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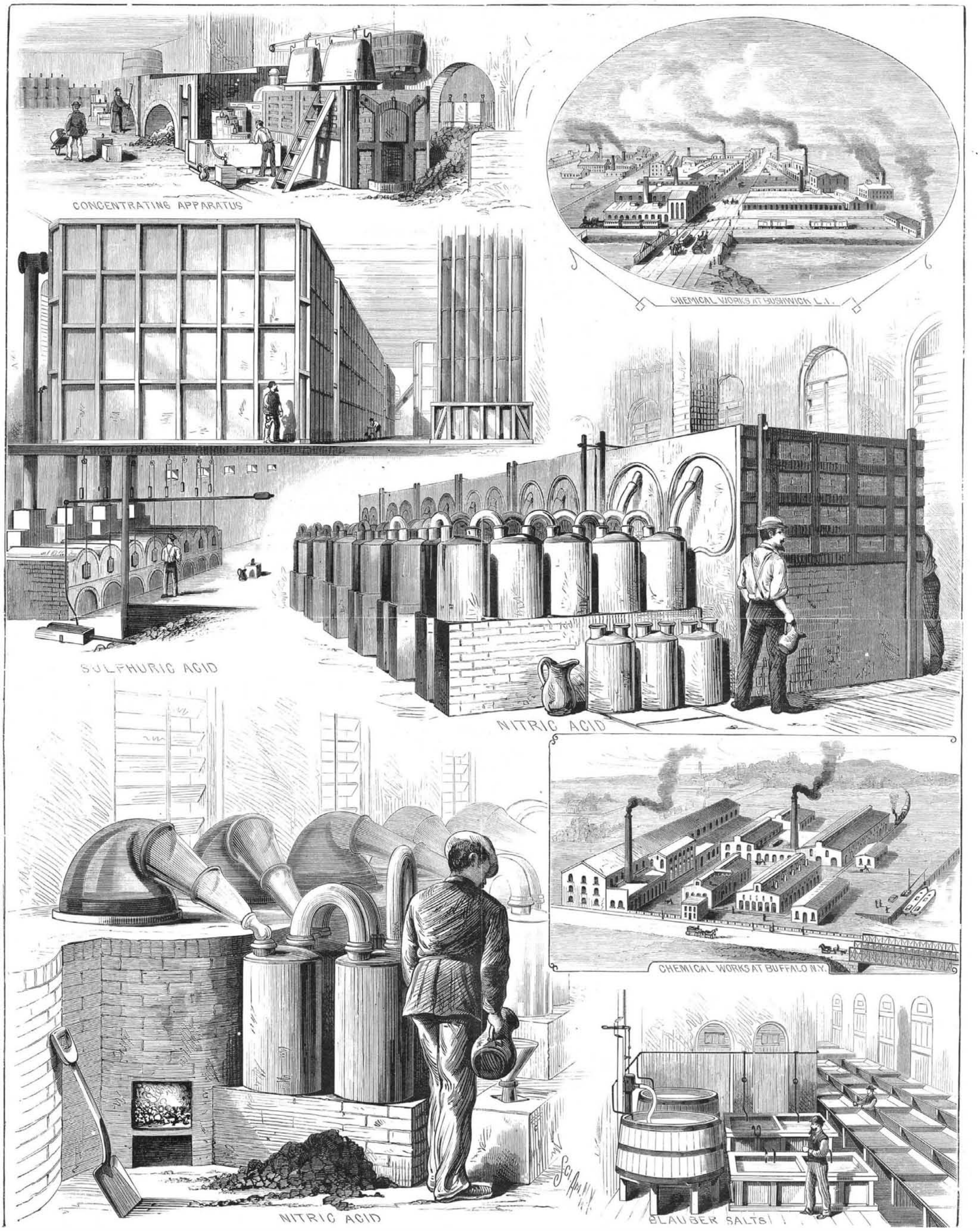

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AMERICAN MECHANICAL ENGINEERS.

The first annual meeting of the American Society of Mechanical Engineers began in this city November 4. About sixty members were present. Prof. R. H. Thurston, of Stevens Institute, presided. The secretary reported an enrollment of two life members, one hundred and sixty-one active members, seventeen associates, and nine juniors. The president submitted the following list of papers to be read before the society:

"Friction as a Factor in Motive Power Expenses," Prof. John E. Sweet; "An Adaptation of Bessemer Plant to the Basic Process," Prof. Holly; "Measurement of the Friction of Lubricating Oils," C. J. H. Woodbury; "Strength in Machine Tools," Charles T. Porter; "The Efficiency of the Crank" and "Adjustment of Cushion in Engines," S. W. Robinson; "A New Type of Regenerative Metallurgical Furnace," Prof. Reese; "Standard Screw Threads," George R. Stetson; "On Practical Methods for Greater Economy of Fuel in the Steam Engine," Allan Stirling; "Putting a New Crankpin in the Crank of the Steamship Knickerbocker," Lewis Johnson; "Mechanical Correctness," Charles A. Hague; "Packing for Piston-rods and Valve-stems," Prof. Lyne; "Study of the Mechanical Theory of Heat," Prof. Wolff; "The Metric System—Is it Wise to Introduce it into Our Machine Shops?" Coleman Sellers.

The first session was devoted to the first and the last paper on the list, Professor Sweet leading by special request made in consideration of his eminent services in connection with the organization of the society. Mr. Sellers took strong ground against the adoption of the metric system as ill-adapted to the use of machinists.

The president's address was delivered in the evening. In it Professor Thurston reviewed at considerable length the conditions and professional needs which had led to the organization of the society, and spoke of its objects, purposes, and prospects. He said:

"The class of men from whose ranks the membership of this society is principally drawn directs the labors of nearly three millions of prosperous working people in a third of a million mills, and other manufactories are responsible for the preservation and profitable utilization of $2,500,000,000 worth of capital, direct the payment of more than $1,000,000,000 in annual wages, the consumption of $3,000,000,000 worth of raw materials, and the output of $5,000,000,000 worth of manufactured products. Fifty thousand steam engines, and more than an equal number of water-wheels at their command, turn the machinery of these hundreds of thousands of workshops that everywhere dot our land, giving quietly and docilely the strength of 3,000,000 of horses, night or day, or all night and all day, whenever the demand comes for their wonderful power. This society, when it shall have become properly representative of such a class, may well claim position and consideration. We are now called upon to do our part in the work so well begun by our predecessors, and so splendidly carried on by our older colleagues during the past generation. We have for our work the cheapening and improvement of all textile fabrics, the perfecting of metallurgical processes, the introduction of the electric light, the increase of facilities for rapid and cheap transportation, the invention of new and more efficient forms of steam and gas engines, of means for relieving women from drudgery and for shortening the hours of labor for hard-working men, the increase in the productive power of all mechanical devices, aiding in the great task of recording and disseminating useful knowledge; and ours is the duty to discover facts and to deduce laws bearing upon every application of mechanical science and art in field, workshop, school, or household."

Following the President's address was a debate on the paper read by Prof. Sweet at the first session; after which Mr. Holly read the second paper on the list. He said that the Bessemer plant in use in America produced twice as large results as the plant in Germany, France, and Belgium, partly, he thought, because our plant was of better make and partly because it was more skillfully worked in this country.

The session closed with the reading of a short paper by Mr. Chas. T. Porter upon "Strength in Machine Tools."

ELECTRIC DISCHARGES FROM ANIMALS AND MEN.

In a recent communication Mr. Jacob Thompson, of Benicia, Cal., describes an interesting exhibition of electric action observed by him on the evening of Oct. 11. For the first time for several months the wind was blowing a pretty stiff breeze from the northeast, the regular summer wind of that part of California coming from the west. With the change of wind there was a marked change from the humid air of the ocean to the dry atmosphere of the interior, with a corresponding change in the electrical condition of the air. This was especially manifested in the appearance of horses and mules, whose hair stood out in all directions, the long hairs of their tails spreading out like a brush. When Mr. Thompson brought his hand near the diverging hairs, the brush of hair was strongly attracted by the hand, and a very perceptible electric discharge was felt, attended by a crackling noise. The appearance was first noticed about half-past four, and continued until six o'clock or later. Never having noticed the appearance before, Mr. Thompson thinks it cannot be very common in that region.

It is the first time, so far as we know, that the phenomenon has been reported from a point so near to and so near the level of the sea. In a recent note to the French Academy, M. Amat mentions a number of observations of a similar kind, made by him while traveling in Algeria, between Djelfa and Laghouat, among the Atlas mountains. M. Amat says that he has frequently drawn large sparks from the hair of his horse by means of his pocket comb. The best results were obtained in dry weather in the evening, between 7 and 9 P.M. If the hair was a little moist, or the sky cloudy, no sparks or cracklings could be got. Animals, and especially horses, present in a higher degree than man the power of exhibiting these discharges. Travelers on the high plateau of Central America have remarked that the coats of their horses discharge sparks under the brush or currycomb; and in South Algeria it is common to see the hairs of the tail so much alive with the electric forces that they diverge from the center. On stroking the tail by hand distinct crackling sounds may be heard, especially during the day. One reason why man accumulates less electricity than the horse is perhaps that the horse is better insulated on his horny hoofs. Animals, however, do not seem to be alone in such electric manifestations.

It appears from a recent report by another African traveler, Mr. A. W. Mitchinson, that the natives of West Central Africa are quite susceptible of electric excitation. One evening, while disciplining a native with a cowhide whip, he was astonished to see sparks produced, not by a blow between the eyes, as would have happened in a more civilized country, but by the action of the whip on the native's naked skin. He says he was "still more surprised to find the natives themselves were quite accustomed to the phenomenon." Evidently their habits of scientific observation are much more advanced than their habits of scientific investigation, or they would have improved the opportunity to discover whether sparks could be brought under like conditions from a white man's skin. Mr. Mitchinson subsequently found, he says, that a very light touch, repeated several times, under certain conditions of bodily excitement and in certain states of the atmosphere, would produce a succession of sparks from the bodies of native men as well as native cattle.

During electric storms mountain climbers not unfrequently find themselves highly charged; and we have seen the same appearances, in a lesser degree, among the Adirondacks during extremely cold weather.

A NEW SYSTEM OF APPRENTICESHIP.

