persons must avoid living in localities where the land is rich, flat and moist, or they must drain those lands; but it is possible to live in such places, and have reasonably good health simply by keeping in the house of mornings, with a brisk blazing fire until breakfast is eaten, and take supper at sundown, because it has been found that these emanations are more poisonous at sunrise and sunset and that if the stomach is excited to action by the process of digestion the emanation is rendered innocuous, perhaps from the fact, in part, that the juices of the stomach at the time of digestion are of a character to destroy the life of these living things; but the fact remains the same, whether this supposition is true or not.

A practical use may be made of this subject in the light of these facts, in reference to breathing night air. Very many advocate the raising of windows in a sleeping apartment summer and winter all the year round; the theory seems a good one, but experience will not corroberate it. Persons living on water courses where the "bottom lands," as they are called, are rich, luxuriant, and damp will save health and life itself by keeping all outside doors and windows opening into chambers closed from sundown to sunrise during the three autumnal months, in fever and ague or intermittent localities.—*Hall's Journal of Health.*

Special correspondence of the Scientific American.

THE EXPOSITION.

A GERMAN PAPER MILL.

In an annex of the kingdom of Würtemburg is erected and kept in operation for a number of hours each day, a train of machinery for the manufacture of paper from wood. The finished paper indeed is not made here, but the wood is thoroughly reduced to pulp, ready for the production of paper in the ordinary manner. The process as here carried on is as follows: The wood, which appears to be quite green, is sawed into lengths of twelve or fourteen inches, by a circular saw. A man with a drawing knife then strips off the bark, and in this state, the round wood being already split into two or three pieces, it is introduced into the grinder. The face of this is the same in width as the length of the pieces of wood; and these are laid across it and held against the revolving face by screw clamps. The speed of revolution is about 100 turns per minute, with a diameter of about three or four feet. The screws that press the blocks of wood against the face of the grinder are each provided with a nut worked by a worm, for the purpose of slowly feeding up and maintaining the pressure as the wood is worn away. These worms are all driven by a belt passing over the pulleys on the ends of their shafts, and to allow for irregularities in the hardness of the wood, the connection between the pulleys and the worm shaft is made by a reversed ratchet, the pawl being held against the teeth of the ratchet by a short and stout india-rubber band attached to a pin on the side of the pulley. If the pressure required to screw up the nut increases beyond a certain limit, the pawl will slip upon the teeth of the ratchet, stretching the india-rubber band and fail to screw up until the resistance becomes reduced. A current of water is kept passing over with the grinder, and the ground wood passes off with this to a revolving drum of coarse wire gauze placed on a lower level and some little distance in advance of the former apparatus. The drum is furnished with an automatic comb, which removes from its surface and throws into a receptacle in front of the drum all coarse pieces of wood or chips that may have been formed, while all the true pulp, even though quite coarse, passes through the meshes of the wire drum and out at one side into a receiving tank provided for it. It does not remain here, however, but flows immediately through a four-inch, or thereabout, copper pipe into another grinder of a conical form, revolving about a vertical shaft, and then again passes to a tank containing a revolving cylinder similar to the first, but of a finer mesh, where it is still more finely strained, and this process is repeated yet once or twice more, so that pulp of several degrees of fineness is obtained, the water at last flowing off nearly clear and returning to be pumped back to the first portion of the apparatus, or running to waste, as the case may be. The pulp, as collected in the last tanks, is quite uniform in substance, and seems to possess considerable fiber and tenacity. The paper manufactured in this way appears to be of excellent quality, and if a certain proportion of cotton pulp is mixed with it, it may be used for almost all the usual purposes of paper made from cloth.

Within the past month most of the buildings in the park, as well as the streets around it, have been completed, and there is not now so much of that unfinished appearance which detracted considerably from the general effect during the first months of the great Exposition.

SCHOOL HOUSE AND COTTAGE.

The United States have added several creditable structures in the grounds, such for instance as a primary free school-house, containing the usual furniture and apparatus of such an institution; in reference to which we can also say that no attempt has been made to produce display by introducing things not in actual use. It looks serviceable and practical. Then we have a portable farm cottage from Louisiana, which is rather more pretentious, having a Grecian pediment and columns before the door.

