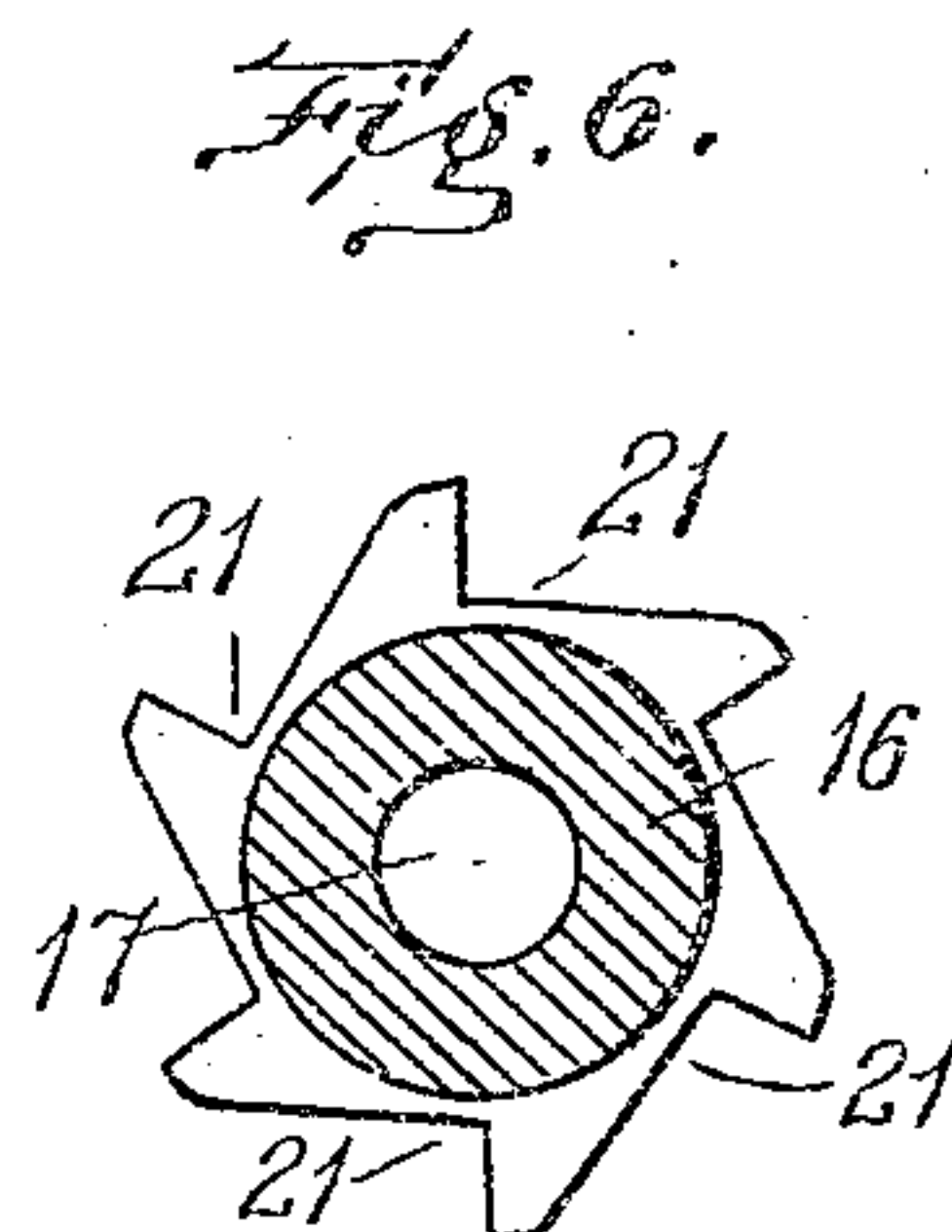
