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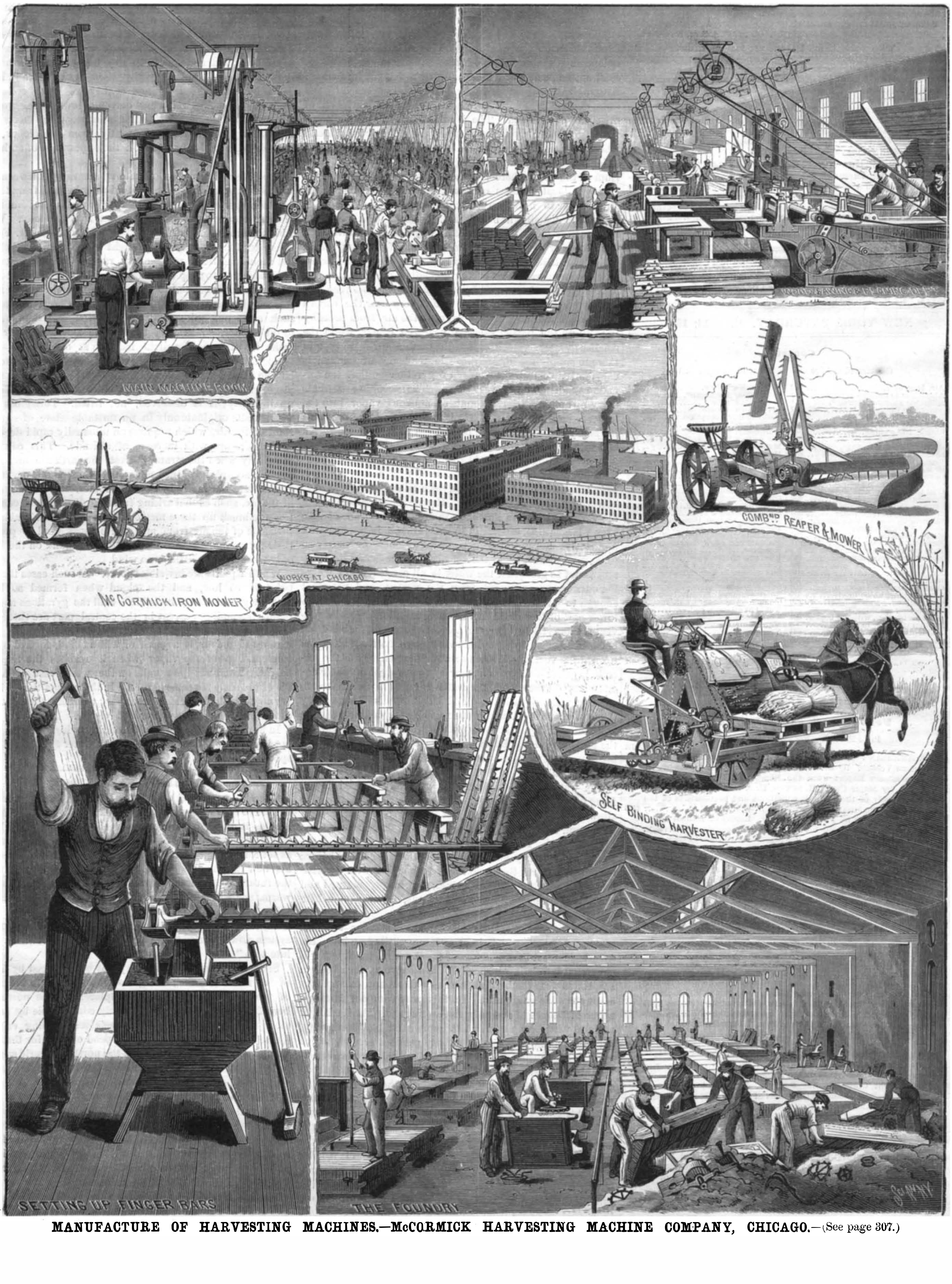

MANUFACTURE OF HARVESTING MACHINES.—McCORMICK HARVESTING MACHINE COMPANY, CHICAGO.—(See page 307.)

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 280,

For the Week ending May 14, 1881.

Price 10 cents. For sale by all newsdealers.

TORNADOES, HAILSTORMS, AND WATERSPOUTS.

At this season of the year, when storms of limited area and great violence are apt to occur, we are equally apt to suffer from outbreaks of newspaper meteorology which are sometimes almost as appalling as the phenomena they attempt to explain. We may be excused, therefore, for assuming that the subject is one of popular interest, and for compiling some of the more significant and certain results of observation and scientific deduction with regard to the origin, conditions, and behavior of this class of storms.

A favorable opportunity for doing this is furnished by the recent publication of the 10th appendix to the report of the Superintendent of the United States Coast and Geodetic Survey, for 1878, containing the second part of Mr. William Ferrel's researches on cyclones, tornadoes, and waterspouts, in which the theory of cyclones is mathematically discussed at great length, with a comparison of the results thus obtained with the facts of observation. We may safely draw from this treatise such information as may seem of interest to landsmen at this time, with reasonable confidence that we shall not be misled with respect either to facts or inferences. Although largely similar to cyclones, and governed by the same general principles, tornadoes form a distinct class of meteoric phenomena. The initial temperature conditions which give rise to cyclones generally extend over large areas. The conditions of tornadoes depend rather upon vertical relations of temperature, under which the unstable equilibrium of the atmosphere is liable to be violently disturbed by slight local changes of temperature causing the under strata of air to burst up through the overlying strata. A cyclone is usually a broad, flat, gyrating disk of atmosphere, very many times greater in width than in altitude; a tornado may be regarded as a column of gyrating air in which the altitude is several times greater than its diameter. The enormous velocities of the ascending currents in a tornado appear to be caused by the differences between the gyratory velocities above and those very near the earth's surface. The former largely prevent the air from pressing in to fill up the partial vacuum near the center, while the smaller gyratory velocities near the earth allow it to rush in there to supply the draught. The tendency of friction is constantly to use up the energy of gyration so that the tornado cannot continue very long. The ascending currents carry up an enormous amount of aqueous vapor into the upper regions of the air, where it is condensed and produces the heavy rains observed in connection with tornadoes. An ascending current of 60 meters a second, which cannot be unusual in tornadoes, would furnish, under extreme conditions of air saturation, four inches of rain a minute, if it were to fall directly back. With such an ascending velocity, however, no rain could so fall. It would be thrown outside the vortex, giving an immense though lighter fall of rain over a larger area, especially if the tornado in its irregular progressive motions should remain stationary or nearly so for several minutes. If the velocity of the ascending current is not so great that the water is all carried up to where the currents are outward from the vortex, and yet great enough to prevent its falling back, there may be in the lower part of the cloud a vast accumulation of rain, prevented from falling by the ascending currents and from being dispersed by the inflowing currents from all sides toward the vortex. When the sustaining energy of the tornado is exhausted by friction or by the weight of water accumulated in the cloud, the water is liable to fall in mass, causing what is called a cloud burst. This is especially liable to occur in mountainous regions, for contact with a mountain must greatly interfere with the gyratory motion of the tornado and the inflowing currents below, and tend to break up the system at once and let the whole load of water drop suddenly.

The water in cloud bursts is generally poured down. Long before the ascending currents are reduced so as to allow the water to fall in drops it seems to collect at certain places and force its way in a solid stream down through the ascending air. Having once made an outlet for itself the water is necessarily accelerated in velocity, so that before reaching the earth the stream may be pouring with irresistible force, cutting, when it strikes, the sharply marked and often deep chasms left by cloud bursts, especially on hillsides.

When the ascending current carries the vapor into the region of frost—which is at a lower altitude within the gyrating funnel than outside of it—the condensed vapor is converted into hail. The small hailstones may then be kept suspended near the base of the snow cloud and enlarged by additions of freezing rain. In this way compact homogeneous hailstones of ordinary size are formed. At the height of 7,000 yards the air has lost more than half its density, yet an ascending velocity of twenty yards a second, which must be no unusual one in tornadoes, would sustain even at that altitude hailstones of considerable size. It is not necessary that the hailstones should remain in the freezing region a long time, or remain stationary. They may be carried from this vortex out where the ascending current is small, and, dropping down some distance, may be carried into the vortex by inflowing currents and again thrown up to the region of frost. The nucleus of large hailstones is usually compacted snow. A small ball of snow saturated with rain is carried higher and freezes; and being of less specific gravity than compact hail it is kept where it receives a thick coating of ice from the unfrozen water dashed against it, and afterwards falls to the earth, either at a distance from the vortex where the ascending currents are weak, or near it after the uprush has been sufficiently exhausted. Sometimes, as in the case of the cloud burst, an almost incredible amount of accumulated hail may fall in a short time, when the energy of the system is suddenly spent.

The formation of large hailstones by concentric layers of clear ice and white snow, laid on like the coats of an onion, will be readily understood from the foregoing. As many as thirteen layers have been observed in large hailstones, showing that they must have made half a dozen circuits, being successively thrown out of the froty vortex above and sucked in below by the inflowing currents, each time adding to their coatings of snow and ice before their final fall to earth.

When the tornado is very small in the area covered by the gyratory motion, a land spout or a water spout is formed, as it may happen to occur on land or at sea. In these the gyratory velocity rapidly diminishes with distance from the center. Their destructive effects are sudden and often great, but the area of violence is small. In the center of a waterspout, as in that of a tornado when in full force no rain falls or water descends in any form, though a heavy shower often falls in the vicinity. On land dust and light substances are carried up, and as they are being collected from all sides by inflowing currents toward the vortex below, they assume the form of a cone, which meets the descending spout, falling apparently from the clouds, and thus give the whole phenomenon the appearance of an hourglass.

The observed diameters of waterspouts range between two and two hundred feet or more, and their heights from thirty to fifteen hundred feet, sometimes very much more; but none of these observations can be regarded as at all exact. With a high temperature and a very low dew point Mr. Ferrel calculates that a water spout might reach a mile in height, but such conditions must occur rarely. Waterspouts are often observed to drop down from a cloud in an incredibly short space of time, and to be drawn up again in the same manner; but this is all an illusion. When the gyrations are such as to not quite reduce the tension and temperature in the center, so as to condense the aqueous vapor and make it visible, a very slight increase at once reduces the temperature sufficiently, and the spout appears from top to bottom almost instantaneously. Just the reverse of this takes place, when the spout breaks, and it seems to be drawn up instantly; it is dissolved, not lifted. Tornadoes and waterspouts originate only in an unstable state of equilibrium of the air, which requires an unusually rapid decrease of temperature with increase of altitude. This can take place only when the strata nearest the earth are unusually heated; accordingly they never occur at night, or in the winter, and but rarely in cloudy weather. If any agitation of the air, such as that arising from the discharge of cannon, tends to break up these meteors, then any considerable disturbance of the air from any cause must tend to prevent their formation. Hence they occur at sea and on the lakes only when there is little or no wind.

White squalls are invisible spouts. In such cases the dew point is so low, and the cloud when formed so high, that the gyrations are invisible. Still the gyrations and the rapidly ascending current in the central part are there, and also the rising and boiling of the sea. Over the boiling sea, high up in the air, is a patch of white cloud, formed by the condensation of the vapor when it reaches the required height. The bulls-eye squalls on the west coast of Africa are of precisely the same nature. In these cases the air is too dry to furnish the cloud necessary to make the spout, or center of the gyratory movement, visible.

In hot dry climates these ascending whirls of air form sand spouts or pillars of sand. Both water spouts and sand spouts are hollow.

HEAT, LIGHT, AND POWER WITHOUT COST.

One of the greatest difficulties that beset the progress of the brave men who venture upon explorations in the Arctic regions is the terrible cold and the deprivation of light. But if we may believe in the theories of Professor Gamgee, as set forth in the remarkable specification of the patent for his new thermo-dynamic engine—date of April 19, 1881—the future Arctic investigator will have no trouble in keeping warm, nor will darkness trouble him, for the harder everything freezes the faster the engine will run.

Says the Professor in his patent: "I utilize heat in this system downward to 0° Centigrade, and below towards absolute zero."

Since both heat and electricity may be produced by means of a rotating wheel, in degrees proportionate to the power of the wheel, it follows that explorers to the north may hereafter make themselves entirely comfortable by taking along a few of Professor Gamgee's self-running engines. These extraordinary machines depend on *cold* for their motive power, the very article that the northerly world supplies in the greatest abundance, and that has heretofore been regarded as a drug in the Greenland market.

If Gamgee and the Patent Office are right, then the owners of coal mines may as well shut up shop. Fuel will no longer be required to produce either motive power, heat, or light. These great factors in human welfare will in future be enjoyed by mankind without labor or cost, all the industries of the world will be revolutionized, and a majority of them discarded for lack of further use.

In view of these considerations we would ask the Commissioner of Patents if he considers that he has done the fair thing in granting a patent to Gamgee, while rejecting the application of poor Keely, the prior inventor?

ANOTHER NEW MOTOR.

The latest candidate among inventors for immortal honors is Prof. John Gamgee, of London, now residing in Washington, for he claims to have found out how to prevent a large part of that celebrated ninety per cent of loss which has hitherto been incidental to the use of steam for dynamical purposes. We learn from the newspapers that President Garfield, Secretary Windom, and others, have examined the new engine, and that Chief Engineer Isherwood has prepared a report on the subject to Secretary of the Navy Hunt.

A correspondent of the *Evening Post* says: "One of the examiners of the Patent Office tells us he regards it as the most important patent since the telephone. If it succeeds at all, however, it will be of far greater consequence than that or any other invention of modern time." The patent is dated April 19, 1881, and is entitled "Thermo-dynamic engine;" also the new engine is called a zeromotor, in recognition of the fact that it is designed to operate it at about the temperature of zero.

The patent clearly and fully describes the invention, and the few paragraphs which we quote will make the matter pretty plain.

"My invention," says Prof. Gamgee in his patent, "relates to the employment as a motor fluid of a liquefiable gas or vapor of adequate tension, the product of a liquid which boils at or near the temperature of surrounding objects.

"I find that by working such a gas or vapor expansively in one or more engine cylinders, its heat can be converted to such an extent into mechanical energy or motion that at the exhaust it will have returned in great measure to its original liquid condition, from which state it may be again caused to assume the condition of a motor vapor or gas by exposing it to the needed temperature.

"It is this feature, viz., the working of such a vapor or gas expansively to the extent of more or less complete liquefaction, and the reconverting it from the liquid to the vaporous or gaseous condition for use again as a motor fluid, which mainly characterizes my invention.

"The vapor having expended its energy, and being mostly liquefied by the conversion of its heat into motion, is discharged from the engine cylinder into a close exhaust vessel protected or insulated from environing heat. The maintenance of the exhaust at the boiling point (for atmospheric pressure or thereabout) of the liquid used may be insured in various ways; for instance, by means of an injector or pump.

"By the injector or pump, or both, the cooled vapor is forced into an apparatus for convenience sake termed a 'boiler,' where it is exposed to the temperature needed to restore it to its original tension, and thence returns to the engine.

"It will thus be seen that it is my object to obtain in a motor engine the conditions of a closed circuit with a liquid boiling at a low temperature relatively to water transformed into vapor, the molecular energy of which is converted into the mass as molar motion of the piston, so that its initial condition is restored.

"In this way in a heat engine I expend the temperature within which the heat is utilized downward in the direction of the absolute zero, instead of upward above the temperature of surrounding objects.

"The intense heat of boiler furnaces, the internal work heat necessary to the formation of water steam, the abundant exhaust waste of the steam engine, difficulties of lubrication, etc., are one and all avoided by my invention.

"The cycle I propose can be performed more or less satisfactorily with almost any liquid yielding expansive vapor below the temperature at which water boils; but in developing most power with most compact apparatus it is essential to use a compound which has a maximum amount of latent heat.

"The agent which I find in practice most available for this purpose is anhydrous ammonia, the boiling point of which at atmospheric pressure approaches closely to 34·4° C. At 0° C. its vapor tension is about four atmospheres, while at 10° it attains to six atmospheres. When the mean temperature attains 20° C., no less a pressure is exerted than nine atmospheres, and at 30° C., or tropical heat, it reaches over ten and a half atmospheres in tension. Since at blood heat two hundred pounds to the square inch is available it is evident that the usual temperature of ocean or river water is most desirable in practice and best in my opinion when below 0° C.

"The latent heat of ammonia is about 900°, as against 960° for water. It is this latent heat which I use in developing energy so as to reduce the amount of rejected heat to a minimum and obtain a maximum rate of liquefaction. Although high pressures are attainable at low temperatures, it will always be found best in practice to work below rather than over 100 pounds to the square inch.

"From the fact that I utilize in this system downward to 0° C. and below toward absolute zero, I propose for convenience to name the apparatus which I employ 'zeromotor.'

"The operation is as follows: The ammonia gas or vapor passes from the boiler into the smaller or high pressure cylinder, where it is worked expansively, the cut-off being adjusted, for instance, to one-tenth of the stroke. In thus expanding and doing work, the gas parts with its heat to a considerable extent. It then exhausts into the second or low pressure cylinder, where it is cut off, say at one-half the stroke, and is thus caused to do further work expansively. The result is that the vapor, by the time that it passes from the second cylinder into the exhaust, has been almost entirely liquefied, only an exceedingly small proportion of the ammonia retaining vaporous form. The engine thus may be said to act not only as a motor, but as the condenser. From the exhaust vessel the ammonia is, by means of the compound pump and injector, forced back into the boiler, to be again brought to the condition of a motor or gas."

The specification continues the subject through various details of construction, but the matter quoted above is sufficient data for a full consideration of the pros and cons. We are obliged to find, however, that Gamgee's motor is mostly delusion; it is likely to be literally a zero-motor. The trouble is not with the ammonia. Dr. Lamm, of New Orleans, Tellier, of Paris, and others have made ammonia motors which had a measure of success. Gamgee's theory would fail with steam or air. A motor vapor during its expansion is a useful source of power, but after it has expanded it is wholly unavailable. It may be brought again to the expanding or condensed condition, but if the cost of the restoration be computed, not the smallest fraction of gain can be discovered. Gamgee's motor would make one stroke, but never another of its own accord. Think of a steam engine which exhausts directly into its boiler! Prof. Gamgee has made an interesting invention, and if he can find some spot in nature where it may rest it promises to make a sensation.

