A ROMANCE OF SCIENCE.

Under the above caption, *Chambers' Journal* gives an account of a passage in the life of the celebrated scientist, M. Arago, from which we extract the following portions. The story, as here told, of the pursuit of knowledge under difficulties, certainly reads almost like some of Charles Reade's sensational stories:

It is to be presumed that all well-informed persons are aware that the system of linear measurement used in France and most continental nations is based upon the meter, which has been extended to measures and weights in general, and carried into practice by a decimal system of computation. At the same time, few are conversant with the circumstances under which the metrical system was established at the commencement of the present century, and the difficulties encountered by the *savants* of the period in prosecuting their scientific operations for that purpose. Scientific expeditions were fitted out in France to determine a standard linear measure, by the admeasurement of a great arc of the earth's circumference, as nearly as possible at a fixed parallel of latitude, from which a fractional section would be taken as an unalterable basis. It is well known that the circumference of the earth is greatest at the equator, and gradually decreases towards the poles. As a medium between these two extremes, it was determined that the parallel of latitude forty-five degrees north should be the basis, especially as it intersected a part of Europe where a great arc of the meridian could be measured by a trigonometrical survey.

In making the survey in Spain, where the members of the expedition, headed by M. Arago, prepared to leave the isles of Formentera and Iviza, and remove their astronomical instruments to the mainland of Spain, the curate of the district where M. Biot was situated requested permission for himself and some of the inhabitants to see their instruments. Though one of the inferior clergy of Spain, yet he took considerable interest in scientific operations, and appreciated the instruments in the observatory. On the other hand, those islanders permitted to enter the building gazed on them with the astonishment of savages. It was a Sunday and a fête day, when a troop of them came in the evening, with the alcalde at their head, dancing and singing in a most extraordinary manner, both men and women. The men clattered with their feet in a kind of half African, half European dance; while the women, having their hair plaited into long pendent queues, turned and pirouetted on their naked feet, without raising them off the ground, like puppets on springs. The music that accompanied these strange postures was quite as barbarous in character; one played on a species of flute, another struck a tambourine, and some had wooden clappers, while the alcalde kept measured time by striking a large metal plate with a piece of iron. As each one, however, entered the observatory, he made his observations in silence; presenting a contrast between civilization and barbarism—a contrast of the most sublime science and the most profound ignorance. It must be admitted, however, that though ignorant of the instruments and objects of the expedition to their solitary isles, these people in no way interfered with the mission, but assisted its members in their simple way when they could be of use.

Not so with the inhabitants of the island of Majorca, where M. Arago was stationed with Señor Rodriguez, on the summit of Mount Galatzo, making his final observations, which he successfully accomplished. While on the eve of departure, the rumor suddenly spread amongst the inhabitants that these operations, these instruments, these fires, these signal lights, were for the purpose of guiding the enemies of Spain to conquer the island. It must be remembered that the fears of the ignorant islanders were excited by the accounts from the mainland. Napoleon was at that time preparing for his Peninsular campaign, and as the leader of the scientific expedition was a Frenchman, they concluded that he and his companions were emissaries of Bonaparte come to spy the land. Galatzo was instantly up in arms, and cries of treason and death to the traitors were raised by the excited peasantry. Fortunately, M. Arago obtained intelligence of these rumors in time to send the report of his observations by a faithful messenger to Palma, a town in the island of Majorca, with instructions to send the expeditionary vessel there to convey the instruments from the observatory in safety to the mainland. This was effected, and M. Arago himself managed to escape, and get on board the vessel.

Instead, however, of finding that an inviolable asylum, the learned French astronomer found new alarms for his safety as soon as he got on board; and from that time he experienced a series of mishaps in the Mediterranean, in his endeavors to reach a port belonging to his own country, that practically illustrate the pursuit of knowledge under difficulties. Hitherto, the captain of this vessel, which was attached to the expedition by the Spanish government, had behaved in a most friendly manner to M. Arago; but, whether from treachery or weakness, he not only refused to take him back to the mainland, but handed him over a prisoner to the custody of the captain-general of Majorca. Here he was confined in the citadel for many months, not merely regretting his want of liberty, but apprehensive of some design on his life. Upon this, his colleague, Señor Rodriguez, considering that the honor of his government was at stake, in the forcible detention of a peaceful *savant*, under its protection, boldly demanded his instant release. This was consented to, provided that M. Arago took his departure in a small trading bark bound for Algiers. Accordingly, he left these inhospitable islands, accompanied by a Majorcan sailor, named Damian, who took charge of the astronomical instruments.

