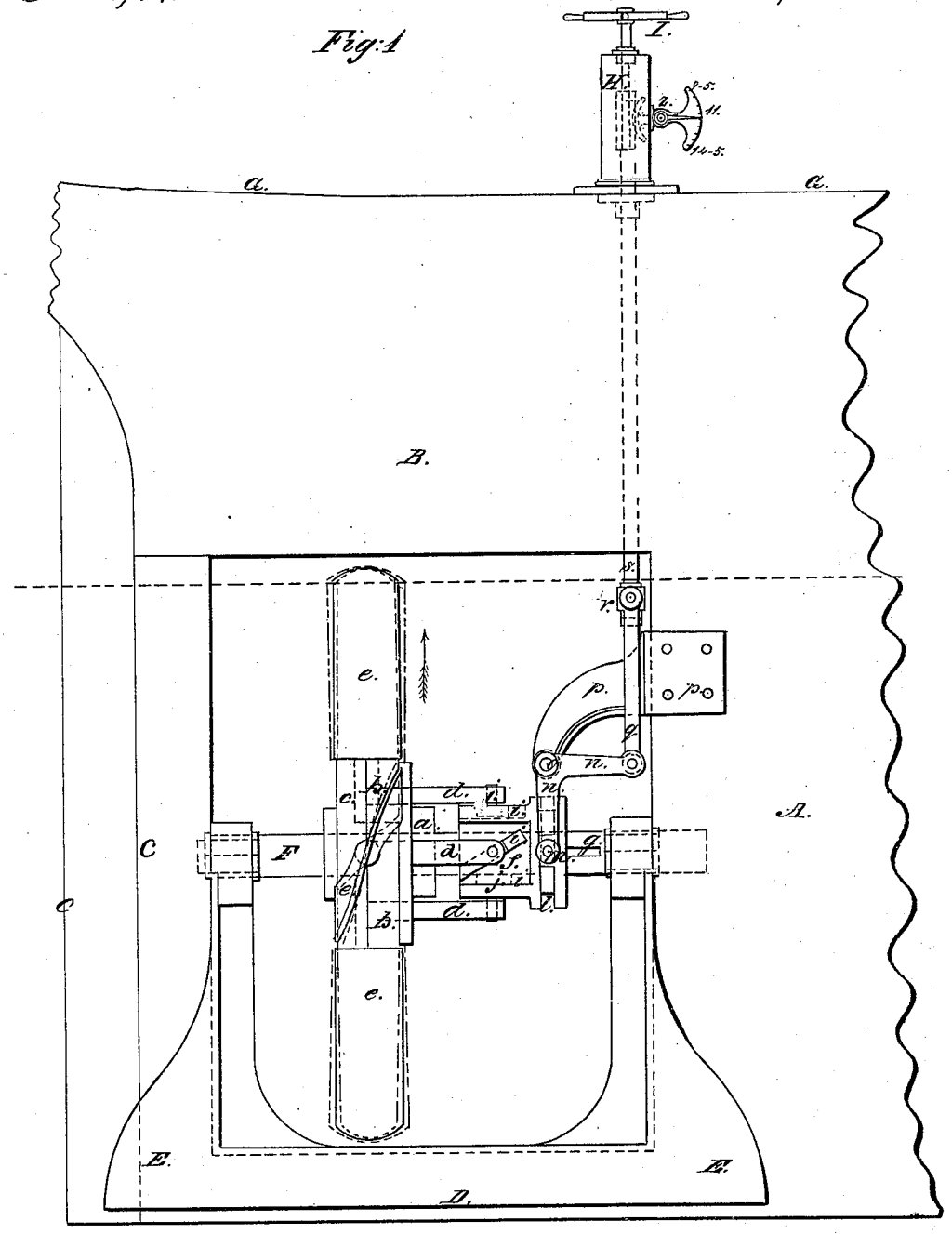
2 Sheets. Sheet. 1.

