

(No Model.)

2 Sheets—Sheet 1.

J. B. McCORMICK, Jr.
ART OF MAKING TURBINE WHEELS.

No. 554,292.

Patented Feb. 11, 1896.

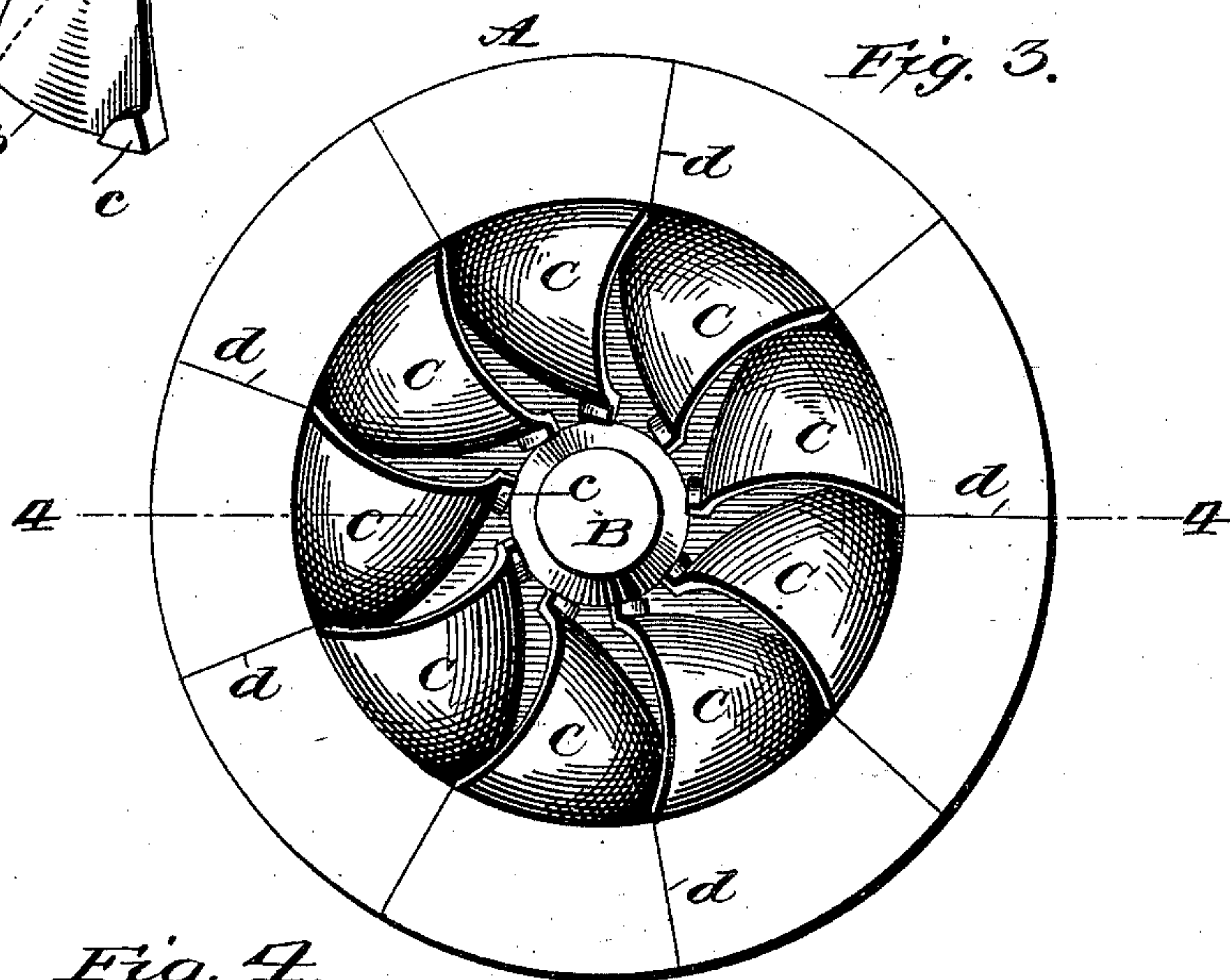
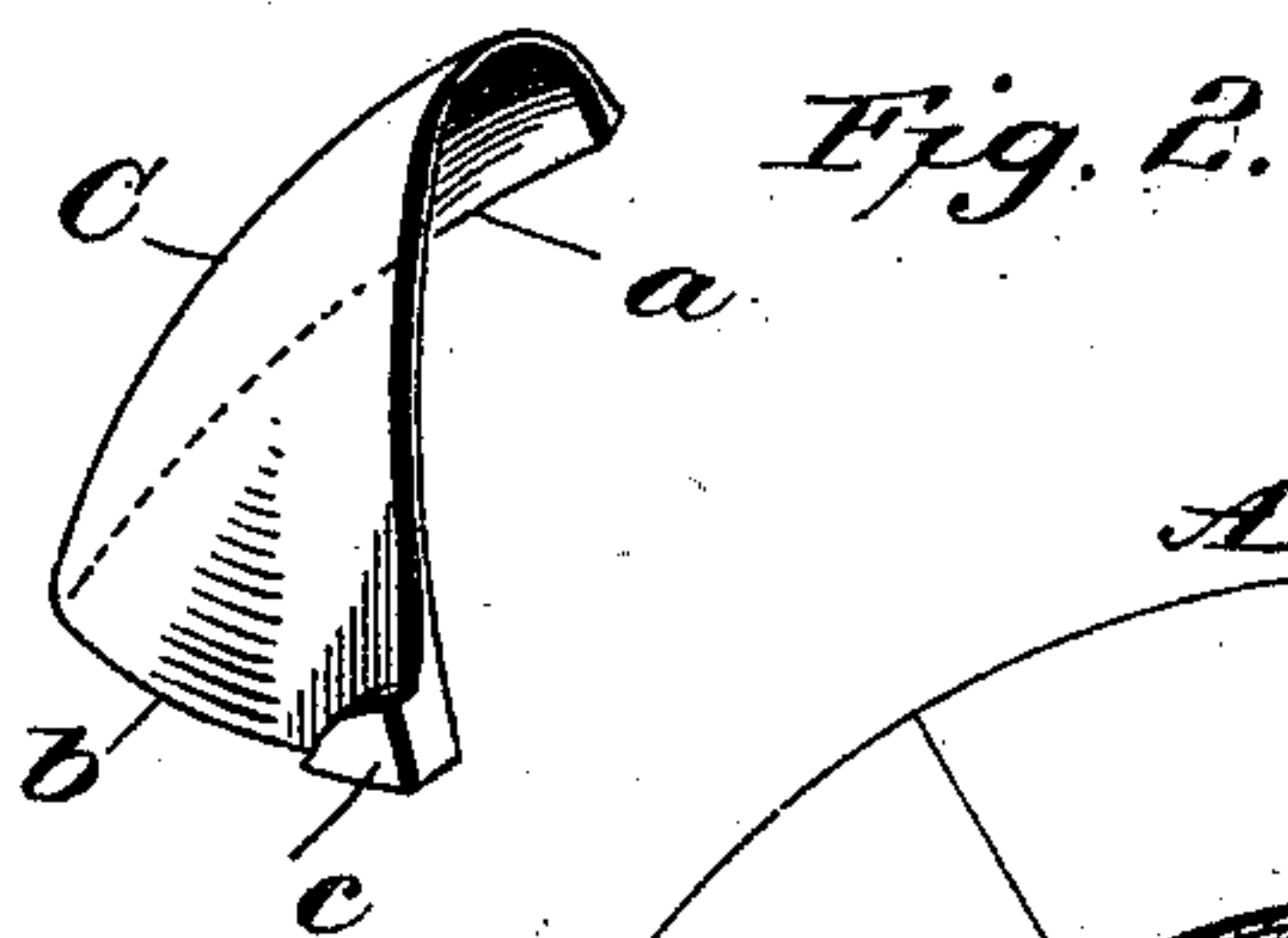
