

No. 665,600.

Patented Jan. 8, 1901.

H. GEISENHÖNER.  
STEAM TURBINE.

(Application filed Oct. 31, 1898.)

(No Model.)

FIG. 1.

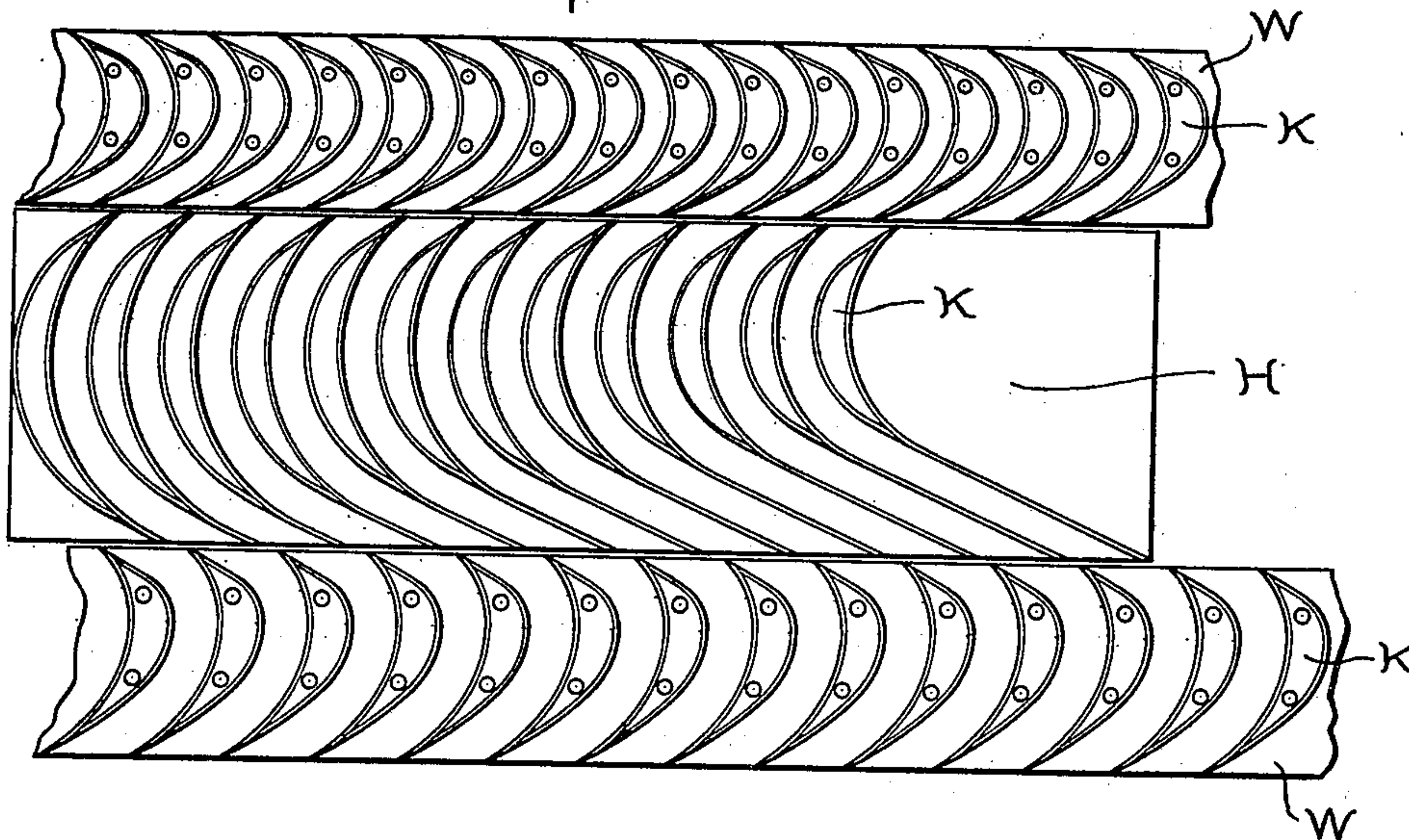


FIG. 3.

