INTERIOR OF FARMHOUSE IN SOUTHERN FINLAND WHERE THE FAMINE' S BLIGHT NOW RESTS.

WATER - LIGHTNING

The Wonderful Development of the Water Wheel as a Primary Source of Power.

The Generation of Electricity and Its Use in Various Parts of the Country.

From The Journal Bureau, Room 45, Post Building, Washington.

Washington, Feb. 5.—Few industrial developments in the decade under review in the last census are of more interest than the revival of the water wheel.

"The use of water as a primary source of power," recites the census office bulletin, "has undergone a complete transformation during the last decade." Before 1890 the largest use of waterpower was in its direct application to machinery at the immediate point of development. The use of electricity as an agency for the transformation and transmission of the energy developed by falling waters has entirely changed the conditions under which it can be utilized to advantage. Mills are no longer built immediately over water powers.

The development of electric power transmission at Niagara Falls has been in many respects typical. There are now two separate enterprises on the American side—one above and the other below ts Horseshoe falls. The plant below the falls has the water of the Niagara river brought to it by a long canal which taps the Upper Niagara river, runs through the city of Niagara Falls, and then discharges the waste water at the cliff just below the first suspension bridge. Here there is a fall of about 215 feet—considerably more than at the plant above; but there is the disadvantage that the turbines and dynamos are located in the gorge, which the building disfigure, and that the conditions are not so favorable for the operation of machinery as in a plant at the surface.

It is the plant above the falls, the current, while used locally in large amounts, is also transmitted to Buffalo, twenty-six miles distant. This includes a short service canal, 250 feet wide at its mouth, 1¼ miles above the falls, and intake being inclined obliquely to the Niagara river. The canal extends inwardly 1,700 feet, with an average depth of 12 feet, and holds water adequate to the development of over 100,000 horsepower. On each side is a powerhouse, the ultimate capacity of each being 50,000 horsepower. The electric generators are at the surface, and the water wheels which drive them are in a wheel pit 150 feet under ground, connected by a steel shaft; the water reaches the wheels through steel tubes. After the water has delivered up its energy, it is carried off by means of a tunnel 7,000 feet in length, with an average slope of 6 feet in 1,000. This tunnel empties just under the first suspension bridge, where the waste water rushes out with a speed of nearly twenty miles an hour. The Niagara Falls Power company has under its charter the right to take sufficient water from the upper river to develop 200,000 horsepower, and has large franchises also on the Canadian side. The diversion of water is too small to make any perceptible difference in the amount passing over the crest of the Horseshoe, or American, falls. The potential power of the main stream is estimated to be at least six or seven million horsepower.

The American company has already given out contracts for a large plant on the Canadian side, where the current will be developed by the largest dynamos in the world, built in the United States, and can, if necessary, be brought across the river for use in this country. A large amount of Niagara current is employed in electrochemical and electro-metallurgical operations. This work, however, is far from exhausting its possibilities. The current is now used for electric ligthing, and about 1,000 horse power is also delivered to the local trolley system. Factories on the spot working up raw material into food, textiles, etc., utilize several hundreds of horse power, and the current is also used for the manufacture of "merry-go-rounds," as well as for operating ventilating blowers in the public schools. It is the transmission to Buffalo, however, which more particularly justifies the utilization of the energy of the great cataract, and illustrates the remarkable manner in which electric power is modifying the methods of American manufacturing and mechanical industries. The current from Niagara to Buffalo is carried over aerial circuits, and delivered to transformer stations which lower the pressure for local distribution. The Buffalo street railway system has five of these sub-stations, so that at all hours of the day and night, Niagara is transporting the public of a great city more than twenty miles distant.

A number of miscellaneous industries and manufactures use blocks of Niagara current at prices which compete so favorably with those of steam, oil, and natural and artificial gas, that the demand is rapidly increasing. Not only is grain ground to flour by electrical power, but it is handled by electricity. One of the most interesting utilizations is that of twenty horse power in a bread bakery. In another building three motors operate ice machines twenty-four hours a day, to furnish refrigeration for a market place on the other side of the street.

The Pacific Coast.