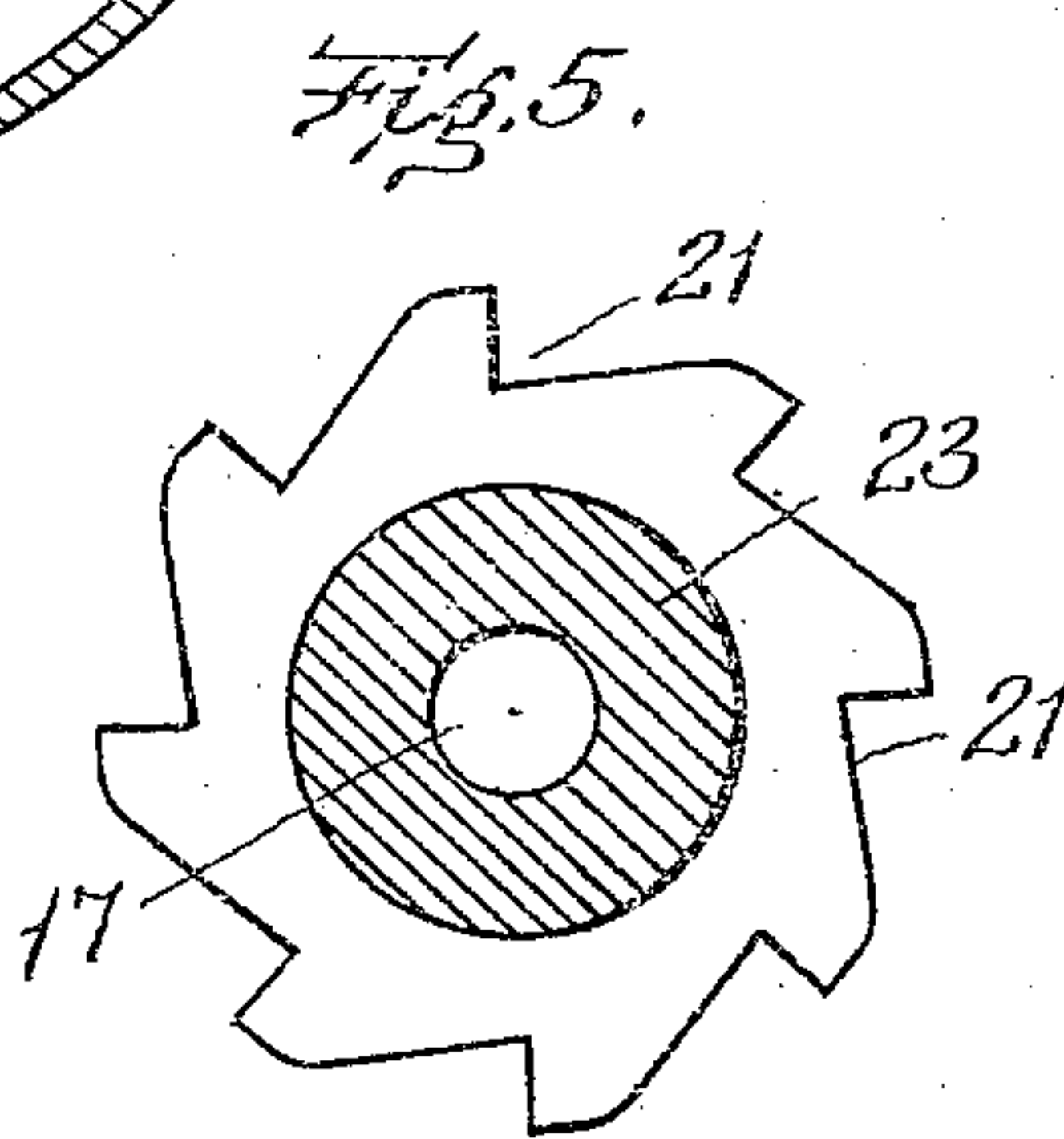