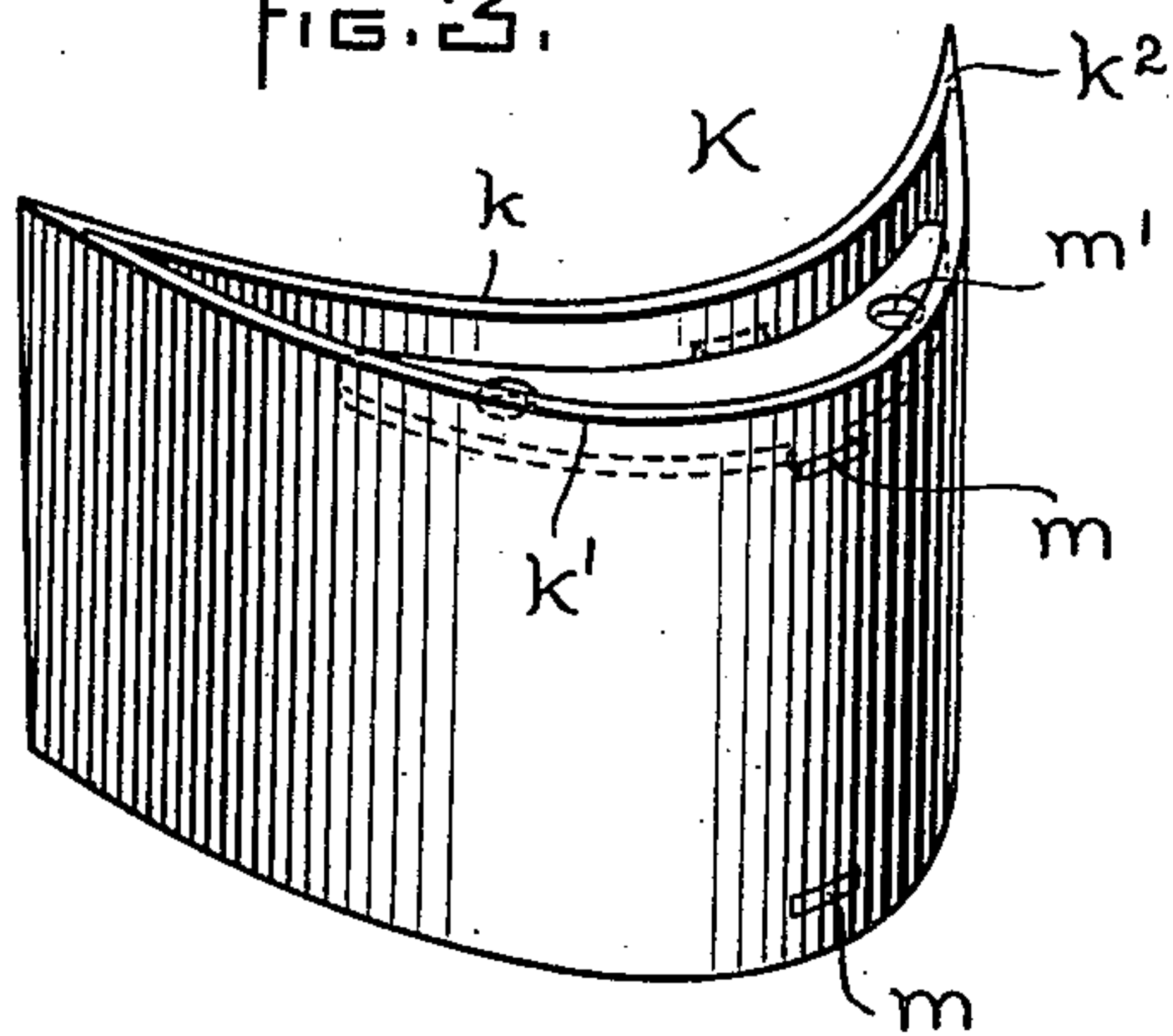


FIG. 4.

