THE PELTON WATER WHEEL AND MOTOR.

The Pelton water wheel, which is illustrated in the accompanying engraving, has attracted considerable attention as an efficient motor for generating electric light currents and for use in connection with mining and manufacturing interests. Where any considerable head can be obtained, the amount of water required to run the motor is not very great. This motor is manufactured by the Pelton Water Wheel Co., with main offices at 121 Main Street, San Francisco, Cal., and with a branch office at 143 Liberty Street, New York.

The Pelton Water Wheel Company have recently placed upon the market a series of small wheels, inclosed in cases, or frames, of neat and substantial design, and, for convenience, they are called motors. These are adapted to light services, and possess in the same proportionate degree the power of the larger wheels. They afford very cheap and reliable power wherever water power is available.

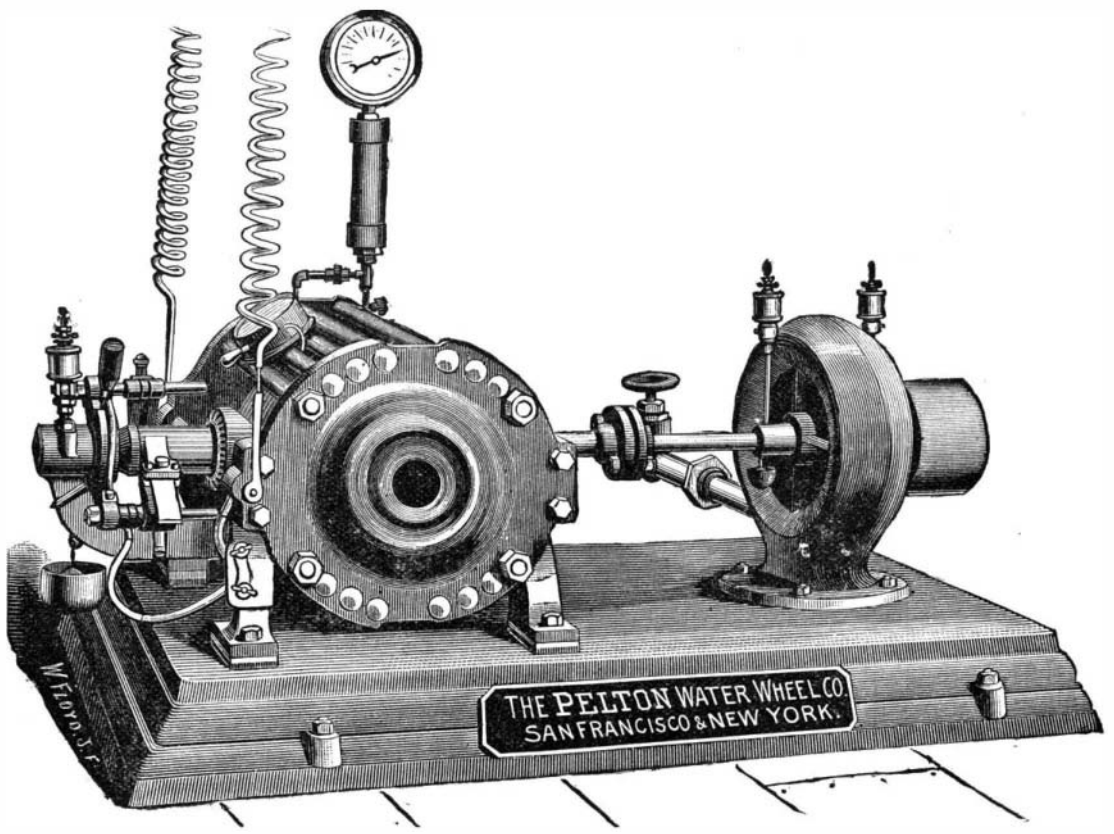
The motor shown in the illustration herewith is a Pelton No. 2, having a 12 in. diameter wheel. As will be observed, its shaft is connected directly with that of a T. & H. dynamo, the coupling being provided with proper insulation. The motor is supplied by water under a sufficient head to afford a working pressure of 140 lb. per. sq. in., which is the proper amount to furnish a speed of 1350 revs. per minute; this in turn is transmitted to the dynamo and affords the desired speed of same. The capacity of the combination is from 55 to 65 incandescent lamps of 16 c. p. each.