The difficulty in getting thoroughly qualified machinists, and the practical failure of the old system of apprenticeship, have led a manufacturing firm in Springfield, Mass., to devise a new plan, involving both school and shop work. For beginners, under twenty years of age, the term of apprenticeship is fixed at six years. In this time it is believed that an apprentice will be able to acquire the theoretical and practical knowledge needed to make him a first-class journeyman. Those who are over twenty years of age are allowed to finish their apprenticeship in five years, and those who have worked in a shop are advanced according to proficiency. The beginner is first put to drawing from sketches, then takes up projection and diagram, and advances regularly according to his ability. It is believed that in this way one year will qualify him as well to work from drawings as four or five years ordinarily. All applicants are taken from four to twelve weeks on trial, and if not satisfactory are then dismissed. For the first year's labor five cents per hour is paid to those under eighteen, six cents to those who are eighteen, and seven cents to those who are twenty and upwards; for the next years the rate is advanced to six, eight, ten, eleven, and twelve cents. The firm also pay two cents per hour additional into a reserve fund, which is paid to those apprentices who finish their full term of service; for the six years this amounts to $400.

The organizers of this scheme, Messrs. Richards & Dole, propose to require of each apprentice fifty-eight hours a week of shop work and nine hours of study. This, we are inclined to think, is too much work and too little study to secure the best results, especially with the younger apprentices. Still the plan is well worth a fair trial. It is said that the applicants for apprenticeship already exceed the number that can be taken, which speaks well for the plan and for the young mechanics of Springfield.

The London International Milling Exhibition.

An international exhibition of flour mill machinery, under the auspices of the National Association of British and Irish Millers, will be held in London in the early part of May next. It will be especially devoted to the means and method of modern milling. The secretary of the association makes the curious announcement that "it is not the intention of the council to attempt in the present experimental stage of the milling industry anything in the way of prizes or medals for machines. Ample steam power will be provided, so that each maker may be able to show the results he may promise, and every facility will be afforded visitors to use their own judgment, unfettered by any official recommendation."

Influence of the Mississippi Improvement.

The effect of the jetty improvements at the mouth of the Mississippi River, in extending the commerce of the Mississippi Valley, is already very great. Since the beginning of this year St. Louis has shipped to Europe, by way of New Orleans, twice as much grain as passed out of the country by that route during the first ten months of last year. The shipments down the river would be still greater were it not for the lack of barges to carry the grain. It is said that a fleet of boats are being built to supply the want.

THE EXPANSION OF STEAM.

BY PROFESSOR R H THURSTON.

A correspondent writes me asking the following question, and requesting me to reply by sending an article to the SCIENTIFIC AMERICAN, "which," as he says for himself and shopmates, "we all read, and where we shall all be sure to see it:" "What *is*, really, the proper point of cut off in steam engines to give maximum economy in dollars and cents?" . . . .

"Some people say one thing and some another. In your History of the Steam Engine, page 475, you say about one-half the square root of the steam pressure is about right 'in general;' and a writer in the *Journal of the Franklin Institute*, for June, who ought to understand the matter, says that the steam pressure divided by the back pressure gives the number of times to expand to secure maximum efficiency.

"Now, your rule would give, for a Corliss engine with 90 pounds of steam, a cut-off at one-fifth, while the last would make it one-seventh. Then again, for an old-fashioned engine with condenser, cutting off steam at 25 pounds, your rule makes it about one-third, and the other says one-fifteenth or even one twentieth, which I know by experience cannot be right."

Ans. The point of cut-off giving maximum economy in steam engines is never precisely the same in any two engines. It will vary with every change of type, with every change of pressure of steam, with every difference in piston speed, and even in two engines built from the same drawings and made from the same patterns, the degree of expansion being the same, the two machines will demand different quantities of steam.

Could all the conditions affecting the expenditure of heat in the production of power be made absolutely invariable, the point of cut-off for maximum efficiency could be determined for those conditions—not by calculation, but by experiment; and it would remain the same just as long as those conditions could be maintained absolutely the same. But this never occurs in practice.

Steam enters the cylinder sometimes barely dry, sometimes superheated, sometimes damp with watery vapor, and often mingled with water to the extent of ten or twenty per cent; it even sometimes carries with it more than its own weight of water. It sometimes comes in contact with hot and nearly dry metallic surfaces, which aid in keeping it in a state of maximum efficiency; but it oftener, in fact usually, meets an interior filled with damp chilling vapors and surrounded by walls cool enough to condense a considerable part of the steam supplied up to the point of cut off. During expansion the steam never follows precisely the law of expanding permanent gases—with which the pressure diminishes precisely in the proportion in which volume increases—but, by condensation at first and by re-evaporation later in the stroke, the expansion line falls below at first and then rises above the curve expressing Mariotte's and Boyle's law, although frequently approaching that curve pretty closely. If the engine speed increases the steam is usually less affected by causes producing loss; if the speed decreases a loss of economy generally ensues. Large engines are less subject to such losses than small ones, and every reduction in the amount of engine friction permits a closer approximation to theoretical conditions.

It is easy to determine the proper point of cut-off for any defined set of conditions provided they are such as can be mathematically expressed, and the larger the engine, the hotter the steam used, the higher the piston speed, the less the friction, and the more perfect the system of lagging and steam jacketing, the more nearly will the actual correspond with the estimated value; but the theoretical rate of expansion is rarely very nearly attained in our very best practice, and experience shows that we must usually content ourselves with a vastly smaller degree of economy by expansion than would be mathematically predicted.

Instead of cutting off at one-twentieth when using steam at 45 pounds pressure in a single cylinder condensing engine, we find that a cut-off of at most one-fourth gives, in practice with ordinarily good engines of moderate size, the best results.

In handling non-condensing engines of two or three hundred horse power, with steam at 60 to 90 pounds and a speed of piston of about 500 feet per minute, and using the standard forms of "drop cut-off" familiar to American engineers, we can barely gain by expanding more than five times.

"In general," taking engines of the best makers, as I have known and handled them, the best results have been, so far as I have observed them, obtained by expanding as many times as is represented by the product of one-half into the square root of the steam pressure in pounds on the square inch measured from the vacuum line, that is, $E = \frac{1}{2}\sqrt{P}$.

As pressures increase the benefit of condensation decreases, and it happens that this rule applies pretty closely both to the old-fashioned condensing steam engine with low steam, and to the modern American type of high pressure "automatic" cut-off engine.

Sometimes an engine is found to give maximum economy when expanding fifty per cent more, that is, $E = \frac{3}{4}\sqrt{P}$.

No *theoretical* determination of the proper point of cut-off has ever been made that is of any service to the engineer. In "compound" engines of large size and high speed expansion can be carried much farther than in the older forms with single cylinder; but even they depart very greatly from the conditions assumed in calculation.

It thus happens that the benefit of expansive working has a limit which is very soon reached, and that the most radical practice, in which condensing engines are driven by steam of 450 pounds pressure, instead of expanding a hundred times, as would be indicated as proper by the purely mathematical analysis referred to by my correspondent, is limited to an efficient expansion of about twenty times, and probably gives best results with still less expansion. The fact is that no device yet invented has ever given even a rough approximation to the efficiency indicated on purely theoretical grounds.

We are gradually learning more and more about the behavior of steam in the engine, and are in our every-day practice, as illustrated by the best builders, keeping very close to what is, all things considered, the line of true economy.

Single cylinders are still doing, at their best, about the same work as the best compound engines, and are rarely made to expand, when condensing, nearly to the back pressure, and the best non-condensing engines hold the expansion line at its termination well above the atmospheric line. To double the rate of expansion in these engines would increase the weight and frictional resistances per horse power developed to so great an extent that this consideration alone forbids maximum expansion.

Steam jacketing and moderate superheating the steam are always sources of economy. A good single cylinder engine, with thorough steam jacketing, has been known to give an economy that is generally considered excellent at as low a rate of piston speed as 100 feet per minute, the coal consumed being but two pounds per horse power per hour.

Increased steam pressure benefits usually, but has its limits. I have known an engine of reputation, working with 250 to 300 pounds of steam, to require over $2\frac{1}{2}$ pounds of good coal per hour per horse power, and its steam jacket proved quite unequal to the task of checking internal condensation. I have no doubt that a "longer cut-off"—the steam was expanded only one-half as much as unchecked calculation would dictate—would have been better, and, *perhaps*, a less piston speed would have made the steam jacket more effective.

All these matters must be finally settled by experience.

LONDON FOGS.

The dense fogs which so frequently convert London day into night, while the surrounding country is bright with sunshine, are commonly attributed to the smoky coal which London burns; and it has been proposed to import Pennsylvania anthracite as a remedy. Doubtless smoke has something to do with the density and blackness of London fogs; but we very much doubt the possibility of largely dispelling them by any change of fuel. It is, we believe, not so much the smoke of London fires as the great volume of water vapor which they produce that serves as the primary cause of the fogs. A necessary product of combustion is water; and the million or more fires of London must send into the air of the city enormous volumes of heat vapor in addition to the steam of boiling water incident to cooking, manufacturing, and similar operations.

While the atmosphere of London is thus being kept at the point of saturation, the manner in which the city is laid out prevents any free passage of wind to sweep away the superabundant moisture. London is made up of a congeries of towns scattered over a hundred square miles or more of area, each with its peculiar net-work of streets and roads, and all grown together into such a snarl of passages, all short and nearly all crooked, that a hurricane would be confused and lost in an attempt to pass through the city. No other large city in the world bears any comparison with London in this respect. All other large cities have long thoroughfares through which the winds can sweep their entire length or breadth. In most cities such avenues are not only long and broad but measurably straight. The nearest approach to such a thoroughfare in London begins at Shepherd's Bush and runs along the Uxbridge road, down Oxford street to Holbert Viaduct. This allows the west winds to penetrate to the very heart of the metropolis, and it is a fact well established by observation that this route is singularly free from fogs.

The native Londoner is apt to deride the chess-board plan of most American and many European cities, with streets crossing each other at right angles and running in monotonous straight lines, mile after mile. This plan may not lend itself so readily to architectural effects as the short and tangled streets of London, but its sanitary and commercial advantages are beyond question. It may be that after all is said and done London may have to choose between enduring an almost ever-present fog or the breaking up of its beloved labyrinths by cutting broad and straight avenues, in various directions, across the length and breadth of the city.

