

No. 735,905.

PATENTED AUG. 11, 1903.

G. PINKERT.
SCREW PROPELLER.

APPLICATION FILED APR. 14, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig:1.

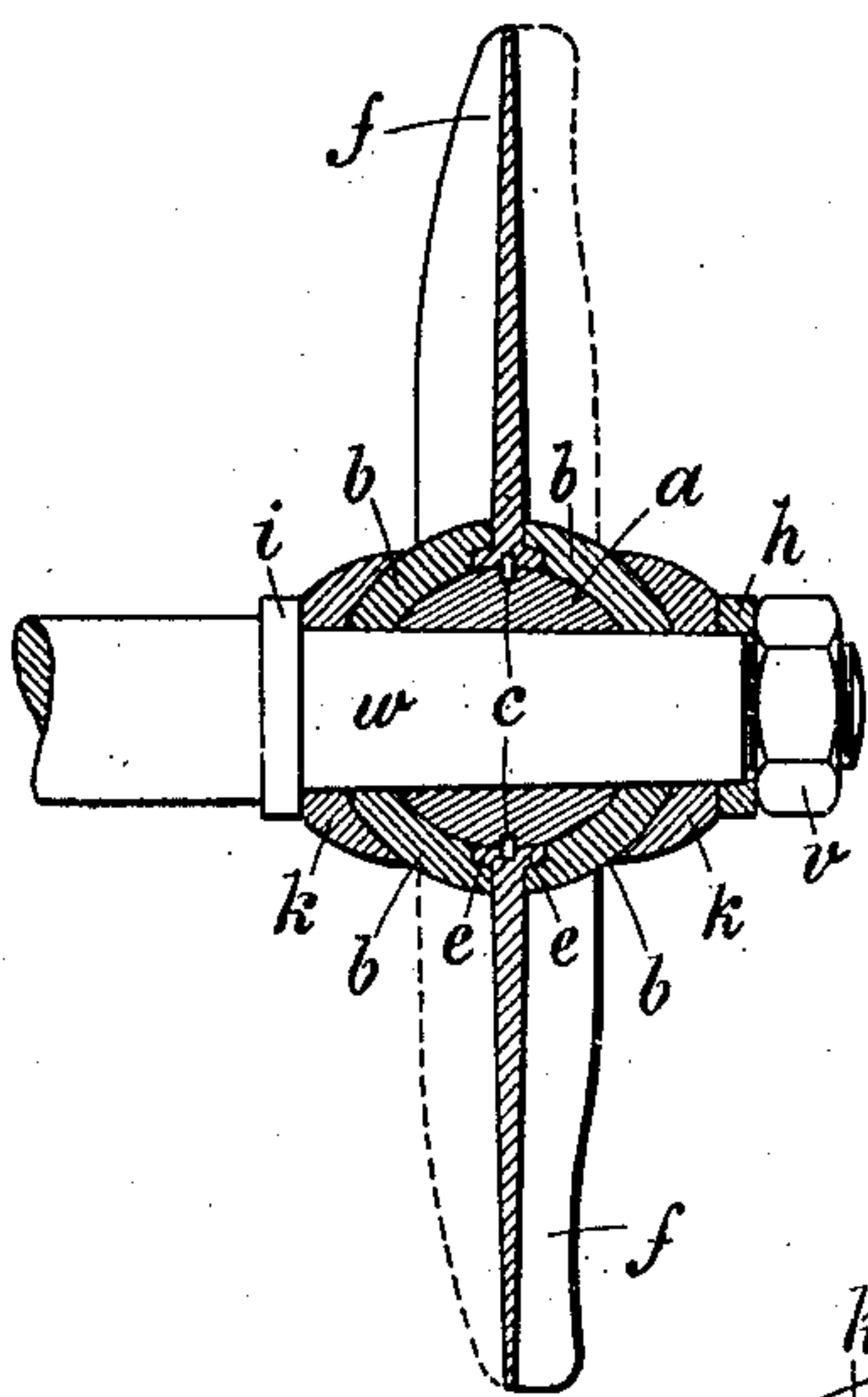


Fig:2.

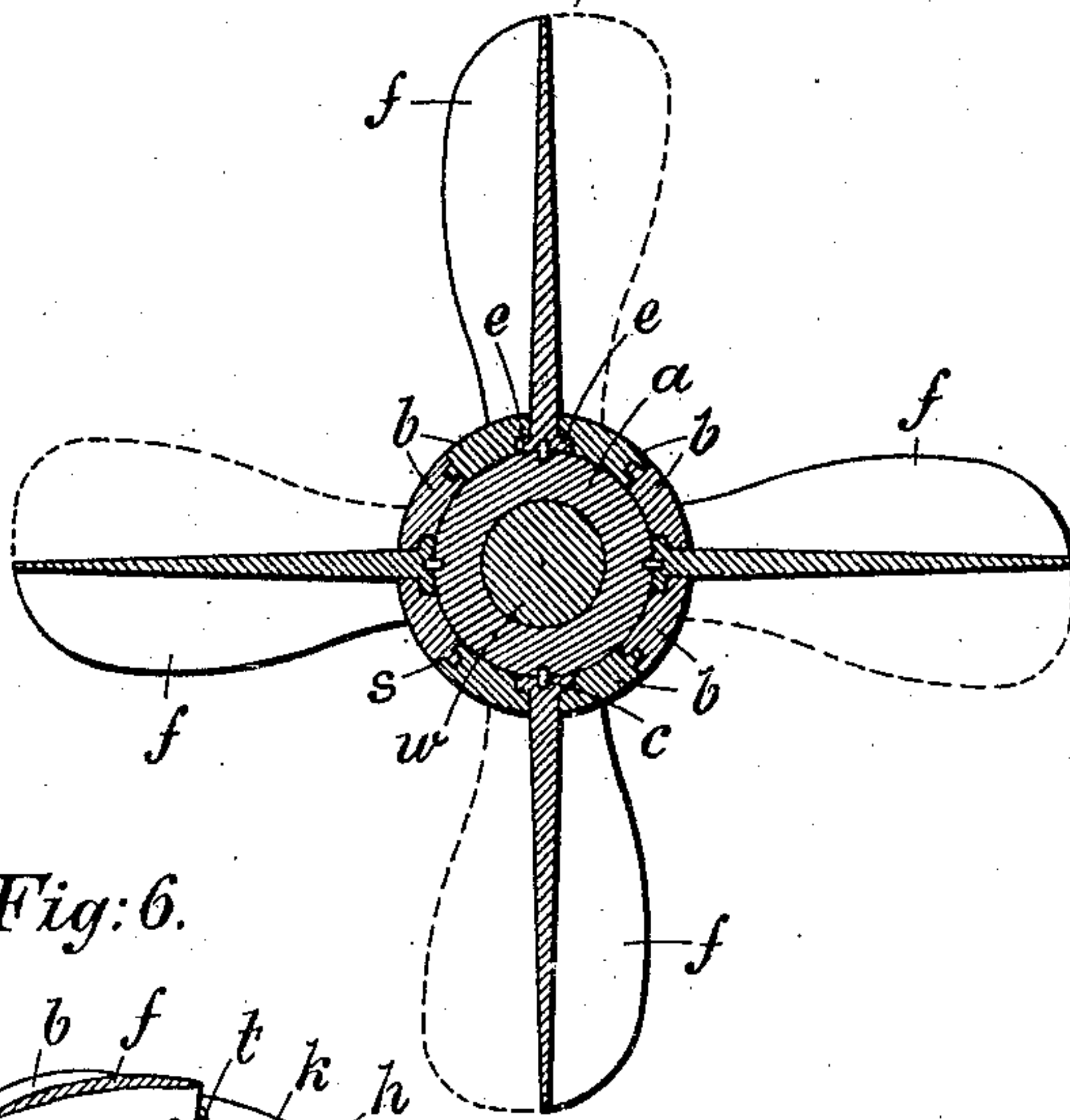


Fig:6.

