In England it is found in greatest quantities in the neighborhood of Whitby, in Yorkshire. There it is mixed with bitumenized wood and coniferous trees in the upper lias or alum shale of the district. In Prussia it occurs in association with amber, and is named by the amber diggers "black amber," a phrase which seems to have traveled to Italy, for the mineral is there sometimes called "ambra nera." This term is more applicable from the fact that jet, like amber, becomes electrical by friction.

There is a belief that amber and jet come from one source: that amber is a fossil gum, while jet is the trunks and the branches of the trees more completely bitumenized and freer from earthy impurities than cannel and other coal. Indeed M. Magellan goes so far as to say that jet is a pure amber, differing only in color from the undisputed variety. In France large quantities are found in the department of the Aude, where a large number of artisans find steady employment in fashioning it into rosaries, religious beads, and ornamental trinkets when fashion demands them. In Spain jet of a very high quality is found at Villaviciosa, in the province of Asturias, and is manufactured principally at Oviedo.

But during the present century jet became a popular ornament, and now probably in not a few minds Whitby and jet are inseparably associated. The article acquired considerable value, and some twenty years ago jet ear-rings ranged in value from 5*s.* to 30*s.* a pair. Then a lucrative trade was carried on at Whitby, jet miners scooped out pits in the pretty Cleveland hills, and a large number of men and young women in Whitby found employment in carving the precious coal into articles of feminine ornament. But the success of the English jet trade brought competition into the field, and with it imitation, which latter first demolished the genuine jet trade and then committed suicide. Cheap and inferior jet was imported from France and Spain, and what was wanting in value with regard especially to the former of these was amply compensated for by the superior taste displayed by the French artists in designing the ornaments. Then colored glass invaded the jet market, but the greatest blow of all was the invention of vulcanite. Vulcanite is a simple compound, its only components being India rubber and sulphur, combined by the pressure of steam. This substances has many advantages over real jet. It is equally black, more tenacious, and consequently more suitable for watch guards. It is also more easily worked, being manipulated while hot, and is not more than one-tenth the price of jet.

Vulcanite became the rage for a time, and jet fell into disuse. But the manufacturers of vulcanite, not satisfied with their victory over genuine jet, fell into evil ways, and succumbed to the great temptation to adulterate the genuine vulcanite. The addition of *litharge* and whitening cheapened the vulcanite considerably, and for a time did not interfere with its appearance; but the pernicious effects of the alloy soon tells, and the "jetty black" of vulcanite turns to a faded green. The vulcanite rage passed over, and fashion in its reaction from the somber ornaments flew to the opposite extreme, and set up a "silver mania." There are now signs that this is on the wane, and the leaning for oxide of gold, by which the rapid transition from jet to silver among the masses was slightly interrupted, does not seem likely to come into favor again. In this state of matters, says the *Colliery Guardian*, comes the announcement from Whitby that there are signs of a revival in the jet trade.

The indications of a resuscitation of the industry are certainly tangible, but while not desiring to throw a wet blanket on industrial hopes of any description, we would venture to question whether there are any real grounds for supposing that the manufacture of jet will ever experience anything like a real revival. It may be true that the stocks of jet ornaments at Whitby are being exhausted, but what does that prove? The fact is that jet has been for some years so low in value as to be hardly "worth keeping," and probably hardly worth carrying away. Ear-rings which in the halcyon days of the jet trade would have fetched 30*s.* a pair, retail price, could, during recent years, have been had for 5*s.*, and what were 5*s.* ear-rings formerly are now worth about 2½*d.* The case is the same with vulcanite, and an ornament of this composition which might have cost 2*s.* ten years ago, could now be bought for 1*d.* or 1½*d.*, and should fashion in its caprice lend a favorable eye to "black jewelry," and jet consequently acquire an increased value, that moment would the market be flooded with vulcanite. How cheap soever jet ornaments may be made, vulcanite will undersell them, and as vulcanite looks equally well, is more durable because less brittle, and is in many respects superior, any resuscitation must be ephemeral, and the sparkling coal from Whitby must succumb before a bare preparation—a fact more galling than that which befell "The ielt or marble farre from Ireland brought," which yielded in Spenser's imagination to the "Stone more of value, and more smooth and fine."

NATURAL HISTORY NOTES.

Origin of the Name "Puss."—Says the editor of the *Zoologist*, the cat was worshiped in Egypt as a symbol of the moon, not only because more active at night, but from the priests conceiving that the contraction and dilatation of the eye afforded an emblem of the increase and decrease of the moon's ever-changing orb. In the British Museum may be seen several figures of the cat-headed goddess Pasht, under which name the moon was worshiped by the Egyptians—Pasht signifying the face of the moon. "Pasht" is compounded of the consonants P, SH, T. T is the coptic feminine article, which, being omitted, the same is reduced to P, SH, but the aspirate SH should be the tenuis S, and then the word would be PS, as in Hebrew, and which may be pronounced "pas" or "pus" (puss). It thus appears that our familiar name for the cat can boast of a very high antiquity.

