May 25, 1926. 1,586,203

C. KIESTER

POWER GENERATOR

Filed March 24, 1924

Fig. 1.

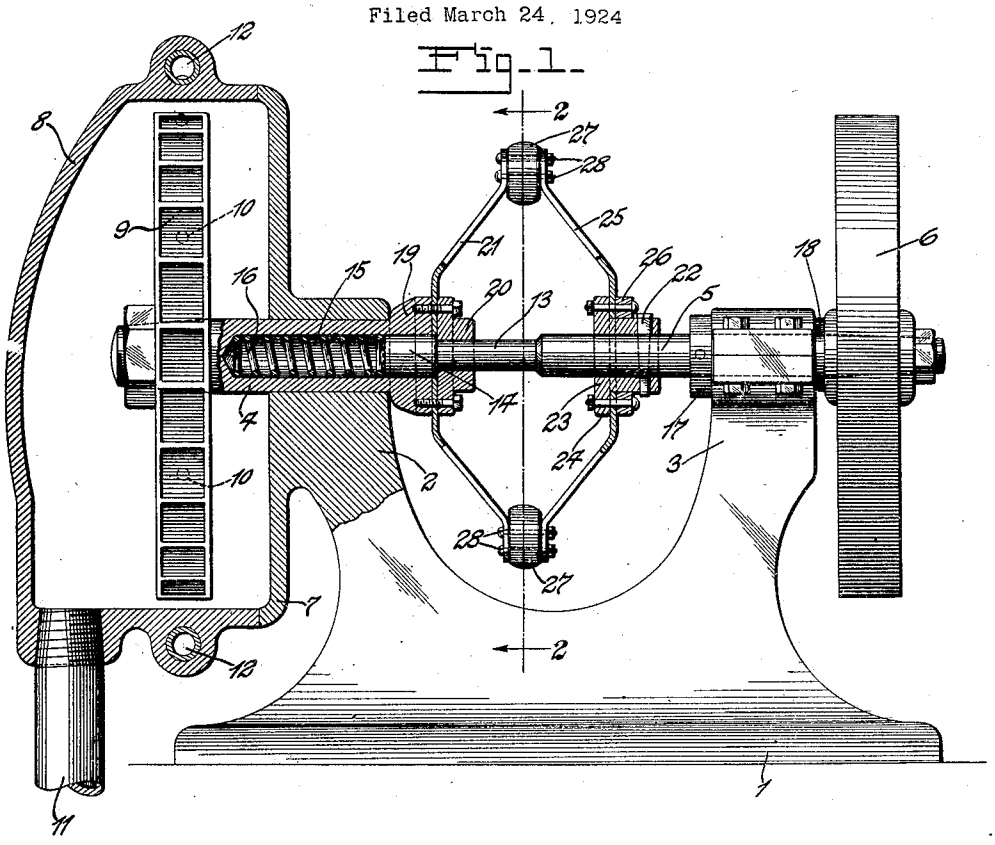
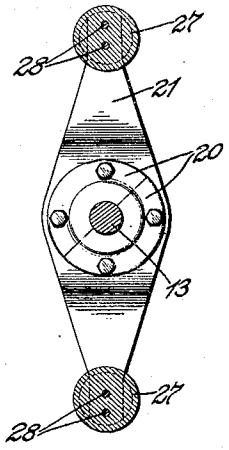


Fig. 2.



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UNITED STATES PATENT OFFICE.

CARL KIESTER, OF YEAGER, OKLAHOMA.

POWER GENERATOR.

Application filed March 24, 1924. Serial No. 701,478.

This invention relates to power units, and more particularly to turbine units, such as steam turbines.

One of the objects of this invention is to provide such a power unit having a novel arrangement of governor mechanism which is simple to construct and effective in operation.

Another object is to provide such a unit in which the governor mechanism is so located as not to be subject to corrosion or other deterioration of its bearing surfaces and the like.

Another object is to provide such a unit in which the governor mechanism is simple and requires no adjustments.

Further objects will appear from the detail description taken in connection with the accompanying drawing, in which:

Figure 1 is a view in elevation, partly in section, showing a turbine unit embodying this invention; and

Figure 2 is a detail of the governor mounting taken on line 2—2, Figure 1.

Referring to the accompanying drawing, 1 designates a base or pedestal which supports the unit. This base is provided with bearings 2 and 3 which carry the operating shaft constructed in sections. This operating shaft comprises a turbine shaft 4 working in the bearing 2 and a driven shaft 5 working in the bearing 3. The power receiving device 6 which may be a belt wheel, a grinding wheel, or other device to be driven, is mounted on the outer end of the driven shaft 5 as shown in Figure 1.

