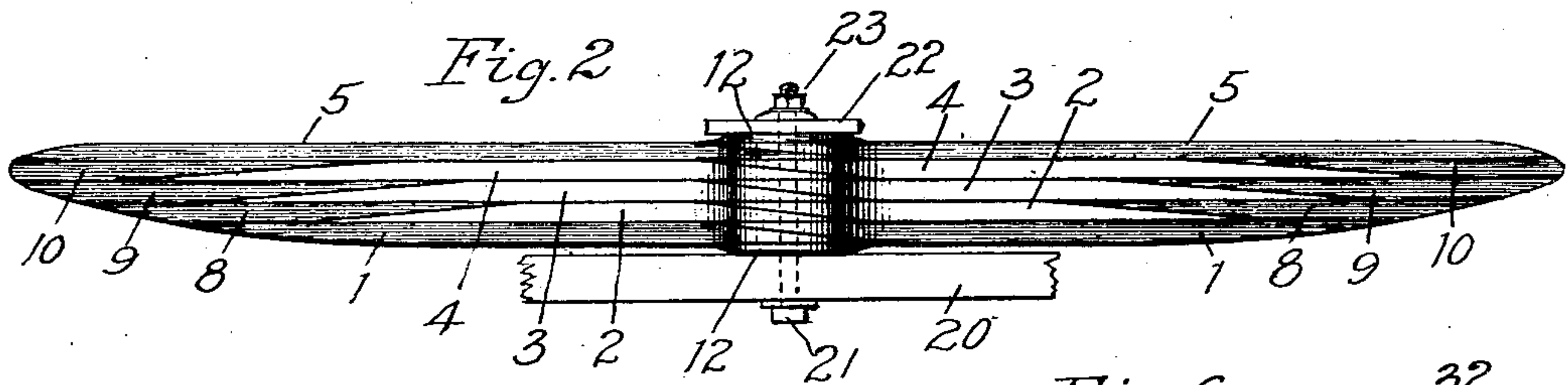
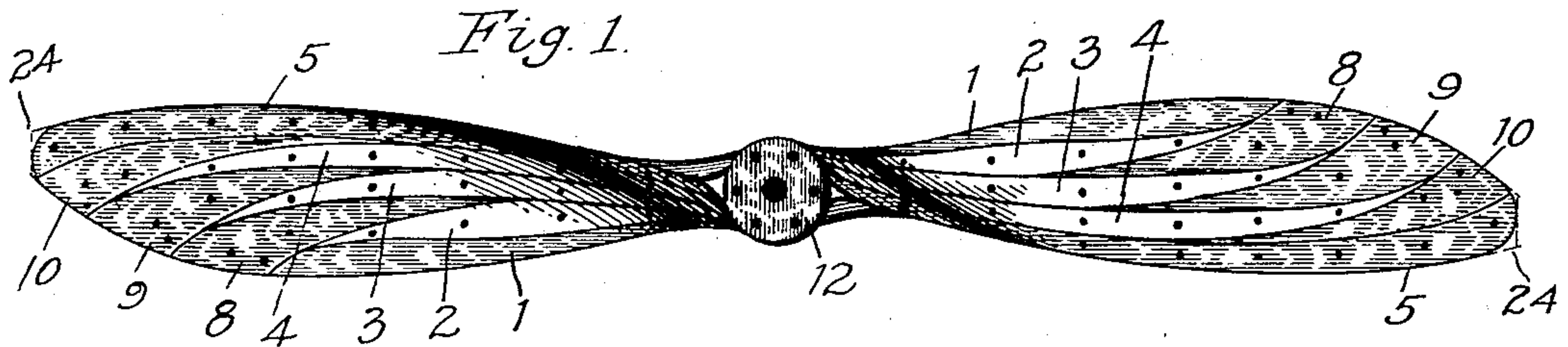
S. HEATH.

PROPELLER.

APPLICATION FILED FEB. 15, 1911.

998,897.

Patented July 25, 1911.



Witnesses
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UNITED STATES PATENT OFFICE.

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PROPELLER.

998,897.

Specification of Letters Patent. Patented July 25, 1911.

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To all whom it may concern:

Be it known that I, SPENCER HEATH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

The invention relates to screw propellers, and particularly to screw propellers in connection with apparatus for navigating the air, and has special reference to laminated propellers formed of wood or similar material.

One object of the invention is to produce a propeller with great strength and durability, without excessive or unnecessary weight.

A further object is to produce a propeller from materials of unlike weight and durability, and having the materials so arranged that the less durable is protected by the more durable at its more exposed edges and surfaces.

A further object is to produce a propeller, of moderate weight from materials of unlike weight, in such manner that the greatest portion of the heavier material shall be incorporated in the portion of the propeller lying farthest from its axis of revolution.

With the above objects in view and further objects which will appear, I have invented the form and style of propeller, one example of which is shown by the accompanying drawing, forming a part of this specification, and in which—

Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is a perspective view of one of the laminations. Fig. 4 is a typical transverse section of the unfinished propeller. Figs. 5 and 6 are alternate forms of Fig. 1.