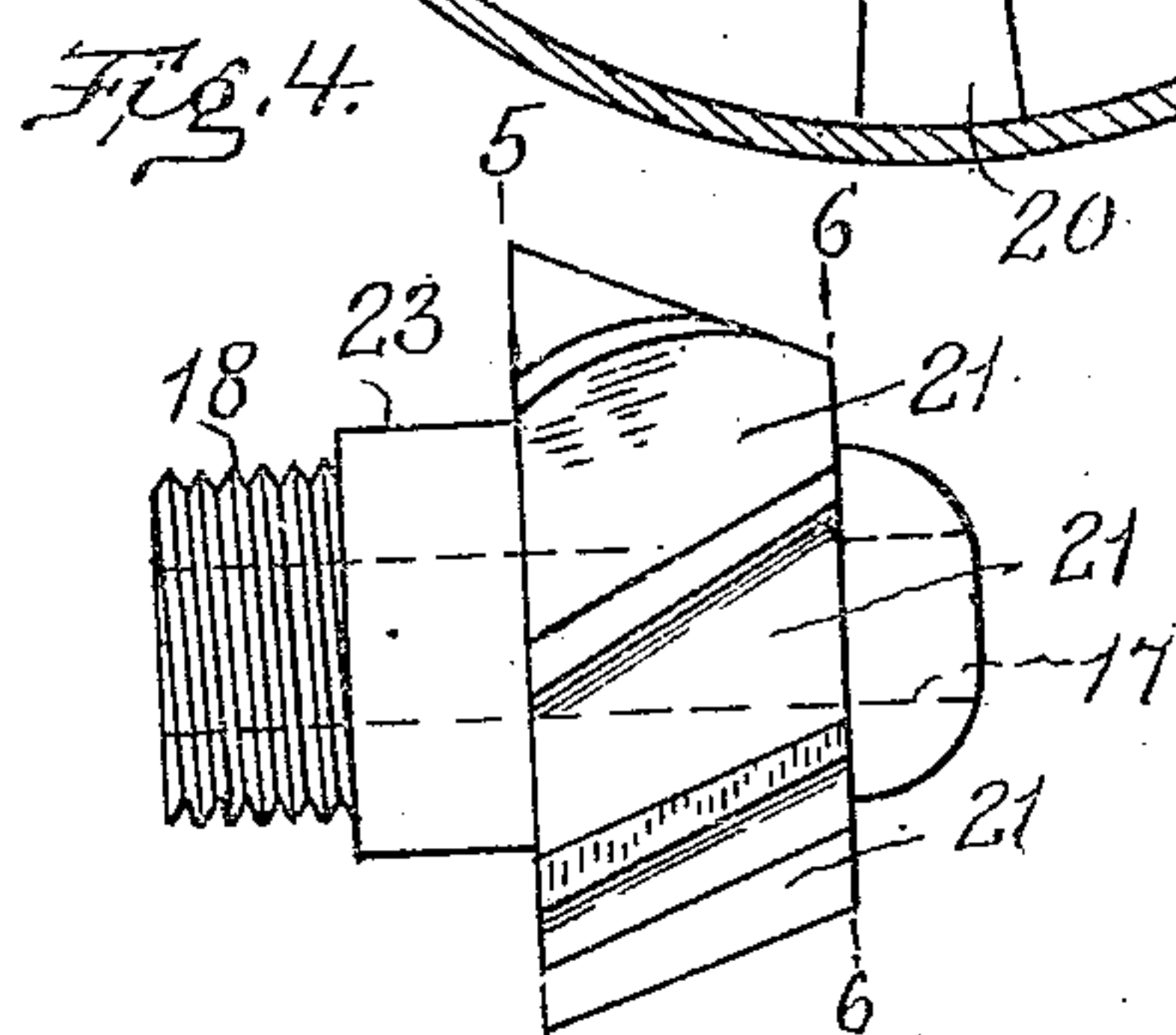
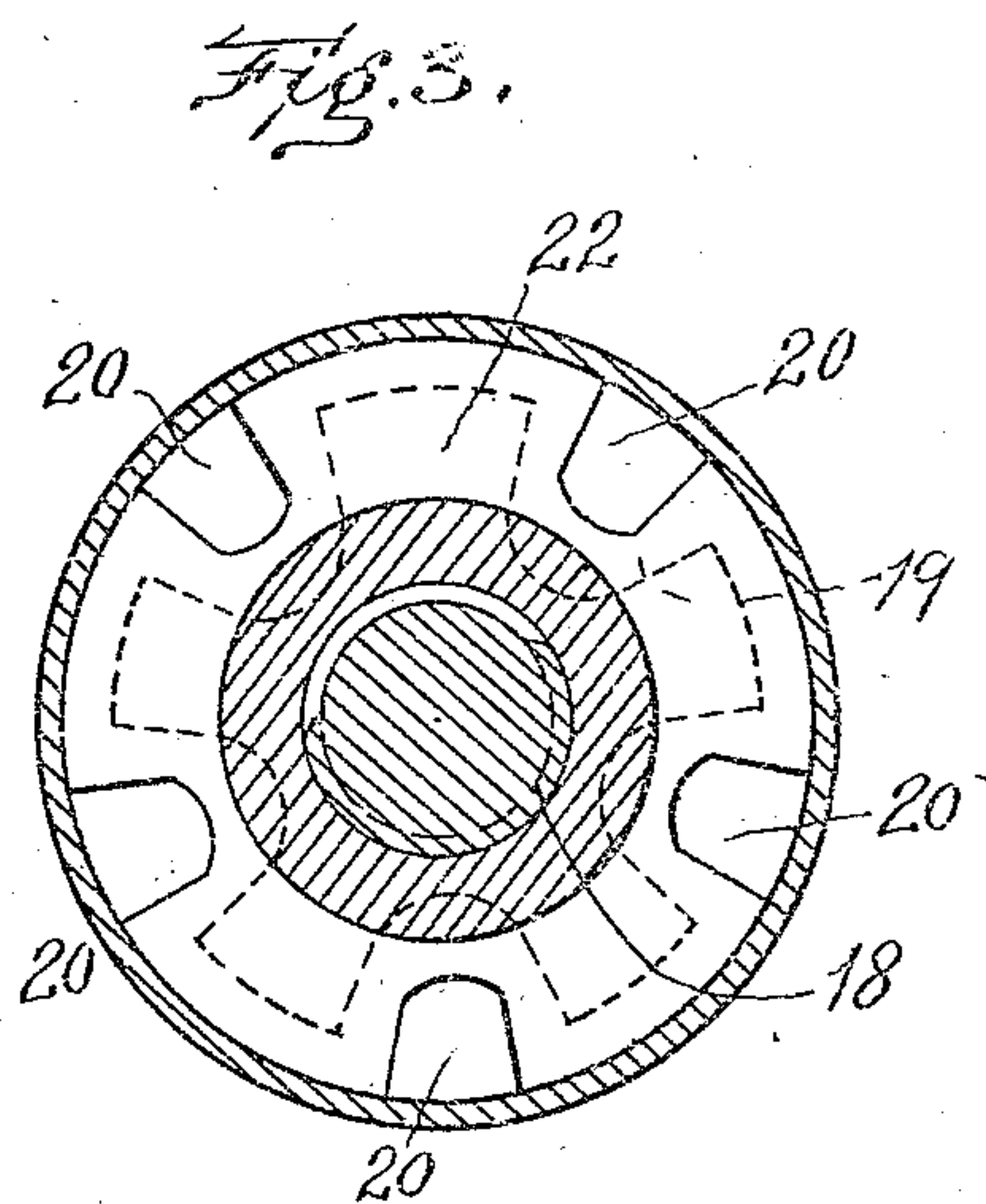