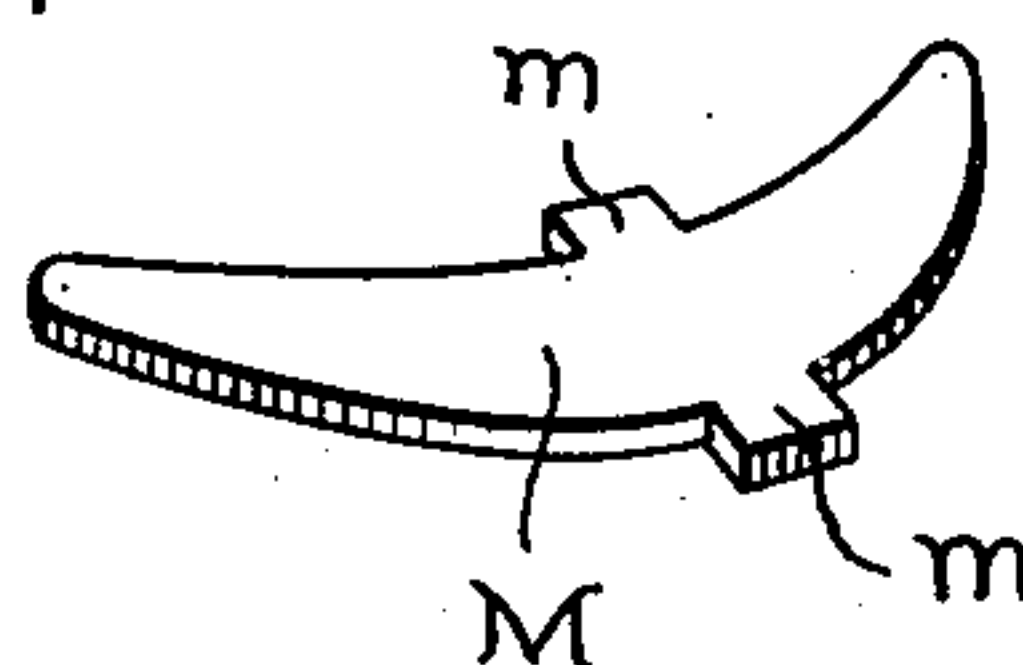
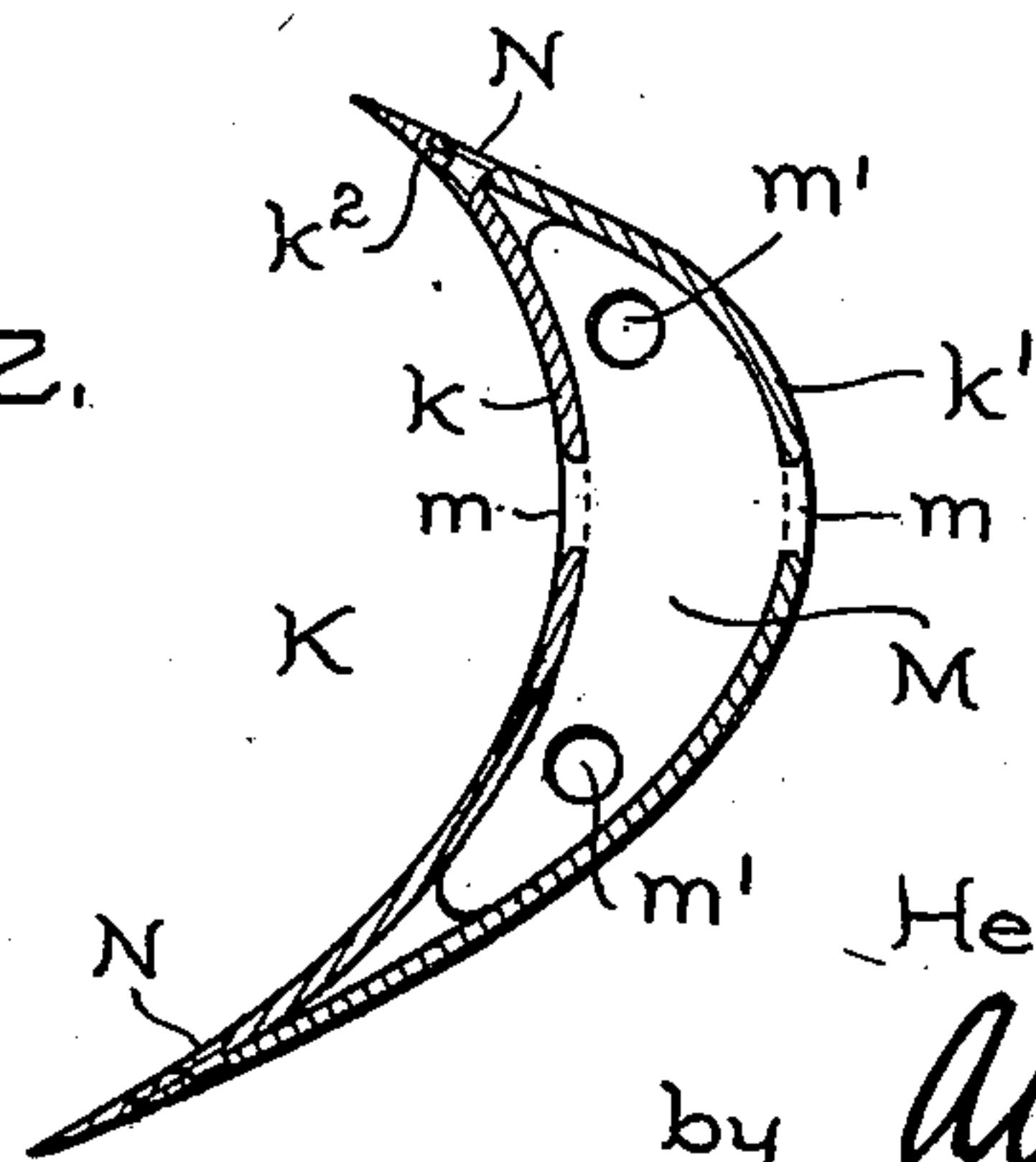


FIG. 2.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

HENRY GEISENHÖNER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE  
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## STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 665,600, dated January 8, 1901.

Application filed October 31, 1898. Serial No. 694,992. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY GEISENHÖNER, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Steam-Turbines, (Case No. 901,) of which the following is a specification.

