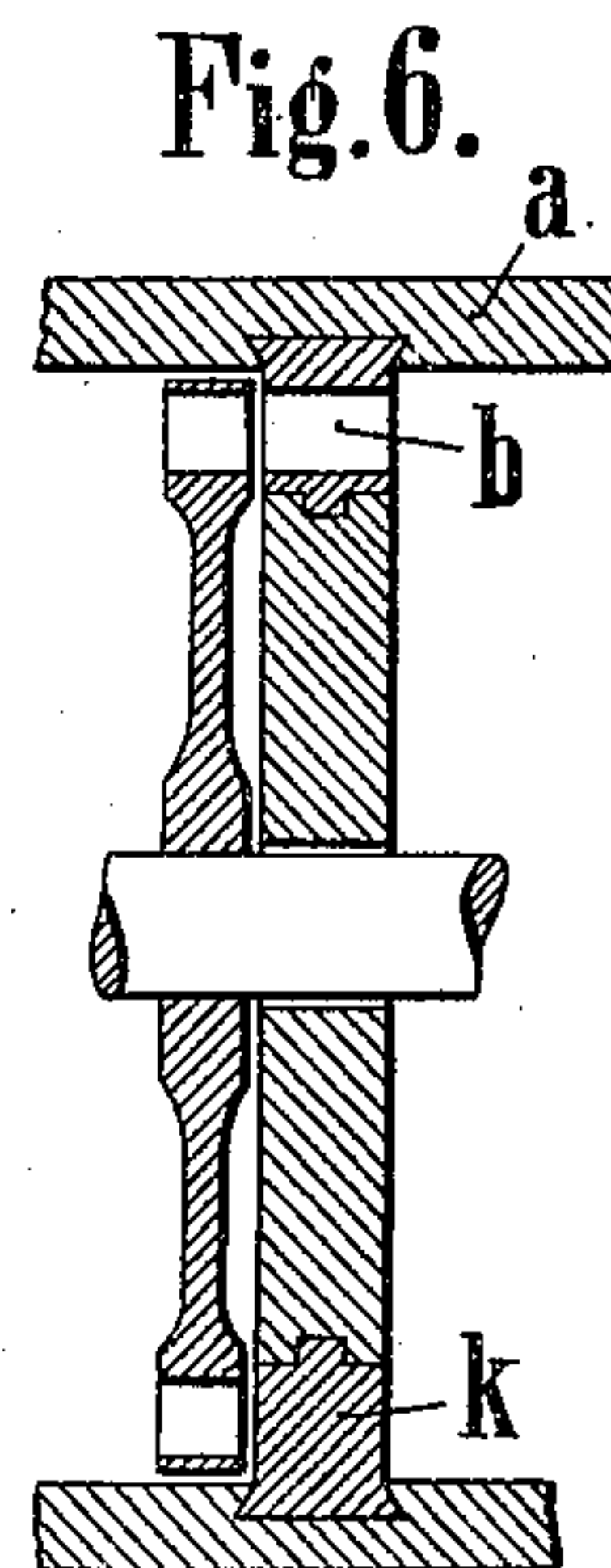
