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PETROLEUM, THE GREAT ILLUMINANT.

The advanced political economist and student of social economy has selected among the exponents of the civilization of mankind two salient industries. The old assertion, that the nation is the most civilized which manufactures the most soap, is far from being a mere hint at the beauties of cleanliness. The real meaning of the assertion is that in the manufacture of soap there is involved an enormous bulk of chemical processes.

The salt itself has to be produced either from mines or from brine, while the mining of sulphur and pyrites and the production of nitric acid are all involved in this first step of the soda ash process. The next steps of the process produce the carbonate, but soap is as yet far off. In its production are joined the tallow manufacturer, the producer of the various vegetable oils, the resin manufacturer, and the lime burner. The country that manufactures the most soap is the one that puts these and other chemical and mining industries to the greatest possible use.

Artificial light is another of the great developments of the day which is accepted as an exponent of the progress of civilization. In olden times, when it was said that a manuscript smelt of the midnight oil, it indicated the fact that the chimneyless lamps of 2,000 years ago produced an odor. The candles of old times required snuffing every ten minutes to dispose of the unconsumed carbonaceous residue of the wick. For thousands of years nothing short of a torch or a bonfire was known that would give a reasonably strong light. So great were the difficulties of producing satisfactory illumination, that what would seem to-day almost trivial inventions were really very great ones. The Argand lamp, with the central draught, and the self-snuffing candle, with wick plated and dipped in borax solution, really represent important improvements.

Burning springs have long been noted as one of the curiosities of nature. It is now more than thirty years ago since the burning springs received their logical development in the establishing of the great petroleum industry, when the oil regions of Pennsylvania began to overflow with mineral oil. The next development was the production of natural gas, and the latter for a while figured as the grandest pyrotechnic of nature. There were not wanting prophets who said that this astonishing manifestation of the powers of nature would cease sooner or later, and already the natural gas supply of the country is diminishing.

Within the last few weeks the price of petroleum, the congener of natural gas, has rapidly risen, which may be taken as indicating a diminution of the supply. Those who live in large cities where the light of gas, itself a recent invention, has been superseded by the electric light; where the streets lighted by the arc lamp are almost as brilliant by night as by day, may feel little concerned in the price of kerosene oil; but throughout the land, far and wide, every farmhouse is lighted by kerosene. Many villages are entirely dependent upon it for their light, and any curtailment thereof is to be regarded as a retrograde step in the march of civilization.

To the traveler abroad one of the most homelike sights are the great piles of blue oil barrels, indicating America's supply of artificial light to the world. On this same supply of petroleum is based one of the greatest business organizations of the country, one which has had the greatest influence on the affairs of the land from the business, social and even educational standpoint. Should the supply of oil from American territory cease, the country would be most profoundly affected from almost every standpoint.

It is to be hoped that, inspired by the idea of giving a reasonable price to their product, the well diggers will succeed in their quest for new oil rock and for new oil territory. It seems as if it were within the possibilities that we might become importers of oil from Russia and the Caspian regions, while hitherto we have exported the refined products by the shipload. In spite of the electric light and of gas light, kerosene remains to-day the great light of the people, and its adaptability to the humblest farmhouse would make its curtailment a national calamity.

Waterproofing Brick.

At a recent meeting of the Australian Association for the Advancement of Science, Professor Liversidge read a paper on the "Waterproofing of Brick and Sandstone with Oils." These experiments were made with the view of ascertaining the length of time that brick and sandstone are rendered waterproof or protected by oiling. The oils used were the three commonest and most readily obtainable for such purposes, namely, linseed oil, boiled linseed and the crude mineral oil known as "blue oil" used for preserving timber. The weatherings were made upon a flat portion of the laboratory roof fairly exposed to the sun and weather. Good, sound, machine made bricks were ex-

perimented on. The amount of oil and water taken up by the sandstone was very much less than that absorbed by the brick, although the area of the sandstone cubes was much greater than that exposed by the bricks. Equal amounts of the raw and boiled oils were absorbed; the blue oil, however, was taken up in much greater quantity by both brick and sandstone, but by the end of twelve months the whole of the 13 1/2 ounces of blue oil had apparently evaporated away, and the brick had returned to its original weight, but those treated with raw and boiled oils remain unchanged. After the second oiling in November, 1890, and exposure for nearly four years and two months, they had practically retained all their oil, inasmuch as they had not lost weight and were also practically impervious to water. It was noticeable that the sandstone cubes treated with raw and boiled oils returned to their original weights, but do not appear to have lost the beneficial effects of the oils, being practically impervious to water.