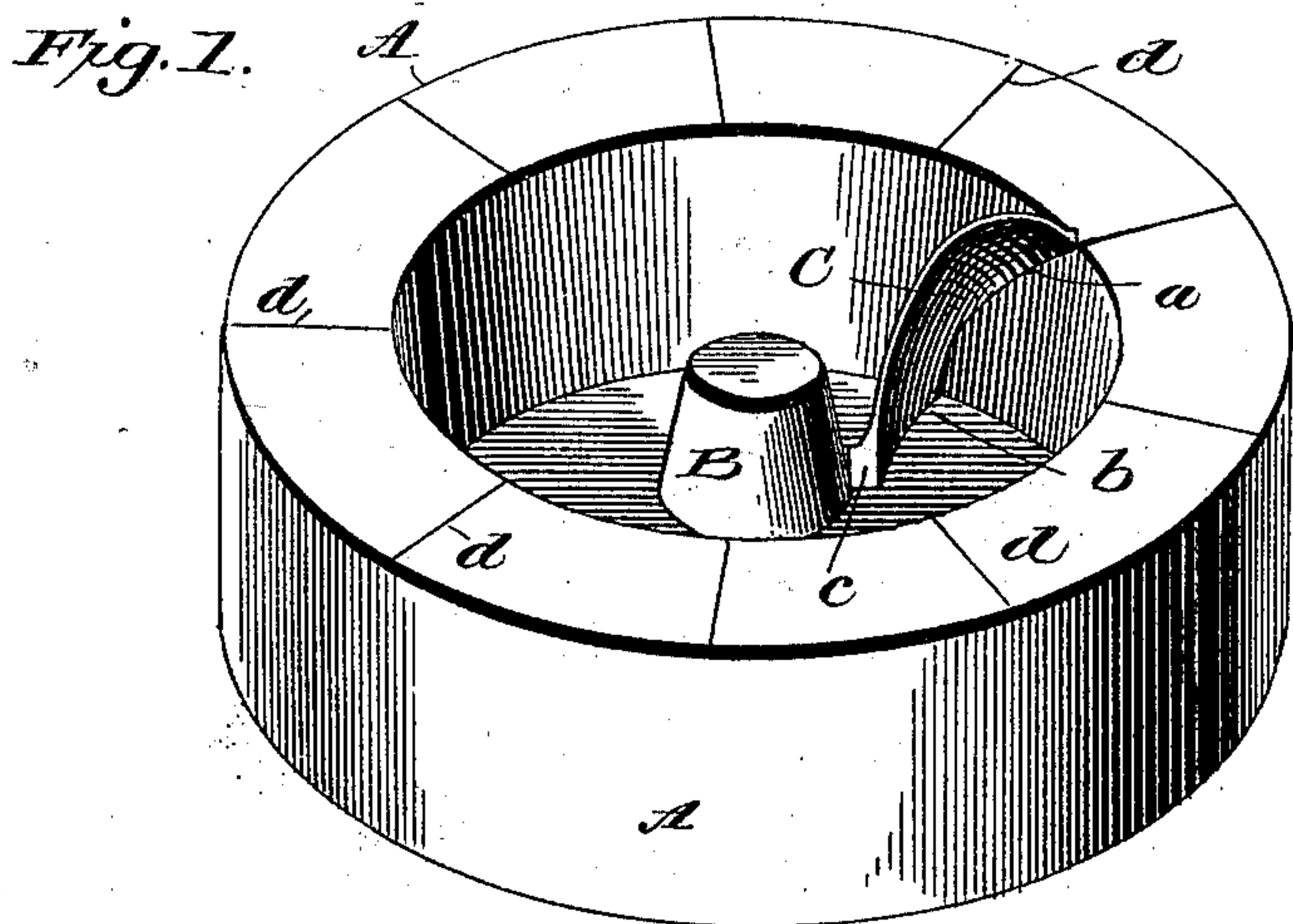
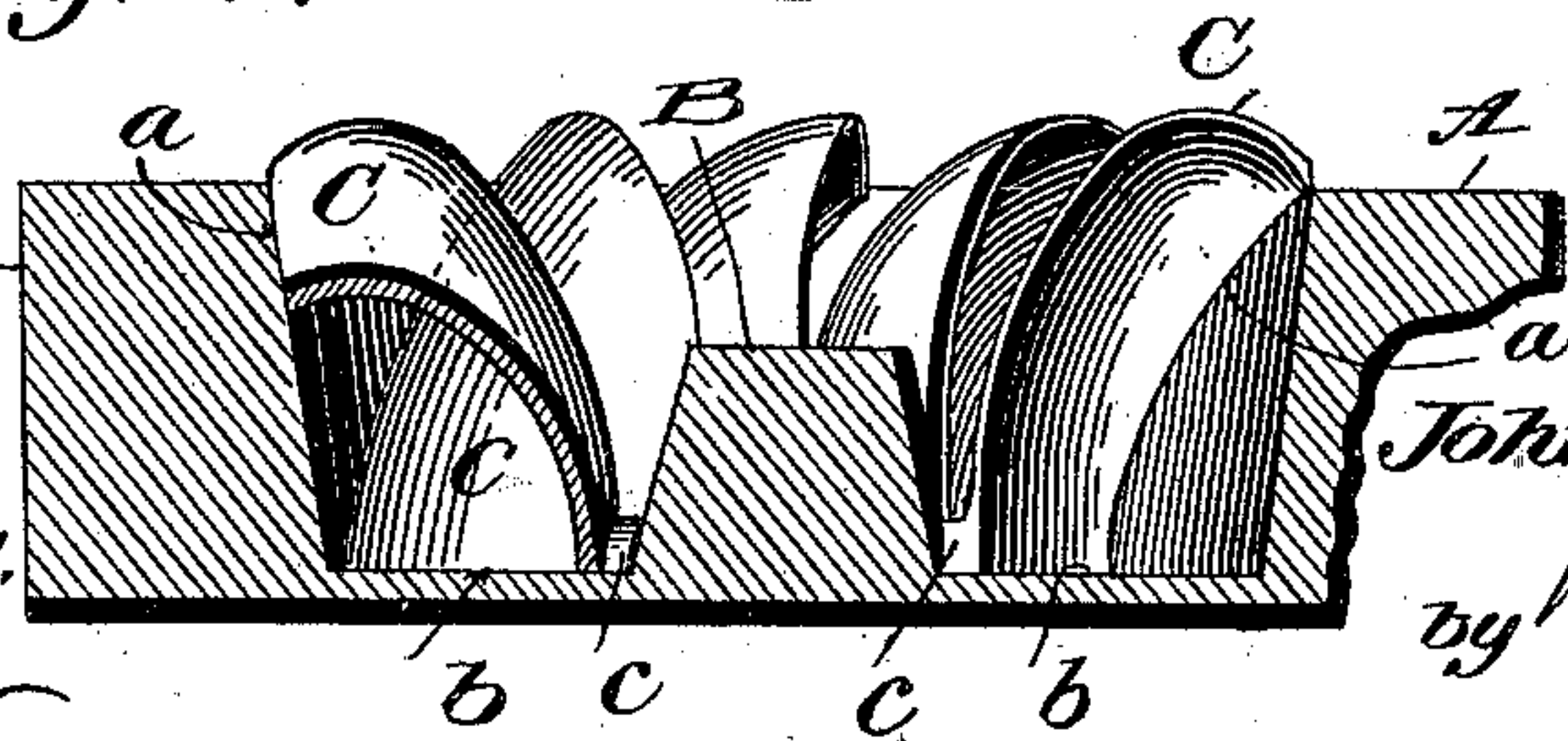