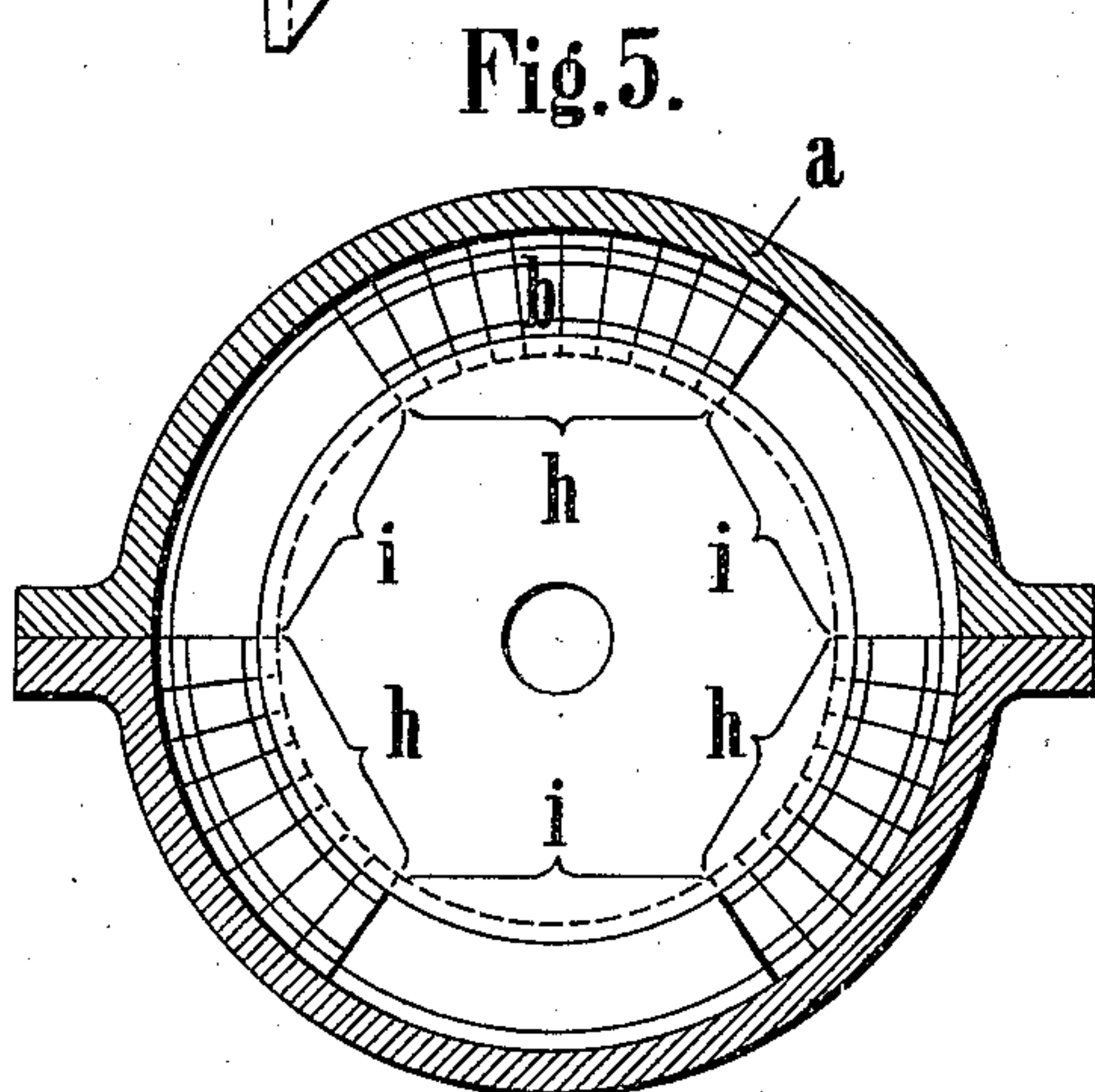
