G. S. RANSTEAD.

HEADLIGHT ENGINE AND GOVERNING MECHANISM THEREFOR.

APPLICATION FILED FEB. 23, 1912.

1,113,484.

Patented Oct. 13, 1914.

3 SHEETS—SHEET 1.

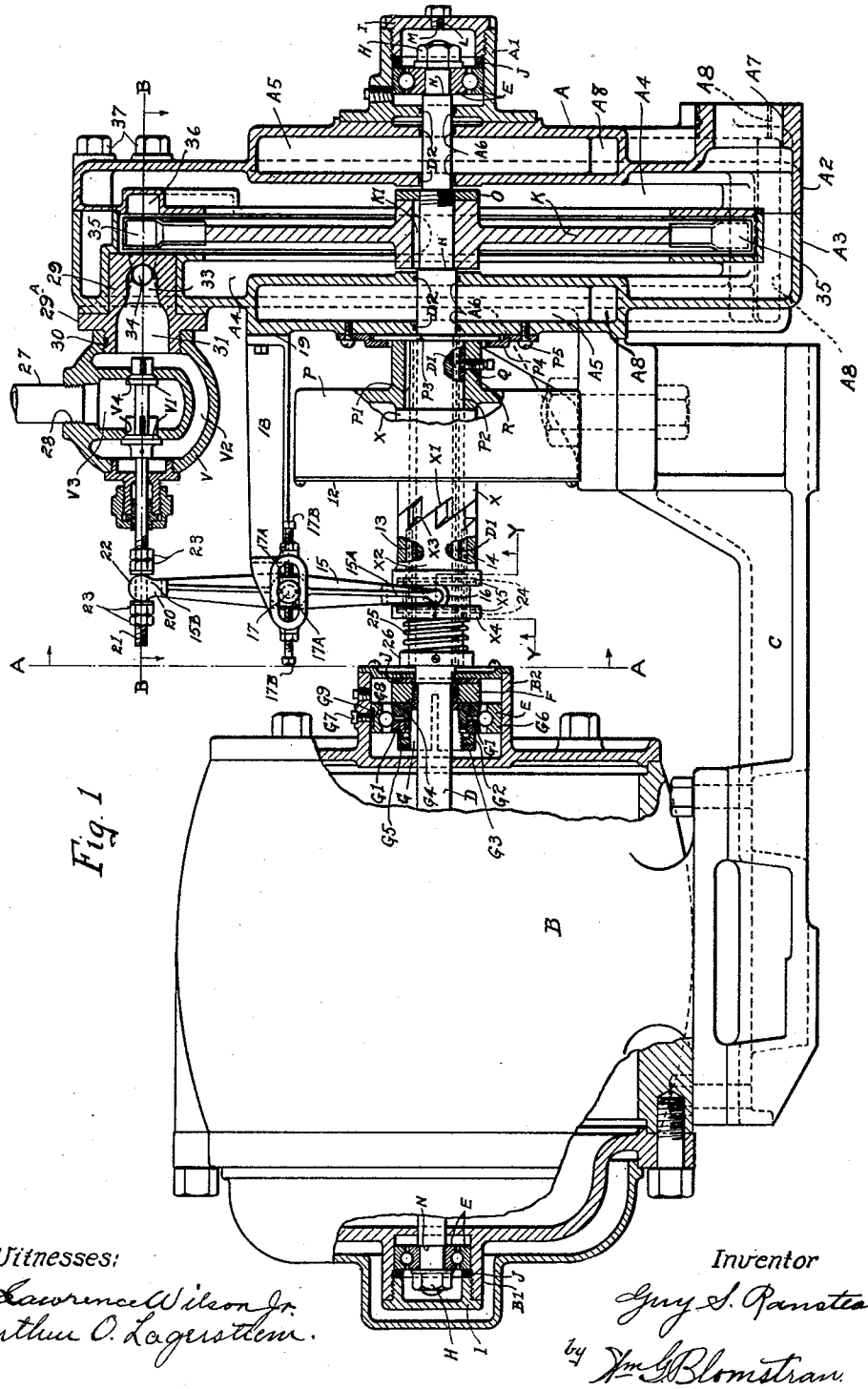


Fig. 1

Witnesses:

Lawrence Wilson Jr.

Arthur O. Lagerstrom.