It is certainly a curious incident of this matter that Chief Engineer Isherwood may become an advocate of working engines expansively, the cut off being adjusted, for instance, to one-tenth of the stroke.

THE KEELY MOTOR DECEPTION.

The stock in this lunary enterprise has of late fallen very low, and a new exhibition of its incomprehensibleness has been deemed necessary. The last performance, given on the evening of April 22, in Philadelphia, is thus described by a reporter of the New York *Herald:*

"The first public exhibition of the Keely engine was given this evening, in the presence of a large body of New York men. Among others present were J. Nelson Tappan, City Chamberlain of New York; Thomas Rowland, of the Continental Iron Works; George H. Peabody, E. F. Searls, General John Carrier, secretary of the American Wrecking Company; J. J. Smith, Edward W. Denny, and others. A private showing was given a few days ago before Major Conway, United States Ordnance Department; Commander Gorringe, United States Navy; Mr. Blanchard, vice president Erie Railway; Commodore Kane, New York Yacht Club; President Sayre, of the Lehigh Valley Railroad; E. J. Randall, Erie Railway, and twenty others. Commander Gorringe frankly declared that Mr. Keely had thoroughly removed the strong prejudices which he had had against both inventor and discovery, and that the exhibition was a wonderful one. To a *Herald* correspondent Commander Gorringe said: 'I am amazed at what I have seen. It is certainly one of the most remarkable curiosities I have ever looked upon, and appears *bona fide.*'

"To-night's exhibition was a very extended one. The two parts of the 'motor,' called the 'generator' and the 'engine,' stand in separate rooms on the second floor of a building on Twentieth street, in the vicinity of Girard College. Without expressing any opinion whatever regarding the scientific principles alleged to be involved, a simple narrative of the evening's occurrences may be set down as follows:

CURIOUS EXPERIMENTS.

"When the visitors, almost completely filling the front room, had been seated, they saw before them an odd-looking machine built of steel, that shone like a mirror. The only description possible to give without an illustration to accompany it is, that it is wholly unlike any other collection of globes and tubes that has ever been exhibited. The first act was to remove every cock and tube, ostensibly to show that the apparatus was empty. Lights were placed underneath it and the visitors were invited to look into and through the various chambers. All the plugs and attachments having been replaced, one of the company drew a glass of water from the hydrant and poured the contents into half a dozen funnel-topped tubes, and in exactly twenty-nine seconds a force was generated sufficient to raise a six-foot lever (one inch fulcrum) upon which were hung 700 pounds of iron. The pressure was asserted to be fifteen thousand pounds to the square inch. The vapor said to create this pressure was then stored in a steel cylinder about thirty inches long and five inches thick, through the center of which is stretched a piece of piano wire. The vapor thus confined was then further 'vivified' by external vibrations of great energy obtained from a tuning fork of immense size. This done, a long tube of very constricted orifice was attached to this steel chamber, to form the connection with the engine in the rear room. Thither, then, all the visitors moved. The engine is called a 'compound' one, which is explained to mean that 'it can be worked with equal effect by positive or negative energy.' After a few cocks had been opened, the 'spirophone' contained in one of the drums began to roar, and the shaft, carrying a belt-wheel, began to revolve with great velocity. The whirring sound (much resembling the rising of a flock of quail), gradually became regular and harmonious, and the engine settled down to a regular speed of about sixty revolutions per minute. Some curious experiments were then made, to exhibit what was denominated 'vibratory energy.' The revolutions of the engine were increased or diminished at will by Mr. Keely striking an iron disk or a gigantic tuning fork, or drawing a bow over a tightly stretched steel wire. The change from the negative to the positive 'energy' was made, resulting in an almost instantaneous reversal of the engine. This reversal, Mr. Keely declared, could be made at the very highest velocity without breaking anything. A brake, specially made with wooden lining, was then applied to the belt wheel with a leverage of five feet and the weight of two of the heaviest of the party, but no perceptible diminution in the speed resulted. Many other strange experiments with the vapor gun and other appliances of the alleged invention were given, after which the party separated.

"The experiments lasted three hours, and were in every way successful. A vote of thanks was given Mr. Keely, on motion of Mr. Tappan. The party returned to New York on the midnight train."

It will be seen from the foregoing that the Keely managers still look to the New York men. It was from them that their first treasure was extracted after the original first exhibition; and the new show is doubtless expected to yield another yellow harvest.

THE GAMGEE PERPETUAL MOTION.

In another article we give the substance of Professor Gamgee's ideas, as expressed in his patent, concerning the principles and operation of his new motor, the practical value of which is alleged to be indorsed by the Patent Office Examiner, by Chief Engineer Isherwood, and by prominent officials of the American Navy Department.

In Professor Gamgee's engine the ammonia vapor expands against and drives the piston, then issues from the back end of the cylinder as a liquid, which runs to the front end of the cylinder, where it expands again as vapor against the piston, then runs back to the front end, and so on, in one perpetual round or "cycle" of duty, without any vulgar assistance from artificial condensers, or from coal, oil, gas, or other common fuel. Cold water—below 66° Fahr.—is the best fuel for him, says Professor Gamgee, in his patent. Water at 66°, he avers, gives heat enough to yield 100 lb. pressure per square inch on his piston. Water at blood heat, or 98° Fahr., would give him, he says, 200 lb. pressure per square inch, more, in fact, than he requires.

A correspondent of the *Tribune* lately asked Professor Simon Newcomb, the eminent physicist, for his opinion of the new device of Professor Gamgee.

Professor Newcomb said: "The question is purely one of physics, and not of steam engineering. The proposed machine, as Mr. Gamgee has explained it to me, and as I see it described in Mr. Isherwood's report, lacks the essential conditions which all experience shows a steam engine must fulfill; not merely because ammonia is used instead of steam, but because no source of external cold or exit for the vapor is employed, except that furnished by the engine itself. I think there is some mistake in describing the respective functions of the high and low pressure boilers in the printed remarks in the *Tribune;* but I think I see clearly what the essential principle is. We have a boiler of liquid ammonia exerting an enormous pressure at ordinary temperatures. A quantity of the vapor from this boiler is admitted into the cylinder of the engine, and thus presses upon the piston, expanding and moving the piston. Its heat is changed into force communicated to the piston, and it thus becomes in the cylinder intensely cold, so cold that a portion of it liquefies.

"So far there is no trouble in the action of the engine. It will make one stroke without doubt. The question now is to dispose of this cool and expanded vapor. The great mistake made by the promoters is in supposing that they can, by some ingeniously contrived machinery, force the vapor back again, so as to act again on the engine and still have a surplus of force left over. It is a perfectly established law of gases—as certain and universal as that of gravitation—that a gas when condensed generates the same amount of heat and exerts the same pressure as in expanding. The consequence is that, when the gas is condensed without some external source of cold, all the power expended in its expansion is used up again in contracting and heating it. Unless, therefore, as in the ordinary steam engine, some external source of cold is provided to absorb the heat which would thus be generated, the machine cannot act. Now this is the very condition which Mr. Gamgee proposes to dispense with. With the ammonia engine working at ordinary temperatures, the external source of cold must be as low in temperature as the expended ammonia itself, and therefore the ammonia cannot be used for the cold.

"To judge of all this we must remember that there is absolutely no new principle claimed in connection with the machinery, and claims made for it are in direct contradiction to the second law of thermodynamics. Yet I do not think a prudent physicist would claim that it was impossible to find in nature some mechanism by which this law could be evaded. All we can say is that to reach this result some radically new discoveries in the properties of matter must be applied. As there is nothing new in any of the principles called into play in the proposed engine, it may be pronounced a chimera with as much safety and certainty as we call perpetual motion machines by that name."

THE TOKIO EXHIBITION.—The National Industrial Exhibition at Tokio, Japan, was opened by the Mikado March 1. The attendance is said to be large.

DOSE-MEASURING BOTTLE.

The engraving shows a novel form of bottle for containing liquid medicines, such as are usually taken in prescribed quantities. It is designed to enable the user to measure and pour out only so much as may be desired, it being provided with a measuring receptacle, formed in the neck in such way that, by first tilting or turning the bottle so as to cause the liquid contents to flow into the measuring device, and then turning the bottle so as to leave a portion of the contents in the measuring receptacle, they may be poured out without discharging any portion of the liquid contained in the body of the bottle.

The neck is suddenly and considerably enlarged or bulged out at one side, immediately beyond the point of its junction with the body of the bottle, so as to form a hollow or receptacle designed to hold a given quantity of the liquid from the bottle. The neck of the bottle may be provided with indicating lines or a scale. This design may be considerably varied without affecting the efficiency of the device.

The engraving shows modifications of the bottle in which there is no bulging receptacle in the neck, which in one case is placed at one side.

A perforated partition divides the body of the bottle into two compartments, and by holding it in a substantially horizontal position, with its shorter side down, and then turning it axially to bring the longer side or line of the body down, the chambers will stand full to the same level, but their contents will be separated by the partition.

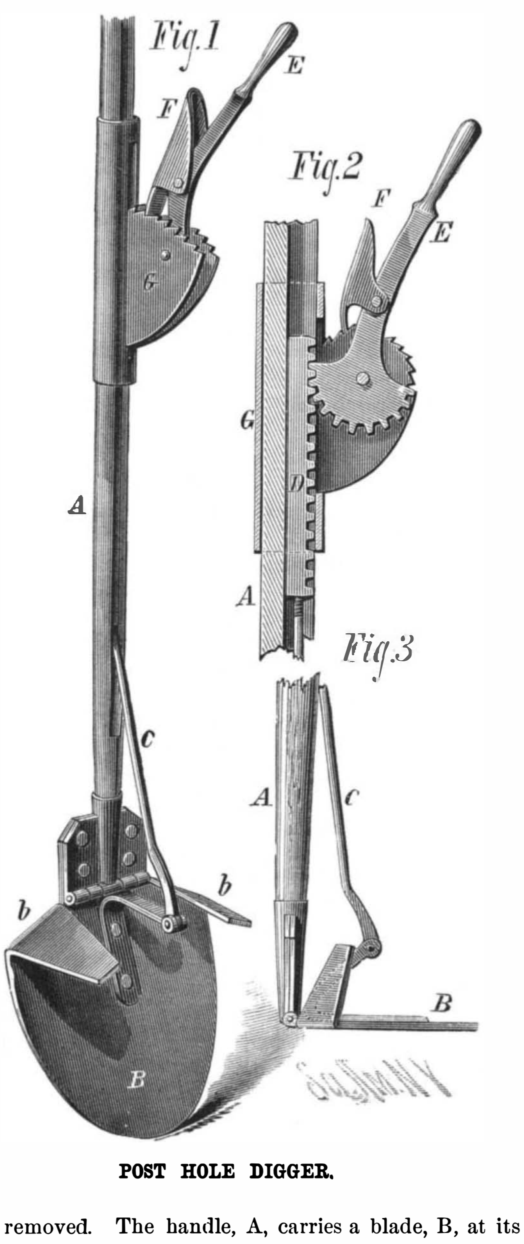
Another modification is shown in the engraving, in which the bottle has its interior divided into two compartments by a solid partition, a tubular passage being provided between the compartments. In this form of bottle the measuring and separate discharge of the desired quantity of the liquid contents of the bottle may be accomplished in the manner above described.

This invention was lately patented by Mr. James M. Dodge, of Chicago, Ill.

DOSE-MEASURING BOTTLE.

IMPROVED POST HOLE DIGGER.

The engraving shows an improved implement for digging fence post holes, which can be inserted in the ground like an ordinary spade, and when inserted to the proper depth can be transformed into a lifter, by which the earth may be readily removed. The handle, A, carries a blade, B, at its lower end, which is hinged so that it can be made to assume any position with respect to the handle, varying from a straight line with it to a right angle. The shovel, at its shoulders, is provided with extensions, *b*, reaching forward at or about right angles to the blade, which form stops to limit the extent of its insertion into the ground to permit of shifting the position of the blade without hinderance. To the blade of the shovel is secured a bent arm, to which is pivoted the end of a curved rod, C, extending backward to the handle, and provided with a sliding rack, D. To the handle is secured a sleeve, G, having a longitudinal slot and two parallel standards, between which is pivoted a lever, E, having a toothed segment, by means of which the rack may be moved back and forth to operate the shovel blade. The rear edges of the standards are provided with ratchet teeth, and the lever with a pawl, F, adapted to engage the teeth so as to hold the lever and other parts in any desired position.



POST HOLE DIGGER.

When the blade is in line with the handle it may be driven into the ground after the manner of an ordinary spade, and when inserted to the proper depth, by operating the lever it may be brought at right angles to the handle, so that the earth may be lifted vertically and removed.

This invention was lately patented by G. B. Van Vleet, of Lodi, N. Y.

Microscopic Tests for Poisons.

Professor Rossbach has just published, in the Vienna *Klinische Wochenschrift*, some remarkable delicate tests for the presence of poisons when they are in too minute quantities to answer any chemical tests.

As small animals, like frogs, mice, etc., are known to be very susceptible to the action of certain of the poisonous alkaloids, so this fact is taken advantage of and very weak solutions introduced into their circulation. Delicate and wonderful as the tests are as applied to frogs, etc., still Professor Rossbach gives far more delicate ones. A drop of water containing infusoria is placed on a glass slide and examined uncovered. The infusoria are examined carefully as to size, form, color, etc. Then a drop of the solution is placed just to the edge of the fluid containing the infusoria. If organic poisons be present the infusoria are instantaneously destroyed, becoming a formless sediment. He startles us with his figures. "If a drop of water containing infusoria and weighing 0·001 grain be used as a test the quantity of strychnine required to cause remarkable changes will be 0·00000006 of a grain. In this way one fifteen-millionth of a grain of atropine can be detected." Thus, he says, if the stomach of a person poisoned by strychnia contains a *liter* of fluid and only three-quarters of a grain of the alkaloid, a single drop of this fluid will contain forty times as much strychnine as necessary for the test.

The Bending of Glass Tubing.

When glass tubes are not too wide they may be easily bent over a common gas jet. A burner, made by attaching a lava tip (such as are now commonly used in illuminating burners) to the stand or base of the ordinary Bunsen burner, will be found convenient. The tube is held horizontally in the flame in such a manner as to be entirely surrounded by the flame, and so all possible draughts are avoided and the flame does not flicker. The tube is soon covered with carbon; then it becomes glowing, and bends, in consequence of the weight of its free end, in an even and uniform manner, without making any wrinkles inside the bend or angle. Wide tubes are first filled with sand, and then suspended over a broad flame burner. A broad tube with flattened end, which exactly fits the Bunsen burner, may easily be procured. Thin glass tubes may be bent in the flame of a simple spirit-lamp, but if they are at all thick a Berzelius lamp becomes requisite. In this case the tube must be held across the flame, for then it would become heated in two places and remain cold in the center (*i. e.*, between). It is, therefore, best to hold it tangent to the flame. If it does not bend freely, it is well to assist the operation with the hand, by slightly pressing the free end in the desired direction. This operation requires a certain amount of skill and dexterity in order to prevent the formation of wrinkles on the interior surface of the bend. These wrinkles not only offend the eye, but so contract the tube that a free current of the gas is prevented, and, in case of distillation, etc., condensable products are caught in the cracks, and the experiment spoilt.—*M. B., in Journal of Education.*

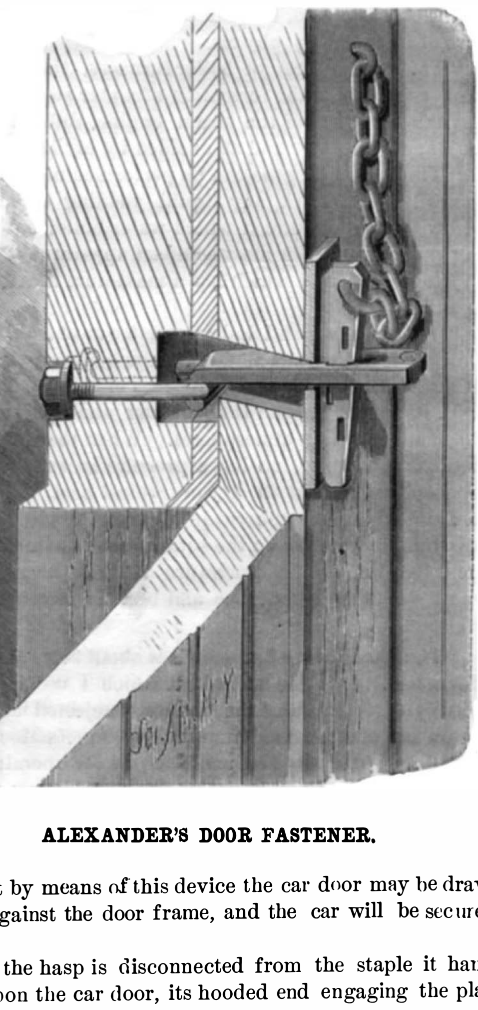
British Scientists to be Invited.

It is rumored that at the next meeting of the American Association for the Advancement of Science, to be held in Cincinnati in August of this year, a proposition will be brought forward to extend an invitation to the British Association to depart from their usual custom so far as to come over to this country in 1883, and hold their annual meeting for that year in conjunction with the American Association, at some place hereafter to be fixed upon. A number of the most prominent scientific men in the States and Dominion are known to be in favor of the plan, and doubtless the members of our association will be glad to send such an invitation as a mark of our cordial feelings toward the students of science in the mother country. It will give us great pleasure if it should prove practicable for the English body to accept. We hope that the proposition may be happily successful. The advantages of such a gathering of scientific men from two countries having a common language, are as evident as they are great. The meetings of the American Association have proved of inestimable value by bringing the investigators of the continent into personal contact with one another. Every scientific man has not only new facts to present, but also theories and hypotheses which may not be sufficiently complete, or justified by positive knowledge, to be put into print, yet it is precisely these vague ideas which are the most valuable stimulants of discovery, because they are the store from which new and sound ideas can be selected. By no other process can this selection be rendered so efficient as by personal discussion with others whose studies are in the same direction. If the suggested meeting be actually held, it will certainly prove as profitable as delightful. There is no room to doubt that on our part we would be lavish of pains to make the meeting successful, and we think our reputation for hospitality is a guarantee that our guests will have a pleasant as well as a profitable visit.—*American Naturalist.*

IMPROVED DOOR FASTENER.

We give an engraving of a very simple and effective door fastener, patented by Mr. F. M. Alexander, of Marshall, Texas, and intended more particularly for application to car doors.