Oyster Canning in New Orleans.

The oysters of the Gulf coast are not only very abundant, but also, if their local reputation is just, of exceedingly fine flavor. It is gratifying to note that an enterprising firm in New Orleans has undertaken the development of this long neglected source of wealth, and has set up a canning establishment with the intention of disputing with Baltimore for the oyster trade of the South. Morgan City, commanding as it does the famed Lake Pelto oysters. is also spoken of as a good site for an oyster cannery. Another promising location is Lock Port, or some point further down on Bayou Lafourche.

THE BUTLER COLLIERY FIRE.

On several occasions notice has been taken in this paper of the fire in the upper vein of the Butler Colliery at Pittston, Pa., which has now been burning for four or five years. Many attempts have been made to extinguish the flames, but without success. At present the plan of Mr. Conrad is being tried. The plan contemplates nothing less than the isolation of the burning mine by means of a broad open trench around the area of fire. In some places this ditch has to be nearly if not a hundred feet deep, and correspondingly wide. At one place, owing to the elevation and the rapid progress of the fire in that direction, a tunnel about a hundred yards in length was dug instead of an open trench. There was some danger that the fire might pass over the tunnel by or through the strata of impure coal overhead, and so reach the workings beyond; but although the fire is raging fiercely at this point it is hoped that its further progress will be stopped. A *Herald* correspondent says that just now the greatest danger is that encountered by the miners who are working the second vein, directly under the burning mine. The heat is so intense that the men are compelled to work in chambers almost naked, and the sulphurous nature of the atmosphere has prostrated many of their number within the last year, while several have been compelled to quit and seek work elsewhere. A few months ago the water from the roof came down upon them boiling hot, and after Mine Inspector Jones visited the scene he caused a suspension of operations and had an air shaft sunk outside the burning area so as to introduce a fresh supply of air to the workmen. But even this is ineffectual now owing to the terrible heat overhead, and again the sulphur and caloric are unbearable. Men are in peril of their lives every time they fire a shot, and in some places it is impossible to blast because of the sulphur and great volumes of dangerous gases generated from above. The vein of coal being worked at present is so intensely hot at some places as to be unbearable to the touch, and frequently the workmen are compelled to let the coal lie for hours before they can land it on the cars, owing to its blistering heat.

Georges Pierson.

In the untimely death of Georges Pierson, in Paris, lately, France loses a brilliant genius and a hard working scientific student. Four years ago he commenced a vast series of researches and experiments upon the natural rhythm of many languages and succeeded in discovering and establishing highly important relations, hitherto unknown, between rhythm and melody—*i. e.*, between the rapidity of vocal music and its modulations. These laws once established and systematized, he was naturally led to apply them in elucidation of the fundamental basis of harmony itself, and found that they constitute a new and perfect theory of harmony, without any of the manifold irregularities and exceptions which encumber all previous theories. It amounted, in fact, to the creation of one more exact science, and the world will soon have the opportunity to test the claims made on M. Pierson's behalf by some of the most competent authorities, his work on "The Natural Rhythm of Language" being announced for speedy publication at the expense of the French Government. M. Pierson had gained renown as a philologist in the course of his studies on the philosophy of music, and had been offered a professional chair in the Dutch University of Groningen on the recommendation of Ernest Rénan. He had been employed by the Department of Public Instruction upon scientific commissions in Austria, and had been tendered his Algerian appointment in the hope that the climate of the colony would restore his health, shattered by too constant labor. He died at the early age of twenty-nine years.

Culture of Food Fishes.

Mr. Eugene G. Blackford, of this city, one of the New York State Fish Commissioners, has just received from the United States Fish Commission one thousand German carp for gratuitous distribution in New York State. These carp were brought from Germany three years ago, and placed in the national carp ponds at Washington, D. C.

From them were raised last year 60,000 young fish, which were distributed throughout the United States. This year they have produced 300,000, which are in process of distribution. Some sent last year to the Brooklyn ponds have weighed two pounds and upward. This is a remarkable growth, trout taking as long as four years to attain the same size. Of the one thousand in Mr. Blackford's possession, each applicant having a suitable pond is entitled to five pair, which will be sent on receipt of a proper vessel for transportation with expressage prepaid.

To illustrate the rapid growth of these fishes, a gentleman placed one dozen carp, measuring from three to four inches in length, in a muddy pond on Orange Mountain, N. J., last July. A few days ago the pond was drawn off and the fishes were captured. They had attained the extraordinary growth of fifteen inches within four months.

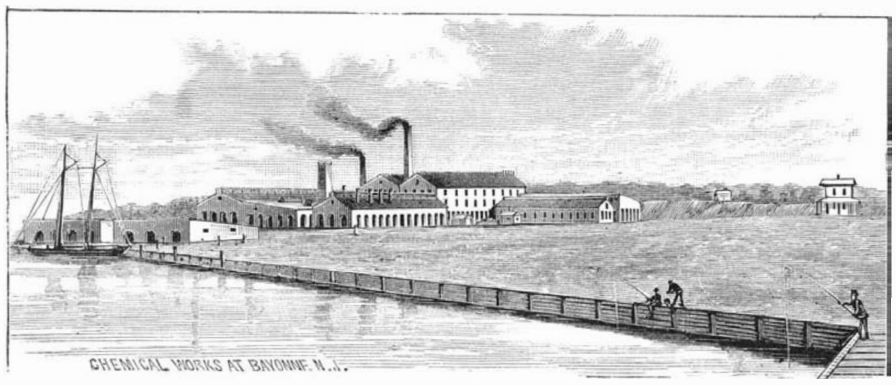
Borax to Prevent Mildew.

We understand that experiments lately made by Whewell, of Blackburn, on the employment of borax for preventing mildew in cotton goods, show that it cannot be employed with flour paste, as it turns the paste yellow. It can be used with advantage with farina, as it does not color the paste, and also increases its tenacity. A six per cent solution can be employed, which, at the present price of borax, namely, £65 per ton, is equal to about £4 per ton.—*Textile Manufacturer.*

AMERICAN INDUSTRIES.—No. 60.

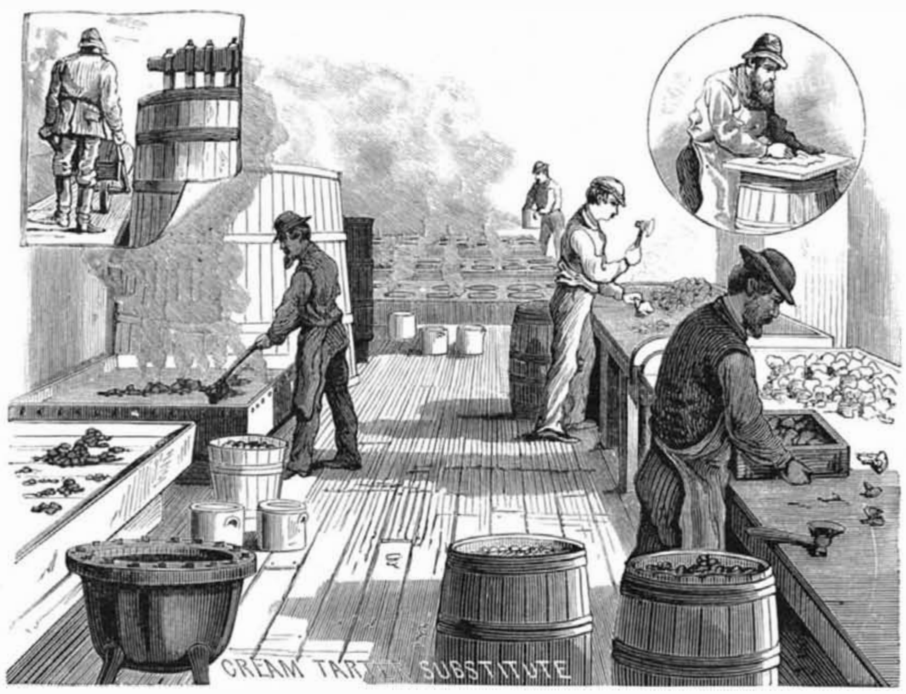
THE MANUFACTURE OF CHEMICALS.

Great as have been the advances of late years in chemical knowledge, and important as have been the relations of this science to many of the most signal discoveries and inventions of modern times, we fear that some of its most simple principles are even yet as an almost unknown world to many otherwise very intelligent members of the community. As the changes caused by chemical action are not generally accompanied by sensible motions, so that we can see their effects as in ordinary mechanical operations, even the broad truths by which so many of the phenomena of every day life are explained, involving as they do a knowledge of the composition of air and water, the elements of matter, the laws of heat, electricity, etc., appear to many only in a sort of dim and misty horizon, as it were, in which the most incongruous and the simplest of demonstrated facts are thrown together in inextricable confusion. To most people, therefore, even the symbols of chemical nomenclature, designed to simplify and render exact the accounts of such changes, are but a stumbling block, and are usually passed over in reading, as would be a quotation from the Arabic or Chinese. For these reasons, no less than for its great importance as a branch of American industry, the illustrations we herewith give of the manufacture of chemicals, as carried on at the works of Martin Kalbfleisch's Sons, the largest establishment of the kind in the country, cannot fail to command particular attention, the more especially as their productions are used in nearly every manufacturing town in the country, and these or similar articles constitute an indispensable part of the stock of every chemist.



CHEMICAL WORKS AT BAYONNE, N.J.

The principal article made at this establishment consists of sulphuric acid, or oil of vitriol, it being usually classed as sulphuric acid when about 58 to 60 degrees strength, while all of the product shipped as oil of vitriol must come up to 66 degrees. But the economical manufacture of this one article, in a large way, almost necessarily involves the production of some of the other acids, and gives such great advantages in the making of several of them that their manufacture may be considered as closely correlative branches of one industry, the processes being to a great extent similar, and the product or refuse of one being a necessary component of the other. The celebrated German chemist, Dr. Rudolf Wagner, describes sulphuric acid as holding the same relations to chemical work in the industrial world as iron holds to the mechanical department thereof. In this establishment we see a good exemplification of the truth of the statement, for sulphuric acid is largely used, directly or indirectly, in all the other productions of the company, which include muriatic and nitric acid, aquafortis, alum, blue vitriol, aqua ammonia, muriate of tin, tin crystals, and sulphate of zinc. The works were originally started in 1829, with one small factory for the production of sulphuric acid, but there are now five factories for this branch of the business, besides those devoted to the other specialties, the buildings and yards covering about twenty acres of land on Newtown Creek, at a point which can be reached by vessels drawing nine feet of water, but yet within the city limits of Brooklyn, N. Y. The firm also have extensive works of a similar character at Bayonne, N. J., and Buffalo, N. Y., with which localities they have thought it best to divide their business on account of its rapid growth of a few years past.



