No. 777,763.

PATENTED DEC. 20, 1904.

L. WILSON.

TURBINE MOTOR.

APPLICATION FILED FEB. 17, 1904.

NO MODEL.

4 SHEETS—SHEET 1.

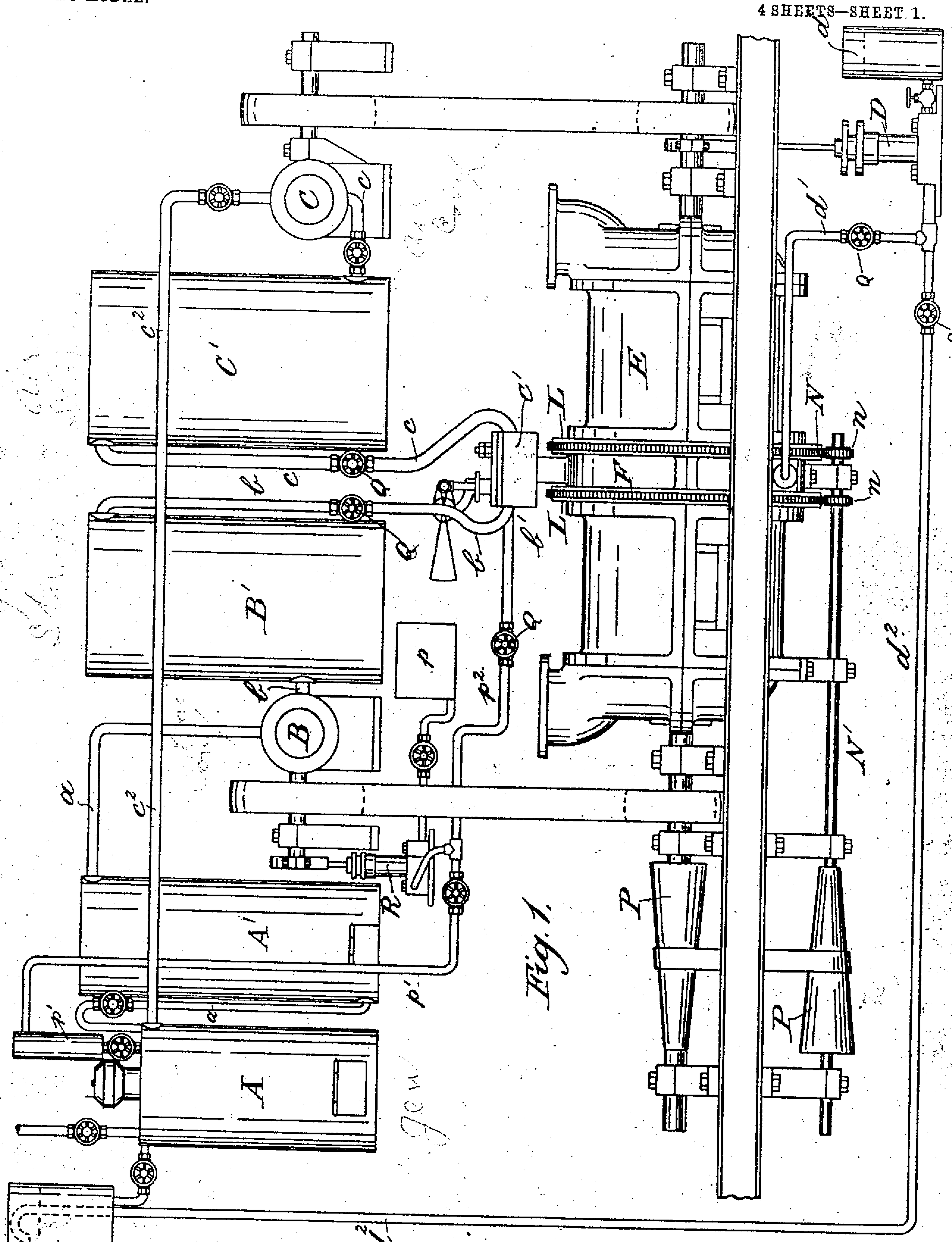


Fig. 1.