An advance beyond the utilization of the power of Niagara Falls is that more recently perfected, by means of which electric current is transmitted from the Sierras in eastern California as far as San Francisco and other cities of the Pacific seaboard. This constitutes the longest electric power transmission in the world, the distance being nearly ten times that on the American side of Niagara Falls. A further striking difference is that whereas the development at Niagara is due to the falling of water in huge volume under a head of only from 150 to 200 feet, in California large enterprises depend upon the utilization of relatively small bodies of water, but with heads of from 500 to 1,800 feet. In California where fuel is still scarce, a great many mining plants have been brought within the sphere of profitable working by this electric power transmission, and a large amount of miscellaneous work through the state is now tributary to these long-distance transmissions, which excel in daring, and in commercial success anything attained elsewhere in the world.

The power plant at Colgate is situated at the base of a 1,500 foot hill, down the side of which extend five steel pipes, each thirty inches in diameter, delivering water to the turbines. Water is brought to these pipes from the impounded river and from a remote watershed by means of a timber flume over seven miles in length with a capacity of 23,000 cubic feet of water per minute. This current is delivered to two circuits of three wires each, carried upon Oregon cedar poles averaging from twenty-five to sixty feet high, upon which are screwed porcelain and glass umbrella insulators twelve inches in diameter. The transmission current is carried across the well-known Straits of Karquines in an enormous span of 4,448 feet, and supported 200 feet above the rapid waters emptying into San Pablo Bay by means of steel latticed towers. The efficiency of the transmission system is such that 1,000 horse-power at the Colgate water wheels nets about 750 horsepower at San Francisco, 6 per cent being lost in the generators, 2 per cent in the step-up transformers, 2 per cent in the step-down transformers at the receiving substations, and 15 per cent in regulation and in the line.

The employment of the current is not less varied than at Niagara, ranging from the operation of street cars in Oakland to the running of a flour mill at Stockton, and from use in mines in various parts of the state to use in miscellaneous industries at Sacramento, Benicia, San Jose, and elsewhere. The plants must be maintained in regular and systematic operation, and as their initial base of dependence is the water supply, storage reservoirs have been provided in the high Sierras 8,000 feet above the sea level, furnishing a supply equal to 150 days, which is the maximum dry period of record in the state.

The third type of power transmission plant is that at the Snoqualmie Falls, Washington, where the dynamo-room with 10,000 horsepower of electrical apparatus is situated 250 feet below the surface in a large whitewashed cavern, blasted and hewn from the solid rock. This unique location is due to the fact that the spray from the falls rendered it impossible to locate any power-house at the surface. The current is transmitted across the Cascade mountains through dense forests to the cities of Seattle and Tacoma, where electric lights, railways and motors are operated.

Sault Ste. Marie.

The Saint Marys river, which flows from Lake Superior into Lake Huron has been utilized for power development upon an extensive scale during the last few years. Instead of a comparatively small flow of water at great head, here is an enormous volume with a comparatively small drop. The difference in the levels of the two lakes is about twenty feet, most of the fall occurring in the rapids known as Saint Marys falls, or Sault Sainte Marie, at the outlet of Lake Superior. On the Canadian side of the river a power canal has been in use for several years, yielding about 20,000 horse-power, a large part of which is used direct from the turbines for driving wood-pulp grinders.

On the American side of the river a much larger power development has just been completed. A canal about 2¼ miles in length, from 200 to 250 feet in width, and of an average of about 20 feet, has been cut from Lake Superior to a point on Saint Marys river below the rapids. A massive power-house contains turbines, capable of developing about 50,000 horsepower. All of this power will be transmitted by electricity to industries on both sides of the river. A third canal of similar proportions is to be constructed on the Canadian side of the river, paralleling the one now in operation. A unique feature of this great development is the precaution taken to prevent possible lowering of the level of Lake Superior or interference with the vast steamship traffic which passes through the locks at the rapids. Lest the increased outlet afforded by canals lessen the flow of water through the steamship locks, compensating works have been constructed at the head of the rapids for the purpose of reducing, by means of movable gates, the outflow over the falls in proportion to the increased outlet created by the power canals. It is designed, by this means, to maintain the flow of water from Lake Superior as a fixed quantity, regardless of the new outlets afforded by the power canals.