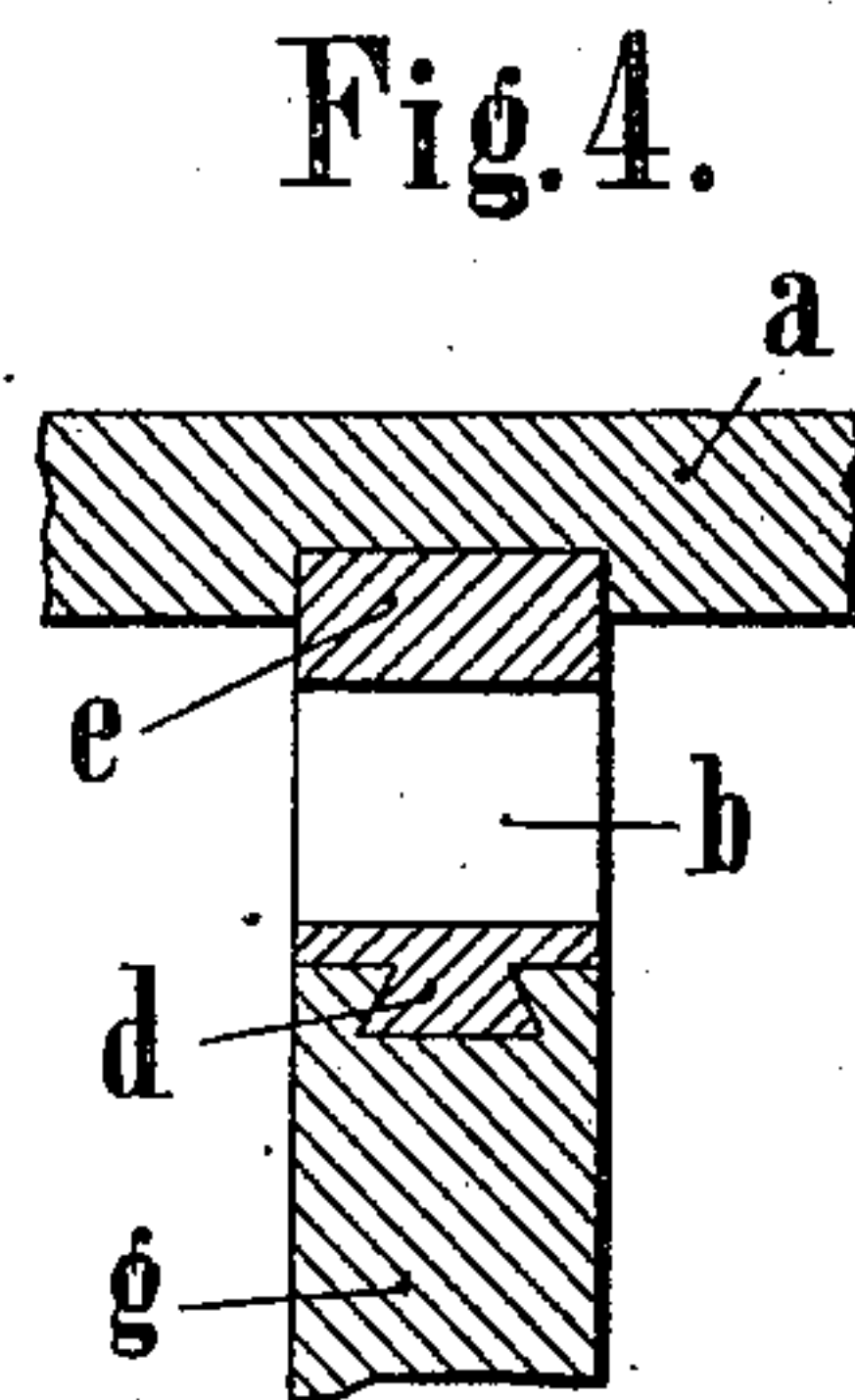
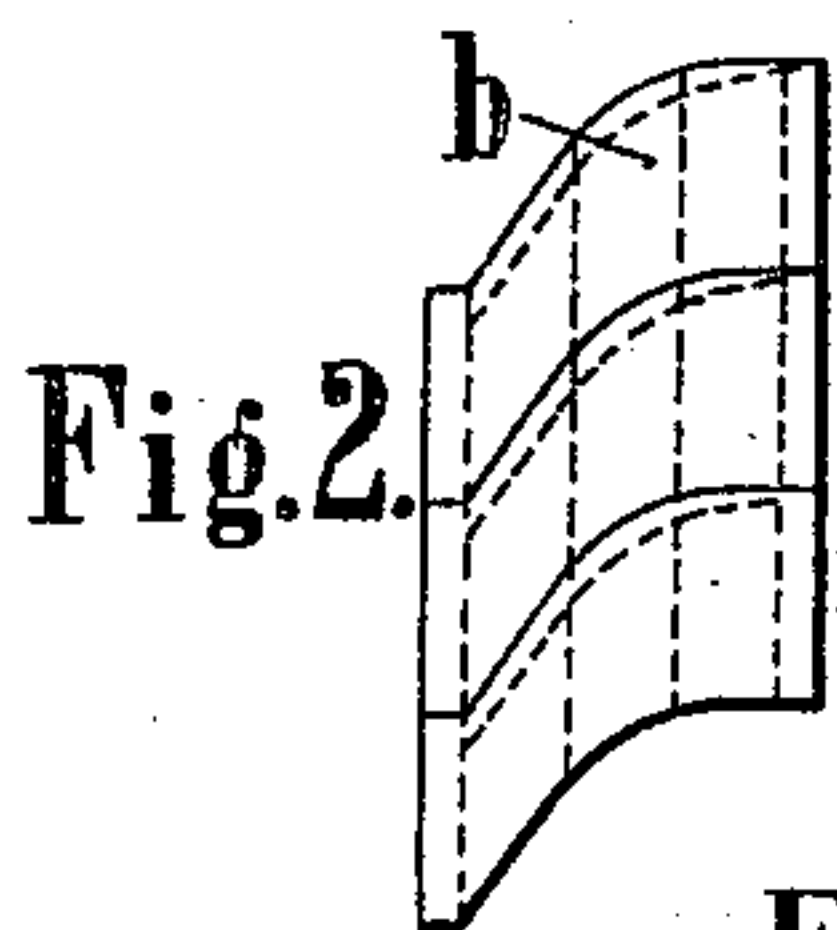