Car Fenders.

There is something to be said in behalf of the trolley road and cable road companies. After experience had demonstrated the need of some safety appliance, most of the companies experimented with various contrivances, and nearly every company adopted some device, presumably the one that seemed to promise the best results in view of the style of cars used by the company and the character of its track. Many of these contrivances have proved to be so much worse than useless that they have come to be known collectively as the murderous car fender. The companies do not want to substitute other patterns of murderous car fenders for the ones in use, nor does the public wish to see this done.

The various fenders in use and the multitude in the Patent Office that will never be used indicate that most of the inventors have no conception of the difference between a trolley car gliding slowly on a perfect track and a trolley car rocking along at the top limit of speed over the average track of Brooklyn, for instance. There are many fenders that under the first named conditions would seat a careless citizen so comfortably in their luxurious meshes that it would seem a pity that their inventors had not added the necessary appliances for handing him a morning paper and putting a lighted cigar in his mouth; yet these same fenders in actual use would knock down the citizen, hold him down despite his struggle for life, bruise and disable him, and, when he was no longer able to resist, would pass him along for the drawbar, brake rods, wheel guards, wheels, and power box to complete the job. The managers of the companies do not want any more of these fenders.

It is probable that some one of the machinists of the trolley or cable companies, or some outside inventor, will see the necessity of departing from the principle of most of the fenders in use, which are grievous sinners, and of producing something entirely different. The incentive is ample; for nearly all of the trolley and cable roads are equipped with comparatively new cars, which they could not afford to discard at once, even if some inventor stood ready with the car of the future, all designed and built for safety from the wheel flanges up. We should say that the successful safety appliance for use until the present cars are discarded should be, first of all, not a murderous fender. It should pick up persons, large or small, whom it might encounter prone on the track and should trip persons overtaken on foot so that they would fall on top of the safety appliance and not beneath it. It should carry along, not necessarily on a feather bed, until the car could be stopped, such persons as it might pick up or trip up, or should dump them aside out of the way of the body or truck of the car. It should protect them from mangling by the projections beneath the platforms, as well as from death under the wheels. It should do this on any track smooth enough for cars to be run regularly over it, and with any possible distribution of the load in the car. It should be easily applied to any car, so that the companies would not be subjected to the cost and the public to the delay of traffic consequent upon laying up cars for a considerable period for alterations necessary before attaching the safety device. It should be reasonably cheap.

We believe that devices which should meet these requirements would be welcomed by the trolley and cable companies, and would be adopted without unnecessary delay. It is not too much to hope that they will be forthcoming before long, and it would be better to wait for them a little longer than to force the companies to substitute other murderous fenders for those now in use.

Meanwhile, it would be well for the parents of Brooklyn and elsewhere to prevail upon their children to quit the practice of darting on to the track in front of a car, standing between the rails and twirling their fingers before their noses at the anxious, almost un-nerved motorman until he brings the car nearly to a standstill. A switch applied properly to the body of a youngster inclined to court collisions with street cars would be a useful car fender.—New York Sun.

**American Shoe Machinery in England.**

There has recently been one of the most prolonged and extensive "strikes" ever known in the boot and shoe industry in England. The Shoe and Leather Reporter states on "unquestionable authority" that there were fully 200,000 operatives out of work early in April, and it is said that large quantities of American shoes have been ordered for the English market, consisting mainly of welted boots and shoes, a class of work which English manufacturers cannot compete with in consequence of the high costs of production there.