Where the head of water and other conditions do not permit attaching the motor to the shaft, as above indicated, it can be connected by a belt direct without any intermediate gear.

As will be seen, the above forms a most simple and effective combination, the motor and dynamo being placed on one solid base plate, and it is an illustration of the convenience and adaptability of these motors to almost every variety of service.

These small wheels have been adopted by many prominent electric light companies throughout the country, on account of their high efficiency and general reliability. Where free water is available, the expense of running any kind of machinery is very little, the first cost being the main consideration.

The enormous waste of power in the unutilized water courses all over the country is beginning to attract general attention, especially as energy can be made available by a variety of means so simple and inexpensive, one of which we have here illustrated.



THE PELTON WATER WHEEL AND MOTOR.

Railways in the Holy Land.

The Turkish government, having decided on the construction of a railway proceeding from Ismidt or Samsun to Bagdad, has invited the administration of the Anatolian Railway and Baron Macar, who received the concession for the Samsun-Sivas line, to a conference in order to consider the best means of attaining its object. The Minister of Public Works has a number of applications for concessions on hand at present. Among them is one from Mehmed Assim Effendi, for the building of a tramway line from Janina to Hanopoulo This tramway would be worked partly by animal traction and partly by steam. Another project is that of Ibrikdarzade Djemil Bey for the construction of a tramway at Broussa.

The Cairo Geographical Society has issued a pamphlet, prepared by Loutfy Bey, of Cairo, with a map in French and Arabic, advocating a railway between Ismailieh and Gaza. The pamphlet contains an interesting summary of various concessions in Syria. It is worthy of note that these enterprises are entirely in the hands of Orientals. Youssef Effendi Navon, of Jerusalem, undertakes three lines radiating from that city to Jaffa, Gaza, and Nablous (Samaria); total, 150 miles. Youssef Effendi Elias, late chief engineer to the government of the Lebanon, proposes not only to unite Damascus with Acre and Haifa, and improve the harbors of the Mediterranean termini, but to put steamers on the Sea of Tiberias; total, 200 miles. Youssef Effendi Moutran, charged with the harbor works at Beyrout, has obtained the right to construct a steam tramway into the Hauran—50 miles. Hassan Effendi Baiohom, also of Beyrout, contracts for the section between Damascus and its port—60 miles. The syndicate for the Damascus-Aleppo system of over 400 miles is in the hands of Messrs. Sola, Ralli & Co., well known Levantine names. Loutfy Bey proposes to devote himself to completing the Syro-Egyptian link of 150 miles. This would bring Jerusalem within seven hours of the Suez Canal.

The Sun Cooling Off.

BY PROF. ALEXANDER WINCHELL, LL.D.

We are not driven to the necessity of summoning exaggerated and imaginary agencies to the destruction of the earth. There are hostile powers reserved for the final conflict that will not be content with directing toward us merely "Quaker guns."

The sun, we say, affords us thirty-nine fortieths of all the warmth which we enjoy, and we feel quite unconcerned about the alleged slow cooling of the earth. To the sun we owe the numberless activities of the organic and inorganic worlds, and we feel quite independent of the waning temperature of this dying ember which we call the earth.

The amount of heat dispensed by our solar orb is truly something the contemplation of which overpowers the imagination. The rays which fall upon a common burning glass, converged to a focus, speedily ignite a piece of wood. The heat which is received by a space of ten yards square is sufficient, as Ericsson states, to drive a nine horse power engine. The amount of heat which falls upon half a Swedish square mile is sufficient to actuate 64,800 engines, each of 100 horse power. The total amount of heat received annually by the earth would melt a layer of ice one hundred feet thick. As the solar heat is radiated equally in all directions, it is easily calculated that the total emission of heat from the sun is 2,300 millions of times the whole amount which reaches our earth.

Such an enormous expenditure of heat is sufficient to reduce the temperature of the sun two and one-fifth degrees annually. During the human period of 6,000 years, the temperature would have been reduced more than 19,000 degrees. At such a rate of cooling it is obvious that the sun must speedily cease to warm our planet sufficiently to sustain vegetable and animal life. But it is certain that the sun's high temperature has been maintained during almost countless ages anterior to the commencement of the human era. Those titanic reptiles which could luxuriate only under tropical warmth flourished a hundred thousand years before the world was prepared for man; and those rank, umbrageous ferns, whose forms we trace upon the roof-shales of a coal mine, existed before the reptile horde, and purified the air for their respiration.