WITNESSES

Wm. Kuhn

Wm. M. Golden Jr.

INVENTOR

Lida Wilson

BY Richards & Co

ATTORNEYS

No. 777,763. PATENTED DEC. 20, 1904.

L. WILSON.

TURBINE MOTOR.

APPLICATION FILED FEB. 17, 1904.

NO MODEL. 4 SHEETS—SHEET 2

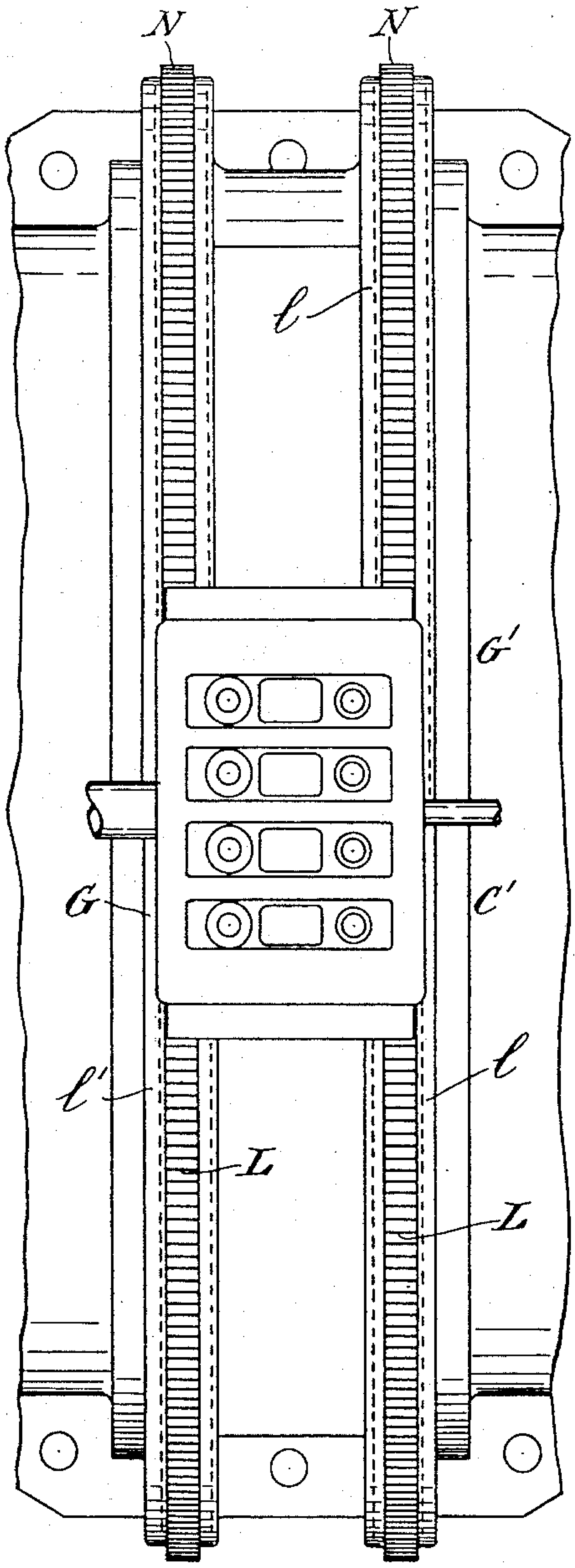


Fig. 3.