Fig. 4.



Witnesses:

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Inventor.

John B. McCormick, Jr.

by Emanuel Daryl
his Atty.

(No Model.)

2 Sheets—Sheet 2.

J. B. McCORMICK, Jr.
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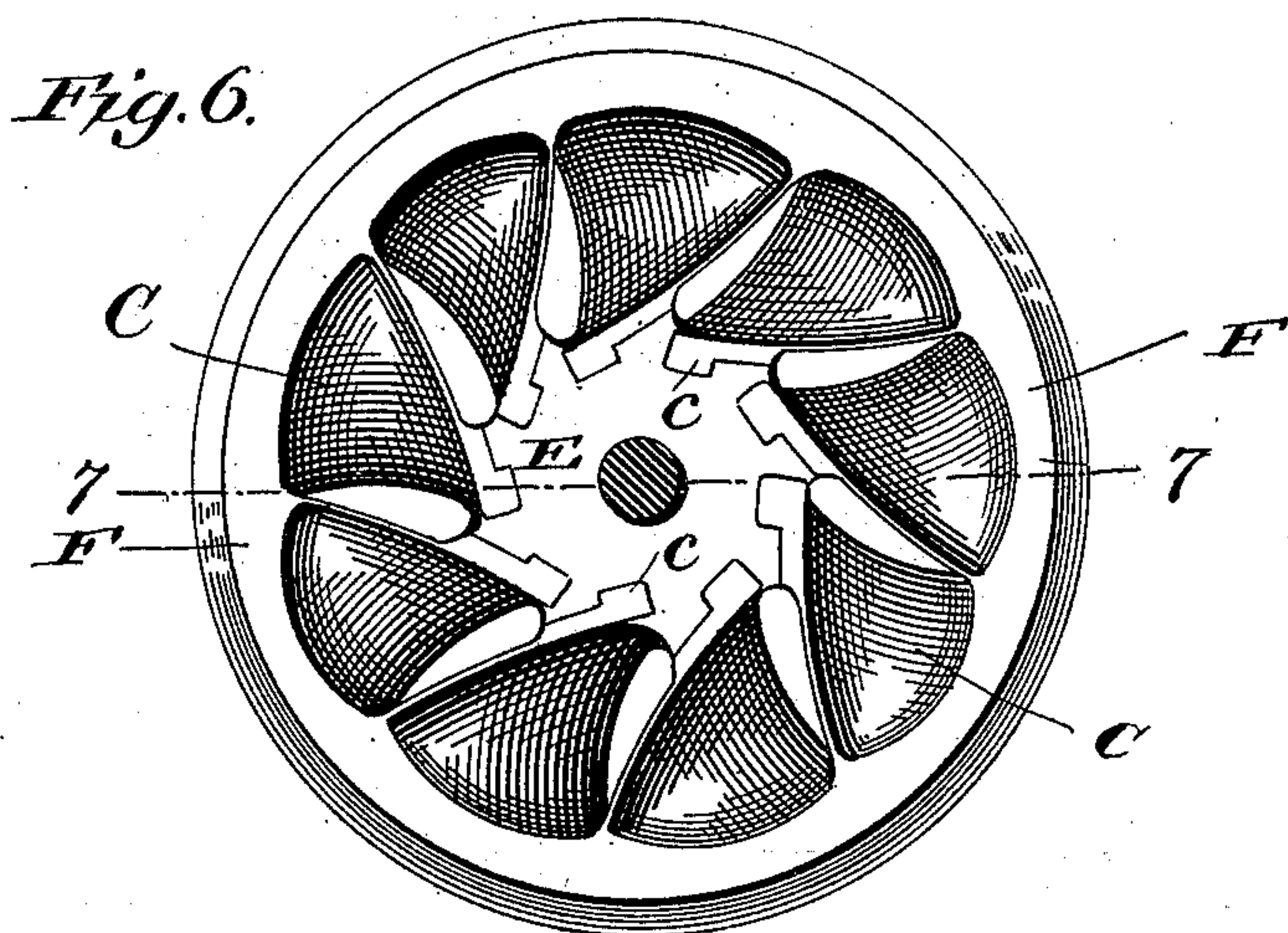
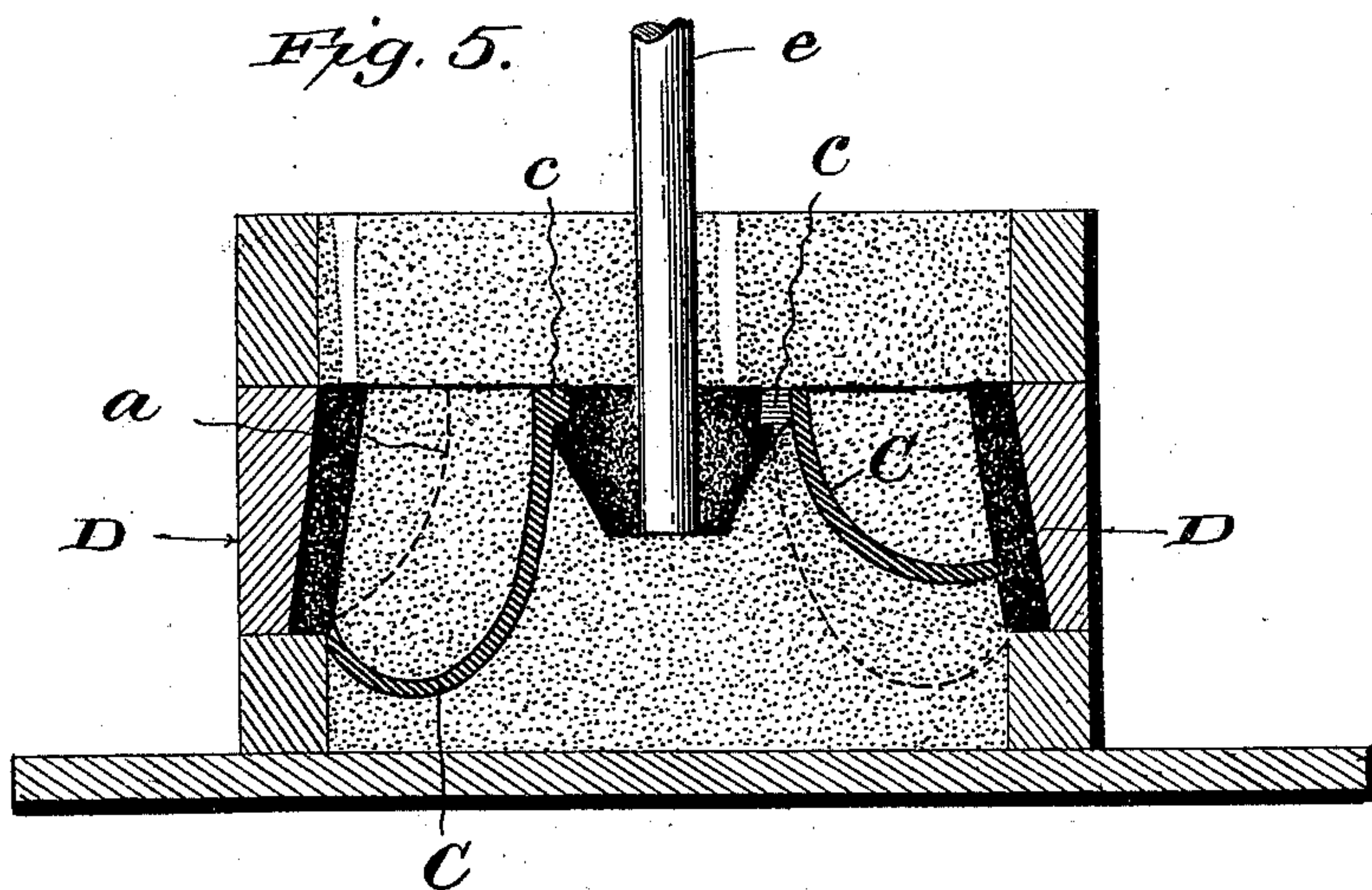
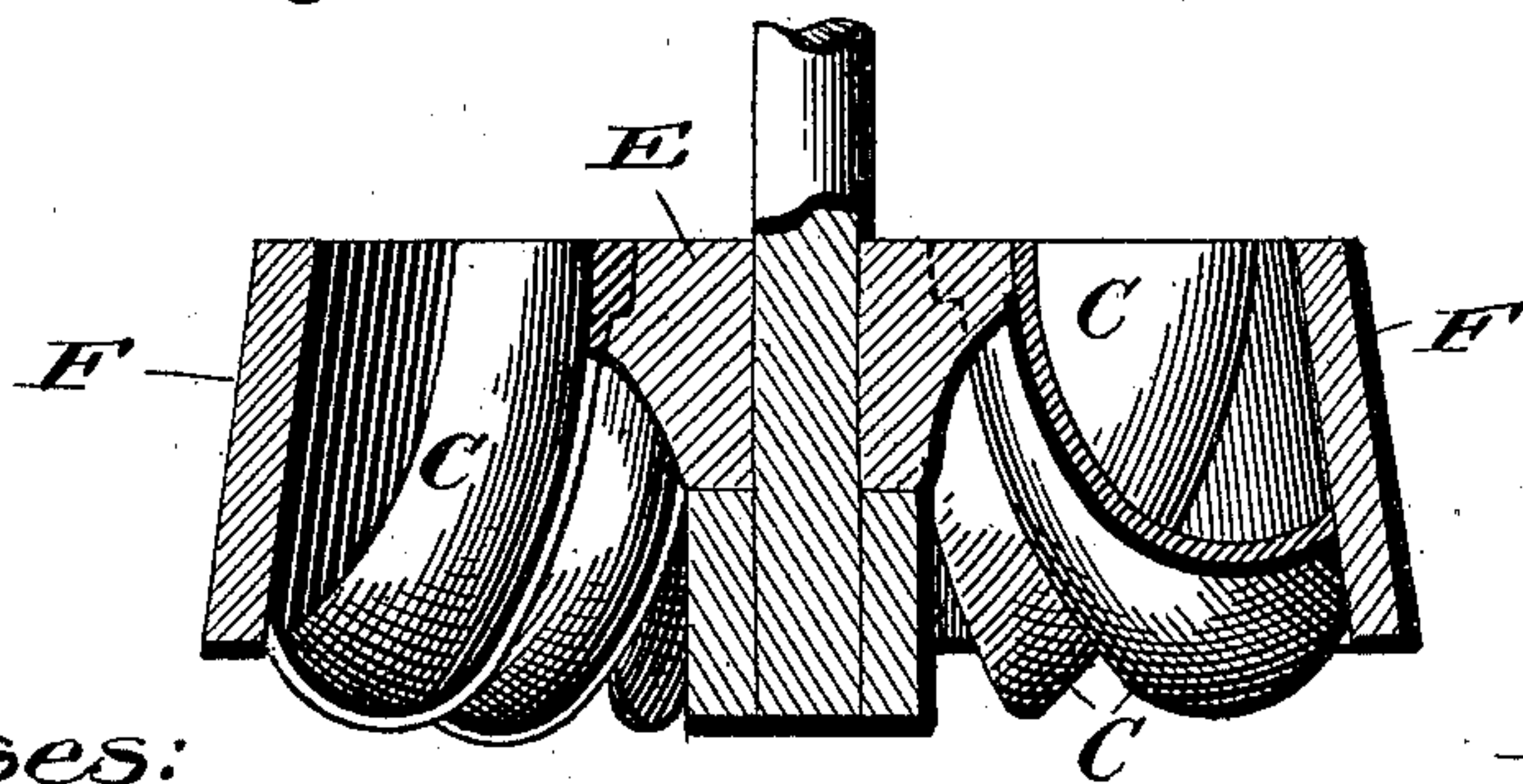