HOT-AIR ENGINES.

More important than this is a building or roof, under which is placed Mr. Shaw's hot-air engine. This has been in course of erection ever since last March, but from bad workmanship has given a great deal of trouble in getting to work. At last, however, it is in operation, and appears to work with a will. This is a machine which theoretically is important, while the practical difficulties, which have always been the chief ones to overcome in this class of engines, appear to have been pretty effectually surmounted. As has been often proposed before, the whole of the products of combustion are applied directly to the piston to produce motion, thereby utilizing a greater proportion of the heat than is possible when these are only used to raise a separate volume of air to an equal temperature with themselves. If the products of combustion are then allowed to escape, and only the air which they have heated used, it is evident that perhaps half the heat is thrown away bodily, unless a very large body of air is raised to a low temperature and worked at a very low pressure. The great difficulty in the way of using the hot gases from the fire directly in the cylinder has been the apparent impossibility of preventing the surfaces from cutting, by the combined action of the heat and dirt. Mr. Shaw seems to have obviated this by attaching to his pistons a drum of a diameter very slightly—say one eighth of an inch—less than that of the cylinder, and a length equal to the stroke, and providing an arrangement by which before each stroke the annular space between the drum and the cylinder is filled with cold and clean air of the same pressure as that which comes upon it afterward. Having no way of escape, this air remains in the space during the stroke and protects the working faces from injury by preventing the hot and dirty gases from impinging at all upon them. As a further and very important means of economy, regenerating surfaces of iron and brick are provided, for abstracting as much as possible of the heat remaining in the exhaust air, and imparting it to the incoming cold air. A trial was had lately with this engine, which showed an economy of coal superior to what has been obtained with the steam engine, and as this is yet in its infancy, we shall no doubt hear much more of it in future.

GLASS WARE AND PLATE.

But as it is raining, let us go in and take a walk through the passages of the main building. Truly the magnificence of the French department surpasses the power of description, and casts all others quite into the shade. The central portion, or the straight piece connecting the two circular portions, at the ends, is devoted to the display of bronzes, tapestry, glass, porcelain, and gold and silver plate, and without question such a display of elegance and taste was never before to be seen under any circumstances. One is almost bewildered by the brilliancy of the glass ware, and stopping to examine it he is charmed with the beauty of the forms into which it is fashioned, and the delicacy of the ornamentation. Among the plate is a service made for M. Petin, of the celebrated firm of Petin, Gaudet & Co., ornamented with appropriate representations of the machinery employed in the manufacture of iron and steel, arranged in groups at the corners and other prominent points. In another case is a set of gold vases enameled in various colors with beautiful devices, in such a way as entirely to hide the precious metal, and thus presenting rather the appearance of finely painted porcelain It may well be questioned whether in any palace in Europe there exists such an exquisite piece of taste and workmanship. This portion of the French department has called forth the most unbounded admiration from visitors of all nations, and it well deserves to have done so.

SCIENTIFIC APPARATUS.

Returning again to objects of a more practical nature, we notice the fine collection of scientific apparatus which the French makers exhibit. They have, as we know, always been celebrated for their proficiency in this branch of manufacture, and their reputation is here well sustained. A very good collection of air pumps is exhibited, presenting some features worthy of notice. The pistons are made in length say twice the diameter of the cylinder, and are simply of brass with a number of small grooves turned on their face, a system now sometimes used as a substitute for packing in the pistons of small steam engines. A very neat substitute for a parallel motion, or means of converting the motion of the crank into that of the piston rod, is adopted in these pumps, and quite frequently in other French machines. It consists of a fixed internal gear placed concentrically with the crank shaft, and within this another gear of just half the diameter on the pitch line, secured to the crank and revolving with it.

Firmly fastened to this is an arm carrying a pin in such a position that when the crank is horizontal or at half stroke, this shall be exactly opposite the center of the internal gear. As the small gear goes around the inner circumference of the former, it will be seen that this pin which moves the piston rod will travel in a straight vertical line, while the construction of the motion is extremely simple.