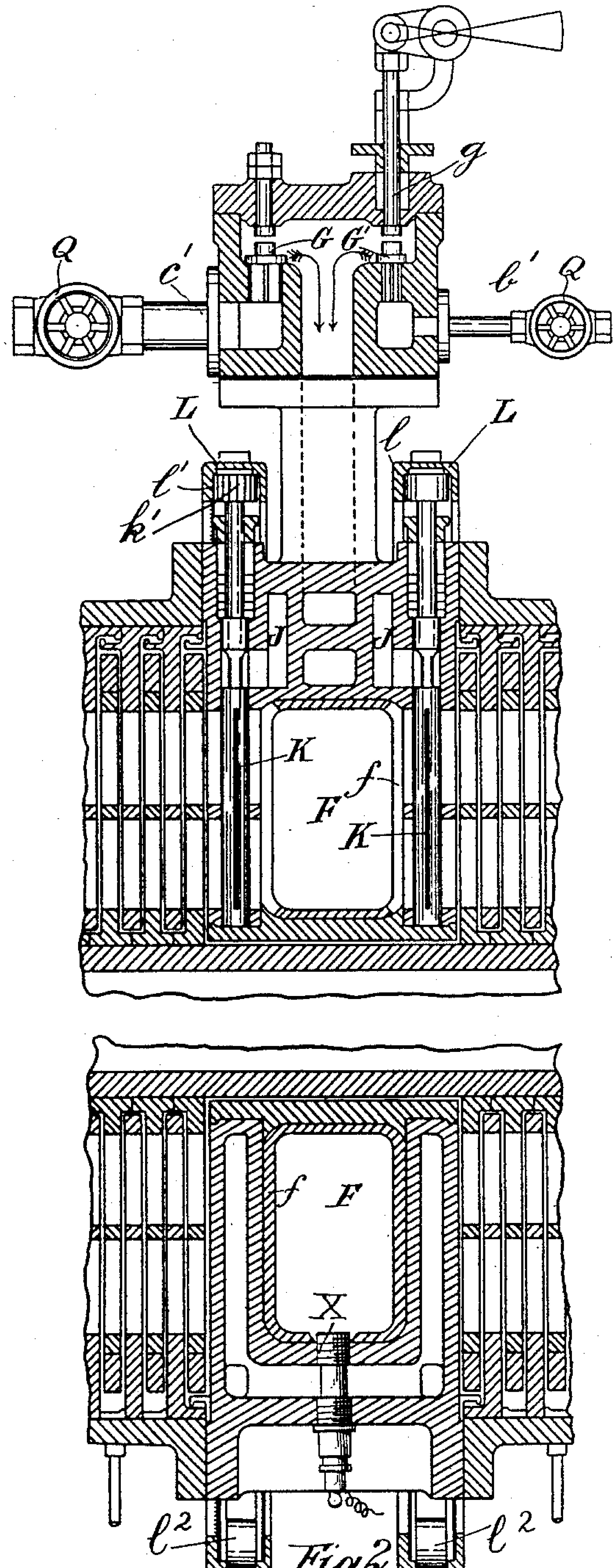


Fig. 2.

WITNESSES

Wm. Kuehne

Wm M Golden Jr.