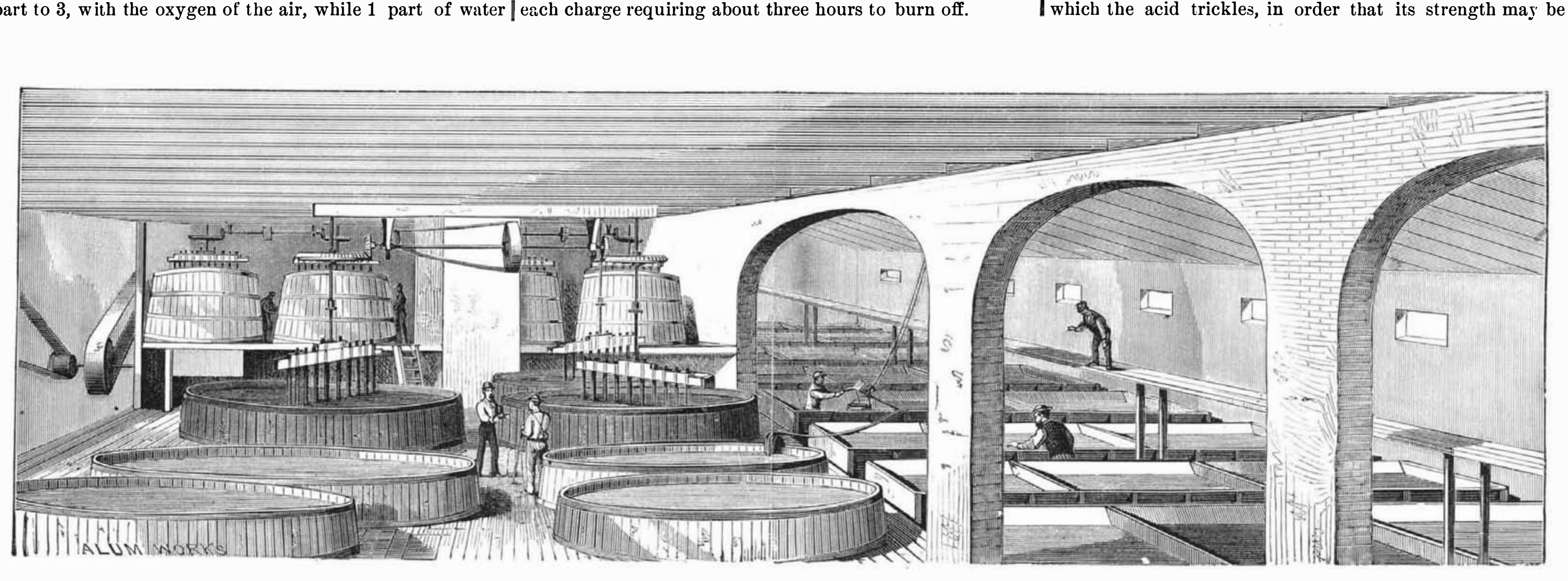
CREAM TARTAR SUBSTITUTE.

The making of sulphuric acid consists, in brief, in so burning sulphur as to unite its vapor, in the proportion of 1 part to 3, with the oxygen of the air, while 1 part of water in the receiving chambers (this water also contributing its 1 part of oxygen) will be saturated therewith. These proportions must be absolutely obtained, or we do not have sulphuric acid, which is represented by the chemical symbols, H_2SO_4, meaning water (H_2O) 1 part, sulphur 1 part, and oxygen 3 parts. With 1 part less of oxygen we shall have sulphurous acid, represented by SO_2, instead of sulphuric acid. The sulphur burned here comes principally from Sicily, where are the largest deposits in the world, it being an almost constant product of active volcanoes, and in all the factories about twenty tons a day are used. The oven-like furnaces in which it is burned are arranged side by side, with large flues at the back to conduct away the vapor; the door at the front is sufficiently loose to admit enough air to form, in combination with the sulphur vapor, sulphurous acid, and the size of the flue singly, or where two or more are joined together from different ovens, must be of corresponding capacity. The sulphur furnace has an iron bed plate instead of grate bars, and, before the manufacture has been put under way, the furnaces must be heated up by fires thereunder, after which the burning sulphur consumes itself, care being necessary to prevent too great heat, which is prevented by the moderate admission of air under the bed plate. After the furnaces are once in thorough operation they are kept going continuously, day and night, the year through. The charge of sulphur is put in by weight, and consists of from 60 to 75 pounds, according to the size of the furnace, each charge requiring about three hours to burn off.

The flues to conduct the sulphur vapor from these furnaces are great lead pipes, leading to immense leaden chambers above, where the vapor is hydrated and oxidized. The latter part of the work, or imparting to the sulphur vapor the necessary proportion of oxygen, may be practically effected in a great many ways, and there are important variations of detail in the processes followed by different establishments, but, in the manner it is commonly effected, through the agency of sodium nitrate, or Chili saltpeter, chemists are even yet divided in opinion as to the precise nature of the various reactions through which the actual results are always definitely obtained. The niter, which is used in exact proportion to the amount of sulphur burned, may be put in a pot, covered with vitriol, in the furnace where the sulphur is burned; here it will be converted into nitric acid, which, on passing into the leaden chambers, in the presence of sulphurous acid, air, and water, is changed into nitrogen trioxide, and freely gives up most of its oxygen to oxidize the vapors there and convert the sulphurous into sulphuric acid. In such establishments as that of the Messrs. Kalbfleisch, however, where the manufacture of nitric acid separately forms a distinct branch of the business, this plan is not followed, but the specified quantity of nitric acid required is introduced directly into the leaden chambers, instead of being made in the furnaces where the sulphur is burned.

The leaden chambers required for the oxidizing of the sulphur vapor are on an immense scale, as may be readily seen from our engravings. They are in a series, generally of five chambers for each set of furnaces, though less may be made to answer with interior curtains or divisions. The capacity of some of these chambers is enormous, amounting to 100,000 cubic feet, or large enough to completely inclose two or three good sized city houses. Lead is used in their construction because it forms a durable material on which the acid has but slight effect. The sides and top are sustained by a framework of wood, to which the sheet lead is held by leaden straps, and, as no solder can be employed in joining the sheets, the joints are made by melting the edges together.

The vapors from the sulphur furnaces, as they pass upward toward the large leaden chambers, have their draught somewhat accelerated by jets of steam in the same direction, and similar jets also furnish steam inside the chambers ready to combine with the sulphurous acid fumes. Nitric acid may also be placed here, in jars, supplied regularly from the outside, or it may be introduced through a system of siphon tubes, the object being to have such a constant movement of the acid as will present its surface many times to the sulphurous vapors, to which it gives up its oxygen for the formation of sulphuric acid. The usual way, however, is to first bring the sulphur vapor into direct contact with the nitric acid in the second chamber of the series, after it has passed there through a tube low down in the first chamber, and then, it having been largely hydrated by the steam jets to which it has been exposed, it rapidly takes up an excess of nitric acid, and the whole is taken back by a tube from the bottom to the still lower bottom of the first chamber, where it is exposed to the fresh mixture of gases, and gives up a large portion of the nitric acid. From this chamber the acid is conducted into the bottom of the third chamber, where all of the acid produced is collected. This chamber is lower than the others, and in order to complete the mixing of the gases therein several jets of steam enter it from different directions. It is provided with a drip from which the acid trickles, in order that its strength may be



ALUM WORKS.

determined, and this acid, called chamber acid before it goes to the concentrating retorts, varies from 45 to 55 degrees. It is adapted to many uses in the works, but is never sold outside except to manufacturers who may call for this particular grade. The product of the other chambers, so far as their gases are condensed, are taken back to the third chamber, and what is passed off, consisting mainly of atmospheric air and nitrous vapors, is taken to the "Gay-Lussac Towers," or coke columns, so called after the name of the chemist who first contrived them. These towers are high, narrow chambers, lined with lead and filled with pieces of coke, through which oil of vitriol is made to trickle, and the waste gases of the chambers passing through the coke give up their nitrous fumes, making nitrous acid to be again used in the chambers, so that very little niter is actually wasted. The nitrous fumes, in fact, again take up oxygen as readily as they gave it out in the chambers, so that with these coke columns, and due care in the working of the furnaces and chambers, the same nitric acid is substantially used over and over again, needing only sufficient replenishing to make up for unavoidable waste, which averages some 5 to 6 per cent. of the weight of sulphur burned.

The proper regulation of the temperature of the leaden chambers is a matter of great importance, and it may be effected by increasing or diminishing the supply of nitric acid or nitrous gas, the greater the quantity used in a given time the higher being the temperature. At a distance of five feet from the floor of the chamber it should be from 40° to 44° C., but near the center of the chamber it will vary from 40° to 60°.

The further concentration of the acid after it has left the chamber is effected by two stages, first in open lead pans, set on iron plates, to receive the heat of the furnace, and then in platinum stills. By the leaden pans the concentration is carried up to 60° Baumé, and a specific gravity of 1·75, but it is impracticable to carry it further by this process, as the necessary heat for evaporation then causes the acid to attack the lead. These platinum stills are beautiful to look at, but so very expensive that many efforts have been made to find a substitute for them. In some establishments glass has been tried for this purpose, but its constant liability to breakage has prevented its general adoption. These stills are arranged in steps one above another, and from them the acid is conducted to cooling chambers, whence it is drawn through leaden pipes to fill the carboys in which it is always shipped. These hold eight to ten gallons, and are packed in hay or straw in stout wooden boxes. The mouth of the carboy is closed with a stopper of clay, bound around with canvas, and the whole smeared outside with tar, this care being necessary to prevent the access of air, from which the acid would take up water. Should this glass carboy be cracked or broken the escaping acid would quickly convert the wood and straw around it into charcoal. These carboys are not very expensive, but they are generally returned to the works when the points to which they are shipped are not too distant.