Electric Power in Cotton Manufactures.

In cotton goods manufacture electric power is being rapidly adopted, both in New England and in the south. One of the larger plants at which waterpower was utilized is the Ponemah Mills, at Taftville, Conn., where the energy from the waterpower at Baltic, 4½ miles away, has been used to run the weaving mill of 1,700 looms, and to operate 1,200 incandescent lights. A street railway system is operated in connection with the mill, and an electric locomotive is employed to haul freight cars a distance of one mile.

The typical southern mills utilizing waterpower are those at Columbia, and at Pelzer, S. C. At Pelter the saving in the first cost of the shafting and belting, as compared with an identical mill driven by a mechanical system amounted to nearly $10,000. The success of the Columbia Mills led the owner to develop a large waterpower system of their own, from which are driven the Granby Mills, 1½ miles distant, using 1,800 horsepower in motors, and the Palmetto Mills, using 200 horse power in motors. An even more striking instance of transmission of energy is that of the Anderson Cotton Mills, at Anderson, S. C., driven from the electric light plant at Portman Shoals, ten miles away. Between the waterwheels at the remote generating plant and the spinning frames in the mill there is not a single belt or auxiliary shaft. The increase in the quality of production obtained by the omission of belting is very marked over the old-fashioned mechanically-driven frames.

Economies of Electric Power.

The economies introduced into the manufacturing processes of the United States by electric power have recently been summarized by Professor F. B. Crocker of Columbia university, as follows:

First—A real economy in amount of power used.

Second—Buildings can be lighter, owing to the absence of heavy lines of shafting and pulleys.

Third—A reduction in expense of service, such as oiling and depreciation.

Fourth—More efficient arrangement of machines and tools, which need no longer be placed in straight lines parallel with the shafting.

Fifth—Access to the machinery is easier from the suppression of belts and pulleys.

Sixth—Greater cleanliness.

Seventh—Hygenic conditions are improved, owing to the diminution of dust and dirt; absence of shafting, pulleys, etc., lessening of noise.

Eighth—Greater ease of placing different shops in separate buildings and in locating them acording to the strict requirements of the work and without regard to the necessities of the motive power.

Ninth—Greater facility in the increase of establishments.

Tenth—Localization of accidents due to motive power, with consequent less injury to individuals and the stoppage of work only at the point where an individual motor is incapaciated.

Eleventh—Greater control of the speed of the tools.

—W. W. Jermane.

$2000. in prizes

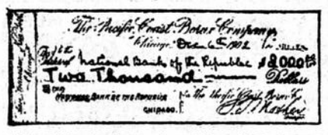
A simple contest with big prizes open to you

$2000 in prizes will be distributed in our "20 Mule Team Borax" contest, divided as follows: 1 prize of $500.00, 2 prizes of $100.00, 4 prizes of $50.00, 10 prizes of $25.00, 10 prizes of $10.00, 100 prizes of $5.00, 250 prizes of $1.00.

We have given each letter in alphabetical order, a numerical value, commencing with one and ending with twenty-six, as follows: A-1, B-2, C-3, D-4, E-5, F-6, G-7, H-8, I-9, J-10, K-11, L-12, M-13, N-14, O-15, P-16, Q-17, R-18, S-19, T-20, U-21, V-22, W-23, X-24, Y-25, Z-26. Persons entering the contest are to write out three reasons why Borax should be used in the Toilet and three reasons why it should be used in the Laundry. In no one of the reasons are more than thirty letters to be used. After the six reasons are written out, add up the numerical values of all the letters used. (Some letters will be used a number of times. Add the numerical value every time.) The person who submits the six reasons in which the sum of the numerical values of all the letters used totals highest will receive first prize, and so on down. In case of ties the prizes will be awarded on the merits of the reasons submitted (to be judged by a committee of three disinterested chemists.)

