the Transportation building have two compound Worthington pumps, which pump water into 20,000 gallon pressure tanks. A hydraulic pressure of 90 pounds is used. The cars are supplied with all safety devices and with an automatic stop, so that they stop at the top and at the bottom independently of the operator without shock or jar. This is accomplished by means of a sleeve, which gradually closes the port as the main piston approaches the end of the cylinder, thus controlling the egress of water and bringing the car to rest gradually. Many of the cars exhibited have inclosing doors which are operated automatically by compressed air.

Steam elevators are used largely in factories and elsewhere where steam is to be had readily. The latest improvement in the construction of steam elevators, and which is shown in this exhibit, is the compound. This has great economy in operation, and the lowering of heavy loads is controlled without the use of the brake. These elevators, like all other Otis elevators, are supplied with safety devices, which stop the car and lock it firmly to the guides should any undue speed be attained from any cause whatsoever in descending. The elevator shown in the foreground of the picture of the exhibit is one of these compounds. The two shown in the rear of the space are electric, so that these in the exhibit space and those in the tower illustrate the three types of elevators manufactured by this company.

This company has installed several elevators which are of more than passing interest, as they show what a degree of perfection has been attained in this direction. The elevators in the Eiffel tower at Paris are of this company's make. At Weehawken, New Jersey, are three hydraulic elevators, each car having a capacity of 135 people or 20,000 pounds, and yet make a speed of 200 feet per minute. This is probably the largest elevator plant ever installed. The company is now installing a large plant in the tunnel under the harbor at Glasgow, Scotland, which has six lifting and six lowering elevators, each of a capacity of 12,000 pounds. This plant will work at a pressure of 800 pounds. Each of these elevators will be equipped with the so-called Thorpe valve. By use of this device a certain quantity of water is called for when the load is under 6,000 pounds, and a double quantity when the load exceeds 6,000 pounds. Another plant that the Otis Company has installed and which embodies many principles of the elevator is the inclined railway in the Catskill Mountains, which is 7,000 feet long, has a rise of 1,600 feet and carries 100 passengers with their baggage the entire distance in eight minutes.

Cooking by Gas.

Briefly enumerated, its advantages are:

It is always available at a fixed price; avoiding the necessity for the troublesome and tedious distribution of wood and coal, and saving the rent of a cellar and loss of money from market fluctuations.

Storage of fuel in the immediate neighborhood of the kitchen fire being unnecessary, the use of gas diminishes the risk of fire in a house.

The full heating power is developed from the moment of lighting a gas fire; thereby saving the time and labor spent on fire lighting, which in the case of liquid fuel is accompanied by danger, and accomplishing the work in the shortest possible time.

Increase or decrease of gas consumption according to the requirements of the moment; taking the place of the inevitable stirring of the fire, or removal of vessels from it.

The consumption can be controlled by the meter, so as not to exceed a certain limit ascertained to suffice for requirements.

It can be used with advantage in small as well as large apparatus; the consumption being exactly proportioned to the work to be done.

Scorching of food during cooking is completely provided against, since each burner can be turned down at any time, and the heat regulated to a nicety.

The radiant heat from a gas fire can be taken advantage of in winter for warming the kitchen, but in summer nearly wholly suppressed.

The retention of the full flavor of food is promoted by gas cooking, through the complete control of the application of heat.

No smoke is evolved from a gas fire, and damage to property, cost of cleaning, and all the inconveniences associated with the smoke nuisance, are avoided.

PERHAPS the meanest of all swindlers are those who prey on poor inventors. They look over the *Gazette*, issued by the Patent Office, every week, and get the names of those to whom patents have been newly granted. Then they write to each one, saying, "We see that you have got a good thing. We know certain parties who will put it on the market, supplying the necessary capital. Send $20 to cover the cost of negotiations." The inventor perhaps borrows the money and fowards it by mail. Subsequently he is informed that $15 more will be required, and in this way he is worked until nothing more can be got out of him.—*The Engineer.*

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 930.

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HOW TO BECOME AN ELECTRICAL ENGINEER.

The SCIENTIFIC AMERICAN from time to time is asked by its correspondents for information on the subject of technical education. At the present time especially the question is asked with reference to electricity and electrical engineering. So much is being done in this field of work, and the importance of the subject is becoming so great, that young men are inevitably attracted toward it. The information sought from us frequently is the address of a school where electric engineering is taught, or what are the best steps for a young man to take to become an electrical engineer.

Sir William Thomson has stated that an educated mechanical engineer requires but a few months study to make of him an electrical engineer. It is fair to assume that the average young man contemplating electricity as a profession, if doing so with any justification whatever, from the force of circumstances must be a mechanic. If so he has taken the first step in the right direction.

The electrical station of the present day is based for its successful operation largely on economy in the generation and utilization of steam. The finest examples of the steam engineering in this country are supplied by them. The general engineering knowledge must not, therefore, stop with simple mechanics. The student must make up his mind to acquire the fullest possible knowledge of steam engineering and practice. It is not enough to know how to run an engine and boiler, he must understand the theory and construction of prime motors. When he feels that he is a thorough mechanic and thorough steam engineer, it will be time for him to think of completing his education by special attention to the electrical branches. While the theory of the science leads him to the higher mathematics, yet for practical work little more than elementary algebra is required. Our student must study the theory and mathematics of the subject from books. While doing this his practical studies should not be neglected. With his knowledge of mechanics he can construct dynamos, motors, and other objects in the engineering field, as well as galvanometers and instruments of precision. His last and graduating course will be an experience in the actual labors of an electrical station.

Reported Open Water Near the North Pole.

A vessel recently returned to San Francisco from carrying supplies to the whaling fleet in the Arctic Ocean, north of Alaska, reports that one whaler found open water at the mouth of the Mackenzie River, and had followed it in a northerly direction until he reached a point a little above eighty-four degrees, or farther north than the Greely expedition reached. It will be interesting to know whether this report can be verified when the master himself returns to San Francisco.

Four years out of five the ice packs in so heavily between Point Barrow and the mouth of the Mackenzie that it is impossible for vessels to penetrate it, but more frequently there is an open sea off into the northeast from Point Barrow. This direction, however, is regarded as a death trap by the whalers, and is religiously avoided. It is such a trap as De Long deliberately went into after being cautioned in the strongest terms by whaling masters not to be enticed into it. There have been seasons during the past twenty years when this northeastern ice entirely disappeared, and about ten years ago, one whaling master, who was determined to find whales, if any were to be found, took the risk and went in this direction some two or three hundred miles, as he estimated. Even then he did not reach any barrier. The water was free from ice, and from whales, too; hence he returned rather than risk going farther and stand the chance of the ice closing in on him from behind. But he reported finding considerable driftwood and seeing land birds. This led him to believe that land yet unknown and unexplored was not very far away. Since that time no whaler has explored in that direction until this one reported in the press dispatches. Hence it will be of importance to the scientific world to hear the full report of this voyage.

Scientific Training.

Professor Von Helmholtz, in a recent address to the students of Columbia College in this city, said that the recognized method of scientific work now was collection of knowledge, retention of that knowledge and its communication to mankind. There has been more accomplished by science during the last two centuries than during 2,000 years previously.

Careful observation makes the artist and makes the brilliant scientist. Trace the connection between events and the laws that govern that connection until doing so becomes intuitional. Train the mind so that the strongest impressions will be made by the most important events until this also becomes intuitional. Follow the advice of scientists of the last two centuries and go on by careful, accurate, complete observations to great discoveries and great successes.