In the nitric acid manufacture the operation is conducted in a series of ovens, 18 in number, 3 of which only are charged each day. These ovens are nearly circular, 4½ feet in diameter by 8 feet deep; into those to be charged are placed the proper proportions of nitrate of sodium, or Chili saltpeter, and sulphuric acid, usually about equal quantities of each, and then the fires are started, it requiring twelve to eighteen hours to burn off the charge. From the rear of the ovens the vapors given off are conducted by clay-lined pipes into a series of earthenware and glass receivers and flasks, these being connected by earthenware pipes. The vapors condensed in the first two or three vessels usually consist of strong nitric acid, while, to secure the entire condensation of all the fumes, water is introduced into the following ones, and the acid there made is of diminished strength. The acid thus produced, when of the best grade, is a colorless, transparent fluid, having a specific gravity of 1·55, and the boiling point at 80° C. Ordinary aquafortis has a specific gravity of 1·19 to 1·25, but when the specific gravity is as high as 1·35 to 1·45 it is termed double aquafortis. Besides its extensive use in the manufacture of sulphuric acid and many other chemicals, nitric acid is largely employed for etching on bronze, brass, and copper, for separating gold and silver, and for many other uses where a powerful oxidizing and dissolving agent is required.

The commercial article known as muriatic or hydrochloric acid, also called spirits of salt, is a solution of the gas given off during the decomposition of common salt by sulphuric acid. It is so readily soluble that water at 15° C., or about 60° Fah., will absorb over 450 times its volume under the normal atmospheric pressure. The apparatus by which it is prepared and condensed consists of several cast iron cylinders, closed similarly to gas retorts by lids luted with clay. At one end of each cylinder is an earthen pipe to convey the gas to a condensing apparatus, and at the other is a leaden funnel, through which, after the retort is charged with salt, sulphuric acid may be introduced. The construction of the furnace is such as to allow the flames to play around the cylinders, when the gas passes off by the earthen pipe at the rear into a series of receivers. That which is collected in the first receiver is raw acid, but the following ones contain each a small quantity of water for the absorption of the vapor, and this aqueous solution is generally purest, the chief impurities having been left in the first receiver. The raw acid is distilled and its product passed into water for purification, or it is diluted till its specific gravity is but little above that of water and then distilled, it being necessary in both cases to reject the first portion of the distillate, which contains chlorine or sulphuric acid. The saturated solution is drawn off into carboys, with airtight stoppers, but it is necessary to leave in each carboy a small empty space, to avoid risk of breakage in warm weather from the expansion of the acid.

There are many technical differences in the manner of making alum, according to whether it is produced from alum stone or shale, or earths having various proportions of alum in combination with other salts, but it is only necessary here to refer to the manufacture from alum stone, as now being carried on at the works. Ordinary alum stone is mostly amorphous and of a reddish color, the purer kinds being white and crystalline. In the preparation of alum therefrom the stone is merely burnt, the calcined mass lixiviated with water, and the solution evaporated to crystallization. In burning, great care must be taken to have neither too much nor too little heat, as in the latter case the stone would not be sufficiently disintegrated, and in the former sulphuric acid would be driven off, leaving an insoluble compound, the burning operation being generally judged to be complete when the vapors contain sulphurous and sulphuric oxides. After burning, the stone is gradually mixed into a paste and lixiviated with hot water in large tanks or pans. When the solution has become sufficiently clear it is drawn off, evaporated at a temperature of about 50° C., and allowed to cool and crystallize in vats, upon the sides of which alum deposits; the mother liquors also yield cubic alum on further evaporation. To keep up the required temperature of the vats for the proper evaporation in the different stages, they are all fitted up with steam pipes, by which the heat is carefully regulated. Alum is very extensively used as a with the use of coal tar colors.

Blue vitriol is made by heating metallic copper, or the crude ores, having only about 60 per cent of the metal, with concentrated sulphuric acid. It may also be made by heating sheets of copper in a reverberatory furnace to the boiling point of sulphur, then adding a quantity of that element, and afterward sufficient sulphuric acid to saturate the oxide of copper, when the clear solution is decanted until it crystallizes. Blue vitriol is the base of many of the pigments obtained from copper, is also used in dyeing and printing, in the amalgamation process of extracting silver, etc.

In the manufacture of aqua ammonia a large iron still is employed, in which are placed sal ammoniac or ammonium sulphate, with an equal weight of fresh burnt lime previously mixed with four times its weight of water, the whole being thoroughly stirred together. A delivery tube leads to near the bottom of a vessel two thirds full of water, and heat being applied, gently at first, ammonia gas and aqueous vapor are driven off; the aqueous vapor is condensed in the first vessel, but the ammonia is absorbed by the water in the second vessel. Pure ammonia gas may be reduced to a liquid state, at ordinary temperature, under a pressure of about 17 atmospheres, or by cold alone at a temperature of —40° to —50° C., and it is this property of "storing up cold," as it were, which has made it so serviceable in the manufacture of artificial ice.

The manufacture of muriate of tin and tin crystals, both being tin salts, is conducted by dissolving granulated tin in muriatic acid; the evaporated solution then leaves colorless, transparent, deliquescent crystals, of course very readily soluble in water. The aqueous solution, forming the muriate of tin, soon deposits a basic salt unless more hydrochloric or tartaric acid be added. Both of these productions are chiefly used in dyeing and calico printing.

The sulphate of zinc, also known as white vitriol or white copperas, is made by dissolving either zinc or its oxide or carbonate, in dilute sulphuric acid, and evaporating the solution, when it separates in small crystals as an opaque white granular mass. The native sulphide or blende is also used, but the sulphate thus obtained is redissolved in water and the solution left in contact with plates of metallic zinc until its impurities, as iron, copper, lead, etc., are precipitated. Aside from its medicinal uses it is largely employed in the preparation of drying oil for painting, in calico printing, and as a mordant in dyeing.

One of the necessities in the manufacture of this large line of chemicals is a continued supply of earthen or clay ware, of many different sizes and shapes, for the breakage of such articles, in so extended a business, would necessarily be great. The firm, therefore, long since commenced to manufacture for themselves all the articles of this class they require, having a pottery suitable for such purposes on the grounds, and workmen especially skilled in filling the requirements of the different factories. The senior Mr. Kalbfleisch, who died seven years since, besides being a man of remarkable executive ability, always exhibited a wonderful degree of push and energy. He personally superintended the starting of this department, and had the kiln built after his own plans, but he was always in such a hurry to get out his ware that he would not wait for the kiln to be heated up as slowly as it should be, and a very large portion of his pots and pipes were snapped in consequence before he would allow an experienced man to take charge of that part of the work. This is a detail which the workman, who still runs this specialty, now relates with no little zest.

The productions of this establishment are shipped to all parts of the country. Lighters convey them up the Sound to the manufacturing establishments of Connecticut, Rhode Island, and Massachusetts, and also up the North River, besides the larger amounts that are forwarded by rail, although their works in Buffalo now supply a considerable proportion of the Western trade. The production of sulphuric acid alone amounts to between 50 and 60 tons daily, and for this, as for all of the other articles they make, each succeeding year shows that the demand is larger than was that of the preceding season.

Their office and store in New York are at No. 55 Fulton, corner of Cliff street.

Adulteration of Artists' Materials.

The system of adulteration which is in such extensive practice at the present time appears not only to affect our food, drugs, and our articles of apparel, but even our artistic productions. The paintings of artists of the highest reputation suffer from this crying evil of our time, and all true artists will feel greatly indebted to Mr. W. Holman Hunt, for his excellent paper on "The Present System of Obtaining Materials in Use by Artist Painters, as Compared with that of the Old Masters," which was read before the Society of Arts, on the 21st of April, and which appears in the society's journal of the 23d of that month. In this paper Mr. Hunt points out the deterioration generally, not only of pigments and coloring matter, but also of varnishes, oils, and even of the canvas itself, the effects of which are prejudicial to the picture either in point of coloring, cracking, or some other change, all of which were guarded against by the old masters.

On the subject of oil alone, which Mr. Hunt refers to as an important one, he says that before the Crimean war the linseed for making oil came principally from the ports of the Black Sea. The practice which then prevailed in the trade was to empty into the hold of the vessel one measure of hemp or other common seed to thirty-nine of linseed. This was called legitimate adulteration.

The war destroyed this trade, and linseed was subsequently brought from India, where the quality was inferior, and where carelessness in planting and reaping the crops caused the seed to be much more extensively mixed; but, in addition to this inferiority, the trade had thought it well to advance its legitimate adulteration to the extent of one measure to every nineteen. Mr. Hunt further stated that it was impossible to find pure linseed oil in all England, and that to procure it the seeds had to be carefully sorted out one by one with the fingers! This question of the genuine nature of artists' materials is one of really great importance, inasmuch as it affects the character of the work of our greatest painters in this generation in future ages, as well as the reputation of the artists themselves. The care with which the old masters treated their colors did not exceed that which they gave their oils, which may look bright without being perfect.

THE address of the inventor of the bolt for double doors, described in our last issue, is W. P. Brachmann, 147 Walnut street, Newark, N. J., instead of Philadelphia, Pa., as erroneously given in the article referred to.

Substitute for Alum in Bread.

Mr. C. Estcourt, F.I.C., writes as follows to the *Analyst*: During the past month I have had submitted to me for examination, by a large baker here, a sample of the liquid, together with a loaf in which it is said to have been used. The sample is declared by the inventor to be perfection, and certainly practically gives no alumina in bread in which it is used.

I give below the result of quantitative analysis of the liquid:

Sp. gr. at 60° = 1174.

	In 100 parts by measure.
Free phosphoric acid, calculated as $H_2P_7O_8$	14 58
Magnes. pyrophosphate	6·94
Ditto sulphate	6·39
Sodium chloride	traces.

The compound is therefore mainly magnesium phosphate kept in solution by phosphoric acid.

