

use by its discoverer of any new or improved mode of production is a species of monopoly, in the sense in which that word is conventionally used. To let a man have the benefit accruing from the employment of some more efficient machine, or better process invented by him; and to allow no other person to adopt and apply for his own advantage the same plan, they hold to be an injustice. Nor are there wanting philanthropic and even thinking men, who consider that the valuable idea originated by individuals—ideas which may be of great national advantage—should be taken out of private hands and thrown open to the public at large.

"And pray, gentlemen," an inventor may fairly reply, "why may not I make the same proposal respecting your goods and chattels, your clothing, your houses, your railway shares, and your money in the funds? If you are right in the interpretation you give to the term 'monopoly,' I do not see why that term should not be applied to the coats on your backs and the provisions on your dinner-tables. With equal reason I might argue that you unjustly 'monopolize' your furniture, and that you ought not in equity to have the 'exclusive use' of so many apartments. If 'national advantage' is to be the supreme rule, why should we not appropriate your wealth, and the wealth of others like you, to the liquidation of the state debt? True, as you say, you came honestly by all this property, but so did I by my invention. True, as you say, this capital, on the interest of which you subsist was acquired by years of toil—is the reward of persevering industry: well, I may say the like of this machine. While you were gathering profits, I was collecting ideas: the time you spent in conning the prices current was employed by me in studying mechanics; your speculations in new articles of merchandise answer to my experiments, many of which were costly and fruitless; when you were writing out your accounts, I was making drawings; and the same perseverance, patience, thought, and toil, which enabled you to make a fortune, have enabled me to complete my invention. Like your wealth, it represents so much accumulated labor; and I am living upon the profits it produces me, just as you are living upon the interest of your invested savings. Beware then, how you question my claim. If I am a monopolist, so also are you; so also is every man. If I have no right to these products of my brain, neither have you to those of your hands; no one can become the sole owner of any article whatever; and 'all property is robbery.'"

ON THE COAL-FIELDS OF THE NORTH PACIFIC COAST.

Abstract of a paper read by Robert Brown, Esq., F.R.G.S., before the Edinburgh Geological Society.

The Pacific Railroad being now nearly ready for traffic, it becomes of importance to inquire what are the fuel supplies—on the Pacific coast—to be relied upon to supply the fleets of steamers and the branch railways which will soon strike off from the main line into almost every valley and to every little mountain town. No doubt, coal might be brought round Cape Horn, as hitherto much of it has been, or across the plains with the railway, but both of these means of supply must necessarily be limited on account of the expense. It behoves us, therefore, to inquire somewhat narrowly what are the extent and nature of the native coal-fields on the North Pacific coast. I must preface what I have to say by telling you that what notes I may have to lay before you, are the result of occasional observations in the course of my wandering in the greater portion of certain regions—explored and unexplored—between California and Alaska during portions of the years 1863, 1864, 1865, and 1866. Though I shall have occasion now and then to refer to general geological questions, yet for the main part what I shall have to say will almost entirely be looked at from a coal-supply point of view, and then as much with the eye of a physical geographer as that of a pure geologist.

Extending from the borders of California to Alaska are three coal-fields belonging respectively to the tertiary, secondary, and palaeozoic ages—the latter being situated, as far as yet known, only in the Queen Charlotte islands, off the northern coast of British Columbia, the exact age being as yet undetermined, though the coal is anthracitic and in all probability palaeozoic. The other two coal-fields are situated, as regards each other, from south to north in the order of their age. The tertiary extends from California northwards through Oregon and Washington Territory, impinging the southern end of British Columbia and Vancouver Island, and extending, with some interruptions, right across the Rocky Mountains—the Miocene coals of Missouri being apparently only a continuation of these same beds. The secondary beds, on the other hand, on the North Pacific are confined to the island of Vancouver, though in all probability they are also a continuation of the cretaceous strata of Missouri. The tertiary lignites of the North Pacific are throughout of Miocene age, and are associated with beds of sandstone, shale, etc. It burns freely, but leaves behind much slag and ash. It has been wrought at various places on the coast. 1. Mount Diablo, California. Here 59,257 tons were mined last year from January to August, the coal selling for eight dollars per ton in San Francisco. At Benicia it was also mined, but has been discontinued. Its analysis is—carbon, 50; volatile bituminous matter, 46; ash, 4. 2. Coose Bay, Oregon. Its analysis shows 46.44 per cent of carbon, 50.27 of volatile matter, and 3.19 of ash. Its percentage of coke is 49.73; but this is dark, friable, and of little value. It produces abundant gas, of low illuminating power. It is used to some extent in San Francisco, 7,759 tons having been imported from January to August, 1868. 3. Clallam Bay, Washington Territory. Several attempts have been made here to get good coal, but have failed to a great extent owing to the want of a harbor. Analysis—carbon, 46.40; volatile matter, 50.97; ash, 2.63. 4. Bellingham Bay. Here the lignite has been mined for some years with success, though it