The staple is fastened in the side of the door frame with its outer end in a recess of the frame. The stile of the door is traversed by an oblique mortise covered on the outside by an iron plate having a slot, through which passes a short flat bar or hasp having a hook turned on its inner end and having in its outer end a rivet which prevents it from slipping inward through the plate attached to the door. The hasp has a mortise for receiving a key or pin attached to the car door by means of a chain. This key is mortised transversely for receiving a lock or seal. The staple is flush with the front of the door frame, and the locking of the door is effected by hooking the hasp over the staple and inserting the key as shown in the engraving. It will be seen that by means of this device the car door may be drawn tightly against the door frame, and the car will be securely locked.



ALEXANDER'S DOOR FASTENER.

When the hasp is disconnected from the staple it hangs down upon the car door, its hooded end engaging the plate on the face of the door.

This fastener is very strong and effective, and at the same time inexpensive. The inventor informs us that railroad men who have seen it fully indorse it.

AMERICAN INDUSTRIES.—No. 73.

HARVESTING MACHINES.

Inventions which have resulted in great industries and the development of great natural resources will always be subjects of deep interest to the student of history and political economy. The cotton gin rendered available the vast agricultural resources of the Southern States, and the correspondingly great cotton manufacturing interests of England and New England. The reaper did as much for Northern agriculture, making possible the harvests which have taxed the powers of transportation, reversed the balance of our trade with Europe, and carried our national prosperity to the highest level.

America is the birthplace and home of the reaping machine. Here it was invented and first successfully introduced, here its greatest achievements have been won, and here it has proved itself one of the factors in transforming a continent from a state of primitive solitude to be the home of fifty million enterprising people engaged in all the arts and manufactures of civilization

When we look back fifty years and remember that the reaping hook and grain cradle were the only means the farmer then had of securing his crop, we are led to wonder how many centuries must have elapsed before the land west of the Alleghanies could have been settled as it is to-day, not only to the Mississippi, but from ocean to ocean. The reaping machine has not only made this possible, but has made farming profitable on a scale never dreamed of before. In Minnesota and Dakota there are grain farms of from ten to thirty thousand acres, whose princely owners purchase and operate reaping machines by the score and by the hundred.

The first successful reaping machine put in use was invented and constructed by Cyrus H. McCormick, a native of Rockbridge County, Virginia, in 1831, a patent upon which was granted by the United States in 1834, and this original machine is recognized as the type and pattern after which all others of subsequent date have been modeled.

The manufacture of this machine was commenced in Virginia, but not until 1845 at Cincinnati, Ohio, did the annual product reach a large number. During that year 500 were constructed and sold. In 1846-7-8 some machines were manufactured at Brockport, N. Y., on "royalty." With discriminating judgment Mr. McCormick foresaw that Chicago was to be the center of trade in the Northwest, by reason of its favorable geographical position and superior shipping facilities, and he therefore transferred the manufacture to that city in 1847, building 500 machines in the new shops. In 1848, 700 machines were made and sold, and in 1849 the figure reached 1,500. Here the first works for making the reaping machine were erected, and the improvement of the machines themselves vigorously commenced, and from that time onward the development of this great industry has been commensurate with the strides which Chicago has made.

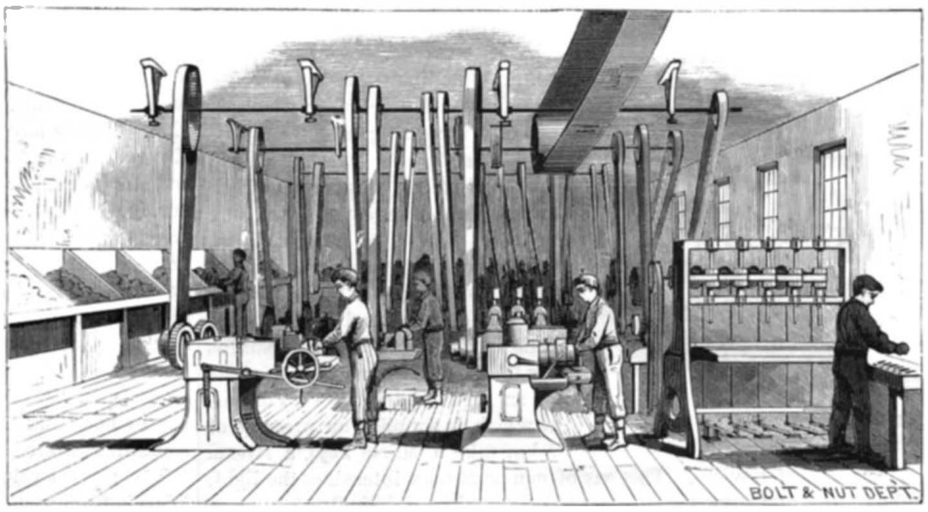
Soon after this, Mr. McCormick induced his two brothers, William S. and Leander J., to come from Virginia to Chicago to assist him in the manufacture of the machine. The former continued with him until his death in 1865, and the latter until now having an interest of one-fourth in the corporation, the remaining three-fourths belonging to Cyrus H. McCormick.

The works of the McCormick Harvesting Machine Company, a view of which, together with the various departments, we have represented on our first page, are situated in the southwestern portion of the city of Chicago, upon the bank of the river, and at a point where all the vast network of Chicago railroads centers.

Ten rooms, 100x60 feet, occupied by the wood-working department, are fitted with the most improved machinery for planing, sawing, shaping, and dressing the various wood parts of the machines. The construction of the main wheels for the harvester is an interesting study in itself, and in this alone are involved more than a dozen processes in wood and iron work. We have shown in the engraving the last operation in its construction that of putting on the tire.

The greatest interest to an observer centers in the machine shop. Looking down the long aisles of machinery, the attention of the visitor is drawn to the many curiously shaped machines of special design necessary in the various processes of the iron work.

The tendency now is toward the extensive use of *iron* in the construction of the machines, which insures greater strength and lightness, and gives the machine a more attractive appearance. As a consequence, the lathe work necessary is largely increased, and this renders specially designed machinery and tools indispensable. For example, the introduction of the inclosed gear frames for reapers, mowers, and droppers necessitated a machine which could bore all the holes required for shafts, etc., at one operation, and several of these are in use, which cost thousands of dollars to build.



BOLT AND NUT DEPARTMENT.

The boring of the rake posts, cams, iron frames of binders and reapers, and many other parts of the machines needs such special machinery as we have alluded to.

This perfection of the work renders easy the renewal of any part in the field, should any piece become broken or worn, and insures the exact duplication of it at any time thereafter, so long as the patterns may be preserved. The blacksmith shop is a large building provided with all the appliances for cutting, punching, forging, and shaping the various pieces of wrought iron used in the construction of the machines.

SETTING UP MACHINES.

The foundry is a fine structure, 245x90 feet, with two wings, one of them 80x60 feet. Here about 75 tons of pig-iron, from its two cupolas, are daily transformed into castings of all descriptions.

MAKING HARVESTER WHEELS.

The foundation of all reaping machines is the sickle-bar, which our artist has graphically represented on the first page, and it is well worthy of note that the original cutting apparatus invented by Cyrus H. McCormick, fifty years ago, has never been superseded or improved in its essential features. A large building in the center of the rectangle contains the grindstones upon which the knives are ground, the tapping machines for serrating the edges of the sections or blades, the machines for rolling the bars, and the room for assembling all the parts necessary to form the complete cutting apparatus.

From the iron and wood working departments all the material for the construction of the machines passes to the paint shops, where the rude contrasts of wood and iron in their natural colors are made to blend harmoniously and with pleasing effect to the eye, by means of the artist's skillful brush. The spacious paint shop, comprising more than a dozen rooms, 100x60 feet, are constantly crowded to their fullest extent, and only the most skilled labor is employed in the final decoration of the machines.

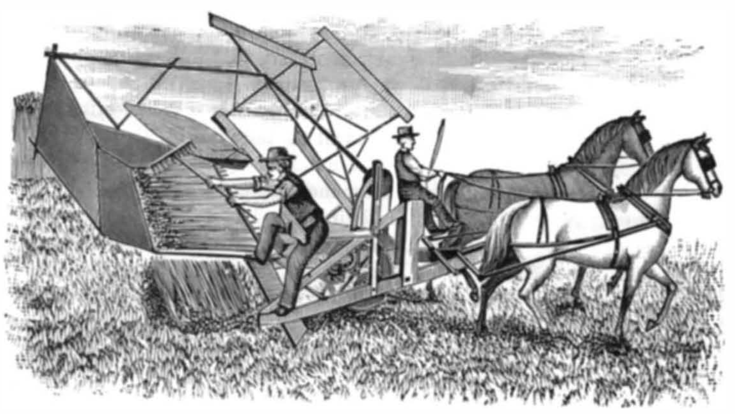
The packing departments, which we have not space to illustrate, are of unusual interest to the casual observer, this work being a science peculiar to itself. The contents of the packing boxes are of such varied shapes and sizes that only long experience and practice on the part of the packers enable them to place them in perhaps one-half the cubic space that an unskillful person would require. The shipping is conducted with great system, and the facilities are such that from twelve to twenty cars can be loaded and dispatched each day. The repair department is a small world of business in itself, embracing as it does the parts of all the McCormick machines made during the past twenty years. All the duplicate parts on hand can be known at once, and any part that is wanted for repairing any McCormick machine can be produced on demand.

That the machines may constantly meet the requirements of the farmer in every respect, and for experimenting with new devices, a corps of draughtsmen, pattern and model makers are employed.

The company finds itself under the necessity of enlarging its manufacturing facilities during the coming season to meet the naturally increasing demand for its productions.

A most interesting department to all scientific persons, in this manufacture, is found in the patented inventions which enter into the construction of the machines, and in the patents which the company hold for the use and protection of their business. To one not familiar with the details of this interest, the importance and magnitude of the operations herein involved would be almost incredible. The original patents of Cyrus H. McCormick, granted in 1834, 1845, and 1847, expired before any material return for his labors accrued to the inventor, and when endeavoring to obtain their extension at the Patent Office—a right which was accorded almost every other inventor of such prominence—Mr. McCormick's claim was refused, not on the ground of its invalidity, but because the invention was of *too great importance* to the world at large to admit of being placed virtually under the control of one man, as would be the case should the patents referred to have been extended. Thus were the essential features of his invention made public, and the inventor was forced to come into competition with other manufactures of the product of his own brain. In improvements upon the original, therefore, lay his greatest chance of success, and in this, as in the first machine, he was foremost. With the introduction into general use of the reaping machine, the attention of inventors on every hand was drawn toward further improvement in this direction, and applications for patents upon every conceivable mechanical devices which could be utilized in connection with harvesting machines have flooded the Patent Office from that time to the present. To the extensive manufacturer, therefore, it becomes a matter of necessity to protect himself from being assailed on every hand by speculators in patents upon every important new feature developed by him, and by obtaining control of or interests in such patents as might bear upon the forms of his construction and manufacture. It affords, therefore, to the McCormick Harvesting Machine Company a power not possessed by other competing manufacturers, that they are the owners of and hold interests in hundreds of patents of this nature. Especially in the development of their twine binder is the value of this self-protection evident, for claimants are constantly arising to share, if possible, in any advantage which may accrue from the use of a particular device tending toward the improvement of the machines.

Comparing the machines which the McCormick Harvesting Machine Company and all their competitors now manufacture with the original reaper invented by Cyrus H. McCormick, as constructed by him in 1847, it will be found that all the vital elements of successful and practical work are retained intact, namely, the cutting apparatus, divider, reel, platform, attachment of the horses; yet from step to step the advancement has been in taking away all manual assistance from the machine, making it as far as possible entirely automatic. The addition of a seat or stand enabling the raker to ride on the machine instead of walking by its side; the substitution of the self-rake for the hand rake; the placing the binder stand upon the machine, whereby the men bound the sheaves while riding, instead of lifting them from the ground; the substitution of the automatic binder for the manual labor; and, finally, the automatic trip, whereby the size of the sheaf throws the binding mechanism into operation, are all consecutive steps in the progress of invention and development of the reaping machine.



THE 1847 MACHINE

Few of our readers can have any idea of the magnitude of this branch of industry. In all the harvest fields of the world the McCormick machines are at work, and the farmers of Australia, New Zealand, France, Italy, and Russia, are as familiar with their superior merits as are the farmers of Illinois, at whose doors they are manufactured. We believe that the verdict of the leading scientific and mechanical authorities of the present day is unanimous in placing the McCormick machines in the lead of all others. At each successive World's International Exposition, from the World's Fair at London, in 1851, to the Melbourne Exposition of 1880, the highest honors have been without exception awarded to the McCormick reaper.

The great extent of this trade at home and abroad will be better understood when we say that there have been built and sold over 300,000 of the McCormick machines since 1849, beginning with an annual product of 1,500 machines, and increasing as the country developed, until the present annual production exceeds 30,000 machines.

It is estimated that there are at this time 200,000 McCormick machines in existence, capable of harvesting annually 60,000,000 acres of grain and grass, an area equal to the entire surface of the great States of New York and Pennsylvania, requiring an army of 200,000 men and 400,000 horses, and furnishing employment for tens of thousands engaged in handling and transporting the vast grain crops of the world. And the man whose brain evolved the idea of a successful reaping machine, and who carried the thought into deeds, and whose energy and shrewdness put this vast force at work, is alive among us to-day, enjoying his well-merited honors and success. His name will go down to posterity as one of the great benefactors of the human race whose victories have been won in the successful effort to lessen toil and bless mankind. What the future of the reaping machine will be when the vast territories of the unexplored far away Northwest—the great grain belt of the world—shall have been brought under cultivation, we leave to the imagination of the reader, our duty as journalists being to trace the early history and present standing of this very important branch of national industry.

Simple Ventilator.

Dr. McKinnon, of Windsor, Ont., has sent to the *Canadian Lancet* a sketch of a stovepipe ventilator, which may not be new in principle, but which will, no doubt, be found useful as it is simple. The stovepipe is surrounded by a cylinder of sheet iron, having a diameter large enough to leave 2½ inches of space between it and the pipe. The vitiated air of the room is admitted through an opening or openings at the lower part, and it passes upward as it is heated between the pipe and cylinder for 18 or 20 inches, according to the height of the latter, and then enters an opening in the stovepipe and passes away with the smoke.

The Heliograph in War.

The extensive use of the heliograph by the British forces in the Zulu and Afghan campaigns has given a wonderful impetus to the art of signaling by means of flashes of light. The heliograph itself as now perfected leaves little to improve upon; but it is of course only applicable so long as the sun is above the horizon. Hence, the attention of inventors is chiefly concentrated upon improvements in lamps for signaling at night. As our readers are aware, the alphabet used is a combination of short and long flashes, corresponding to but not exactly identical with the dots and dashes of the Morse telegraph system. The most obvious plan for signaling at night is to use a lamp with a movable diaphragm, which will shut off the light for long or short periods as may be required. An English inventor some time since contrived a lamp in which a jet of pyrotechnic mixture, consisting largely of powdered magnesium, was propelled into a spirit flame by means of bellows. This arrangement gives long or short flashes of intense light, which would be visible for many miles. M. Mercadier has lately proposed a cheaper, and at the same time an efficient form of apparatus for the same purposes. It consists of an argand burner for oil or gas, to which is supplied on pressure of a key (like a Morse key), a stream of oxygen. This gas of course at once intensifies the light, and signaling can be carried on without difficulty.

RECENT DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of New Hampshire.

MONCE *vs.* WOODWARD.—PATENT GLASS CUTTER.

Clark, J.:

Letters patent No. 91,150 to S. G. Monce, June 8, 1869, for tool for cutting glass, declared invalid in view of testimony establishing the fact that similar tools had been made and used before the invention thereof by Monce.

This patent was for the rotary disk glass cutter—a steel cutting wheel set in the end of a handle.

Supreme Court of the United States.

CROUCH, APPELLANT, *vs.* ROEMER.—PATENT SHAWL HANDLE AND STRAPS.

Shawl straps with handles attached to a leather cross-piece having loops at the ends being old, it is no invention to stiffen by artificial means the leather cross-piece, which had before been made as rigid as it could be by thickness, doubling, and stitching. The use of known equivalents for some of the elements of former structures, to make them somewhat better, is not invention.

Appeal from the Circuit Court of the United States for the District of New Jersey.

Mr. Chief Justice Waite delivered the opinion of the court.

United States Circuit Court.—Southern District of New York.

WARING, JR. *vs.* JOHNSON.—PATENT CHECK BOOK.

Blatchford, J.:

1. Reissue of letters patent No. 8,199, granted to G. Waring, Jr., April 23, 1878, held to be valid.

2. Where an invention is claimed as the "combination, in a check book, of checks and stub-pieces of substantially the same size, so united that two checks lie between every two stub-pieces, substantially as specified and set forth," it is immaterial, in view of the state of the art, whether the defendant's book has the line of perforation between the check and the stub leaf at the top or bottom of the stub leaf or at the leaf end of the check.

3. It will not invalidate the reissue that the claim is broader than the claim of the original patent, provided that it is "for the same invention" shown and described in the specification and drawings.

William Ennis.

William Ennis, inventor, of Troy, New York, died at sea, March 29, in his fifty-ninth year. Like so many of our persistent and successful inventors, Mr. Ennis acquired the knowledge utilized in his inventions by actual experience and personal study and investigations, his opportunity for early schooling having been but the slightest. Most of his inventions were improvements in furnaces and related apparatus for domestic and manufacturing purposes. For many years he was engaged in the manufacture of hot air furnaces. He invented the duplex heating furnace, and took out a number of patents for improvements in metallurgical processes. His later work was in connection with an apparatus for economizing fuel, and the sea voyage which ended his life was undertaken to make the necessary preparations for the application of his invention to the steamship Richmond, of the Old Dominion Line.

PHENOMENA OF OPTICS AND OF VISION.—M. TREVE.—The author mentions the fact that the flame of a lamp appears brighter, and that a vertical shaft, a post, or mast is seen more distinctly through a vertical than through a horizontal slit, while a house, a landscape, or the disk of the sun or moon is perceived more clearly through a horizontal slit. He finds similar differences in photographs according as the light passes from the object to the plate through a vertical or a horizontal slit, and ascribes the results to the action of diffused light.

Correspondence.