Grass Fatal to Sheep.—One remarkable fact connected with the botany of Queenstown is, that a grass, which grows locally abundant in the more northern portions of the colony, *ristida hygrometrica*, is fatal to sheep by reason of its long, sharp, tripartite awns getting entangled in the wool and ultimately piercing the skin and penetrating to the viscera of the thorax and abdomen, causing death after prolonged wasting and suffering; the heart, liver, kidneys, etc., are sometimes, on dissection, found pierced by these mischievous awns in all directions.

The Influence of Soil on Plants.—Sufficient attention, perhaps, has not been paid to the study of the influence of soil in producing variation in plants, and changes and modifications of their constituents. A writer in the *Pharmaceutical Journal* has recently called attention to the fact that it is rare to find the *Viola odorata* with blue flowers on a calcareous soil in England, the prevailing color being white. One of the genus of violets has lately been examined by Dr. König, who finds as much as 21 per cent of zinc oxide in the ash of the plant. This violet is so distinct in appearance that it has been considered a good species by some botanists, and called *Viola calaminaria*. But by most authorities it is regarded as a variety of *V. tricolor*, its characteristics being due to the soil on which it grows. It appears to be restricted to soil containing zinc, and thus serves to indicate the presence of the metal in the soil, where it might not otherwise have been suspected. The extent to which medicinal preparations may be affected by the soil upon which the plants they are prepared from have grown, is illustrated by an experience of M. Gérardin, pharmacien, in the Marne department. Having prepared some extract of belladonna from a defecated juice, he found it after some weeks full of grannlations. These proved to consist of a mixture of silicate and chloride of potassium equal in weight to 6·8 per cent of the original extract. It was then remembered that the belladonna plants used had been collected from a spot which had long been frequented by charcoal burners for their operations, and the remainder of the explanation was to be found in the decided fondness of solanaceous plants for silica and potash.

Changing the Color of Feathers in Live Birds.—It is stated in Kidder and Fletcher's "Brazil" that the Indians have a curious art by which they change the color of the plumage of many birds. They pluck out a certain number of feathers, and in the various vacancies thus occasioned infuse the milky secretion made from the skin of a small frog. When the feathers grow again they are of a brilliant yellow or orange color, without any mixture of green or blue, as in the natural state of the bird; and, it is said, the yellow feather will ever after be reproduced without a new infusion of the milky secretion.

Leaf Structure.—Long ago Nehemiah Grew published some very accurate drawings of the structure of leaves and leaf stalks—so far as the disposition of the fibrous tissue is concerned. Quite recently M. Casimir De Candolle has investigated the same subject with special reference to the distinction and resemblances to be drawn between allied species of the same family. It is found that different species of the same genus sometimes accord, but sometimes differ notably in this part of their anatomy. For this reason the classificatory importance of these differences is low, although they may often be turned to good account in the discrimination of related species. The essential fibro-vascular system of the petiole, as displayed on a cross section, forms either a closed ring or an arc open superiorly between the outer or cortical, and the inner or medullary tissue. In the first case it is said to be closed or complete, in the second open or incomplete. Very commonly this is the only vascular system of the petiole, ribs, or veins. Not rarely there are additional or accessory bundles, sometimes external to the essential system, or *intracortical;* sometimes within the arc or ring, or *intramedullary;* occasionally there are both intracortical and intramedullary bundles. Generally plants of the same natural order will agree, at least approximately, in having the closed or open system, and in having or wanting the accessory bundles without or within. But while *Acer pseudo platanus* has a well developed intramedullary cord, *. platanoides* has none, and in general the maples are divided in this respect quite independent of other characters; and the difference is similar and equally marked between the species of *Æsculus*. The oaks, which have been made a special study in this regard, appear to be somewhat equally divided between species provided with and those destitute of intramedullary bundles; but related species generally belong to the same category, although not always. For in one case two species, of doubtful distinction until now, are confirmed by the discovery of an anatomical difference of this sort. All the birches examined want the intracortical bundles, and the principal system forms an open arc, and one or two alders nearly agree with them; while the others have a closed ring and are furnished with intracortical bundles.

Barometric Plants.—Linnæus, in his "Flora Lapponica," writing on the white clover *Trifolium repens*, states that it is a common practice to predict a coming storm by an inspection of this plant, for when the air is hot then the leaves hang down, whereas when there is moisture in the atmosphere the leaves are erect. This observation, he remarks, holds good not only for the clover, but also for almost all plants which have declinate stamens. All the flowers, too, he adds, generally converge when a shower is impending, as though they knew that the water would interfere with the fertilization of the plant, for when the fertilization has been effected no such convergency is exhibited. He instances *Mimosa, Cassia, Bauhinia*, and their allies, as plants whose leaves converge every evening, even though there be no diminution of temperature, and concludes by asking the still unanswered question, What is the cause of this sensitiveness, and what change is there in the night air beyond the absence of light and heat? Dr. Hooker states that the leaflets of *Oxalis* are pendulous at night, and often sensitive to light. Of *Anagallis arvensis* he remarks that the corolla opens in clear weather, and a number of plants besides those specified exhibit the same phenomenon, and doubtless obey the same law. What is this law?

Some Facts about our Territories.