Inventor

Guy S. Ranstead

by Wm. G. Blomstrom

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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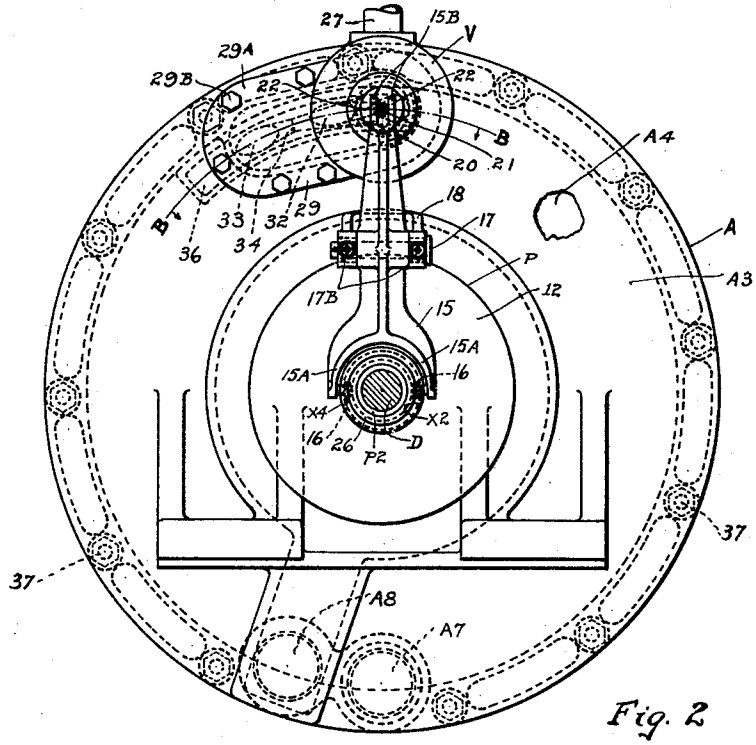


Fig. 2

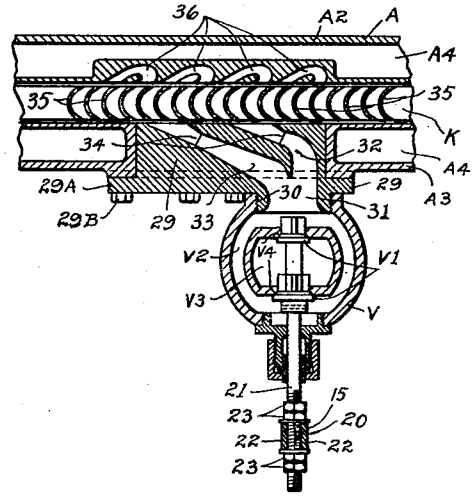


Fig. 3

Witnesses:

Lawrence Wilson Jr.

Arthur O. Lagerstrom

Inventor

Guy S. Ranstead

by Wm G. Blomstrom.

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 3.

