

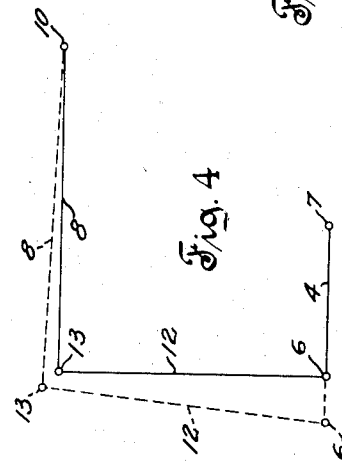
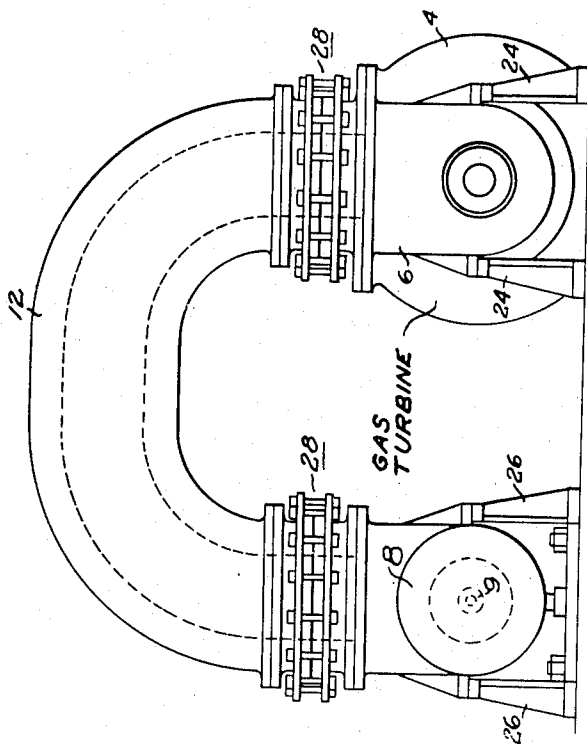
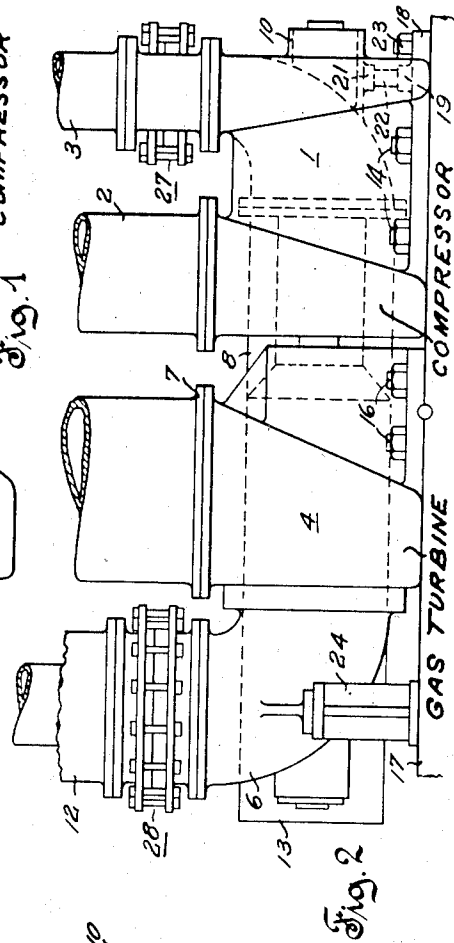
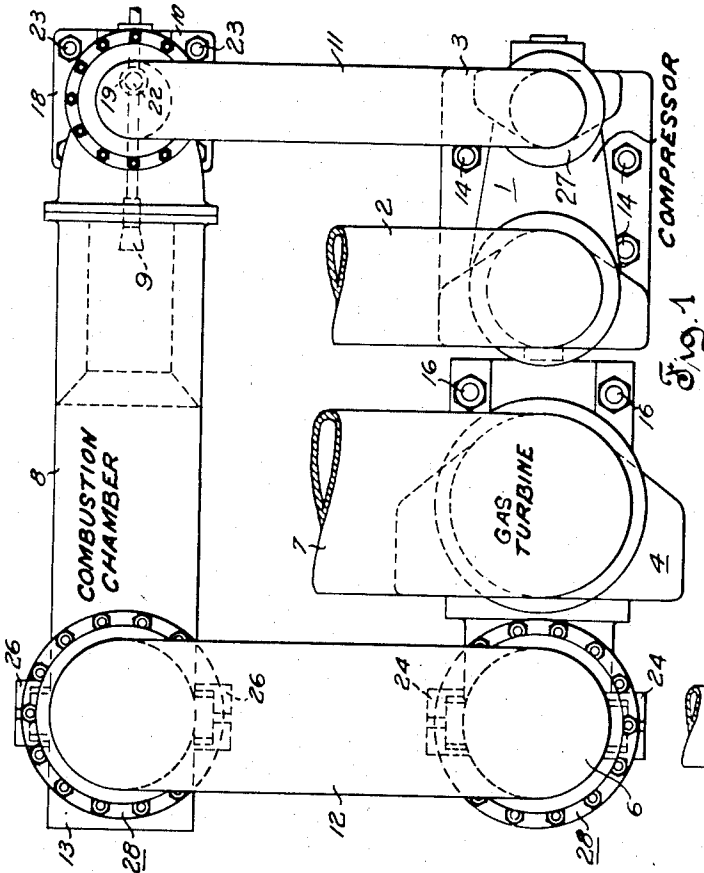
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J. L. RAY