B. Woodcroft,

Screw Propeller.

No. 4,441. Patented Apr. 4. 1846.

Fig: 1



Witnesses.
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2 Sheets. Sheet. 2.

B. Woodcroft,

Screw Propeller.

No 4,441. Patented Apr. 4. 1846.

Fig: 4.

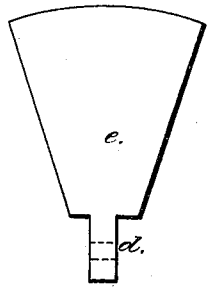


Fig: 5.

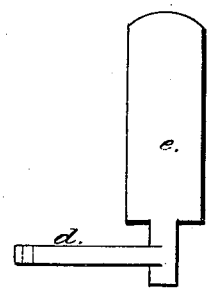


Fig: 2.

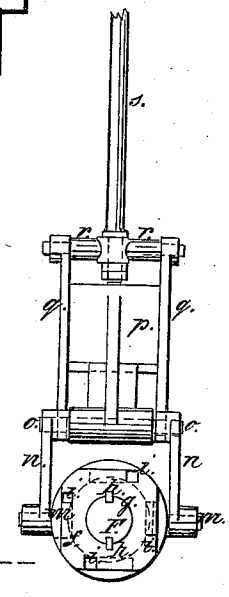


Fig: 8.

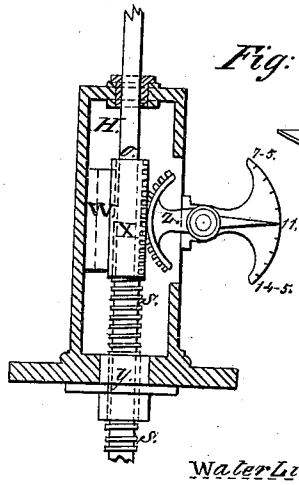


Fig: 6.

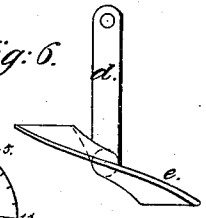
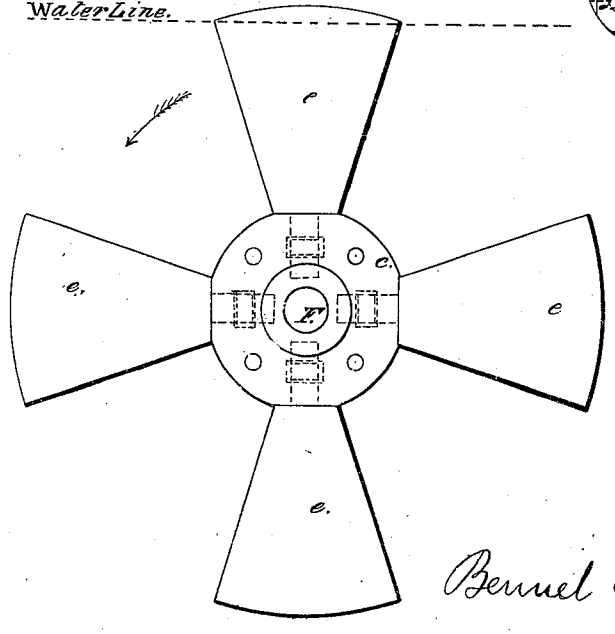


Fig: 7.



Fig: 3.



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UNITED STATES PATENT OFFICE.

BENNET WOODCROFT, OF MANCHESTER, ENGLAND.

SPIRAL PROPELLER.

Specification of Letters Patent No. 4,441, dated April 4, 1846.