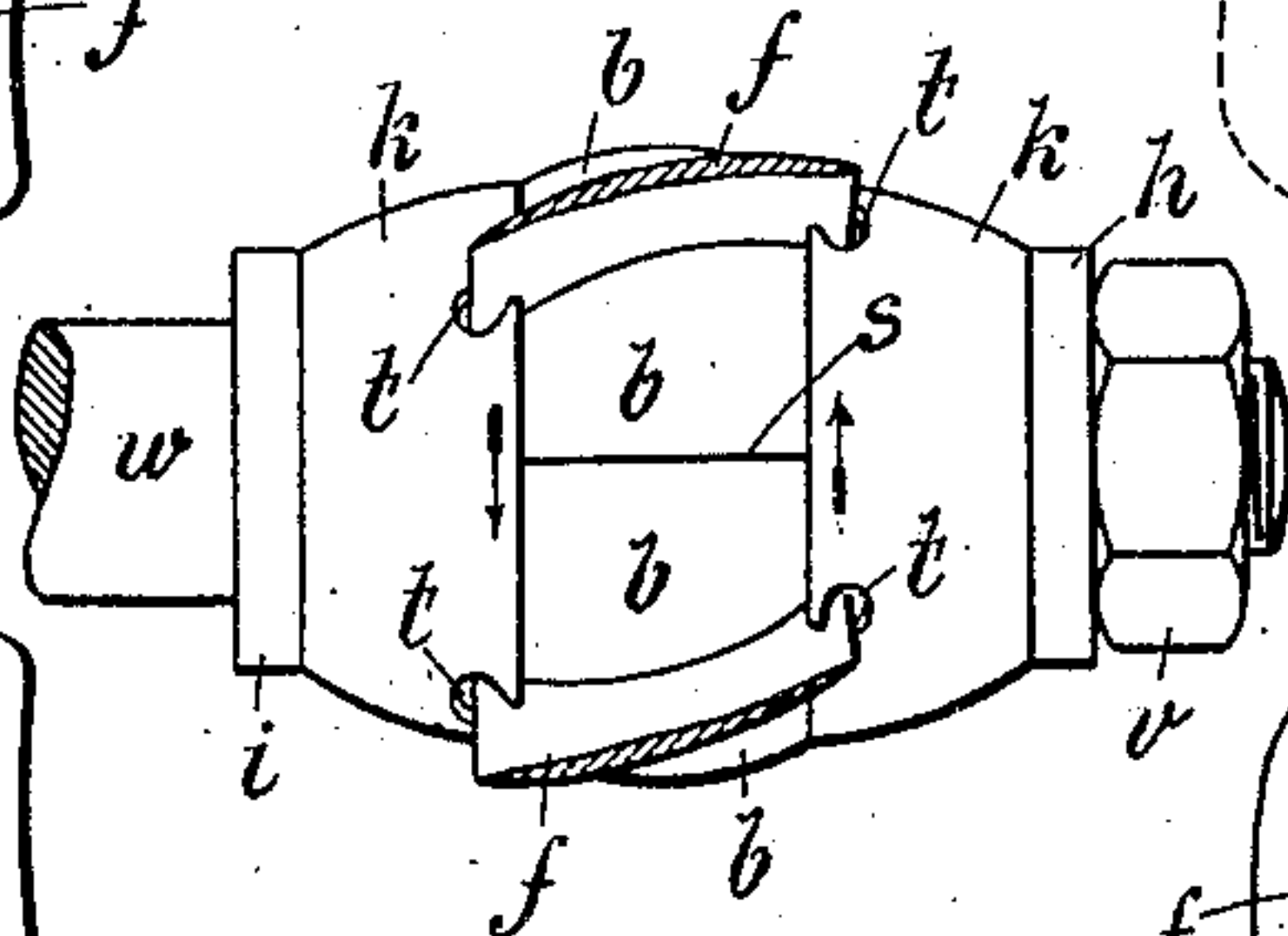


Fig:3.

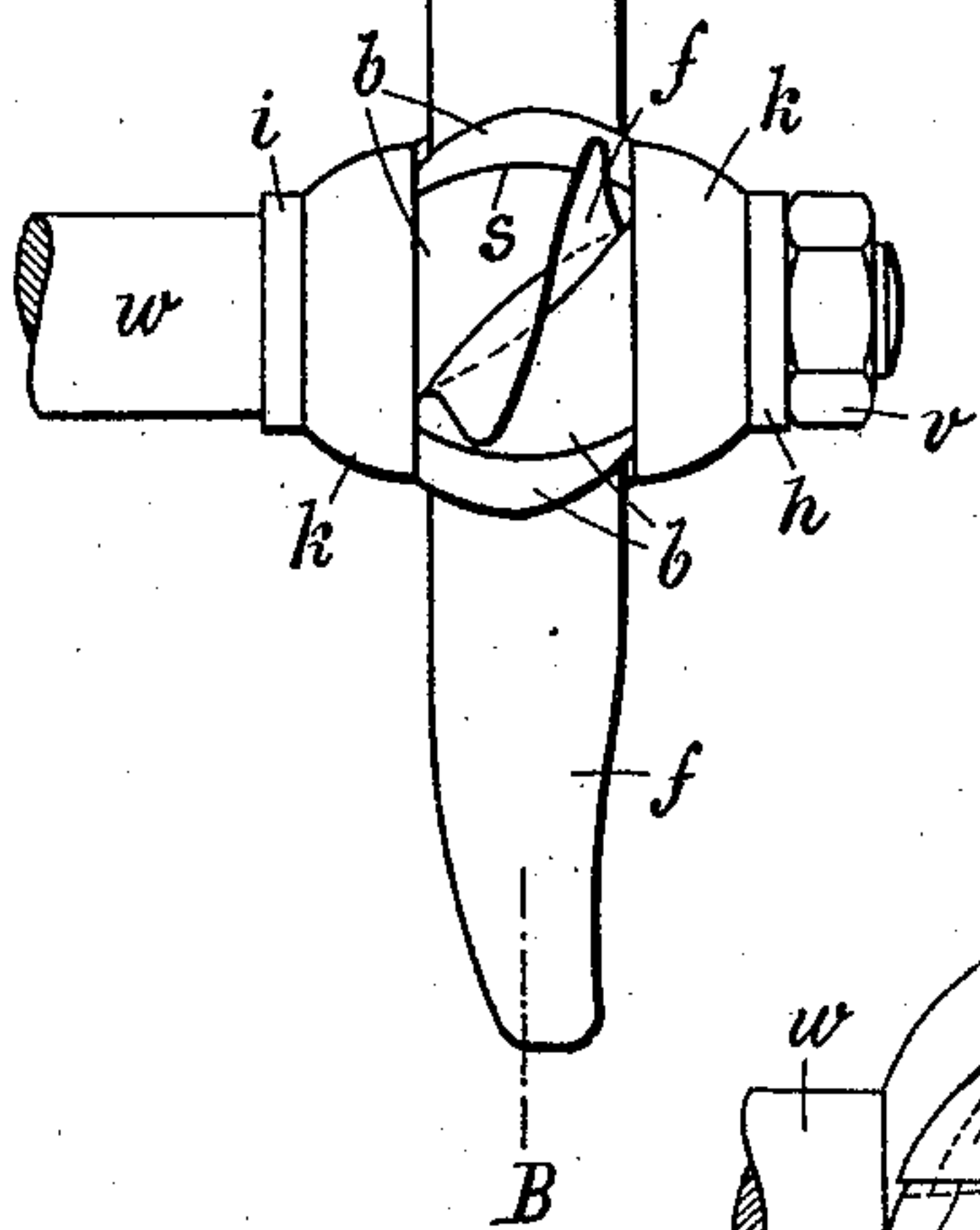


Fig:4.

