C. J. MELLIN.

FLUID PRESSURE TURBINE.

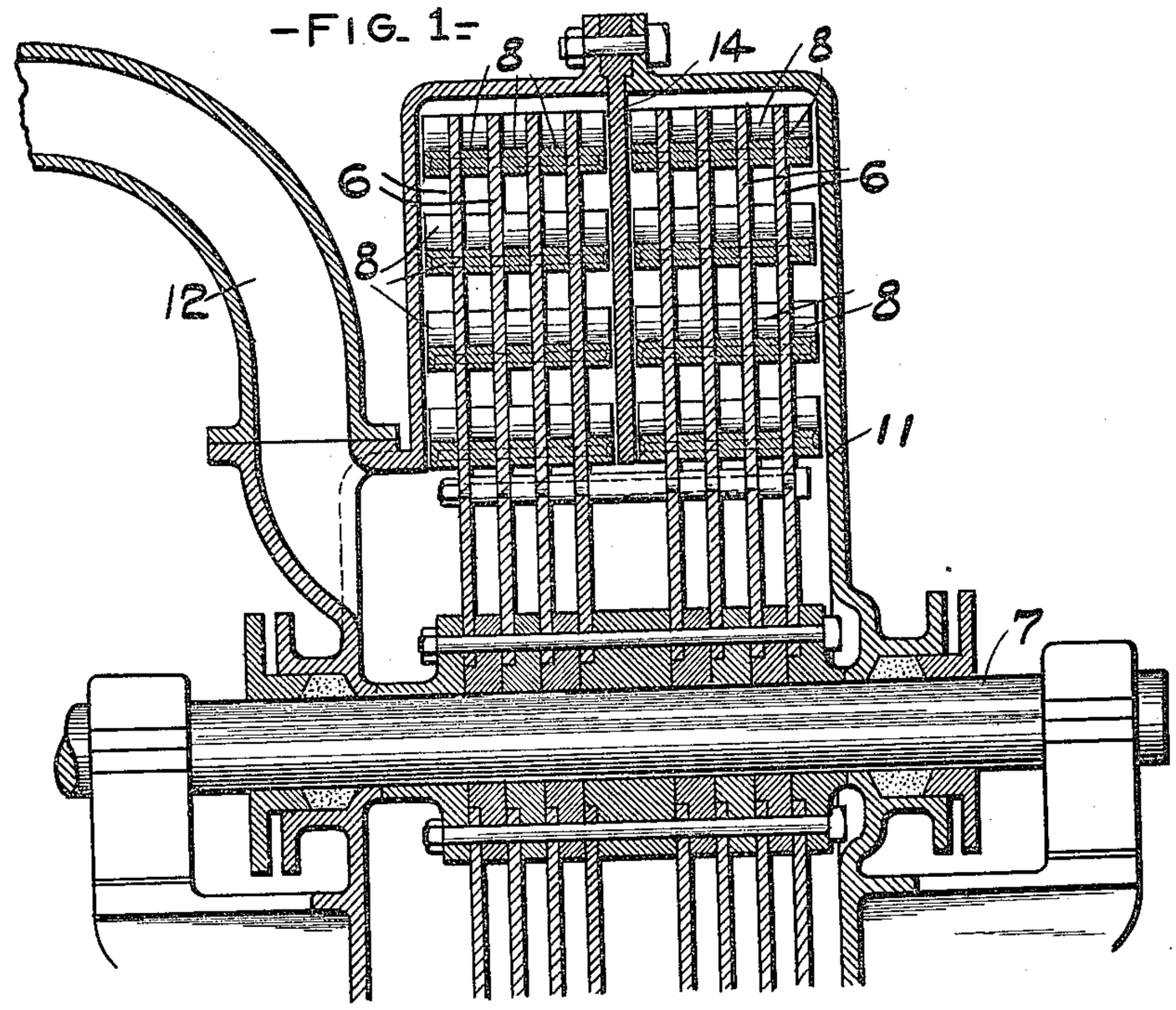
APPLICATION FILED DEC. 5, 1914.