The annual report of the Secretary of the Interior contains a large amount of information with regard to the present condition and future prospects of our Territories, furnished by their respective Governors. The more important facts are as follows:

UTAH.

The snows which fall in the mountains and remain there during the summer provide the main supply of water necessary for irrigation. During last winter but little snow fell, hence the short supply and the deficiency in the crops. Some of the largest streams in the Territory have gone dry, something never before known to the oldest settlers. Even the Great Salt Lake has fallen four or five feet. Stock has suffered severely on the mountain ranges.

Attention is called to the defects in the present mining laws, and suggestions are made as to the amendments necessary. The Governor holds that "a man's patent to his mine should be a perfect title to the property covered by his patent, and parties purchasing patented mines should be required to trace titles no further than to the patentees." He also favors the granting of a larger surface area, and the confinement of rights within the lines granted. In other words, a mining claim should be as definite, so far as boundaries go, as that of a city lot, and the right to work should be confined within the perpendicular lines of its side and end. Following the dip of mineral veins on the ground of other parties is, in his opinion, the fruitful source of litigation. The mining interests of Utah are reported as in a most excellent condition; the introduction of new methods of reducing ore causing larger profits to be realized than were possible in former years.

From the year 1870 to 1878, inclusive, the Utah board of trade reports, as taken from the books of the Utah Central Railroad, the shipment from Salt Lake City of 76,912 tons of lead ore, 109,276 tons of argentiferous lead bullion, and 8,197 tons of lead, worth in the aggregate about $40,000,000. The value of the ores taken out during the past three years was $18,558,805.48; of this $5,379,446 was lead, the remainder being the precious metals.

During the past year 150 miles of additional railroad have been built.

WASHINGTON TERRITORY.

The Governor of Washington Territory reports satisfactory advancement in the development of the agricultural, manufacturing, mining, and commercial resources of the Territory. Its isolated position and the misconception existing in relation to its climate and productions have tended to prevent its rapid growth.

Situated between the 46° and 49° north latitude, its climate is generally believed to be cold, and yet the results of careful observation show that the climate of Western Washington is mild, during the winter months the temperature seldom falling below the freezing point. A tabular statement is given, showing the character of the climate throughout the year, based on accurate meteorological observations taken at Port Blakeley, on Puget Sound, in latitude 47° 36′. It would appear from this statement that the lowest temperature during a period of twenty-six months was 25° above zero. The highest in 1877 was 88°; in 1878, 94°; and in 1879, 86°.

The average rainfall is about the same as in the Eastern and Western States. The mildness of the climate is due to the presence of the thermal current, having its origin at the equator, near the 130° east longitude, Greenwich, and which flows northwardly to the Aleutian Islands, where it separates, one branch flowing eastwardly, along the peninsula of Alaska, and then southwardly, along the coast of British Columbia, Washington Territory, and Oregon. The prevailing winds during the winter are from the southwest, and those of the summer from the northwest.

The temperature of Eastern Washington as compared with the western division is slightly higher during the summer and lower during the winter. The average annual temperature is reported as follows: spring, 52°; summer, 73°; autumn, 53°; winter, 34°.

All the cereals, fruits, and vegetables grown within the temperate zone can be raised in Washington Territory. Eastern Washington is the great wheat field of the Territory, with a capacity for upwards of 100,000,000 of bushels. The average yield is 25 bushels to the acre.

The exportation of wheat during the present year will be upwards of 60,000 tons. Transportation facilities are inadequate to the demand, and will so continue until the obstructions are removed at the Dalles, Cascades, and other points on the Columbia River.

The exports of the Territory have been the cereals and wool, flour, live stock, canned salmon, fish, lumber, coal, potatoes, hops, hides, barrels, lime, etc. The export of coal during the year was 190,000 tons; lumber, 150,000,000 feet; salmon, 160,000 cases of 48 cans each, or a total of 7,680,000 cans.

The population of the Territory on the first of May last was 57,784, an increase of 7,273 over last year.

NEW MEXICO.

The three leading interests are mineral, grazing, and agricultural; manufacturing is confined almost exclusively to jewelry, of which very exquisite work in filigree is produced in Santa Fé, mostly from gold and silver native to the Territory.

But little advancement has been made in agriculture. Its present condition is very primitive, the old Mexican wooden plow still holding preference with the farmers. The little produced is with a view to satisfy local consumption. Wheat and oat fields, as rich as any in Illinois and Minnesota, may be seen six or seven thousand feet above the level of the sea. The grape is easily raised, is free from disease, and affords a good quality of wine. The area of agricultural production cannot be even approximately given. All irrigable lands, wherever found in the Territory, may be classed as productive or farming land.

The Rio Grande Valley, about four hundred miles in length by an average of five in width, has a soil light, warm, and surpassingly rich. Not more than one tenth of this land is occupied. Fruits succeed admirably in this locality, although the varieties at present cultivated, except the grape, are of the poorest kind. The valley of the Pecos River is almost entirely devoted to grazing purposes. Like the valley of the Rio Grande its soil is rich when properly irrigated, and its climate healthy and delightful. The Mesilla Valley, like the two mentioned, is inviting both for agricultural and grazing purposes. The vast tracts of table lands bordering the valleys are too high for irrigation, but yield grasses of the richest kind for cattle and sheep raising. With such unlimited ranges, stock raising has become a profitable industry, with promise of substantial growth in the future.