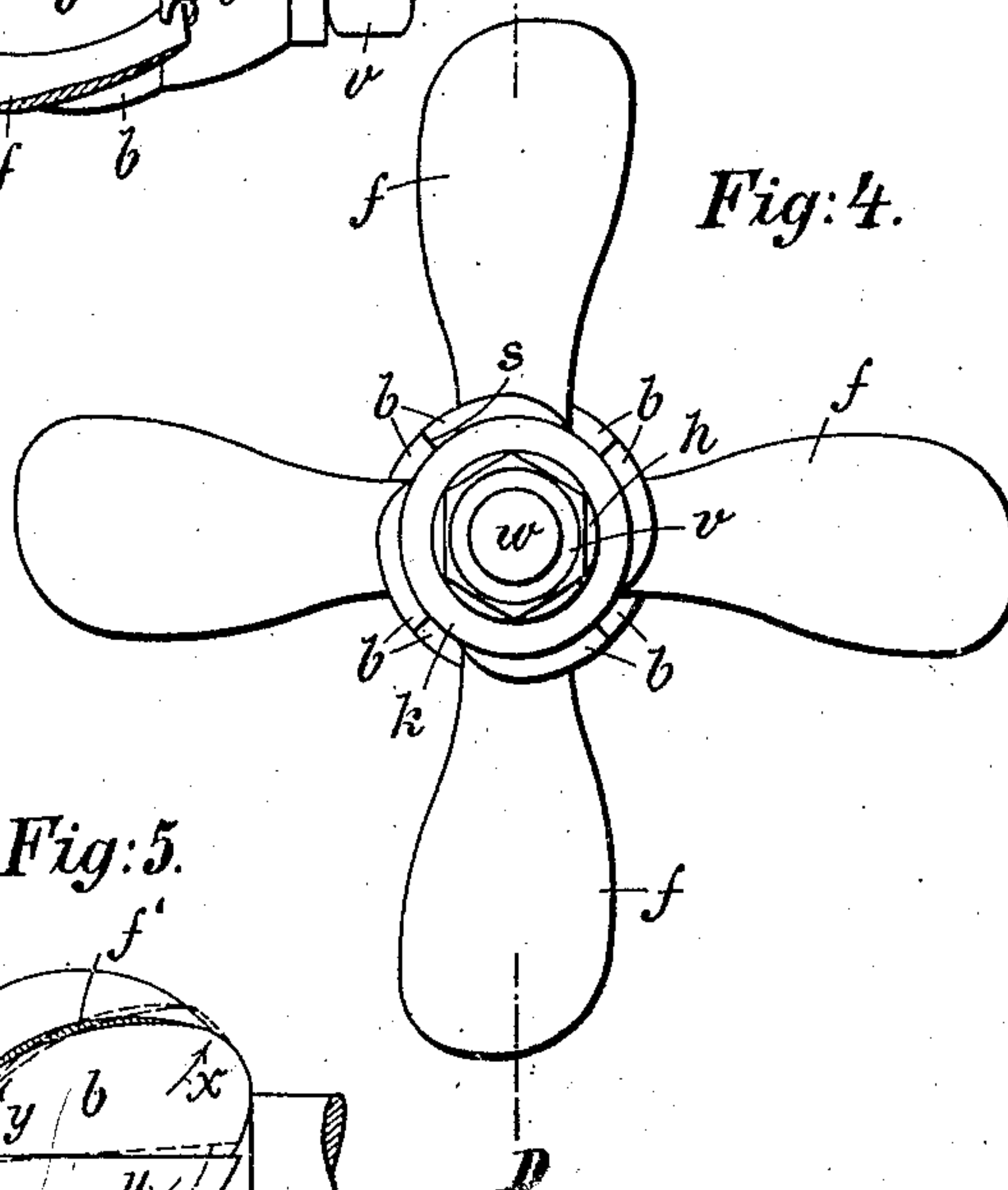
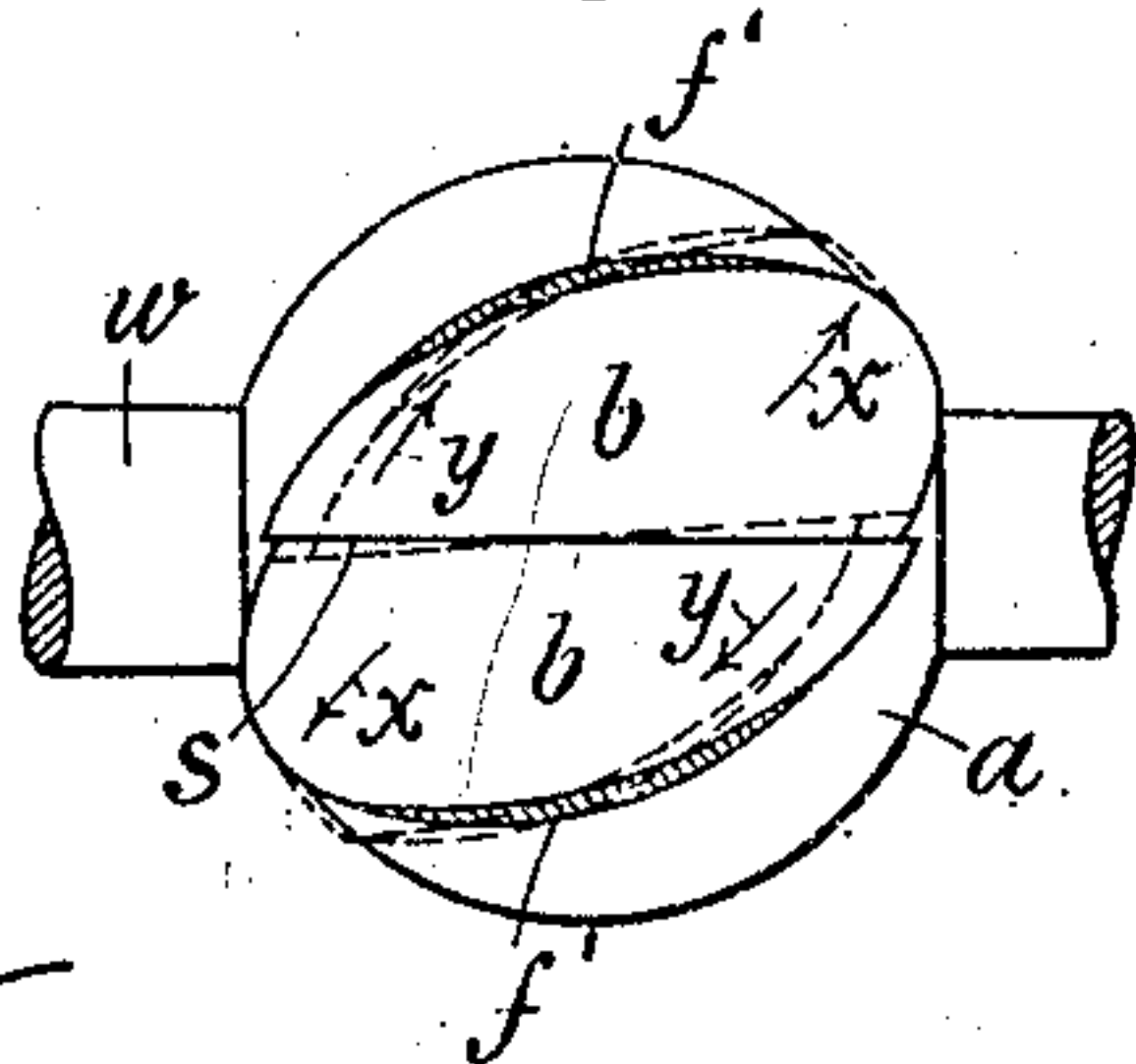


Fig:5.



Witnesses:-
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Paul Arras.

Inventor:-
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his attorney.