1,154,648.

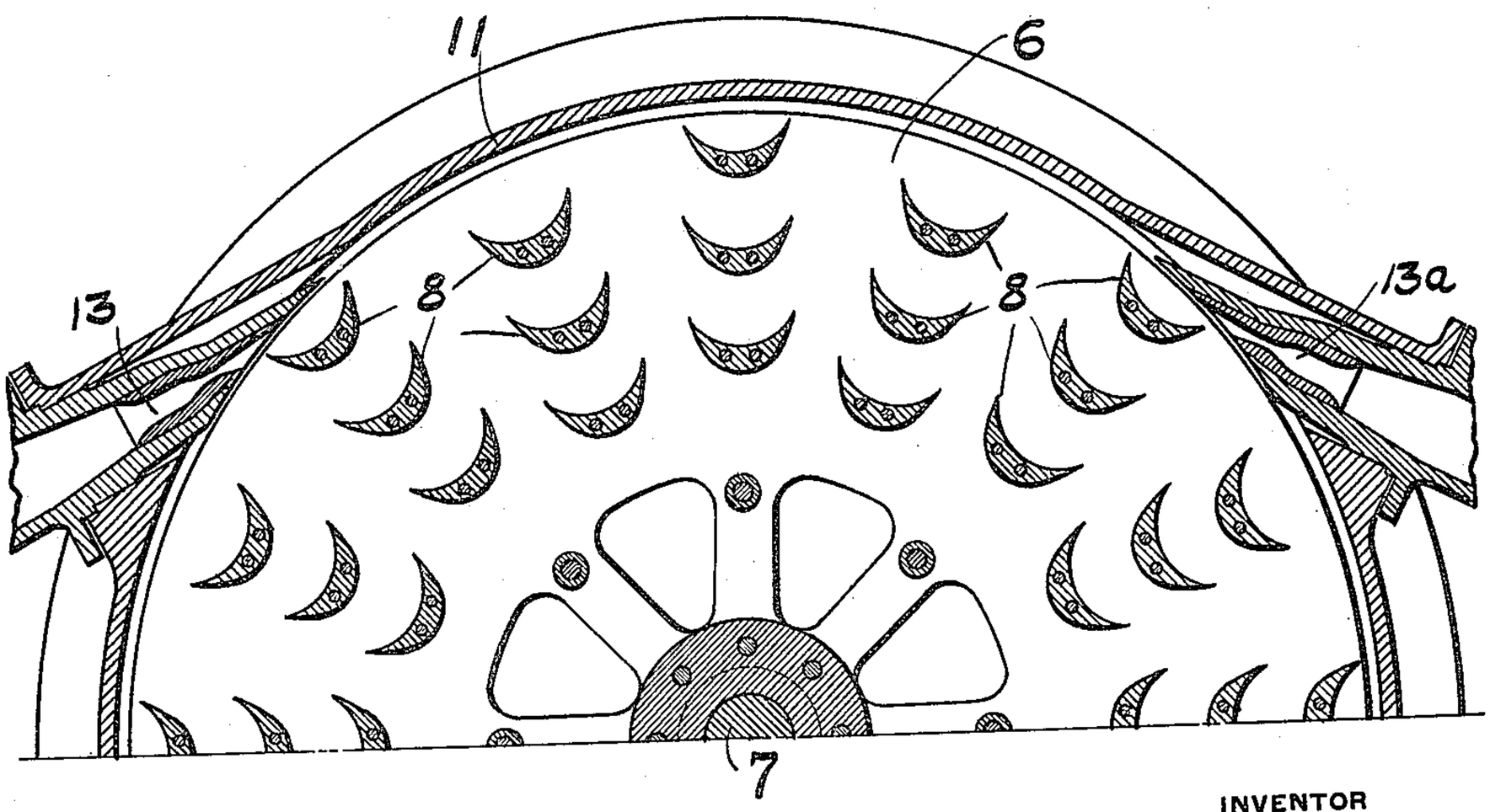
Patented Sept. 28, 1915.

