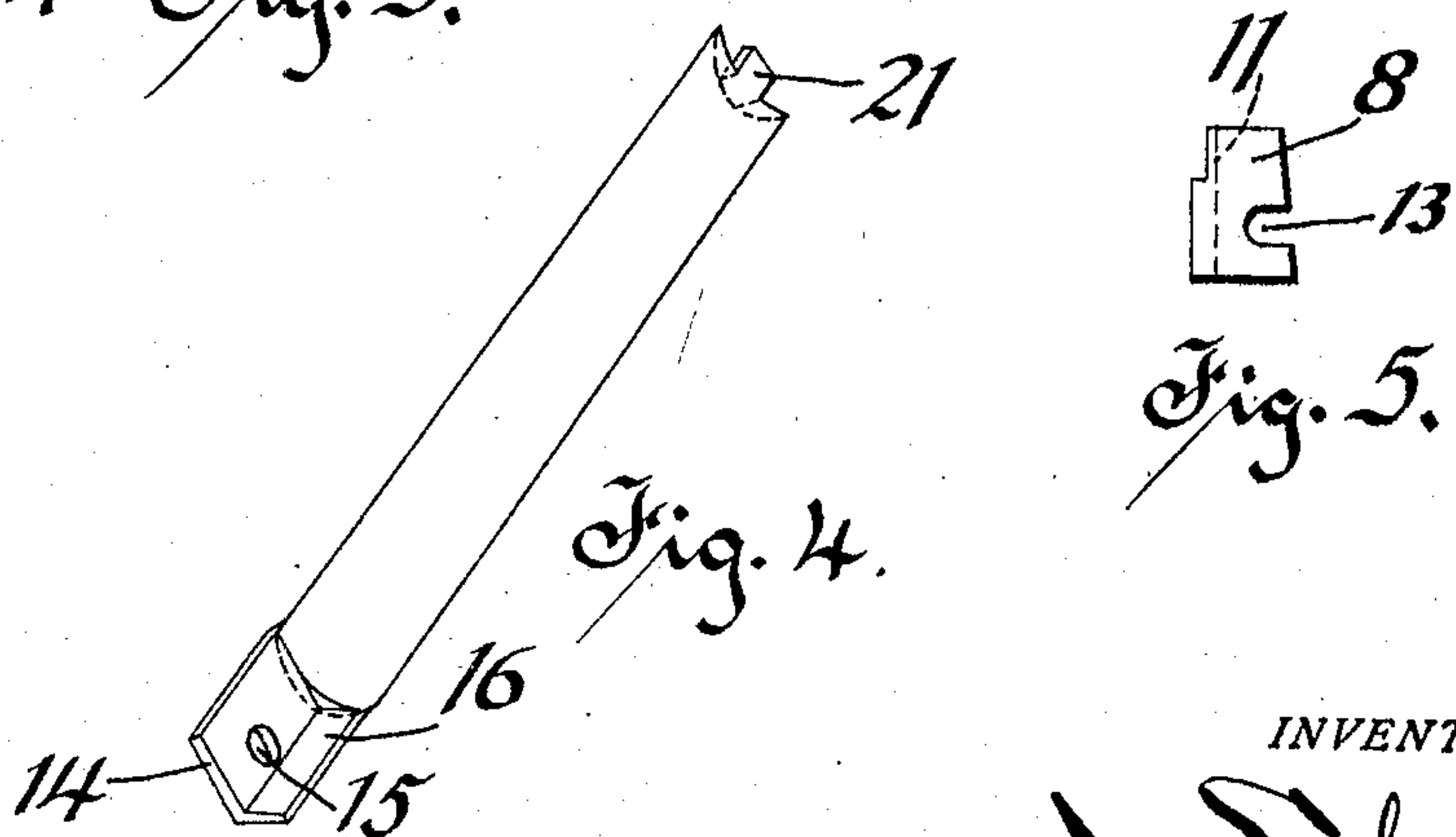
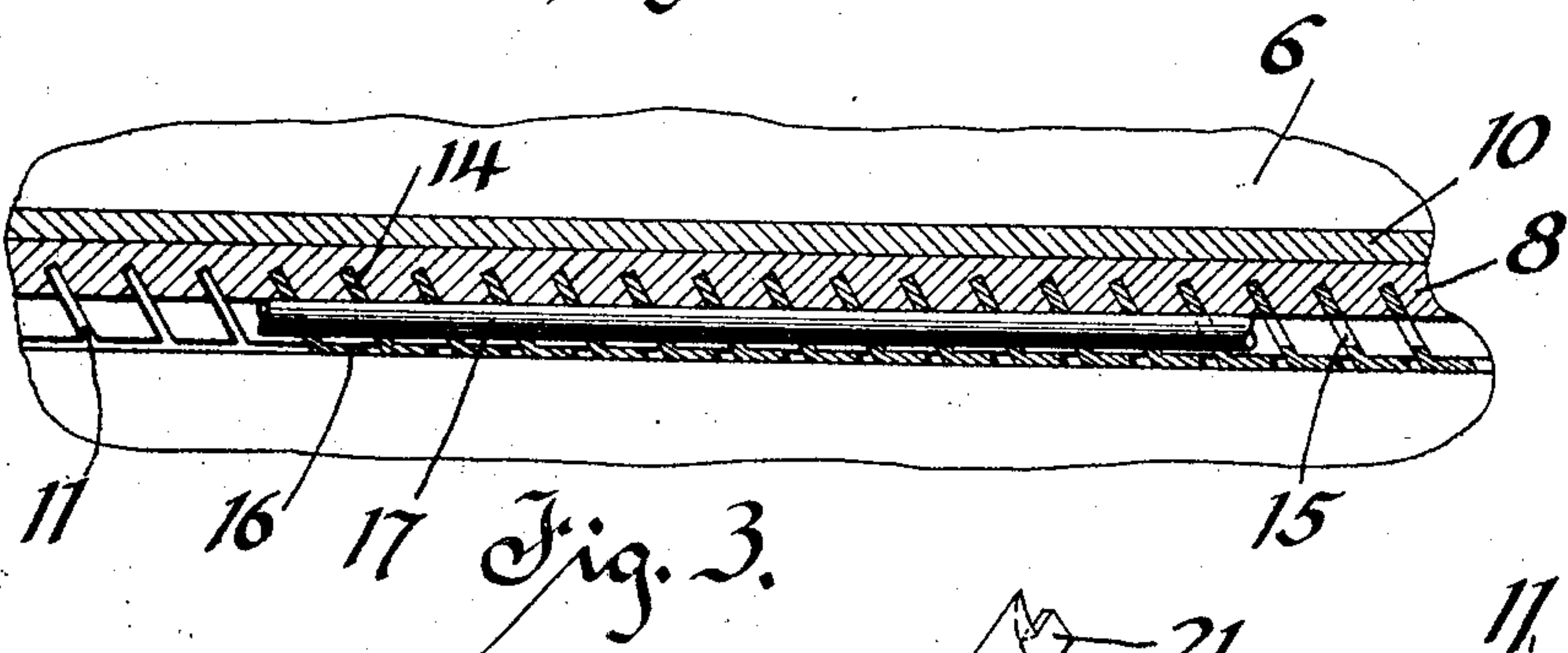