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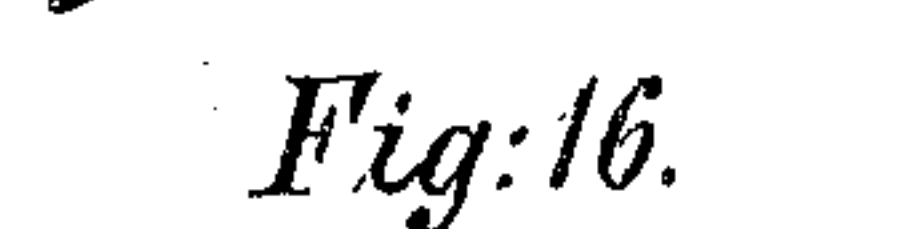
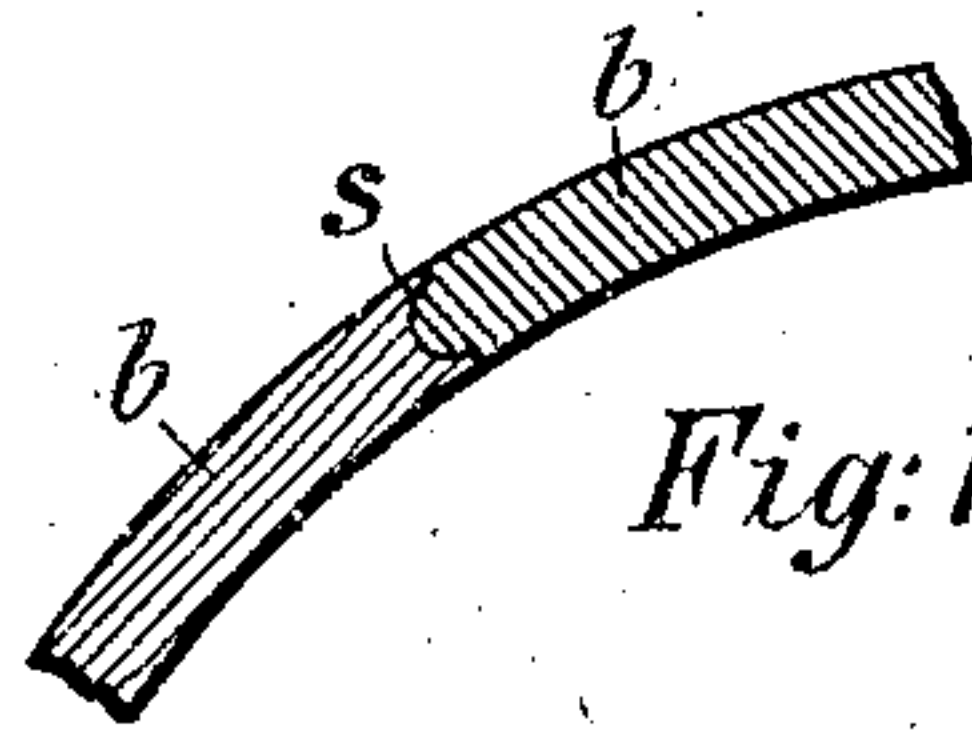
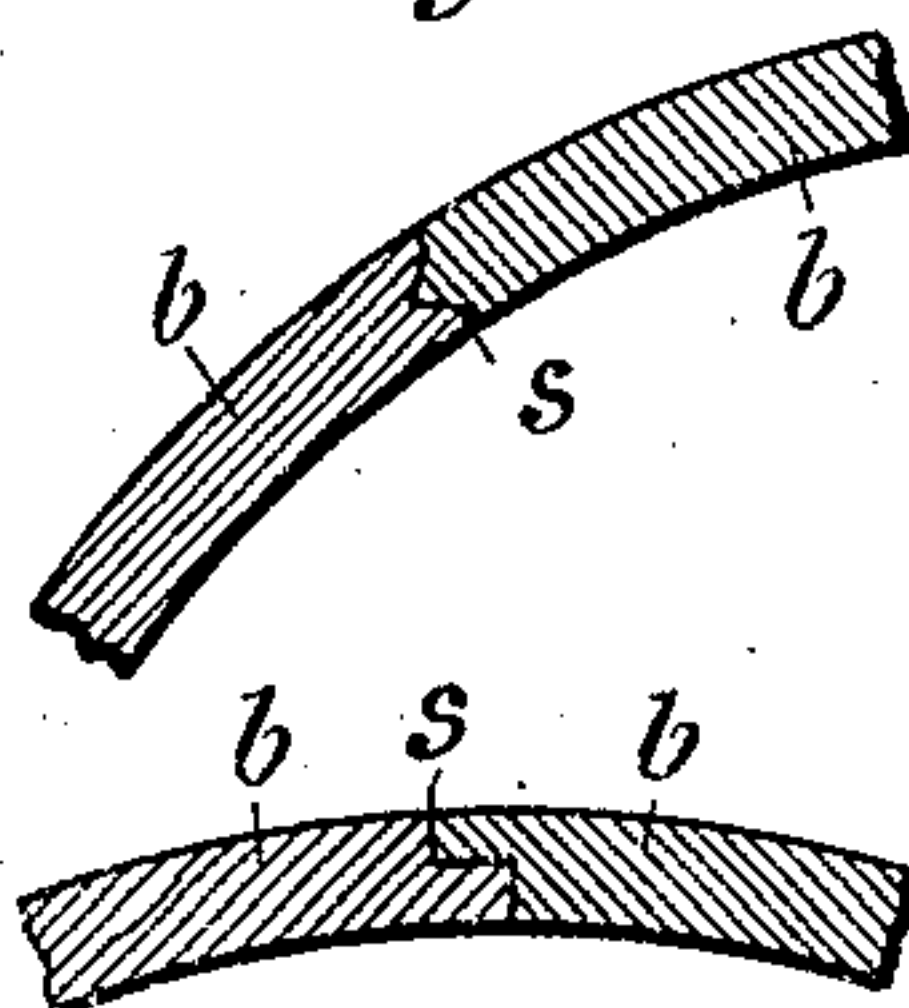