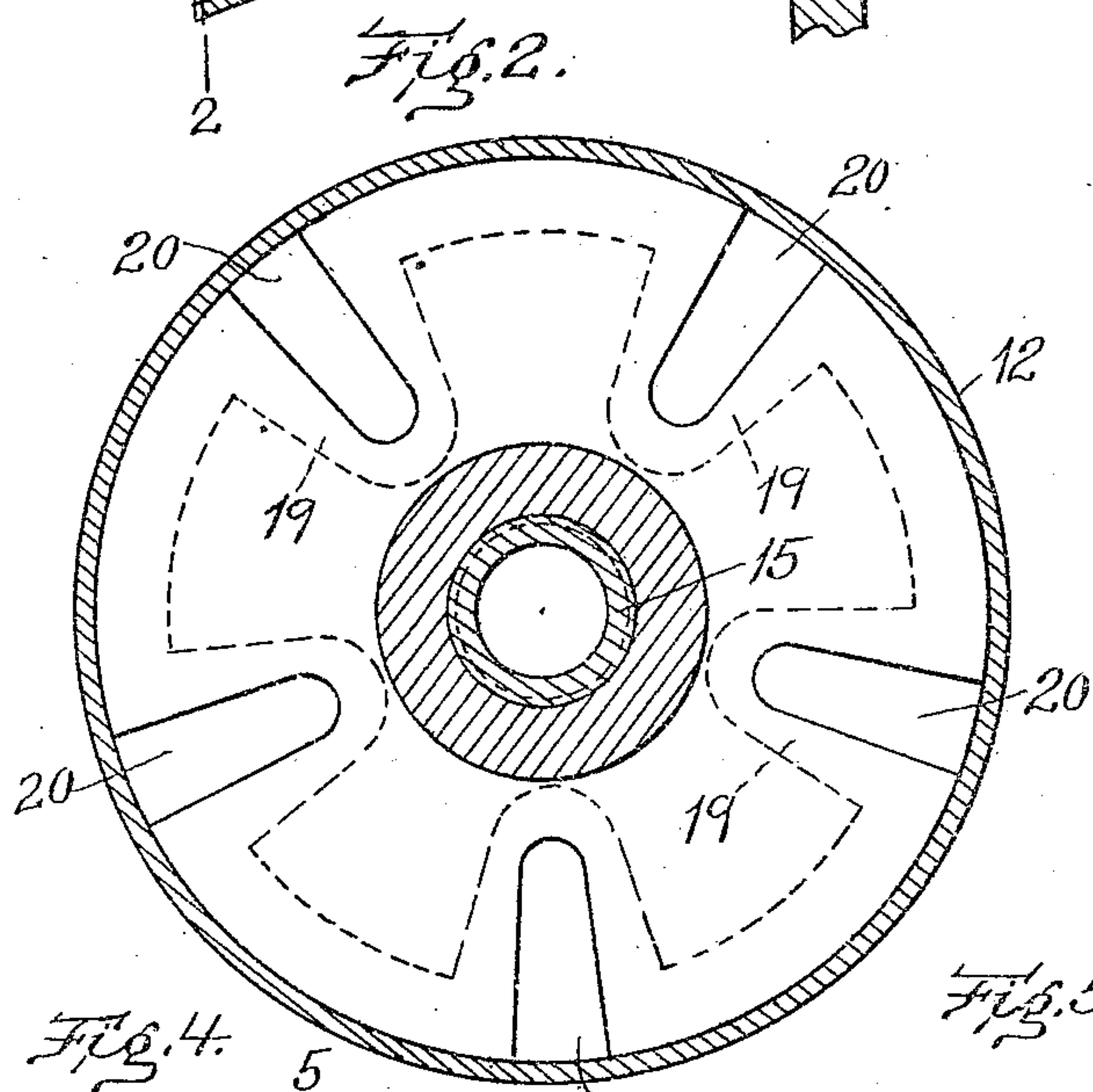