To all whom it may concern:

Be it known that I, BENNET WOODCROFT, of Manchester, in the county of Lancaster, in that part of the United Kingdom of Great Britain and Ireland called England, consulting engineer, have invented certain Improvements in Propelling Vessels, which consists, first, in such a combination of the blades of what are usually called "screw-propellers," or of blades which act in the water as screw-propellers, with other suitable apparatus as will when required enable the angle such blades form with the driving-shaft or axis upon which they are placed to be changed from a less angle to a greater or from a greater angle to a less, so that the best pitch of the blades may thereby be obtained for driving the vessel under varying circumstances, such as alterations in the speed of the vessel, in the depth of its immersion in the water, and in the current of water or wind or of both in which it is acting; secondly, in the combination of apparatus with the blades by which they are held to any required angle with the driving-shaft upon which they are placed or are moved from one angle to another, so as thereby to alter their pitch, and, lastly, in the combination of an indicator with the above-mentioned apparatus and blades so constructed as at all times to show at what pitch the blades then are or as nearly so as in practice is required.

The nature of my said invention will admit of its being applied to a propeller having any required number of blades and such blades may be made from portions of a plane or from portions of a screw or from portions of a helix or what is usually called a screw of increasing pitch or they may be of any shape or of any dimensions capable of being moved so as to alter their pitch as much as is required to obtain the best results from the propeller but I prefer blades of increasing pitch (whatever be their form in other respects) such as I previously invented and for which I obtained Letters Patent for England on the twenty second day of March one thousand eight hundred and thirty two. Blades of propellers made on the increasing pitch are now so well known and understood by persons conversant with the making of screw propellers that it is not needful here to explain their mode of construction.

The nature of this invention will also admit of the blades the apparatus by which the pitch is regulated and the indicator being placed in any suitable part of the vessel.

Having now described the nature of my said invention I shall proceed to show the manner in which the same may be performed by the following description reference being had to the drawings annexed and the figures and letters marked thereon.

The same letters denote the same parts throughout the drawings.

Figure 1 represents a portion of a steam vessel with my improvements attached thereto. Fig. 2 represents an end view of the groove box which slides upon and turns around with the shaft and also the cranked lever and part of the rod by which such box is slid backward or forward upon the shaft to the required distance. Fig. 3 represents an end view of the propeller shown in Fig. 1. Figs. 4, 5 and 6 show one of the blades of the propeller with its arm at the lower extremity in three different positions. Fig. 7 shows the periphery of the middle blades shown in Fig. 1 at three different angles to the driving shaft or axis upon which it is placed each of the angles being shown in a different color.

All the above mentioned figures are drawn upon the scale shown in the drawings. When the periphery of each blade of the propeller is at the angle shown by the blue line in Fig. 7 the blades will then be at or nearly at a seven and a half feet pitch and provided no slip or recession of the water were to take place by the propeller being turned in the water at the rate of one hundred revolutions per minute the propeller would in an hour's time have passed through a distance of eight miles and nine hundred and twenty yards or thereabouts. When the periphery is at the angle shown by the black line the blades will then be at or nearly at an eleven feet pitch and provided they were turned at one hundred revolutions per minute and provided also that no slip or recession of the water were to take place the propeller at that pitch would in an hour's time have passed through a distance of twelve miles and a half or thereabouts. And when the periphery is at the angle shown by the red line the blades will then be at or nearly at a fourteen and a half feet pitch and if they were turned under the same circumstances as to

speed and as to water as in the two preceding cases the propeller would in an hour's time have passed through a distance of sixteen miles and eight hundred and forty yards or thereabouts.

In Fig. 1 A, B, C, D, represent portions of a vessel the part marked A being the stern post of the vessel the part marked B being a portion of the vessel projecting beyond the stern post and over the opening in which the propeller is placed. The part marked C is a false stern post and the part marked D is a continuation of the keel extending under the propeller from the real to the false stern post.

E is a piece of iron which passes on each side of and is united to the pieces A, C, and D to keep them fixed in their places.