Fig. 4

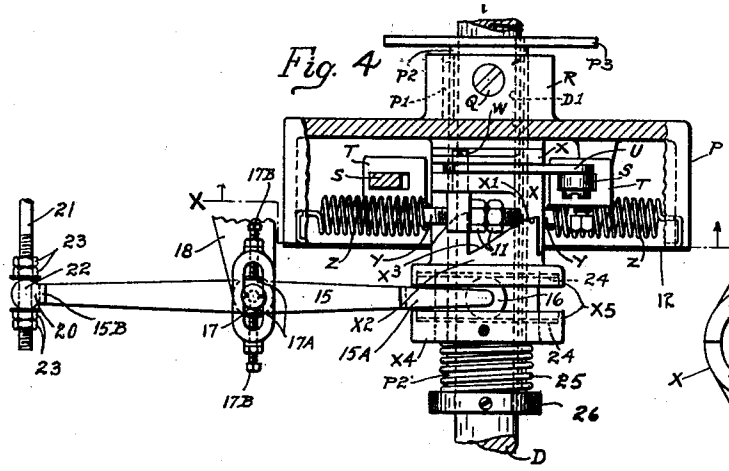


Fig. 7

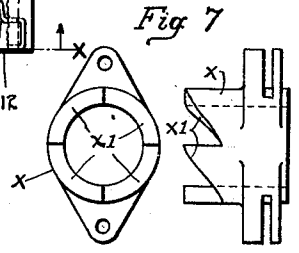


Fig. 8

Fig. 5

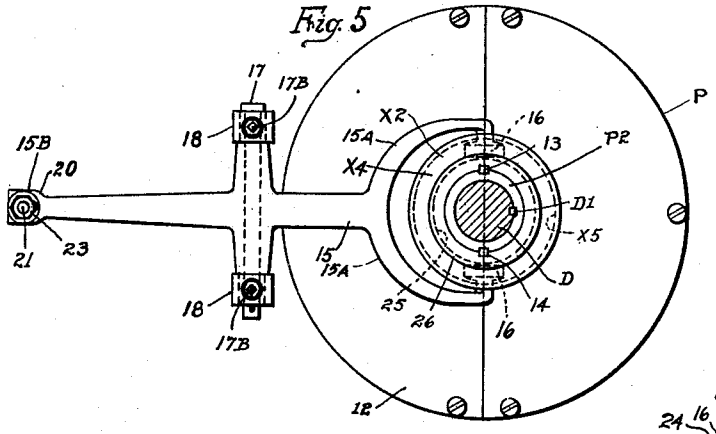


Fig. 9

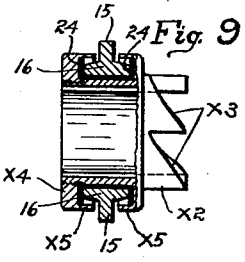


Fig. 10

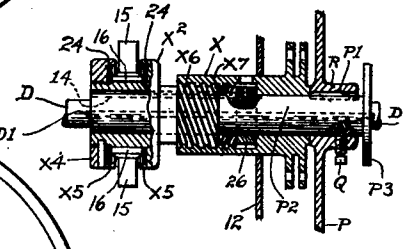
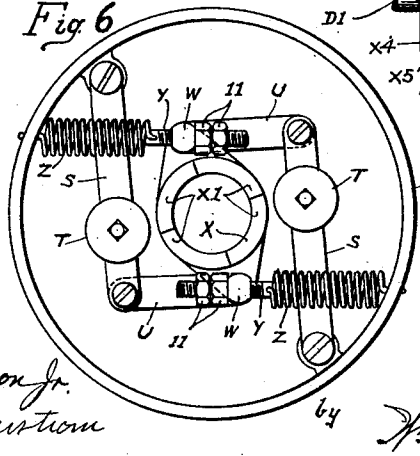


Fig. 6



Witnesses

Lawrence Wilson Jr.

Arthur O. Lagerstrom

Inventor

Guy S. Ranstead.

by Wm. G. Blomstrom.

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GUY SYDNEY RANSTEAD, OF CHICAGO, ILLINOIS.

HEADLIGHT-ENGINE AND GOVERNING MECHANISM THEREFOR.

1,113,484. Specification of Letters Patent. **Patented Oct. 13, 1914.**

Application filed February 23, 1912. Serial No. 679,235.

To all whom it may concern:

Be it known that I, GUY SYDNEY RANSTEAD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Headlight-Engines and Governing Mechanism Therefor, of which the following is a specification.

My invention relates more particularly to improvements in headlight engines of the turbine type together with a novel governing mechanism, the features of which will hereinafter be particularly pointed out; and the objects of my improvements are, first, to construct an engine of the turbine type in which the steam or fluid will be utilized to a greater and more economical advantage than present engines of the turbine type; second, to provide a governing mechanism which will effectually and economically control the amount of steam or fluid through the engine; third, to provide a means for substantially preventing the steam from escaping from within the casing through the bore of the shaft bearings of the turbine; fourth, to provide means for substantially taking up the longitudinal wear of the engine shaft without affecting the adjustment of the governing mechanism; fifth, to provide means for preventing the adjustment of the governing mechanism from being affected by the longitudinal movement of the engine shaft; sixth, to provide means by which the wear caused by the gyratory motion of the engine shaft can be readily and substantially taken up.