The pedestal 1 may be provided with a plate 7 on which is mounted a casing 8 adapted to house the turbine wheel or runner 9 mounted on the turbine shaft 4. The casing is provided with nozzles or jet openings 10 communicating with the supply duct 12 for directing the power supplying fluid, such as steam, against the vanes of the wheel 9. One or more jets 10 may be provided according to the power to be developed. An exhaust conduit 11 leads the spent fluid from the casing 8. The turbine shaft 4 extends through the bearing 2 to the outside of the casing. On the outside of the casing it is connected to the driven shaft 5 by means of a telescopic connection. The shaft 5 is provided with a reduced portion 13 and provided at its end with a plug or cross-head 14 adapted to fit within the bore 15 of the hollow turbine shaft 4. A spring 16 lying within the bore 15 bears against the head 14 so as to urge the shaft 4 to the left, Figure 1, in order to maintain the wheel 9 in normal position in alinement with the jets 10. It will be understood that the shaft 5 is restrained from longitudinal movement in the bearing 3 by the collars 17 and 18. The shaft 4 is provided with a head 19 providing a shoulder adapted to abut against the bearing 2 to limit the movement of the shaft 4 to the left, Figure 1, and to position the turbine wheel 9. A split collar or cap 20 is adapted to fit the reduced portion 13 of the driven shaft and is rigidly fixed to the head 19 so as to retain the head 14 within the bore 15. It will be clear that the shafts 4 and 5 are thus connected by a loose telescopic connection so as to permit longitudinal sliding movement of the turbine shaft 4 in the bearing 2 for a purpose which will be described presently. Such longitudinal movement is, however, opposed by pressure of the spring 16.

Clamped between the head 19 and the split collar 20 is a resilient plate 21 whose tapered ends extend radially in opposite directions from the shaft. The outer ends of the plate 21 are bent laterally as illustrated in Figure 1. Rigidly fixed to the shaft 5 by means of a pin 22 or other suitable fastening is a collar 23 provided with a shoulder 24. A plate 25 similar to the plate 21 is mounted on the collar 23 and clamped to the shoulder 24 by means of a collar 26 as illustrated in Figure 1. The plate 25 is similar in form to the plate 21 and has radially extending ends bent laterally in a similar manner but in the opposite direction from that of the plate 21. Thus it will be seen that the plate 25 is rigidly secured to the shaft 5, while the plate 21 is rigidly secured to the head 19 and the shaft 4. Mounted between the extended ends of the plates 21 and 25 is a pair of centrifugal elements or governor weights 27. The weights 27 are rigidly secured to both plates 21 and 25 by means of bolts 28 or other suitable fasteners. The plates 21 and 25 are thus rigidly secured together through the governor weights 27 and since these plates are rigidly secured to the shafts 4 and 5 respectively, a driving connection is thus established between these two shafts. On account of the flexibility of the plates 21, 25, however, this connection, while it is rigid in a circumferential direction so that it is ca-

pable of transmitting torque, yet permits by its flexibility the relative longitudinal movement of the shafts 4 and 5. In other words the shaft 4 may slide in the bearing 2 while at the same time this flexible connection may be transmitting torque from the shaft 4 to the shaft 5.

In the operation of this device the driving fluid being admitted to the casing through the jets 10 will impinge upon the vanes of the turbine wheel 9 so as to drive the same in rotation. The turbine wheel through its shaft 4 and the connections 21, 25 will then drive the shaft 5 and the power receiving device 6. As the speed of revolution approaches a predetermined point, the centrifugal force of the governor weights 27, being exerted radially outwardly, will tend to expand the flexible frame comprising the connections 21, 25. Since these connections are resilient, such expansion takes place and will be accompanied by a corresponding contraction of the frame in a longitudinal direction with respect to the shafts. Such contraction will have the effect of drawing the shaft 4 to the right, Figure 1, sliding the same in the bearing 2. The shaft 5 will not move as it is confined between the collars 17 and 18. As the shaft 4 moves to the right, the wheel 9 moving therewith will gradually pass out of registry with the jets 10. Upon passing out of registry the power delivered to the wheel 9 by the jets will be correspondingly diminished and hence the speed will be correspondingly reduced. Upon reduction of the speed, the centrifugal force exerted by the weights 27 will also be reduced and the resilience of the frame 21, 25 assisted by the pressure of the spring 16 will operate to return the wheel 9 to its normal position in registry with the jets 10. It will be clear, therefore, that by properly adjusting the resilience of the frame 21, 25 and the spring 16, the governor can be made to maintain the speed of rotation substantially constant at a predetermined value.