INVENTOR

Lida Wilson

By Richards & Co

ATTORNEYS

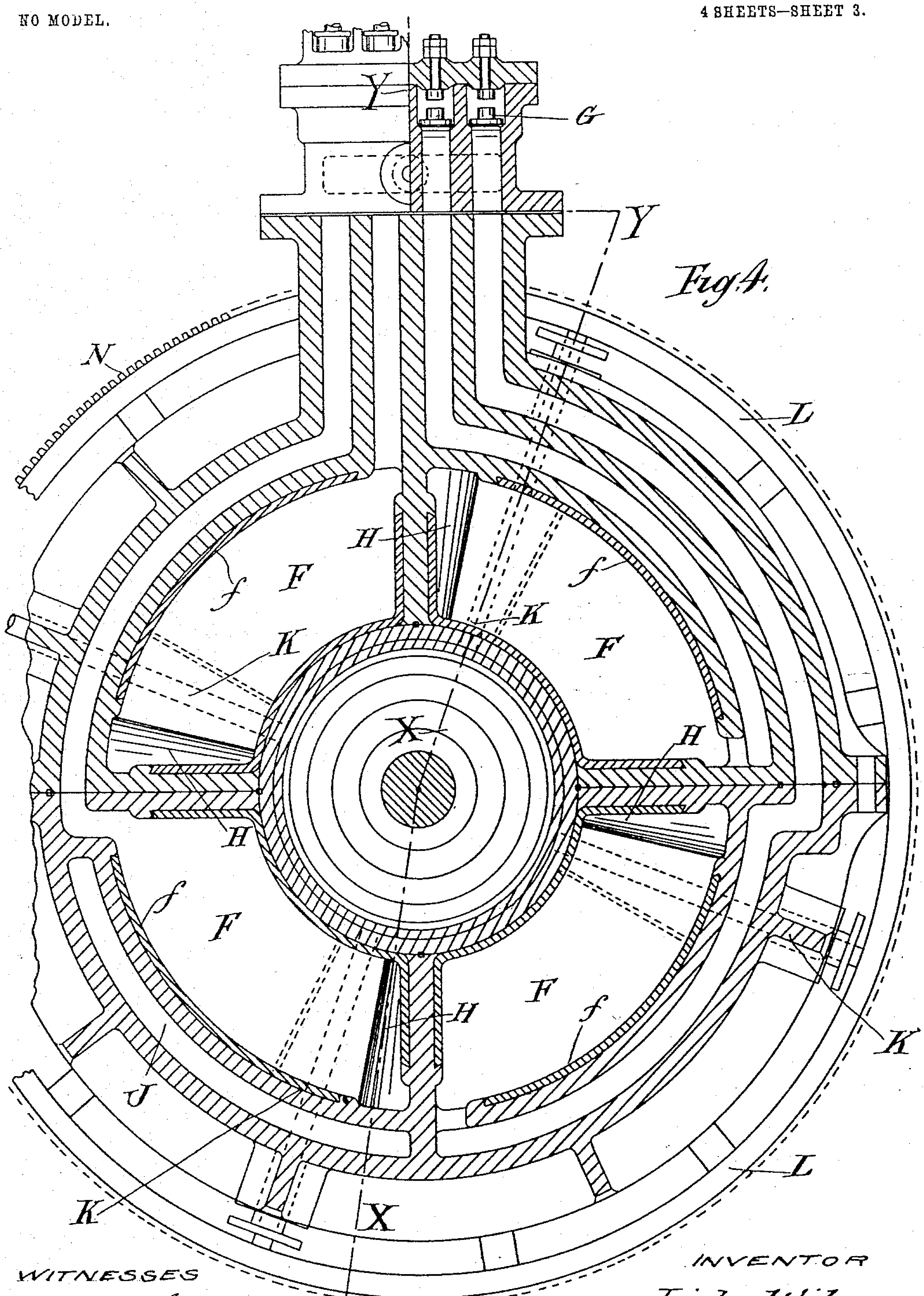
No. 777,763. PATENTED DEC. 20, 1904.

L. WILSON.

TURBINE MOTOR.

APPLICATION FILED FEB. 17, 1904.

NO MODEL. 4 SHEETS—SHEET 3.



WITNESSES

Wm. Kuehne

Wm M. Golden Jr.

INVENTOR

Lida Wilson

By Richards & Co.

ATTORNEYS

No. 777,763. PATENTED DEC. 20, 1904.

L. WILSON.

TURBINE MOTOR.

APPLICATION FILED FEB. 17, 1904.

NO MODEL. 4 SHEETS—SHEET 4.