Arrived safely at that city, M. Arago called upon the French consul, who received him with great kindness, and soon found a passage for him in an Algerian trader bound for Marseilles. After a fair and quick passage, the vessel came within sight of that port, when she was attacked by a Spanish privateer, seized, and taken as a prize into the port of Rosas. Here M. Arago thought he could easily escape across the Pyrenean frontier into France, but he was again unfortunate. He was entered on the list of passengers as a German merchant, but, by an unlucky chance, one of the privateersmen recognized him as a Frenchman, and thereupon M. Arago, together with the crew and passengers, were plunged into a frightful captivity.

At this time, Spain and Algiers were on friendly terms; consequently, this seizure of an Algerian vessel by a Spanish cruiser was contrary to international law. As soon as the Dey of Algiers was informed of this insult to his flag, he demanded instant reparation—the restoration of the ship, cargo, crew, and passengers; threatening, in case of refusal, to declare war. This had the desired effect. M. Arago and his fellow prisoners were released, and allowed to re-embark in their ship, to complete its voyage to Marseilles. Again she came within view of that port, but a frightful tempest from the northeast came on, which prevented her entering the harbor, and afterwards drove the vessel to seek shelter on the coast of Sardinia. Here was another peril to encounter; the Sardinians and Algerians were at war, and if the vessel were seized by a cruiser, they would again suffer captivity. Accordingly, it was decided to run for the coast of Africa before the tempest, and at last the vessel safely entered the small port of Bougiah, a hundred miles east of Algiers.

At this place they learned that the Dey who had acted so promptly in demanding their release from the Spanish prison and the restoration of the vessel, was dead. He had been killed in an *émeuté* among his barbarous subjects. Another ruler was in his place, who was of a less enlightened character. The customs officials at Bougiah boarded the vessel, and carefully examined the cargo. When they came to the cases of astronomical instruments, and felt their weight, they suspected that these contained heavy articles of gold. Their suspicions increased on opening the cases, and finding them filled with the highly polished instruments, so carefully wrapped up. They were quite sure they must be made of gold, on that account, and refused to deliver them up to M. Arago. Seeing the difficulty of treating with ignorant barbarians, whose cupidity had been excited, he resolved to venture on the journey by land to Algiers, where the road crosses a mountain chain, and travelers are in peril from the lawlessness of the people. In order to avoid notice, he dressed himself in Algerian costume, and in company with some friendly natives, made the journey without molestation.

When M. Arago called on the French consul at Algiers, that functionary was much astonished to see him dressed like a Mussulman; at the same time he gave his learned guest a hearty reception. Through his official position, the instruments were claimed, and ultimately delivered up. But it was chiefly on account of the Algerians finding them made of brass, and not of gold, that this was done. Even then it was a difficult matter to get them restored, so that M. Arago was detained six months at Algiers. By that time, the French consul had obtained permission to leave that consulate; and on appealing to Paris, the Emperor gave orders that a ship of war should convey him, his family, and M. Arago to Marseilles. They set sail with a fleet of merchantmen under convoy, and arrived in sight of that port. Here an English squadron blockaded the passage, ordering the French vessels to proceed as prizes to the island of Minorca. All obeyed the order except the ship in which M. Arago was, which, by a slant of wind, got safely into harbor.