In relation to the mineral resources, the governor is of the opinion that New Mexico will compare favorably with her neighbors in the yield of precious metals. Although the era of prospecting has hardly given place to that of development, enough is already known to warrant the assertion that the Territory is well stored with gold, silver, iron, copper, lead, zinc, mica, gypsum, coal, marble, and precious stones. The coal croppings in Socorro and Colfax counties, and on the Galisteo River, indicate an inexhaustible supply both of bituminous and anthracite. Cannel coal is also found in the Territory. No attention is being paid to the production of iron, although it is to be found, more or less, in every mountain range. The same may be said of copper, lead, and mica, while gypsum is so common that it is hardly a merchantable commodity. Silver and gold are to be found in many localities, and many mines are being worked to advantage. The great drawback at the present time is the want of water.

Mention is made of the numerous hot springs in the Territory. The waters of many of these have well determined curative properties, and at Las Vegas elaborate preparations are being made for the care and entertainment of guests and invalids.

An approximate estimate gives the territory a population of 125,250. The Pueblo or town Indians are estimated at 9,000 and the wild Indians at 14,500.

The report concludes with a statement giving the results of certain observations relating to the climate of the Territory. From this it would appear that the central portion has a delightful and healthy climate. The prevailing diseases are rheumatism and catarrh, while consumption is almost unknown.

DAKOTA.

Dakota is the largest of the organized Territories, containing about 150,000 square miles, or an area nearly equal to Pennsylvania, New York, and all the New England States combined. The Governor reports the present year as one of unexampled prosperity. Although the crops in some of the southeastern counties were partially destroyed by drought and grasshoppers, those of other sections have been excellent.

The products of the Black Hills mines are estimated at $3,000,000 for the past year. Immigration has been larger than in previous years. In the absence of accurate returns, the population of the Territory can only be approximately given at 160,000.

Railroad facilities are being largely increased, about 400 miles being already completed, with a promise of at least 500 miles by January.

The Governor favors the division of Dakota, and is of the opinion that two or three Territories could be advantageously formed out of the present area.

IDAHO.

The year has been one of thrift and prosperity. Agriculture and mining have been remunerative, schools have been encouraged, and good health has prevailed. With the advent of railroads and improvements in highways a large immigration may reasonably be expected.

The numerous streams of Idaho afford facilities for irrigation in those sections where rain is infrequent, while the lands of Northern Idaho can be cultivated without resort to artificial means. The Governor describes the methods employed for irrigation and the encouraging results which ensue therefrom. He favors goverument aid in the effort to reclaim lands for cultivation, and the adoption of some system by which large tracts may be secured by individuals willing to expend their capital in building the necessary works for irrigating purposes.

The timber supply of the Territory is abundant, but a reckless disregard for the public interests has marked its destruction for years past. In addition to the waste of timber by man, the fires which constantly sweep the mountains destroy a greater amount than is taken for consumption by the entire population.

Since 1863 the gold and silver product of Idaho has amounted to about $67,000,000. As there is no law requiring miners or public officers to make returns, only approximate estimates can be given. The improved methods employed in reducing the ores and the increasing facilities for transportation will in the future largely augment the annual yield of the precious metals.

The mining laws especially need revision; and in the Governor's opinion Congress should pass a comprehensive and carefully revised act, covering the mining field, clearly defining all rights and remedies, and leaving but little scope for local legislation. It is also suggested that Congress interpose for the protection of agricultural interests by preventing the monopoly of the streams of the Territory by private individuals or corporations. The usufruct of natural streams should be guarded by stringent laws, so that the water needed by the many should not be monopolized by the few.

The finances of the Territory are reported to he in a satisfactory condition, and the debt of the Territory is gradually being reduced.

No reports had been received from the Governors of Arizona, Wyoming, and Montana.

Kansas Natural Lime.

Among the natural products, some of them possessing very peculiar characteristics, which the young and growing State of Kansas contains, is a singular substance, lying in very considerable beds, and called "Kansas native lime." It is, says a correspondent of the *American Architect*, of a beautiful white color and of a very fine-grained texture. It is soft, smooth, and readily made into a plastic condition by the admixture of a suitable quantity of sand and water. The mortar thus made up has seemingly identical qualities to the best mortar as made from superior limes selected from kilns where the lime rock which had been employed for burning had been of the very purest nature.