The bread sent was said to have been made from poor English flour, which would not, owing to deficiency in gluten, have made a presentable loaf without alum. It was found to be beautifully white, firm, and yet well aerated. The air spaces of the loaf, shown when it was cut through, were very numerous and of a uniform size. The total amount of alumina found in it equaled rather less than 10 grains of alum per 4 pound loaf, which, as will be remembered, does not much exceed the quantity allowed for by some analysts as being naturally present.

Whether or not such a compound can be safely used in bread is a question of vital importance, both to the general public and the baking trade. If the compound is declared by competent medical authorities to be innocent in its results in the small quantities used, there is no doubt it will be a great boon. Wet harvest times result in large quantities of wheat, which wheat, when ground, cannot by itself be made into presentable food for man without the use of the admittedly injurious drug—alum. Thus this quality of wheat is not available for use by bakers who prize a good name; but if the use of this compound can be proved to be innocuous it would render possible the use of such flour to the mutual advantage of both the public and the agriculturists—the one obtaining cheap bread, and the other being saved from that partial ruin which is so often the result of a bad harvest. I am making experiments as to quantities used, and will give the results in a future paper.

English Views of American Farming.

In the report of Messrs. Read and Pell on American agriculture, they say:

"Few English farmers have any idea of the hard and constant work which falls to the lot of even well-to-do farmers in America. Save in the harvest, certainly no agricultural laborer in England expends anything like the same time and strength in his day's work; therefore it is essential to guard against putting the value of the farmer's own labor at too low a figure, and to make due allowance for the drawback which must occur upon the most skillfully managed and best arranged big farms. The calculations are here made in the endeavor to strike an average of the cost of the production of wheat between the very large and the very small farms of America, and in estimating the cost of the latter to give a fair and reasonable value to the labor of the farmer and his family.

"The readiness with which the tillers of the soil take to machinery in America would surprise some of the farmers in the old country. The skill and ease with which they are worked say something for the manufacturer, but still more for the intelligence of the farmer. In America the presence of labor-saving machinery upon even a small farm is an absolute necessity. There is the further inducement to obtain implements of all kinds by buying them on long loans, and by paying for them by installments, which sometimes tempts a farmer to buy more machinery than he can afford. The machines used upon the farms are well constructed, and exceedingly light and handy. The land is level, the soil light, the climate dry, and the crops by no means bulky. Under these favorable conditions, machines that would soon come to grief in England, work well for many seasons in America. But having got a good machine, and skillfully used it, it appears beyond the power of an American farmer to take the slightest care of it. Not only the common implements of the farm, but such costly and delicate machines as drills, mowers, self-binding reapers, and thrashing machines, stand abroad all the year round. A few poles and a ton or two of that straw which is lying about in masses ready to be burnt, might protect all the spare machinery on a farm. But nothing of the sort is attempted, or at least it is so rarely done as only to prove the exception to a very general rule of wanton negligence. When, therefore, one hears of the perishable nature of the American implements, it would appear that the chief fault rests with the farmer rather than the maker. We should say that good machinery and improved implements are much more common on American than English farms. The tools are certainly lighter, better shaped, and better made. It may be true that a 'good workman never finds fault with his tools,' but it is truer still that a Yankee laborer is too sensible ever to work with a bad one."

Improvement of the Upper Mississippi.

THE Mississippi River Commission have finished the examination of that portion of the river between St. Paul and St. Louis, a distance of 700 miles. Great improvement was found in the channel, especially for low water navigation, the result of the improvement works in process of execution by the corps of engineers. These works consist of low wing dams of brush and stone, projecting from the shore for the purpose of narrowing the water way, supplemented by a brush and stone revetment of the opposite bank and elsewhere if necessary wherever the contraction produces caving.

New Explosive Substances.

In the coal mines at Polnich-Ostran, near the Ferdinand Railroad, in Austria, a number of experiments have recently been made with some new explosive matters in order to ascertain whether they could be used advantageously instead of dynamite. The results show that these new substances answered the purpose even better than dynamite.

Their composition is as follows:

1. *Peralite*, a large grained powder, manufactured by Prochska & Lisch at Buda-Pesth, seems to contain 64 per cent of nitrate of potassium, 30 per cent of charcoal, and 6 per cent of sulphuret of antimony.

2. *Janite*, manufactured by H. Jahn, at Peggau, contains 65 to 75 per cent of nitrate of potassium, 10 per cent of sulphur, 10 to 50 per cent of lignite, 3 to 8 per cent of picrate of soda, and 2 per cent of chlorate of potassium. It is less inflammable and less violent in its action than peralite, blasts greater quantities of coal and in larger pieces.

3. *Carbazotine*, invented by Messrs. Cahuc & Soulage, and manufactured at Dombrau in Moravia, contains about 610 per mille of nitrate of potassium, 8 per mille of sulphate of iron, 247 per mille of soot, lamp black, and organic substances, and 135 per mille of sulphur. It is not in the form of grains, only half as heavy as powder, and is very hygroscopic, but can easily be dried by the heat of a stove. It is slow in its action and not easily inflamed; its use is therefore perfectly safe, if the necessary caution is taken.

The cost of each of these substances is about $13.60 per hundredweight.

4. *Carbon Dynamite, No.* 3. This product is manufactured by Messrs. Mahler & Eschenbacher at Vienna; it is analogous to the cheap dynamites of Noble, and consists of a mixture of nitro-glycerine and a gunpowder of an inferior quality, which here takes the place of the porous silica.

The experiments were made in a stratum of coal having the thickness of about 10 feet. The surfaces of attack were 10 inches square and 10 feet distant from each other. The results are shown by the following table, in which three different sizes of the coal obtained are given, large, medium, and small:

Explosive Substances.	Large.	Medium.	Small.
Carbon dynamite	21·4 p. c.	35·6 p. c.	43 p. c.
Carbazotine	26·3 "	37 7 "	36 "
Peralite	19·9 "	37·7 "	44·4 "
Janite	22·9 "	38·5 "	38·6 "

The price of the different explosive substances, and the market price of the quality of coal obtained by the employment of these substances for blasting, are indicated by the following table:

Explosive Substances.	Price per ton.	
	Of the explosive sub. used per ton.	Of the coal.
Carbazotine	$0·043	$2.66
Janite	0·059	2.64
Carbon dynamite	0·042	2.60
Peralite	0·015	2.56

The amount of the savings per year in using these explosive substances in the coal mines at Polnisch-Ostran was, as the report says, fully $10,000.

New Ammonia Process.

The *Chemical News*, of April 2, mentions a patent taken out by Messrs. Rickman & Thompson for the manufacture of ammonia from the nitrogen of the atmosphere and the hydrogen of water, which, if it realizes the expectations formed concerning it, will exercise an important influence on the future of artificial fertilizers. The operation is carried on in a closed brick furnace, having an ash-pit closed to regulate the current of air. The deoxidizing material used is the dust of steam coal. In the presence of this at a full red heat the vapor of water is decomposed and the hydrogen combines with the nitrogen from the regulated current of air. But ammonia is decomposed at a bright red heat, so, to prevent loss by accidental excess of temperature, 5 to 8 per cent of salt is mixed with the coal. This chloride of sodium being decomposed at a full red heat, in the presence of the nascent ammonia, chloride of ammonia is formed, which is volatilized without decomposition. It is estimated that, with a consumption of 20 to 28 pounds of the mixture of coal dust and salt per hour, from 2 to 3 pounds of ammonium chloride will be obtained.

Balloon Photography.

An interesting paper on balloon photography, giving a detailed account of the results of some experiments made by M. De Fonvielle in the neighborhood of Rouen on the 14th of June last, is contained in a recent number of the *Spectateur Militaire*. Two views of the surrounding country were taken during an aerial excursion, from a height of about 3,300 feet, while the balloon was traveling at the rate of 20 to 25 feet per second. The photographic apparatus was affixed to the rim of the car on the side opposite to the direction in which the balloon was traveling. Miniature views were obtained of territorial sections about twenty-three acres square, upon which roadways, house roofs, garden walls, hedges, are plainly discernible. Had the sky been perfectly clear, M. De Fonvielle entertains no doubt that every human figure within the scope of the lens would have been distinctly visible in the pictures obtained, and he points out the obvious availability of balloon photography for supplying exact information respecting the dispositions of an enemy's camp and the number of his forces in war time, the operator being safely beyond the range of any projectile susceptible of discharge from a rifle or other "arm of precision." The objections to the utilization of balloon photography for military purposes are at present twain—namely, the rapid movement of the balloon, which interferes with the distinctness of the picture, and the impossibility of steering the balloon so as to impart to it exactly the desired direction. The first of these difficulties M. De Fonvielle alleges to have been already obviated by a mechanical process of Paul Desmarets's invention; for the second, no remedy has hitherto been discovered.

About Filing Saws.

The all-absorbing question of the present day among mill men seems to be, how can we run thin saws? Now, the practice of many filers is to use a beveled face, or beveled backed tooth—or both—claiming that it cuts easier and runs straighter than any other. Having learned this when young, they conscientiously think that it is all so, and as it is very difficult for most men to file a square tooth, they stick to the old bevel, and will not try the square. This is their practice, and this class of men number about one-half the filers.

In some sections all filers use this absurd old-fashioned tooth, which practice has already said was wrong. We will look at this phleme tooth in a theoretical way. It is a well known fact that all hand-filed saws get "out of space," that is, alternate spaces between the teeth get wider than the others, consequently, the teeth following these spaces have more work to do than their fellows, and as each draw outward, the teeth having the most to do—and they are all on the same side—will pull the hardest, and the saw be drawn that way just in proportion to the amount of feed carried or the work done, and no amount of hammering, tinkering, or grinding will prevent this continual pull and hard drawing, so long as the phleme tooth is used. Then we will look a little further and see what theory has to say against this beveled tooth. The filer must give his saw all the set necessary to clear itself upon, running on slow feed, and when forced to carry heavy feed, the teeth will be drawn outward all that they will spring, increasing the width of the cut from one-sixteenth to one-eighth of an inch, although the saw may go perfectly straight. This condition of things will make the lumber thicker at one end than the other, and as the saws are generally started in on slow feed, which is steadily increased, until the other end is reached, there is a taper on both sides of the board. Then again, when these teeth run into a hard knot, they are suddenly drawn in opposite directions, making the saw cut wider and consequently very much harder. This sudden wrench has been the cause of breaking more saws than any other one thing.