Fig. 7.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN B. McCORMICK, JR., OF YORK, PENNSYLVANIA, ASSIGNOR TO HIMSELF
AND JAMES DIXON, OF SAME PLACE.

ART OF MAKING TURBINE WHEELS.

SPECIFICATION forming part of Letters Patent No. 554,292, dated February 11, 1896.

Application filed July 25, 1895. Serial No. 557,117. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. McCORMICK, Jr., of York, in the county of York and State of Pennsylvania, have invented a certain new and useful Improvement in the Art of Making Turbine Wheels, of which the following is a specification.

The object of my invention is to simplify and expedite the operation of casting turbine wheels, and at the same time to obtain a wheel of great strength and durability.

The invention involves, among other things, the employment of a mold-box, by means of which, in conjunction with the shape of the buckets themselves, the buckets are held securely in their adjusted position without the aid of extraneous fastenings while the box is being rammed with sand. The box also is so formed that it may be readily withdrawn after the sand has been filled in. To withdraw the box it, after the sand has been rammed in, is first turned upside down, after which it can be lifted and drawn up away from the buckets, leaving the latter firmly bedded and held in place in the packed sand, after which a flask is applied of suitable construction to mold the rim, the core is applied, and then both the rim and the hub are cast upon the buckets, the central depression in the sand for the hub having been formed by a suitable projection in the mold-box at the time of ramming the sand therein.

In the accompanying drawings I have illustrated the apparatus employed, as well as the several steps in the manufacture of the wheel, so far as required for purposes of explanation.

Figure 1 is a view of the mold-box. Fig. 2 is a view of one of the buckets. Fig. 3 is a plan of the mold-box with the buckets in place therein. Fig. 4 is a section on line 4 4, Fig. 3. Fig. 5 represents in section the buckets bedded in the sand in the position they occupy after the mold-box has been inverted and withdrawn, together with the flask around the buckets for casting the rim. Fig. 6 is a plan of the completed wheel. Fig. 7 is a section on line 7 7, Fig. 6.

The mold-box A is cylindrical in shape, with walls which outwardly flare on their inner surfaces. In its center it has a tapering or frusto-conical boss or hub B, which rises

from the bottom to the height required for the hub of the wheel. It is by this boss that the central hub-cavity in the sand-mold is produced.

