

**THE STOLZE GAS TURBINE.**

BY DR. ALFRED GRADENWITZ.

The steady progress made by steam turbines on the one hand and the ever-increasing use of reciprocating gas motors in cases where steam engines were formerly exclusively used, lend particular interest to a gas turbine that has been introduced in Germany.

The gas turbine in question is, strange to say, of no recent date. In fact, it was invented by Dr. Stolze as far back as 1873.

We are indebted to the courtesy of the Gasturbinen Gesellschaft Stolze, of Berlin-Charlottenburg, for the particulars given below, as well as for the illustration reproduced.

The principle underlying the construction of this turbine consists in compressing atmospheric air to a moderate tension, say one and one-half atmospheres above atmospheric pressure, and in heating afterward this compressed air so as to cause it to assume a two or two and one-half fold volume, with the same tension, after which the air tension is allowed to drop again to atmospheric pressure.

The excess of work performed over the absorbed energy is thus due to the increase in volume resulting from the heating.

Two sets of turbines of different design are mounted on a common shaft. One of these serves as an air compressor, while the other drives the shaft by means of the heated air. Each set consists of several rows of guiding vanes, fitted to the engine casing, and of several rows of running vanes of a corresponding design, secured to a common rotating cone, which turns with the shaft. One of these turbine systems draws in the fresh air, compressing it to a given tension through a preheater (heated with exhaust gases) and driving the greater part of it into a chamber lined with refractory material. The smaller part is conveyed beneath the grate of a producer, where it serves to volatilize the fuel. The gas thus formed penetrates into the chamber mentioned, to be burnt there by the compressed air in suitable burners and converted into carbonic acid and water vapor, while evolving large amounts of heat. These gases next enter the second turbine system, where they are allowed to expand in traversing the various steps, thus performing useful work.

The process is thus analogous to the cycle performed in all combustion engines. A distinguishing feature is, however, that the mixing takes place after compression, and the combustion at constant pressure.

A large-sized engine of an output of 200 effective horse-power is nearing completion in Berlin, and this plant is represented in the accompanying photograph.

**THE OLD PORTAGE RAILROAD IN PENNSYLVANIA.**

BY EDWARD H. L. PAGE.

The recently constructed freight cutoff of the Pennsylvania Railroad Company south of Altoona, Pa.,

for the purpose of relieving the greatly congested freight traffic of that city, has destroyed some of the historic old landmarks of the State, and suggests at this time a sketch of the evolution of transportation during the nineteenth century in the Keystone State.

For some time prior to 1800, travel across the State had been made in canoes, and in river barges propelled by poles, or along the shores of her ever-winding rivers by horse and foot, and by intervening portages on Indian trails, connecting points on the different rivers. Thus at this time was made the disas-

second only to the grand old Roman military roads of Great Britain. In 1834 the old Portage Railroad was built from Hollidaysburg to Johnstown, over the Allegheny Mountains, a distance of forty miles, to connect the canals which traversed the State east and west from these points.

The Old Portage Road was constructed from material brought from England. The British government sent over experienced engineers to instruct the Americans in the running of the stationary steam engines used upon the inclined planes of the road. The railroad's highest point was about twenty-seven hundred feet above sea level; being only two hundred feet lower than the neighboring hill, which is the highest point of the Allegheny Mountains in Pennsylvania. The road consisted of ten planes, five of which were on either side of the mountain, and intervening levels. In 1835 the canalboats were so constructed that they could be taken in sections and hauled over the mountain on flat cars, without disturbing their cargoes.