3 SHEETS—SHEET 1.

-FIG. 1-



-FIG. 2-



WITNESSES

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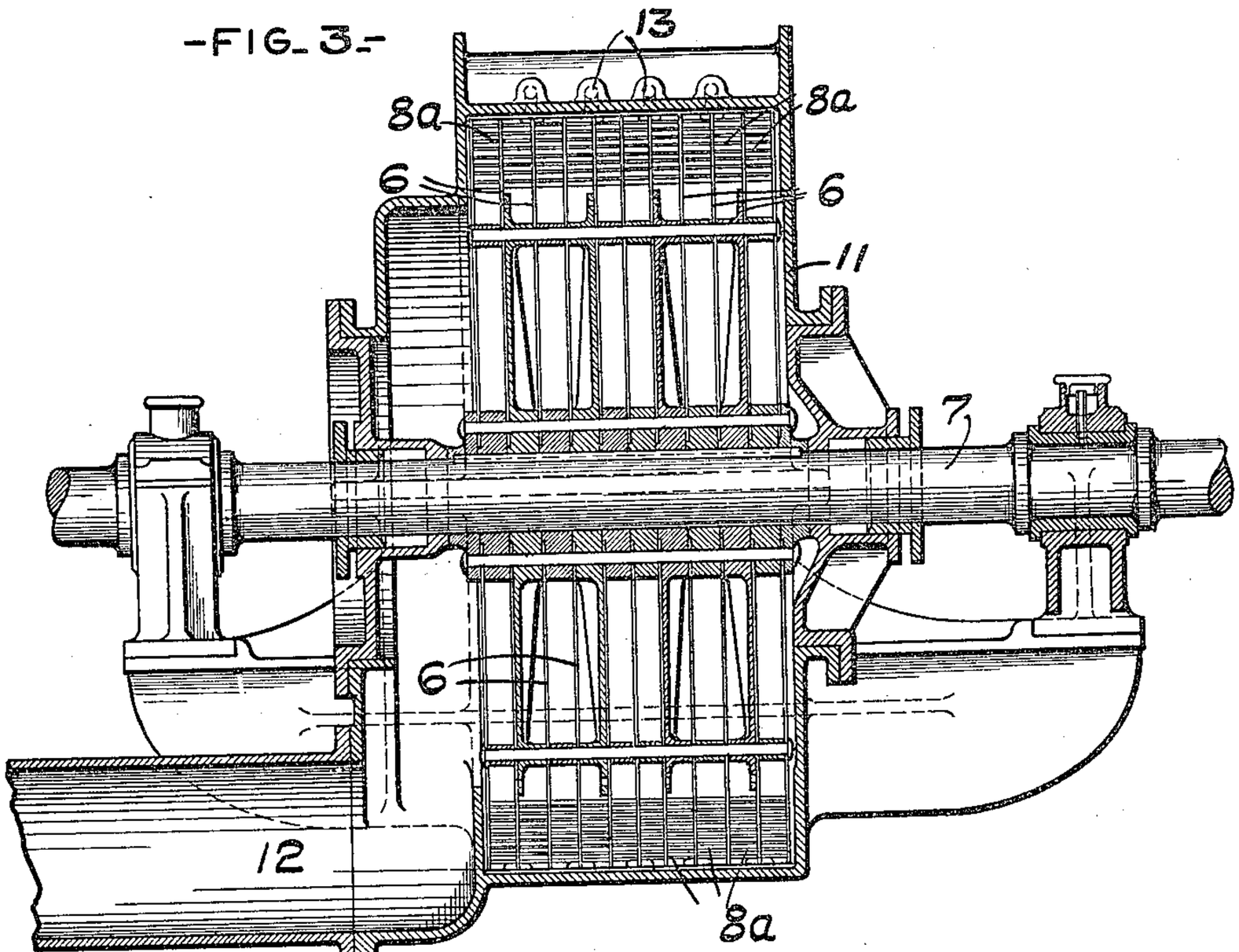
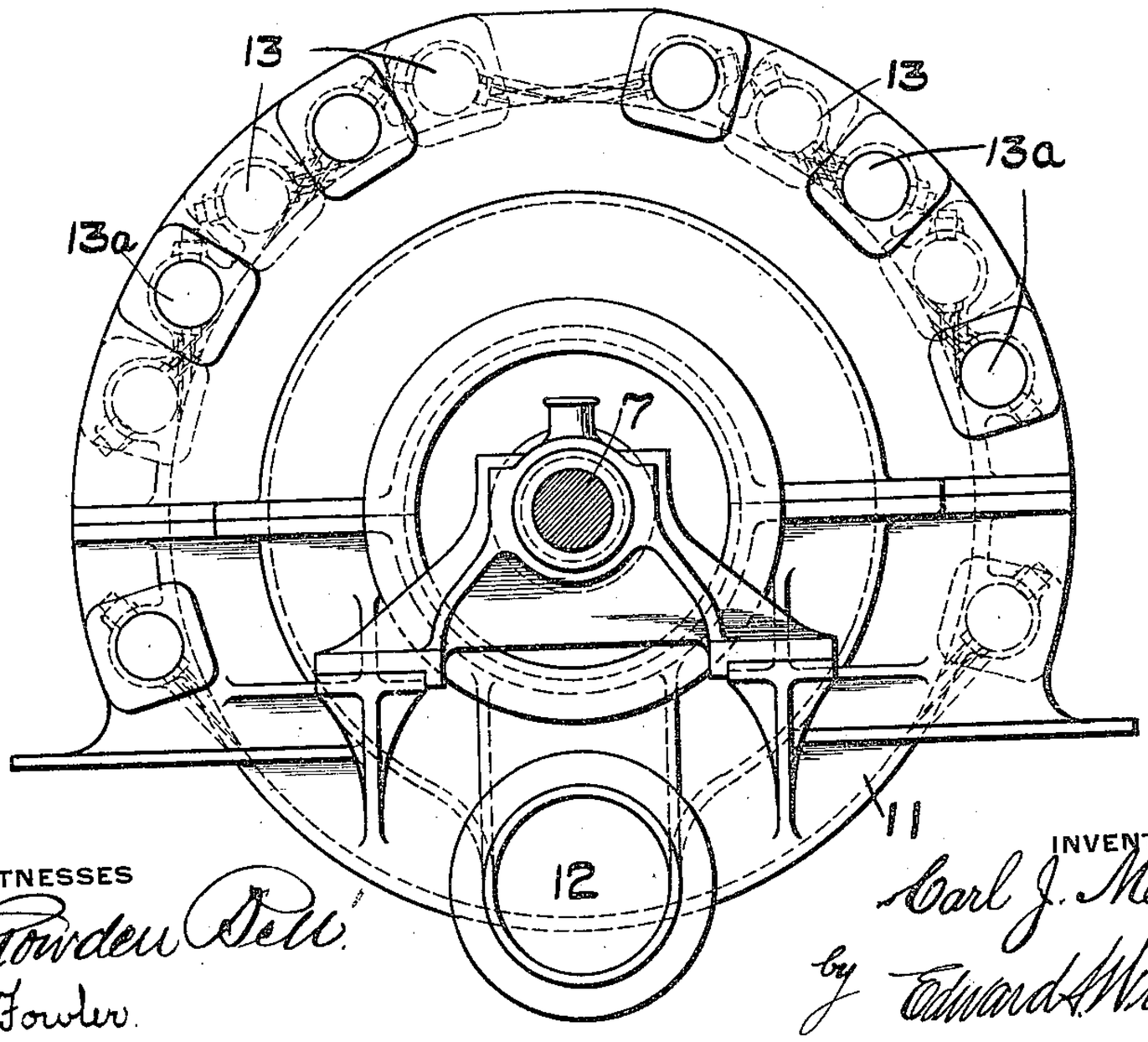
-FIG. 3.-