The native lime is a sort of whitish and pure white clay, lying disposed favorably in beds more or less horizontal in their position. These beds are seen to be outcropping along the borders of certain streams and in the breaks of hills, and in such places the beds can be worked entirely above the water level. Experiments which have been performed by workmen and artisans in Kansas have exhibited the fact that Kansas lime mortar serves as good purposes as any other usual styles or kinds of mortar, and even better than some of the artificial mortars, especially for nice inside work. The tendency of this newly discovered deposit of pseudo-lime, when made into mortar for walls and stonework or plastering, is to soon set and harden. Another remarkable quality then noticed is its turning immediately to an intense whiteness. The beds are very thick and easily dug; so that large quantities of the substance can be thrown up, and at once applied to use. Beside its ready adaptability to purposes of mortar, it has also been applied to the purposes of whitewashing, and in this respect it has been accepted as an admirable substitute for lime prepared artificially. These immense beds of pseudo-lime occur in localities where railways of Eastern Kansas can readily be utilized for shipping the material to all parts of the country. It is, perhaps, presumable that upon the spread of the knowledge of this fact, the excellent natural mortar lime and whitewash lime from these native deposits may become articles of export, especially as improved styles of building and more permanent structures everywhere in Kansas, Missouri, Nebraska, Iowa, and Illinois are growing to be more and more the requisites of the times. The great pseudo-lime beds or native beds of calcined lime rock are a geological phenomenon. They are difficult to account for in any plain or obvious manner. They have a close resemblance in their physical condition and looks, and in their feel or touch, and in their action when mixed to form mortar, to the best mortars made in the usual ways with the very best of limes. Can it be possible that some of the unknown laws of electro-magnetism and of terrestrial magnetism, which cause certain metamorphisms to occur in metalliferous beds, are likely to be discovered as the laws also which set the elements at work to alter the chemical conditions of this singular lime rock stratification? Can the problem of their origin and nature be clearly or satisfactorily accounted for in any other way? Does such a strange product as this occur in any other section of our continent?

Bad Work Makes Bad Trade.

The statistics of railway accidents during the past year in England, among which were 937 failures of tires, 346 failures of axles, and 1,377 broken rails—leads a London writer into a strain of moralizing which may contain some sound warnings, if not practical lessons. to American manufacturers. He says: "Two thousand six hundred and seventy three flaws and failures in wheels, couplings, and rails. Any one of these sufficient to cause a fatal calamity. No more shameful illustration of the way in which English manufacturers have been meeting competition could be put forth. Bad iron, ill-worked steel, and 'scamped' workmanship; these are the chief causes of the 'failures' in tires and axles and rails. It has become quite an old story, unfortunately, this relaxation of honest pride and commercial honor during the last few years. Loaded cottons, shoddy cloths, rotten iron, ill-tempered steel, poorly ground cutlery, short weight, and adulteration of all kinds have taken the place of the genuine English goods by which the old country had made her reputation. Masters driven to despair by trades-unions and strikes, by prohibitory tariffs abroad, have laid down their old-fashioned honor and put size into their calico, rags into their cloth, worthless 'brands' of raw material into their tires and rails, third-class goods into first-class wrappers; and so trebled the speed with which commerce has been running down the hill of stagnation. One of the best signs of the day is an occasional outspoken acknowledgment of the absolute necessity of turning out once more genuine goods, the utter, absolute necessity of rehabilitating the English name in the markets of the world, and it must be said for many solid old firms that they have never sacrificed their reputation by a reckless attempt to meet exceptional times and competition. It has, nevertheless, been a common thing for Sheffield to take inferior foreign goods and finish them, more particularly by putting a local trade-mark on them 'for a consideration,' thus lowering the standard of Sheffield goods. Time was when the woodmen and farmers of America and the Colonies would use nothing but Sheffield axes. It is not only the splendid character of American manufactures in this direction, but the turning out of bad work under Sheffield trade-marks, that has made the American ax popular not only elsewhere, but here in England. An English saddle used to he regarded as the acme of strength and perfection; but Prince Napoleon lost his life through the giving way of a portion of his saddle fixings, the bad workmanship and material of an English manufacturer. Sad lessons these! They are being laid to heart by many traders, and it is believed that with the present improvement in business some regard will be paid to one feature of the moral of our national misfortunes. Here and there the workingmen seem unwilling to co-operate with the employer in meeting the new demands; but, on the other hand, there are evidences of an earnest desire to make the most and the best of the trade revival."

Hitherto American productions have won their way by honesty of workmanship not less than superiority in practical fitness. It is sincerely to be hoped that whatever may be the results of the increasing competition at home and abroad, any lowering the high standard of honesty thus far maintained by our manufacturers will not be among them.

Electrical Poetry.

The late Prof. Clerk-Maxwell was in the habit of recreating his mind from its severer task by penning amusing physio-comic parodies of well known poems. One of the best of these was his electric valentine, which runs as follows:

ELECTRIC VALENTINE.

Telegraph Clerk A to Telegraph Clerk B.

"The tendrils of my soul are twined
With thine, though many a mile apart;
And thine in close-coiled circuits wind
Around the magnet of my heart.

"Constant as Daniell, strong as Grove;
Seething through all its depths, like Smee;
My heart pours forth its tide of love,
And all its circuits close in thee.

"O tell me, when along the line
From my full heart the message flows,
What currents are induced in thine?
One click from thee will end my woes."

Through many an Ohm the Weber flew
And clicked this answer back to me:
"*I am thy Farad staunch and true*
Charged *to a Volt with love for thee.*"

$\frac{d\,p}{d\,t}$.