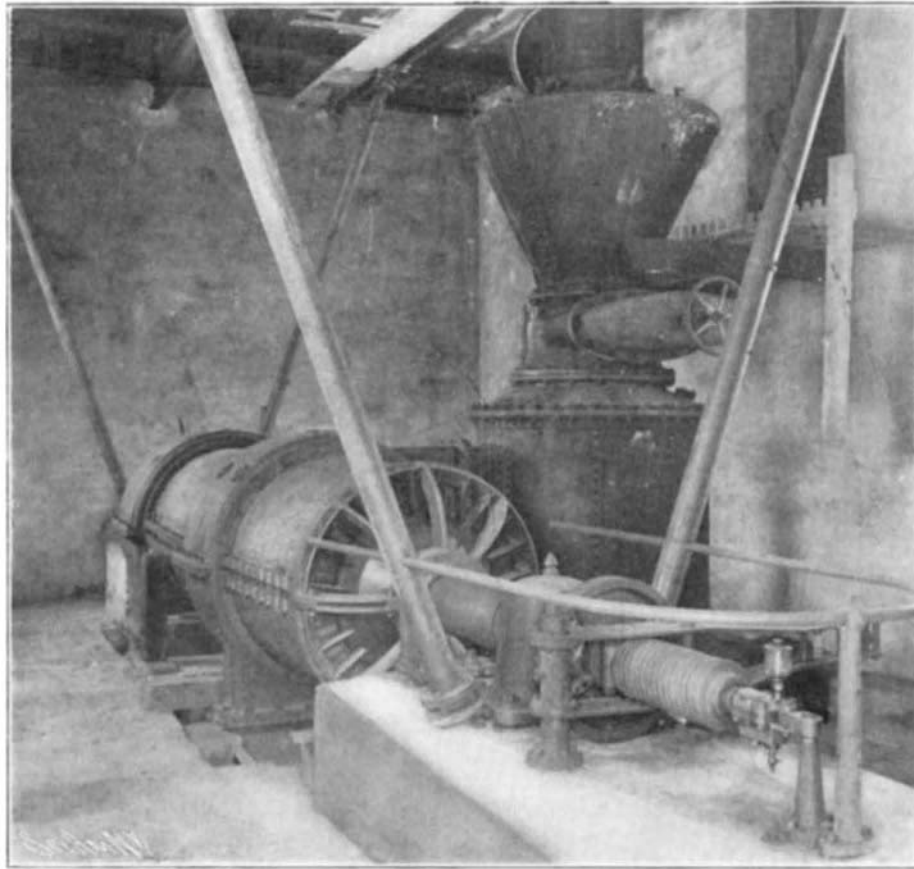
The road was governed by a board known as canal commissioners, who were elected by popular vote. The canal commissioners had entire charge of the maintenance of the canals and the Portage Road.

A superintendent was elected from among their number, to have especial authority over the railroad.

The rails of the road were of iron, weighing about twenty-five pounds to the foot, and were secured to stone sleepers twenty inches square, which were sunk in the ground in parallel rows. The width between the rails was about six feet. Until some twenty-five years ago, stone sleepers were in use upon the New York, New Haven & Hartford Railway, and were then removed on account of the especial wear and tear upon the rolling stock, which was avoided in the use of the more resilient, modern wooden

tie. Few of the stone sleepers to-day remain embedded in their old resting places, most of them having been removed, recut, and utilized in the construction of public buildings in the nearby county seats. In this era of railway construction the modern iron and steel bridges were unknown. The crossing of streams and the national pikes was done by the construction of the substantial stone arches and culverts.

In 1845 to 1855 the construction of railway locomotives had reached such a stage of perfection, that it permitted the building of railroads ascending the mountain, by gradually graded routes, entirely dispensing with the necessity of inclined planes with their stationary engines. And so the "New Portage" Railroad was built by the State, and contemporaneously, beginning in 1846, a company of private individuals, known as the Pennsylvania Railroad Company, was formed, stock issued, and the road laid along its present route. In 1854, after the rival lines had run for about two years, the Pennsylvania Railroad Company bought the New Portage Road from the State. Com-

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trous expedition of the British, under the leadership of the foolhardy Gen. Braddock, for the purpose of driving the French and Indians from Fort Duquesne, in the western extremity of the State. Several years after the States had gained their independence, the merging of Fort Duquesne into the settlement of Pittsburgh suggested to the national government the advisability of an improved method of communication with this distributing point.

Accordingly, the Philadelphia-Pittsburg national pike was built upon such a substantial basis, that wherever undisturbed, as in the central part of the State, by the encroachment of "modern improvements," we still find the gracefully-modeled arches of solid masonry almost intact, after more than a century has passed. The completion of the Old Portage Railroad, by the State of Pennsylvania in 1834, put an end to the time-honored "coach and six," with the many picturesque and commodious inns and taverns, along the line of this broad macadamized toll road; which in its substantial construction was, in point of endurance,



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**SECTION OF OLD PORTAGE ROADBED, SHOWING DOUBLE ROWS OF STONE SLEEPERS.****MASSIVE STONE CULVERT, RECENTLY DESTROYED. ERECTED IN 1848 ON THE LINE OF THE NEW PORTAGE RAILROAD.**