Referring to Fig. 1, the propeller consists of a series of five compound laminations; these laminations being formed of either two or four pieces of wood. The lowermost lamination, 1, is formed of two pieces of hard wood (usually quartered white oak) joined together at the hub with a diagonal scarf. The uppermost lamination, 5, is likewise formed of two similar pieces of hard wood joined together at the hub. The intermediate laminations, however, are made up of four pieces each; two of these pieces being of soft wood of low specific gravity (usually spruce). These two light portions, 2, 3 and 4, of each intermediate lamination are similar to each other and joined together by a

diagonal scarf at the hub, in the same manner as the hard wood laminations, 1 and 5. The outer extremities, however, of these interior soft wood portions are formed of pieces 8, 9 and 10, of hard, heavy, and durable wood. These pieces 8, 9 and 10, are secured to the extremities by the inner soft portions, 2, 3, and 4, respectively, by long slanting scarfed joints. With this arrangement of the wood, the propeller is formed of a relatively light inner core or filler, surrounded and protected at all edges and exposed portions of the blade and hub by the harder, heavier, and more durable material.

In constructing a propeller of the kind I have described, the corresponding pieces forming each lamination are selected from adjacent portions of the same board, and after placing one above the other they are sawed out together to the precise profile form which they will have in the finished propeller. The hard wood portions for the extremities of the inner laminations are sawed out, each pair together, in a similar manner. Fig. 3 shows one of the inner laminations with the hard wood extremities ready to be glued on, and the joint ready to be made at the hub. After the two sides or half laminations have been prepared, a hole is bored in the center of the hub portion of each, and numerous similar holes are bored at regular intervals throughout the length of each half lamination. These holes are so arranged that when the pieces are assembled in the propeller in their correct relation, the holes in the adjoining laminations will register correctly for the insertion of screws to bind them together, as in Fig. 4, after an adequate coating of glue or cement has been applied to the overlapping portions. A bench or slab, 20, is provided with a perpendicular bolt, 21. The prepared half laminations are placed, one at a time, upon the slab with the bolt projecting upward through the holes in the hub portions, the laminations for each blade being alternately placed, and glue or cement being laid between their joints. Screws are then inserted through the registering holes in each blade, drawing all joints together and holding them securely until the glue is set. A suitable block or washer, 22, is laid upon the hub portion and the nut, 23, screwed down firmly to clamp all the scarfs and laminations in the hub securely together. For convenience in designing the laminations, the ends, 24, of

each blade are left square, as shown by the dotted lines, and afterward removed to form the rounded ends. In Fig. 1, the outer extremities of the inner laminations are superposed where they are joined to the lighter and softer portions. While this is the preferred manner of making these joints, it is also a part of this invention to reverse this arrangement in any one or more of the laminations in which case the soft wood would appear uppermost at the joints, with the resulting effect as shown by Fig. 5 where the shaded oaken portions, 26, 27 and 28, lie under the white spruce portions where they are joined on. In Fig. 6 the arrangement of the oaken extremities is alternate, the portion 32 overlapping the spruce portion 34 and the portion 33 underlapping 35. After the inner set of laminations has been secured together by the bolt and screws in their correct relation and the glue has set, the screws are removed and the holes are reamed out for the reception of hard wood dowels tightly inserted with glue. This leaves the rough propeller formed of stepped laminations which are then carved down to a smooth and even surface as indicated in Fig. 4, leaving the profile of each lamination, however, substantially unchanged. Hard wood veneers, 12, are secured to each face of the hub with the grain of the wood transversely placed, insuring greater strength and security to the hub portion. With the corners of the blades removed and all surfaces smoothly polished, the propeller is ready for use.

Peculiar advantages appertain from the form of construction I have described, in which the heavier and more durable wood is placed at the extremities of the blades. It is not new to arrange alternately laminations of hard and soft wood, in which the soft wood is continuous throughout the full length of the lamination to the extremity of the blade. Using the hard wood extremities, however, placed upon the inner laminations, two peculiar advantages accrue. First the edges and extremities of the blade being formed entirely of hard and durable wood, are far more resistant to the extreme wear to which these portions of the blades are subjected in handling as well as in actual use, there being no soft portions whatever in the region of the extremities of the blades that would be exposed to damaging influences. A less obvious but even more im-

portant result, lies in the fact that with the all hard wood extremities, the radius of gyration of the revolving blade is at a much greater distance from the center than in any other construction. This contributes very materially to the balancing or fly-wheel effect of the propeller. Many aviators prefer a heavy propeller, some of them preferring the heaviest of white oak throughout, on account of its benefit as a fly-wheel upon the engine upon which it is attached. By the use of the heavy oak extremities, with a spruce interior, substantially the same fly-wheel effect can be produced and at a considerable saving in weight as compared with the employment of heavy wood throughout.

Besides its very obvious advantages from the mechanical standpoints of durability and fly-wheel effect, this form of construction lends itself to the production of very popular and attractive designs.

Having now fully described my improved construction, what I claim is:

1. A laminated propeller consisting of interior laminations of soft wood, exterior laminations of hard wood, and hard wood portions forming the extremities of the interior laminations.

2. A laminated propeller consisting of interior laminations of soft wood, exterior laminations of hard wood, and hard wood portions forming the extremities of the interior laminations, the hard wood extremities being joined to the interior laminations by long slanting scarfs.

3. A propeller lamination comprising a central portion of light material and a peripheral portion of heavy material.

4. A propeller lamination comprising a central portion of light material and a peripheral portion of heavy material, the two portions being joined together by a long, slanting scarf.

5. A propeller lamination for two blades comprising two similar interior portions of light wood scarfed together at the hub and two similar peripheral portions of heavy wood scarfed to the extremities of the interior portions.

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

SPENCER HEATH.

Witnesses:

N. CURTIS LAMMOND,
N. E. COSTELLO.