TRACTION ENGINES AND AGRICULTURAL MACHINERY.

A portion of the park is devoted to traction engines of various descriptions and the machines there exhibited are of interest as showing the progress that has been made in the application of steam. The importance of steam power for agricultural purposes is becoming more fully appreciated now in Europe as the very large number of portable engines adapted to this end, which have been sent to the Exposition, clearly shows. The traction engines are chiefly intended for the same use, the gearing being so arranged that in addition to the ordinary functions of portable farm engines they may be used as locomotives in drawing wagons. The examples exhibited illustrate admirably the practice of the different makers, and perhaps in no class of machinery in the Exposition are the distinctive characteristics of French and English design more strikingly shown.

Messrs. John Fowler & Co., of Leeds, who are among the most prominent makers of agricultural machinery in England, send a traction engine of simple and substantial construction. The power is furnished by a pair of horizontal cylinders, and the gearing, though such as to permit of the pistons working at a tolerably high speed, consists of but few wheels, and these have teeth of good size, being in fact if anything too heavy. The driving wheels receive their motion from a large gear wheel running on the same shaft and placed just inside of the former, a friction clutch being employed to throw them in or out of gear. The machine is steered by a chain passing around a pitch pinion and taking hold of the forward axle on each side of the center. The pinion is moved by a worm gear on the upper end of its shaft. Messrs. Aveling & Porter also have an engine which has proved its capabilities for work by drawing five loaded wagons weighing 35 tuns up a slight grade. In this engine a single horizontal cylinder is employed, and the motion is so reduced by gearing as to enable this to supply all the power required, while from the high speed so necessitated no trouble from working over the centers is experienced. The motion is imparted to the driving wheels by a pitch chain passing over a pinion in connection with the gearing, and a large pitch wheel turning on the same shaft with the driving wheels. A stout pin is used to clutch the chain wheel to the drivers, and by withdrawing this the engine is free to work while remaining at rest, while if one pin only be withdrawn the engine is enabled to turn easily around a short corner. The steering is effected by a single knife edged wheel in front, which supports merely enough weight to give it a proper bite on the ground without imbedding it too deeply.

A third engine which stands by the side of those already mentioned is of French construction being built by Messrs. Lotz, Fils ainé, of Nantes. It presents a marked difference in design and workmanship to the English engines. It is intended to be used as a plowing engine as well as for traction, and this of course gives rise to some of its peculiarities, but like many Continental machines it is full of light rattle traps which are never so much out of place as in an engine for rough use like an agricultural one. A pair of vertical cylinders are employed, the crank shaft pillow blocks being secured in an extension of the fire box casing. The driving wheels are moved by a pitch chain as in the last mentioned engine, and more than one diameter of pitch wheel is provided so that the speed and tractive force of the engine can be varied. All the gearing, however, appears light and inferior. The barrel of the boiler is encircled by two drums for winding in or out the wire rope by which the plows are to be drawn. These bear, through the intervention of rollers, on an inner ring or seat fastened to the shell of the boiler, and are driven by gearing at their circumference. An over ingenious moving guide is provided to lead the wire rope on the drum in such a manner that it shall not over-ride itself, the motion resembles that used in some slotting drills for traversing the tool back and forth. A longitudinal shaft runs along the top of the boiler to convey motion from the engine gearing to the drums.

The same makers exhibit a traction engine with a single vertical cylinder working a pinion shaft from which motion is communicated to the driving wheels by a pitch chain. It is steered by a single wheel in front. Notwithstanding the manifest inferiority in design of these engines to the English, they have received a medal of a much higher class than the latter! There is nothing from America in this line; indeed, though there is a large demand for portable engines with us there appears to have been but little done as yet with traction or plowing engines.