There are reasons enough why a man who files a phleme tooth cannot run thin saws, because they are more sensitive than thick ones, and show the defective fitting more readily, and no filer ever fitted thin—if hammered right—with a perfectly square tooth, top and bottom, who could not run them and do good work. At least of the hundreds of mills I have visited in the last three years, I have failed to find one. If millowners would require their filers to swage the teeth full and heavy, giving them one-fourth of an inch side joint, with a comparatively steady motion, a 10 gauge saw can be run just as easy as a 6 gauge saw. No man should ever use a taper saw, for if it be tapered on one side and straight on the other when standing, it will be tapered alike when running, as the centrifugal force will straighten it up and put twice the strain on one side that there is on the other, making it more liable to break. These theories can be proven by any mill man, without cost, in his own mill, and will enable him to show himself practical as well.—*W. L. Covel, in N. W. Lumberman.*

Arizona Cement.

Tucson, Arizona, is underlaid by a deposit of cement, which promises to be of great value to the Pacific coast. The *Citizen* says that hundreds of tons of it were recently excavated by the railroad company in leveling the ground for their roundhouse at that place. It is easily converted into quicklime by burning, after which, if mixed with from two to four parts sand, it produces a hydraulic building mortar, or artificial stone, said to be equal to that made with the best English Portland cement. By similar treatment with three parts of fine sand through one-eighth mesh sieve it produces a concrete, which, when moulded and pressed, gives a hydraulic stone-brick of superior quality, suitable for all common building purposes. There are hundreds of thousands of barrels of Portland cement used on the Pacific coast which may be entirely supplanted by an Arizona production.

This deposit seems to correspond closely with that forming the hydraulic mineral belt of Texas, as described in the SCIENTIFIC AMERICAN a few weeks ago.

Removal of Hair from the Face.

We frequently have inquiries, chiefly from ladies, who find their beauty marred, as they think, by growth of hair on the lips or other portions of the face, for a recipe or method by which they can get rid of their trouble. Caustic alkalies have been recommended; but they injure the skin and the hair soon grows again; the razor no lady likes to use. The only permanent remedy appears to be the absolute destruction of the follicle by electricity, the hairs being killed one by one. The operation is tedious, and is thus performed by Dr. John Butler, of this city:

The patient being seated in a chair in a semi-reclining position, the head well supported, and the face opposite a strong light, the operator selects the hair for the first attack, takes hold of it in a pair of forceps, making it tense by gentle traction.

A moistened sponge electrode from the positive pole of the battery having previously been placed on the back of the neck, or fixed at some other convenient adjacent spot, a three cornered needle with sharp cutting edges set in a suitable handle and attached to the negative pole of the battery, is made to enter the hair follicle, alongside the hair, care being taken to make the needle penetrate to the entire depth of the follicle. The action of the current soon causes a few bubbles of the viscid froth alluded to, to be observed. As soon as this evidence of electrolytic decomposition manifests itself, the needle should be rotated a few times, so as to cause the sharp corners of the needle to scrape away the *débris*, and allow electrical contact with a fresh surface. The operation is continued until the hair becomes quite loose, and comes away with the very slightest traction, the whole operation lasting a very much shorter time than it takes to describe it. The operator then proceeds with the next hair in like manner, and so on with the whole series, as many as there are to be removed, or as long as the patient can bear it. It is by no means a painful procedure (except in trichiasis), but is usually complained of as a disagreeable sensation. There is a great difference in patients, however, in this regard; some will tolerate a seance of half an hour or even more; indeed, I had one patient who stood it, or rather sat it out, unflinchingly and uncomplainingly, for over an hour, and would willingly have allowed the seance to be continued much longer, but that the operator's eyes became so tired that it was impossible to proceed. I should not omit to mention that I use a modification of a jeweler's magnifying glass, which I had made for me by Meyrowitz Brothers, the well-known opticians. It consists of a lens with a four inch focus set in a cork cap, for the sake of lightness, and made of such a shape as to fit the eye, and is readily held there as a single eyeglass is made to do.

Even with the lens the operation is fatiguing to the eyes; but without it it is almost impossible to continue the seance uninterruptedly for over ten or twelve minutes, and then it must necessarily be done in an unsatisfactory manner, as it is impossible to see how the details are being carried out. With the lens, a skillful operator ought to be able to destroy about three or four hairs to the minute, and continue the seance half an hour. It will be noticed that I have laid great stress upon the non-removal of the hair previous to the destruction of the papilla; this is one of the principal points in the operation, for as long as the hair remains in, we have a positive guide as to the direction of the follicle, and when it becomes loosened, from the action of the current, it may be taken as almost proof that the papilla has been entirely electrolyzed. I use the word "almost" advisedly, as about ten to twenty per cent of the hairs acted upon return, and have to be electrolyzed the second time.

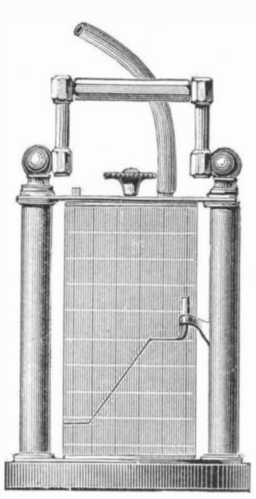
The points of the operation for which I claim originality are: the shape of the needle, and the rotatory movement thereof; the construction of the lens, and the mode of holding it as adapted to its special use; the advisability of leaving the hair in situ, until the chemical action of the current effects its loosening.

The Cultivation of Vaccine Virus.

Dr. Martin, of Boston, was the first American physician who, in view of the danger attending the use of vaccine virus taken from the human body, experimented successfully upon a return to Dr. Jenner's original method of using the bovine virus. Dr. Foster, of New York, and in 1867 Dr. Robbins, of Brooklyn, followed Dr. Martin's example, and Dr. Robbins, with his associate, Dr. Lewis, is now engaged in the production on a large scale, of virus derived from Beaugeney stock, upon which they have "ingrafted" the celebrated Vincennes stock, to procure which Dr. Robbins made a special visit to France. It is worthy of note, however, that the original stock is just as potent as ever, though its power varies according to the constitution of the animal from which it has been obtained. The *modus operandi* is to select the best calves—heifers being preferred—at an age varying from a few days to a year or even more, but the younger the better, the animals being the more easily handled. If the subject is a small one it is thrown upon its side upon a table, and its fore feet and head being secured, its hind legs are stretched apart and spots upon the belly six or eight inches wide are shaved, and if necessary the epidermis or skin is thinned down. After this vaccination as in the ordinary manner is proceeded with, the animal being retained in the one position for six or seven days, when the matter is ready for removal either into tubes or quills, and must be as clear as water or else rejected. Calves of the Jersey breed are preferred. Drs. Robbins and Lewis have sent the vaccine to France, to Egypt, to China, Japan, and to all parts of North and South America. The greatest care is taken to provide that the calf which is to be vaccinated shall be in the best possible health. It is said that after a day or two the calves do not appear at all inconvenienced by their confinement, but munch their food with zest and in fact get fat. During the summer animals which are "under process" are kept in the country, it being found that they thrive better than in town.—*New York World.*

THE STEP OF MAN.

At a recent sitting of the French Academy of Sciences, Monsieur Marey read a very interesting paper, giving the result of his experiments with a machine for measuring the length and rapidity of man's strides in walking. The machine, called the odograph, consists of a cylindrical body containing clockwork which causes the cylinder to revolve at the uniform rate of 2·36 inches an hour. A pen is so arranged as to trace a line on paper rolled around the cylinder, and the track made by this pen shows the rapidity of the footsteps of the person to whom it is attached. An air valve is placed in the sole of the shoe, and it communicates with the instrument by means of a rubber tube leading up the trowsers' leg. Each time that the foot strikes the ground a slight puff of air is sent through the tube, causing the pen (which would otherwise mark only a horizontal line) to rise a distance equal to 0·004 of an inch. Thus a line is traced on the paper from left to right, rising at a greater or less angle with the horizontal according as the rapidity of the step is increased or diminished. If a man stepped exactly 3 feet at each step it is evident that in going 3,000 feet the pen would rise just 0·4 of an inch, but it was found in practice that the distance the pen was raised varied between 0·51 and 0·67 of an inch, showing that the average step varied in length from 2½ to 2 feet.



Mons. Marey found that a number of circumstances modified the length of the step. His experiments were made with soldiers from the young recruits to the bronzed veteran, and as they knew nothing of the objects of the experiments, their walk may regarded as absolutely natural.

From the large number of trials made certain facts were positively determined as follows: The step is longer going uphill than in going down; longer for a man carrying a load than for one unloaded; longer with low heels than with high heels; and longer for a man wearing thick soles and those which project slightly beyond the toe than for one wearing short and flexible soles. It was found that while the heel might be lowered indefinitely without detriment to the gait, the sole could not be made perfectly rigid nor prolonged too far without interfering with the speed and ease of the wearer. Experience alone was able to determine the exact length and thickness necessary to produce the best results.

The rapidity of the step and its regularity could be determined to a nicety. If the rapidity of the step did not change, the line drawn on the paper would keep a regular fixed angle with the horizontal; but if the step quickened, an increased angle would result, making the line curve upward; and if it slackened, the curve would have its concavity downward, these results being, of course, irrespective of the length of the step. Sometimes, as in going uphill, the length of the step increased while its rapidity slackened; but on a level it was found that hastening the step caused an insensible increase in its length also.

Mons. Marey proposes to study all the circumstances which affect man's walk, in order to determine those which produce the best results. The nature of the soil walked on, the temperature of the air, the state of abstinence or digestion, fatigue or repose of the walker, will all be taken into consideration. The effect obtained by marching troops to the drum-beat and bugle will be compared with that produced by their free march, and finally the effects of gymnastic training will be carefully observed.

An English Engineer on American Locomotives.

Mr. R. M. Brereton, C.E., writing on this subject, says: "I argue that the greater duty done by the American motor is due to the better design and the better system of working the locomotives. The American builder excels in the system of framing and counterbalancing, and in the designs of crank axles, etc., so that the engine may run remarkably easy and without jar round sharp curves, and work not only the light roads, but also diminish the wear and tear on the solid roads, and at the same time increase the effective tractive force. The English engine is a very heavy affair, and in running it not only wears and tears itself very rapidly, but also the roadway, and it greatly, by its unsteadiness and jar, fatigues the drivers and firemen. I have ridden hundreds of miles on engines in India, in England, in France, and in the United States, and I have always found the American engine most easy and comfortable, but I never did the English or the Continental engines. It is almost impossible to give these engines their full hauling power, simply because the greater portion of the weight cannot be thrown on the driving wheels."