When sending in your entry use one side of one sheet of paper. Write your name and address at the bottom of the sheet with your three reasons why BORAX should be used in the Laundry immediately above. Over them write your three reasons why BORAX should be used in the Toilet and at the top of the sheet in plain figures mark the sum of the numerical values of all the letters you have used in your six reasons. Each entry must be accompanied by the top of a 1-lb. package of "20 MULE TEAM BORAX," to be had of your druggist or grocer. Please do not write us for any further explanation. There is no catch. The contest is very clear and simple and the prize winners will get good returns for comparatively little effort. Below is shown the check which we have deposited with the National Bank of the Republic, Chicago, for division among the prize winners. We believe that it is worth trying for.

Borax Prize



The following letter from Edward Gudeman, Ph. D., the food and sanitary expert, will partially explain the value of BORAX.

Chicago, November 26, 1902.

Pacific Coast Borax Company, Chicago.

Gentlemen: Replying to your inquiry, I have the following report to make: Water is said to be "hard" when it contains lime and magnesium salts, which retard the saponification or lathering of soap and interfere with the cleaning action and the solubility of the soap itself. All natural waters contain a certain amount of this "hardness" which is eliminated by strong alkalies; soda, ammonia and other caustic materials) or by borax. The strong alkalies, used directly or as found in strong soaps, will destroy organic tissue and are very harmful in their effects. Borax is harmless and even healing in its effects. A mild or neutral soap used with water softened by borax will cleanse better than strong soap or washing compound (which is generally a mixture of soap and soda) used without borax.

For toilet and bathing purposes, I would recommend that only sufficient borax be used to counteract the hardness of the water so that the soap used will become soluble and be readily rinsed from the skin and out of the pores. For laundry purposes I would recommend that a larger proportion of borax be used with a mild soap, as the borax itself is an excellent and a harmless cleanser besides a water softener. I have examined Lake Michigan water for you and find that it is not so "hard" as the average natural water. It contains only 7 to 9 grains of lime and magnesium salts to the gallon. A quarter teaspoonful of borax will soften two quarts of Lake Michigan water, counteracting all the lime and magnesium salts therein contained. Harder water will require a proportionately larger amount of borax.

(Signed) EDWARD GUDEMAN,
Chemist and Chemical Engineer.

We recommend that you send a two-cent stamp for our booklet, "Borax—Come In," which will greatly aid you in preparing your reasons. All answers must be in our office by MARCH 5, 1903. If neither your druggist nor your grocer can supply you with a one-pound package of "20 MULE TEAM BORAX" send us their names with twenty cents in stamps to cover cost and postage and we will supply you direct. Address all communications bearing on this contest to City Department

PACIFIC COAST BORAX COMPANY
Chicago, Ill.

Paine's Celery Compound

Will Banish Your Neuralgia.

Read the Strong Testimony of an Eminent Kentucky Physician.

Neuralgia, rheumatism, and a general "run-down" condition result directly from an impoverished and famished nervous system.

Paine's Celery Compound quickly corrects this faulty condition. Being a true nerve food and nourisher, it builds up the nervous system and fully sustains it. While Paine's Celery Compound is working at the root of disease (the nerve centers), bracing and building up the weakened and irritated parts and purifying the blood, neuralgia, rheumatism, and poisons are expelled forever from the system. Dr. Phelps' wonderful prescription is carrying health and happiness into thousands of homes; it is what you need for your present troubles; it makes sick people well and strong. Dr. Dudley Conner of Simpsonville, Kentucky, says:

"I have carefully examined the formula of Paine's Celery Compound and have no hesitancy in pronouncing it a compound of great therapeutic value. It has a wide range in its adaptation to the treatment of disease, as it possesses tonic and alterative, laxative and diuretic properties, and can be used any length of time without danger of toxic effect. It is a safe and judicious combination, well adapted to the treatment of neuralgia and rheumatism in all their varied forms, and all diseases dependent upon a depression of the nervous system and torpor of the bowels. I regard it as a good blood purifier."

FOR THE HOUSEWIFE

DIAMOND DYES

have been manufactured. They give fast, beautiful colors and are prepared for home use. Simply follow directions.

Direction book and 45 dyed samples free.
DIAMOND DYES, Burlington, Vt.