Other objects of my improvements will present themselves in the drawings and be more particularly described in the following specification.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1, Sheet 1, is a longitudinal elevation of my invention, partly in section, disclosing in part, my improvements embodied therein. Fig. 2, Sheet 2, is a section taken on line A—A of Fig. 1 on a smaller scale. Fig. 3, Sheet 2, is a section taken on line B—B of Figs. 1 and 2, disclosing in particular, the buckets or vanes on the rotor of the engine and the steam redirecting chambers or pockets in the engine casing, and, the inlet ports. Fig. 4, Sheet 3, is a side view of the governing mechanism as mounted on the engine shaft; the casing therefor being partly in section to disclose more in detail the governing mechanism. Fig. 5, Sheet 3, is an end view of Fig. 4. Fig. 6, Sheet 3, is a section taken on line X—X of Fig. 4, with the engine shaft removed. Fig. 7, Sheet 3, is an end view in detail of the oscillating governor cam. Fig. 8, Sheet 3, is a side view of Fig. 7. Fig. 9, Sheet 3, is a section taken on line Y—Y of Fig. 1, Sheet 1, (on a different scale and with the engine shaft and sleeve removed) showing more in detail, the construction of the valve lever operating cam. Fig. 10, Sheet 3, is a modification of part of the governing mechanism shown in Figs. 8 and 9, and to be known respectively as the oscillating governor cam and the valve lever operating cam; said modification, and other parts (to be described later), are shown partly in section and partly in full.

Similar letters refer to similar parts throughout the several views.

In the views 1, 2 and 3, (A) represents the turbine, (B) represents the generator, and (C) represents the base to which both the turbine (A) and the generator (B) are secured, making substantially a self-contained unit. This arrangement maintains practically, rigidity and alinement. It will also be particularly noted that the points of bearing, or the bearings, are spaced substantially equidistant, so that any gyratory motion of the revolving shaft (D) is brought down to the minimum. It will be further noted that the shaft (D) is supported in self-contained roller, or ball bearings (E) secured in the journals (A^1), (B^1) and (B^2) of the turbine and generator respectively. The journals are constructed to contain oil for lubrication of the bearings; there being means provided for filling in the oil.

The generator (B) (the conductors and commutator, etc., not shown) is of the ordinary electric generator or dynamo type, with the exception of the bearings and journal boxes, there being in the central bearing, means for taking up the wear caused by the gyratory motion of the shaft (D). In said bearing is a take-up nut (F) for drawing the split cone sleeve (G) into the compound internal cone roller, or ball container (G^1). Drawing said sleeve (G) into said container (G^1) causes said sleeve (G) to clamp se-

curely on the shaft (D). At the opposite end from the take-up nut (F) on said cone sleeve (G), is a flanged adjusting nut (G^2) and a lock nut (G^3). After the proper adjustment of the nuts (G^2) and (G^3), and the sleeve (G) has been adjusted to its proper location and secured, it will be seen, by referring to Fig. 1, that by any further tightening up of the nut (F), forces the right hand half (G^4) of the container (G^1) into the left hand (G^5) of the container (G^1), and as (G^5) is backed by the nut (G^2), substantially forces same in the opposite direction to (G^4), thereby filling in the space that was originally occupied by the balls and ball races of said central ball bearing (E) before the reduction of the balls and the enlargement of the ball races took place, caused by the gyratory motion of the shaft (D). The annular ring, or ball race, (G^6) is slidably mounted in the journal (B^2), but secured from turning with the shaft and ball bearings by a shouldered screw or screws (G^7). The end (G^8) of the screw (G^7) projects in the slot or groove (G^9) of said ring (G^6) which permits of the bearing (E) being carried along with the longitudinal movement of the shaft (D), if such movement occurs. On the extremities of the shaft (D) is provided nuts (H) for taking up the longitudinal wear.

The journals (A^1), (B^1) and (B^2) are provided with screw caps (I); making them dust proof. Between the caps (I) and the bearings (E) are liner rings (J) which can, from time to time, be increased to make up for longitudinal wear. This arrangement also permits of adjusting the rotor (K) of the turbine engine (A) to its proper position. In one of the screw caps (I), is provided a screw hole (L) in which a screw (M) is inserted. On removal of this screw (M) a speedometer can be inserted in place thereof and pressed against the shaft (D). The shaft (D) is shouldered at several places, as at (N), for the proper alinement of the rotor (K) and the armature of the generator (B); the armature not being shown. The rotor (K), as will be seen, is keyed to the shaft, preferably by a Woodruff key (K^1), and secured from longitudinal movement, against the shoulder (N), by the screw collar (O). Intermediate (A) and (B), and upon the shaft (D), is disposed and secured the governing mechanism, including the balance valve (V).

