No. 713,095. Patented Nov. 11, 1902.

J. A. HELLWEG.

STEAM TURBINE.

(Application filed Mar. 24, 1902.)

(No Model.)

Fig. 2.

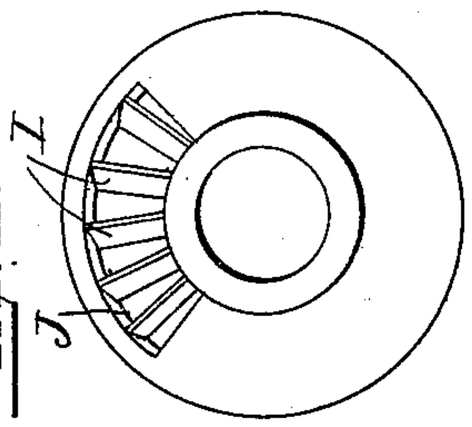


Fig. 3.

Fig. 5.

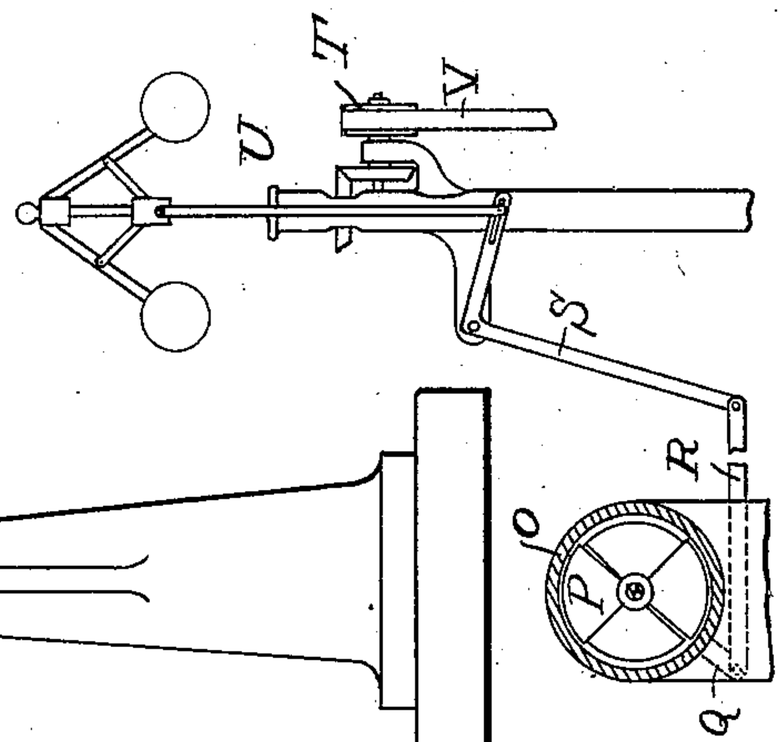


Fig. 4.

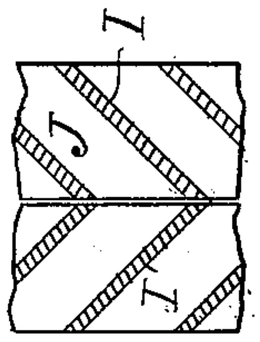
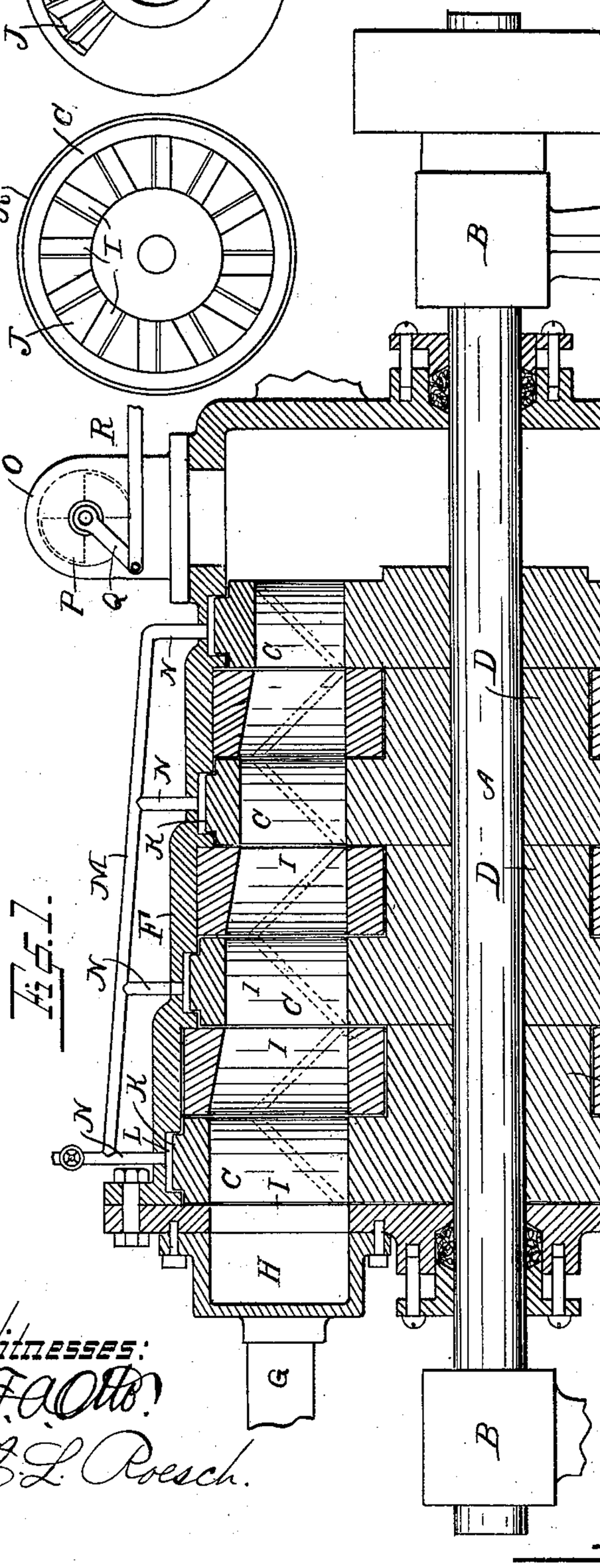