Fuel from Hay, Straw, Flax, Etc.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of the 16th inst., you refer to the want in parts of the West of a machine for preparing flax straw for burning as ordinary fuel. This is true. Not only is a machine needed for preparing flax straw, but all other kinds of straw and also prairie hay.

In a large portion of the West straw of all kinds is allowed to rot in the field or is burned in the stack. Thousands of tons of wheat straw are burned every year as soon as thrashed, and this, too, in a country where fuel is scarce and high. Prairie hay that costs only the cutting and stacking also goes to waste in vast quantities. If this wealth of hay and straw could be compressed into bricks convenient for burning in an ordinary stove, thousands of dollars might be saved to the hard working farmers on our Western prairies—provided, of course, that the desired machine be not too expensive, or could do its work cheaply. Possibly it would be best to have the hay or straw cut into short pieces before being compressed.

Hay stoves have been invented and are in use in some localities, but it takes a large amount of time to twist up the hay by hand and feed the stove, besides keeping the room constantly littered with loose particles.

The market value of prairie hay in this portion of the West is from $2 to $3 a ton. Plenty of it may be contracted now for $2.50. Straw has no market value. The writer of this, last fall, burned the straw from 160 acres of wheat land as soon as it was thrashed in order to get it out of the way, and in doing this only followed the common practice of the country. At the same time wood is worth $6 to $6.50 a cord, soft coal $4 to $6 a ton, and hard coal $10 to $14 a ton.

W. C. HAYWARD.

Garner, Iowa, April 18, 1881.

[Our correspondent's suggestions are useful, and we hope that some of our ingenious readers will be led to study the subject of utilizing the products he mentions. But if soft coal can be had at $4 a ton, we doubt whether hay fuel, no matter how compressed, could compete with it. The fibers will probably have to be utilized in some other way than as fuel. Paper pulp might be made, for example.—EDS.]

The New Mineral Hiddenite.

To the Editor of the Scientific American:

A late publication in your "Correspondence" column from Mr. J. A. D. Stephenson, of Statesville, N. C., in which he claimed the discovery of this mineral, demands answer from me.

The definition of hiddenite in Dr. J. Lawrence Smith's own words is, "an emerald-green variety of spodumene," and it is this variety only that I consider myself the discoverer of.

To show to you that it was in truth a discovery, I will state that I was not searching for the mineral when I discovered it. It was while I was at work here with a corps of men pushing forward a systematic investigation of this mineral belt for the purpose of discovering a mine of the true emerald (species beryl), that I unexpectedly came upon the vein eight feet below the surface that contained the new mineral.

Mr. Stephenson said to me last week that "the specimens he obtained were either colorless or only slightly yellowish green." He had never seen them having a pure emerald-green color until he saw those I had unearthed.

Now it follows, then, that the mineral he obtained was not hiddenite, but simply a variety of spodumene, not characteristic enough in color to merit a new name.

Mr. Stephenson has never made or caused to be made any scientific investigation of either the locality or of the mineral, and by reason of such neglect has forfeited any rights he may have had in this matter.

As you are well aware, it is to the person who gives the animus or momentum to an investigation that leads to a discovery who receives the honor.

Even the discovery of the variety Mr. Stephenson obtained does not belong to him, but very properly, under the laws of priority, to the farmer (Mr. J. W. Warren) who first found it in the soil here and subsequently sold it to Mr. Stephenson.

I would only too cheerfully accord to Mr. Stephenson any rights he might have in this matter; and I do freely accord to him, and to the mineral specimens he has sent North from this interesting region, the incentive to my present work here, and whatever, if any, success I have attained.

WM. EARL HIDDEN.

Stony Point, N. C., April 26, 1881.

A Remedy for Scale Bugs.

At a recent meeting of the California Academy of Sciences, Dr. Gibbons exhibited a large bunch of beautiful roses of exceeding fragrance, and in full bloom, which he gathered from a bush in his garden which two months before was overrun with scale bugs and nearly dead. He applied to it a mixture of crude petroleum and castor oil, with a feather, daubing it slightly on the leaves and stem, not allowing any to fall to the ground or reach the roots. Rain followed, and the plants were throwing out their first growth of leaves, to which the scale bugs were directing their attention. Now no sign of any scale insect can be seen in the whole garden.

NEW INVENTIONS.

In the concentration of certain liquors or extracts in vacuum pans, where very dense or thick extracts are required—such, for instance, as in the case of dyewood extracts—it is found that, owing to the low temperature that exists in the vacuum, it is impossible to remove sufficient of this moisture to secure the required concentration. Hence it is usual to destroy the vacuum at intervals by opening the valves and admitting air, and then allowing the mass to heat up to the temperature allowed by atmospheric pressure, after which the exhaustion is again effected, which insures an increased disengagement of the moisture from the mass, now heated much beyond the vacuum temperature, so that a more dense concentration is thus effected. As this system, however, requires repeated and alternate stages of heating and exhausting, its action is slow, and the repeated abrupt renewals of the vacuum are manifestly wasteful of power. Mr. Jacob G. Reed, of New York city, has patented certain means whereby the vacuum or partial vacuum in the pan may be kept constant, or nearly so, while at the same time an influx of hot dry air is discharged in regulated jets up through the mass of fluid, so that the moisture is absorbed or evaporated from all parts of the mass, and the mass kept at the same time in constant motion during the influx and exhaustion, insuring uniform liquidity and the reduction of the mass to the desired density in a constant, rapid, and economical manner.

Mr. George W. Thorp, of Wellington, Kan., has patented an improved holdback, in which the tongue cap is provided with screw holes in its lower part and the separable holdback stop with a screw thread upon the end of its upright arm, to screw into one of the screw holes of the cap, and a hole in the end of its inclined arm, through which a screw passes into a hole in the cap or into the tongue, so that the stop can be adjusted forward or back as the size of the horses may require.

An improved ore-washing apparatus has been patented by Mr. James H. Totman, of Plattsburg, N. Y. The object of this invention is to provide a simple and effective device for keeping the journal bearings in ore-jigs and other machines free from dust, sand, and other substances that otherwise get in them and cut the journals and bearings. It consists of a double ring or annular box closed at the bottom and open at the top of the annular space between its sides, and having a lateral opening from said space for the introduction of water therein, it being designed to set said water box about a journal or journal bearing, and to force a constant stream of water through the lateral opening, so that said water shall flow out of the annular space in the box against the journal or bearing, and thereby keep off all dust, sand, etc., which might otherwise lodge on or in it.

An improved device for feeding fine fuel to furnaces, forges, etc., has been patented by Mr. Augustus Greiner, of Somerset, Ohio. It consists of an air-tight coal dust vessel provided at one end with an inlet adapted to be connected with an air or steam supply, and at the other end with an outlet adapted to be connected directly with the furnace.

A Long-Lived Community.

Some curious statistics of local longevity are furnished the Providence (R. I.) *Journal* by a correspondent at Thompson Center, Windham County, Conn. At the beginning of April—the letter is dated the 11th—the resident population of the school district—excluding transient "help"—was 331. Of these 5 were over 90 years of age, 14 were between 80 and 90, and 28 between 70 and 80. The average of the first five (all men) is 93 years. The average of the next 14 (4 men and 10 women) is 82 years. The third group (8 men and 20 women) average 75½ years of age.

Percentage of population			over 90 years	1·51
do.	do.	do.	between 80 and 90	4·23
do.	do.	do.	over 80	5·74
do.	do.	do.	between 70 and 80	8·46
do.	do.	do.	over 70	14·2

The first houses beyond the district limits, in three directions, are occupied by aged women, two of them of 87 years, the other 83 years old.

Evidently the district is a healthy one. It is pretty evident also that, like so many New England districts, it is a good one to go away from. So large a proportion of aged inhabitants indicates the early migration of most of the youth of the community to more active though possibly less healthy towns.

Mountain Mahogany.

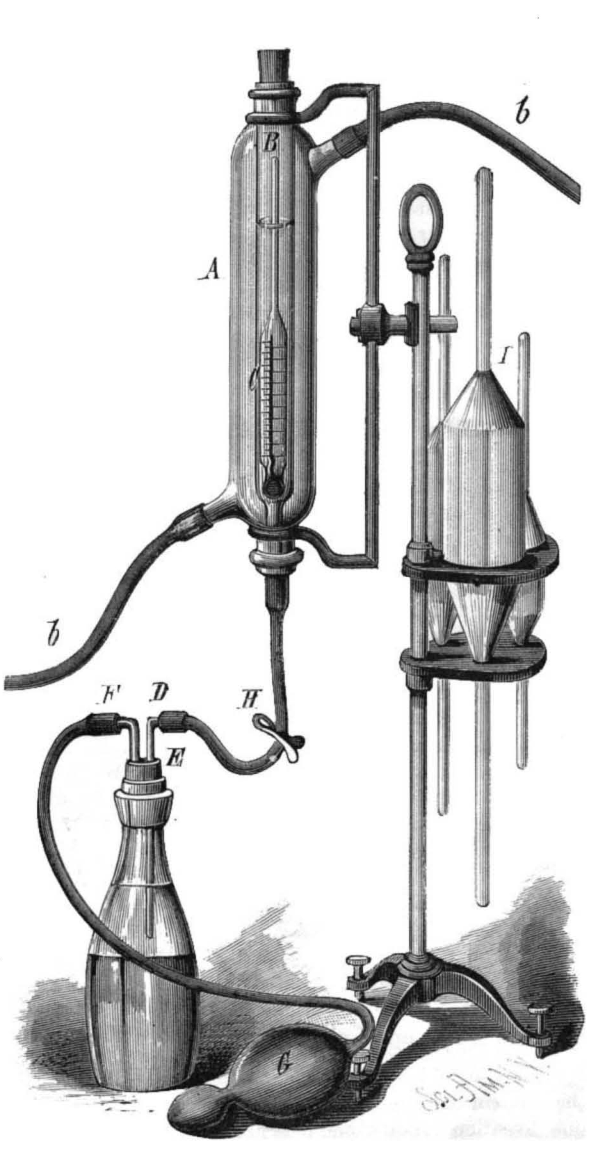
This wood is indigenous to Nevada. The trees do not grow large; one with a trunk a foot in diameter is much above the average. When dry the wood is about as hard as boxwood, and of a very fine grain. It is of a rich red color and very heavy. When well seasoned it would be a fine material for the wood carver. In the early days it was used in making boxes for shafting, and in a few instances for shoes and dies in a quartz battery. Used as a fuel it creates intense heat, it burns with a blaze as long as ordinary wood would last, and is then found (almost unchanged in form) converted to a charcoal that lasts about twice as long as that of ordinary wood.

L'Electricité states that M. Dohrn has introduced the telephone in connection with his scientific explorations of the bed of the Bay of Naples. By its use the diver and the boatmen overhead are able to communicate with each other quickly and intelligibly.

ARAOMETRIC METHOD FOR THE ESTIMATION OF FAT IN MILK.*

The principle of this method does not occur in any of those in use. It is as follows: A known quantity of milk, caustic potash solution, and ether are shaken together; the fat, as is known, dissolves completely in the ether, which, after standing for a short time, rises to the surface. A small portion of the ether, which is always constant, remains dissolved in the alkaline solution, but does not contain any fat, as the ether in the water does not dissolve the slightest trace of fat. The remaining portion of ether forms with the fat a solution whose concentration varies as the amount of fat present in the milk. The concentration of this ethereal solution of fat can be ascertained by the estimation of its specific gravity with as certain and accurate results as those obtained by estimating the amount of alcohol in an aqueous solution with the alcoholometer, as the difference between the specific gravity of fat and ether is as great as between that of water and alcohol.

Apparatus and Materials.—(1.) Apparatus for the determination of specific gravities, with three pipettes for measuring the milk, caustic potash solution, and ether respectively, and several bottles in which to agitate the mixtures. (2.) Caustic potash solution, of sp. gr 1·26 to 1·27, prepared by dissolving 400 grms. fused caustic potash in a half liter of, water, which after cooling is made up to one liter; or by dissolving 400 grms. caustic potash in 870 grms. water. (3.) Ether saturated with water. This is obtained by shaking commercial ether with one-tenth to two-tenths of its volume



Dr. Soxhlet's Apparatus for the Estimation of Fat in Milk.

of water at the ordinary temperature. (4.) Commercial ether. (5.) A large vessel of at least 4 liters capacity, filled with water at a temperature of 17° to 18° C. When several estimations are to be made at the same time the vessel must be larger. When the temperature of the room is warmer, the temperature of the water should at first be 17°, when cooler, 18° C.

Manner of Procedure – The milk being thoroughly mixed, and at a temperature of 17·5° C., 200 c.c. are measured by the largest pipette and discharged into one of the bottles for agitating, which should have a capacity of 300 c.c. In the same manner 10 c.c. of the potash solution are measured, discharged into the bottle containing the milk, and mixed; 60 c.c. ether saturated with water are then added. The ether, when measured, must be between 16·5° and 18·5° C. The bottle is now closed with a cork or India-rubber stopper, shaken violently for half a minute, placed in the water at 17·5° C., and shaken every alternate half minute for a quarter of an hour. After standing a quarter of an hour longer, a clear layer of the ethereal solution of fat forms in the conical part of the bottle, the collection and purification of which is accelerated by giving to the contents of the bottle a gentle circular movement. It is indifferent whether the entire solution of fat, or only a portion, has collected, if there be sufficient to cause the aräometer to float. The ethereal solution must be perfectly clear. With milk containing a large amount of fat (4½ to 5 per cent) the separation takes longer than a quarter of an hour; sometimes, but exceptionally, from one to two hours. In such cases, if the vessel containing the water is large enough, it is judicious to lay the well-closed bottle in a horizontal position in the water; the way for the ascending drops is thus considerably shortened, and the collection of ether hastened. When the bottle can again be placed in an upright position, the purification may be assisted by the gentle circular movement.

In order that the following manipulations may be understood the apparatus for the estimation of the specific gravity of the ethereal solution will be described.

The stand has a holder fitted with a movable screw for holding the cooling tube, A, to the tubes of which are attached two short India-rubber tubes. The holder of the tube, A, turns on its axle so that A can be placed in a horizontal position. In the center of A is fastened a smaller tube, B, whose diameter must be 2 mm. greater than that of the float of the aräometer. At the lower end of B are fastened three small pieces of glass, to prevent the aräometer from adhering to the sides, while the upper end is closed by a cork. The scale of the aräometer, C, is divided into degrees from 66 to 40, corresponding to the specific gravities from 0·766 to 0·743 at 17·5° C.; these, again, are further divided by smaller and finer lines into halves. In the float of the aräometer is fastened a small thermometer, so graduated that 0·1° C. may be read off. The drawn-out end of the tube, B, which passes through the cork in the bottom of A, is connected by means of an India-rubber tube to the glass tubes D, which passes through the cork, E, of the agitating bottle. The glass tube, F, to which is attached the small hand bellows, G, also passes through the cork. The stand also holds the three pipettes, I, for measuring the milk, caustic potash solution, and ether.

The apparatus is now used as follows: The India-rubber tube connected to the lower tube of A is placed in the vessel containing the water at 17° to 18° C. A is now filled with water by suction at B, and closed by connecting both ends with a glass tube. The stopper of the agitating bottle is now replaced by the cork, E, and the tube, D, so inserted as to dip nearly to the bottom of the clear ethereal solution. The cork at the top of A and the clamp, H, being opened, a quantity of ether, sufficient to cause the aräometer to float, is forced by means of a gentle pressure at G into the tube, B. The clamp is now closed, and the cork inserted in B, in order to prevent any evaporation of ether.

After waiting from one to two minutes till compensation of temperature has taken place, the aräometer is brought as nearly as possible into the center of the tube, and the position of the scale read off. That part of the scale is read off which coincides with the middle part of the deepest curved line on the surface of the liquid (meniscus). As the specific gravity is diminished by a higher and increased by a lower temperature, the temperature during the estimation of the specific gravity of the ethereal solution must be noticed. Therefore, shortly before or after ascertaining the position of the aräometer, the temperature of the liquid is obtained to within 0·1° C. from the thermometer in the aräometer. If the temperature be exactly 17·5° C., the specific gravity will, of course, require no further correction; in other cases, however, the specific gravity obtained by the aräometer can be easily calculated to that at the standard temperature, 17·5° C. For each degree Celsius over 17·5° C., one degree is added to, and for each degree under 17·5° C., one degree is subtracted from, the statement of the aräometer; *e. g.*, 58·9 degrees at 16·8° C., at standard temperature become 58·2; 47·6 degrees at 18·4° C., at standard temperature become 48 5. The temperature of the water in A may fluctuate between 16·5° and 18·5° C. The specific gravity of the ethereal solution at 17·5° C. being found, the amount of fat in weight per cent is obtained directly from table I.

After finishing the determination, in order to prepare the apparatus for a second, the cork of B, and the clamp, H, are opened to permit the ether to flow back into the agitating bottle. B is now filled from the bottle with commercial ether, which is allowed to flow back again. The tube, B, India rubber tube, etc., are now thoroughly dried by forcing a current of air through the apparatus by means of a hand bellows, G. As the aräometer is apt to be injured by coming in contact with B, it is advisable, before forcing the air through, to turn the tubes A and C to a horizontal position.

The estimation of the specific gravity, including the preparation of the apparatus for another estimation, scarcely takes five minutes. From the description of the manner of cleaning the apparatus, it will be seen that there is little risk of the aräometer being injured, as it is never taken out of the tube, B. Allowing half an hour for the mixing and separation of the ethereal solution, an estimation of fat may be made in from forty to forty-five minutes; but five estimations can be made as easily in an hour, when they are carried on at the same time. The method, therefore, not only allows several estimations to be made at the same time, but is also very expeditious.

*By Dr. F. Soxhlet in *Chemical News.*

Steam Sledge for Arctic Use.

A dispatch from Washington relative to the outfit of the relief steamer Mary and Helen, states that Chief Engineer George Sewell, of the Navy, now on duty at New York, has, upon official request, forwarded to the Navy Department designs for a steam sledge which is intended to be self-propelling and capable of towing a number of sledges.

NEW HOT-AIR BATH CHAMBER.

The engraving shows a portable bath chamber suitable for all kinds of baths, but especially designed for hot air in the treatment of disease. The inventor claims that during many years of medical practice in the most unhealthy portions of the South he has used heat as a remedy with such success that he now considers it far more valuable than all other curative agents combined.

Steam being objectionable, he proposes to make the general use of the hot-air bath, among physicians and families, practicable and cheap.