The governing mechanism, together with the balance valve (V) are composed of the parts as follows:—The casing (P) is keyed to a sleeve, by a key (P^1), but held from longitudinal movement, by a shouldered screw (Q) through the casing hub (R) and in the sleeve (P^2), which is feathered on the shaft (D) by the feather key (D^1) secured in said shaft (D). The sleeve (P^2) has a flange (P^3) which is rotatably secured against the engine casing (A) and held from longitudinal movement with the shaft (D), by the flanged ring (P^4) which is secured to said casing (A) by screws (P^5). In the casing (P), are pivotally secured, weight arms (S), to which are adjustably secured weights (T). To the free end of the weight arms (S), is pivotally secured a link (U) connecting said weight arms to pivot pins (W), pivotally secured in the oscillating governor cam (X), which is mounted on said sleeve (P^2). Through one end of the pins (W) is passed a tension screw (Y), one end being secured to balance or governor springs (Z). On the free end of said screws (Y) are lock nuts (11) for adjusting the tension of the balance springs (Z). Together with the balance springs, and means for adjusting same, and the adjustable weights, it will be seen that a very delicate, but substantial and practical adjustment can be maintained for any desired speed, this feature being one of the main objects of the invention. On the open side of the casing (P) is a cover (12) secured, to prevent dust and foreign substances from entering into same and clogging up the joints, etc. It will be particularly noted in Figs. 1, 4, 6, 7, 8 and 9, that the oscillating governor sleeve (X) has on one end, cam surfaces (X^1) which mesh into corresponding cam surfaces (X^3) in the valve lever operating cam sleeve (X^2), so that when any slight movement of the governor weights (T) occur, due to the high excessive speed of the turbine throwing the governor weights (T), outwardly of the shaft, causes the cam (X) to oscillate and force the lever operating cam (X^2) longitudinally of the shaft (D). Said cam (X^2) is slidably mounted on the sleeve (P^2), and is prevented from rotating about the sleeve (P^2) by feather keys (13) and (14) secured in said sleeve (P^2). In Figs. 9 and 10 particularly, it will be seen that (X^2) is made up of two parts, (X^3) and (X^4) to accommodate the construction of the valve lever (15) at (16). The lever (15) is pivotally hung on a pin (17) mounted in adjustable bearings (17^A), adjustably secured by adjusting screws (17^B) in the bracket (18) which is fastened to the turbine (A) at (19). At the end (20) of the lever (15) said end is forked to straddle the valve stem (21).

The forked members (15^A) and (15^B) of the lever (15) are enlarged, as at (16) and (22), to allow for free movement of said lever (15) to and from its normal position. Valve stem (21) is provided with two pairs of adjusting lock nuts (23), which permit of adjusting the valve disks (V^1) to their proper relation with the said governing cams and valve seats. Also, on either side of the enlarged ends (16) of the lever (15) are fiber rings or washers (24) which can

be replaced or renewed from time to time, as wear requires. The parts (X^2) and (X^4) are flanged, as at (X^5), to prevent oil from being thrown, from the recess formed by said flange, by the centrifugal force due to the high speed of the engine. In Fig. 10, will be seen a modification of the oscillating governor cam (X), and the valve lever operating cam (X^2), in which screw threads of the proper pitch are employed instead of the cam surfaces (X^1) and (X^3). With this arrangement, the necessity of having an auxiliary spring (25) to keep the valve lever operator (X^2) in its proper relation with the oscillating governor (X) is done away with. It being quite evident, however, that in order to keep said cam surfaces in contact with each other, said spring must necessarily be employed; but in the modification, it will be seen that the adjacent or coöperating ends of the oscillating governor (X) and said lever operator (X^2) have respectively, coöperating screw threads (X^6) and (X^7), which, when any oscillating movement of (X) occurs, (X^2) will be moved longitudinally of the shaft (D). In order to prevent (X) from longitudinal movement on the sleeve (P^2), a set collar (26) is employed. This collar (26) or a similar one, is also used as a backing for the auxiliary spring (25) when said cam arrangement is employed.