-FIG. 4.-



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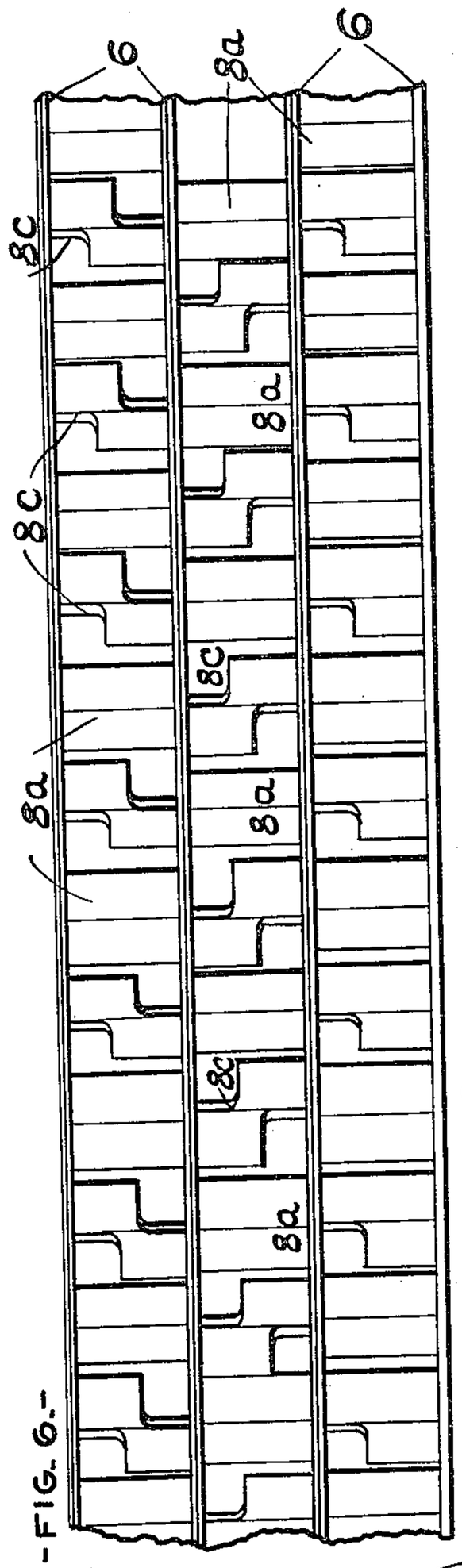
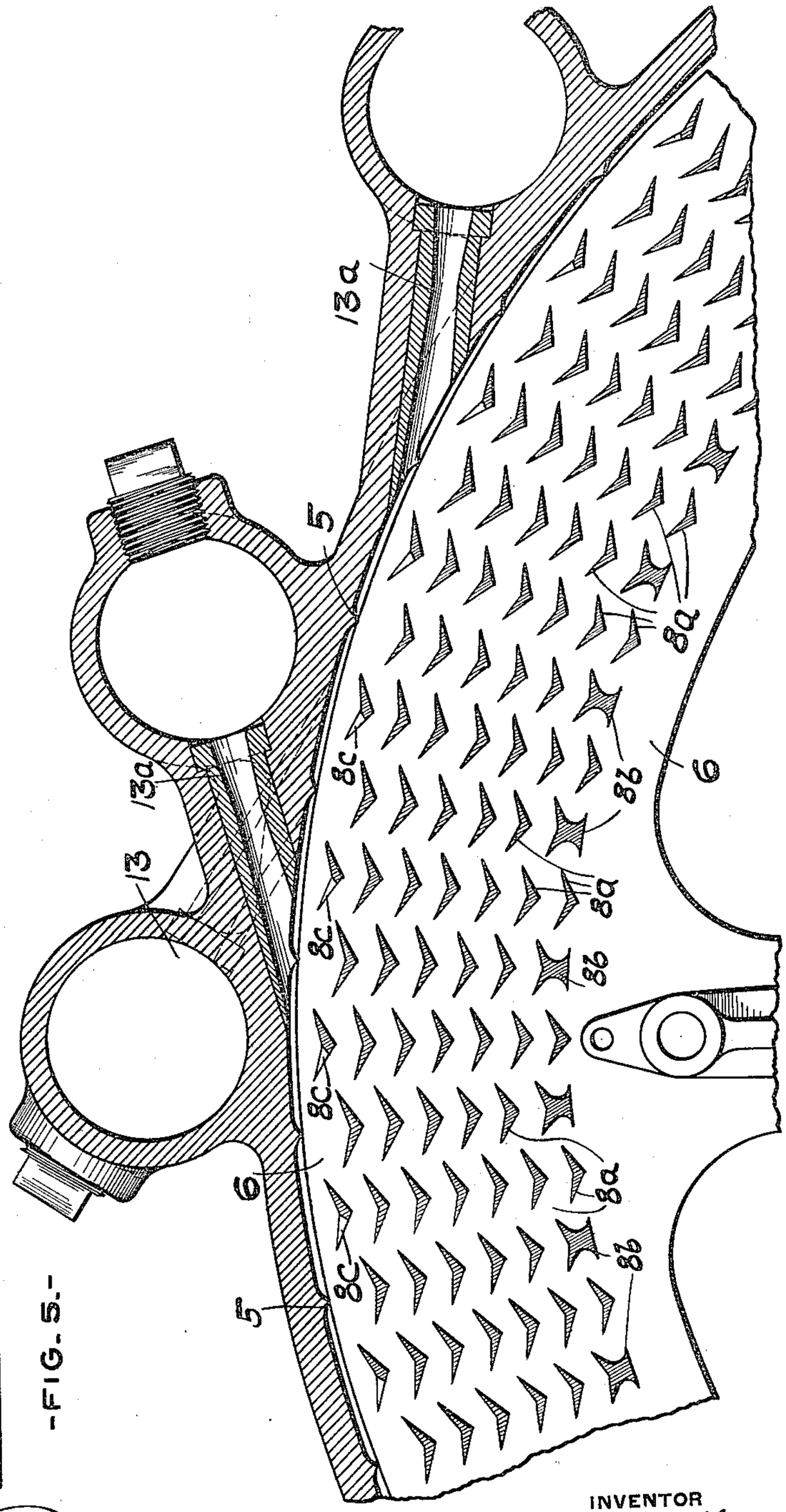
3 SHEETS—SHEET 3.