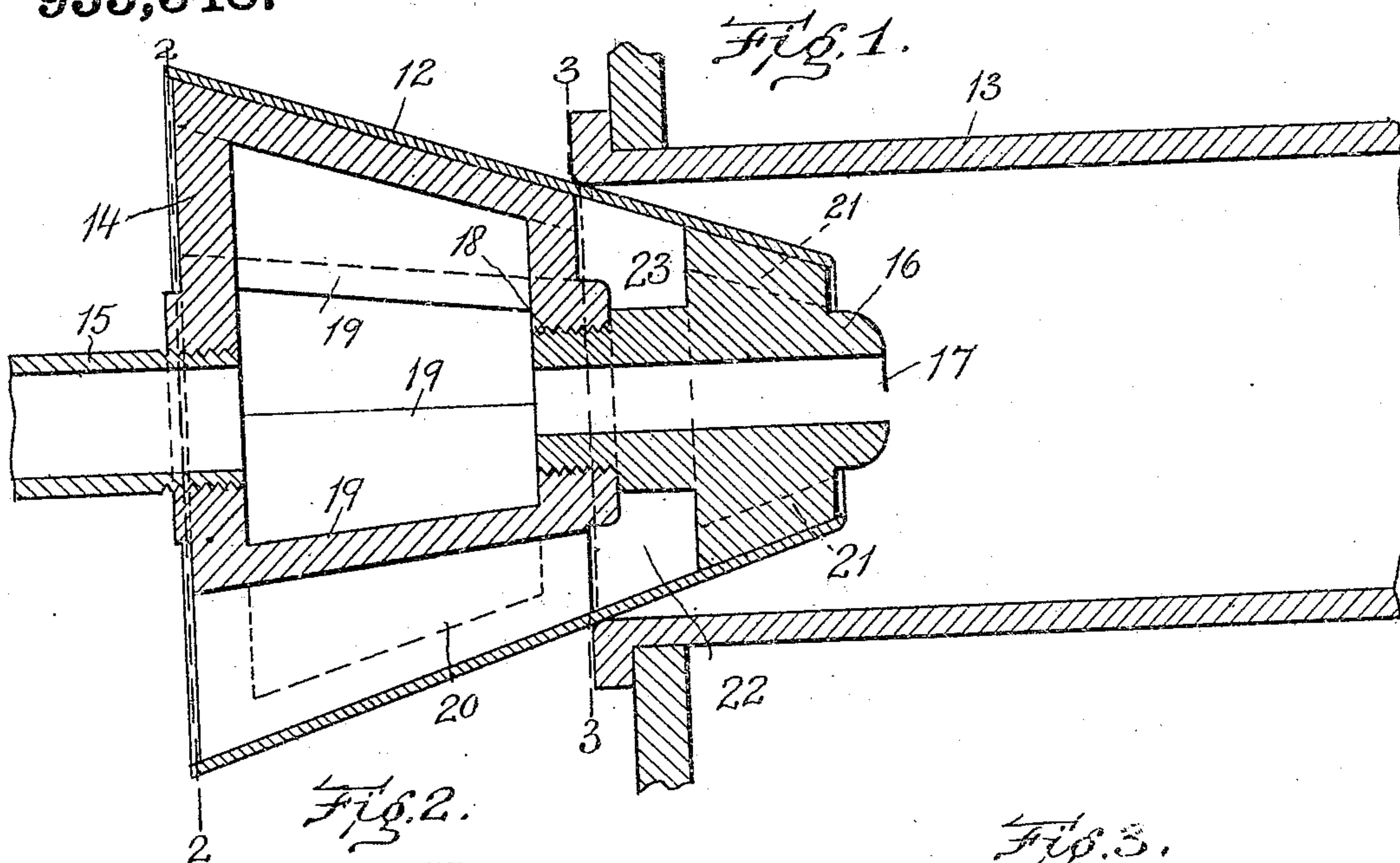