Comparing the relative cost of production in America and in England, a London paper says: "We have on view at this office a pair of gentlemen's high class Good-year welted boots made by a tiptop New York house. Nothing better in either workmanship or material could be produced in Northampton, though the style is hardly right for the English market. The labor cost of making and finishing this boot in America works out as follows, and it is important to remember that at the rates quoted, the American workmen make a minimum of £3 a week, running up to £4 10s. in many cases, and higher in exceptional cases, each man working single handed and in factory hours:

How Paid.		Cents per Pair.
Piece work....	Lasting machine operator.....	3
"	Pulling upper over last.....	3
"	Tuck pulling and bracing toe.....	1
Day work.....	Sewing welt.....	1 3/4
Piece work.....	Welt beating.....	3/4
"	Repairing.....	2
"	Filling bottom.....	2
"	Sole laving and rounding seat.....	2
"	Rounding and channeling.....	1 3/4
"	Stitching.....	3
"	Leveling.....	2
"	Sprigging seat.....	1/2
Day work.....	Slugging top piece.....	1/2
Piece work.....	Heel attaching.....	1 3/4
Day work.....	Breasting heel.....	1/2
Piece work.....	Trimming heel.....	1 3/4
"	Trimming edge.....	2
"	Pricking stitches.....	1
"	Burnishing edge.....	2 3/4
"	Scouring heels.....	1-6
Day work.....	Burnishing heels.....	3/4
Piece work.....	Seat wheel.....	1
Day work.....	Inking shank and top piece.....	1/2
Piece work.....	Finishing shank and top piece.....	1 3/4
"	Finishing bottom.....	2
"	Beading edge and top piece.....	3/4
Day work.....	Rubbing off.....	3/4
"	Pulling lasts.....	3/4
Total (say 1s. 7 1/2d.).....		38 3/4

"The total labor cost of this boot throughout in New York (a more expensive city to live in than London) is a trifle under 3s. 2d., and the boot sells to the trade at 17s. 6d., so that the wages bill comes out at about 18 per cent all told—a veritable triumph of manufacturing. There is not a manufacturer in Northampton who would not be delighted to pay higher wages than are shown in the above costing, and yet the costing as it stands gives the men about double the wages they earn in this country! How is it? Just this, that Englishmen will not work the machines to their proper capacity. The old-fashioned fallacy has been drilled into them that the more boots can be made to cost, the better it will be for trade, and the less work done by each man, the more there will be to go round. It seems incredible, but it is nevertheless true, that the employers who use machinery are prepared to double the present earnings of their men, provided the latter will only work at the same speed as their American brethren of the craft. But they won't do it, and when they are only asked to work at half speed they consider they are being used as 'pacemakers.'"

The English workmen have hindered the introduction of many machines that are in common use in this country, and for that reason better shoes, more stylish, light and "dressy," are made here and at considerably less cost than in England. The Goodyear sole sewing machine has been generally introduced. It is proved that the welted shoes made by it are better than those made by hand. They are, of course, much cheaper. Then the team work in American factories is an advantage, and there are many little mechanical contrivances in use which the workman strenuously objects to. It has been known to a few persons for some time, and now the people of two continents have learned on English authority that though "the prices paid in England to operatives are in many cases double those in the United States," yet shoes "can be freighted across the Atlantic and sold in England for less than shoes of the same quality can be made there."

**Crystallized Carbon Dioxide.**

Prof. A. Liversidge says: When solid carbon dioxide is examined under the microscope, it presents along its edges projecting wire-like crystals, which have branching filaments issuing from them apparently at right angles, resembling somewhat the groups of minute crystals seen in crystallized iron, gold, and ammonium chloride. The rapidity with which the carbon dioxide evaporates makes it difficult to catch the form of the crystals, either by photography or other means.