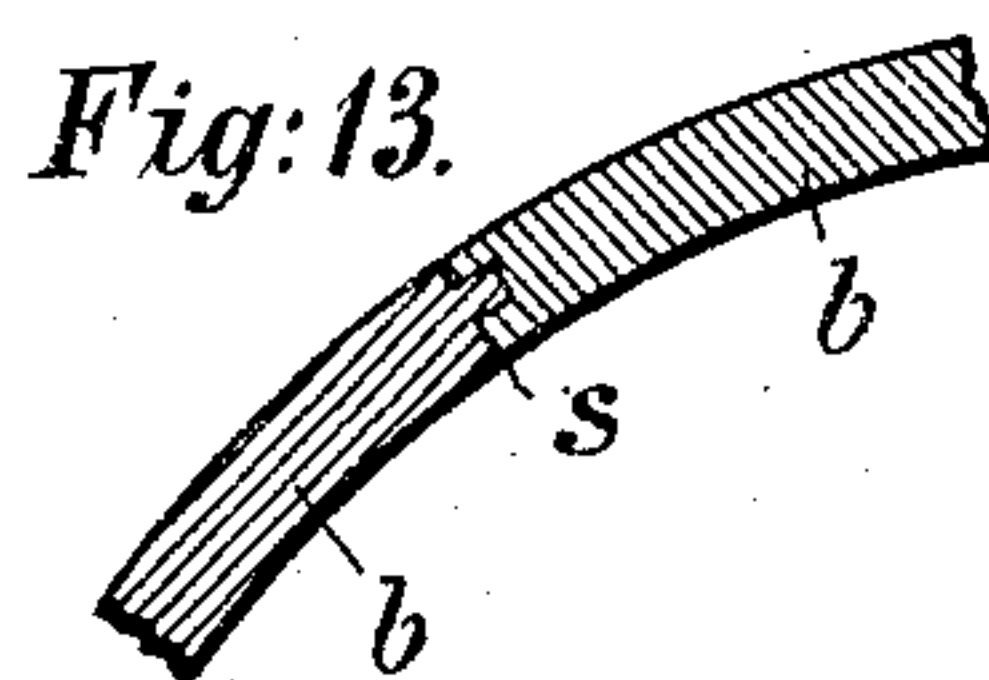
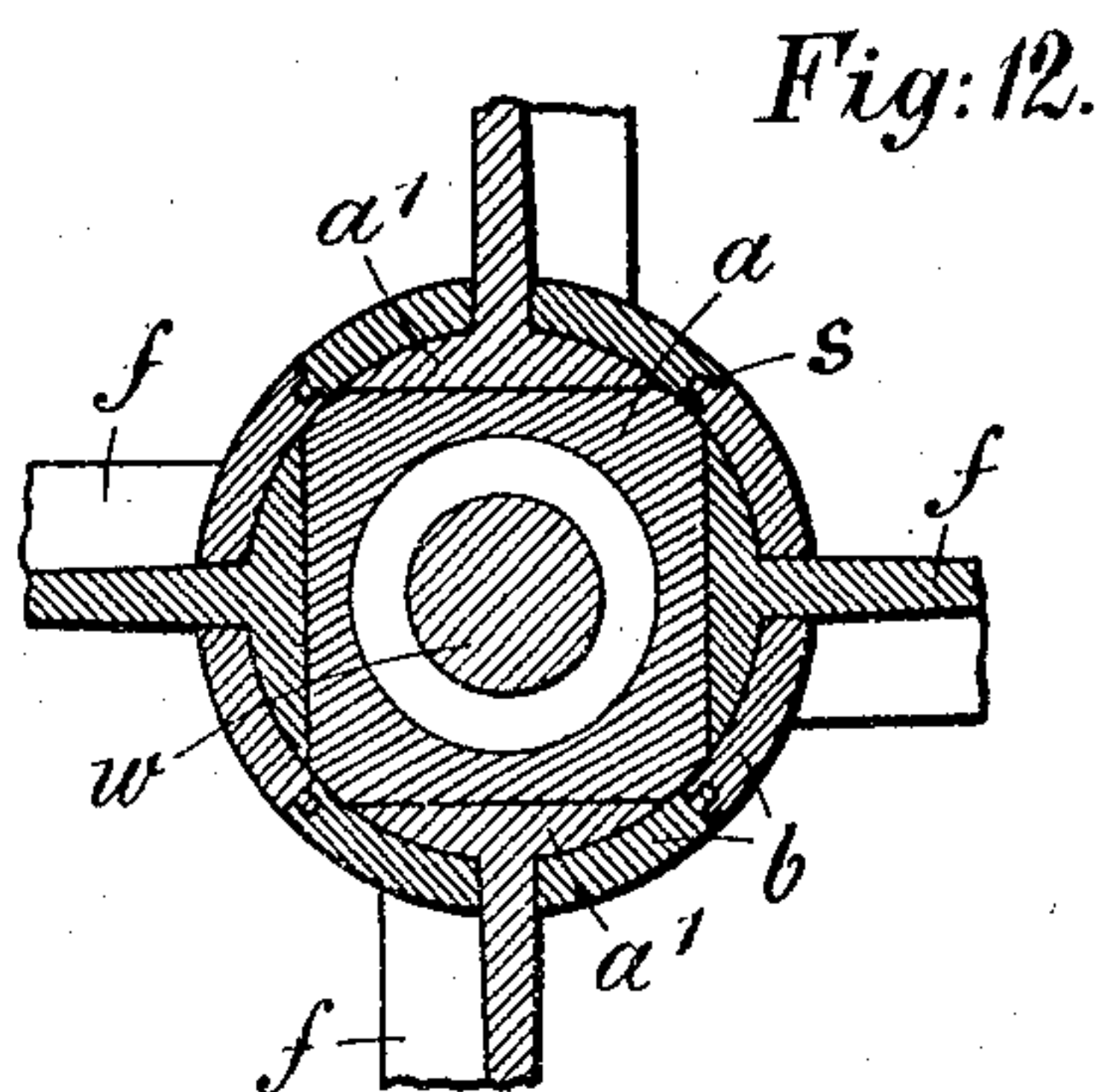
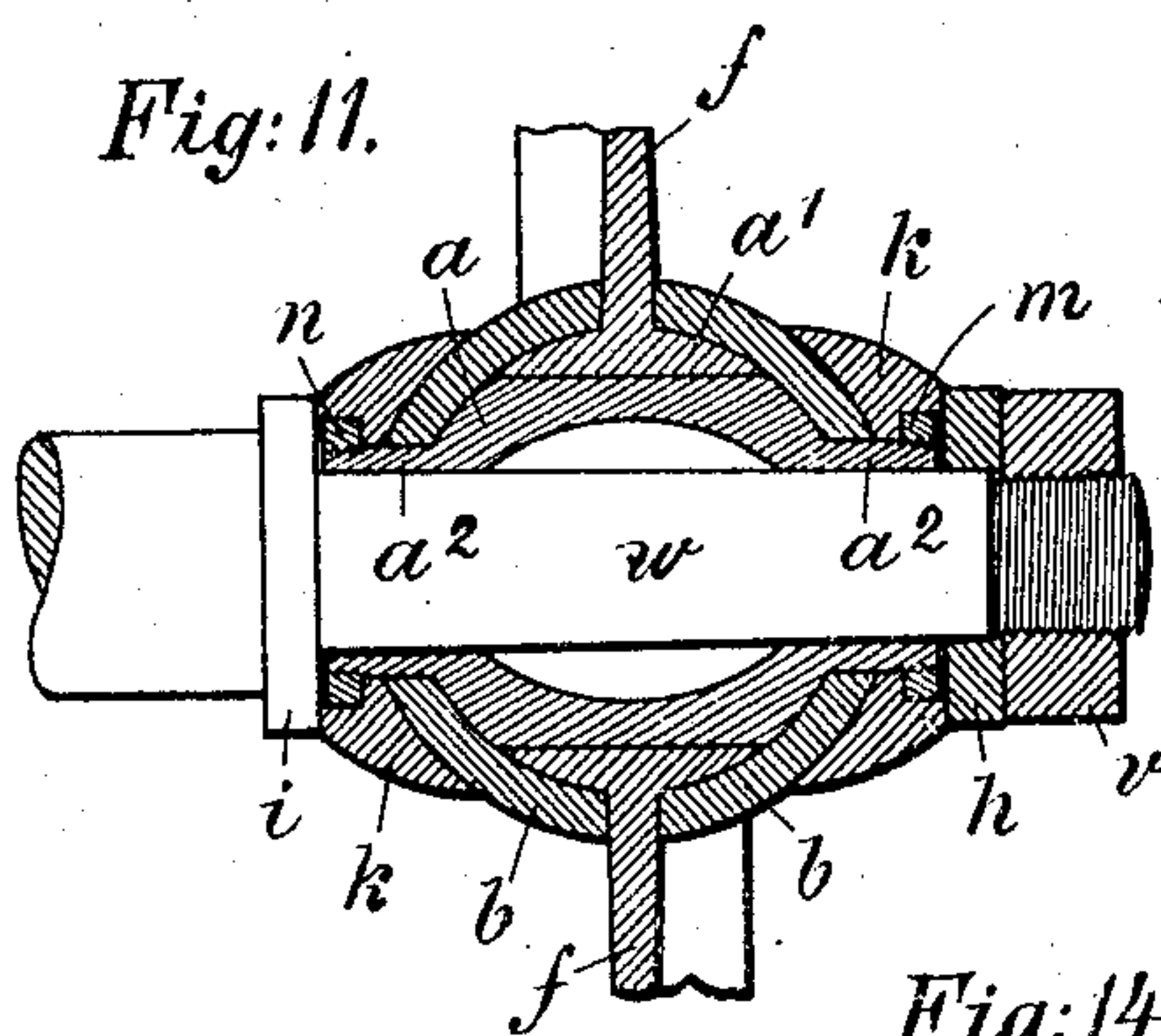
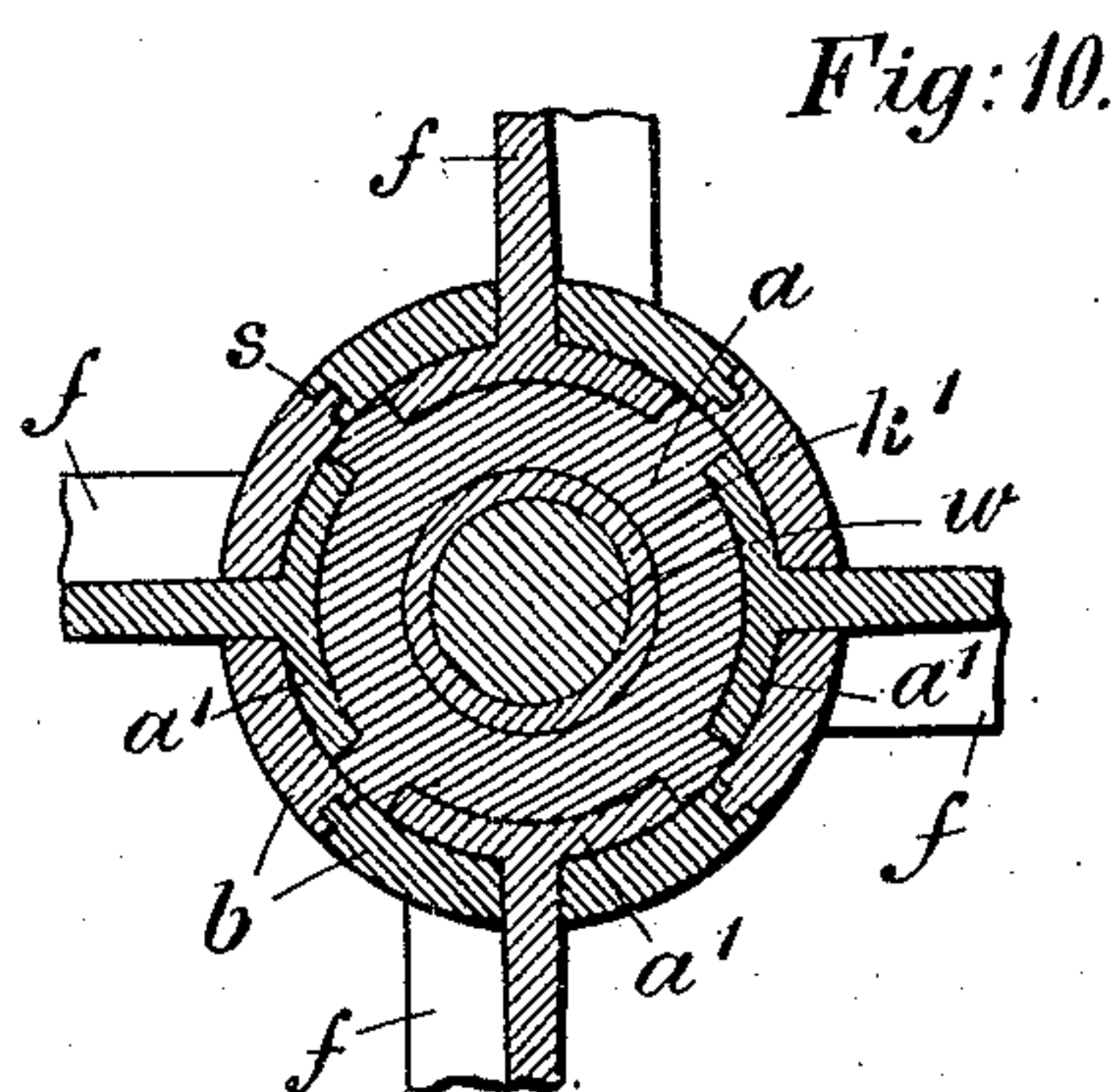
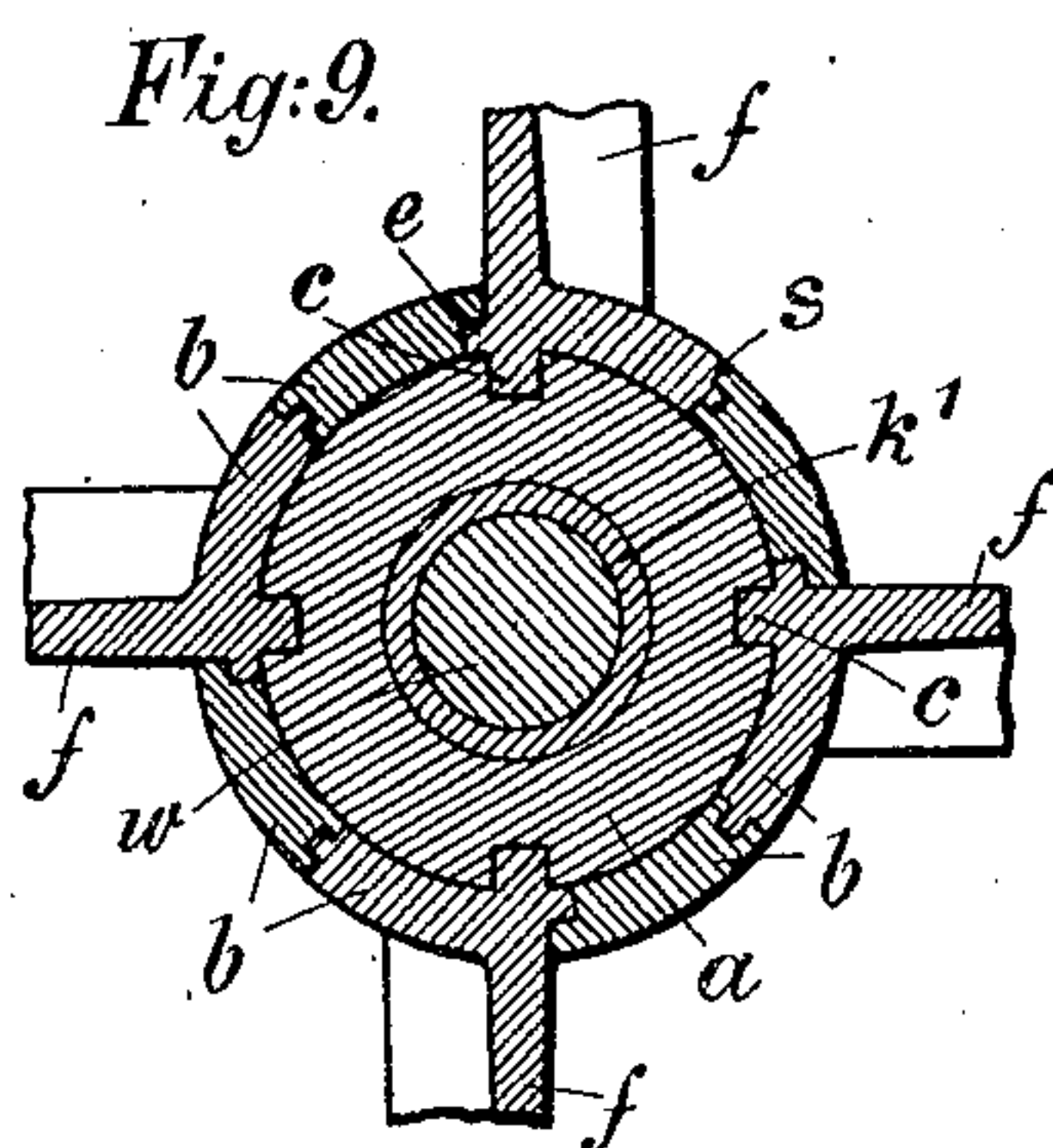