The inscrutable signature, $\frac{d\,p}{d\,t}$ is explained by a correspondent in *Engineering* to be adopted from the fundamental equation of thermodynamics $\frac{d\,p}{d\,t} = \text{J. C. M.}$ (James Clerk-Maxwell.

The First Year of the New York Elevated Railroads.

The report of the New York Elevated Railroad for the year ending with September last covers the first year during which the whole length of the road was operated, that is, about 8½ miles from the battery to Harlem, and 5 miles from the battery to Fifty-ninth street. In that year 29,875,912 passengers were carried, and the earnings from passengers (all the other earnings were but $4,546) were $2,233,402, an average of 7·48 cents per passenger, and about $165,540 per mile of road. The expenses of operation were $1,171,339 for "operating the road," which in the New York schedule includes all working expenses except maintenance of road and maintenance of equipment. Under these latter heads only $51,459 was expended on road and $74,458 on rolling stock—thus bearing an extremely low proportion to the other working expenses. As this was the first year of operation for most of the road, these maintenance expenses were probably lower than they will be on the average hereafter. They will doubtless always be a smaller proportion

of the total expenses than on ordinary railroads, at least for maintenance of road, because the train movement is extraordinarily great, the trains exceptionally light, and the road exceptionally durable and permanent—no ballasting to keep up, ties uninjured by bad drainage, no liability to floods, only the rails wearing out about as on other roads in proportion to the tonnage passing over them. The average *expense* per passenger carried was not quite 4 cents (3·92 cents). If a uniform fare of 5 cents had been charged at all hours, which has been strongly advocated by some of the city papers, the net profits (with the same traffic) would have been reduced from $1,068,150 to $322,660, or to little more than two thirds of the interest on the bonds. Doubtless a 5 cent fare in the middle of the day would increase the traffic considerable, but certainly not enough to make up the difference in the rate. To do that it would be necessary for the number of passengers to become more than three times as great. As the road already carries at 5 cents during the four hours when traffic always is heaviest, and when the greatest bulk of the necessary travel must be done, there would be no possibility of any such increase; but this does not prove that some modification in rates, which would fill the trains when they now run more than half empty, might not prove profitable. It now costs as much to travel a quarter of a mile on this road as to ride the 8½ miles from the battery to Harlem. On the Third avenue line, which passes through a densely peopled district where most of the residents are not very rich and many are very poor, and which passes close to some of the leading retail centers, most people would rather pay 5 cents to ride a mile, many to ride two miles, and not a few to ride three miles, on the street cars, than pay 10 cents on the elevated road. But it would not by any means be an easy matter to provide for the collection of different rates for different distances on this road.

The enormous net earnings of $79,122 per mile were all absorbed except $28,690 by the payments of interest, the 10 per cent dividends on the stock, and a payment of less than $28,000 to the city of New York as a sort of charter tax. The traffic of this road will doubtless increase (at least till the Second avenue line is opened), but it is not at all certain that the expenses will be so low hereafter, now that prices have risen and after the road and rolling stock have had time enough to wear out a little. The cost of the road and equipment is reported at just about $1,000,000 per mile; this is the cost in stock and bonds. The contract for constructing it could be, or could have been, let for cash for less than one half of that amount, doubtless.

The Metropolitan Elevated Railway has also rendered its report for the same year, during the whole of which its line from Trinity Church to Central Park was open, and during three fourths of it the line through Fifty-third street giving access to one additional important station, while later, one after the other, it was opened to three or four other stations, only one of which, however, yielded any considerable amount of traffic during the year in question. It shows for the year a profit of $576,456, while the bonds outstanding at the close of the year require $304,920 for interest, and the 10 per cent dividends on the stock guaranteed by the Manhattan Company will amount to $650,000. This, however, will cover a great deal of road not in operation last year, though it can hardly be expected to be as productive as the old road for some years to come.—*Railroad Gazette.*

Light Draught Fast Steamers.

The following particulars are given by a correspondent of the *American Ship:* Although there are many points of construction which might be adopted from Eastern steamers with advantage, on the shallow and dangerous rivers of the Mississippi Valley, it is doubtful whether their hull models could be studied with profit. Nearly all the steamers navigating the Mississippi and its tributaries are constructed upon the Ohio. The perfection the builders along that river have attained in constructing vessels of exceedingly light draught may be inferred when we state that, on any day during the navigation season, steamers, having a freight capacity of from 1,000 to 1,800 tons, may be seen at the Cincinnati wharves, which draw less than three feet light. And there are many boats plying the Upper Ohio which trim on two feet, to say nothing of the little low water "dinkies," which can almost "navigate a meadow after a heavy dew."

The Telegraph, a large passenger boat, 288 feet in length, 41 feet beam, and 6 feet hold, draws light, two feet.

The Golden Crown, a fine stern-wheel steamer of the Southern Transportation Line, running between Cincinnati and New Orleans, has a capacity for over 1,500 tons of freight, and trims, with steam up, *two feet* water.

The Mary Houston, of the same line, side-wheel, draws less than three feet, and carries 1,500 tons.