F is the driving shaft upon which the propeller and the grooved box are placed. This shaft extends from a bearing or step attached to the false stern post C and through a stuffing box in the stern post A to the driving gear or engine by which it is turned.

a, *b*, is a boss, or hub keyed fast upon the driving shaft through openings or mortises in the part *b*, of which the arms *d* of the blades are passed so as to project over the sliding grooved box. Each of the openings is sufficiently wide to admit of the arm being traversed sidewise as much as is required to alter the pitch or angle of the blade with the driving shaft the boss *a b*, on its innerside is made with semicircular slots or openings in which with corresponding slots or openings in the cap *c*, which screwed on to form circular bearings or steps for the shafts at the bottoms of the blades. When the arms *d*, and the blades *e*, are put in their places the cap *c*, is bolted to the fixed bearing *a b*, and thereby secures the blades in their working position.

f, is a grooved box placed upon the driving shaft F, which shaft has one or two fixed keys or tongues *g*, let into it running in the direction of its length. The box *f*, is placed over these tongues, or tongue and it has a slot, or slots or key grooves *h*, in the inside shown in Fig. 2 in which the fixed keys on the shaft enter and by which when the shaft is turned around the box is turned also but these slots and tongues, or keys do not prevent the box from being slid backward or forward on the shaft. On the outside of this box are four oblique grooves *i*, which receive the heads of the studs *j*. The round parts of these studs pass through circular openings *k*, (see Fig. 6) in the ends of the arms *d*. *l*, is a slot passing around the box *f* into which two studs *m*, project (see Fig. 2) fixed to the two lower extremities of the bell crank levers *n*. These levers work upon centers at *o*. The pin which passes through the levers and to which they are keyed works in a bearing of the bracket *p*, which is attached to the stern post of the vessel. Two links *q*, unite the bell crank levers to the cross head *r*. Through this cross head *r*, the rod *s* passes, and it is so attached to that cross head as to turn, or swivel freely around in it or to move it up and down as required. The upper part of this rod passes through the deck the line of which is shown at G, and through a short column H, fixed on the deck. Part of the rod which passes through this column has a worm cut into it so as to form a screw which works in a nut *y*, fixed in the lower end of the column H. On the top of the rod *s*, is fixed a wheel I, with handles by which the rod *s*, can be turned. *z*, is an indicator with a number of teeth placed concentric with its axis on the one side and having on the other a finger; an index plate showing at what pitch the screw is. This column H, and the indicator are best shown on an enlarged scale at Fig. 8.

x, is a case which rests upon the worm on the rod *s*, with a pin passing through the rod over the case. This case has a rack on one side in which works the teeth of the indicator *z*.

w, is a key, or check slide fixed to the column H, which takes into a groove behind the case *x*, and which prevents the case from turning around.

When the wheel at the top of the rod *s*, is twined so as to force the rod down it will by its action upon the links and bell cranks force the sliding box on the shaft nearer to the propeller and the oblique grooves in the box acting upon the arms of the propeller blades will turn the blades to a less angle with the axis and thereby decrease the pitch of the propeller and when the wheel is turned so as to draw the rod up it will by its action upon the links and bell cranks draw the sliding box farther from the propeller and the oblique grooves in the box acting upon the arms of the propeller blades will turn the blades to a greater angle with the axis and thereby increase the pitch of the propeller. It will be obvious that when the rod *s*, descends or ascends by the screw upon it the case *x*, also descends or ascends with it and the rack upon it thereby moves the finger of the indicator over that part of the plate of the indicator which shows at what pitch the blades of the propeller then are.

Having now described the nature of my said invention and the manner in which I carry it into effect I declare that I do not claim any of the parts separately which I have used in my improvements in propelling vessels but

I do claim as of my invention—

The combination of the blades of propellers such as I have shown and described

with an apparatus for setting the same arranged and operating substantially as herein set forth. The sliding box with oblique grooves being made to operate upon arms which are attached to the shaft upon which the propellers are to turn; said sliding box being made to move back and forth on the propeller shaft by the turning of a rod *s*, or by any other equivalent means.

BENNET WOODCROFT.

Witnesses:
JOHN ALCOCK,
THOS. BROWN.