The portable chamber consists of a detachable top in three parts or sections, and the walls are made up of four corner sections, with the doors hung to the free edge of each one of the wings, which, hinged together in pairs, make the corner sections. When required, the chamber sets upon a base frame containing the heating apparatus; however, the chamber may be used independently of the base frame and furnace, when a parlor, office, or cook stove already in use is available.

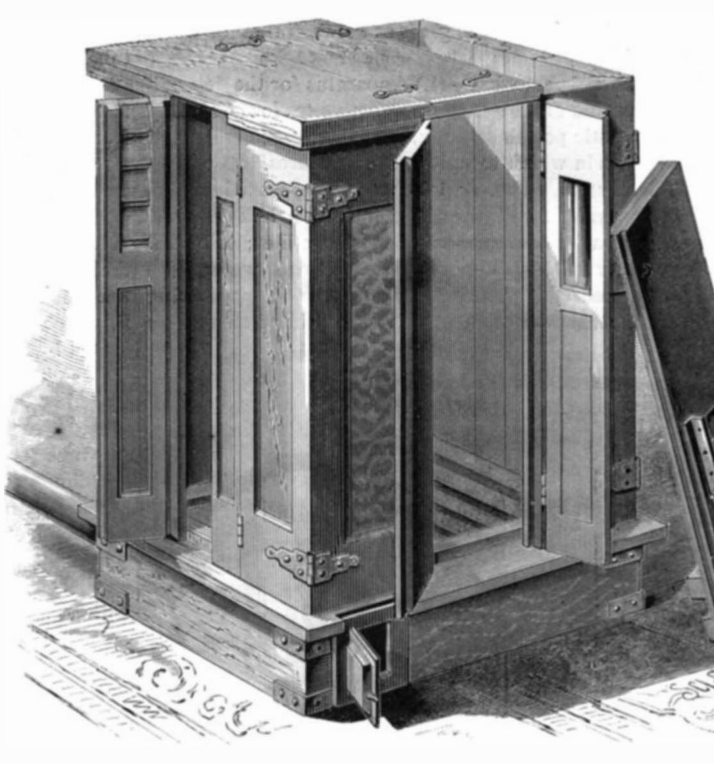
There is a space or recess cut in the top of one of the doors, and also in one of the roof or top sections, the former to fit over the stovepipe if horizontal, the latter if vertical, and are both provided with square shutters fitted to the stovepipe. By means of this ingenious arrangement the chamber can be readily set up about a hot stove without touching the pipe, and where families have even a cookstove in daily use they can avail themselves of the chamber alone without the expense of base frame, furnace, and extra fuel; and when done bathing, the chamber may be removed from the cookstove and set up elsewhere and for other purposes if desired.

This chamber can be taken down in detached parts without the aid of tools; is easily carried from place to place; and may be set up in any room, or, if necessary, around the bed upon which the patient is lying, without creating any disturbance.

The plan of construction is so simple and perfect that each part, whether door, corner, or top section, is interchangeable with all other similar parts, and the door containing the window may be readily changed from one side of the chamber to the other, when desirable. The same is true of the door containing the square shutters for the pipe opening.

It is adaptable to any place or circumstance, and will render the hot-air and Turkish baths practicable with both physicians and families.

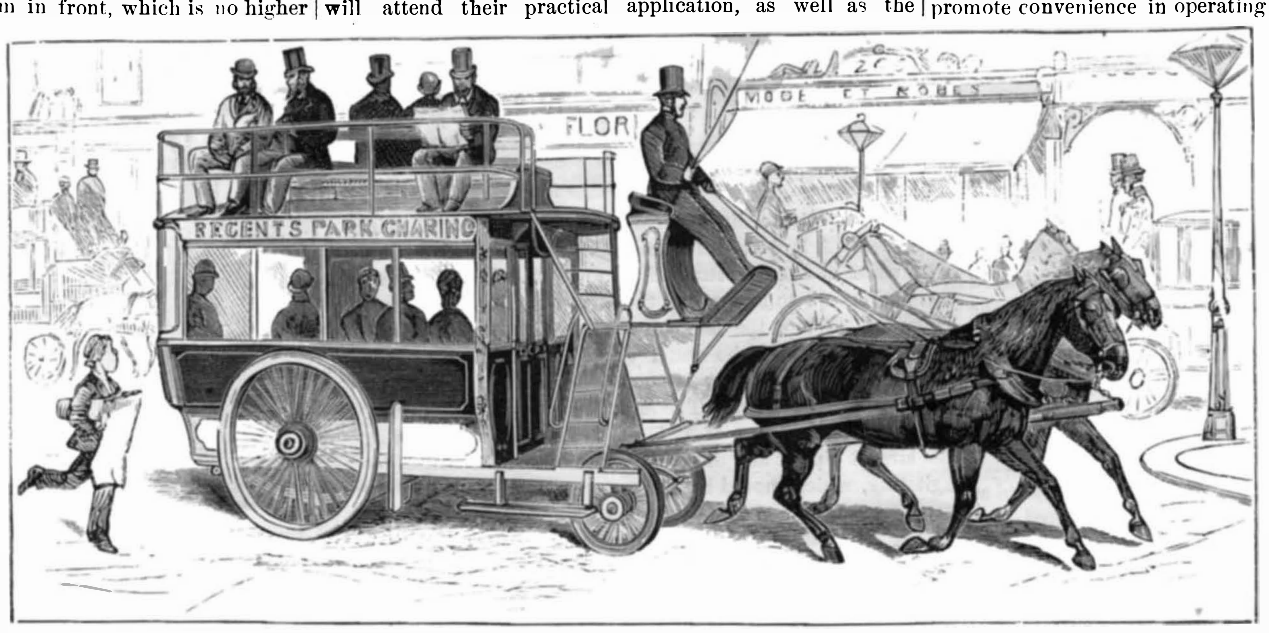
Full information in regard to this novel chamber may be obtained by addressing Dr. Andrew Walker, Natchitoches, La.



PORTABLE HOT-AIR BATH CHAMBER.

NEW ROAD CAR.

The road car shown in our engraving will shortly commence running on various routes in different parts of London, the London and District Omnibus Company (Limited) having entered into arrangements for the purpose with the inventor, Captain Molesworth, R.N. The chief difference between the old and the new vehicles is that the latter are principally supported on the two large wheels, which arrangement not only gives greater facility in running, but by means of the crank axle also brings the car much nearer the ground, passengers being thus able to step easily from the pavement on to the platform in front, which is no higher than an ordinary curbstone. An additional, and perhaps a more acceptable advantage gained in adopting this principle, is that, however rough the ground or however the load may be distributed, the car glides forward with an undulating, easy motion, most enjoyable compared with the rather "rough and tumble" jolting of the old omnibus. The two small wheels in front act rather as a foundation for the driver's seat than as an additional support to the car. This new arrangement affords great facilities for rapidly turning and changing the vehicle's course in crowded thoroughfares, and also enables the driver to have proper command of his horses, to be free from interference from passengers, and also to be in close communication with the conductor, who stands on the platform in front, where, in contrast to the old style, is the door. We have seen and traveled in one of the new vehicles, were much pleased with its comfort, roominess, and brightness, and especially with the novel arrangement of the seats on the top; the "knife board" being abolished for a double row of comfortable garden chairs, so placed as to allow of every one sitting with his or her face to the horses. These chairs are not shown in the illustration, but the majority of the cars are fitted with them.—*London Graphic.*



MOLESWORTH'S ROAD CAR.

Proposed Electric Postal Railway.

Models of a proposed electric railway and letter post delivery were recently exhibited before a scientific club in Vienna. A Siemens electro-dynamic machine was used to furnish the motive power. The chief advantage claimed for the system was that the power was generated at the stations and not carried along the line by locomotive engines. The letter post was intended to supply for long distances the want now filled for short distances by pneumatic tubes. Miniature lines of railway were to be built along the passenger lines, and on them, at an exceedingly high rate of speed, would be run small electric engines and cars to take up letters. It would have the advantage of being entirely independent of the regular passenger road, and could be used at any time.

The National Academy.

The closing session of the National Academy was held Friday, April 22. The following papers were read: "Additions to our Knowledge of the Currents and Temperature of the Ocean in the Vicinity of Behring Straits," W. H. Doll; "Results Obtained with Regard to the Molecular Weight of Hydrofluoric Acid," J. W. Mallet; "A Method of Finding the Proximeters of the Orbits of Minor Planets," C. H. F. Peters; "Incandescent Lighting," G. F. Barker; "The Auriferous Gravels of California," T. Sterry Hunt. At the conclusion of the last named paper, President Rogers said that before announcing the adjournment of the Academy he wished to express his gratification at the variety and excellence of the communications presented during the session. The brilliancy of some of the results, the large beneficence that will attend their practical application, as well as the harmony and fraternal feeling that had characterized their deliberations, were matters for congratulation. The members of the Academy, he said, as indeed all scientific men, constitute a republic; and its government is necessarily attended with some of the inconvenience that attends such a form of government, which encourages the development of strong individuality. The history of the Academy is one of progress, and there lies a grand and brilliant future before it.

RECENT INVENTIONS.

Mr. Henry S. Norse, of 2238 Third avenue, New York city, has patented an improved duplicating press. The object of this invention is to furnish a foot or power press for use in printing from stencil plates, particularly stencils prepared with the Edison electric pen, so that the labor and time heretofore required in such work shall be reduced. The invention consists in a hinged frame carrying the stencil plate, and a vibrating lever carrying the ink roller, combined together and with a fixed platen or bed, and operated by mechanism of novel construction, by which the hinged frame is raised for insertion of the paper, dropped upon the paper, the ink roller brought over the stencil plate with the required pressure, and then withdrawn while the frame is again raised.

An improved barrel hoop making machine has been patented by Mr. Edward E. Thresher, of Reed City, Mich. This machine is designed especially for cutting hoops from boards or planks, and is so constructed as to cut the timber into oval strips and cut each strip into two beveled hoops. The machine can be readily adjusted for sawing lath and making mouldings.

An improved horse power has been patented by Mr. Benjamin F. McCarty and Richard E. Lindsay, of Seale, Ala. The object of this invention is to furnish horse powers designed especially for driving cotton gins, but which can be used with advantage for various other purposes. They are so constructed that they can be built upon the drive wheels of ordinary horse powers.

An improved crate for the transportation of fish, meats, and other like perishable articles, so as to protect them from decomposition during transportation or storage, has been patented by Mr. William S. Braman, of Key West, Fla. It consists of a crate made of a network of galvanized iron, and provided with a series of knees or projections, which keep the sides of the crate from coming in contact with the sides of the box.

Mr. John Flanagan, of Newburg, N. Y., has patented an improvement in hydrant valves. The invention consists in combining with a hydrant case having a side aperture and an apertured extension a cross slotted cylinder provided with annular exterior packing grooves and a valve sustained at the center by arms and carrying at the lower end a packing disk.

Mr. Albert Rousseaux, of Brussels, Belgium, has patented an inhaler by means of which air impregnated with tar or other medical odors can be inhaled for penetration to the bronchial tubes and lungs. The invention consists in a cigar holder or mouth piece fitted with a cigar-shaped portion containing tar or other materials formed with air conduits, and provided with a cover perforated for admission of air, so that by being held in the mouth the user can inhale the exterior air, which, on passing through the cigar and holder, becomes impregnated with the tar, medicine, or other material used.

An improved curtain fixture has been patented by Mr. Benjamin Landon, of Canton, Pa. The object of this invention is to improve the construction of the window shade fixtures for which Letters Patent No. 132, 726 were granted to the same inventor under the date of November 5, 1872, in such a manner as to simplify the construction and promote convenience in operating them.

An improved engraving machine has been patented by Mr. Allan E. Francis, of Garrettsville, Ohio. The improvement relates generally to engraving machines employing a pantograph to which are connected the tracer and the graving tool, and particularly to the means for facing the tool properly and the lever for operating the tool to the construction of the pantograph; to the construction of the tracer arm and the means for adjusting the tracer; to the bed and supports of the machine, and the means for adjusting the pantograph and the work. This invention cannot be described without engravings.

An improvement in wagon gear has been patented by Mr. Horace L. Kingsley, of Racine, Wis. The object of this invention is to provide a cheaper and more durable oscillating gear for platform spring wagons, whereby greater elasticity and freedom of movement is given to the wagon bed. The invention consists of the combination, with the bed piece, of horizontal rocking bars having their inner ends supported in a revolving king bolt plate, and their outer ends in segments that travel over the fifth wheel on the platform.

THE ELECTRIC LIGHT IN AN ART GALLERY.

At a reception held at the Union League Club House, in this city, a few evenings ago, the experiment of lighting a portion of the picture gallery with electric lights was tried with satisfactory results.

One part of the gallery was lighted with gas and the other portion with Maxim's incandescent burners, supplied by the United States Electric Lighting Company, who also illuminated the street and avenue fronting the building with one of their powerful arc lights.

It was considered doubtful if the commingling of the two lights—gas and electric—would be sufficiently harmonious to admit their use together without destroying the harmony of color or richness of tint in some of the ninety beautiful paintings—valued in the aggregate at $265,000—which adorned the walls of the Club House on this occasion. But the result has proved that the electric light is feasible for illuminating galleries of art, and in many respects that it is far better than gas for the purpose.

The quality of the light approaches very closely to that of daylight, hence the artist's conception of color is not distorted as by the yellow tint which gas produces. The picture appears to the observer as it did to the artist when it left his easel.

The electric light takes up none of the oxygen of the room, the exhaustion of which in galleries where gas jets are used renders them uncomfortably warm, vitiating the atmosphere, and thus detracting from the pleasure of visiting such places at night.

The result attending the exhibition the other evening, of using the electric light and gas light together, and then either separately, establishes the feasibility of using the electric light alone for exhibiting pictures to the best advantage or of blending the two and heightening the brilliancy.

The Maxim incandescent burners were placed at intervals between the gas jets on the main pipe which extends around the room, so that the rays of light were projected from the same line, thus avoiding a cross-light, which artists and exhibitors so much abhor.

A Summer School of Natural Science.

The Boston Society of Natural History will open a seaside laboratory at Annisquam, Mass., June 15, the session to end September 15. There will be no stated course of instruction and no lectures, the purpose being to afford opportunities for the study and observation of the development, anatomy, and habits of common types of marine animals under suitable direction and advice.

MISCELLANEOUS INVENTIONS.

Mr. Joseph L. Camp, of Cannonsburg, Pa., has patented a device for facilitating the sealing of cans with wax, whereby the objections to the old method are avoided. It consists of an upright metallic lamp chimney having an inclined open spout or conductor attached at one side, near its base, both chimney and spout being heated by a lamp. There is a slide supported by suitable standards on the lamp holder or case, and inclined toward the chimney, in which slide is placed a stick of wax with its lower end resting against the chimney, above the spout, and as the wax is gradually melted by the heat of the chimney it drops into the spout, and may be poured thence upon a can to seal it.

Mr. Charles G. Trafton,tof Slatersville, R. I., has patented an improved thread guide for spooling machines for guiding the thread as it runs from the bobbin to the larger spool. The object of this invention is to relieve the self-adjusting guide of all pressure tending to increase the friction of its movement, so that the action shall be most delicate. It consists in a guide plate pivoted to a supporting rod that is formed with the friction surface over which the yarn runs.

Mr. David Gaussen, of Broughton Hall, Lechlade, County of Gloucester, England, has patented an improvement in the manufacture of vulcanized India-rubber, etc., which consists in corrugating such sheets on both sides, so as to produce a series of hollow arches or hollow semi-cylindrical formations, such as those usually formed by the corrugation of sheets of galvanized iron, the grooves on the one side being alternate with those on the opposite side of the same sheet, that which is a convexity on one side being itself a concavity on the other side, and on one and the same side a convexity or ridge being followed by a concavity, and a concavity by a convexity.

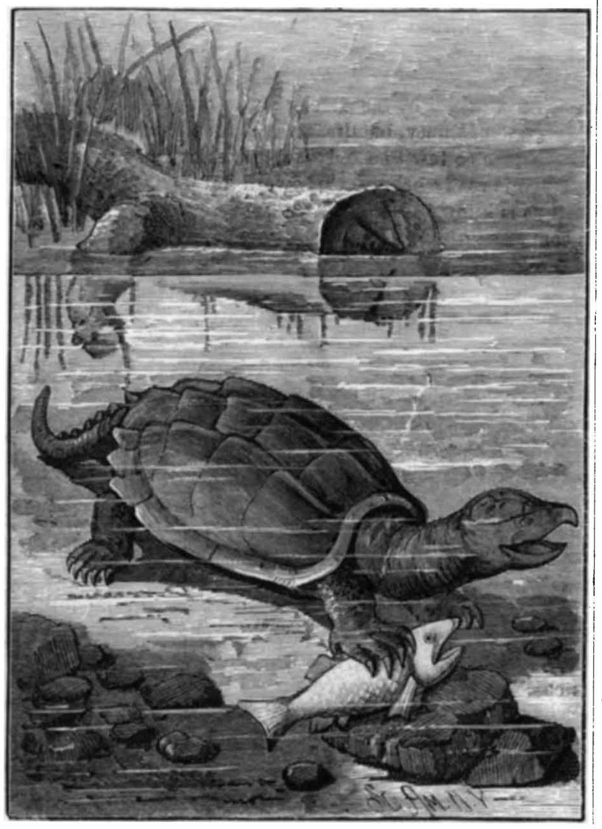
KRUGG JUGS.

The jugs shown in the annexed engraving are made by the celebrated manufacturer whose name they bear. They are faïence and gris, and exhibit the odd forms and curious decoration once so popular in Austria. The work is minute and the execution fine, and the quaintness of the designs would recommend them to any collector of objects of vertu.

KRUGG JUGS.

THE ALLIGATOR SNAPPING TURTLE.

