

## DISCUSSION

### U. Oprecht<sup>2</sup>

The authors are to be congratulated for their successful application of gas bearing technology to hot turbomachinery and their scientific approach to the problems involved. However, their statement: "Start-up of this unit is believed to mark the first time that a gas turbine machine has been successfully operated using its own cycle gas as the bearing systems lubricant," seems to me rather optimistic.

Adolph Saurer, Ltd., built and tested some time ago a gas turbine, where the high speed rotor was supported on a gas-lubricated journal bearing. This bearing was located inside an annular combustion chamber adjacent to a radial inflow turbine wheel. It was lubricated by compressor discharge air which, after lubricating, served as turbine wheel back face coolant (see Fig. 15).

This engine was run for the first time under its own power on February 17, 1961, after several years of intensive component testing. Consequently, various design aspects are covered by patents. This engine is the forerunner of an auxiliary-type gas turbine now in production at Adolph Saurer, Ltd., and which has been described in ASME Paper No. 66—GT-87<sup>3</sup>.

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<sup>3</sup> U. Oprecht, "Problems Related to the Development of a Gas Turbine in the 10–30 hp Class," ASME Paper No. 66—GT-87.

### Authors' Closure

The authors wish to thank Dr. Oprecht for his interest in the paper and for his complimentary remarks.

The authors also appreciate being informed of an Adolph Saurer, Ltd., gas turbine which, in 1961, was operated with a gas-lubricated turbine bearing. This accomplishment predates start-up of the 24,000-rpm gas-bearing turbocompressor by almost four years. However, it appears from Fig. 15 that rolling element bearings were also used in the Adolph Saurer machine to support the compressor and to carry thrust loads. The gas turbine machinery discussed in the present paper, on the other hand, is solely dependent upon gas lubrication for support of rotor weight and thrust loads.

It is becoming more and more evident, as turbine speeds and inlet temperature continue to increase, that gas lubrication has very definite advantages relative to oil-lubricated and rolling element bearings. In this regard, it would be very valuable if Dr. Oprecht could publish the design details and operating experience of the prototype Adolph Saurer, Ltd., gas-lubricated engine. From ASME Paper No. 66—GT-87, it appears that the referenced engine is now being produced with only rolling element bearings. This suggests that problems may have been encountered with the original gas bearing concept. If such was the case, it would be valuable to know the nature of these problems—stability, thermal distortion, materials, manufacturing tolerances, or whatever. Most rapid development and demonstration of reliable gas-lubricated engines would be assured if the results of various test programs could be disseminated.