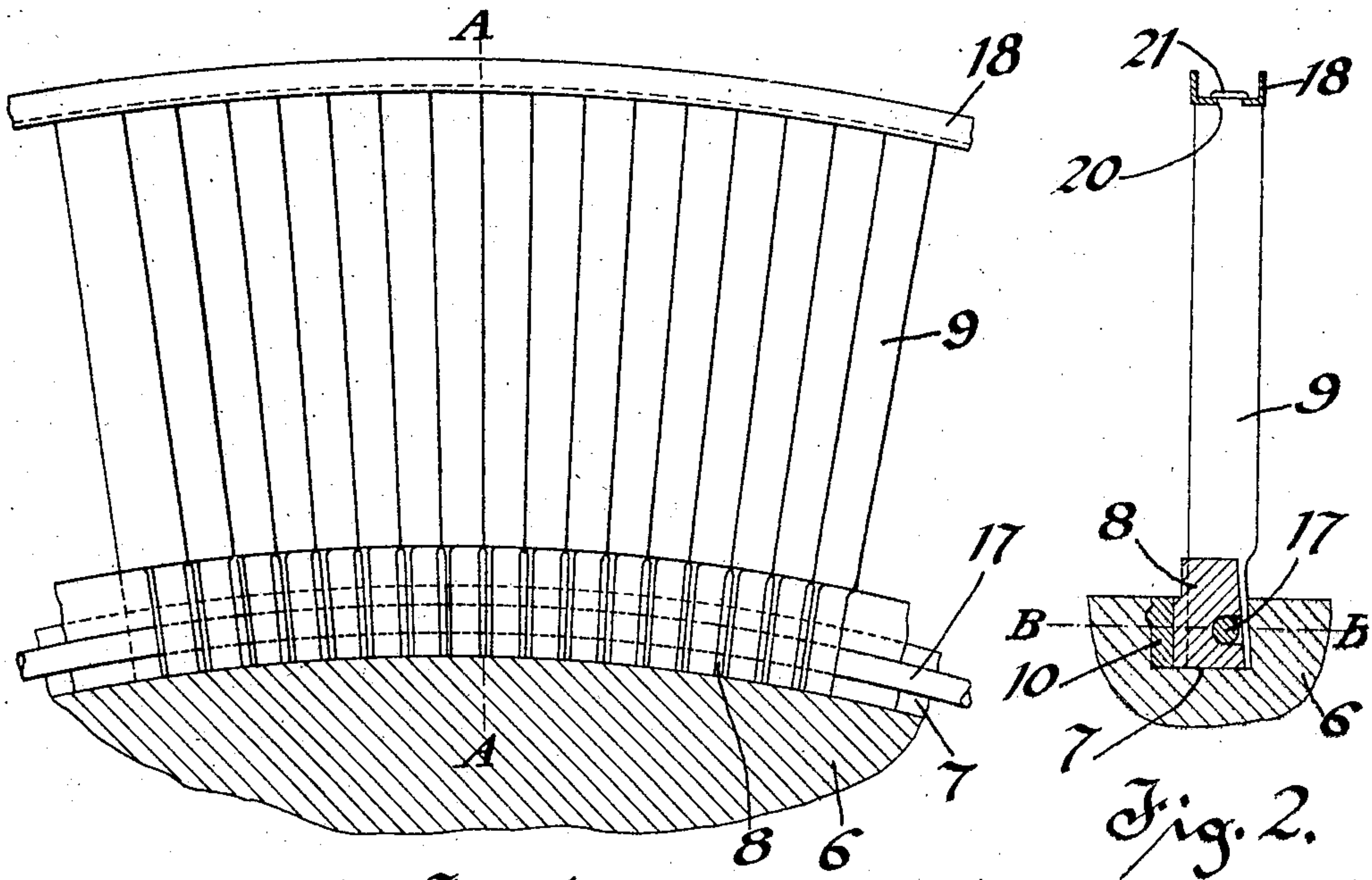