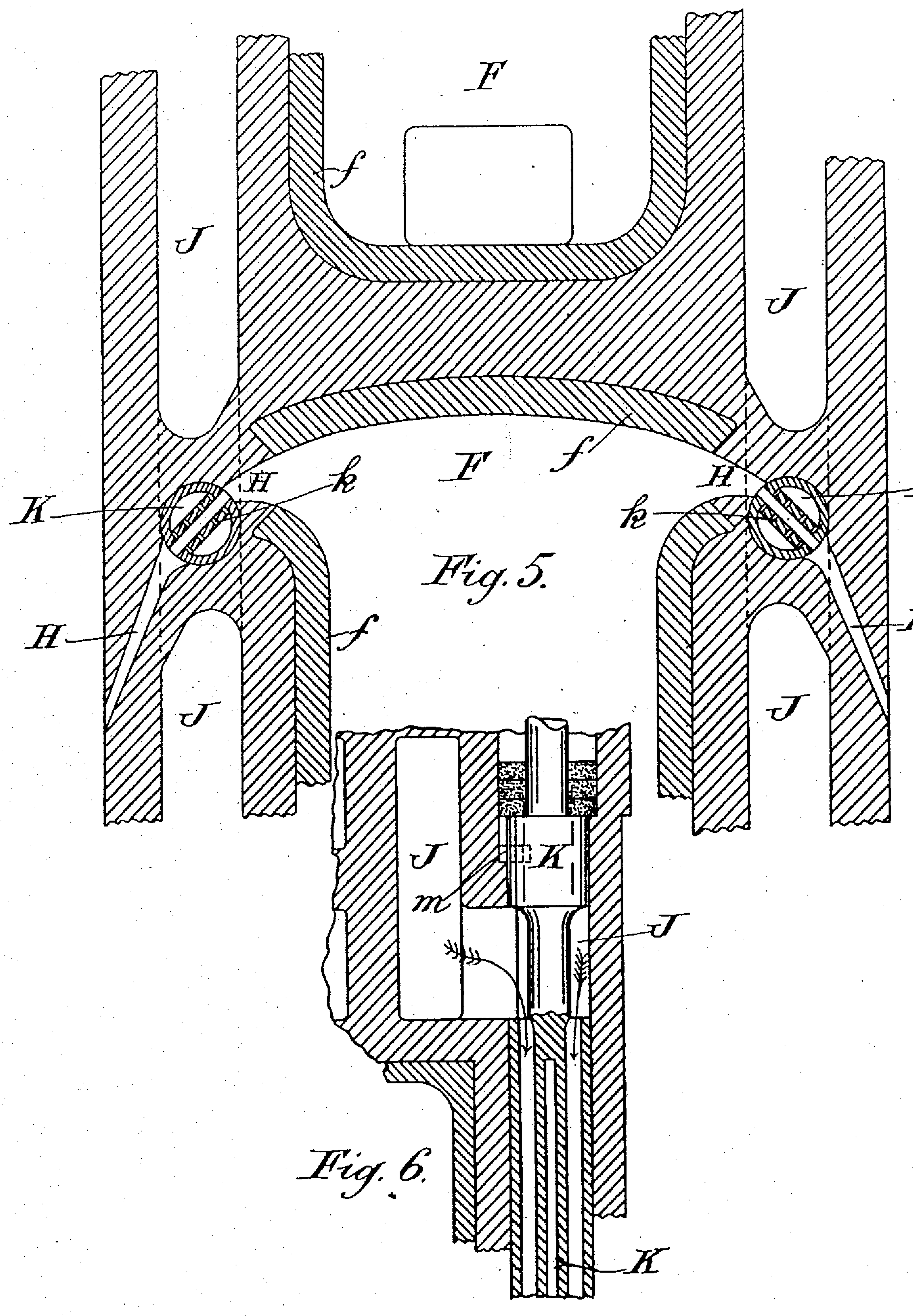


Fig. 5.

Fig. 6.

WITNESSES
Wm. Kuehne
Wm M. Golden Jr.

INVENTOR
Lida Wilson

By Richards & Co
ATTORNEYS

UNITED STATES PATENT OFFICE.

LIDA WILSON, OF GLASGOW, SCOTLAND.

TURBINE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 777,763, dated December 20, 1904.

Application filed February 17, 1904. Serial No. 194,036.

To all whom it may concern:

Be it known that I, LIDA WILSON, a citizen of the United States of America, whose present address is care of the United States consulate, Glasgow, Scotland, have invented a certain new and useful Improvement in and Relating to Turbine-Motors, of which the following is a specification.