Thus, after many "hair-breadth 'scapes by flood and field," this hero of science returned to Paris, where he received the reward of his genius and indomitable perseverance, in being appointed Astronomer-royal, which post he filled to a venerable age, and obtained a European reputation. Though he encountered more of the vicissitudes and dangers of travel than any of his colleagues in the expedition, yet he suffered less in health. One member, M. Chaix, fairly succumbed under the fatigue, and died at the town of San Felipe, in Spain, whither he had retired to recruit his strength. M. Biot suffered also from the exigencies of the expedition. His exposure on the island of Formentera brought on an attack of fever, which laid him prostrate for twelve days. After recovery, he embarked in a small Algerine vessel at Iviza, to return to Spain. On the passage it was seized by a privateer of Ragusa, on the Dalmatian coast, sailing under the English flag with "letters of marque." The captors declared this a lawful prize, and would have taken the vessel into the port of Oran, in Algeria; but on M. Biot exhibiting his safe-conduct pass from the British government, and his scientific instruments, he and his companions were allowed to proceed on their voyage. However, they kept several ounces of gold, which M. Biot had with him, and he thought himself lucky in getting off so easily. At last, he arrived safely at Denia, in Alicante, where he passed a short quarantine in an old chateau, formerly the residence of the Dukes of Medina-Cœli, during the time of their puissance in Spain. From thence he passed without hindrance into France, and reported the progress of his operations to the Institute.

LEAD ore lately brought from Jefferson county, Ohio, possessed the extraordinary proportion of 88 per cent of lead and 2 per cent of silver. The *Ohio Farmer* states that the ore was found only ten feet below the surface. When we add to its intrinsic value and its proximity, the fact that coal of the best smelting quality is abundant in the neighborhood, our readers will see the value and importance of the discovery.

Inventions Suggested by the Late Civil War.

The inventions to which our late war gave rise are as multifarious as were its wants. Some idea of its achievements may be gained by a look at the cases of models in the United States Patent Office. Shelf after shelf is loaded with inventions suggested by the necessities of war. Not a piece of ordnance, nor firearm, nor vehicle, nor tent, camp chest, cooking utensil, nor appurtenance of war of any kind, but was "improved" by the indomitable, self-confident, inventive, "tinkering" fellow. The caisson, gun carriage, bomb shell, gun wad, the cap, and the bullet, are all of new fashion. There are new modes of working, packing, transporting, cleaning, and loading such antiquated instruments of warfare as are permitted still to exist—new kinds of priming, new methods of ignition, and new-fashioned cartridges, with new machines for cutting, trimming, pressing, filling, and packing. An officer's arms must be attached by a modern method; his shoulder straps be fastened on with a spring; and even the old flag is expected to run up the staff and unfurl to the breeze by means of some new-fangled, patent contrivance.

As great ingenuity, if not as great genius, is shown in models of apparatus designed to promote the comfort of the sick or wounded. In the beginning of the war there was no hospital tent which gave satisfaction. That used in France is the same which answers the ordinary purposes of shelter—the regulation tent, as it is called—by its conical shape giving to the tented field a picturesqueness gratifying, no doubt, to French love of effect, but inclosing too many feet of useless space to suit Americans. The English "marquee" serves an excellent purpose after it is pitched and ready for use, but the qualities of compactness, portableness, convenience in pitching and striking are quite overlooked. It is substantial, ponderous, costly, but it isn't *handy;* and this, to Americans, is objection enough. A score or more are there, of all shapes and sizes, but that finally adopted and used during the war—the wall tent, with sloping roof and straight sides, is pre-eminently superior. It is light, easily managed, portable, and cheap. An umbrella tent was suggested and even made, having a central pole or handle, radiating arms, upon which the cover is spread, a hoisting apparatus raising and shutting it. But it was too complicated.

Still pursuing our search we see miniature ambulances, a procession of which adorns the shelves. The ambulance in use of old was bare of all comfort. Look now inside one of these new models, and you see every contrivance imaginable to lessen the suffering of the sick or wounded. The ambulance is no longer an instrument of torture. The mattresses, used as stretchers also, slide along the floor on rollers fastened to a frame work resting upon springs beneath and at the sides. An immense amount of ingenuity is shown in economizing and utilizing means and space. Each appliance is made to serve many purposes. Seats are used as beds; iron wheels answer for legs. A second tier of berths is suspended from the sides of the wagon by rubber rings. Seats, readily put out of the way, are placed outside for attendants. Each is furnished with a chest for supplies, ice, and water tanks. The cover is of enameled cloth, light and impermeable. Two horses can draw it, while on European battle fields four are required. The American ambulance combines strength and lightness; the European, with its wooden cover, enormous weight, and small capacity, carrying but two persons, supposes strength and clumsiness to be inseparable.