THE PERIL IN THE EAST

The War Against Turkey May Imperil the Peace of Europe.

London, Feb. 5.—For many years there have been perennial war scares over the Balkan question, until diplomats as well as the world at large have with indifference come to regard the cry of wolf. It is impossible to ignore or belittle the alarming nature of the present situation.

The Times to-day does not exaggerate when it says:

Every European chancellery is aware that there is most imminent danger of a revolt in Macedonia on a totally different scale from the usual spring disturbances, and an opening up of questions that may lead to a struggle the limits and issues of which a wise man will not pretend to forecast.

The preparations of the Macedonian revolutionary committee for a general rising in the spring are so extensive that it is impossible to keep them secret, and it is imposible to offset them except by a large army and campaign arrangements. It is only necessary to point out the main features of the situation in order to demonstrate the imminence of the peril. The sultan's atrocious misgovernment of Macedonia, despite all warnings and protests, has at last aroused both the Christian and Ottoman populations to revolt. The Bulgarian government has given formal assurances that it will do everything in its power to avoid interference in the coming quarrel. It is quite beyond its power, as all concerned know, to prevent the Bulgarian people from crossing the frontier and making common cause with the Macedonian revolutionists. Servia also professes its intention to stand aloof, but there also no government is strong enough to keep the country long out of the field after the fighting begins.

It would be unfair, perhaps, to question the sincerity of the efforts which Russia and Austria, as the powers chiefly concerned, are now making to avert the crisis. It has been decided to press upon the sultan certain reforms, the principal being the appointment of a Christian governor of Macedonia, with practically full powers. This concession, if it could be offered to Macedonia as an accomplished fact, even at this late day, might avert a revolution.

Russia and Austria have already begun massing troops on the frontier for a campaign which they consider inevitable early in the sprirg.

The sultan himself is by no means idle. He is preparing to put down in his usual savage fashion any rebellion in his diminions. There is no doubt of the result, however. If while struggling with the revolting provinces Abdul Hamid is confronted by the troops of Russia and Austria, the Turk will at last be driven out of Europe. But what will be the effect of a Russian seizure of Constantinople? A few years ago it would have been the signal for a general European war. This is less probable to-day, but again to quote the Times, a wise man will not pretend to forecast the limits and issues of the questions which would be opened up.

CUT THROAT IN A SALOON

Young Idaho Man Made Desperate by Deep Drinking.

Special to The Journal.

Boise, Idaho, Feb. 5.—Harry Davis attempted to take his own life by cutting his throat yesterday afternoon. He is about 22 years of age and a son of Thomas Davis, one of the best-known pioneers of Idaho. The attempt was made in a Main street saloon. After he was disarmed by bystanders he rushed out on the street and ran several blocks before his father arrived to take him home.

The cause which led to the rash act is not known, but it is said that for the past week Davis has been drinking heavily. Walking toward the end of the bar in the saloon, he said to James Straight, the bartender:

"Did you ever see a man cut his own throat?"

Without waiting for an answer to his strange query, he drew a large pocket knife and made a bad cut in his throat, extending just below the lobe of the right ear down the side of his neck. The cut was about four or five inches long. It bled profusely.

CAMERON TO COME BACK

Escaped Minnesota Convict Is About to Complete a Term at Cheyenne, Wyo.

Cheyenne, Wyo., Feb. 5.—J. Z. Barnard of the Minnesota penitentiary guard force has arrived here to await the termination of John C. Cameron's sentence, which will take place in a few days, and Cameron will be returned to Minnesota to complete a term there. He escaped from the Minnesota prison on Dec. 19, 1901, while serving a sentence for forgery.

Lincoln—Friends of irrigation claim a great victory in an opinion by the supreme court, which sustains the constitutionality of the Nebraska irrigation law and with it grants the right of eminent domain to irrigation companies.