What unseen cause has perpetuated, for a million of years, those solar fires? Kepler asserted that the firmament is as full of comets as the sea is of fishes, and Newton conjectured that these comets are the fuel carriers of the sun. Alas! we only know that the wandering comet, though flying in tantalizing proximity to the sun, but accelerates its speed and hurries onward, as virtue hastens past the vortex of ruin. Is it a chemical action which maintains the solar heat? The most efficient chemical action for this purpose is combustion. Now, if the sun were a solid mass of coal, its combustion would only suffice for the brief space of forty-six centuries to replenish the solar system with its vivifying influence. Is it the effect of the sun's rotation on his axis? Such rotation could generate no heat without the resistance of another body. Even if that other body were present, a calculation based upon the sun's mass and his rate of rotation shows that the heat generated could only supply the expenditure for the space of one hundred and eighty-three years.

There exists, nevertheless, a means of recuperation to the solar energy. It is not an exhaustless resource, but it prolongs materially the period of the sun's activity. Though no comet has been *known* to fall into sun, it is now generally admitted that cosmical matter is raining down upon the sun from every direction.

Besides the planetary and cometary bodies which revolve about the sun, it is now demonstrated that the interplanetary spaces are occupied by smaller masses of matter, from the size of a meteorite to particles of cosmical dust. These all are flowing about the sun in a circling stream, but forever approaching nearer and nearer, until they are gradually drawn into the solar fires. The showers of meteoric hail which pelt our earth at certain periods of the year are merely cosmical bodies that have been diverted from their path in certain parts of her orbit. That faint cone of light which streams upward from the setting or the rising sun, near the time of the equinoxes, is but a zone of planetary dust illuminated by the sun's rays—a shower of matter descending upon the solar orb, and rendered visible to us, like the rain sent down from a summer cloud and projected upon the clear heavens beyond.

Arrested motion becomes heat. The blacksmith's hammer warms the cold iron. A meteorite falling through the earth's atmosphere develops so much friction as to generate heat sufficient to dissipate the body into vapor. One of these cosmical bodies falling upon the sun must, by the concussion, produce about 7,000 times as much heat as would be generated by an equal mass of coal. It is thus that the enormously high temperature of our sun is maintained.

But the very mention of this source of recuperation of exhausted solar energy suggests a limit to the process. For how many ages can the cosmical matter within the limits of the solar system be rained down upon the sun without complete exhaustion? The space inclosed by the orbit of Neptune is not infinite. The supply of cosmical matter is but a finite quantity. Time enough will drain the bounds of the solar system of all its wandering particles of planetary dust. What then will be the fate of the sun?

The conviction cannot be resisted that the processes going forward before our eyes aim directly at the final extinction of the solar fire. Helmholtz says: "The inexorable laws of mechanics show that the store of heat in the sun must be finally exhausted." What a conception overshadows and overpowers the mind! We are forced to contemplate the slow waning of that beneficent orb whose vivid light and cheering warmth animate and vivify the circuit of the solar system. For ages past unbounded gifts have been wasted through all the expanding fields of space—wasted, I say, since less than half a billionth of his rays have fallen upon our planet. The treasury of life and motion from age to age is running lower and lower. The great sun which, stricken with the pangs of dissolution, has bravely looked down with steady and undimmed eye upon our earth ever since organization first bloomed upon it, is nevertheless a dying existence. The pelting rain of cosmical matter descending upon his surface can only retard, for a limited time, the encroachments of the mortal rigors, as friction may perpetuate, for a few brief moments, the vital warmth of a dying man.—*Methodist Magazine.*

Lake Bonneville.

According to the monograph by J. R. Gilbert, published by the United States Geological Survey—the paper being chiefly geological, but having an important bearing upon the secular changes in climate--Lake Bonneville was the ancestor of the great Salt Lake of Utah, which has frequently altered its level, even in recent years. At the time of the glacial epoch its level was about 300 meters higher, and it occupied about ten times its present area. The cause of the drying up of a large part of the former area is found in the prevailing winds, which, on their way from the Pacific and in their passage over the Sierra Nevada, have precipitated much of their moisture, and pass over this region as drying winds.

A SOLUTION of bichloride of mercury is about the best material for taking indelible ink out of linen.