The alligator snapper (*Macrochelys lacertina*), the largest of fresh water turtles, has its headquarters in the shallow, tepid bayous of Louisiana, although it ranges up the Mississippi to the Missouri. It bears a strong resemblance to a common snapping turtle greatly magnified in size and ugliness, and in this latter quality might well contest the palm with the South American matamata, a turtle, by the way, of which no correct cut has fallen under our notice. It is usually represented with a thick head and neck, whereas they really look as if a log had fallen on and flattened them. In our present species the head and neck are out of all proportion to the body, giving it an overbalanced appearance,



THE ALLIGATOR SNAPPING TURTLE.

and rendering it impossible for the animal to more than slightly draw the neck beneath its shell. As far as protection is concerned this is of small consequence, for none of the coresidents of its haunts would think of attacking it, their chief concern being to avoid falling into his clutches. Lurking in the shadow of some rock or log, or partly buried in the mud, with neck retracted as far as possible, its rough-brown skin and moss-covered back give it so much the appearance of an old stump that it is unnoticed by the fish sporting in the vicinity, until, perhaps, one ventures too near. Then, with a sidelong spring, at the same time darting out its neck, the turtle seizes his prey, which he devours at leisure, holding the fish down and under him as a dog would a bone. It is so voracious as to cause sad havoc among the fish, while its wariness renders it difficult to capture. A gentleman who had introduced a pair into a small fish pond found them so destructive that he wished to get rid of them. They preyed upon the fish, and also came to be fed whenever the fish were. One was speared while feeding; but the larger kept out of the way until he was tempted to seize a hook baited with a large minnow. Finding himself caught he braced against the rock, and, with a sudden jerk, broke the hook. After this escape he was more careful than ever, and succeeded in keeping out of danger. This turtle occasionally attains a length of 6 feet and a weight of 150 pounds, but the most common size is from 10 to 50 pounds. It is brought into the markets to some extent as an article of food. The eggs, like those of all other turtles, are deposited in the sand and hatched by the heat of the sun. If the eggs are broken the immature young will snap in a feeble way, showing that this part of their disposition is inborn and not the result of education.

FREDERIC A. LUCAS.

New Rust Preventive.

A new method of protecting the surface of iron from rust has been brought forward by Mr. Ward, of London. The new "inoxidizing" process, as it is termed, consists in combining a silizate with the metal by the aid of heat. Cast or wrought iron objects are first coated, by painting or dipping, with a silicate glaze, which quickly dries, and the articles are then passed through a furnace, or rather oven. In this way the silicate composition is said to be fused and absorbed into the metal, which upon cooling is found to have assumed a dull black appearance. The coating is said to be so far homogeneous with the metal as to protect it from any change from long exposure to the atmosphere; and at the same time the silicate is not liable to disintegrate or separate from the iron. The articles treated in this manner may be ornamented by combining the silicate wash with any vitrifiable colors. Thus smooth polished colored surfaces may be produced upon iron, which, while possessing features distinct from ordinary enameling, yet present superior and more durable results than those obtainable by ordinary painting and varnishing.

The Matanzas Exhibition.

Late advices from Havana state that the Matanzas Exhibition is likely to prove a financial failure. The attendance is very small, except on Sundays. In the department of industrial products the Exhibition is pronounced a success, but it fails in its display of machinery and agricultural products. The exhibit of the Havana Arsenal is particularly full and well arranged, so that visitors can readily study the successive stages and processes of manufacture of each object. The models of cannon of all sorts and periods, from the earliest to the most modern, are regarded as particularly creditable; but it is not an encouraging sign to see the post of honor accorded to such things in an industrial exhibition.

The Beef Juice Furor.

In the present *furor* for fluid beef juice, says Dr. Fothergill, the necessity for starchy matters is being quite overlooked, or, to be very safe, underestimated. These meat products furnish—the best of them—little glycogen or animal starch, and yet that is the fuel food of the body *par excellence*. We must be guided by rational knowledge, by physiology and not by fashion, in our dietetics. When there is very feeble digestion, then the digested milk and milk gruel advocated by Dr. Roberts is to be employed.—*The Practitioner*

Kentucky Horses.

It is claimed that the fastest horses in the world have been bred in the neighborhood of Lexington, Ky. Among the more notable are Maud Stone, better known as Maud S., record, 2:10¾; Wedgwood, 2: 19; Woodford Mambrino, 2:24; Trinket, 2:19¼; Dick Moore, 2:22: John Morgan, 2:24; Indianapolis, 2: 21; and Voltaire, 2: 21.

The number of superior carriage, saddle, and trotting horses sent out from this part of Kentucky is very great. A prominent breeder was lately asked the secret of their superiority. He replied: "There is a combination of causes. The great majority of the horses here have some good blood in them, and you will find it crossed somewhere back in their pedigrees. The best strains of running and trotting blood have been taken from here to other States, and they there fail to produce the desired results. There is something in the blue grass, the water, the atmosphere, and the general climatic influence, and much in judicious breeding and training. We force our horses to a gait when they are one year old, and at three years old they are pretty well developed. The Northern men, however, always improve them." "How long have Kentucky horses held their high place?" was asked. The breeder replied: "No one hereabout can tell. I know men who have lived here eighty-five years, and they state that from their earliest childhood they have heard of the superiority of our horses. Their fathers before them had the same story to tell. The fact is that somewhere in the past there was brought into this State a pure strain of thorough blood, derived from the best stock of the mother world, and it has transmitted its qualities from sire to son to the present time. It is a lamentable fact that we have not the exact data upon which to base a history of the Kentucky horse."

The Manufacture of Bromide.

Fifteen years ago a few hundred pounds of bromide per year, imported from Europe, sufficed for the wants of the trade, and the price of the article was about $5 per pound. Since that time the value of bromide of potassium as a nervous sedative has caused such a demand that a supply of nearly 50,000 pounds per month is absorbed. Bromine, from which bromide and hydrobromic acid is made, is found in the "mother" or "bitter" water yielded by the salt wells of the Ohio valley at Pomeroy, O.; also the Kanawha and Monongahela valleys, tributary to the Ohio from West Virginia and Southwestern Pennsylvania. The two first named regions furnish the wells whose water is richest in bromine, and this element is almost entirely wanting in the salt waters of the Saginaw and Syracuse salt regions. The price of the article has, in the time stated, fallen to less than one-tenth that given above, and the demand for bromide shows a steady increase.

BOTANICAL NOTES.

Insectivorous Plants.—Last year attention was called in the *Cronica Cientifica* to the fact that Vayreda, in his work on the "Noteworthy Plants of Catalonia," had asserted that certain Spanish species of catch-fly (*Silene crassicaulis*, *S. aperta*, and *S. nutans*) possess the property of digesting the soft portions of the bodies of the insects that they capture by means of the viscid secretion which invests their stems. In a recent number of the *Cronica* Sig. Vayreda gives the results of certain experiments made by him on one of the above-named species last summer, for the purpose of verifying his original statement. He found that the viscid secretion on the internodes of the stem began to make its appearance about twelve or fifteen days before the flower buds opened. This secretion is transparent, colorless, and has a faint characteristic odor. Its viscidity is about the same as that of bird-lime. It is partially soluble in water and almost entirely so in alcohol, and appears to be an oleo-resin mixed with a volatile oil. It produces a marked narcotic action on insects that come in contact with it. Sig. Vayreda having selected a number of plants of *Silene crassicaulis* of the same age, size, and vigor, dusted the viscid substance of some of them with plaster of Paris and covered that of others with cotton fibers so as to entirely prevent the access of insects to it; other plants he left in their natural state, and carefully watched the results in both cases. After numerous and attentive observations on the plants fed with insects and on those deprived of them, the author was obliged to confess that he could perceive no appreciable difference between them in development, dimensions, color, or physiological evolution, all having thriven equally well. When the seeds were mature, these were likewise compared microscopically and also weighed, but no difference could be distinguished between them. Sig. Vayreda hence draws the conclusion that while there is no doubt at all that the viscid secretion of *Silene* possesses the power of capturing and killing insects and of discoloring their bodies, its purpose is not to prepare nourishment for the plant, but rather to serve as a protection to the floral organs against unwelcome visitors; and, further, he believes that the secretions of other alleged insectivorous plants, such as *Drosera*, are provided for a like purpose. It would prove an interesting matter if some one, following Sig. Vayreda's example, should pursue a series of investigations on some of our American viscid species of *Silene*, the wild pink (*S. pennsylvanica*), for example, with a view of ascertaining whether the viscid secretion possesses the property of dissolving the soft portions of insects' bodies, and, if so, whether this proves of any special benefit to the plant.

Absorption and Diffusion of Heat by Leaves.—In a recent number of the *Annales Agronomiques*, M. Maguenne gives an account of an elaborate series of experiments undertaken by him with a view to ascertain the amount of heat absorbed by and radiated from leaves under given conditions. The author's paper is so long that we can merely give an abstract of his conclusions, which are as follows: "All leaves, it appears, diffuse a portion of the heat which they receive, more or less, according to the source of heat. Generally, but not universally, the lower surface gives off more heat than the upper. The absorption of the heat is due to the presence in the leaf of absorbent substances, such as water and chlorophyl. Thick leaves absorb more than thin ones; but the latter, however, transmit heat better than thick ones."

Changes in the Diameter of Trunks of Trees.—According to the *Gardener's Chronicle*, MM. Kraus and Kaiser have been making some researches, from which it appears that the trunks of trees undergo daily changes in diameter. From early morning to early afternoon there is a regular diminution till the minimum is reached, when the process is reversed and the maximum diameter attained at the time of twilight; then again comes a diminution, to be succeeded by an increase about dawn—an increase more marked than that in the evening. The variations in diameter coincide, therefore, with those of the tension, but they are shown to be inverse to the temperature, the maximum of the one corresponding roughly to the minimum of the other, and so on.

Action of Anæsthetics on Plants.—Claude Bernard has shown, says the *Lancet*, that the vapor of chloroform and of ordinary ether hinder the germination of seeds, and M. Rabuteau has found that this is equally true of bromide of ethyl and bromide of amyl. He finds, also, that all the ethers have the same effect. The experiments were made with grass seeds; but the property of germination is merely restrained. Seeds kept thirty-seven days exposed to the vapor of bromide of ethyl or bromide of amyl germinated, when placed under proper conditions, in two days. The question then presents itself: Have these substances a similar action upon plants which are in full progress of growth? Growing cress was exposed for two hours to an atmosphere saturated with vapor of bromide of ethyl. It then appeared feeble, the leaves hanging down, and it continued in this condition for a day or two, and then revived, but exhibited considerable retardation in its growth compared with other plants of the same age. The leaves of heliotrope become brown, and die in the course of two hours. Acetate of ethyl is somewhat less powerful. Cress lives after it has been exposed to the vapor for three hours, but does not survive an exposure of six hours. Heliotropes are only killed by an exposure of three or four hours. The action of acetate of ethyl is also correspondingly less active on animals.

A Western Oil Flood.

O. P. Yelton, now in Laramie City, Wyoming Territory, has kindly sent the *Era* a copy of the last issue of the weekly *Boomerang*, published in that city, from which the following article is taken:

"We have frequently spoken of the extensive oil wells now being worked by the Rocky Mountain Oil Company, in Sweetwater County, but the facilities for obtaining particulars have been so few that our people are not fully aware of how much is really being done toward developing so rich a deposit as is known to exist there. The company referred to is composed of Omaha capitalists, with Dr. Graff at its head. For the past month he has been superintending the work at the wells in person, and a report of a lengthy interview, on his return to Omaha the other day, appears in the *Herald*.

"Last season the company bored in several places, and collected the oil at other spots where it exuded from the ground, and built six or seven reservoirs to contain it. They stored two or three thousand barrels, but were fated to lose a part of it through an unforeseen casualty. About two weeks ago an ice gorge formed in Popajie Creek, above two reservoirs which held an aggregate of 1,200 barrels. The water poured over and into the reservoirs, and being heavier than the oil displaced it wholly.

"The sea of oil ran over the meadows for several miles about, blackening them as if a prairie fire had swept across. The farmers were incensed, but it was such a loss as the insurance companies would have classed under the heading of 'Acts of God,' and no one charged with fault. Since the gorge passed out the water is being pumped from the wells, which will soon fill to the brim again.

"The company can store from 1,000 to 1,500 barrels of oil a day, when they desire, and can dispose of it, and have reason to believe that theirs is an oil interest larger than that of the whole of Pennsylvania and far easier developed. The president of the company guarantees that they can produce 50,000 barrels per day when they require it.

"The value of Wyoming oil has already been tested. In its crude state, without the least refining or treatment, it serves as an excellent lubricating oil, and the Union Pacific engines are using it. This summer the oil company propose to erect a refinery alongside the Union Pacific railway track, where they will refine it for illuminating purposes, making an excellent head-light oil. Dr. Graff has been out to see about building a direct wagon road from the wells to the railroad, instead of following the present roundabout way, the length of the former being seventy-six miles. He was driven back by the winter, the season being too little advanced. Dr. Graff is looking forward to the time when these wells shall supply all the country west of the Missouri."—*Bradford Era.*

Venus and Mercury at Noon-Day.

We had a superb telescopic view of these two planets a few days since nearly at the time when the sun passed the meridian. We first took a peep at our brilliant neighbor Venus with the naked eye, for she may be seen any clear day in the bright sunshine, if one knows where to look. A pin-head of filmy cloud or a dot of molten silver was the modest form assumed by our sister planet in the sun's majestic presence, as after looking intently, she suddenly came into view from the depths of the blue sky. The telescope was then turned toward her, and the cloudy speck was transformed into a charming crescent as large as the moon. The color was pale gold, and the crescent as slender as the waning moon two or three days before her change. The terminator or line between the light and dark portions of the disk was slightly irregular, so that, though twenty-three million miles distant, we were actually seeing the summits of the mountains on Venus illumined by the sun. The crescent Venus comes next to Saturn and Jupiter as an object of telescopic interest.

Mercury was the next subject for observation, and the shy planet, difficult to find even when the sun is below the horizon, quickly made his appearance under the magic spell of the glass. He did not take on a grand aspect, for he is far away and comparatively small in size, but he looked much as Venus now looks to the naked eye, perhaps not quite as large and far less brilliant. He had, however, a distinctly gibbous phase, like the moon after she has passed her first quarter, for both Mercury and Venus, revolving within the orbit of the earth and being nearer the sun, pass through all the phases of the moon during their course, as seen by terrestrial observers

Only a short time remains in which Venus may be studied in her present phase, for she is rapidly approaching the sun, and will soon be hidden in his light. A good spy-glass will show the crescent form of this bewitching planet. This was all the help that Galileo had, and with its aid he was the first observer who beheld the crescent phase. A good opera glass will accomplish the feat with sharp-sighted observers. A few instances are on record where the crescent has been seen with the naked eye, but this, like detecting the moons of Jupiter, is an exceptional visual gift, which ordinary star-gazers may not hope to enjoy.—*Providence (R. I.) Journal.*

Product of an Iowa Creamery.

The *Farmer's Review* prints the following table showing the amounts of milk received each month last year by an Iowa creamery, with the amount of butter made therefrom, and the percentage of the yield. The average for the twelve months was $4\frac{1}{8}$ pounds of butter for each 100 pounds of milk. During six months the milk was received twice a day, the rest of the year but once a day. It was set in cooling cans, in water at a temperature of from 50° to 55° Fah.

	No. of lb. milk.	Lb. of butter.	Yield per 100 lb.
January	50,193	2,225	4·23
February	47,643	2,003	4·20
March	66,986	2,779	4·00
April	98,691	3,795	3·74
May	194,166	8,069	4·15
June	245,047	9,695	4·07
July	244,973	9,977	4·07
August	215,177	8,371	3·90
September	200,437	8,923	4·44
October	169,195	6,793	4·01
November	110,383	4,737	4·29
December	77,597	3,434	4·42

The Second Bridge Between New York and Brooklyn.

The bridge from New York to Brooklyn, crossing Blackwell's Island, is under contract, and the contractors are now busy on the iron work of the pier foundations. The estimated cost of the bridge is $5,000,000; the time fixed for its completion is three years. There will be four piers, one at Ravenswood, another at the coal dock on Blackwell's Island, a third on the west side of the island, and the fourth on the New York side, between Seventy-sixth and Seventy-seventh streets. It is intended that the New York approach shall form a junction with the railroads in the Fourth avenue tunnel, a mile and a quarter above the Grand Central Depot, and that the Long Island approach shall connect with a spur of the Long Island Railroad. The bridge will be 74 feet wide, and will be arranged for two sidewalks, two carriage-ways, and two steam railroad tracks. The span over the water from Ravenswood to Blackwell's Island will be 618 feet, that across the island 700 feet, and that over the river to New York 734 feet. Each pier will rest on bed rock, the dip of whose strata at all points is nearly vertical. The Ravenswood pier only will stand in the water, and a coffer dam will be placed in position next week to prepare the rock for its reception. One corner only of the New York pier will touch the water. The roadway will be 154 feet above the river at high tide, and 160 feet at low tide. A commission to appraise the land needed on Blackwell's Island has been appointed by the Supreme Court.

Cutting Holes in Glass.

The operation of making holes and sections in glass and porcelain is often a troublesome and unsatisfactory one. The firm of Richter & Co., in Chemnitz, have found a way of so impregnating thin German silver disks (15 to 25 mm. diameter) with diamond, that when fitted to a quickly rotating tool, these cut through glass or porcelain in a few seconds, or effect any desired carving with great accuracy. With cylinders made on the same principle, round holes can be quickly and exactly made. The wear of the implement, even after much use, is hardly perceptible.

Lack of Air.

Some workmen think themselves "tired" when they are only poisoned. They labor in factories, breathe air without oxygen, and live in an atmosphere of death. They are, too often, allowed to smoke, and thus add fuel to the flame which is consuming them. They knock off work "tired" and listless, when they are merely weakened by foul air and made dull and heavy by an atmosphere charged with disease. They keep the windows shut and close the door on health, while they lift the gratings of the tomb by breathing and re-breathing the poison from their own lungs, and the floating particles of matter about them. Open the windows—let in the sunshine and the breeze, stop smoking, and you will soon find that it is the poison of confinement, and not labor, that wearies and tires.—*Montreal Herald and Star.*

Magic Mirrors.

The magic mirrors, which have been a good deal discussed of late, are all of metal. M. Laurent has succeeded in making them of glass, which is sufficiently elastic for the purpose. At first he used pressed glass, polishing the surface opposite to the projections; then he tried the thin glass of commerce, engraving a hollow design. The two methods may be combined. When at rest the mirror is plane, and gives good images. By a blowing or sucking action the characteristic features are brought out. Both sides of the mirror are silvered.

Maple Sugar.

From two groves of maples in North Harpersfield, Delaware County, New York, the yield this year has been seven tons of maple sugar. The groves contain 4,200 trees. In 1875 the town of Harpersfield produced 200,000 pounds of sugar, an amount which this year's crop is thought to exceed.