It will be noted that in accordance with the present invention the governor mechanism is placed entirely outside of the casing which houses the turbine wheel. The working parts of the governor mechanism are thus removed from liability of corrosion, such as does occur in devices where that mechanism is placed within the steam chamber. The steam invariably carries with it certain impurities which are injurious to the metal parts and operate to corrode and roughen the bearing surfaces and render the operation of the device erratic and unreliable. In accordance with this invention, therefore, these difficulties are overcome and a device is provided which is simple to construct, requires no adjustments, and is reliable and effective in its operation.

It is obvious that various changes may be made in details of construction without departing from the spirit of this invention; it is, therefore, to be understood that this invention is not to be limited to the specific details shown and described.

Having thus described the invention, what is claimed is:

1. The combination with a casing having a fluid jet therein a turbine wheel in the casing and cooperating with the jet and a power-transmitting member driven by the wheel and in fixed alinement, of governor mechanism comprising, a centrifugal element outside of the casing, and a yielding connection between said element and the wheel, adapted to move the wheel relatively to the jet without disturbing the alinement of the power-transmitting member.

2. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet and a power-transmitting member driven by the wheel and in fixed alinement, of governor mechanism comprising, a turbine shaft slidable in the casing, a driven shaft loosely connected with said turbine shaft, a centrifugal element, outside of the casing and connections between said element and said shafts adapted to move said turbine shaft.

3. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable in the casing, a driven shaft loosely connected with said turbine shaft, a centrifugal element outside of the casing, and a driving connection between said shafts and controlled by said element adapted to move said turbine shaft.

4. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable in the casing, a driven shaft loosely connected with said turbine shaft, a centrifugal element, and a flexible frame connecting said shafts and engaging said element adapted for expansion to move said turbine shaft.

5. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable in the casing, a driven shaft loosely connected with said turbine shaft, a centrifugal element, yielding means engaging said shafts adapted to normally retain the wheel in operative position, and flexible connections between said element and said shafts adapted to move said turbine shaft.

6. The combination with a casing having a fluid jet therein a turbine wheel in the casing and cooperating with the jet and a power-transmitting member driven by the

wheel and in fixed alinement, of governor mechanism comprising, a turbine shaft slidable with respect to the casing, a centrifugal element, and connections between said element and said shaft adapted to slide said shaft without disturbing the alinement of the power-transmitting member.

7. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable with respect to the casing, a centrifugal element outside of the casing, a driven shaft having a telescopic connection with said turbine shaft, and connections between said element and said shafts adapted to slide said turbine shaft.

8. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising a turbine shaft, slidable with respect to the casing, a centrifugal element, a driven shaft having a loose connection with said turbine shaft, and a flexible frame connecting said element with said shafts and adapted to be flexed by said element to slide said turbine shaft.

9. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable with respect to the casing, a centrifugal element, a driven shaft having a loose connection with said turbine shaft, and a pair of flexible plates connecting said element with said shafts and adapted to be flexed by said element to slide said turbine shaft.

10. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, a turbine shaft slidable with respect to the casing, a centrifugal element, a driven shaft having a loose connection with said turbine shaft, a flexible frame connecting said element with said shafts and adapted to be flexed by said element to slide said turbine shaft, and resilient means for returning said turbine shaft.

11. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising, an extensible turbine shaft slidable into and out of the casing, a centrifugal element, and connections between said element and said shaft adapted to slide said shaft.

12. The combination with a casing having a fluid jet therein and a turbine wheel in the casing and cooperating with the jet, of governor mechanism comprising an extensible turbine shaft slidable into and out of the casing, a centrifugal element outside of the casing, and connections between said element and said shaft adapted to slide said shaft.

In testimony whereof I affix my signature this 18th day of March, 1924.

CARL KIESTER.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,586,203, granted May 25, 1926, upon the application of Carl Kiester, of Yeager, Oklahoma, for an improvement in "Power Generators," an error appears in the printed specification requiring correction as follows: Page 2, lines 87 to 89, claim 2, strike out the words "and a power transmitting member driven by the wheel and in fixed alinement"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of June, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.