The Guiding Star, also of the S. T. Line, is over 300 feet in length, and has a capacity for 1,800 tons. She draws 33 inches, light.

The New Natchez, one of the fastest of the big palatial steamers on the Lower Mississippi, is 303 feet long, 46 feet beam, and 10 feet hold She has 8 steel boilers 36 feet long, 43 inches diameter. Engines, 10 feet stroke, 34 inches diameter; capacity for 2,000 tons freight or 8,000 bales cotton; draws light, less than 5 feet.

The St. Lawrence, an elegant and swift Ohio river side-wheeler, is 270 feet long, carries 1,000 tons, and *draws twenty-seven inches.* The Pittsburg, stern-wheel, carries over 1,000 tons, and draws only 24 inches.

Many other steamers of equally remarkable draught could be enumerated had I the space. Many of the small stern-wheelers, navigating the bayous and small tributaries of the Mississippi, draw less than 14 inches, and yet have room for 1,200 or 1,400 bales of cotton. The most necessary improvement in Western steamers, and especially in the boats plying in long distance trades, is an increase of speed. With the exception of a few of the fast palaces on the Lower Mississippi, there are few boats that ever attain 15 miles an hour up stream, and 12 miles an hour is considered extraordinary. Such slow time is unpardonable in an age of rapid transit like this, and, as long as Western river boats continue to disregard the demands of commerce, railways will hold the upper hand in competition.

Kroh's Rapid Process.

The formulæ for Herr Kroh's rapid plates is given as follows in the *Photographisches Wochenblatt:*

To one kilogramme of iodide collodion add a quarter of an ounce (= 8·75 grammes) of the following somtion: Absolute alcohol seventy grammes, and three to four grammes of isinglass or gelatine cut small and dissolved by heat in a glass containing thirty-five grammes of distilled water; then add four grammes of iodine of potassium and three grammes of bromide of ammonium, and when all is completely dissolved and filtered through a piece of linen previously thoroughly washed in alcohol, pour into a bottle capable of holding about a kilogramme and a half. To a quarter of an ounce (= 8·75 grammes) of the above solution add one kilogramme of iodide collodion and shake thoroughly for eight or ten minutes; then add from eight to ten drops of acetic ether, and the result will be the so-called "cheesy collodion."

Remarks on the Foregoing.—On the addition of the gelatine and iodine solution there is an immediate, though harmless, appearance of turbidity, and by this addition cotton is precipitated, but may be redissolved by diligent shaking. The iodizer—that is, the gelatine iodizing solution—may be varied according to the state of the light and the position of the studio. If powerful pictures are desired the following should be used:

Iodide of ammonium	4 grammes.
Bromide of cadmium	4 "
Absolute alcohol	70 "
Distilled water	175 "

If it be desired to work without intensification, and to have an extremely sensitive collodion, then take:

Iodide of sodium	4·50 grammes.
Iodide of lithium	3 "
Absolute alcohol	70 "
Distilled water	26·25 "

If the collodion be required to work rapidly, but not powerfully, then to one kilogramme of prepared collodion add 0·73 gramme of sublimed iodine. It is as well when pouring off superfluous collodion to let it run into a second bottle. Allow the plate to become *perfectly* dry before dipping it into the silver bath.

The development is effected by two developers, Nos. 1 and 2:

DEVELOPER NO. 1.

Distilled water	60 ounces	= 2·1 kilogrammes.
Ferrous sulphate	3 "	= 105 grammes.
Acetic acid	3 "	= 105 "
Absolute alcohol	4 "	= 140 "

RAPID DEVELOPER NO. 2.

Distilled water	60 ounces	= 2·1 kilogrammes.
Ferrous sulphate	5 "	= 175 grammes.
Acetic acid	3 "	= 105 "
Absolute alcohol	4 "	= 140 "
Oxalic acid	4 to 5 grains	= 0·36 gramme.

Developer No. 1 is applied cold. The rapid developer requires that the ferrous sulphate, the water, and the oxalic acid should be heated and properly dissolved in a shallow vessel; when the solution has become cold the alcohol and acetic acid are added, and then the whole is filtered. After the exposure the plate is coated with developer No. 1; when the highest lights have been brought out it is poured off, and then the rapid developer is taken, which immediately brings out the deepest shadows. If soft pictures for intensification be required then the rapid developer should remain a long time upon the plate, and a short time in the reverse case.

FIXING BATH.

Water	10 parts.
Cyanide of potassium	1 part.

INTENSIFIER.

Silver	17·5 grammes.
Distilled water	1 kilo. 35 "
Chemically-pure nitric acid	5 drops.
Pyrogallic acid	2·75 grammes.
Citric acid	1·46 gramme.
Water	560 grammes.
Glacial acetic acid	17·5 "

After drying the plates, which are not sufficiently powerful, are varnished with common varnish, and then strengthened with the above intensifier. If the plates are blue after being well washed they are coated with a solution of 5·5 grammes of cyanide of potassium in 350 grammes of water, to which from five to eight drops of the intensifying silver have been added (and well shaken) until the surface becomes a bright yellow.

SILVER BATH.