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TURBINE SYSTEM

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Inventor
J. L. Ray
by K. S. Wyman
Attorney

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TURBINE SYSTEM

James L. Ray, Elm Grove, Wis., assignor to Allis-Chalmers Manufacturing Company, Milwaukee, Wis., a corporation of Delaware

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9 Claims. (Cl. 60—41)

This invention relates generally to elastic fluid turbine systems and more particularly to systems embodying a high temperature motive fluid generating means, a turbine and an interconnecting motive fluid conveying conduit means; the primary object being to provide an improved system embodying a simplified and compact correlation of elements effective to materially reduce space requirements and to eliminate or to reduce to safe values the stresses inherently set up in interconnected parts by the rapid expansion and contraction thereof due to extreme and rapid variations in temperature.

A further object of this invention is to provide an improved high temperature elastic fluid turbine system which is durable and inexpensive and which can be readily installed and serviced with a minimum of time and expense.

In accordance with this invention, the above stated objects may be accomplished in a system embodying the correlation of elements shown and described, but not claimed, in my copending application Serial No. 469,983, filed December 24, 1942, and one or more of the above stated objects may be accomplished in whole or in part by a correlation of elements comprising an elastic fluid turbine, a high-temperature motive fluid generating means, means including a pivot support mounting said motive fluid generating means for movement both longitudinally and angularly relative to said support, and motive fluid conveying conduit means connecting said turbine with said generating means, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

The invention accordingly consists of the various features of construction, combinations of elements, and arrangements of parts as more fully set forth in the appended claims and in the detailed description, reference being had to the accompanying drawing, in which:

Fig. 1 is a plan view of a gas turbine system embodying the invention;

Fig. 2 is a partial side elevation of the system shown in Fig. 1;

Fig. 3 is an end view of the system shown in Fig. 1; and

Fig. 4 diagrammatically illustrates the relative displacement of the interconnected elements effected by the longitudinal expansion thereof.

Referring to Figs. 1-3, inclusive, of the drawing, it is seen that a gas turbine system embodying the invention may include a compressor 1 having air inlet and discharge connections 2 and

3, respectively, a gas turbine 4 drivingly connected with said compressor and having inlet and exhaust connections 6 and 7, respectively, a high-temperature motive fluid generating means comprising an elongated combustion chamber 8 having a fuel burner 9 in the end 10 thereof, a conduit means 11 connecting the discharge 3 of said compressor with the burner end 10 of the combustion chamber 8 for supplying air thereto, and a conduit means 12 connecting the opposite or discharge end 13 of the combustion chamber 8 with the intake 6 of the turbine 4 for supplying motive fluid thereto. The compressor 1 and the exhaust end of the turbine 4 are fixedly secured by any suitable means such as the bolts 14 and 16, respectively, to a stationary foundation or the like 17 as best shown in Fig. 2. The burner end 10 of the combustion chamber 8 is mounted on a pivot support for angular movements relative thereto; said support comprising a base member 18, a pair of opposed bosses 19 and 21 and a pin member 22. The base member 18 is preferably secured to the foundation 17 or to an equivalent mounting by any suitable means such as bolts 23, thereby preventing a longitudinal movement of the burner end of said combustion chamber relative to the pivot support therefor. The inlet end of the turbine and the discharge end 13 of the combustion chamber are slidably mounted on pedestal members 24 and 26, respectively, which are in turn fixedly secured to the foundation 17 or to an equivalent thereof by any suitable means (not shown); the latter member permitting the discharge end of the combustion chamber to move or slide thereon both longitudinally and angularly relative to the inlet or burner end 10 thereof.