This invention relates to an improvement in turbine-motors operated by pressure derived from combustible liquids or gases which expand by combustion with air or oxygen, and has for its object to effect more progressive and better combustion and expansion, the more effectual clearance out of the burned products of the preceding charges from the combustion-chamber, and the more effectual cooling of the nozzles and turbine-blades and of the hot gas from the combustion-chambers before its impact on the said blades without detracting from the efficiency of the gases of combustion.

To carry this invention into effect, I provide compression-pumps of any known convenient type, by one of which pumps a combustible liquid or a gas—such as producer-gas, blast-furnace gas, coal, oil, or other gas—is compressed and delivered at a determined pressure by suitable pipes to a combustion-chamber associated with a turbine-motor. Similarly another compression-pump collects and delivers charges of air or oxygen at any required pressure, the same being also delivered through suitable pipes to the said combustion-chamber. Another pump forces water to the turbine-nozzle valves through pipes.

The form of device to which the present system is particularly applicable is a turbine-motor situated in proximity to a chamber or chambers to receive the charges of air and combustible fluid under pressure, as before mentioned, and from which the products of their combustion impact through suitable nozzles upon rotatable blades attached to the turbine-shaft and are by them deflected onto fixed blades attached to the casing of the turbine and by them again deflected onto other rotatable blades in manner well known, or rotatable blades only may be employed to receive the impact of the products of combustion without the intervention of the deflecting fixed blades.

Figure 1 shows diagrammatically a convenient arrangement of plant for the purpose. The arrangement may be varied without departing from my invention. Fig. 2 is a sectional view of the inlet-valves and combustion-chambers of the turbine through a broken sectional line *x x y y* on Fig. 4. Fig. 3 is a plan of the same. Fig. 4 is a transverse section through the said combustion-chambers. Fig. 5 is an enlarged section through the discharge-nozzle from the said combustion-chambers. Fig. 6 is an enlarged sectional view of the top of nozzle-valve, showing apertures for access of water to its interior.

A represents a gas-producer furnace of any convenient construction. *a* is the connection from the said producer for the conduct of the combustible fluid through a dust-collector A′ to the compression-pump B, *b* representing the pipe connections therefrom through a collecting-chamber B′ to the inlets *b′* to the combustion-chamber F of the turbine E. C is a second compression-pump collecting air or oxygen and delivering the same at suitable pressure by the pipes *c* through a collecting-chamber C′ to the inlets *c′* of the combustion-chamber of the turbine. Further, the said air-pump C compresses and delivers air through the pipe c^2 to the gas-producer A.

D is a water-pump drawing water, say, from a supply-tank *d* and discharging water at suitable pressure through the pipes *d′* to certain hollow valves situated in the nozzles leading from the combustion-chambers F of the turbine and to the water-jacket thereof, as hereinafter more particularly described, and also by the pipe d^2 to a gravity-feed tank d^3 communicating with the gas-producer A.

R is a pump driven conveniently from one of the compression-engines, drawing combustible liquid from a supply-tank *p* and delivering it either by the pipe *p′* to the gas-producer A or direct by the pipe p^2 to the inlets *b′* of the combustion-chamber F of the turbine.

N′ is a counter-shaft driven by cones P and belting or gears from the turbine-shaft for driving the rotatable valves in the exit-nozzles of the combustion-chambers F.

E is the body of the turbine-motor of any convenient construction as regards its internal arrangement of vanes or blades, F being a combustion-chamber attached thereto. There may be many combustion-chambers attached to the same turbine. The combustion-chambers F are lined with a highly heat-refractory material *f*. The supply of air or oxygen and combustible liquid or gas is introduced into them in relatively proportional quantities, so as to insure perfect combustion. To initiate such combustion, I may employ an electric spark in manner well known, and therefore not shown, until the internal heating of the lining *f* of the said combustion-chamber produced by continued combustion therein will suffice to cause the combustion.

In each of the inlet-pipes *c'* and *b'* I provide a check-valve G and G', respectively, which will close by back pressure from the combustion-chamber. The valves G' are controlled as to the extent of their opening by a stop *g*, operated from a speed-governor of any convenient form.