Inventive genius does not desert the soldier, after wounding him according to scientific methods and nursing him to health with the aid of its improved apparatus. It also does its best to make good his loss of members. The Patent Office shows a hundred model legs and arms, which seem so excellent, with all their springs and cords, tendons and joints, that if it were not for a suspicion that we might be as stupid as the Irishwomen with the washing machine, we should almost regret having no use for them. A dear old lady from the country, whose eyesight was poor, had her attention called to these models. Glancing at them without her "specs," she said, in a tone of deepest sympathy, "And these are the limbs of our soldiers' shot to pieces in battle? Poor fellows! And now their legs are brought up here for *kooriosities!*" There are arms which bend backward to the shoulder, and over the head; hands of which the fingers and palm act with such facility that a pen or a playing card is held with ease. At the Paris Exposition the American specimens of this class were pronounced superior to all others. One is surprised to observe how greatly we are indebted to the use of caoutchouc for this degree of excellence. In this direction, as well as in the manufacture of surgical instruments and dentistry, it has effected a revolution. Contrary to the general rule, too, that cheapening processes are inferior processes, this substance is superior for the surgeon's use to the costly metals it supersedes. Mr. Seward's face bears testimony to its utility, one of the bones broken by the assassin's blow being restored to shape by its help. The capability which caoutchouc possesses of hardness or elasticity, its susceptibility of molding and coloring, the fact that it is incorruptible and inoxidizable, and cannot therefore poison or irritate the flesh, give it an essential advantage over any other material.—*From Lippincott's Magazine.*

THE frequent damage to trees by high winds and cattle will render the following directions for tree-surgery interesting to farmers: Let the broken limb be put into its place, and the torn and bruised bark be covered with clay and bound up, as in grafting. A correspondent of the *Cincinnati Gazette* reports the recovery of a cherry tree, broken by a horse. The writer supported the tree by tying it to a stake, and covered the broken place with grafting wax. The success was complete.

Improved Dovetailing Machine.

We illustrate herewith a dovetailing machine that for simplicity, strength, efficiency in operation, and accuracy of performance, will, we think, commend itself to all who may inspect its working.

The cutters are arranged in a gang, shown at A, and are driven by a belt, B, which passes alternately over and under pulleys on the cutter arbors. A vertical guide bar, C, descends from a sliding way upon which the cutter head rests, and slides up and down with it in suitable guides, when actuated by the hand lever, D, the rock lever, J, and the connecting rod, I.

From the side of the cutter head, A, extends a collar which slides on the guide lever, K. This guide lever is pivoted at the bottom, and being set at the proper angle by means of a graduated arc, and held in place by a set screw, it causes the cutter head to move laterally upon the sliding way which supports it, whenever it is raised or lowered by the lever, D, rock bar, J, and connecting rod, I, the resultant movement of the vertical and lateral motions being oblique to the vertical axis of the guide bar, C. When the pivoted guide bar, K, is set to the center of the graduated arc, the motion of the cutter head will be vertical.

The guide lever, K, is adjustable vertically with the graduated arc, by means of the screw, H, which raises or lowers it, so that when raised the motion of K to the right or left of the center of the graduated arc increases or diminishes the lateral motion of the cutter head, according as it is set higher or lower. The motion of the guide lever, K, is limited and regulated by means of set screws at the ends of the arch bar.

In dovetailing with this machine, the mortises are cut in the following manner: A number of pieces are placed on the bed of the machine and adjusted laterally by guide plates moved by the screws, G. The pieces are held down firmly by a vertical screw, F, and a foot plate which rests on the top of the upper piece of the boards to be worked. The cutter arbors being armed with tools, the sectional outline of which, on the axis of revolution, is that of the mortises: and the guide lever, K, being set to the center of the arc, the machine is set in motion, and the lever, D, being moved outward, causes the cutters to rise vertically, cutting through the ends of the boards, and by a single upward movement forming a large number of mortises.

In making the tenons, as well as the mortises, the ends of the board are placed against a guide plate attached to the cutter head, by which they are uniformly adjusted.

In tenoning, only single pieces are worked, as many tenons being cut simultaneously, as the number of cutters, if desired.