Fig. 1.



Witnesses:
F. A. Otto.
C. L. Roesch.

Inventor
John A. Hellweg
By Erwin & Whelden
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN A. HELLWEG, OF MILWAUKEE, WISCONSIN.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 713,095, dated November 11, 1902.

Application filed March 24, 1902. Serial No. 99,641. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. HELLWEG, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Steam-Turbines, of which the following is a specification.

My invention relates to improvements in steam-turbines; and it pertains to the construction and arrangement of the several revoluble wheel-sections and their intervening partitions and guide-flanges to each other and also to the means of governing the speed of the motor by automatically throttling the exhaust.

The construction of my invention is explained by reference to the accompanying drawings, in which—

Figure 1 represents a longitudinal vertical section thereof. Fig. 2 represents one of the stationary partitions located between the revoluble sections of the motor. Fig. 3 represents one of the revoluble wheel-sections removed from the shaft. Fig. 4 is a detail showing a top view of a portion of the guide-flanges of the stationary partition and the wheel-sections with the inclosing case removed, and Fig. 5 is a detail showing means for connecting the exhaust-valve with a governor of ordinary construction.

Like parts are identified by the same reference-letters throughout the several views.

My turbine comprises a supporting-shaft A, having journal-bearings at the respective ends in the standards B. Secured to the shaft A are a plurality of wheel-sections C, all of which, except the last one in the series, are provided with annular sleeves D.

E represents the annular partitions, which are interposed between the respective wheel-sections and are secured at their peripheries to the inclosing walls of the chamber F.

G is an inlet steam-pipe which communicates between the steam-generator and the steam-chamber H of the turbine.

A series of annular flanges I are located between the steam-chamber H and the first wheel-sections and also in the several partitions which are interposed between the several wheel-sections, by which the steam is directed at right angles to the buckets J of the wheel-sections, the buckets J being placed at nearly right angles to those of the flanges of the stationary partitions, as indicated in Fig. 4, whereby the steam acts against the buckets of the wheel-sections with the highest efficiency.

Heretofore it has been common in the construction of steam-turbines to make each wheel-section and intervening partition between the inlet and the exhaust successively larger than the first with a view of providing a larger area for the contact of the steam as it expanded in passing through the turbine. By the construction shown, however, this order is reversed, and the steam is led first to the wheel-sections of the largest diameter, and said wheel-sections are made successively smaller as they approach the exhaust, whereby a very important object is attained.

It is a well-known fact that the velocity of steam is in proportion to its temperature and pressure. I have for this reason reversed the usual order of the wheel-sections, as stated, whereby the steam is first brought in contact with the largest wheel-sections near their peripheries, where the same has its highest velocity, when it passes on to the next wheel-sections, which are made successively smaller to correspond with the diminished velocity of the steam as its temperature is lowered. Thus it is obvious that when the steam is at its highest temperature and greatest velocity it acts upon that part of the turbine which moves with the highest speed, and when it has lost a portion of its velocity by friction and cooling it is brought in contact with that part of the turbine which moves with a less velocity, whereby the efficiency of the steam in passing through the turbine is greatly increased. To provide, however, for the free escape of the steam from the turbine and prevent the same from being throttled when passing through the guide-flanges of the partitions as it expands, the number of apertures in the stationary partitions are successively increased from the inlet toward the exhaust end of the turbine corresponding with the increased volume of the steam.