is of no better quality than the others. From January to August, 1865, 5,680 tons were imported into San Francisco. Analysis—carbon, 47.63; bitumen, 50.22; ash, 2.15. Coal crops out at various other localities—Fraser River, Burrard Inlet, islands of the Haro Archipelago, Sanetch Peninsula, the northern (Vancouver) shores of De Fucas Strait, etc.—but has not been worked; and I am of opinion that all these outcrops are of tertiary age, the secondary formation not appearing south of the Chemainos River. There are newer (Pleistocene, or perhaps recent) lignites in the cliffs of Useless Bay, Whidby's Island, associated with remains of the mastodon, a tradition of the existence of which animal still lingers among the Indian tribes. This lignite is in small quantity, and quite worthless for fuel. The whole coast of Vancouver on the east coast, north of Chemainos, is bounded by a belt of carboniferous strata, composed of sandstone, shale, and coarse gravelstone conglomerates, interstratified with which are beds of coal of a much superior character to any hitherto described. These beds from the contained fossils appear to be cretaceous. Everywhere the strata named form a characteristic accompaniment of the coal (especially this coarse conglomerate) and nearly everywhere it is underlain by one or more seams of coal cropping out at some point on the circuit named, though it may reasonably be supposed yet to be found on the opposite shores of British Columbia. Outcrops are seen on some of the coast-lying islands, etc.; but it is only at Nanaimo where it is wrought to any extent, this being the only mine in Vancouver Island (or in the British North Pacific territories) exporting coal. Here is a village of 500 inhabitants and some fifty miners. Last year the company exported 43,778 tons, and declared a dividend of 15 per cent. The coal is bright, tolerably hard, and not unlike some of the best qualities of English coal. It is used all over the coast for steaming and domestic purposes. It brings eleven dollars per ton in Victoria, and thirteen in San Francisco. An analysis gives carbon, 66.93; hydrogen, 5.32; nitrogen, 1.02; sulphur, 2.20; oxygen, 8.70; ash, 15.83. The fossil remains were then described. North of Nanaimo, on Brown's River, immense seams of coal have been discovered by myself and party; on Salmon River the Indians report coal; at Sukwash, near Fort Rupert, coal appears; and at Koskeemo Sound, on the western shore, are extensive undeveloped fields of what will ultimately, no doubt, prove the best coal in Vancouver Island, both from its quality and easy shipment. The latter, on analysis, gave carbon, 66.15; hydrogen, 4.70; nitrogen, 1.25; sulphur, 0.80; oxygen, 13.59; ash, 13.60. Other coal-fields will no doubt be discovered as exploration proceeds, but the country is so covered with dense forests and undergrowth as to render exploration very difficult. The anthracite is found on the Queen Charlotte Islands, off the north coast of British Columbia. The beds are much broken up by faults, felspathic trap dykes, and other disturbing influences, so that to work it will always be expensive and troublesome. Still, the value of the discovery is of the highest importance to the coast. The coal is associated with conglomerates, a fine hard slate, out of which the Haida Indians carve the pipes and other ornaments so common in the European museums, and metamorphosed sandstones. On first sight I was inclined to believe it only debilitated cretaceous coal, but from the fossils recently discovered I am induced to change that opinion and to believe it of palaeozoic age. An analysis gave—carbon, 71.20; moisture, 5.10; volatile combustible matter, 7.27; ash, 6.43. The only good or extensive coal-fields in the North Pacific are, therefore, within the English colonies of Vancouver Island and British Columbia, and in the possession of these coal-fields these States, at present so depressed, have a mine of wealth which, if judiciously managed, will ultimately render them the seat of busy industry.

From the Century.

SOMETHING ABOUT BELLS.

The origin of bells may be dated from the time of Moses. In the 28th chapter of Exodus, verses 33-35, "a golden bell" is mentioned as upon the hem of the robe of Aaron, in order that "his sound shall be heard when he goeth into the holy place before the Lord." Bells are also mentioned in the 14th chapter of Zechariah, verse 20, as being upon horses; and it is not improbable that Tubal Cain, the sixth in descent from Adam, "an instructor of every artificer in brass and iron," may have known something of the art of making them. The early historians inform us that the Greek warriors had small bells concealed within their shields, and when the captains went their rounds of the camp at night, each soldier was required to ring his bell in order to show that he was watchful at his post. Plutarch also mentions that nets, with small bells attached, were spread across the stream to prevent the inhabitants of Xanthus from escaping by swimming the river when the city was besieged.

Church bells originated in Italy, being formed by degrees out of the cymbals and small tinkling bells used in the religious ceremonies of the East, as a means of honoring the gods. Pliny states that bells were invented long before his time. They were called *tintinnabula*. Among Christians they were first employed to call together religious congregations, for which purpose runners had been employed before. Although first introduced in the fourth century, it was not until the sixth century that they were suspended on the roof of the church in a frame. The hours of the day were first ordered to be struck by Pope Sebastian in 605, to announce to the people the time for singing and praying.