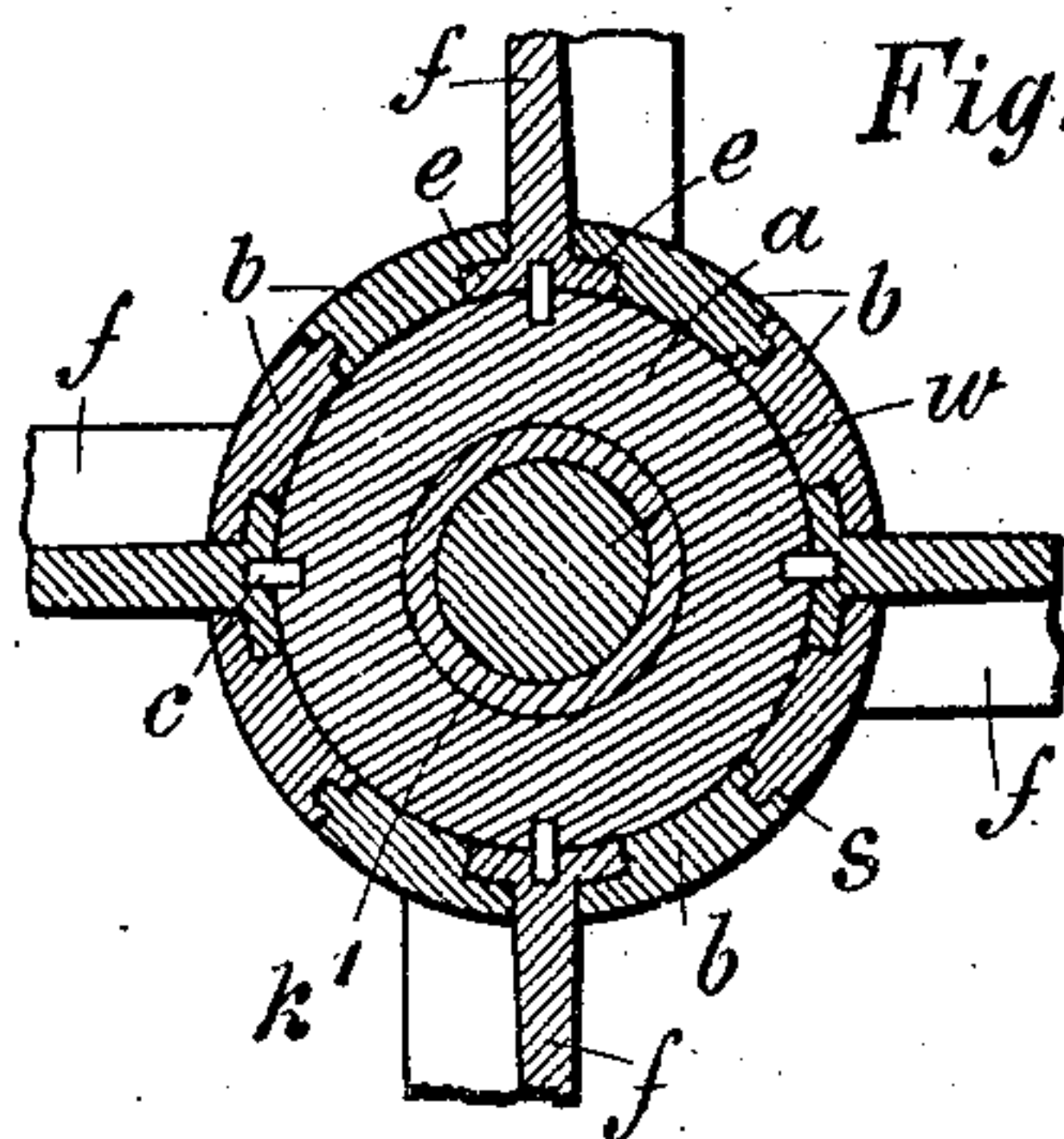
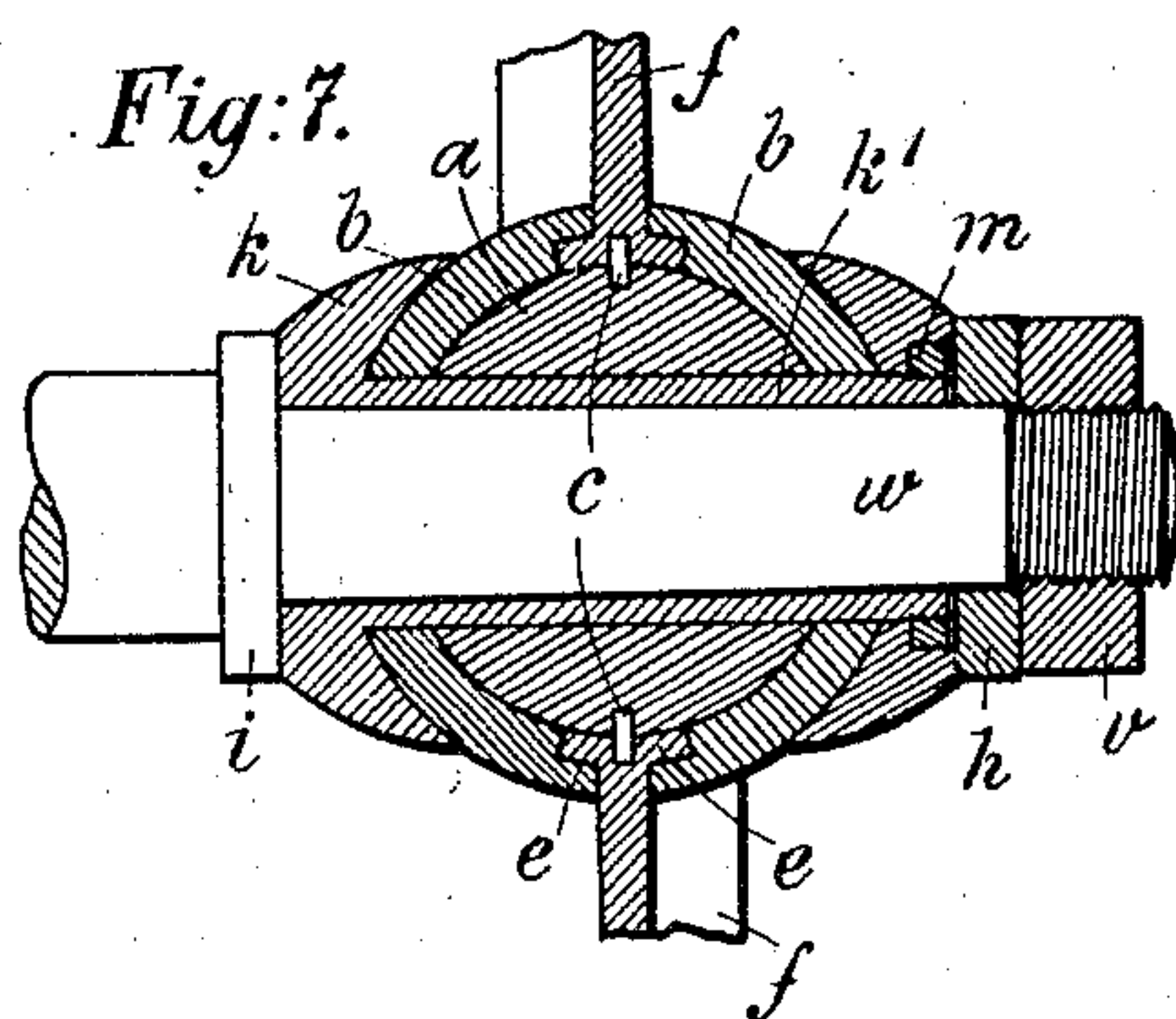
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G. PINKERT.
SCREW PROPELLER.