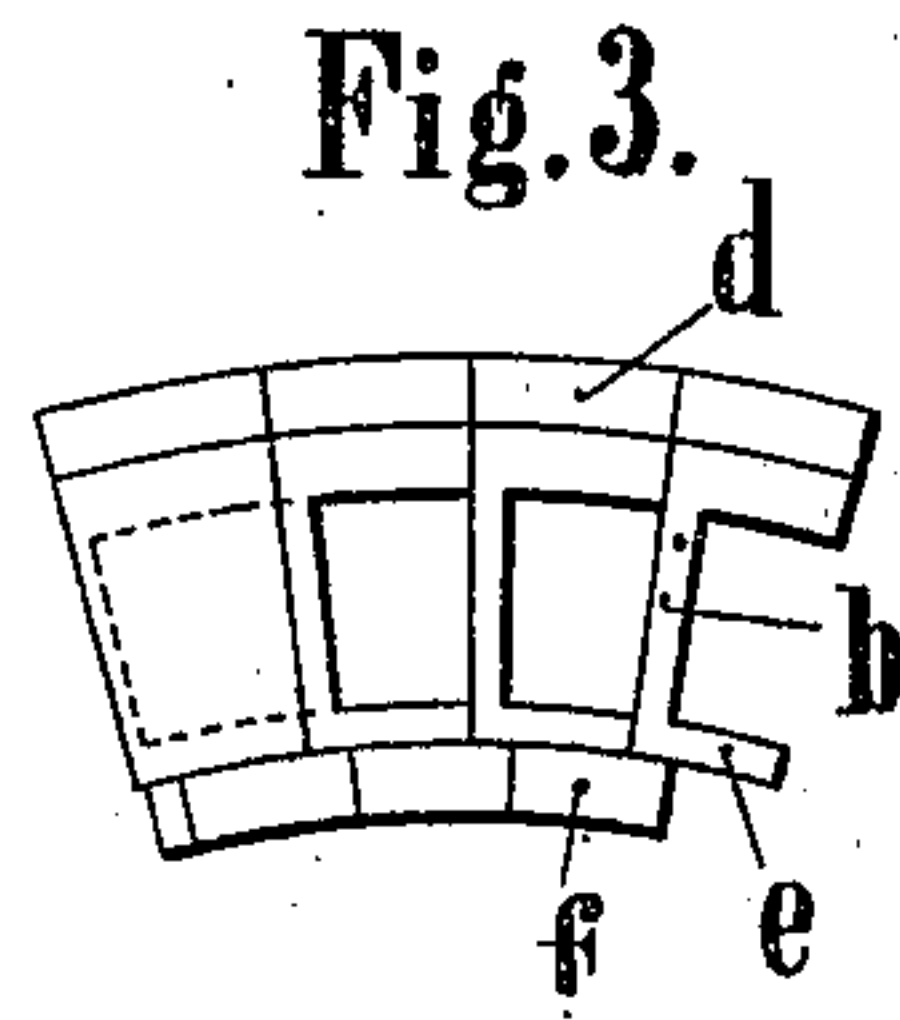