THE NEW STORE

Sale Dent's Gloves

The yearly clean-up from the factory of every single pair returned during the year, reinspected, REMADE practically, and better than ever. DENT'S Coronets, Manillas, Tavistocks, Havanas, etc., regular prices $1.50, $2.00, $2.25 and $2.50, for men, women, girls and boys; all sizes, kinds and colors, but none BAD, for that's a word left out of DENT'S dictionary. This is the fifth time—it may be the last—it IS the best. Ready Friday morning at 8:30, sharp. Pick and choose to your heart's content for just **50c**

Evans, Munzer, Pickering & Co

THINGS WORTH KNOWING

Bits of Scrapbook Wisdom on Various Household Topics.

In buying things for the table it is not always those that look best that are really the best. An instance of this is celery. Almost any grocer will show you the long and large stalks of celery, and tell you they are something vey fine, whereas, the little short, rather stumpy ones, are really much more delicate and have a better flavor. The long stalks are very apt to be coarse. And in spite of the actual superiority of the small stalks, they are less expensive.

A dark calico bag or case to cover the ironing board when not in use wears one of the practical presents received by a young housekeeper last Christmas. It was something she had not thought of making for herself, but its usefulness was apparent at first sight. It is a nuisance to remove the ironing sheet every time the board is put aside, but unless this is done, or the board covered, the sheet becomes soiled and damaged.

A girl traveling abroad writes home of the smart effect produced by bouquets tied with black velvet ribbon. Hot-house marguerites, loosely bunched, with asparagus fern and held with a knot and bow with long ends of the velvet ribbon, were most attractive. Other white and pale yellow flowers were similarly treated.

A high school miss who was spending the evening with some friends consented to make some fudge, says Good Housekeeping. When it was time to add the vanilla for flavoring it was found there was none. She asked for a lemon, and she used the juice, which, combined with the chocolate, gave the fudge a delightful flavor. She made the discovery that the acid of the lemon made the fudge more creamy than any she had previously made. The lemon juice is always used now, frequently vanilla being added as well. Part maple sugar or good brown sugar varies the flavor of the fudge. Broken nut meats may be added occasionally for another change. Pure cream fudge is another fancy at present, the chocolate being omitted.

When vegetables are placed in the same platter with meats they not only ornament the dish but contribute to the ease of serving the dinner. When they are used, the dish is called a la jardiniere or a la printaniere. Probably every cook knows how to serve mashed or fried potatoes or green peas in the center of a circle of chops. Similar combinations can be made in various ways and of many things. Spinach, beans, carrots, purees, macaroni, spaghetti or rice may be placed so as to form a base, raising the chops like a crown, or grouped with them in rows, or alternating with the individual pieces. Macedoine is a mixture of any number of vegetables, such as peas, beans of various kinds, carrot and turnip balls, flowers of cauliflower and any other vegetable obtainable. They may be mixed together, or each vegetable may be kept distinct and placed in small piles around the platter. Small portions of vegetables left over may be used to advantage in this way. Very little need be used of any one and any number may be combined on the same dish. Potatoes boiled or fried can be prepared in many fancy ways to make them suitable for garnishing. Well-seasoned spinach is excellent with chops, steaks or roasts. Browned onions are often used. Meats with onion garnishes make dishes called a la soubise. Brussels sprouts, hot, are a suitable garnish for corned beef; or cold with a French dressing are an excellent salad to serve with cold beef. They should not be overcooked or they will lose their shape. Stuffed potatoes may be used with almost any meat dish.

HE KNEW.

Teacher—What's the quickest way to turn dollars into pounds, shillings and pence?

Pupil—Marry an English dook!

OVERSUSPICIOUS.

Hewitt—Gruet hasn't any confidence in anybody.

Jewett—No; I don't believe he'd cash his own check.

THE SATURDAY EVENING POST

EVERY WEEK

From Now to July 1, 1903

Only 50 cents

Old Gorgon Graham

By the author of Letters from a Self-Made Merchant to His Son. A new series of papers in which Old Man Graham preaches the gospel of good business and tells some of his characteristic stories. This Life Story of a Self-Made Merchant, by George Horace Lorimer, will be one of the features of coming issues of the magazine. The Letters from a Self-Made Merchant to His Son met with universal favor, and there is every reason to believe that the new series by the same author will be equally popular. In the new series old Graham tells the story of his own business career: how he began life as a farmer's boy, worked his way to the front and became the biggest pork packer in the West.

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