**The Use of Steam Pilot Boats.**

The Sandy Hook pilots of New York and New Jersey have for some time been in favor of using steam for pilot boats, and the recent meeting of the Pilot Commissioners in New York has served to call forth some very interesting arguments in favor of the innovation. It is claimed that four large sized steam pilot boats will be able to do the work of the twenty-one boats of the New York pilots and eight boats of the New Jersey pilots which are at present in use. These boats would have to be at least 130 feet in length, of high speed and worthy to rank with the best class of private steam yachts. The advantages of such boats over the pilot boats now in use are obviously very great. During heavy fogs they would be able to find a vessel and guide it by signals. They could take off the pilots from outward-bound vessels in any weather and there would be no more cases of pilots being blown across the ocean by heavy storms. The ice would not prove so troublesome to a steam vessel as it does to the present pilot boat. It is thought that the steam boats could run up so close to a vessel in heavy weather as to board her, no matter how severe a storm raged. The advocates of steam pilot boats also contend that the distressing accidents and loss of life on pilot boats during the recent blizzard could not occur to steam pilot boats. It is thought probable that the steam pilot boats will be introduced in the near future. The fifty-six New Jersey pilots are all in favor of the plan. There is still some opposition among the one hundred and eleven New York pilots, but the friends of the movement expect to overcome all objections.

**Railroad Telegraphers' Law.**

On this subject the Railroad Gazette expresses the following views:

The proposition to regulate the employment of railroad telegraph operators by law, which has been presented in a number of State legislatures within the last year or two, has now appeared in New York, Representative Audett, of Brooklyn, having presented a bill making it a misdemeanor to employ any person under 18 years old to send or receive train orders unless he has had a year's experience at telegraphing. This is not exactly the same as telling a boy that he shall not go near the water until after he has learned to swim, but the wording of the bill suggests that kind of a regulation. This is a matter which cannot be regulated by a hard and fast rule fixed in statutory form. Probably nine-tenths of the fatal blunders due to inexperience or lack of training have been made by persons over 18 years old; that is, persons who have both the age and the experience prescribed in this bill. Experience in telegraphing alone is but a single item, and it is not a decisive qualification, because so many operators with even two or five years' experience are yet poor operators. The age qualification means experience in the whole field of life; but this, again, is of indefinite value. The essential demand is for a person who has had experience and training in the line of work he is to do; sending and receiving messages, delivering them to conductors, holding trains, and the whole procedure specified in rules 500-527 of the American Railway Association. A law stipulating experience should specify where or under what kind of a tutor; but how can the legislature of New York or of any other State do this? If there were a school of train dispatching, with the author of "The Train Wire" at its head, some good might be effected by means of diplomas, but as long as there is not such a school, and no systematic discussion has been had by qualified persons as to the minimum of ability that could safely be tolerated, the legislature can only work in the dark. A crude law like Mr. Audett's, only scratching the surface, helps to inspire disrespect for all laws, as it is so poorly adapted to the problem in hand that it will not be thought of three months after its passage. If there are incompetent operators in the service of New York railroads, the railroad commissioners ought to inquire into the subject and report the actual facts of the situation.

The most prominent defect in the training of telegraph operators for railroad service is the loose way of bringing the teachers and learners together. A beginner generally learns to telegraph from a second-class operator, learns the other important duties of his position—how to manage his signal and how to deal with trainmen—from a second-class station agent, perhaps, and for the finishing touches—touches to make up for the deficiencies of these teachers—dependence is placed either upon the division operator or the dispatcher, communicating chiefly by wire, or upon the learner's native ability. The highest grade teacher comes into personal contact with the pupil very little, if at all. A few weeks in the office with a first-class dispatcher is worth more to most pupils than a year at a small office with the average operator. We know of roads on which a reform in this feature would produce an improvement in the service; but publicity at the hands of the railroad commission is the only instrumentality that the State can apply at present with any hope of useful results. A specific statute would run against a snag in trying to designate the suitable

dispatchers for instructors. A speaker at a recent meeting of the Central Association of Railroad Officers brought out an important point in connection with the personnel of the telegraph service, to wit, that operators handle all sorts of communications between the officers of a road, and are therefore in the position of confidential secretaries; and, consequently, that the moral character of all applicants should be particularly looked into. It has been the boast of the telegraph service of America that thousands of operators, working for small pay and under no bonds or any very impressive pledge, have faithfully kept the secrets of telegrams, with exceedingly rare exceptions; but this is no warrant for neglecting all reasonable measures to keep this standard from being lowered. Moreover, the superintendent who looks sharply to moral character is pretty sure to find all his problems of discipline much easier to deal with.