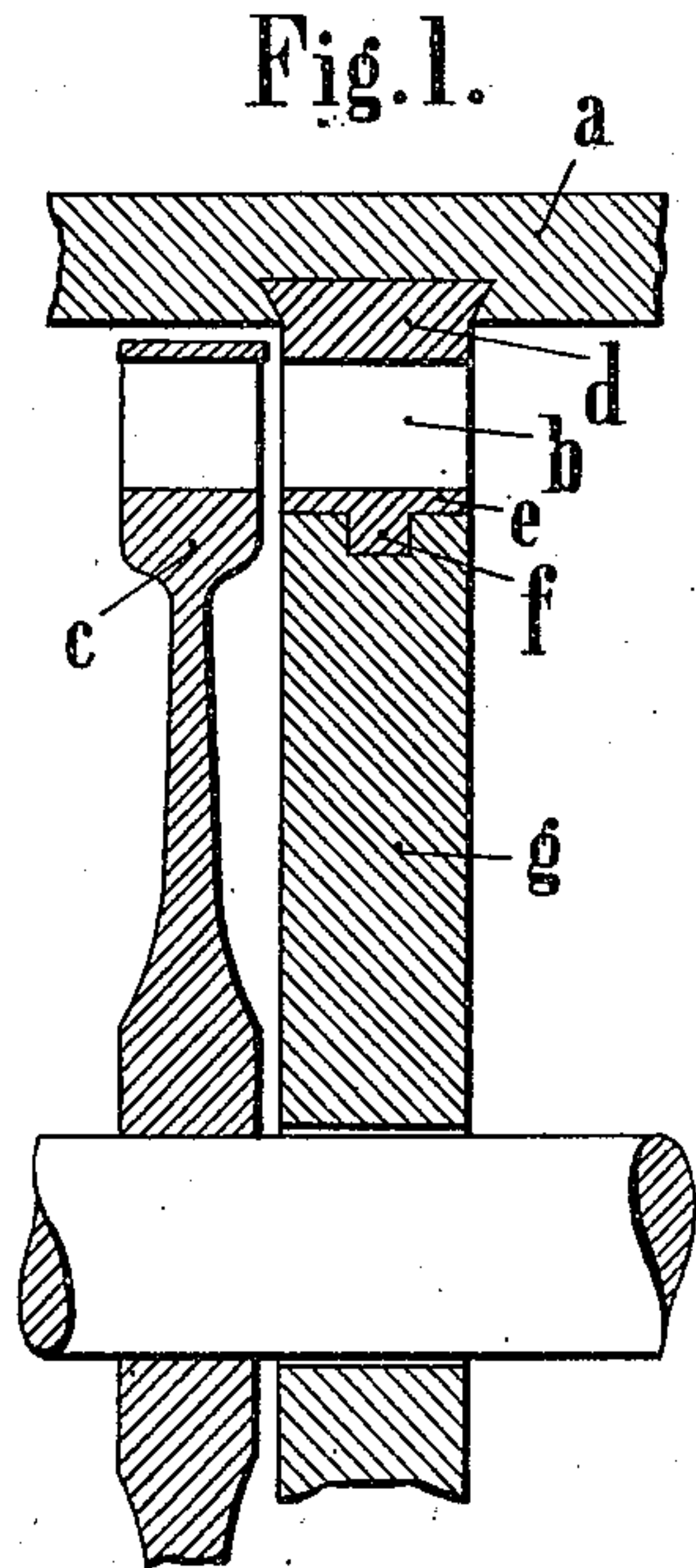