My present invention relates to steam-turbines, and has for its object principally to provide a new and more desirable form of bucket for this type of engine. Buckets for steam-turbines have in the past usually been made of cast or wrought metal. They are of peculiar shape, their general configuration and characteristics being fixed by certain physical laws, to which it is unnecessary here to refer. This shape necessitates having the buckets thin upon the edges, and cast metal has been found in practice to be objectionable because of insufficient strength at the thinner parts of the bucket and also because it makes the wheel or revolving part of the turbine unduly heavy. To some extent the same objections arise with wrought metal buckets; but the principal objection to their use has been the great cost, since it has been found quite impracticable to form them by forging, and the only method heretofore available has been to cut them by hand from a ring of forged steel of the diameter of the wheel. In practice I have found that only one man can be employed efficiently at one time in this work and that this construction is so slow and costly as to be entirely uncommercial. While in many cases the increase in weight is not objectionable, as it increases the fly-wheel effect, it is nevertheless highly desirable to diminish the centrifugal strains in all the high-speed machines and to keep down the total weight of the engine. The construction which I have devised obviates the defects pointed out and in addition is simple and considerably cheaper than the cast-metal form, the attachment to the turbine being also more secure.

Buckets constructed in accordance with my invention are of sheet metal. While they might be formed, if desired, from metal of sufficient thickness to be stamped in a single piece, this is more costly and not more effi-

cient than the form which I prefer, which consists of back and face plates made of pressed sheet metal and provided with stiffening-plates between the two, with means for securing the parts together. In general I prefer to provide a shoulder upon the face-plate and to bring the edges of the back-plate into the shoulder, confining the parts by rivets, as I have found that if the edge of the back-plate projects to any extent beyond the general contour of the back the high pressures used with these engines will tend to force the plates apart and destroy the bucket.

In the accompanying drawings, which show an embodiment of my invention, Figure 1 is a view, developed, of a portion of the periphery of a compound steam-turbine provided with buckets constructed in accordance with my invention; and Figs. 2, 3, and 4 show the construction of the buckets in detail.

In Fig. 1 I show the abutment H, usually fixed in space, and two wheels W W, each capable of rotation with reference to the abutment. The nozzle, casing, &c., are omitted in the drawings, since my invention relates solely to the construction of the buckets K K K, which are best seen in the perspective detail, Fig. 3, and in the section, Fig. 2. They each consist of face-plates  $k$  and back-plates  $k'$ , secured together by the rivets N N. The face-plate is provided with a shoulder or recess  $k^2$  on the side next to the back-plate  $k'$ , and the edge of the latter is fitted into the recess or shoulder, so that the curved back contour of the bucket is unbroken. I prefer also to braze the parts securely together, so that they may resist high pressures more successfully.

At the top and bottom of the bucket I provide plates M M. The form of one of these plates, which is also of stamped or pressed sheet metal, is shown in Fig. 4. It is provided with ears  $m$   $m$ , which pass through preferably wedge-shaped recesses in the face and back plates, as shown in Fig. 2, the ears being then upset in place and ground off, so that the curve of the bucket is maintained. Screw-holes  $m'$   $m'$  are then drilled through the plates M, and through these screw-holes the bolts or screws are passed to hold the buckets to the rim of the wheel.



By the construction described I am able to make a strong and substantial bucket at very low cost.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. As a new article of manufacture, a bucket for a turbine, comprising a plurality of sheets of metal arching in the same direction but having different slopes and joined together at their edges, and sheet-metal strengthening-strips between the two, secured to the same at points between their ends.

2. As a new article of manufacture, a bucket for a turbine, comprising a curved sheet of metal, a curved sheet of shorter radius secured thereto at its back to stiffen the bucket, and means for supporting bolts between the two, to secure the bucket to a wheel.

3. As a new article of manufacture, a steam-turbine bucket, of pressed metal, composed of curved back and face plates connected together and to transverse stiffening-plates in which are provided openings to accommodate bolts to secure the bucket to a wheel.

4. As a new and useful manufacture, a

steam-turbine bucket of pressed sheet metal, having a curved face-plate with shoulders, a curved back-plate with its ends fitted into the shoulders, stiffening-plates spacing the two apart, and means for securing the parts together.

5. A sheet-metal bucket for a turbine formed of two sheets of metal arched in the same direction but curved on different radii, secured together and to a transverse stiffening-plate provided with screw-holes for attachment to the wheel.

6. A sheet-metal bucket for a turbine formed of two sheets of metal curved on different radii and united to transverse stiffening-plates between the two at or near their ends, the stiffening-plates being provided with screw-holes for attachment of the bucket to the wheel.

In witness whereof I have hereunto set my hand this 28th day of October, 1898.

HENRY GEISENHÖNER.

Witnesses:

B. B. HULL,

M. H. EMERSON.