H, Fig. 5, represents the nozzles from the combustion-chamber leading to the rotatable turbine-vanes, which nozzles are provided near to their orifice of issue next to the said vanes with valves K, serving, as hereinafter described, to alternately open and close the nozzle-outlets, and thus to permit successive discharges of the products of combustion at high pressure from the said combustion-chambers onto the rotatable vanes of the turbine, which are illustrated as on each side of the combustion-chamber; but they may be arranged on only one side thereof.

To effect more progressive and better combustion and greater pressure therefrom of a combustible liquid or gas and a more complete clearance out of the burned products of the preceding charge from the combustion-chambers, I deliver the air thereto either at a higher pressure than that of the combustible fluid or if the respective pressures of air and combustible fluid are maintained equal I make the check-valve G on the air-inlet *c'* lighter in proportion to its area than that of the combustible-fluid-inlet check-valve G', the result in either case being that the air-inlet check-valve G opens sooner and remains open later for each charge than that on the combustible-fluid inlet G', so that the air which enters the combustion-chamber first sweeps out the burned products remaining therein from the previous charge and fills the combustion-chamber with a fresh supply of air into which the combustible fluid enters and burns with a continuous increase of pressure until such pressure suffices to close the check-valve G' of the combustible-fluid inlet. The air, however, continues to enter the combustion-chamber until the pressure therein closes the air-inlet check-valve G, so that the air-supply commences sooner and continues later for each charge than that of the combustible fluid, thereby insuring complete progressive combustion and consequent greater pressure, owing to the excess of air present in the combustion-chambers at the right moments. All these results, however, could not be properly attained by merely making the air-inlet and consequent supply of air greater than that of the combustible. The air must be delivered into the combustion-chambers at the right moments and in right quantities. The quantity of air supplied must always be sufficient to entirely consume the combustible fluid supplied.

It is advantageous to introduce both the air and combustible fluid hot to the combustion-chambers. This is effected by the considerable length of the passages in metallic connection with the walls of the combustion-chamber or chambers traversed by the air and combustible fluid before entering the combustion-chamber proper. The heat of combustion of the gases leaving the combustion-chambers may be reduced in the nozzles H by a spray of pure or distilled water (which will not deposit a crust or scale) delivered at any convenient points thereof. The water, should any pass unvaporized through the nozzles or be subsequently condensed in the turbine, may be removed from the inside of the turbine by troughs arranged in proximity to the casing and by pipes and traps, as patented to me in the United States under No. 733,105. The valves K, situated in the nozzles H, as hereinbefore stated, are hollow and punctured with small holes *k* to permit water admitted under pressure from the water-pump D or from the water-jackets J to be sprayed on the hot gases passing through the said valves before entering the turbine. These rotatable valves may be provided with the water-spray outlets from their hollows, so arranged that the sprays of water may flow freely from the outlets *k*, opening into the throughway of the valves, when said throughway is opened by the rotation of the valves in the nozzle-cylinder in which they are placed. The nozzles and the combustion-chambers are water-jacketed at J, the hot water therefrom used for the aforesaid sprays being conducted between the water-jackets and valves by suitable apertures. All water used inside the nozzles, their valves, or otherwise entering the turbine should be pure or distilled water, which will not deposit a scale or crust therein or thereon. The respective water, air, and combustible-fluid inlet pipes are provided with valves Q (in addition to the check-valves G and G') to regulate the flow therein.