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TURBINE.
APPLICATION FILED SEPT. 7, 1909.

974,956.

Patented Nov. 8, 1910.



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UNITED STATES PATENT OFFICE.

PAUL EMDEN AND WALTER FRITZ, OF BERLIN, GERMANY.

TURBINE.

974,956.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed September 7, 1909. Serial No. 516,537.

To all whom it may concern:

Be it known that we, PAUL EMDEN, a citizen of the Swiss Republic, and WALTER FRITZ, a subject of the German Emperor, both residents of Berlin, Germany, have jointly invented certain new and useful Improvements in Turbines, of which the following is a specification.

Our present invention relates to steam turbines and is particularly applicable to that type of turbines in which the steam acts successively or in stages on a plurality of rotary members carrying buckets or blades. These buckets or blades form annular series and hitherto it has been customary to cast the carrier rings in one piece with the buckets (whether of the rotary member or of the stationary member) or the rings have been made as separate pieces in which the blades or buckets were secured by casting metal into the joints or by otherwise inserting and securing such blades. The inner ring in such cases carries the partition intervening between adjacent chambers or stages, or the partition and ring may be made integral. Cast rings present the drawback that it is very difficult to give them the exact shape desired especially when the height of the blade is small and furthermore the cross sections of the blade channels will not be of the exact dimensions desired since irregularities are inevitable in casting and a troublesome and expensive finishing of these channels is therefore required. In the case of separately inserted blades, also, the work is very difficult on account of the large number of parts to be worked and finished accurately and to be fitted together.

According to our present invention a valuable improvement is obtained by providing the nozzles, buckets or blades with heads serving directly to hold the partitions or in another form of our invention heads of this novel character are formed on the nozzles, buckets or blades to fit the stationary or rotary member which carries them.

An instance of the first form of our invention is shown in Figures 1, 2 and 3, Fig. 1 being a partial longitudinal section; Fig. 2 a plan view of three adjacent blades and Fig. 3 a corresponding side view. The second type of our invention is illustrated by the cross section Fig. 4. Figs. 5 and 6 show how the first type of our invention may be applied to a turbine in which buckets form

a series of segments instead of a continuous ring.

In Figs. 1, 2 and 3 the blades *b* are each secured to the stationary member or casing *a* in any suitable manner as by means of dovetailed feet *d* fitted within corresponding grooves of the casing. The steam passing through the blades *b* impinges on the rotary member *c* of any suitable construction. According to this form of our invention the heads *e* of the blades *b* are each provided at their inner ends with projecting lugs *f* extending circumferentially and are preferably arranged so that the lugs of adjacent blades will abut against each other and form a continuous circumferential ring, which fits into the stationary partition *g* which is thereby held firmly in position. We have shown the feet *d* and heads *e* as made integral with the blades *b* although this is not essential to our invention. This construction allows the blades to be individually manufactured very accurately and they can then be inserted in the turbine casing without requiring any further finishing operation in order to obtain steam channels of uniform dimensions.

In Fig. 4 we have shown what may be considered a reversal of the construction as described, that is to say the heads *e* are secured to the casing *a* while the dovetailed feet *d* carry the partition *g*. The ribs *f* have been omitted in this form, but might be used if desired.

It will be obvious that our invention is applicable to turbines in which the blades form a complete annular series as well as to turbines in which the blades are disposed in the shape of sectors only. Such a construction is illustrated by Figs. 5 and 6, which is practically the same as the one shown in Figs. 1, 2 and 3, except that the blades *b* are arranged in three sectors *h* between which intervene solid sectors *i* which are fitted to the partition *g* in the same manner as the blades *b*.

We claim as our invention:

1. In a turbine, the combination with a casing and a partition of individual blades arranged adjacent to each other and connected directly with said casing and provided with heads fitted to and carrying said partition.

2. In a turbine, the combination with a casing and a partition, of segments formed

of individual blades and solid segments alternating with them, all of said blades and of said solid segments being directly connected with said casing and provided with
5 heads fitted to and carrying the partition.

3. In a turbine the combination with a carrying member and another member forming a partition, of individual blades each having an open recess and arranged adjacent
10 to each other, said blades being connected rigidly with one of said members and provided with heads fitted to the other member, the one wall of one blade forming a wall for and closing the recess of the next preceding blade.
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4. In a turbine the combination with a

carrying member and another member forming a partition, of individual blades each having an open recess and connected with
both of said members, said blades being arranged adjacent to each other so that the
20 wall of one blade forms a wall for and closes the recess of the next preceding blade.

In testimony whereof we have hereunto set our hands in the presence of two
25 scribing witnesses.

PAUL EMDEN.
WALTER FRITZ.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.