60 grammes of iodide of potassium dissolved in 70 grammes water.
25 " " nitrate of silver " " 420 " "
8 to 10 drops of the iodizing solution given above.
2 drops of nitric acid.

The bath may be used the second day. The photographer is recommended to prepare three silver baths, and to use a different one every day for three days and then recommence, so that each bath is only used one day in three. In studios where from twenty to thirty sittings are given daily six baths will be required. Time of floating, three minutes. The duration of the exposure should, with a good light, be three-quarters less, and with a bad light a half less, than by other processes.

The Erie Canal.

In a recent letter to the New York *Tribune* urging the deepening of Erie Canal, Mr. T. C. Ruggles says:

The reasons why steam has not succeeded better on the canal are, first, the steamer was not long enough; it required either more length itself or another boat to push; and next, the bottom of the canal was not finished to its proper width of fifty-six feet, and to a depth of seven feet for this width at the bottom, so that two loaded boats could easily pass each other. The only way to do on the canals, as the locks would not admit longer boats than those now in use, was to fasten one boat before the other, taking them apart at the locks. This, in fact, has doubled the capacity of the steamer, and enabled the same crew to bring down twice the load for the same price, and has made steam a success. The State Engineer, the Hon. Horatio Seymour, Jr., recommends deepening the canal one more foot; but eight feet deep, though a great aid, will make but little difference in the cost of transportation (about one quarter of a cent a bushel), and no difference in time. If steamer and consort are each to be loaded forty more tons, they will be so deep in the water that there will be but a few inches between the propeller wheel and the bottom of the canal; consequently the steamer and consort will not go over two and half miles per hour, or be eight days from Buffalo to New York. Three feet deeper, with the canal banks raised one foot, will reduce the time to New York to four and one quarter days, instead of eight, and the cost of moving a bushel to one and three quarter cents.

The cost of deepening the canal one foot is estimated by Mr. Seymour at $1,100,000. From 1868 to 1876 the canal reduced the tolls from six cents a bushel to two cents, but made no improvements in reducing the cost of transportation. The New York Central in the same time was constantly improving its means of transportation. In 1875 and 1876 this road expended $3,849,270 for depots, engines, superstructures, etc., for the purpose of expediting and cheapening its transportation. The following is the comparative result of the canal and railroad policy:

In 1868 the canal moved tons one mile	1,033,751,268
In 1876 the canal moved tons one mile	570,969,064
Loss	462,782,204
In 1868 the railroads moved	366,199,786
In 1876 the railroads moved	1,674,447,055
Gain	1,308,247,269

The canal lost in eight years nearly half its tonnage, while the railroad in eight years nearly quadrupled its tonnage.

The White Wax of Sze-chuen.

Describing some curiosities of trade in China, the *Pall Mall Gazette* gives a number of interesting facts with regard to the production of the white wax of Sze-chuen.

In the Keen-chang district of that province there grows in abundance the *Ligustrum lucidum,* an evergreen tree with pointed ovate leaves, on the twigs of which myriads of insects spread themselves like a brownish film, in the spring of each year. Presently the surface of the twigs becomes incrusted with a white waxy substance secreted by the insects, and it increases in quantity until the latter part of August, when the twigs are cut off and boiled in water. During this process the wax rising to the surface is skimmed off, and is then melted and allowed to cool in deep pans. By one of those curious accidents which have done so much to increase the knowledge of mankind, it was discovered that by transporting the insects bred in Keen-chang to the less congenial climate of Kea-ting Fu, in the north of the province, the amount of wax produced was vastly increased. No people more readily discern a commercial advantage, or more speedily take advantage of one when unencumbered with political considerations, than the Chinese; and this singular effect of removing the insects from a congenial climate to one so uncongenial as to prevent their breeding was eagerly taken advantage of by the Sze-chuen traders. Travelers by night on the high road between Keen-chang and Kea-ting Fu may meet in the spring of the year hundreds of wax merchants, each carrying his load of female insects, big with young, on their way to the wax farms in Kea-ting Fu. The journey is rough and long and a fortnight's sun would precipitate the hatching, which should take place after the females have been attached to the trees. To the unscientific eyes of Chinamen the round pea like female appears to be nothing more than an egg, and this belief is the more excusable since the birth of the young is the signal for the death of the parent, of whose previous existence there remains only as evidence an outer shell or husk. Six or seven of these prolific mothers are wrapped in a palm leaf and tied to a branch of the *Ligustrum lucidum.* In a few days swarms of infinitesimally small insects creep forth and cluster on the twigs of the tree, where they fulfill their mission and perish with its accomplishment in the boiling pot each August. Baron Richthofen considers the value of the annual crop to be on an average upwards of $3,000,000; and during last year there was exported from the one port of Hankow upwards of $400,000 worth of it.

NEW INVENTION.

Mr. John Rogers, of Eldridge, Iowa, has patented an improved harrow, in which the frame is made in two parts, an upper and a lower, connected together and fitted to move lengthwise upon each other. The teeth are pivoted upon the upper frame, and pass through apertures in the under frame, so that the inclination of the teeth is dependent upon the relative position of the two parts of the harrow.