The piece is clamped in the same way as in mortising. The guide lever, K, is first moved to the extremity of the arc on one side, and the cutters being raised by the lever, D, move upward obliquely, and cut one side of the tenons to the previously adjusted bevel. The cutter head thus rises till it engages with a stop previously fixed to regulate the depth of the cuts. The lever, K, is then pressed over to the opposite side of the arc, which causes the cutters to traverse laterally and complete the cuts, except beveling the remaining side of the mortise, which is done by reversing the position of the lever, D, which causes the cutters to descend in the proper angle.

The cutter head is counterpoised as shown, and the distances of the cutters are uniformly and simultaneously adjusted by the hand screw, E.

The inner angles of the dovetailed mortises are rounded in blind dovetailing, and the tools for cutting the tenons are shaped to give the corresponding form to tenons.

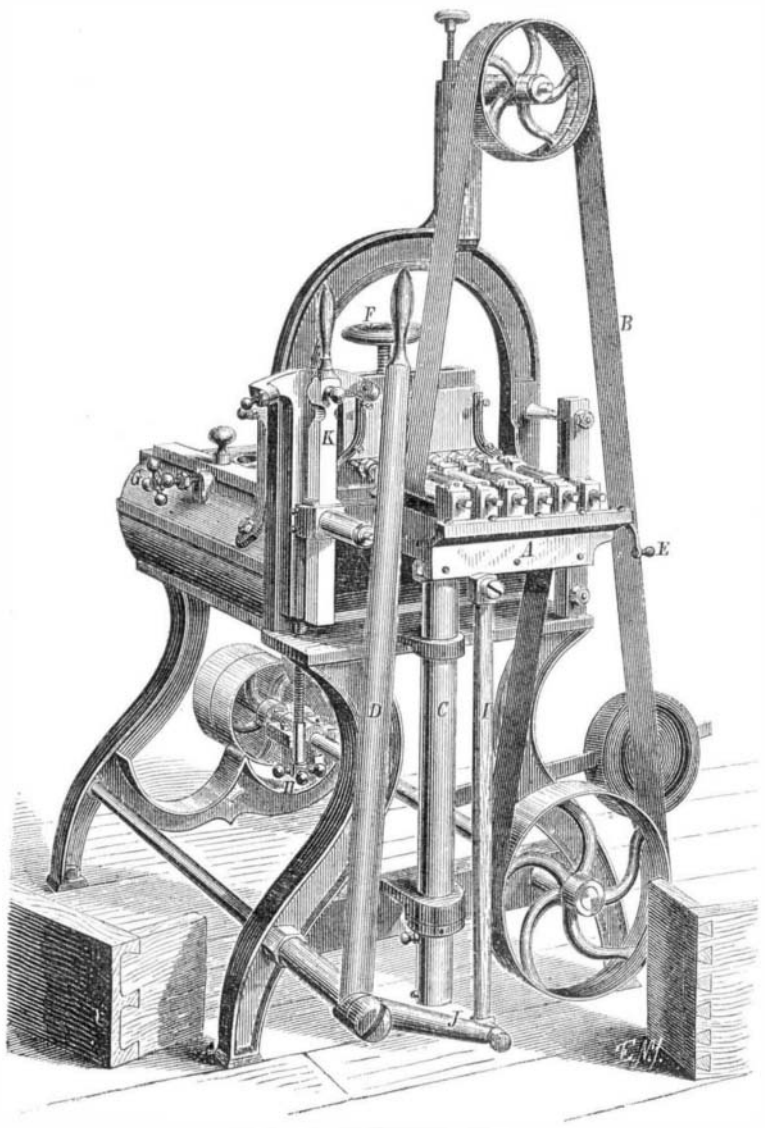
This machine makes a complete dovetail instead of a substitute for it, and does not weaken the work by cutting away wood unnecessarily for the sole purpose of making a fit. The cuttings are made by rotating cutters, which cut into the side of the grain of the wood, by which it is claimed they will retain a sharp edge to do four times the work that can be done by tools cutting endwise of the grain. This method of cutting also prevents splintering, in obstinate kinds of timber.

The lateral adjustment of the cutters to any desired width within the limits of the machine, without loss of time, attained by the use of the screw, E, is a great advantage.