The display of farming implements in general is very good. That in the English department is much the most complete, but this, as compared with what we might have shown, is due in part to their greater proximity to Paris, since the tools that are to be seen in the American annex are not lacking in merit, while it is easy to recognize an American model in very many of the machines in the English department. As a rule the French tools are inferior in design and workmanship to either the English or American. As already stated in a previous letter the grand prize in this class has been awarded to Messrs. Howard, of Bedford, England. Their system of steam plowing is represented by a model in the British annex, but their full size apparatus is at Billancourt, one of the suburbs of Paris, where are grounds more suitable to such an exhibition. Messrs. Fowler also have a fine display of similar machinery.

Messrs. Ransomes & Sims, of Ipswich, also large manufacturers of agricultural machinery exhibit among other things a very useful arrangement of thrashing machine in combination with apparatus for cutting up the straw for fodder for animals in countries such as Spain, Turkey, Mexico, etc., where grass is not grown for hay. The straw which is raised in these countries, is quite thick and nutritive, and if it be cut with an ordinary hay cutting machine, thus leaving the edges strong and sharp, the palates of the animals are so injured by the passage of the rough food over them that they absolutely refuse that kind of fodder. It is necessary, therefore, to bruise the straw so as to destroy its stiffness in order that it may be of any use. In this machine the straw is passed into the box containing two rollers fitted with knives and lugs which pass between pairs of similar ones on the side of the casing; these run at a high speed and from the rapid motion and peculiar shape of the cutters the straw leaves the machine thoroughly bruised and prepared for the cattle.

In the French and Belgic grounds are exhibited model barns and barnyards showing various approved plans of stalling cattle, sheep, etc., and the opportunity is also taken to exhibit specimens of choice breeds of stock. Fresh milk and sand wiches are served out to those who are fond of such plain fare in the little restaurants adjoining.

The awards of medals in this department has been such as to devide the honors pretty equally between the principal nations, Wood and McCormick receiving gold medals in the United States, and about the same number being awarded to French and English exhibitors. The Americans have always shown the greatest aptitude for this class of work, and the greatest originality in invention, but they have not carried

it quite so far in all directions as has been done in England.

The Emperor of Russia obtained a grand prize for efforts to improve the equine race, exemplification of what he had done being given by a splendid lot of horses, which are exhibited at certain hours in the day in an enclosure in front of their stables, which are very complete in arrangement. The English have also several exhibitions of stalls showing modes of drainage, feeding, watering, and ventilation, besides many other details of minor importance but which tend to give a look of neatness and comfort to a stable, and which have a real utility beyond mere appearance. SLADE.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The sixteenth annual meeting of this association, held this year in Burlington, Vt., was brought to a close on Monday, Aug. 26th. This society is a much more democratic body than its younger branch, the Academy of Science, whose meeting at Hartford we noticed two weeks ago, no limit being enforced upon its number of members, any person sufficiently interested in the progress of science to contribute the small annual fee being eligible for membership. The association had its origin in a convention of geologists at Philadelphia in 1840, when an organization was effected under the name of the Association of American Geologists and Naturalists. Its sphere was subsequently enlarged and the present title selected, the first meeting being held in 1848. The objects of the association, as set forth in its constitution, are to promote intercourse between those who are cultivating science in different parts of the United States, to give a stronger impulse to scientific research, and to procure for the labors of scientific men increased facilities and wider usefulness. There are now over five hundred names upon the roll of membership, but less than one fifth of this number were present at any one of these meetings.

The afternoon session of the first day was opened by Prof. Lovering, who exhibited an apparatus for making sound visible. By a suitable arrangement, the air pulsations caused by a sounding organ pipe are communicated to a burning gas jet, producing corresponding vibrations of the flame. A revolving mirror is employed to make these vibrations visible to the eye. By this arrangement the relative velocities of different classes of vibrations given by theory were verified. A singular result was noticed when two pipes of precisely the same pitch were placed side by side; they tended to silence each other, the vibration of the one rising while falling in the other. Prof. Newcomb read the second paper, on a "new determination of the distance of the sun," the calculations having been made at the Washington Observatory. Ten years since astronomers began to suspect that the value of the sun's distance found by Encke from the transits of Venus observed in 1761 and 1769, was largely in error. This distance, 95,300,000 miles, had long been received as the standard. But all the modern tests which could be applied to it indicated that it was about three millions of miles too great. In the year 1862 circulars were issued independently from the observatories of Washington and Pulkowa, (the Russian national observatory situated near St. Petersburg,) inviting the coöperation of astronomers everywhere in a general attempt to determine the parallax of Mars at apposition of that year. The plan was generally adopted, and nearly every active observatory in the world engaged in the observations, which occupied ten weeks. It was the most extended coöperate effort on the part of astronomers which had been made during the century.