A New Alkalimetric Indicator.

BY H. W. LANGBECK.

Nitro-phenic acid dissolved in 100,000 parts of distilled water presents a nearly colorless liquid, but if a trace only of an alkali be added a distinct yellow color appears. This delicate indicator is, of course, only useful if colorless or slightly colored fluids are to be examined. In determining, for instance, the temporary hardness of water, I dissolve 1 part of nitro-phenic acid in 5,000 parts of distilled water; I also prepare centinormal potash and acetic acid solutions. 100 c. c. of distilled water are put into one Nessler glass, the same quantity into another, and again 100 c. c. of the water to be examined into a third. To each of them 5 c. c. of nitro-phenic acid solution are added (one is kept for comparing), which leaves the distilled water nearly colorless, while the common water turns yellow to deep yellow according to hardness. From a burette centinormal potash solution is then added to the one glass of distilled water until the color is of the same shade as the common water; each c. c. used is equal to 0·00028 of lime, CaO. To verify the result, centinormal acetic acid is added until the first shade (nearly colorless) returns; the quantity of acid required is, of course, the same as the alkali. The common water is now also treated with the centinormal acid until the first shade is reached; each c. c. used equals 0 0005 of carbonate of lime. I compared, for instance, 100 c. c. of distilled water with 100 c. c. of water of the East London Company. The distilled water required 1·9 centinormal potash solution to color it the same shade as the common water, and also 1·9 c. c. of acid to become nearly colorless again; the water in question contained, therefore, 0·532 lime (CaO) in 100,000 parts. The common water required 29·8 c. c. to return to the first shade. From this quantity 1·9 = lime found must be deducted. Each of the remaining c. c. is equal to 0·0005 carbonate of lime, = 13·95 in 100,000 parts, or total temporary hardness = 14·482.—*Chem. News.*

Judgment and Forethought in the Education of Children.

In a very thoughtful and suggestive inquiry as to the reasons why "promising" children so seldom turn out as parents and friends anticipate, the Philadelphia *Public Ledger* discovers a potent cause of failure in the man which parents will find worthy of serious consideration. After speaking of the more familiar ways of spoiling children by unwise management or improper training, the *Ledger* says:

The truth is, we need more forethought and less self-indulgence in the training of our youth. We please ourselves too much, and study their future too little. It is so easy and pleasant to gratify our own vanity or ambition by stimulating and exhibiting them in points where they excel; it is so hard and comparatively tame to exercise them in what they are deficient, and to foster their most meager abilities. Yet until educators acquire the necessary self-control and patience to do the latter; until they can work quietly and steadfastly without display, and fix their aim on future results instead of present glitter, the most promising children will continue to sink down into inferior men and women.

The qualities that are the most attractive in childhood are not by any means the most valuable in maturity. We look for determination, will, decision of character, firmness in the man, and refuse him our respect if he have them not. But when the child exhibits these qualities, even in their incipient stages, we are annoyed, and, perhaps, repulsed. Instead of rejoicing in his strength of will and guiding it into right channels, we lament it as a grievous fault in him and a misfortune to us. It is the meek and yielding child who cares not to decide anything for himself, in whom we delight, and whose feeble will we make still feebler by denying it all exercise. Yet, when he grows up and enters the world and yields to temptation, and, perhaps, disgraces himself and his family, we look at him in imbecile wonder that so *good* a child should have turned out to be so bad a man, when, in truth, his course has only been the natural outcome of his past life and training. The power of standing firm and going alone we know to be desirable in the adult, but the child seems more lovable who is utterly dependent upon us, and we therefore strive to cherish this dependence, shutting our eyes to the fact that we are thus actually unfitting him for the life that awaits him. Concentration, too, is a quality that we admire in the adult, but greatly undervalue in the child. We prefer that he may be easily drawn away from what he is engaged in, and quickly turned from one thing to another at our pleasure; and while we praise him for his ready obedience, or rebuke him for seeming absorbed, we are really breaking down the power of concentration, and depriving him of its invaluable results.

It is true that many things are suitable for manhood that are not for childhood, but this is not the case with mental and moral qualities. If it were there could be no such thing as consistent preparation for a good and useful life. Every quality that the man or woman needs is incipient in the child, and needs development and exercise. Our part in his training is not to cherish in him simply what is most attractive to ourselves, or what feeds our own and his vanity, but rather to study his future needs, and to help him to supply what is most lacking. It is where he is deficient, not where he excels, that our earnest efforts are demanded. Not until parents and teachers realize this so fully as to identify with it their highest interest and pleasure in their charges, will promising children fulfill their promises, and the question no longer be asked, "What has become of them?"

Paper Pulp from Wood.

The following is a description of the process of making wood pulp: The wood, four feet in length, and of any thickness, is brought in at the basement of the manufactory, placed in the barking jack (one stick at a time), where two men with draw-knives rapidly peel off the bark. It is then conveyed by an elevator to the first floor, sawed in two-foot lengths with crosscut saws, and passed on to the rip-saw, where it is slabbed (that is, a small portion of wood on opposite sides taken off), to permit it resting firmly in the grinding engine. It is then passed to the boring machine (an upright 1½ inch auger, with foot attachment, driven by power), where the knots are bored out. The wood is then placed in racks of the same size as the receptacle in the grinding engine, and carried out to be ground. The grinding engines are upright, and receive at a filling one-twentieth of a cord of wood. The wood is placed in a receptacle, and by a simple, variable, automatic feed process, is pressed flatwise between two outward revolving rolls, composed of solid emery, which are flooded with a spray of water, carrying off the fibrilized pulp in a stream through revolving screens to the tank or stuff-chest in the basement. It is then pumped up into a vat that forms part of the wet machine. In this vat is constantly revolving a large cylinder faced with fine brass wire-cloth, which picks up the particles of pulp out of the water and places them on the felt (an endless piece of woolen goods which makes between rolls, for different purposes, a continual circuit of the wet machine). On the cylinder is turned a heavy roll, called the "couch;" between the two, where they meet, the cylinder leaves the pulp, with most of the water pressed from it. The pulp now makes its appearance on the felt above the concha roll in a beautiful sheet, 38 inches in width, and is carried along in a steady flow a distance of about 8 feet, where it passes between (the water here again being pressed from it) but not beyond two heavy rollers, the upper one iron, the lower one wood; it adheres to the upper roll, which is constantly turning, wrapping it up, and when a sufficient thickness is attained, is cut off by a knife being pressed to the roll, which is attached to the machine for that purpose. It now leaves the roll in a thick white sheet, 36x38 inches, which is received by a boy in attendance on a table conveniently attached to the machine, and folded into a sheet 14x26 inches. It is then placed on scales until the weight is 100 pounds, when it is placed in a press and firmly tied into square, compact bundles. It is now ready for shipment to the paper mill.

Adventure in the Cave of Cacahuamilpa.

A serious but fortunately not fatal termination came to a recent excursion from the City of Mexico to the Cave of Cacahuamilpa, in honor of some American visitors. About fifty persons left Mexico, but the party received so many accessions by the way that when the cave was reached there were as many as 500 persons in the company, including the military guard.

It appears that Señor Carlos Quaglia, Governor of Morelos, had ordered a banquet to be prepared in that portion of the grotto which bears the name of "The Organ Salon," on account of the stalactites which have there assumed the form of an organ. The place was illuminated by electric lights, yet there were also many torches of resinous wood burning. The *élite*, who numbered perhaps ninety persons (there were also a great many servants), occupied the Organ Salon. In close proximity were placed several shelter tents for the ladies and children to sleep in. These were filled with sleepers, and along one side of the banqueting hall many gentlemen were lying on mattresses, mats, or blankets. A few of the more animated guests lingered over the table until 2 o'clock in the morning, and were chatting, when Governor Quaglia fainted. All efforts to restore him to consciousness seemed futile. While he remained in this condition some ladies complained of illness, others were asphyxiated, and a gentleman suggested that all this might be due to mephitic exhalations. Mothers at once hastened to their children, and, finding some in a stupor, comprehended the danger. A panic ensued. General Diaz ordered an instant retreat from the grotto. General Ord and others instructed the soldiers to carry out the ladies and children. Ex-Governor Romero Vargas aided Señor Mariscal, Minister of Foreign Relations, to scramble over the rocks. In fact, all who had strength assisted those who were asphyxiated, and every person was removed to a purer atmosphere. Some persevered until they reached the entrance of the cave (three miles distant) and threw themselves down on the bare ground, almost exhausted with fatigue, but safe.

George Stephenson.

At an influential meeting lately held in the Town Hall, Newcastle-on-Tyne, the following resolutions were carried unanimously:

"That this meeting is of opinion that it is desirable to commemorate the centenary of the birth of the late George Stephenson on the 9th of June next, and expresses the view that Newcastle-on-Tyne, being practically the place of his nativity, and where his first and most important engineering triumphs were won, is the most fitting center where such celebrations should be held.

"That this meeting is of opinion that there is no better way of doing honor to the name of Stephenson and perpetuating his memory in this district than by erecting a building for the use of the University of Durham College of Physical Science, to be called the Stephenson College."

A Yellow Crow Lost in the Mails.

A white crow is a rare bird, but a yellow one is rarer still, and yet a bird of this color has been lost in the United States mails, that general receptacle for all sorts of merchandise to be transported over the country. One of Uncle Sam's officers in this far Western country, while perambulating the Rocky Mountain region (in the southern part of Colorado) came upon a rare bird, a yellow crow, which he succeeded in capturing. The bird was carefully skinned, the skin thoroughly cured and prepared for shipment to the Smithsonian Institution, at Washington. There being no way save the mails for shipping such articles from the wilds of La Plata County, this rare and valuable specimen of ornithology was intrusted to the care of the Post Office Department, and there the story ends for the present. The yellow crow still remains unknown, except to the very few who saw the bird before shipment, but earnest and determined efforts are being made to find the lost specimen, and Gen. Cameron, the Post Office Inspector for this division, to whom the case has been intrusted, expresses a determination to find the missing bird, unless the same has been stolen outright by some dishonest official.—*Denver News.*

Automatic Recording of Telephone Messages.

In a book on the application of the telephone and microphone to physiological and chemical uses, Dr. Boudet describes his method of automatic recording of telephone messages. To do this he removes the diaphragm of the Bell telephone, screws to the wood one end of a steel spring, the other end being opposite the pole of the magnet. To the free end he solders a small piece of soft iron, weighing one-tenth of a gramme. Attached to this piece, and in the prolongation of the axis of the spring, he fixes a light bamboo arm, ten centimeters long, and terminated by a needle of whalebone. In fact, the diaphragm is replaced by a movable armature resembling the interrupter of an induction coil. The tracings are made on smoked paper, and transferred to glass. There are some points of difference, as well as resemblance, which make it probable that tracings of this kind may be deciphered, but the matter is in embryo yet.

Imperfect Eyes among School Children.

Three years ago the Philadelphia Medical Society appointed a committee to investigate the condition of the eyes of the children in the city schools. The report of the committee was read by the chairman, Dr. Risley, at a recent meeting of the society. The committee had examined about 2,000 pairs of eyes. The condition of those examined, Dr. Risley said, had proved better than had been expected by the committee. The cases of impaired sight ranged from 25 per cent among the smaller children to 40 per cent among the older scholars. The average of diseased eyes ranged correspondingly from 30 to 60 per cent. The instances where any blame attached to the Board of Education or their sectional boards for want of care for the eyes of the children were only two, one of which was the case of the primary practicing class in the Normal School. The room is lighted by one large western window, which, owing to the position of the desks and the master's table, the children are obliged to face.

Fusion of Metals by Electricity.

M. Imbert describes Siemens' method of fusing large metallic masses by means of electricity. He uses a plumbago crucible, surrounded by a thick refractory wall, the cover being traversed by a carbon rod of 20 millimeters (0·79 inch) diameter. This rod is suspended by one of the arms of a balance beam, the other arm carrying a cylinder of soft iron sliding freely in a solenoid and plunging into a liquid, in order to moderate the oscillations which might arise from sudden variations of current. In one experiment 500 grammes (1·102 pounds) were melted into a compact ingot in four and one-half minutes. In melting large quantities the electrical method is rather more than twice as costly as the ordinary furnace, but for the fusion of precious or refractory metals, for chemical purposes, and for other applications where the question of economy is secondary, the new method is very convenient and practical. In melting small quantities it may even prove economical.—*Ann. du Gen. Civ.*

Excess of Fat.

Dr. George Johnson's diet for excess of fat: The patient *may eat:* lean mutton and beef; veal; lamb; tongue; sweetbread; soups, not thickened; beef tea and broths; poultry; game; fish; cheese; eggs; bread, *in moderation;* greens; spinach; watercress; mustard and cress; lettuce; asparagus; celery; radishes; French beans; green peas; Brussels sprouts; cabbage; cauliflower; onions; broccoli; sea-kale; jellies, flavored but no sweetened; fresh fruit in moderation, without sugar or cream; pickles.

May not eat: Fat bacon and ham; fat of meat; butter; cream; sugar; potatoes; carrots; parsnips; beet root; rice; arrowroot; sago; tapioca; macaroni; vermicelli; semolina; custard; pastry and pudding of all kinds; sweet cakes.

May drink: Tea; coffee; cocoa from nibs, with milk, but without cream or sugar, dry wines of any kind, in moderation; brandy, whisky, or gin, in moderation, without sugar; light bitter beer; Apollinaris water; soda water; seltzer water.

May not drink: Milk, except sparingly; porter and stout; sweet ales; sweet wines. As a rule, alcoholic liquors should be taken very sparingly, and never without food.

Express Atlantic Steamers.

A company is being formed, with a nominal capital of two and a half millions, to work a line of express steamers between Milford Haven and New York. Although certain statements have been made concerning the proposed dimensions of these ships, we may say at once that nothing has been settled concerning this point; the size of the company's steamers is still an open question. The idea is that they will be about 550 feet long, 45 feet beam, and that they will draw about 25 feet when loaded; but these figures must be taken as approximate, as well as the statement that they will carry 5,000 tons of goods and 400 first-class passengers.

Only one point has really been settled, or can at present be settled, but it forms the pivot round which all or nearly all other questions connected with the new ships and their construction must turn. This is their speed, which is to be 20 knots, or about 23 miles an hour. No such speed has ever been attained by any screw steamer of large size; and it has only been reached by a very few paddlewheel yachts on rare occasions. The first ship driven at this speed across the Atlantic will have performed a feat without, for the time, a parallel; and when we bear in mind in what a rapid ratio the resistance of a ship increases with each augmentation of speed, it will be seen that the construction of the proposed express Atlantic steamers presents a tremendous problem for solution to naval architects and engineers.

Calculations have been made, which appear to be accurate, and they go to show that 16,000 indicated horse power, and probably more, will be required to drive a ship of the stated dimensions at 20 knots an hour across the Atlantic. It is very doubtful if the required velocity could be got at all with a vessel with much less than 7,000 or 8,000 tons displacement.

It will be understood that the conditions of the problem are very different from those affecting the design of a torpedo boat. The latter can only attain a high velocity in comparatively still water; but these great Atlantic liners must be driven at full speed through head seas; and sheer dead weight and great length must be present in them to enable them to preserve their way steadily, instead of being constantly checked and beaten off their course by the waves. If large dead weight and great length are necessary, it follows that the engine power must be in proportion; and for these reasons the idea that a small steamer of little power may be made to attain a high speed in a sea like the Atlantic, is well understood by all naval architects and engineers to be futile.

We may thus consider it as certain that engines exerting 16,000 horse power at least will be a necessity in the proposed ships. We have said that these vessels will draw only about 25 feet. They cannot be fitted with propellers of more than about 22 feet or 23 feet in diameter; and it is a very grave question if anything like 16,000 horse power can be sent through such a propeller without great loss. The shallow draught has been adopted no doubt for good reasons, and it may be taken that a propeller of greater diameter than we have stated cannot be used.

Let us suppose, however, for the moment that 16,000 horse power can be sent with economy through a single propeller, and we are face to face at once with the question, Where is a crank shaft to be had which can transmit this power when revolving at a moderate speed?

Making every allowance for the skill of modern smiths, we cannot help regarding it as somewhat doubtful that a trustworthy shaft of the kind can be made. Allowing that steel is to be used, and that the shaft will be built up on the most approved principles, we shall find that many portions of it cannot be less than 2 feet 6 inches in diameter by about 7 feet long. Sound forgings of these dimensions have never yet been produced. The weight of such a block would be when finished nearly 8 tons. It is true that heavier forgings have been made for years, but they have not been solid. We do not assert that a sound crank shaft, with a minimum diameter at any place of 2 feet 6 inches, cannot be made; but we do say that no such shaft has yet been made, and that it will not be easy to produce one. Such a shaft might, perhaps, be depended upon to transmit power safely at the rate of 250 horses indicated per revolution per minute. This means 64 turns per minute to provide for 16,000 horse power, and this velocity implies a great deal more than appears at first sight. If the engines are to be kept down to reasonable dimensions they cannot well have a stroke of less than 6 feet, corresponding to a piston speed of 768 feet per minute.

Considering the enormous dimensions of the masses to be moved at this velocity, it is evident that unusual precautions will have to be taken in arranging the lead and in balancing the engines. Apparently the only type of engine that can be used is that of the Britannic, repeated and modified for the better, either on the system designed by Mr. W. Allen, of Sunderland, for the City of New York; or by Mr. Humphries, of Barrow-in-Furness, for the City of Rome. That is to say, the engines must have at least six cylinders—the three high pressure above the three low pressure, and the main shaft fitted with cranks arranged at 120°.

But the engines of the City of Rome, to indicate 10,000 horse power as a maximum, are probably about as large as engines of the type can be conveniently made; and consequently, unless the builders of the engines of the new steamers are prepared to use cylinders of much greater diameter than those of the City of Rome—namely, 43 inch and 86 inch—eight cylinders, or four engines, will be required. More would be necessary, but the velocity we have named, 64 revolutions per minute, is greater than that of the City of Rome's engines by some 14 or 15 per cent. With six cylinders of 55 inch and 110 inch we think the requisite power might be got, but the strain on the crank shaft would be proportionately augmented. The crank shaft of the City of Rome is built up of hollow forgings of fluid compressed steel; it is 25 inches in diameter, or but 5 inches smaller than the dimensions which we have named as the least possible for those of the proposed boats.

