SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico.....$3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845) .....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, FEBRUARY 16, 1907.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

GOVERNMENT REGULATION OF NIAGARA POWER.

The decision recently promulgated, under the Burton act, by Secretary of War Taft regarding government regulation of the utilization of the hydraulic power of Niagara Falls, has put a very effective stop to the alarming encroachments which the various power companies were making on the volume of the upper Niagara River, upon which the world-famous Falls depend for their scenic beauty. The decision allows the various existing companies on the American side to draw from the upper river volumes of water which are practically the same as those which are now utilized, and are permitted, as a maximum amount, by the provisions of the Burton act. The Niagara Falls Power Company may take 8,600 cubic feet per second, and the Niagara Falls Hydraulic Power and Manufacturing Company is restricted to 6,500 cubic feet per second. Power generated on the Canadian side may be imported in the following amounts: The International Railway Company, 1,500 horse-power; Ontario Power Company, 60,000 horse-power; Canadian-Niagara Falls Power Company, 52,500 horse-power; and the Electrical Development Company, 46,000 horse-power; making a total amount, which may be imported into the United States, of 160,000 horse-power. The Secretary of War may revoke these permits at his pleasure, and in any case, in the absence of any further legislation by Congress, they expire on June 29, 1909. Under these permits, there may be drawn from the upper river a total amount of 15,100 cubic feet per second on the American side, all of which is now being taken, and on the Canadian side they cover about 12,000 feet per second, of which last amount it is likely that about 5,000 cubic feet per second will be drawn during the three years covered by the permits. The volume of water passing over the Falls is estimated to be about 220,000 cubic feet per second; and as the total amount that will be drawn off during the coming three years is only about 20,000 cubic feet per second, it will be seen that the action of the United States government has effectively checked the desecration of the Falls, at least as far as American control of them is concerned, before it had proceeded to a point where the beauty and majesty of the Falls were seriously impaired.

Secretary Taft has done his work thoroughly; for not only is the further withdrawal of water to be prevented; but steps are to be taken to mitigate, if not remove, the unsightly conditions on the American side of the canyon below the Falls, the effect of which upon the sightseer is described as being that produced by looking at the backyard of a house negligently kept. A committee has been appointed to consider the question of restoring the American side of the canyon at this point, so as to put it once more in harmony with the Falls and other surroundings, and conceal, as far as possible, the raw commercial aspect that now offends the eye.

STUPENDOUS WATER SUPPLY SCHEME.

Three of the leading hydraulic engineers of the country have recently reported favorably upon what is probably the most daring municipal water supply scheme that has ever been projected. We refer to the proposal, which we understand has every prospect of being successfully prosecuted, to supply the city of Los Angeles and the surrounding district with an abundant supply of water drawn from the distant Sierra Mountains. The scheme involves, first, the construction of a conduit 226 miles in length, capable of supplying the city with a quarter of a billion gallons of water daily; second, the construction of large storage reservoirs, a single one of which will have the enormous capacity of 85 billion gallons of water; and lastly, the development of a total of 100,000 horsepower, available for six days of the week and nine hours of each day, the greater part of which can be developed within a distance of 45 miles of the city. The total cost of this very ambitious undertaking will be about $25,000,000. The guarantee for planning this work on a scale of such magnitude is to be found in the certain and very large income to be derived from the sale of water for irrigation purposes and for power, in and around a city which doubled its population in the ten years preceding the last census, and is recognized to-day as being, next to San Francisco, the most important commercial center in the flourishing State of California.

A SIMPLE-CYLINDER SUPERHEAT LOCOMOTIVE TEST.

An important question now being investigated by locomotive builders is the comparative efficiency of compound locomotives using high steam pressure and simple locomotives using low steam pressure with superheat. There has now been in operation on the Atchison, Topeka, and Santa Fé Railroad for over a year a simple-cylinder locomotive, which is identical with a class of compound locomotives operating on that road, in every particular except its cylinders, its boiler pressure, and the fact that it is provided with a superheater. The compound engines have tandem, compound cylinders, there being a 19-inch high and a 32-inch low on each side of the boiler, with a common stroke of 32 inches. The type was changed, in the experimental locomotive, by leaving out the 19-inch high-pressure cylinders (thus transforming the locomotive into a simple engine with two 32-inch diameter by 32-inch stroke cylinders), providing the boiler with a superheater, and lowering the pressure from 225 pounds of steam to 140 pounds, the superheater being built for the provision of 70 degrees of superheat. The locomotive started service with 130 pounds pressure, and this was successively raised to 135, 140, 145, finally to 150 pounds. The superheat ranged between 30 and 40 degrees. In spite of the failure to realize the expected 70 degrees of superheat, the locomotive has shown an efficiency within 5 per cent of that of the compound engines engaged in the same service. The record of this locomotive has been excellent, as is shown by the fact that it requires less repairs, and has been for a greater total time in service, than the compounds. Moreover, it is popular with the engineers, and by them preferred to the compound, not only because it requires less repairs, but on account of its adaptability to the water used on the division on which it has been working, which has the bad quality of excessive foaming. The absence of foaming is due to the drying-out effect of the superheater on the water carried over with the steam. The fuller data which will be available when the official report is made, will be awaited with no little interest. In this connection it should be noted that the value of superheated steam in locomotive service is to be investigated by Prof. Goss, of Purdue University, under a special grant of $3,000 a year for four years from the Carnegie Institution.

ONE YEAR'S WEAR OF A STEAM TURBINE.