The rotatable nozzle-valves K are opened and closed for each charge either by gears, connecting-rods, and cranks or by frictional surfaces. A convenient arrangement by means of the latter is to operate alternately upon opposite sides of the stems of the valves K by frictional surfaces l, spaced alternately upon the cheeks of rings L, rotating around and supported outside the turbine-casing on rollers l^2, Fig. 2, so that when one frictional surface spaced on one ring is in contact with one side of a valve-stem it rotates it in one direction to close it and when the next alternately-spaced frictional surface on the other ring is in contact with the opposite side of the valve-stem it rotates it in the opposite direction to open it. Studs m, Fig. 6, are affixed to the valve-stems to prevent the frictional surfaces from rotating the valve-stems too far in either direction, so that when the studs oppose further rotation of the valve-stem in either direction the corresponding frictional surface slips on the valve-stem. The rings may be separate, arranged to operate on opposite sides of the valve-stems, or be of an inverted-trough shape to embrace over the valve-stem head; but in any case the ring or rings should be provided with gear-teeth N upon or near their outer periphery, operated by corresponding geared wheels n, Fig. 1, of suitable size to rotate the ring or rings at the desired speed and mounted on a counter-shaft N′, driven by gearing or preferably by differential cone-pulleys P, (connected by a belt, as is well understood,) one on the counter-shaft, the other on the turbine-shaft. By employing cone-pulleys and shifting the belt thereon the speed of the counter-shaft is readily adjustable, and thereby the speed of semirotation of the valve-stems increased or decreased, with the consequent greater or less number of charges permitted to pass out from the combustion-chambers to the turbine and consequent greater or less total driving effect upon the turbine-blades. The position of the belt on the cone-pulleys may be controlled by a suitable speed-governor. Alternatively I may rotate the nozzle-valves K by gears l', the valves K in this case being turned uniformly in one direction of rotation and are provided with teeth-pinions k' on their outer spindles or stems, which are actuated by corresponding toothed gear l' on the ring L, surrounding them and supported on rollers. In this case instead of said ring having alternately-spaced opposite frictional surfaces, as hereinbefore described, it has gear-teeth l' on one face meshing into the gear-teeth of the pinions k' on the nozzle-valve stems, which are thus rotated uniformly in one direction, the throughway of the plug-valve being open for the passage of gas as it is turned past the open nozzle. The valve-plug and walls of the nozzle surrounding it are lubricated by the water from the interior of the plug-valve entering the throughway as it is turned. To prevent water in the throughway when accumulated there under pressure from entering the combustion-chamber at the moment the throughway is opened to the nozzle, the width of the nozzle-way orifice from the valve toward the rotatable blades of the turbine is made wider than at the inner side next the combustion-chamber, so that water contained in the throughway may have a "lead" to escape from it outwardly toward the turbine-blades before it opens toward the combustion-chamber.

Having now described my invention, I declare that what I claim, and desire to secure by Letters Patent, is—

1. In combination, a turbine-motor; a combustion-chamber adjacent to axial passages traversed by the rotatable blades of the turbine and in communication therewith; one or more nozzles affording outlets from the combustion-chamber arranged at suitable angles to the rotatable blades of the turbine; apertured hollow rotatable valves, in such nozzles; means for the supply of water to the hollow body of such valves spraying the water from such apertured valves into the nozzles, onto the hot gas passing therethrough, and thereby onto the rotatable blades of the turbine.

2. In combination, a turbine-motor; a combustion-chamber adjacent to the rotatable blades of the turbine and in communication therewith; one or more nozzles affording outlet from the combustion-chamber to the rotatable blades of the turbine; water-jacketing about such nozzles; suitable means of supply of water to such water-jacketing; rotatable hollow valves in such nozzles; means of access for water to the interior of the hollow valves; and apertures in the walls of such hollow valves for the spraying of water onto the gas passing through them and onto the nozzles and thereby onto the blades of the turbine.

3. In combination, a turbine-motor; a combustion-chamber adjacent to the rotatable blades of the turbine and in communication therewith by one or more nozzles; rotatable valves in such nozzles; ring-gear externally engaging with and adapted to rotate the stems of the said valves; gear-teeth upon the external periphery of the said ring; a counter-shaft gearing with such ring-gear teeth by a suitable pinion; and connections from the turbine-shaft to the said counter-shaft adapted to permit variation of the frequency of the opening and closing of the nozzles by said valves.

In witness whereof I have hereunto set my hand in presence of two witnesses.

LIDA WILSON.

Witnesses:
JOHN MCFADZLAN,
ROBERT THOMSON.