(No Model.)

A. T. ZEISE.

SCREW PROPELLER.

No. 389,430. Patented Sept. 11, 1888.

Fig. 2.

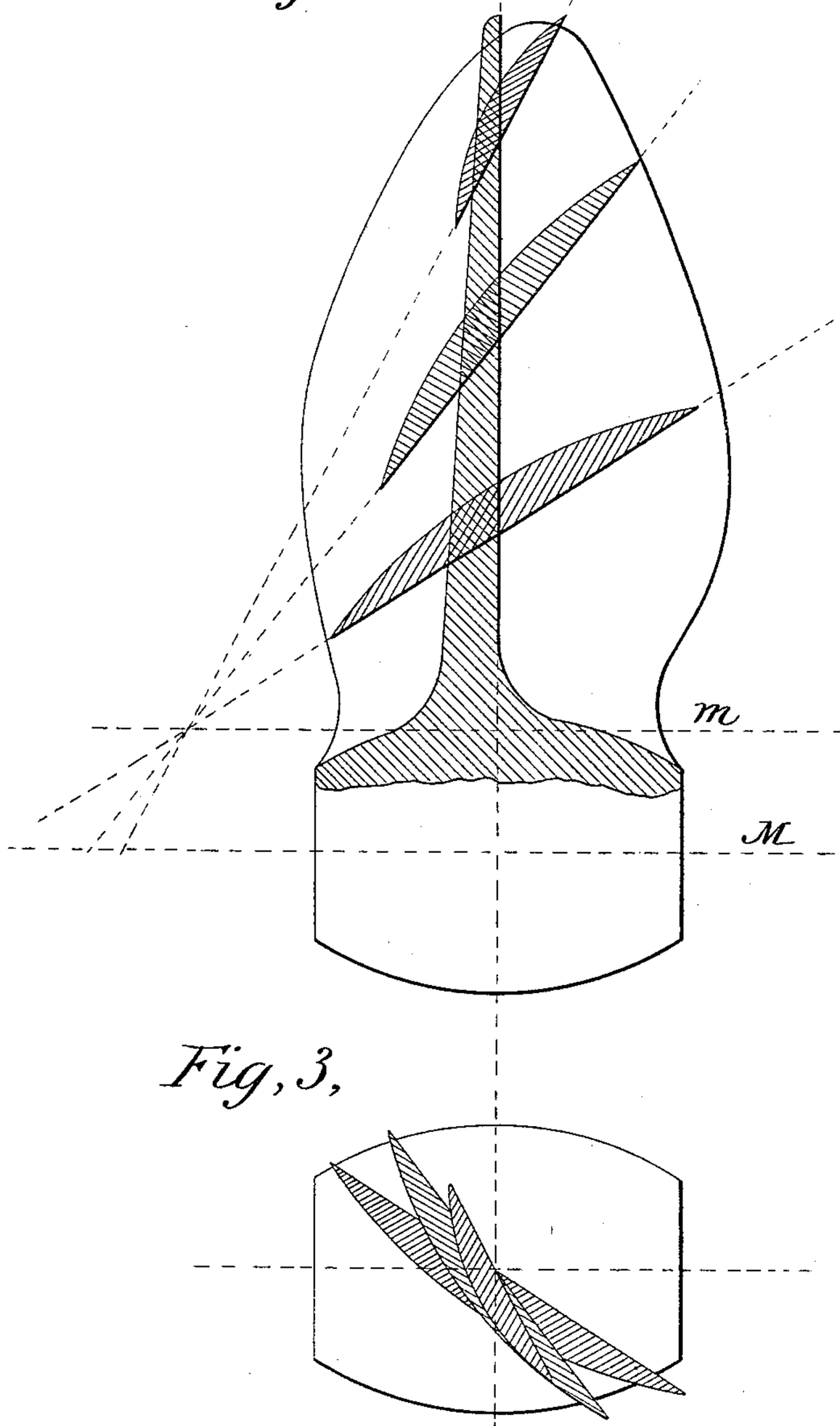

Fig. 1.