The economy of the steam turbine in certain classes of service is fully established. Its mechanical durability, however, is not so well known, and indeed the serious wrecking of the blades in some of the earlier machines had raised a reasonable doubt upon this point. Valuable testimony to the wearing qualities of the Parsons turbine, however, was recently given in a report, by the vice-president and manager of the operating department of the Baltimore Power Company, on the condition and performance of the turbines at the Gold Street car station, where the equipment consists of three 2,800-horse-power steam turbine units, the first of which was placed in service in July, 1905, the second in August, 1905, and the third in April, 1906. Recently the second unit was opened, after eleven months of more or less constant service, and a thorough examination was made. The machine was found to be, as regards its general condition, as good as when first installed; and although saturated steam had been used, no blades were missing in either cylinder or spindle; nor was there any evidence of erosion, both edges of the blades and the steam surfaces of the same being intact. Furthermore, careful examination was made of the ends of the blades and of the inner surfaces of the cylinder which faced them, and also of the surface of the spindle barrels facing the ends of the blades which project inwardly from the cylinder. In neither case was there the slightest evidence of contact or rubbing between the two. Mechanically, then, this turbine must be admitted to have fulfilled every expectation.

As regards operation, the report states that the service rendered has been very satisfactory. The plant gives a twenty-four-hour service with a load varying from 12 to 15 per cent during week days, down to 5 to 8 per cent on Sundays. The turbines have shown that they are well suited to a high vacuum, no extraordinary trouble having been experienced in providing a vacuum within one inch of the barometer, particularly during cold weather. Notwithstanding the low load factor of 12 to 15 per cent, the station for one month averaged 3.36 pounds of coal per kilowatt hour generated, including all coal for banking and changing boilers, the coal being largely of bituminous mine cuttings. The corresponding water consumption of the station during the same month averaged 23.9 pounds per kilowatt hour. All of the condensed steam from the turbines is used for boiler feed water. During the same month the actual evaporation from a feed temperature of 180 deg. Fah. averaged 7.11 pounds of saturated steam per pound of coal. In concluding the report, the vice-president states that from an operating standpoint, steam-turbine motive-power equipment has proved eminently successful. It has been found to be entirely suitable for central station service, permanent in construction and adjustment, and economical of steam especially at low loads. Finally, the turbine plant is simple to operate, requiring less attention both skilled and unskilled than a reciprocating engine plant of corresponding size.

REINFORCED CONCRETE CONSTRUCTION ON THE PACIFIC COAST.

Already it is quite apparent that reinforced concrete is to enter largely in the reconstruction of San Francisco. There is scarcely a block in the downtown burned district that will not soon boast of at least one reinforced concrete building, for they are to be seen on every hand in various stages of construction. A five-story building on the corner of Geary and Market Streets, is the first structure of this kind to be occupied, while several others of from three to seven stories are in course of erection.

The most notable reinforced concrete building which has yet been announced for San Francisco is to be erected on the corner of Fourth and Market Streets, the site of the old Flood Building. It will be nine stories high and will cost $1,000,000. Its exterior, for the first two stories, will be veneered with ceramic tile in rich browns. Above the second story the entire front will be faced with cream-colored glazed terra cotta in rich detail. The corridors and lobbies will be finished in imported marbles, and six electric high-speed elevators will be installed. One remarkable feature of this concrete structure is the fact that nine stories are made possible within the limit of height to which concrete buildings are restricted by the city ordinance—one hundred and two feet. The first story will have a height of twenty feet; the second, twelve feet; and the other stories, ten feet each. By an ingenious arrangement of the structure, the fact that the roof is of concrete makes it possible to dispense entirely with an attic story.

The concrete firms declare that no other construction will stand fire and earthquake as well as reinforced concrete; and according to investigations made by the California Promotion Committee, it would seem that the facts bear out this assertion. It is well known, for example, that the museum at Stanford University was built seventeen years ago of reinforced concrete, being the first building of its kind in California. As compared with our modern methods, it was a very crude example of reinforced concrete construction. Nevertheless, it stood the earthquake admirably. One statue was thrown from the top, and all the marble statuary in the interior was toppled to the floor and broken. The pictures on the walls were swung with their faces toward the wall. However, the building sustained no damage, not even being cracked in the slightest extent. The girls' dormitory was also of concrete construction except in the roof. The roof was badly damaged, but the remainder of the building was only slightly injured.

In San Francisco, the Bekins warehouse was constructed with brick walls, and reinforced concrete for all other parts, such as floors, girders, and interior columns. This building sustained practically no damage either from fire or earthquake. At the time of the quake the building was under construction, and but two stories had been completed. The first story had already been filled with inflammable merchandise, which was entirely consumed. The building was not damaged in the least.

There were many other buildings in San Francisco having reinforced concrete floors. The National Board of Fire Underwriters' report of the San Francisco disaster shows that less than five per cent of these reinforced concrete floors were damaged.

In the Baltimore fire there were two buildings of reinforced concrete in the hottest part of the conflagration. One of these was five stories high with brick walls, and all the interior construction of reinforced concrete. The brick walls were destroyed by the intense heat, leaving the entire interior construction standing, with the full five stories practically undamaged, and requiring only the outer walls to be replaced to fit the building for use. The other building was a bank. The first two stories were of reinforced concrete construction, with three stories above of brick and timber. The upper stories were entirely destroyed, heaping great piles of debris into the top of the two concrete floors. The two concrete stories suffered no damage, not even the woodwork being burned.

In Los Angeles, reinforced concrete has been more extensively used than in any other city in the United States up to the present time. The immense Audi-