The buckets C each have the shape shown in Fig. 2. What is essential in the bucket so far as concerns the present invention is the shape and dimensions of its outer edge, *a*, and its bottom edge, *b*, or rather that edge which is at the bottom when the bucket is in the mold. The inner corner of the bucket at the edge *b* has preferably a tenon or projection *c*, intended to be interlocked with the hub when the latter is cast. The tenoned corner *c* of the bucket, when the latter is placed correctly in the mold-box, bears against the central boss B. Its lower edge, *b*, extends thence tangentially, or nearly so, to the boss across the bottom and to the adjoining wall of the box. It is of a shape to fit against the bottom and of a length to reach to the wall. The outer edge, *a*, of the bucket fits closely against the wall of the mold-box throughout its length from top to bottom. In order to easily fit the buckets in place the rim of the mold-box is subdivided into equal segments by lines *d*.

To fit a bucket into the mold-box its upper outer corner is held to its particular line *d*, while the bucket is so pressed and fitted into the box as to bring its outer edge into contact throughout its length with the wall of the box and its bottom edge into contact with the bottom of the box. When this has been done the bucket will be found to occupy its proper position and to be held so firmly in that position that it will retain it without any extraneous support or fastening devices during the operation of ramming the mold-box with sand. When the buckets are thus placed each will be separated from the other by the proper interval, and their tenoned ends or corners will be a sufficient distance apart from one another to permit the metal which forms the hub to enter between and pass around them. After the buckets have been thus adjusted and fitted into the mold-box the latter is rammed with sand, the height of the mold-box being increased, if desired, to any required height by the addition of one or more flasks, as usual in similar cases. Then the mold-box

is inverted upon the usual bottom board, and is withdrawn, the taper of its walls and hub facilitating and making easy this operation.

By the withdrawal of the mold-box there
5 will be left the sand-mold section, having embedded in it the buckets, with exposed outer edges *a* and inner tenoned corners *c*. The sand is cleared away from between the corners *c* of the buckets to an extent sufficient
10 to provide for a firm union with the hub to be cast. Then a flask *D* is placed around the sand-mold section, the flask being of such size and internal shape as to permit the casting of a wheel-rim of the desired pattern, and
15 then after applying the core the casting of the hub and rim is proceeded with in any suitable metal, the molten metal for the rim entering the annular spaces between the sand-mold section and the flask *D*, and thus meeting
20 ing and uniting with the outer edges, *a*, of the buckets, while the metal for the hub enters the central cavity in the sand-mold section left by the withdrawal of the central boss *B* of the mold-box, and flows around and between
25 the tenoned corners *c* of the buckets, which are thus most firmly united to and, as it were, dovetailed into the hub. In casting the hub a central core *e* should, of course, be provided, so as to form in the hub the central
30 opening for the passage of the shaft which is to be applied to the wheel.

The finished wheel thus made is shown in Figs. 6 and 7. It is practically as strong as a homogeneous casting. Its buckets are
35 bedded at their inner upper corners in the hub *E*, and are attached at their outer edges throughout their length to the rim *F*.

The wheel itself by reason of its construc-

tion is very strong and durable, and by the employment of the method of manufacture 40 and apparatus hereinbefore described it can be made most expeditiously and at small expense.

Having described my invention and the best way now known to me of carrying the 45 same into effect, what I claim, and desire to secure by Letters Patent, is—

1. The improvement in the art of making turbine wheels which consists in fitting into a mold-box having a central boss or hub, 50 buckets at stated intervals apart with their inner lower corners against the hub and their bottom and outer edges in contact with and bearing against the bottom and side walls of the box, then ramming the box with sand, 55 then inverting the box and withdrawing it from the sand and buckets bedded therein, and finally placing a flask in position around the sand-mold section and casting the hub and rim of the wheel upon the buckets substantially as hereinbefore set forth. 60

2. The mold-box formed with flaring walls and a central tapering or frusto-conical hub rising from the bottom of the box to a height required to form the mold-cavity for the 65 wheel-hub and constructed and adapted to be used in connection with the buckets *C* substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set 70 my hand this 22d day of July, 1895.

JOHN B. McCORMICK, JR.

Witnesses:

W. F. HENDRIX,
M. N. LEHMAYER.