E. I. K. NOYES.
BOILER TUBE CLEANER.
APPLICATION FILED AUG. 9. 1909.

Patented Apr. 19, 1910.

955,348.



Witnesses.
F. R. Rouletone.
in witness

Inventor.
E. I. K. Noyes
by *Wright & Son* *Attys*

UNITED STATES PATENT OFFICE.

EDWARD I. K. NOYES, OF BOSTON, MASSACHUSETTS.

BOILER-TUBE CLEANER.

955,348.

Specification of Letters Patent.

Patented Apr. 19, 1910.

Application filed August 9, 1909. Serial No. 511,919.

To all whom it may concern:

Be it known that I, EDWARD I. K. NOYES, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Boiler-Tube Cleaners, of which the following is a specification.

This invention relates to a boiler tube cleaner which includes a frusto-conical head adapted to be inserted in one end of a boiler tube, and provided with means for delivering into the tube a blast of steam and currents of air, the flow of which into the boiler tube is induced by the steam blast, the blast of mingled air and steam passing forcibly through the tube and cleaning the interior of the same. In practice, when a jet of steam is driven into a boiler tube through an ordinary steam tube cleaner, a large volume of cold air is drawn into the tube by the action of the steam jet, and mixes with the steam, and by lowering the temperature of the steam, causes precipitation of moisture. This moisture mixes with the soot, forming a paste which adheres to the walls of the tube, and is afterward baked into a hard scale which has to be removed by a scraper or wire brush.

The invention has for its object, first, to provide for the heating and drying of all the air drawn into the boiler tube to such an extent that precipitation of moisture within the tube will not occur and the hot dry air will take up any natural moisture in the steam thus keeping the tube dry.