Through the pressure of other duties and the illness of the astronomer who had proposed the work, the Pulkowa observatory had not been able to undertake the discussion of this great mass of observations, so that for five years their result remained unknown. Last winter an arrangement was made between the observatories at Washington and Pulkowa, by which this discussion was placed in possession of the speaker, to be executed and published by authority of the Naval Observatory. It is now complete, and the sun's distance is determined to be 92,340,000 miles, and the velocity of light is thus reduced to 185,500 miles per second.

Prof. C. S. Lyman, of Yale College, exhibited a new apparatus for illustrating the motion of the waves of the ocean. Mr. Roosevelt followed with a paper on the distribution of the precious metals in the United States, and Prof. E. N. Horsford closed with an essay on the subject of bread, which is an old hobby of his.

"The Relative Value of Gold and Silver for a Series of Years" was the theme of the opening paper of the second day's meeting, by Mr. E. B. Elliott. It seems that in 1700 the average market value of gold was 15·5 times that of silver. In 1841–1848, the average was 15·8; in 1849–1852, 15·5; and since 1852 it has averaged, at first 15·33, and later 15·4. It is now about the latter figure, quite persistent, and tending rather in favor of gold, by the increasing production of silver. The production of the latter in the world is on the increase, and the present value of the metals is not likely to be reversed or particularly changed, except in favor of the higher price of gold. Prof. Hall followed and repeated the remarks concerning the Cohoes mastodon, made by him at the late Hartford meeting, but which then caused a spirited discussion. Both conclusions, as to the age of the mastodon and those relating to the glacial action in the distribution of the bones, being disputed, Prof. Dawson, of Montreal, declared himself a disbeliever in the American glacial theory; other eminent geologists held the same opinion, and the mastodon was in turn referred to several ages before, after, and during the glacial periods. At this point of the proceedings the members were divided into the two sections of (A) mathematics and physics, and (B) natural history and geology.

The papers read at this first session of section A were of such a character that no report such as our limited space will permit, would do justice to them. The subjects and their authors were the following: 1. Remarks on meteorological results deduced from the new method of registration; G. W. Hough. 2. Remarks on the laws of winds; Prof. J. B. Coffin, of Lafayette College. 3. On the periodicity of the aurora; Prof. Lovering. 4. Occupations of the people classified; E. B. Elliott, the eminent statistician. 5. On the determination of latitude from observations in the prime vertical; W. A. Rogers; 6. On new diagrams and derivation symbols, illustrating the prominent characteristics of chemical elements; Prof. S. D. Tillman.

In section B: 1. "The study of the orthoptera of North America" was treated by L. H. Scudder, of Boston. 2. "Traces of ancient glaciers in the White Mountains," by G. L. Vose. The speaker found glacial scratches 5,350 feet above the sea on Mount Washington, and he considered this peak as the center of the glacial system. 3. Prof. Marsh read a paper on the "Origin of lignilites or epsomites." 4. Prof. Hall explained the "Geographical distribution of fossils in the Hamilton, Portage, and Chemung groups." 5. Mr. L. E Chittenden interested the audience with an account of a species of shell, the *Lininea megasoma*, found only in lakes Huron and Champlain, and rapidly disappearing even there.