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2 SHEETS—SHEET 2.



Witnesses:—
C. N. Schilling
Paul Arras.

Inventor:—
Georg Pinkert
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his attorney

UNITED STATES PATENT OFFICE.

GEORG PINKERT, OF HAMBURG, GERMANY.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 735,905, dated August 11, 1903.

Application filed April 14, 1903. Serial No. 152,572. (No model.)

To all whom it may concern:

Be it known that I, GEORG PINKERT, a subject of the Emperor of Germany, residing at Hamburg, Germany, have invented certain new and useful Improvements in Screw-Propellers, of which the following is a specification.

In the constructions heretofore employed for securing the blades of a screw-propeller to the boss there is a disadvantage which is very prejudicial to the useful effect of the screw—namely, that the boss must have an angular form in order to offer a secure basis for the fixing-flanges of the blades. These fixing-flanges also increase the size of the boss considerably and make the boss of the completed screw still more angular, while the screw studs and nuts serving to secure the fixing-flanges to the boss project beyond the flanges themselves and produce foaming of the water.

The present invention relates to improved means for securing the screw-blades to the screw-boss; and the object is to leave to the boss its round shape and to render unnecessary the blade-fixing flanges, as well as the screw studs and nuts heretofore employed. The improved means of securing also facilitates the changing of the blades and altering of their pitch. Furthermore, by the suppression of the usual fixing-flanges the employment of thin rolled or forged screw-blades of tough elastic material with sharp cutting edges is rendered possible, whereby the friction and certain other resistances of the screw-blades in the water and the consequent loss of useful effect are materially reduced.

In the accompanying two sheets of drawings are shown various methods of carrying the invention into effect.

Figure 1 shows a sectional elevation of a four-bladed propeller on the line C-D of Fig. 4 according to my invention; Fig. 2, a sectional elevation of same on the line A-B of Fig. 3. Figs. 3 and 4 show, respectively, side and rear views of the propeller. Fig. 5 is a diagrammatic view illustrating the adjustability of the screw-blades, and Fig. 6 shows a construction of the boss of the screw corresponding to Fig. 3 in which a uniform adjustment of all the blades is effected by means of

special devices. Figs. 7 and 8 show the same method of securing the blades as that shown in Figs. 1 and 2, but with the addition of a connecting-sleeve. Figs. 9 to 12 are sectional views of further modifications of the devices for securing the screw-blades. Figs. 13 to 16 show cross-sections of joints for the hollow spherical segments which serve to secure the blades in place.

The fundamental idea of the invention is that of holding the screw-blades by their bases on a spherical boss by means of hollow spherical segments adjustable on the said spherical boss, which latter is secured on the shaft, so that it cannot turn thereon, and the said spherical segments are pressed firmly onto the bases of the screw-blades and onto the spherical boss by means of two spherically-shaped clamping devices corresponding in shape to the external spherical surfaces of the hollow spherical segments by tightening up a special screw-nut or by tightening up of the end nut on the propeller-shaft used for securing the entire screw-propeller on the shaft. The screw-blades may be pinned at their bases into the spherical boss or may take onto pins formed on or fixed in the spherical boss itself, so as to be rotatable on their virtual axes passing through the center of the spherical boss to enable them to be adjusted so as to vary their pitch, if necessary, the hollow spherical segments being so placed between the blades that when moved in opposite directions they effect this desired turning of the screw-blades.

The securing devices (shown in Figs. 1 to 4) are constructed as follows: The boss of the screw consists of a spherical boss *a*, bored out conically, as usual, to fit onto the conical part of the screw-shaft *w* and is prevented from turning thereon by means of keys in the usual way. On this boss are placed hollow spherical segments *b*, with their inner spherical surfaces exactly fitting the outer spherical surface of the boss. The number of these segments *b* as fixed by practical experiments is double that of the screw-blades. The shape of these segments is the same in all and depends partly upon the cross-section of the screw-blades *f*. The hollow spherical segments *b* are held in place longitudinally of

the shaft *w* by two dish-shaped clamping devices *k k*, which extend as far over the segments *b* as the screw-blades *f* will allow, whereby an intimate contact of the inner surfaces of the clamping devices *k k* with the outer surfaces of the segments *b* is secured. The clamping devices *k k* are bored to suit the conical shape of the shaft *w*, and they may be prevented from rotating on the shaft by keys, like the boss *a*. A washer *h* takes the pressure of the screw-nut *v*, whereby the whole of the parts composing the boss are pressed firmly together, the front clamping device *k* thereof being pressed against the collar *i* of the shaft *w*. The washer *h* may likewise be prevented from turning on the shaft *w* by means of keys. The screw-blades *f* are rotatable on pins *c* of the spherical boss *a* perpendicularly to the longitudinal axis of the shaft *w*, the axial lines of such pins passing through the center of the spherical boss *a*. These pins *c* may be fixed either in the spherical boss *a* or in the bases of the screw-blades *f*. The inner surfaces of the bases of the blades *f* correspond exactly to the shape of the spherical boss *a* and bear at all parts firmly against the latter. The bases of the blades *f* are provided with laterally-projecting fixing-flanges *e*, which are overlapped by the inclosing hollow spherical segments *b*.