J. S. GREEN.  
BLADING FOR ELASTIC FLUID TURBINES.  
APPLICATION FILED AUG. 6, 1908.

950,804.

Patented Mar. 1, 1910.



WITNESSES:

*Robert*  
*E. M. Callister*

INVENTOR.

*J. S. Green*



# UNITED STATES PATENT OFFICE.

JONATHAN S. GREEN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

BLADING FOR ELASTIC-FLUID TURBINES.

950,804.

Specification of Letters Patent.

Patented Mar. 1, 1910.

Application filed August 6, 1908. Serial No. 447,230.

*To all whom it may concern:*

Be it known that I, JONATHAN S. GREEN, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful invention in Blading for Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines and more particularly to blading for such turbines.

An object of this invention is to provide simple and effective means for assembling and positively securing the turbine blades into segmental rings which may be subsequently secured to the blade-carrying elements of the turbine.

In the drawings accompanying this application and forming a part thereof, Figure 1 is a fragmental transverse section of a rotor element provided with blades shown in elevation and mounted in accordance with my invention; Fig. 2 is a section along the line A—A of Fig. 1; Fig. 3 is a section along the line B—B of Fig. 2; Fig. 4 is a perspective view of a blade forming a detail of my invention; and, Fig. 5 is an end view of a blade strip included in my invention.

In carrying out my invention I provide a base strip which is notched along one side to receive the bases of the blades. One end of each blade is swaged to form an L-shaped or angular mounting portion, one leg of which is adapted to be inserted into one of the notches in the base strip and the other leg of which is adapted to lie alongside of the side of the strip between the notches. I also employ means for positively locking the blades together and for positively securing them to the base strip. The longer leg of the mounting portion of each blade, that is, the leg adapted to extend into one of the notches in the base strip, is provided with a hole which extends transversely there-through and by means of which the blades are strung onto a rod or wire, which, when the blades are in place on the base strip, is located in a slot extending longitudinally of the strip and intersecting the notches provided in the strip.