The invention also has for its object to provide a sectional construction in a tube cleaner of this character, which will enable the principal parts of the cleaner head to be cast in such form as to provide air conducting passages, the major portions of the walls of which constitute radiating surfaces which are backed by live steam, and are therefore adapted to impart a high degree of heat to the air passing through the heat.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a longitudinal section of a tube cleaner embodying my invention, the cleaner head being shown engaged with one end of a boiler tube. Fig. 2 represents a section on line 2—2 of Fig. 1. Fig. 3 represents a sec-

tion on line 3—3 of Fig. 1. Fig. 4 represents a side elevation of the section of the cleaner head which constitutes the discharge nozzle, and coöperates with the external shell in forming the air outlet or discharge passages. Fig. 5 represents a section on line 5—5 of Fig. 4. Fig. 6 represents a section on line 6—6 of Fig. 4.

The same reference characters indicate the same parts in all the figures.

In the drawings, 12 represents a frusto-conical shell adapted to be partially inserted in one end of a boiler tube 13. In said shell is closely fitted a head of frusto-conical form. The larger end portion of the head constitutes a steam chamber 14, having a steam inlet with which is engaged a steam supply pipe 15. The smaller end of the head constitutes a steam delivering nozzle 16, the bore or passage 17 of which communicates with the interior of the chamber 14. The said steam chamber and nozzle are preferably made in two independent parts having a screw thread or other detachable connection at 18. The steam chamber 14 is provided with a series of longitudinally extending, inwardly projecting, straight hollow bosses 19, the major portions of which are within the periphery of the steam chamber, and are backed by the steam space therein, so that heat is radiated from the steam chamber into all parts of longitudinal air inlet passages 20 which are formed by the outer surfaces of the bosses 19, and by the portions of the shell which extend across said bosses, as shown in Figs. 2 and 3. The sides of the bosses 19 are radially arranged and are in relatively close proximity to each other, so that the depth of each air passage 20 from the periphery toward the center of the steam chamber is much greater than its width, or the distance between the radial sides of the bosses the air passages being therefore relatively deep and narrow. Provision is thus made for highly heating the air passing through the passages 20.

The tapering periphery of the nozzle 16 is provided with a series of grooves 21 which are preferably arranged diagonally or spirally, as shown in Fig. 4, these grooves coöperating with the portions of the shell which extend across them in forming air outlet passages which are grouped around the nozzle, and deliver jets of the heated air to the interior of the boiler tube 13, there

being a suitable communication between the said air outlet passages and the air heating inlet passages.

The combined capacity of the air inlet passages in the steam chamber is greater than that of the air outlet passages in the nozzle, so that the air drawn into the boiler tube by the vacuum caused by the forcible inrush of steam into the tube, will pass slowly into the inlet passages in close contact with the hot walls thereof, and will be thoroughly dried and heated before reaching the interior of the tube and mixing with the steam, thus preventing any condensation of the steam and precipitation of moisture on the walls of the tube. The relatively small capacity of the air outlet passages in the nozzle causes the air to pass through said passages with great velocity so that a powerful blast of hot dry air is induced within the boiler tube. The spiral direction of the air outlet passages gives the blast of hot air a whirling motion within the boiler tube, thus increasing the effectiveness of the cleaning operation. The air inlet passages are preferably straight so that the frictional resistance to the air passing through them is reduced to the minimum.

In the preferred embodiment of my invention here shown, a reverberatory air chamber 22 is formed between the air inlet and air outlet passages, the inner end portion of the nozzle being reduced to form a neck 23 which constitutes the inner wall of the chamber, the side walls of which are formed by opposed surfaces on the steam chamber and nozzle, while the outer wall of the chamber is formed by the surrounding portion of the shell 12, the air chamber being of annular form.

The capacity of the air chamber is such that the hot air which enters it through the air heating inlet passages is maintained substantially at atmospheric pressure so that the inward flow of air through the air heating passages is not unduly accelerated, but passes at a relatively slow rate through said passages and is thoroughly heated before reaching the air chamber. The hot air accumulating in the air chamber is distributed to the contracted air outlet passages surrounding the nozzle.

