The advantages of direct current table and live roll motors are fully recognized, but it is interesting to note that in perhaps the largest steel works on the American Continent, where the main power supply is three-phase, all the table motors are direct current and a large and costly installation of converting machinery has been provided to convert the three-phase current to direct current to supply these table motors.

It may be argued that the cost of cables with a 500-volt direct current system is much higher than for a high voltage three-phase system, but it must be remembered that a well laid out steel works is comparatively compact and the distances are relatively short, so that the cost of cables is not a very serious item, and that the additional capital cost of three-phase generating plant to produce power, which is wasted in the slip resistance, etc., will pay for a good deal of extra cable.

In steel works where there are blast furnaces and coke ovens, the modern tendency is to install large gas engines using blast furnace or coke oven gas, both for driving the blast furnace blowers and for generating electrical power, and experience shows that a direct current gas engine power house is cheaper in capital cost and easier to operate than a three-phase power house.

Gas engine driven three-phase alternators present the most difficult problem in parallel running, and while sufficient experience has been gained in the past ten years to enable these difficulties to be overcome by proper design, the provision of very heavy flywheels is always necessary, and these largely increase the capital cost of the three-phase generators, which are intrinsically more expensive than direct current generators. The higher the periodicity the heavier the flywheels for the three-phase generators become. The 500-volt direct current system has found very wide application in the steel works on the Continent of Europe.

DIESEL ENGINE EXHIBIT AT THE PANAMA-PACIFIC EXPOSITION.

It is announced by the Department of Machinery of the Panama-Pacific International Exposition that more than a dozen large firms have contracted for space in which to install engines built on the Diesel principle. These exhibits will occupy a central space in the great Palace of Machinery, and will be under operation through connection with electric generators or other machinery for the purpose of showing the efficiency and economy of working.

It will be recalled that the tragic death of Dr. Rudolph, inventor of the motor, by drowning in the English Channel, which occurred in September, 1913, was almost simultaneous with the final triumph of his ingenious motor by its adaptation to railway traction on a large scale.

NATIONAL IRRIGATION CONVENTION.

Arrangements are being made for a National Irrigation Convention to be held in Calgary next September. A fund of $20,000 is practically assured for it. The convention will bring a large delegation of irrigationists from Oregon, Washington, Montana, Idaho, Utah, Texas, California and other States. Irrigation work in Canada has created a good deal of interest in the country to the South, and the gigantic project of the Canadian Pacific Railway, as outlined in *The Canadian Engineer* for January 1st, 1914, will receive a thorough inspecting by many irrigationists who are extremely interested in the enterprise.

A detailed programme of the convention will be announced at an early date.

THE ZOELLY STEAM TURBINE.

IN 1898, Mr. Zoelly designed a new type of steam turbine which resembled in many respects a water turbine of the impulse type. This machine was designed on the radial flow principle. The blades were not curved. A second machine with curved blades gave better results, however, the steam in this case striking against the rotor blades in radial direction. The principle of the impulse type has been adopted from the commencement as being the best, and the only alterations that took place were in the manner of guiding the steam onto the wheels. The turbine has gone through many stages of improvement which, however, have been solely of a constructional character. No departures from the adopted principle have taken place. On the original type the governing is effected simply by throttling the live steam and not by varying the number of channels through which the steam is admitted.

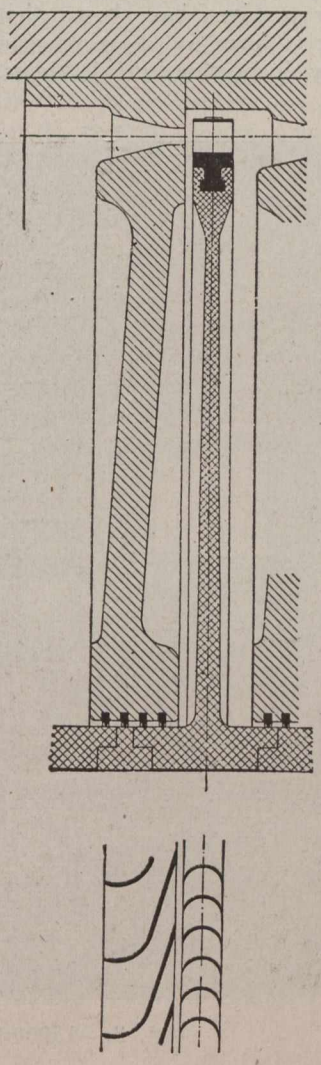

Fig. 1.—Runner and Guide Wheel of Zoelly Turbine.

This turbine has, in the past, been subjected to a good deal of criticism respecting the steam pressure and temperature in the first stage which were considered to be excessively high and which were supposed to have a deleterious effect upon the stuffing boxes. In the case of the present Zoelly turbines these criticisms are without foundation as in the first stage a greater pressure drop and likewise a correspondingly higher steam velocity is made use of than previously. This velocity equals or even surpasses that of sound corresponding to the steam conditions of this particular stage.

In order to be able to construct large units without having to employ too large blades in the last two stages, these stages are provided with a greater drop of pressure so that they also work with steam velocities which may be five and even more per cent. higher than the velocity of sound. The intermediate pressure stages work with steam velocities which do not, or only in a very slight degree, exceed the velocity of sound belonging to the conditions of these stages. At any rate, the excess of velocity over that of sound is in the intermediate stages never so great as in the first and last stages.

The total drop of pressure available has been divided up in such manner that it has been impossible to reduce the number of stages and thereby shorten the turbine by an appreciable amount. If necessary, these stages are constructed with expanded guide channels or nozzles. This expansion is not, however, designed for full load