No matter what point of view we regard the problem from, it will be found fraught with doubt and trouble, and we still hesitate to say that a trustworthy shaft can be made to transmit 16,000 horse power at 64 revolutions per minute. It is questionable, however, if this speed will suffice. Making a small allowance for slip, the screw must have a pitch of at least 36 feet, which is fully sharp for a diameter of about 23 feet; a higher velocity would give a lighter engine, a smaller crank shaft, and a better screw. But on the other hand, is it certain that colossal machinery of this kind can be made to work at a much higher speed than 64 revolutions per minute with ease and safety for a week at a time? The experience to be had in men-of-war is of no use whatever in this connection. It is one thing for engines to make a six hours' full power trial, and another to run at full power for a week at a time in all weathers, and to do this month after month without accident or heavy repairs.

All that we have said seems to indicate the use of twin screws instead of a single screw. In this way we should have two 8,000 horse power engines instead of one of 16,000 horse power; but, tempting as the advantages are thus held out by the twin screw system, we hesitate to say they are worth having at the price to be paid for them. Indeed, it is more than doubtful if it be possible to obtain under any circumstances 20 knots with twin screws. They give handiness, no doubt, and they render the use of comparatively light machinery compatible with the development of great power; but none of the great ocean companies have adopted them, and there are objections to their use which are, we think, insuperable.

All things considered, we think engineers will find it more easy to get a sound crank shaft of the required size, than to drive a ship at 20 knots with twin screws. Whether 16,000 horse power can or cannot be used up by single four-bladed propellers, 23 feet in diameter and 35 feet or 36 feet pitch, remains to be seen. Assuming that 50 per cent of the whole power developed is, as is usual in screw ships, wasted, the screw would still exert a thrust of not less than 130,000 pounds, or over 58 tons. It is not easy to see how so enormous a thrust can be got out of so small a propeller. It would be very mortifying if, after the ships were finished, it was found that their screws were quite inadequate to utilize the power of the gigantic machinery which turned them round.—*The Engineer.*

The Coming Bleach.

When Thenard succeeded in adding another equivalent of oxygen to water, converting H_2O into H_2O_2, he had made one of the most brilliant of modern discoveries. Sixty-three years have passed since that event, yet oxygenated water, peroxide of hydrogen, hydrogen dioxide, as the compound has been successively called, is still regarded as one of the most remarkable products of chemistry. Resembling water in its freedom from color and odor, and mingling with it in all proportions, it is distinguished from that liquid by its sirupy consistency and by its higher specific gravity (1·452). When pure it begins to undergo decomposition at 70° Fah., giving off bubbles of oxygen and being converted into water. This change is quickened by the addition of an alkali, and retarded by that of an acid. When dissolved in water it is much more stable, and its aqueous solutions are prepared and sold for medicinal and photographic purposes.

For the preparation of hydrogen dioxide, baryta is still found indispensable, and a clearer conception of the process and its probable cost will be gained if we remember what is the source and what are the properties of baryta. This substance occurs as the sulphate, called heavy spar, in various parts of the United States, notably at Hopewell, New Jersey, on the line of the Bound Brook Railroad, about 30 miles from Philadelphia. When pulverized, mingled with powdered charcoal, and strongly heated, the sulphate of barium becomes the sulphide, and if this be treated with hydrochloric acid and water added, we have a solution of barium chloride. By decanting this and adding a solution of an alkaline carbonate, barium carbonate is precipitated, and if we collect the precipitate and calcine it in a crucible, the oxide of barium—baryta—BaO, results. Now this oxide, when placed in a tube, heated to dull redness, and subjected to a current of atmospheric air, takes up another portion of oxygen, becoming that interesting substance, barium dioxide or peroxide of barium, BaO_2, which, as some of our readers will recall, was brought into use by Tessie du Motay for bleaching silk, feathers, etc., and which is rapidly growing in practical importance.

Powdered barium dioxide, made into a paste with water and put by portions at a time into cold and dilute hydrochloric acid, dissolves without disengagement of gas, yielding barium chloride and hydrogen dioxide. The changes may be thus expressed:

Barium dioxide.		Hydrochloric acid.		Barium chloride.		Hydrogen dioxide.
BaO_2	+	$2HCl$	=	$BaCl_2$	+	H_2O_2

The barium chloride and hydrogen dioxide both remain in solution, and to separate the barium it is precipitated in the form of the sulphate by the careful addition of dilute sulphuric acid, agreeably to the following equation:

Barium chloride.		Sulphuric acid.		Barium sulphate.		Hydrochloric acid.
$BaCl_2$	+	H_2SO_4	=	$BaSO_4$	+	$2HCl$.

The hydrochloric acid thus reproduced now admits of more barium dioxide being added, and the operation may be many times repeated if the vessels are kept cool. If the hydrogen dioxide be required pure and concentrated, the remaining barium chloride is precipitated by sulphate of silver, the solution poured off, and evaporated *in vacuo.* The concentrated hydrogen dioxide is not demanded for industrial purposes. Solutions containing 3·04 per cent by weight suffice for the English market. They are called ten-volume solutions, because 1 cubic inch evolves 10 cubic inches of oxygen when fully decomposed. Twenty-volume and thirty-volume solutions are made in England to order.

It is said that when the Empress Eugenie, who was a blonde, led the fashion, certain dark-haired belles of Paris, anxious to emulate her even in the color of her hair, had theirs bleached to the "golden" tint, by a hairdresser of that city, who employed for the purpose hydrogen dioxide. In London it is used for a like object on dark false hair, which is saturated with a ten-volume solution and then exposed for two or three days, when the oxygen is liberated and the lighter shades are obtained. Hydrogen dioxide effectually bleaches blood serum in one of the processes for obtaining colorless blood albumen. It is also used for cleaning and bleaching oil paintings and engravings, and for bleaching oil, wax, and ivory, especially the last. Of this, the inferior qualities used in Sheffield for knife handles are put first into a solution of sodic carbonate to remove the grease and open the pores; then washed and immersed in a solution of crude hydrogen dioxide containing about 2·9 per cent, to which one-eighth part of strong aqua ammoniæ had been added. This is kept in a warm place for two or three days, when the handles are removed and slowly dried in the air. The deep color is thus removed, and a beautiful pearly-white ivory, when polished, is the result.

The action of hydrogen dioxide in bleaching is to destroy the color directly by oxidizing it, and this, without the introduction of any foreign body into the vat, an action altogether different from that of the principal bleaching agents, sulphurous acid and chlorine. The former does not destroy the coloring matter, it merely combines with it to form a colorless compound which is prone to undergo decomposition and therefore to return to the original color. Chlorine acts only in the presence of water, from which it takes the hydrogen to form hydrochloric acid, leaving the oxygen thus liberated to do the bleaching.

That hydrogen dioxide, either under a true or false name, is employed in the bleaching processes of print works, and that its cost alone prevents its general introduction, there is no doubt. Anticipating its extended use, and recognizing its unrivaled advantages, the *Société Industrielle de Rouen* offers a prize open to competition until the 1st of October, for a process of manufacturing a hydrogen dioxide which shall possess the power to decolorize indigo equal to that of chlorine, and which shall not cost more than ten times as much as that bleach. Left to itself, the perfecting of such an invention may linger for a generation. The prize offered is a gold medal, and the prize winner retains the exclusive right to his invention. This may be all that the Rouen Society can afford to offer, but in view of the great and general benefits to be anticipated from such an invention, the prize should be made international, and societies in Belgium, Austria, Germany, England, and America ought to co-operate with their French sister, and so swell the amount that experts in all nations shall feel the stimulus.—*Textile Record.*

A Remarkable Discovery of Natural Coal Tar.

The Titusville, Pa., *Herald* reports the discovery of a tar-like oil in sinking a well seven miles west of Foxburg, Pa. The oil is jet-black, and has a strong odor like that of "spirits of tar." In its natural state the oil emits on burning a dense black smoke carrying much soot, which suggests its use in the manufacture of lampblack. It is also thought that it may be available in the manufacture of aniline dyes. The *Herald* adds: The strike is certainly an extraordinary one, and as far as we can learn, nothing like it has ever before been known in the history of the oil trade. No other well in or near the vicinity has anything approaching to it. The oil seems to be found in the slate at a depth of 270 feet, and what is the more singular is that, although the drill passes through the same kind of slate and at the same depth in adjacent wells, no such yield as we have been describing has come from any other.

Florida Oranges in England.

London papers are noticing a new American product in the English markets, and, as it threatens no competition with anything raised at home, they seem disposed to give the new comer a hearty welcome. The *Pall Mall Gazette* says: A trial box of Florida oranges, dispatched from Jacksonville, Fla., to this city, arrived in prime condition after a journey of three weeks. Only three oranges were damaged *en route.* The experiment is likely to be repeated on a larger scale, and before long it is quite possible a thriving fruit trade may spring up between England and the Southern States. The supply of oranges in Florida is almost inexhaustible; their quality is said to be much finer than those from the Mediterranean, and if once the trade was established, the time of transit would be materially reduced.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Comfort and happiness after using one bottle German Corn Remover. Price, 25 cts. Sold by druggists.

The clergy, as also the temperance lecturers, use Van Beil's "Rye and Rock" for the throat.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

For Sale.—A Valuable Patent for Photographers' use, or can be manufactured on royalty. Address G. W. Baker, Wilmington, Del.

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

If your boiler requires frequent cleaning, it can be obviated by removing the sediment continuously by circulation to mud drum on top of boiler by Hotchkiss Mechanical Boiler Cleaner. 84 John St., N.Y. Circulars free.

Send to Geo. W. Loss & Son, Fashionable Clothiers, 70 Fulton St., New York, for samples of Cloths, from which they make (men's) garments to order in superior style and workmanship. Business suits from $20 to $30; dress suits from $25 to $40. Samples and fashion plates sent free.

A $20 Breech-loading Shot Gun for $7. The Champion Imported Breech-loading Shot Gun, advertised in this issue by the reliable well known firm of E. G. Rideout & Co., New York, is pronounced by sportsmen to be unrivaled in every detail, well worth $20, and the biggest bargain ever offered in firearms. Order at once, as the offer is only good until July 15.

German Corn Remover—cleanly to use, easily applied, perfectly harmless, but cures every time. 25 cts.

Maker of Forged Taper Keys send address to M. E. Card, Cazenovia, N. Y.

A Business Man would like to make arrangements with some party to handle their goods on commission. Address K., P. O. Box 985, Providence, R. I.

Propellers, 10 to 26 in. Geo. F. Shedd, Waltham, Mass.

Bradford Reduced Oils for Lubricating and Manufacturing Purposes. M. Lewellyn & Co., Olean, N. Y.

For the best Jig Saw Blades, go to Wm. Cuddy, 108 Hester St., New York.

Gardiner's Pat. Belt Clamp. See illus. adv., p. 284.

Portable Railway Track and Cars. Contractors, Planters, Miners, send for circulars. Francis W. Corey & Co., 5 & 7 Dey St., New York; 95 Washington St., Chicago, Ill.

Essay on Inventions.—What qualities will make them profitable, and how to incorporate these qualities in inventions. 25 cts. postpaid. Address N. Davenport, Valparaiso, Ind.

Improved Skinner Portable Engines. Erie, Pa.

"Rival" Steam Pumps for Hot or Cold Water; $32 and upward. John H. McGowan & Co., Cincinnati, O.

Skinner's Chuck. Universal, and Eccentric. See p. 268.

Inventors sending a three cent stamp to Inventors' Institute, Cooper Union, New York city, will receive a copy of the *Industrial News* free.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

The Newell Universal Mill Co., Office 7 Cortlandt St., New York, are manufacturers of the Newell Universal Grinder for crushing ores and grinding phosphates, bone, plaster, dyewoods, and all gummy and sticky substances. Circulars and prices forwarded upon request.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co. 52 Dey St., N.Y.

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Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brookn, N. Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 252.

The I. B. Davis Patent Feed Pump. See adv., p. 269.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 269.

The Sweetland Chuck. See illus. adv., p. 269.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

For best Duplex Injector, see Jenks' adv., p. 269.

Blake "Lion and Eagle" Imp'd Crusher. See p. 284.

4 to 40 H. P. Steam Engines. See adv. p. 286.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 285.

Long & Allstatter Co.'s Power Punch. See adv., p. 285

Eclipse Fan Blower and Exhauster. See adv., p. 285.

Peck's Patent Drop Press. See adv., page 300.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Turbine Wheels; Mill Mach'y. O.J.Bollinger, York, Pa.

For Mining Mach'y, see ad of Noble & Hall, p. 301.

Silica Paints (not mixed); all shades. 40 Bleecker St., N. Y.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Wren's Patent Grate Bar. See adv. page 300.

Brass & Copper in sheets, wire & blanks. See ad. p. 300.

The None-such Turbine. See adv., p. 286.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

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Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Blake's Belt Studs are the best fastening for Rubber and Leather Belts. Greene, Tweed & Co.

Houston's Four-Sided Moulder. See adv., page 301.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 300.

New Economizer Portable Engine. See illus. adv. p. 301.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 301.

For Light Machinists' Tools, etc., see Reed's adv., p. 301.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

Saw Mill Machinery. Stearns Mfg. Co. See p. 300.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Saunders' Pipe Cutting Threading Mach. See p. 301.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. C. Toope & Co., M'f'g Agt., 353 E. 78th St., N.Y.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Walrus Leather. A choice lot for Polishing Metals. Greene, Tweed & Co., 118 Chambers St., New York.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Green River Drilling Machines. See ad. p. 286.

Akron Rubber Works, Akron, O., Manufacturers of Mechanical Rubber Goods.

For Machinists' Tools, see Whitcomb's adv., p. 301.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) A. S. writes: One of your correspondents asks for a cure for warts. Some years since a corn doctor advised me to use coal oil. My hands were covered with them. Having little faith I tried it, putting a drop on each of common kerosene and letting it absorb; where there was a hard crust, scraping it to facilitate absorption. In a fortnight, after twice daily treating them thus, they began to lessen, and finally disappeared without scar. Then the right hand, in part, leaving one which remained after all others had passed away, and then that one. Have advised others to try it, with like effect, on persistent use. Simply softened the top, dropped the oil on, and let it be, for some minutes, to absorb. Let S. R. B. try it; it may relieve.

(2) S. L. J. asks (1) for a receipt for good black ink. A. For black inks see "Inks," SUPPLEMENT, No. 157. 2. For good black or blue black writing fluid. A. For blue-black writing and copying ink—Blue Aleppo galls, free from insect perforations, 5½ oz.; bruised cloves, 1 drachm; cold soft water, 3½ pints; purified sulphate of iron, 1½ oz.; sulphuric acid by measure, 35 minims; sulphate of indigo in the form of a thin paste, and which should be neutral or nearly so, ¼ oz. Digest together in a closed vessel, with occasional agitation, for two weeks, the galls, cloves, and water. Then filter the liquid through a piece of cotton cloth, and press out as much of the liquid as possible from the sediment. Dissolve in this completely the powdered sulphate of iron, stir in briskly the acid, then the indigo, and filter the liquid through the paper (filter paper).

(3) E. H. R. asks: Can I clean silver ware—tea set, etc., in daily use, with receipt given in answer to W. H. P., page 251 (32), and how can I keep the silver clean? A. No. Cyanide of potassium cleans silver readily, but it is very poisonous and consequently dangerous to use for such purposes or to have about the house. Lacquer or varnish is never used on such articles. The best way to clean domestic silver ware is to lightly scour it with a little fine whiting or tripoli moistened with sweet oil (olive oil). This is washed off by dipping in a strong hot solution of washing soda, then in clean hot water, on removing from which it dries quickly without rubbing. 2. What is used to stiffen washed lace and make it look new? A. Very thin clear starch or gum water.

English Patents Issued to Americans.

From April 8 to April 12, 1881, inclusive.

Carding machinery, J. Pollitt, Philadelphia, Pa.
Design, process of producing, I. S. Hyatt, U. S. A.
Ivory, imitation of, I. S. Hyatt, U. S. A.
Lead pencils, B. A. Fiske, Naperville, Ill.
Locks and staples, G. M. Hathaway *et al.*, Jersey City, N.J.
Powdered substances, manufacture of articles from, I. S. Hyatt, U. S. A.
Shoe fastening, T. L. Jacobs, New York city.
Shoe machinery, D. C. Knowlton, Boston, Mass.
Spectacles, R. A. Carter, New York city.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending April 12, 1881, AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Abdominal supporter, S. A. Drewry 239,943
Acid, preparation of hydrochloric, E. Solvay 240,196
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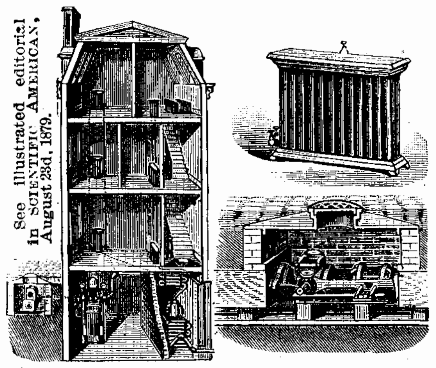

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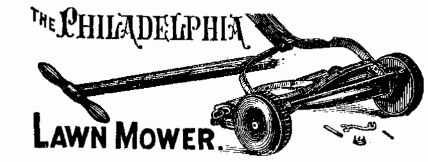

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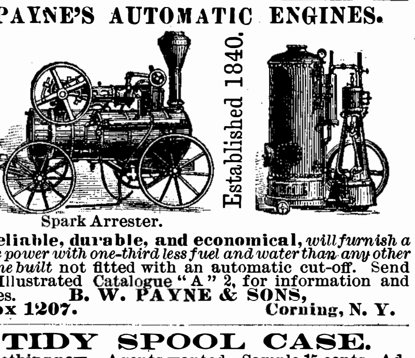

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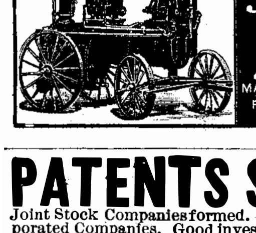

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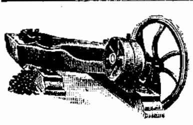

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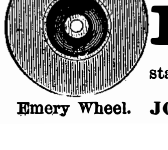

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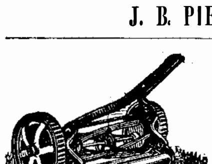

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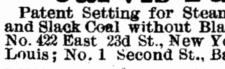

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