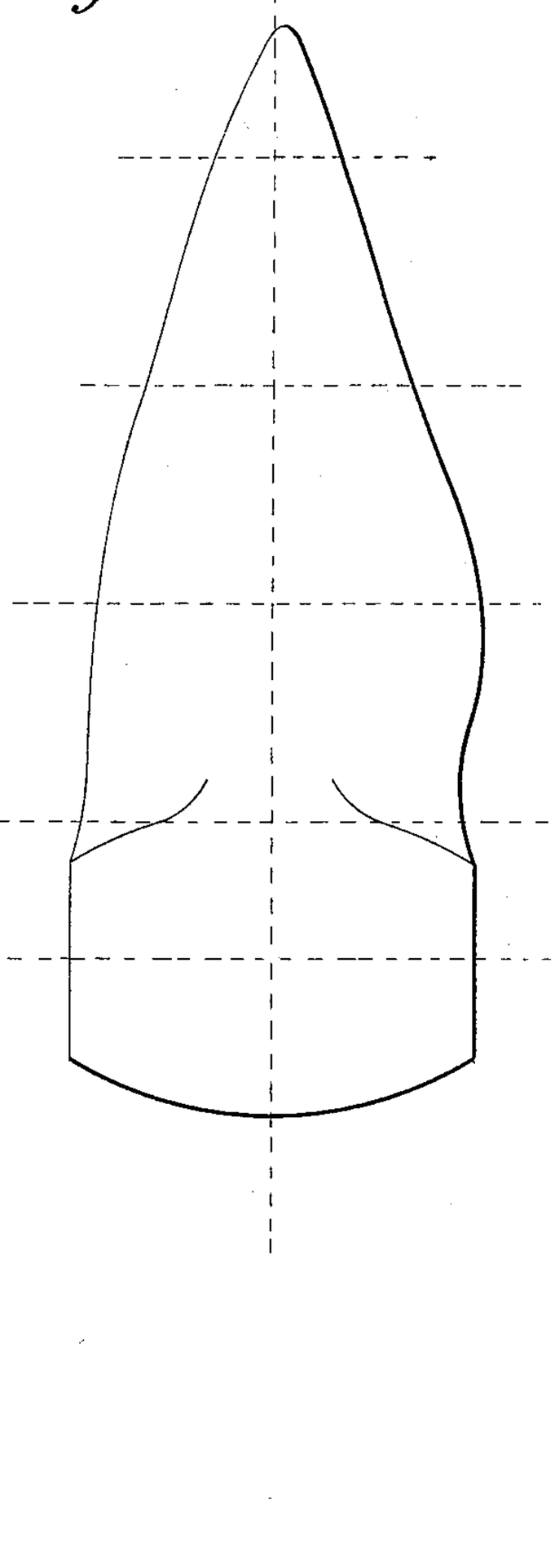

Fig. 3.

Attest.

Geo. T. Smallwood,

Walter Scott.

Inventor.

Alfred Theodor Zeise

By Paine & Lord.

Attys

UNITED STATES PATENT OFFICE.

ALFRED THEODOR ZEISE, OF OTTENSEN, GERMANY.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 389,430, dated September 11, 1888.

Application filed December 17, 1886. Serial No. 221,896. (No model.) Patented in England November 29, 1886, No. 15,572.

To all whom it may concern:

Be it known that I, ALFRED THEODOR ZEISE, a subject of the German Emperor, and a resident of Ottensen, in the German Empire, have invented certain new and useful Improvements in Screw-Propellers, (for which I have obtained a patent in England, No. 15,572, dated November 29, 1886,) of which the following is a specification.

My invention relates to improvements in screw-propellers; and the object of the same is to equalize the pressure over the whole surface of the propeller-wings.

Heretofore when calculating the effect of propelling-screws only the outer parts of the surface of the wings, being most effective ones, could be taken into consideration, as in consequence of the diminishing circumferential velocity the effective pressure is decreasing toward the axis during the rotation of the screw. Hence the main effect of the screw has been calculable as dependent on those parts of the wing-surface outside of half the radius. The form or the size of the wing or the pitch are co-ordinated to obtain the effect. In the first case the common mathematical screw with rounded corners, in which the breadth of the wings at the outer circumference is, in comparison with their breadth at the axis, of the same proportions as the way made during the rotation of the periphery of the screw to the pitch, may be regarded as representing that class of screw-propellers which obtain the effect required by the area of the outside halves of the wings. The loss of work caused by this construction is presented in the other case, with regard to the pitch, in such a manner that the wings are made equally broad everywhere, or they are shaped like a bag toward the outside. In such cases a pitch radially decreasing toward the nave has been applied, besides the variable peripherical pitch, as by Griffith, and afterward by Hirsch. Thereby the effect falls to the outside halves of the wings, and, moreover, a quick discharge of the whirling currents, caused by the decreased pressure, is obtained. Besides these and other propeller-screws, as employed heretofore—the new French one, the Mangin propeller, and the Thornycroft propeller—there exists a large number of different constructions; but they all show that their useful effect depends on the correct form and pitch of the outside halves of the wings.