The burner end 10 of the conduit means 11 embodies therein a swing joint connection 27 permitting the hereinabove specified angular movements of the combustion chamber 8; the opposite end of the conduit means 11 being fixed to the compressor discharge 3 as indicated since in this case the compressor is fixed to the foundation 17 as hereinbefore specified. Both ends of the conduit means 12 include a swing joint connection 28 permitting angular movements of the conduit means 12 relative to the discharge end 13 of the combustion chamber 8 and relative to the inlet connection or end 6 of the turbine 4. The burner end 10 of the combustion chamber 8 can move angularly but not longitudinally and the discharge end 7 of the turbine 4 cannot move either angularly or longitudinally. Consequently, longitudinal expansion of the combustion

chamber 8, of the conduit means 12 and of the turbine 4 will effect a displacement of the elements similar to that illustrated to an exaggerated degree by the dotted lines in Fig. 4, in which like numerals are used to designate the corresponding elements and in which the full lines represent the cold positions of the elements, and it should therefore be obvious that the hereinbefore described correlation of elements is effective to permit the indicated displacement of the elements from overstressing interconnected parts.

In operation, axial expansion of the turbine 4 and of the combustion chamber 8, unless equal, results in an angular movement of the conduit means 12 relative to the turbine and relative to the combustion chamber; such relative movement being permitted by the swing joint connections 28 which may be of any suitable construction, such for example as that disclosed in applicant's copending application hereinbefore identified. Moreover, since the turbine 4 cannot move angularly, longitudinal expansion of the conduit means 12 effects an angular movement of combustion chamber 8 relative to the pivot support for the burner end 10 thereof and relative to the conduit means 12; such relative movements being permitted by the associated swing joint connections 27 and 28. Connection 27 may also be constructed in any suitable manner such as hereinbefore indicated with respect to the connections 28. Furthermore, it should be noted that the longitudinal axis of the combustion chamber and the longitudinal axis of the turbine and compressor lie in the same horizontal plane and that therefore the combustion chamber is mounted for movement both longitudinally and angularly in a plane including the the axis of the turbine.

The invention is of general application to elastic fluid turbine systems embodying a high-temperature motive fluid generating means, a turbine and an interconnecting motive fluid conveying conduit means irrespective of whether the axes of the motive fluid generating means and turbine lie in a horizontal plane or in a plane making a selected angle with respect to a horizontal plane and it should therefore be understood that it is not intended to limit the invention to the exact combination of features and details of construction herein shown and described as various modifications within the scope of the appended claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, an elastic fluid turbine, a motive fluid generating means, means including a pivot support mounting said generating means for movement both longitudinally and angularly relative to said support, and motive fluid conveying conduit means connecting said turbine with said generating means, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

2. In combination, an elastic fluid turbine, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement relative to said support, and motive fluid conveying conduit means connecting said turbine with a portion of said generating means, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

3. In combination, an elastic fluid turbine having one end mounted for axial movement relative to the opposite end thereof, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement relative to said support, and motive fluid conveying conduit means connecting said one end of said turbine with a portion of said generating means, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

4. In combination, an elastic fluid turbine, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement relative to said support, and motive fluid conveying conduit means connecting said turbine with a portion of said generating means remote from the pivot supported end thereof, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

5. In combination, an elastic fluid turbine having one end mounted for axial movement relative to the opposite end thereof, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement relative to said support, and motive fluid conveying conduit means connecting said one end of said turbine with a portion of said generating means remote from the pivot supported end thereof, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

6. In combination, an elastic fluid turbine having one end mounted for axial movement relative to the opposite end thereof, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement in a plane including the axis of said turbine, and motive fluid conveying conduit means connecting said one end of said turbine with a portion of said generating means remote from the pivot supported end thereof, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

7. In combination, an elastic fluid turbine having one end mounted for axial movement relative to the opposite end thereof, a motive fluid generating means, means including a pivot support for one end of said generating means mounting same for both longitudinal and angular movement in a plane including the axis of said turbine, and motive fluid conveying conduit means connecting said turbine with a portion of said generating means, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said generating means.

8. In combination, a compressor, an elastic fluid turbine having one end drivingly connected with said compressor and having its opposite end mounted for axial movement relative to said one end, a combustion chamber, means including a pivot support mounting said combustion chamber for both longitudinal and angular movement relative to said support, a motive fluid conveying conduit means connecting said turbine with said combustion chamber, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said combustion chamber.

tion chamber, and an air conveying conduit means having one end connected with the discharge of said compressor and having its opposite end provided with an angularly movable portion connected with the pivot supported end of said combustion chamber.

9. In combination, a compressor, an axially aligned turbine having one end drivingly connected with said compressor and having its opposite end mounted for axial movement relative to said one end, a combustion chamber, means including a pivot support mounting said combustion chamber for both longitudinal and angular movement rela-

tive to said support, a motive fluid conveying conduit means connecting said opposite end of said turbine with a portion of said combustion chamber remote from the pivot supported end thereof, said conduit means including portions rendering same angularly movable relative to said turbine and relative to said combustion chamber, and an air conveying conduit means having one end connected with the discharge of said compressor and having its opposite end provided with an angularly movable portion connected with the pivot supported end of said combustion chamber.

JAMES L. RAY.