**Great Gold Nuggets.**

A correspondent of the Mining and Scientific Press says the largest piece of gold, free of quartz, in the world was taken from the Byer & Haltman gold mining claim, Hill End, New South Wales, Australia, on May 10, 1872, its weight being 640 pounds; height, four feet nine inches; width, three feet two inches; average thickness, four inches, and was worth \$148,800. It was found embedded in a thick wall of blue slate, at a depth of 250 feet from the surface. The owners of the mine were living on charity when they found it.

The Welcome Stranger nugget was found on Mount Moliagal, February 9, 1869; it weighed 190 pounds and was valued at \$45,000. It was raffled for \$46,000.

The Welcome nugget was found at Bakery Hill, June 9, 1859; it weighed 184 pounds 9 ounces 16 pennyweights, and was worth \$44,356. It was raffled for \$50,000.

The Lady Hotham nugget was found in New South Wales, Canadian Gully, September 8, 1854; it weighed 98 pounds 10 ounces 12 pennyweights, and was sold for \$23,557.

The Union Jack nugget was found February 28, 1857; it weighed 23 pounds 5 ounces, and was sold for \$5,620.

No name nugget was found at Eureka, Dauttons Flat, February 7, 1874, at a depth of thirty feet from the surface; it weighed 52 pounds 1 ounce, and was sold for \$12,500.

The Leg of Mutton nugget was found at Ballarat, January 31, 1853, at a depth of 65 feet; it weighed 134 pounds 11 ounces, and was sold at the bank for \$32,380. This nugget was shaped like a leg of mutton, hence its name.

No name nugget was found at Bakery Hill, Ballarat, March 6, 1855, near the surface; it weighed 47 pounds 7 ounces, and was sold for \$11,420.

No name nugget was found in Canadian Gully, Ballarat, January 22, 1853, near the surface; it weighed 84 pounds 3 ounces 15 pennyweights, and was sold for \$20,235.

The Kohinoor nugget was found at Ballarat, July 27, 1860, at a depth of 160 feet; it weighed 69 pounds and was sold for \$16,686.

The Sir Dominic Daly nugget was found February 27, 1862; it weighed 26 pounds, and was sold for \$6,240.

No name nugget was found at Ballarat, February 28, 1855; it weighed 30 pounds 11 ounces 2 pennyweights, and was sold for \$7,395.

No name nugget was found August 1, 1879; it weighed 12 pounds, and was worth \$2,280.

No name nugget was found at Ballarat, February 3, 1853; it weighed 30 pounds, and was sold for \$7,360.

No name nugget was found in Canadian Gully, January 20, 1853; it weighed 93 pounds 1 ounce 11 pennyweights, and was sold for \$22,350.

No name nugget was found at Bakery Hill, March 6, 1855; it weighed 40 pounds, and was worth \$9,600.

The Nil Desperandum nugget was found November 29, 1859; it weighed 45 pounds, and was sold for \$10,800.

The Oats & Delson nugget was found at Donolly gold field in 1880, at the roots of a tree; it weighed 189 pounds, and was sold for \$50,000.

In addition to the above are the Huron nugget, worth \$20,000, and the Empress nugget, worth \$27,661. A great number of smaller nuggets, too numerous to mention, have been found.

Many large nuggets or lumps of gold have been found in California during the era of placer mining; but Australia must claim the largest. The California lumps are as follows:

A piece of gold and quartz was found in Calaveras County, on Carson Hill, on the mother lode; it was valued at \$42,000.

The Downieville lump of quartz and gold, of Sierra County, as stated by Louis Blanding, gave a value of nearly \$90,000; but it was not a nugget.

The mass of gold and quartz found in the Bonanza mine, Sonora, Tuolumne County, gave a value of over \$40,000.

The Australian statistics are correct, I having obtained them from government authority. ARGUS.