The perfect adjustability of all the parts of the machine, is an important improvement, and it is claimed that it is more durable, and will perform more work in a given time, than other machines of its class.

We have seen the machine at work, but not under circumstances to test its speed of performance. Of the accuracy and beauty of its work we are, however, perfectly satisfied.

Patented June 7, 1870, and Jan. 3, 1871. For rights and other particulars, address H. H. Evarts, 93 Liberty st., N. Y., where a machine may be seen in operation, or at 66 Twenty-fourth st., Chicago, Ill., or Trevor & Co., manufacturers, Lockport, N. Y.



DOVETAILING MACHINE.

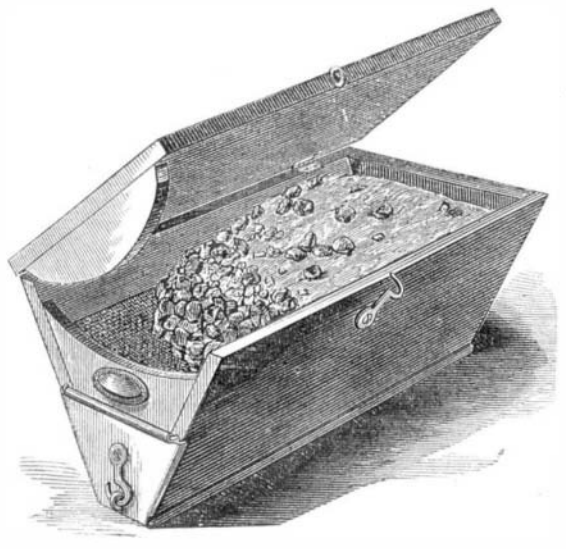
Trial of the New San Francisco Flying Machine.

The newly invented "flying machine," of which our readers have heard so much during the last year or two, was recently tried again, and, according to the San Francisco *Bulletin*, with considerable success. When everything was tightened and got in good running order, and the propeller arranged to cause elevation, it was just quarter of one o'clock. The fire for raising steam was kindled, and in one minute and a quarter steam was opened. At thirteen minutes to one the machine was cut loose, and the propellers started. She then rose most gracefully in the air, amid the cheers of the crowd who had gathered to witness the ascension. The machine was guided by cords attached to both ends of the balloon, and in the hands of persons on the ground. She ascended fifty feet, and sailed along about a block, when she was pulled down to have her boiler replenished. Again she rose, this time to a hight of about 200 feet. All the machinery connected with it worked to the perfect satisfaction of the inventor, who intends to place it on exhibition at some place, of which notice will be given. The name given her is "America."

IMPROVED COAL ASH SIFTER.

Our engraving illustrates the form of a new device for sifting coal ashes, by the use of which the inconveniences of dust are wholly obviated.

The sifter is a box of the form shown, with handles at the ends, and divided by a wire screen into an upper and a lower



compartment. A door leading from the lower compartment permits the removal of the ashes. Both this door and the top lid are made to fit so tightly as to be impermeable to dust.

The mixed coal and ashes being put into the upper compartment, a rocking motion of the box, or shaking it by means of the handles, separates the ashes from the coal and cinders, and this may be done on the stove or carpet without the escape of dust. The device seems well adapted to the purpose designed, can be furnished cheaply, and will prove a useful household utensil.

Patented through the Scientific American Patent Agency, Nov. 8, 1870. State, county, and manufacturer's rights for sale. Address W. S. Estey and I. S. Clough, patentees, 63 Fulton street, N. Y. B. T. Clough, of Waltham, Mass., may be addressed for rights in Massachusetts.

The Bituminous Coal Trade of 1870.