In the screw-propeller constructed according to my invention a main importance is attributed also to the effect of the inside halves of the wing-surfaces, and by uniformly increasing the pitch toward the hub in proportion to the active and circumferential velocity taken together an equal distribution of pressure over the whole blade, and consequently a uniform slipping off of the water and diminution of the whirls, is secured. I preferably construct such propeller-screws with gradually and uniformly increasing pitch toward the nave, in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a diagram showing the surface of a wing placed in the plane of the drawing and a vertical section, as well as three horizontal sections, at the lines I, II, and III of the wing, Fig. 2 is a side elevation of one wing of the propeller connected with the nave; and Fig. 3, another diagram illustrating the reciprocal position of the three sections I, II, and III.

I therefore suppose a special pivot-line, *m*, for each wing. This pivot-line *m* is placed between the outside end of the wing and the axis M of the propeller parallel to the latter. On such lines the wings are constructed as usual. The distance between the axis of the propeller and the auxiliary construction-line is variable and depends on the desired degree of increased pitch. The nearer the auxiliary line is placed toward the screw-axis the less is the increase of the augmentation of the pitch, for each wing, when joined to the nave, shows, with regard to the screw-axis, a pitch which increases gradually toward the axis and will be infinitely large in the auxiliary line. This effect arises from the difference in length between the radius *a c* of the composed screw and the radius *b c*, at which each separate wing has been formed originally. The pitch of such screw, as calculated from the screw-axis M, is shown in the following formula: $x = \frac{D\,x\,y}{d}$, in which x is the pitch of the screw D the diameter of such screw, y the pitch of each separate wing, and d the diameter at which the separate wings have been formed.

In molding such screw-propellers a spindle, to which the modeling board or sleeker is piv-

oted, is placed exactly in the auxiliary line for molding each wing separately. Thereby a very exact transition from one pitch to another is secured, and the desired augmentation of pressure is obtained by correctly placing the auxiliary line with regard to the velocity of these screw-propellers. The pitch at the outside periphery is decisive. All other pitches down to the nave serve only to compensate for the loss of pressure caused by the decreasing circumferential velocity of the wings toward the nave. In this construction the surface of the wings at the outside periphery can be reduced considerably, as the advantage resulting therefrom is caused by the reduction of the resistance produced by friction and the inertia of the water to be removed. The formation of whirls at the nave, as in the ordinary screws, and the downward suction of the stern resulting therefrom in most ships are entirely prevented, and the useful effect of the propellers is augmented by the gain of force.

I am aware that prior to my invention propellers have been made with a pitch increasing gradually from the periphery, and then more decidedly to the hub. I therefore do not claim such a combination, broadly; but

What I do claim as my invention, and desire to secure by Letters Patent, is—.

A screw-propeller in which the pitch of each blade is smallest at the periphery and increases gradually and uniformly therefrom to the hub, each blade having a pivot-plane represented by the line *m*, located between the periphery of the blade and the real axis represented by the line M, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 20th day of November, 1886.

ALFRED THEODOR ZEISE.

Witnesses:

ALEXANDER SPECHT,

EMIL Y. HAASE.

Correction in Letters Patent No. 389,430.

It is hereby certified that in Letters Patent No. 389,430, granted Septem 1888, upon the application of Alfred Theodor Zeise, of Ottensen, Germany improvement in "Screw-Propellers," an error appears in the printed speci requiring the following correction: In lines 97 and 98, page 1, the formula $x = \frac{D\,x\,y}{d}$ should read $x = \frac{D \times y}{d}$ and that the Letters Patent should be re this correction therein to make the same conform to the record of the case Patent Office.

Signed, countersigned, and sealed this 7th day of May, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the In

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.