The process of putting together the parts composing the screw-propeller will be easily understood from an inspection of Figs. 1 to 4 and is as follows: First the front clamping device *k* is pushed onto the shaft *w* as far as the collar *i* and the spherical boss *a* is put on the shaft. The blades *f* are then placed with their bases against the spherical boss *a*. The hollow spherical segments *b* are next placed on the boss *a* between the blades *f*. Then the rear clamping device *k* and the washer *h* are pushed onto the shaft, and finally the whole is pressed firmly together by screwing up the nut *v*. In screwing up the nut *v* care must be taken that the blades *f* take the intended pitch. If, however, one blade is made to take the required pitch, all the others must automatically take exactly the same pitch, because, on the one hand, by reason of the exactly opposite placing of each of the similarly-formed segments *b*, and, on the other hand, the intimate contact between the flanges *e e* or the surfaces of the blades and the overlappings of the segments *b*, and exactly similar angular position of all the blades *f* is secured and a separate adjustment of each of the blades is therefore rendered unnecessary.

As it is desirable in most cases to put the screw-propeller together complete before placing it on the shaft *w*, the further arrangements shown in Figs. 7 to 12 have been devised to facilitate the carrying out of that object.

The construction shown in Figs. 7 and 8

differs only from that above described in that the front clamping device *k* projects backward nearly to the washer *h*, so as to serve as a connecting-sleeve *k'*. This sleeve *k'* is bored out conically to fit the conical shaft *w* and is prevented from turning on the latter by means of keys in the usual way. Externally the sleeve *k'* is cylindrical, and the spherical boss *a*, segments *b*, screw-blades *f*, and rear clamping device *k* are pushed onto this cylindrical sleeve *k'*. The rear end of the sleeve *k'* is furnished with a screw-thread, onto which is screwed the nut *m*, for which a recess is formed in the rear pressure-receiving surface of the clamping device *k* and by which nut the whole of the parts composing the boss device are pressed together. The annular remaining edge of the rear pressure-receiving surface of the clamping device *k* must project a little beyond the rear end of the sleeve *k'* and of the nut *m*, screwed on the latter. Then the shaft-nut *v* exerts pressure, by means of the washer *h*, on the clamping device *k* and acts as a lock-nut.

In the modification shown in Fig. 9 the hollow spherical segments *b* are cast on or fixed to one side of the base of the blade, and such a segment *b* may be regarded as an extension of the flange *e* of the arrangement already described. The pivot-pin *c* may be cast in one piece with the base of each blade.

The device for fastening the blades shown in Fig. 10 differs from those previously described in that the base of the blade *f* is formed as a circular segment *a'*, the diameter of which corresponds with the lower breadth of the blade. These segments *a'* are let into the spherical boss *a*, and their outer surfaces complete the regular spherical form of the latter. It may be observed that this method of constructing the segments *b* simplifies the mechanical construction, because the overlapping rabbets of the segments for the flanges *e e* are not required.

In Figs. 11 and 12 is shown another modification, in which the fixing-flanges *a'*, made in one piece with the blades *f*, are formed as spherical segments, the outer surfaces of which complete the spherical boss *a*. Furthermore, in this arrangement a connecting-sleeve *a²* forms a part of the spherical boss *a* and projects in both directions concentric with the axis of its bore to the requisite distance. This sleeve *a²* is provided at both ends with screw-threads, onto which the nuts *m* and *n* are screwed and effect the pressing together of the whole of the parts. Each of the clamping devices *k k* has at its outer pressure-receiving surface a recess for the reception of the nuts *m* or *n*. The annular pressure-surfaces around these recesses project somewhat beyond the nuts *m* and *n*, so that the pressure of the shaft-nut *v* is received by them, and all parts of the boss are pressed together by the pressure of the said nut *v*.

The nuts *m* and *n* should only serve for holding together the parts of the screw-propellers, the requisite pressure for securing the blades *f* to the boss being given chiefly or wholly by the much more powerful action of the shaft-nut *v*, whereby the latter serves at same time as a lock-nut.

The connecting-sleeve *a*² (shown in Fig. 11) may form a part of the spherical boss *a* in the construction shown in Figs. 9 and 10. In the arrangements shown in Figs. 9 to 12 the sleeves *k'* or *a*² may be entirely omitted and the simpler fixing for the screw-blades shown in Figs. 1 to 4 be employed instead thereof.

The means for enabling the pitch of the screw-blades *f* to be altered are illustrated in Figs. 5 and 6. As already stated, the limiting-curves of the hollow spherical segments *b* are partly dependent upon the cross-sections of the screw-blades *f* at the points of contact between the latter and the segments. In the drawing Fig. 5 there are shown for the sake of clearness only two blade-sections *f' f'*, with the segments *b b* placed between them. These segments are connected together so as to form a kind of cap by a suitable joint *s*, which, as shown by way of examples in Figs. 13 to 16, may be constructed in various ways. The halves of this cap are moved in opposite directions, as shown by the arrows *x* and *y*, by turning the blade *f*, so that the breadth of the divided cap lying between each two blades *f* adapts itself exactly to the varying distance apart of the blade-surfaces that are turned toward each other by the rotation of the blades, so that there is always intimate contact between the curved surfaces of the blades *f* and those of the segments or cap. In Fig. 5 the dotted lines indicate a movement of the segments *b* in the directions of the arrow *x* and *y*; but it should be observed that the alteration of the pitch of the blades *f* is shown exaggerated. In practice it is only a question of altering the pitch of the screw to the extent of two or three degrees. The segments *b b* are so curved at the pointed ends, which are turned toward the shaft *w*, that the said ends in case of a reverse movement come to bear against the shaft *w*.

In the construction of the propeller-boss shown in Fig. 6 the clamping devices *k k* extend farther over the segments *b* and in between the blades *f* and are furnished with suitable recesses *t*, into which take the claw-like edges of the blades. If with this construction an alteration of the pitch of the propeller-blades *f* be required, the shaft-nut *v* is first slackened. Then the clamping devices *k k* are turned, by means of suitable tools, in the direction of the arrows until the required alteration of the pitch of the blades *f* is effected, whereupon the whole boss system is tightened together again firmly by the nut *v*. As by the engagement of the edges of the blades in the recesses *t* of the clamping devices *k k* all

the blades *f* are uniformly turned together, they all take exactly the same pitch without the necessity of adjusting each blade separately.

By turning the blades *f* ninety degrees and replacing the hollow spherical segments *b* with reversely-divided segments a right-handed screw can be altered to a left-handed, and vice versa.

What I claim is—

1. In screw-propellers, the combination of the conical shaft, screw-blades, fixing-flanges on said blades, a spherical boss secured on said shaft, a plurality of spherical segments with recesses adapted to receive the said blade-flanges, clamping devices partly overlapping the said segments, and means for holding the various parts together, substantially as set forth

2. In screw-propellers, the combination of the conical shaft, screw-blades, fixing-flanges on said blades, a spherical boss secured on said shaft, a plurality of spherical segments with recesses adapted to receive the said blade-flanges, clamping devices with recesses adapted to receive the edges of the said blades and partly overlapping said segments, and means for holding the various parts together, substantially as set forth.

3. In screw-propellers, the combination of the conical shaft, screw-blades, pivot-pins on said blades, fixing-flanges on said blades, a spherical boss secured on said shaft and adapted to receive the said pivot-pins, a plurality of spherical segments with recesses adapted to receive the said blade-flanges, clamping devices partly overlapping the said segments, and means for holding the various parts together, substantially as set forth.

4. In screw-propellers, the combination of the conical shaft, screw-blades, one-sided long flanges on said blades of spherical segmental shape, short fixing-flanges on the other side of the blades, extensions on said blades below the said flanges, a plurality of spherical segments with recesses adapted to receive the said blade-flanges, a spherical boss secured on said shaft and adapted to receive the said blade extensions, clamping devices partly overlapping said segments, and means for holding the various parts together, substantially as set forth.

5. In screw-propellers, the combination of the conical shaft, a spherical boss with circumferential recesses on said shaft, screw-blades, a spherical segmental base on said blades adapted to take into the recesses of said boss, a plurality of spherical rabbeted segments adapted to fit over said blade-bases, and clamping means for holding the various parts together, substantially as set forth.

6. In screw-propellers, the combination of the conical shaft, a sleeve keyed on said shaft, a spherical boss riding on said sleeve and secured against rotation thereon, screw-blades,

fixing-flanges on said blades, a plurality of
spherical segments with recesses adapted to
receive the said blade-flanges, clamping de-
vices partly overlapping said segments, inde-
5 pendent means for tightening the said clamp-
ing devices, and means for holding the vari-
ous parts together, substantially as set forth.

In testimony that I claim the foregoing as
my invention I have signed my name in pres-
ence of two subscribing witnesses.

GEORG PINKERT.

Witnesses:

LOUIS SÜDECUM,
CARL FRANCK.