A Pittsburgh exchange says:—The total production of bituminous coal in this country, in 1870, amounted to fully 18,000,000 tuns. The bituminous trade bids fair to eclipse the anthracite in a few years. The latter amounted last year (as far as reported in Pennsylvania) to only 16,889,505 tuns. In Boston, in 1870, the anthracite trade fell off 36,400 while the bituminous increased 49,709 tuns. During the past year, the Baltimore and Ohio Railroad, with the Chesapeake and Ohio Canal, brought to market 1,717,075 tuns of Cumberland coal, a decrease of 165,000 tuns. The Huntingdon and Broad Top Railroad transported 313,822 tuns, a decrease of 46,850 tuns. The Tyrone and Clearfield branch of the Pennsylvania Central carried 345,000 tuns of the Phœnix Vein, while Alleghany Mountain mines shipped 90,000 tuns, mostly for local consumption. The Blossburg and the Towanda mines, which largely supply New York State and the Lake region, supplied, as near as can be ascertained, 500,000 tuns, Thus, the total consumption of bituminous coal, for iron, steam, and domestic uses, on the seaboard north of Cape Henry, aggregated 3,000,000 tuns. In addition, the gas coals of Western Pennsylvania and Virginia gave 1,500,000 tuns, of which one half was brought eastward by the Pennsylvania Central. The statistics of the western bituminous trade are only approximate.

It is an authenticated fact that Pittsburgh, beside consuming locally 600,000 tuns, shipped 2,000,000 tuns down the Ohio, at $2 each; yet so inadequate was the supply that it commanded $8 a tun at Memphis. Cleveland received, for its own consumption and for transportation on the lakes, nearly 1,000,000 tuns, by the Cleveland and Pittsburgh, and the Cleveland and Mahoning railroads. The great West and Northwest, taking the statistics of the "Panhandle" and the Pittsburgh, Fort Wayne and Chicago Railroads, consumed an additional 2,000,000 tuns. As near as can be ascertained, the Indiana, Illinois, Michigan, and Kentucky mines yielded nearly 4,000,000 tuns; and to these are to be added the productions of the vicinity of Richmond, Va., of Alabama and Tennessee. In view of this great and increasing production, the strikes of the anthracite miners will yearly become of less practical value. A silent revolution is at work in the coal trade. Baltimore seems to be losing the supremacy on the seaboard once held by the Cumberland coal, owing to the valuable tracts opened up in Clearfield county, Pa., during the last three years; but by the completion of the Cumberland Valley Railroad to the Potomac river, Baltimore retaliates by a sharp competition in the iron manufacturing regions of Central Pennsylvania. And while Philadelphia enjoys the benefits which Baltimore had by her Cumberland mines, Pittsburgh will lose command of the gas coal trade, by the completion of the Pittsburgh and Connellsville Railroad, opening up to Baltimore and the seaboard the rich gas coals of the Youghiogheny Valley. The present year promises to make some other important changes in the coal trade.

COD-LIVER OIL.

In every country on the earth there are to be found sufferers whose chief reliance against the ravages of damp and cold air is found in the oil from the codfish liver (*jecus aselli*). It is not, therefore, surprising that the single port of St. John, Newfoundland, exported last year nearly 350 tuns of this invaluable medicine. The declared value of this quantity is about $110,000. The oil is dissolved from the livers by gentle heat, in a tin vessel placed in boiling water, and filtered twice. The last filtration is made through heavy woolen cloth, and takes from the oil nearly all its odor and color, leaving in it all the iodine to which, in combination with its carbon, its alterative, fattening, and heat-creating properties are due. It is not only in consumption, but in scrofulous affections and diseases wasting the tissues, that its value is felt. The sickly infants of poor mothers, whose atrophy, from bad and insufficient food, commences even before their birth, can be nursed into health and plumpness by its aid. From its first introduction to the world in the year 1782, the use of it has been steadily on the increase; and the recent annual report of one of the largest of the London hospitals shows that 70 per cent of the patients of all classes are largely benefited by its use. It was first introduced into medicine by Dr. Percival.

Death of a Well-known Manufacturer.

Mr. James Albro, a well-known citizen of Elizabeth, who died on Friday, the 27th ult., had, in his special branch of business, a national reputation, as being the first American who had made original designs for oilcloth manufactured in this country. His experiments commenced as early as 1835 or 1836. At that time almost all the oilcloth used in the country was imported from England; the quality of the cloth manufactured here being inferior, and the patterns being copied from English cloths. Taking a national pride in producing, in price and quality, American goods that should give the imported cloths a less brisk market than they were enjoying, he devoted his attention exclusively to the improvement of the American oilcloths, and with such gratifying result that at the World's Fair in London, in 1862, the first prize was awarded to the firm of which he was the head.