By constructing the conical head in a plurality of separate sections, I am enabled to cast said sections in the forms shown, no difficulty being experienced in casting the steam chamber 14, with its relatively deep and narrow inwardly projecting bosses 19, first, because said bosses are straight, and secondly, because ample openings are permitted in the ends of the steam chamber. The said sections formed as shown, provide air heating inlet passages adapted as described to thoroughly heat the entering air, air outlet passages having a spiral arrange-

ment and the inner and side walls of a reverberatory annular air chamber. I believe myself to be the first, however, to provide a steam tube cleaner having a frusto-conical head located within a frusto-conical shell, and provided first, with straight air inlet passages formed in straight inwardly projecting hollow bosses, the major portions of the walls of which are located within the periphery of the head, and are backed by the steam space so that the walls of the bosses constitute effective heat radiators adapted to thoroughly heat air passing through the same, and secondly, air outlet passages grouped around a steam discharge nozzle and of smaller capacity than the inlet passages. So far as these and other features of my invention are concerned, I do not limit myself to a sectional formation of the head, although for the reasons stated, I consider this highly desirable.

I claim:—

1. A boiler tube cleaner comprising a frusto-conical shell adapted to enter a boiler tube-end, and a frusto-conical head fitting the interior of the shell, the larger end portion of the head forming a steam chamber having a steam inlet, and straight relatively deep and narrow inwardly projecting hollow bosses the major portions of the walls of which are within the periphery of the steam chamber and are backed by the steam space therein, said walls radiating heat into relatively deep and narrow air inlet passages formed by their outer surfaces and by the shell, the smaller end portion of the head forming a steam discharge nozzle having grooves in its periphery forming, with the shell, a series of air outlet passages, which communicate with the said inlet passages, and are of smaller capacity than the latter.

2. A boiler tube cleaner comprising a frusto-conical shell adapted to enter a boiler tube-end, and a frusto-conical head fitting the interior of the shell, the larger end portion of the head forming a steam chamber having a steam inlet, and straight relatively deep and narrow inwardly projecting hollow bosses, the major portions of the walls of which are within the periphery of the steam chamber and are backed by the steam space therein, said bosses and the shell forming substantially straight relatively deep and narrow air inlet passages, the smaller end portion of the head forming a steam discharge nozzle having oblique grooves in its periphery forming, with the shell, a series of oblique air outlet passages, which communicate with the said inlet passages, and are of smaller capacity than the latter.

3. A boiler tube-cleaner comprising a frusto-conical shell adapted to enter a boiler tube end, and a frusto-conical head fitting the interior of said shell, the larger end

portion of the head forming a steam chamber, and its smaller end portion a steam delivering nozzle, the external formation of the body being such as to form, with the
5 shell, a reverberatory air chamber between the ends of the body, a series of straight air heating inlet passages extending from the larger end of the body to the air chamber, and a series of oblique air outlet passages
10 extending from the air chamber to the smaller end of the head, and of smaller capacity than the air inlet passages.

4. A boiler tube-cleaner comprising a frusto-conical shell adapted to enter a boiler
15 tube-end, and a frusto-conical head fitting the interior of said shell and composed of a plurality of detachably connected sections, one of which is a steam chamber forming the larger end of the head and having a
20 steam inlet, while another is a steam discharge nozzle forming the smaller end of the head, a portion of the head being reduced to form, with the shell, an annular reverberatory air chamber, between the ends
25 of the head, and the said sections having straight longitudinal air passages which co-operate with the shell in forming a series of air inlets extending from the larger end

of the shell to the air chamber, and a series of oblique air outlets extending from the
30 air chamber to the smaller end of the head.

5. A boiler tube-cleaner comprising a frusto-conical shell adapted to enter a boiler tube-end and a frusto-conical head fitting
35 the interior of said shell and composed of two sections one of which is a steam chamber having a steam inlet, while the other is a steam delivering nozzle, one section having a reduced neck detachably secured to the
40 other section and forming, with the adjacent end portions of the sections and the shell, an annular reverberatory air chamber, the steam chamber and nozzle having longitudinal channels which coöperate with the
45 shell in forming a series of air inlets extending from the larger end of the shell to the air chamber, and a series of air outlets extending from the air chamber to the smaller end of the head.

In testimony whereof I have affixed my
53 signature, in presence of two witnesses.

EDWARD I. K. NOYES.

Witnesses:

A. C. RATIGAN,
P. W. PEZZETTI.