-FIG. 6.-



-FIG. 5.-

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FLUID-PRESSURE TURBINE.

1,154,648. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed December 5, 1914. Serial No. 875,574.

To all whom it may concern:

Be it known that I, CARL J. MELLIN, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Fluid-Pressure Turbines, of which improvement the following is a specification.

This invention relates to turbines adapted to be operated by steam or other fluid pressure, and more particularly to that type of turbine in which the wheel or rotatable part, is composed of a series of thin plates or vanes rigidly secured together with narrow spaces between the same, and mounted to turn with the shaft, the object being to provide additional deflecting surfaces against which the steam may impinge, and thereby increase the efficiency of the turbine.

According to my improvement, a large number of spacing pieces in the form of buckets or other shapes are rigidly secured between the plates of the wheel, and so arranged, with reference to location and shape that the steam or other fluid as it is delivered in jets from nozzles directed tangentially passes through the narrow spaces between the plates, against which it operates by adhesion, and impinges against the surfaces of the bucket spacing pieces at such an angle as to be deflected from one to another on the general spiral course of the fluid from the nozzles, until it ultimately escapes at the outlet at the center of the wheel. In this way the fluid is not abruptly checked at any one bucket, which might produce more or less shock, but is gradually retarded on its course, as it is deflected from one surface to another, whereby the energy of the fluid is gradually absorbed, thus allowing a slower speed of the wheel, but at the same time taking up substantially all of the energy of the steam or other fluid by the time it reaches the exhaust at the center of the wheel.

The bucket pieces may be substantially crescent shaped with the outer surface concave and the inner surface convex, or both surfaces formed of planes meeting together at an obtuse angle at the center, and may be arranged in radial rows between the plates of the wheel, the buckets of adjacent rows being staggered, or arranged according to any other preferred design, as desired. The radial arrangement of the aforesaid shaped buckets is particularly adapted for reversible turbines, the surfaces being so disposed that the steam in passing in either direction through the wheel will be deflected repeatedly from one surface to another, that is between the inner or outer surfaces, or both inner and outer surfaces of the buckets.

Any desired number of plates with the interposed bucket spacing pieces may be connected up together in this manner, and any number of fluid pressure nozzles of any suitable shape may be arranged around the wheel. When a large number of such plates are built up together for producing a turbine of high power, the series of plates may be divided up into a plurality of sections by stationary walls extending between said sections, each of which may be provided with a separate nozzle or set of nozzles.

In the accompanying drawings: Figure 1 is a longitudinal section of the upper half of a turbine embodying my improvement; Fig. 2, a transverse section of the same; Fig. 3, a longitudinal section showing a slight modification; Fig. 4, an end elevation of the same; Fig. 5, a transverse section of a portion of the same upon a larger scale, and showing the modified form of buckets; and Fig. 6, a plan of a portion of the rotatable element comprising the disks and bucket pieces.

According to the construction shown in Figs. 1 and 2 of the drawings, the wheel is built up of two sets of plates or disks, 6, there being, in this instance, four plates in each set, rigidly bolted together and mounted on the shaft, 7, within the casing 11. The plates are preferably formed of thin metal, and are separated by narrow spaces within which are rigidly secured the bucket distance pieces, 8, which are formed substantially crescent-shaped and arranged in radial rows, the adjacent rows being staggered, as shown. The shape and arrangement of these bucket distance pieces may be changed to suit different conditions, the object being that the steam shall impinge with a glancing blow and be repeatedly deflected from the surface of one bucket to the surface of another until substantially all of the energy is absorbed from the steam at the time it reaches the exhaust at the center of the wheel.

Where a plurality of sets of disks are employed, there may be one or more stationary division plates, 14, fixed to the casing and extending in between the disks of adjacent sets, and the bucket pieces may also be

mounted on the face of the rotatable disks adjacent to the fixed division plates, 14, and the walls of the casing.

The casing is provided with an exhaust pipe connection, 12, and jet nozzles, 13 and 13ª, for driving the wheel either in a forward or a reverse direction.

In the modification shown in Figs. 3 to 6 inclusive, the bucket pieces, 8ª, are more shallow and the outer surface, instead of being concave, is formed of two substantially plane surfaces inclined at an obtuse angle to each other. The under surface is similarly formed, thus making two tapered wings extending in opposite directions from the apex of the bucket piece and adapted to give a gentle deflection to the incoming steam as it passes from one bucket to another, whereby substantially all shock is eliminated.