The valve (V) as before stated is of the balanced type, and has the usual packing gland and nut for making steam-tight the bore through which the valve stem (21) passes. Said valve (V) has a steam inlet pipe (27) screwed in the opening (28) of the valve body. In said pipe (27) an ordinary valve is inserted for controlling the supply of steam to the turbine. The valve (V) is screwed on a block (29) at (30); said block (29) extends inwardly of the casing (A^3) and secured thereto by bolts (29^B) through the flange (29^A). The block (29) has a bore (31) communicating with the chamber (V^2) of the valve (V). This bore (31) communicates also with two angular bores (32) and (33), in the block (29), which lead angularly in the direction of rotation of the rotor (K). These bores (32) and (33) are contracted intermediate their extremities, as at (34). This construction has the same effect upon the flow of steam, as does the Venturi meter upon the flow of water. The bores (32) and (33) lead to and direct the steam into the vanes or buckets (35) of the rotor (K). But the velocity of the steam is always greater than that of the buckets (35), and so continues on beyond said buckets into backwardly inclined curved openings (36) and is directed further with substantially the same velocity and force as the initial steam against oncoming buckets, forward or backward of the inlet ports (32) and (33). With this arrangement it is quite evident that the force of the steam is utilized to a greater and more economical advantage than present engines of this type of turbine.

The casing of the turbine (A) is made in two halves, (A^2) and (A^3), forming an inclosure for the rotor (K), and as well, an expansion chamber (A^4) for the exhaust steam. The two halves have each an expansion chamber (A^5), through which the shaft (D) passes. The bores (A^6) of the casing (A^2) and (A^3) have a smooth working fit for said shaft (D). But, it has been heretofore, quite a difficult matter to prevent the steam escaping where the moving parts pass through the casing of the turbine, especially around the shaft; even water pockets, and packing joints of different kinds have been tried without avail; so in order to overcome this difficulty, I construct the auxiliary expansion chambers (A^5) as shown in Figs. 1 and 2, and, also provide packing rings (D^2) as ordinarily used on pistons, as a further precaution for preventing steam from escaping around the shaft (D) through the bores (A^6). The steam after it has left the buckets (35) expands into the chamber (A^4) and thence passes out through the exhaust port (A^7) into an exhaust pipe, (not shown). When the steam has entered into the chamber (A^5) it loses practically most all of its expansion force; but nevertheless there is substantially enough force left to possibly cause same, due to its pressure, to force its way from the chamber (A^4), other than through the exhaust port (A^7); and so, what little steam may pass from the chamber (A^4) through the bore (A^6) around the shaft (D) into the auxiliary chambers (A^5), further expands substantially to its practical limit, so that no force is left therein, except to pass from the casing through an auxiliary port (A^8), (the path of least resistance), which communicates with each of said chambers (A^5) and the exhaust pipe, (not shown). The two halves of the turbine (A) are secured to each other by bolts 37.

Referring to Fig. 1, it will be seen that the valve (V) is closed; being the position maintained until the engine has slowed down to its normal speed or speed required.

As regards the operation of the above described mechanism, it will be understood that the said valve, and valve governing mechanism, are in their respective normal or relatively opened positions on starting; that is:—when no steam or force is applied to the turbine rotor, the governor springs (Z) together with the auxiliary spring (26), (in case that is used), force back the valve governing or controlling parts to said normal or opened position. Therefore, when the steam, in this case, is turned on, it enters

from the pipe (27) into the valve chamber (V^3), thence through the valve ports (V^4) into the chamber (V^2), thence through the ports (32) and (33) onto the blades or buckets (35) of the turbine rotor (K), causing same to rotate. When the speed of said rotor (K) has attained any speed over a certain limit, the governing mechanism being indirectly a part of the rotor (K), is at once acted upon by the centrifugal force, throwing, as before stated, the weights outwardly of the shaft. Therefore, the weights being operatively connected with the valve operating lever and also to the governor springs, moves said lever which closes the valve to its abnormal position.

It will be seen by referring to the several views and particularly to Fig. 1, that my construction is, in comparison with the types of engines for similar purposes, very compact, which is an important item to users as well as to manufacturers of this type of mechanism. Simplicity of construction is another important feature taken into consideration in my improvements as set forth, which is also not overlooked by the users and buyers of these engines.

Having thus described my invention, it will be seen that the minor details of my construction can be altered in many ways without departing from the spirit of my invention, but

What I claim and desire to secure by Letters Patent is—

1. The combination in a turbine engine governing mechanism, of, a sleeve feathered to the engine shaft and rotatably secured against the housing or casing of the turbine engine; a controlling-valve-lever operating mechanism slidably mounted on said sleeve, laterally relative to the movement of governor or balance weights adjustably secured to arms operatively secured to an oscillating cam or screw threaded sleeve carried by said feathered sleeve; of governor or balance weight arms pivotally secured to and within a casing mounted on and adjustably secured to said feathered sleeve; a steam controlling valve lever adjustably secured in a bracket secured to the engine casing.