For the sake of brevity and also for convenience of description, the term "blade" or "blades" will be employed throughout the specification and in the claims to denote either the rotating blades or the stationary

vanes and the term "blade-carrying element" will denote either the stationary or the rotating blade-carrying element.

Referring to the drawings: The blade-carrying element 6 is provided with a plurality of circumferentially-extending and undercut blade-mounting grooves 7, in which a base strip 8 and a plurality of blades 9 are secured by means of a calking strip 10. The base strip is rolled or otherwise formed in segmental section and is provided along one side with a plurality of laterally-extending notches 11 which are cut into the major portion of the strip at an angle of about  $60^\circ$  to its longitudinal axis. The notched face of the strip is inclined to correspond to the inclination of one wall of the blade groove, which is slightly undercut, and a longitudinally-extending slot 13 is provided in this face and is so located as to intersect the notches 11.

One end of each blade 9 is swaged to form an L-shaped or angular base portion. One leg 14 of the base portion of each blade is longer than the other leg 16 and is provided with a hole 15 which extends there-through and is located in close proximity to the shorter leg. The leg 14 is adapted to be inserted into one of the notches 11 of the strip 8 and the legs are so inclined relative to each other that the leg 16 will lie alongside the inclined face of the strip, between adjacent notches, when the leg 14 is in place within one of the notches.

The blades are strung on a rod or wire 17 which is adapted to extend through the holes 15 in the base portions before they are assembled into the base strips. The slot 13 of the base strip is so located as to receive the rod 17 when the legs 14 of the bases of the blades are located within the notches.

A shrouding channel 18, if desired, may be provided for the outer or free ends of the blades. This channel is provided with a plurality of suitably spaced holes 20 which extend through its web portion and through which tips 21, formed on the outer ends of the blades, are adapted to extend and, by being riveted over, to rigidly secure the channel in place.

After the blades have been assembled into a segmental ring, each base strip is so located within the blade-mounting grooves 7 that its inclined face is adjacent to the un-



dercut wall of the groove. The calking strip 10 is then introduced between the normal face of the strip and the normal wall of the slot and by being calked or transversely expanded forces the legs 16, of the base portion of each blade of the strip, into gripping contact with the undercut wall of the groove and thereby positively locks the base strip and the blades in place. The wire 17 positively locks the bases of the blades together and positively locks each blade to the base strip.

Various means may be employed for securing the outer ends of the blades together or for securing the blade strips into the blade-mounting slots and blades of various contours may be assembled in blade rings in accordance with this invention.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:

1. In combination in a turbine, a notched blade strip, blades provided with bases swaged to fit the notches and a locking wire extending through holes provided in the bases of the blades and secured in place within a slot provided on said base strip for positively locking the blades together to said strip.

2. In combination with a turbine blade-carrying element provided with a groove, a blade strip provided with a plurality of blade-mounting notches, blades provided with base portions adapted to extend into said notches, a rod extending through holes provided in the base portions of the blades and means for securing said blades in said notches by securing said strip into one of said grooves.

3. In combination with a turbine blade-carrying element provided with a groove,

a blade strip provided with a plurality of notches, blades provided with base portions adapted to engage said notches and to lie against the notched face of said strip and means comprising a rod passing through said blades for positively locking said blades together and to said strip when said strip is secured into said groove.

4. In combination with a turbine blade-carrying element provided with a groove, a blade strip provided with a plurality of notches, blades provided with bases adapted to engage, but to project from said notches and means comprising a rod passing through said blades for positively locking the blades to said strip when said strip is secured into said groove.

5. In combination with a turbine, a base strip provided with a plurality of notches, blades provided with bases adapted to engage but to project from said notches and a stringer member secured in place on said strip for positively locking said blades together and to said strip.

6. In combination with a turbine, a blade-carrying member provided with a plurality of notches, blades provided with bases adapted to engage but to project from said notches and a stringer member for positively locking said blades together and to said strip and located within a slot provided in said strip.

7. In combination with a turbine, a blade-carrying member provided with a groove, a base strip provided with a plurality of blade-mounting notches, blades provided with bases adapted to engage but to project from said notches and a rod extending through holes provided in the base portion of said blades and located in a slot provided in said strip.

In testimony whereof, I have hereunto subscribed my name this 4th day of August, 1908.

JNO. S. GREEN.

Witnesses:

BIRNEY HINES,  
GEO. A. WALKER.