The buckets of the successive radial rows should be spaced with a progressive pitch from the periphery toward the center of the wheel whereby the steam travels from the injecting nozzle in a spiral path from one bucket to the next down through the wheel to the outlet. In the outer circumferential row of buckets the wings upon the side opposite the inlet may be cut away, as indicated at 8ᶜ, so that the steam from the inlet nozzle will not be thrown out against the casing, but will be deflected into the bucket system of the wheel. Any desired number of circumferential rows or rings of bucket pieces may be employed to most efficiently utilize the energy from the steam, and in order to take out the final inertia, the last bucket engaged by the steam in the various spiral paths may be provided with a curved pocket, 8ᵇ, for deflecting the steam backward or in the opposite direction as it discharges to the exhaust through the center of the wheel.

As indicated in Figs. 3 and 4, several sets of forward and reverse jet nozzles, 13 and 13ª, may be placed around the periphery of the wheel and they may also be located in such positions that each nozzle is in the plane of one of the supporting disks of the wheel, so as to discharge into the two bucket channels upon both sides of the disk, and by arranging the successive sets of forward and reverse nozzles alternately, the same bucket channels are used when running in either direction.

In order to prevent a free circulation of steam around the inner surface of the casing, longitudinal ribs, 5, may be provided at intervals, which will serve to deflect the steam into the bucket system of the wheel.

When the steam or other fluid under pressure is admitted through the nozzle or nozzles for driving the wheel, it passes through the narrow spaces between the disks, 6, and exerts considerable force to turn the wheel simply by the adhesion or friction of the fluid upon the surface of the disks, but it also impinges at an angle against the surfaces of the bucket pieces, and is repeatedly deflected back and forth between the inner and outer surfaces of the various buckets, on its general spiral course between the disks to the center of the wheel, where it escapes through exhaust pipe connection, 12. These repeated deflections of the steam upon the surfaces of the buckets assist in gradually absorbing the energy from the steam and greatly increase the efficiency of the turbine.

The construction shown in Figs. 1 and 2 is identical with that of my prior pending application Serial No. 871,400, filed November 10, 1914, which is a renewal of original application Ser. No. 708,812, filed July 11, 1912.

I claim as my invention and desire to secure by Letters Patent:

1. In a fluid pressure turbine, the combination of a casing, a tangential admission nozzle for the fluid, a plurality of rotatable disks rigidly secured together with narrow spaces between the same and having a central exhaust outlet, and bucket distance pieces having deflecting surfaces rigidly secured between said disks.

2. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and distance pieces secured between said disks and having surfaces disposed at an angle to the direction of the fluid for deflecting the same to other surfaces.

3. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and bucket pieces between said disks and having outer inclined surfaces and inner inclined surfaces adapted to deflect the fluid.

4. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and bucket pieces secured in radial rows between said disks.

5. In a fluid pressure turbine, the combination of a casing, a rotatable shaft, a plurality of disks rigidly secured together and mounted upon said shaft, a tangential nozzle for delivering fluid through the spaces between the disks, and a plurality of rows of bucket pieces rigidly secured in the spaces between said disks and having inclined surfaces for deflecting the fluid from one bucket to another.

6. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and a plurality of rows of bucket pieces secured between said disks, said buckets being formed with oppo-

sitely tapering wings having inclined surfaces for deflecting the fluid from one bucket to another.

7. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, bucket pieces having oppositely tapering wings secured between said disks, and tangential nozzles for delivering fluid to the buckets, the outer buckets having one wing cut away.

8. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and bucket pieces secured between said disks and having inclined surfaces for deflecting the fluid from one bucket to another, the inner buckets being provided with curved pockets for the final deflection of the fluid.

9. In a fluid pressure turbine, the combination of a casing, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, bucket pieces secured between said disks and having inclined surfaces for deflecting the fluid from one bucket to another, and tangential nozzles located in the planes of the respective disks for delivering fluid into the spaces at both sides thereof.

10. In a fluid pressure turbine, the combination of a cylindrical casing having longitudinal ribs upon its inner surface, a plurality of rotatable disks rigidly secured together with narrow spaces between the same, and bucket pieces secured between said disks and having inclined surfaces for deflecting the fluid from one bucket to another.

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Witnesses:
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A. S. FOWLER.