2. The combination in a turbine engine governing mechanism in combination with a turbine of, a feathered sleeve mounted on the engine shaft and rotatably held against the housing or casing of the turbine engine; a feathered cam or screw threaded sleeve mounted on said feathered sleeve and operatively connected to a controlling valve operating lever; said cam or screw threaded sleeve slidably operative laterally relative to an oscillating cam or screw threaded sleeve rotatably mounted on said feathered sleeve; an oscillating cam or screw threaded sleeve operatively connected to governor or balance weight arms pivotally secured to and within a casing or housing adjustably secured to said feathered sleeve.

3. In a turbine engine governing mechanism, the combination, of a sleeve feathered upon the engine shaft; said sleeve rotatably secured against the turbine casing or housing from longitudinal movement with the engine shaft; of a governor or balance weight containing case adjustably secured on said sleeve; of governor weight arms pivotally secured to and within said governor case and operatively connected to an oscillating cam or screw threaded sleeve; an oscillating cam or screw threaded sleeve, mounted on said feathered sleeve, operating laterally a cam or screw threaded sleeve longitudinally feathered on said feathered sleeve; a longitudinally feathered cam or screw threaded sleeve, mounted on said feathered sleeve, operatively connected to a governing or controlling valve lever; a controlling valve operating lever pivotally mounted adjustably in a bracket secured to the engine casing; a balance or controlling valve operatively controlled by said governing mechanism.

4. In a turbine governing mechanism, the combination of, a governor or balance weight controlled oscillating cam or screw threaded sleeve moving laterally thereof a cam or screw threaded feathered sleeve; an oscillating cam or screw threaded sleeve controlled cam or screw threaded sleeve mounted on a feathered sleeve mounted on the turbine engine shaft; a feathered sleeve mounted on the engine shaft and rotatably secured from longitudinal movement therewith against the turbine casing; said feathered sleeve carrying said oscillating cam or screw threaded sleeve, and said cam or screw threaded feathered sleeve, and a casing or housing having mounted therein the said oscillating cam or screw threaded sleeve operating governor or balance weights.

5. The combination in a headlight steam or fluid turbine engine fluid governing and controlling mechanism of, an automatic steam and speed governing and controlling mechanism, substantially as described, mounted slidably adjustable longitudinally on a fluid turbine shaft, but operatively secured to the turbine casing.

6. The combination in a headlight steam or fluid turbine governor of, an adjustable steam-controlling-valve-controlling-lever relatively adjustable to the seat of the steam controlling valve and the position of the steam-controlling-valve-controlling-lever governing or controlling mechanism, substantially as described; said steam valve operating and controlling means, or valve lever, operatively secured to the governor or governing mechanism carried by a sleeve feathered on a steam turbine shaft but rotatively held against the turbine casing from

longitudinal movement; a feathered sleeve carried by a turbine shaft, substantially as described and for the purpose specified.

7. The combination in a headlight steam or fluid turbine engine governing and steam controlling mechanism of, a sleeve, carrying an automatic steam and speed governing and controlling mechanism, of the class described, carried by a steam turbine shaft but operatively secured against the turbine casing; a steam-controlling-valve-controlling-means or lever controlled by the before described controlling and governing mechanism.

8. The combination in a headlight steam or fluid turbine engine governing and steam controlling mechanism of, the described governing mechanism mounted on the turbine shaft and operatively secured against the turbine casing; a feathered sleeve rotatively held against the turbine casing from longitudinal movement, and carried by the turbine shaft; a steam or fluid turbine speed governing and controlling mechanism carried by said sleeve; a steam controlling valve controller, or adjustable lever, operatively connected with the steam valve and with the described governing mechanism or governor.

9. The combination in a headlight steam or fluid engine governing and speed controlling mechanism, of the described governor operatively secured along the engine shaft and against the turbine casing and connected with a steam-controlling-valve-controlling-lever adjustably secured in a bracket secured to the turbine casing; of means for adjusting said lever for maintaining, substantially, a positive relative position between the steam controlling valve and the steam controlling valve controlling and governing mechanism, substantially as described.

GUY SYDNEY RANSTEAD.

Witnesses:
W. HARDING,
LAWRENCE WILSON, Jr.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."