In England large bells were first introduced in churches about the seventh century, and it is supposed that they gave rise to that feature of ecclesiastical architecture known as the Bell Tower.

Bells were often baptized and christened with great pomp and ceremony, and in the middle ages were much used as a

part of the ceremonial of the church. The Sanctus bell, which is a small bell still used by one of the attendants of the priests of Roman Catholic Churches just before the elevation of the Host, was formerly a larger bell hung in the outer turret of the church, at the sound of which, all who heard bowed in adoration. The Ave Maria bell announced the hour for offering a supplication to the Virgin, and for beginning and ceasing labor. The Vesper bell was the call to evening prayer. The Passing bell was so named as being tolled when any one was passing from life, and it was ordered that all within hearing should pray for the soul of the dying.

From this custom is doubtless derived that of tolling the church bells at funerals, and also that which is practiced in some localities of tolling the bell immediately after a death, and indicating the age of the deceased by the number of the strokes.

The ringing of the Curfew bell was introduced into England from France by William the Conqueror. It was called the *couvre feu* (cover fire) bell, and when rung at eight or nine o'clock in the evening it was expected that all fire and light would be extinguished. It is to be remembered that at that early period houses were mostly built of inflammable materials, and the law of the Conqueror, though arbitrary, was intended to prevent conflagrations. The custom was enforced for less than fifty years, but there are many localities in England where, even now, "the curfew tolls the knell of parting day."

In olden times it was superstitiously believed that the ringing of bells would disperse evil spirits, check tempests, drive away infections and avert the lightnings. The most common of the old inscriptions upon the Latin bells were to this effect.

The use of bells to sound alarms in the event of dangers from fire, flood, and the enemy dates from an early period. It is related that in the year 610, when Sens was besieged, the Bishop of Orleans ordered the bells of St. Stephen to be rung, and the sound so frightened the assailants that they abandoned the siege.

When Macbeth shut himself in the forest of Dunsinane, and it was announced to him that Birnam Wood was moving on the castle, he cried out in his desperation:

Ring the alarm bell! Blow wind! Come wrack!
At least we'll tie with harness on our back.

In later years, the use of bells has become so systematized as not only to sound the alarm of fire, but to indicate the locality of the danger, and there are several cities in the United States in which, by means of electricity, every fire bell may at once announce this fact. Perhaps the most perfect operation of this system is to be seen in the city of New York.

The largest bell in the world is in Moscow—the City of Bells. It was cast by order of the Empress Anne, in 1653; is twenty-one feet four and a half inches in height, twenty-two feet five and a half inches in diameter where the clapper strikes, and is believed to weigh from 360,000 to 440,000 lbs. Historians are in doubt whether this giant among bells was ever hung. Dr. Clark, who saw it about the year 1801, says, in his "Travels," "The Russians might as well have attempted to suspend a line-of-battle ship with all its stores and guns." Bayard Taylor, on the other hand, maintains that it was both hung and rung, "it being struck by the clapper," as Korb says in his diary, "fifty men pulling upon it, one half upon each side."

In 1837, the Czar Nicholas caused it to be disinterred from its bed of sand, where it is supposed it was lodged during the conflagration of 1737, and placed it on the granite pedestal where it now rests. It was then consecrated as a chapel, the entrance to the interior being through a large fracture near the mouth, the cause of which is also a subject of controversy.

It is recorded that at the casting of this bell nobles were present from all parts of Europe, who vied with each other in the value of the gold and silver plate, jewelry, and other votive offerings which they cast into the furnace. It is doubtless owing to this practice, which prevailed in olden times, that the existing notion is derived that ancient bells are of better material than the modern ones, on account of the silver in their composition. It may be added, however, that the idea is incorrect, since recent experiments have shown that its introduction causes a positive deterioration of the resonant quality of bell metal. Whoever has been in Russia recalls as chief among his memories the sounds of the great bells which form a part of religious worship, and are regarded by the Russians with superstitious veneration. In Moscow alone there are five thousand, and when they unite on festive occasions in one mighty chime, the effect especially at a distance, is said to be majestically grand.

There is now suspended in the tower of St. Ivan, at Moscow, a bell which weighs 144,000 pounds, and the diameter of which is thirteen feet. It is said that when it sounds, which is but once a year, "a deep, hollow murmur vibrates all over Moscow, like the fullest notes of a vast organ or the rolling of distant thunder."

The bell of Notre Dame Cathedral at Paris, cast in 1680, weighs 30,000 pounds; that of St. Peter's at Rome, weighs 17,000 pounds; that of Notre Dame Cathedral, Montreal—the largest in America—29,000 pounds; and that of the Parliament House in London, 30,000 pounds. When it is remembered that the largest bells heard in our American cities rarely weigh more than three or four thousand pounds, some idea may be had of the volume of tone which belongs to the monster bells above described.

The Chinese have likewise produced bells of colossal size, one of which at Pekin weighs 120,000 pounds, but the tone of their bells is said to be discordant and "panny" like that of their gongs.

Probably the most celebrated bell in this country is that