At the general session on the third day, Dr. Gould read a paper on the "Velocity of transmission of signals by the telegraph." Previous to the year 1849, it was supposed that the velocity of electricity through wires was too great to be measured. In that year, Sears C. Walker discovered, while measuring longitude, a perceptible retardation. Between Washington and St. Louis the velocity was found to be only 15,000 miles per second. On the submarine cable between Greenwich and Brussels the velocity was only 8,000 or 9,000 miles. On the Atlantic cable, Prof. Gould found the velocity to be between 7,000 and 8,000 miles per second, being greatest when the circuit was made by the two cables. Incidentally it was shown that the usual practice of telegraphers to increase the power of their batteries is entirely unnecessary and unwise. A single element is sufficient to produce the signal through 4,100 miles of the cable. The speaker mentioned the fact that he had transmitted signals from Valentia to Newfoundland with a battery composed of a percussion cap, a drop of acid, and a morsel of zinc, and had also transmitted signals on wires from which the battery had been removed, by the previous charge alone. The insulation of the cables improved by time, and signals were sent most rapidly by alternating positive and negative currents.

The second speaker was Prof. Horsford, who lectured on the structure of ice, in relation to the sudden disappearance of ice on Lake Champlain. This ended the scientific exercises of the general session, the other papers being referred to their appropriate sections.

In section A, Prof. Hungerford read a paper relative to experiments with snow at a temperature below 32°. He attempted to show that snow could be then changed directly into ice, by simple pressure. He was followed by Prof. Hough in an abstruse paper on "Personal equation in transit observations." Dr. Bradley claimed "Tellurium as a metal." His reasons for this classification have previously appeared in these columns. Prof. Tillman next presented his "Method of representing musical intervals upon a spiral projection." The exercises in this section closed with Prof. Hyatt's paper on the "Value of wood spirit for practical purposes." In section B, Prof. Newberry exhibited portions of a fossil fish from Devonian rocks in Delaware, Ohio, remarkable for its size, it being probably not less than twenty-five feet long. The second paper was by Mr. Scudder, of Boston, on fossil insects of North America. Prof. Hitchcock read a paper on Winooski marbles at Colchester, Vt. Prof. Verrill, of Yale College, on zoological affinities of tabulated corals. Prof. Worthen followed with a paper on the coal measures of Illinois. Prof. Dawson read the last paper, on new points in geology in Nova Scotia and New Brunswick.

At the general session on Monday, after the passage of resolutions tendering thanks of the association to George Peabody for his donations in behalf of science, the society proclaimed itself as cordially in favor of the introduction of the metric system of weights and measures, but opposed to change the weight of the existing monetary unit, the gold dollar.

In the sectional meetings papers were read on the geology of the state of Maine, and another on the geographical distribution of radiates on the western coast of North America. "Climate glacial epoch in North America," also a paper on the "Ripton sea beaches," both by Prof. Hungerford; "Geology of Vermont," by Prof. Hitchcock; and "Ichthyological fauna in Lake Champlain," by Mr. Putnam.

After some business transactions, the session was declared adjourned, to meet next year in Chicago.

The Late Obed Hussey.

In the annexed history, from the *Ohio Farmer*, we regret to notice the absence of the name of a citizen of Maryland, says the *Turf, Field and Farm*, to whom, undoubtedly, belongs the credit of having invented, and brought into practical use, the first reaper and mower ever seen upon this continent. We allude to the late Obed Hussey, of Baltimore. We remember, when quite a young man, the interest with which we watched him, hour after hour, toiling upon the rude materials, which, at the bidding of his genius, were soon to be fashioned into the machine, which has done so much to lessen the toil of the farmer and cheapen the food of mankind. We remember his many heart breaking discouragements, and the brave perseverance with which he encountered and overcame them. We remember, too, rejoicing with him at the first successful trial of his mower, made on the estate of the late Gustavus Weems, in Annie Arundel Co., near Herring Bay. If we are not mistaken, the heirs of Hussey are now reaping, in the shape of a royalty on part of his invention, the reward which he, unfortunately did not live to enjoy.

Most people take it for granted that reapers and mowers are quite of modern invention, but such a conclusion is far from being correct. Others have supposed that some American Yankee first conceived the idea of constructing a machine for cutting grain with horses or oxen; but history informs us that reapers were in operation before Columbus discovered the Western Continent, and that the sickle and the scythe, in some of the oriental countries, had been superseded by reapers that were worked by one or two oxen, in the early part of the Christian era.