Heretofore it has been common in this class of engines, as well as the ordinary steam-engine, to locate the steam-controlling valve and governor at the inlet steam-duct of the engine, whereby the pressure and tempera-

ture of steam in the engine are diminished, as the throttle-valve controlled by the governor is closed and whereby when said steam-valve is opened a certain interval of time elapses before the steam acts with its original pressure and temperature upon all of the buckets of the turbine, while by throttling the exhaust and leaving the inlet steam-ports open, as shown and described, the pressure and temperature of the steam in the turbine remain constant and are not diminished by throttling the exhaust and retarding the movement of the turbine. To prevent the escape of steam past the peripheries of the wheel-sections and to provide for lubricating and packing the same, the periphery of each wheel-section is preferably provided with an outwardly-projecting flange K, which registers with and operates in a corresponding channel L. The channel L is made slightly larger than the flange K, whereby an annular space is formed in said channel for the reception of oil, which serves the twofold purpose of lubricating the wheel-sections and as a liquid packing to prevent the passage of steam between the wheel-sections and their inclosing case. The several channels L are connected with an oil-duct M through the branch ducts N, whereby all of said annular channels may be lubricated simultaneously by pouring oil into the upper branch duct N of said series.

O represents the exhaust-duct, which is provided with a steam-controlling valve P. The steam-controlling valve P is connected with a governor U of ordinary construction through the arm Q, link R and elbow crank-lever S. The governor U is connected with a driving-shaft A of the motor through the pulley T and belt V in the ordinary manner.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam-turbine, a wheel-inclosing case; a longitudinally-arranged revoluble shaft, centrally located in said case; a plurality of wheel-sections affixed to said shaft, of successively less diameter from the inlet toward the exhaust port of the turbine; a series of radial blades arranged at an angle to the line of movement of said wheel-sections; a plurality of stationary partitions respectively located upon the steam or inlet side of said wheel-sections; a plurality of radial guide-flanges located in said partitions and arranged at an angle to the blades in said wheel-sections.

2. In a steam-turbine, a wheel-inclosing case; a longitudinally-arranged revoluble shaft, centrally located in said case; a plurality of wheel-sections affixed to said shaft, of successively less diameter from the inlet toward the exhaust port of the turbine; a series of radial blades arranged at an angle to the line of movement of said wheel-sections; an annular flange formed on the periphery of said wheel-sections; an annular channel formed in the inclosing case of said wheel-sections, registering with, and for the reception of, said annular flange; means for applying a lubricant to said annular flanges within said channels; a plurality of stationary partitions, respectively located upon the steam or inlet side of said wheel-sections; a plurality of radial guide-flanges located in said partitions, and arranged at an angle to the blades in said wheel-sections.

3. In a steam-turbine, a wheel-inclosing case; a longitudinally-arranged revoluble shaft centrally located in said case; a plurality of wheel-sections affixed to said shaft, of successively less diameter from the inlet toward the exhaust port of the turbine; a series of radial blades arranged at an angle to the line of movement of said wheel-sections; a plurality of stationary partitions respectively located upon the steam or inlet side of said wheel-sections; a plurality of radial guide-flanges located in said partitions and arranged at an angle to the blades in said wheel-sections; a steam-controlling valve located in the exhaust-duct of said turbine; a governor for controlling the escape of said exhaust-steam; means for communicating motion from the shaft of the turbine to said governor; and means for communicating motion from said governor to said steam-controlling valve.

4. In a steam-turbine, a wheel-inclosing case; a longitudinally-arranged revoluble shaft, centrally located in said case; a plurality of wheel-sections affixed to said shaft, of successively less diameter from the inlet toward the exhaust port of the turbine; a series of radial blades arranged at an angle to the line of movement of said wheel-sections; an annular flange formed on the periphery of said wheel-sections; an annular channel formed in the inclosing case of said wheel-sections, registering with, and for the reception of, said annular flange; means for applying a lubricant to said annular flanges within said channels; a plurality of stationary partitions, respectively located upon the steam or inlet side of said wheel-sections; a plurality of radial guide-flanges located in said partitions, and arranged at an angle to the blades in said wheel-sections; a steam-controlling valve located in the exhaust-duct of said turbine; a governor for controlling the escape of said exhaust-steam; means for communicating motion from the shaft of the turbine to said governor; and means for communicating motion from said governor to said steam-controlling valve, all substantially as and for the purpose specified.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN A. HELLWEG.

Witnesses:
JAS. B. ERWIN,
E. P. HAYES.