The first account of a machine to reap grain appears to be that given by Pliny the Elder, who was born, it has been supposed, about the year of our Lord 23—more than 1800 years ago. This historian says:—"There are various methods of reaping grain. In the extensive fields of the lowlands of Gaul, vans of a large size, with projecting teeth on the forward edge, are driven on two wheels through the standing corn (oats and barley are called corn) by an ox yoked in a reverse position—with the machine forward of the ox. In this manner the ears (or what we call heads of barley or panicles of oats) are torn off and fall into the van. In some places the stalks are severed in the middle by sickles, and the ears, or heads of grain, are stripped off between two hatchels."—Palladius. an Eastern ecclesiastical writer, gives the following account of reapers in A. D. 391. In the Gallic lowlands they employ a more expeditious method of reaping, requiring the assistance of a single ox during the whole of harvest time. A cart is constructed which moves on two wheels. A low box of boards is constructed on the wheels, and the boards in front are lower than the rest. Behind this cart two shafts (or thills) are fastened, like the poles of a sedan chair. To these an ox is yoked and harnessed, with his head turned towards the cart; and the ears, or heads, are gathered in the box, and the driver regulates the elevation and depression of the teeth with a lever."

The next account of a reaper is given in proposals, submitted in Britain in 1785, for constructing a reaper. This machine was propelled by a horse or ox, clipping the heads of grain and depositing them in a large box, which was emptied when it was full into a store roon. In the details of this machine, a drive wheel, pulleys, pinions, tooth wheels, and iron combs, or teeth, are spoken of.

In 1799 another reaper is spoken of as being propelled by a horse behind it, which cut and laid the grain in a swath, on one side of the reaper. A boy could manage the machine, and with one horse could cut a swath about two feet wide, or rather more than could be reaped in the same time by six men with sickles.

In 1806 Mr. Gladstone produced a reaper for cutting grain, delivering the straw into gavels to be bound. Drive wheels, pulleys, bands, etc., are alluded to in the details of this reaper.

In 1807 Mr. Pluckenett constructed a machine in which a horse drew the machine instead of pushing it forward, according to the usual custom of operating reapers. After this period many inventors entered the field with reapers of an improved construction, and in 1823, Mr. Mann, under the auspices of the Highland Society of Scotland, brought forward a new reaper, which was worked with one horse and which could reap 10 acres in 10 hours.

In 1830 a mowing machine was produced, and soon after that a combined reaper and mower is spoken of. After that time the celebrated McCormick reaper entered the field, astounding Americans as well as farmers of the Old World.

The Petroleum Fuel Mania.

A successful experiment was made last week on the Ohio River with petroleum as a substitute for coal in navigation. The *Cincinnati Gazette* says of the new method of raising steam: "The advantages of this arrangement are so obvious that it seems almost superfluous to speak of them, yet we cannot resist pointing out a few of them. First, we have the economy of the fuel itself, $20 worth of petroleum being equal to $50 worth of coal. Then, there is the economy of weight and space, which is as one to ten. In addition to this we have the saving of wages of firemen and coal-heavers, the saving of time in taking the fuel on board, and above all, the perfect control of the engineer over the fire, and complete absence of danger from sparks. The explosive qualities of petroleum have hitherto been the great bugbear by which our enterprising steamboat builders and machinists have been scared off. We are not at all surprised at this, for steam itself had to struggle hard ere it could assert its supremacy over every other power in use, and we feel satisfied that coal will give way to petroleum as the tow path gave way to the railway."

The above is an excellent sample of the rubbish concerning the use of petroleum for fuel, which has been circulating in newspapers for the past few months.

GERMAN MOURNING CANDLES.—These are made by heating paraffine with the shells of the Anacardium nut, which contains a black resin soluble in paraffine. While the paraffine is liquid it is of a dark brown color, but on solidifying it becomes jet black. The candles have a very thin wick and burn without giving off any unpleasant odor or vapor. Who will invent some combination of chemical substances to incorporate into sterine or wax candles which will give a variety of colors when burning, say red, green, or yellow. The demand for such an article would be very great for illuminating purposes.