Unsinkable Ships.

A party of gentlemen interested in steam navigation lately met at North Woolwich to inspect a steam launch built on Mr. James Long's unsinkable system. The principle consists in attaching to the sides of the hull of a vessel a series of flat air-tight metallic cylinders or drums, the inner heads of which are built into and form part of the framing and inner skin of the vessel. These drums project on either side of the ship and are cased in, the under sides of the casings normally resting upon the surface of the water and becoming slightly immersed under a load. The result is a light draught with great freeboard, and it is claimed that a greater stability under canvas and a higher rate of speed under steam or sail are thereby attained, besides the advantages of greater cargo capacity, economy in construction, and, above all, unsinkableness, however damaged by collision or otherwise. The launch in question, which is only experimental, is steel built, 37 feet in length, 6 feet in depth, and 5 feet 8 inches beam internally. She has seven cylinders fitted on each side, each cylinder being 3 feet 6 inches in diameter and 1 foot 8 inches deep, and which give her a width on deck of 9 feet over all. She draws 2 feet of water without her load, and has a freeboard of 4 feet. A short run was made with the vessel, a fair rate of speed being attained, while its unsinkable character and other points were demonstrated by Mr. Long by means of a model vessel.

600,000 Barrels of Petroleum Wasted.

Since midsummer there has run to waste in the Bradford oil region something like 600,000 barrels of petroleum. A recent dispatch from that region says that there are in round numbers nearly 8,000 producing oil wells in the Bradford district. Their daily yield is 70,000 barrels. The lower or old oil fields are producing 12,000 barrels a day. The daily demand for petroleum is 55,000 barrels. This is the amount now run by the pipe lines. The accumulation of oil for which there is no present demand long ago exhausted the storage capacity. For three months 6,000 barrels of oil have been running to waste every day. There are 2,000,000 barrels of petroleum in wooden tanks at the wells. It is estimated that there are at least 8,000,000 barrels of accumulated stocks in the storage tanks of the pipe lines. The oil that is running to waste is run upon the ground and into the creeks. Enterprising individuals build dams along these streams and collect the floating "grease." Hundreds of barrels are pumped off and stored in improvised tanks to await a market. Individual producers are building private tanks to store the overproduction. There are now 400,000 barrels of this tankage in this region. The number of wells steadily increase every month, in spite of the situation.

The Bradford wells are all flowing wells. This fact is what caused the abandoning of so many of the wells in the lower field, they being all pumpers. Until recently the "sucker rod" and pumping engine were almost unknown in the Bradford field. Now they are in demand. Many of the old wells have fallen off greatly in their yield. The supply companies cannot furnish enough sucker rods and engines to meet the call for them. Second-hand ones from the lower field find a ready market at good prices. This resort to the pump is creating no little uneasiness in the field. It indicates that the gas is failing. A flowing well on being pumped increases its yield largely; but the continuance of a full yield becomes uncertain. The positively defined area of the Bradford oil-producing field includes over 65,000 acres. There is a well to every 5 acres of land that has been developed, which leaves about 30,000 acres yet to drill. Wells on this territory will not be put down with such reckless haste as has characterized past operations, because it is controlled by large companies of capitalists.

Prizes for Designs for Furniture.

The Council of the Society of Arts, London, are trustees of the sum of £400, presented to them by the Owen Jones Memorial Committee, being the balance of the subscriptions to that fund, upon trust to expend the interest thereof in prizes to "students of the schools of art, who in annual competition produce the best designs for household furniture, carpets, wall papers and hangings, damask, chintzes, etc., regulated by the principles laid down by Owen Jones;" the prizes to "consist of a bound copy of Owen Jones' 'Principles of Design,' a bronze medal, and such sums of money as the fund admits of."

The prizes will be awarded on the results of the annual competition of the Science and Art Department. Competing designs must be marked "In Competition for the Owen Jones prizes."

The next award will be made in 1881, when six prizes are offered for competition, each prize to consist of a bound copy of Owen Jones' "Principles of Design," and the society's bronze medal.

American Carriage Production.

At the recent meeting of the Carriage Builders' National Association in Chicago, the president called attention to the fact that more pleasure carriages are manufactured in the United States than in Great Britain, France, Italy, and Germany together. Not one of the countries of Europe produces annually so many pleasure carriages as are made in "one little city" in this country. Since carriages are kept only by the smaller portion of our well-to-do citizens, the vast number in use speaks volumes with regard to the general wealth and prosperity of the American people.

CENTER TURNING ATTACHMENT FOR LATHES.

The engraving shows a handy little tool for turning and truing up the centers of lathes, and for turning center reamers or countersinks. No center gauge is required where this tool is used, as the angle is fixed and unalterable. One tool serves for an entire shop, and all of the centers will of necessity possess the same angle, and work centered with the centering tools turned with this device will fit the centers of the lathe, and will wear truer and longer than centers made in an irregular way, and will insure finer work.

Fig. 1 shows the tool in perspective, and Fig. 2 shows the manner of placing the tool in the lathe. It will be seen that the device is virtually a slide rest fixed at the required angle and carried by the tail spindle.

The cutting bit is carried across the center by turning the small handle.

The cutter in the attachment is adjusted to the exact line of centers by turning the tool post slightly in one direction or the other on the barrel which supports it until the cutting edge of the bit is exactly on the center line. It is then tightened by turning a set screw at the bottom of the slide.

The depth of the cut taken by the tool is regulated by moving the tail spindle in or out.

This useful invention has been patented by Mr. Samuel Brown, of 1020 Hunter St., Philadelphia, Pa., who should be addressed for further information.

Fig. 2

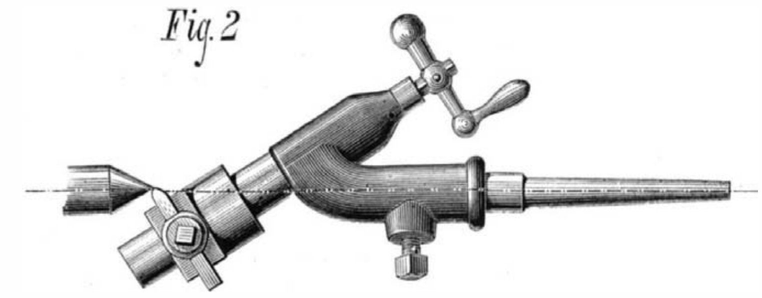
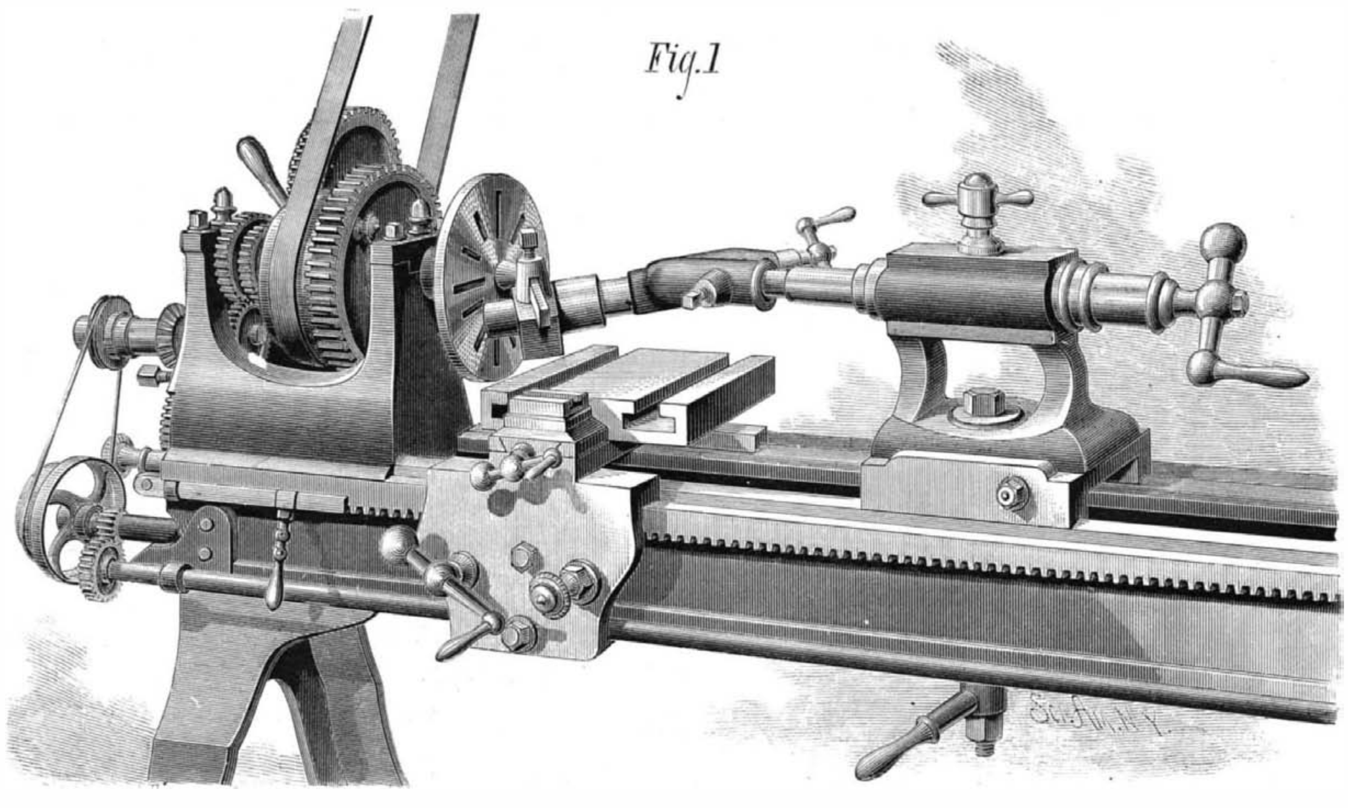


Fig. 1



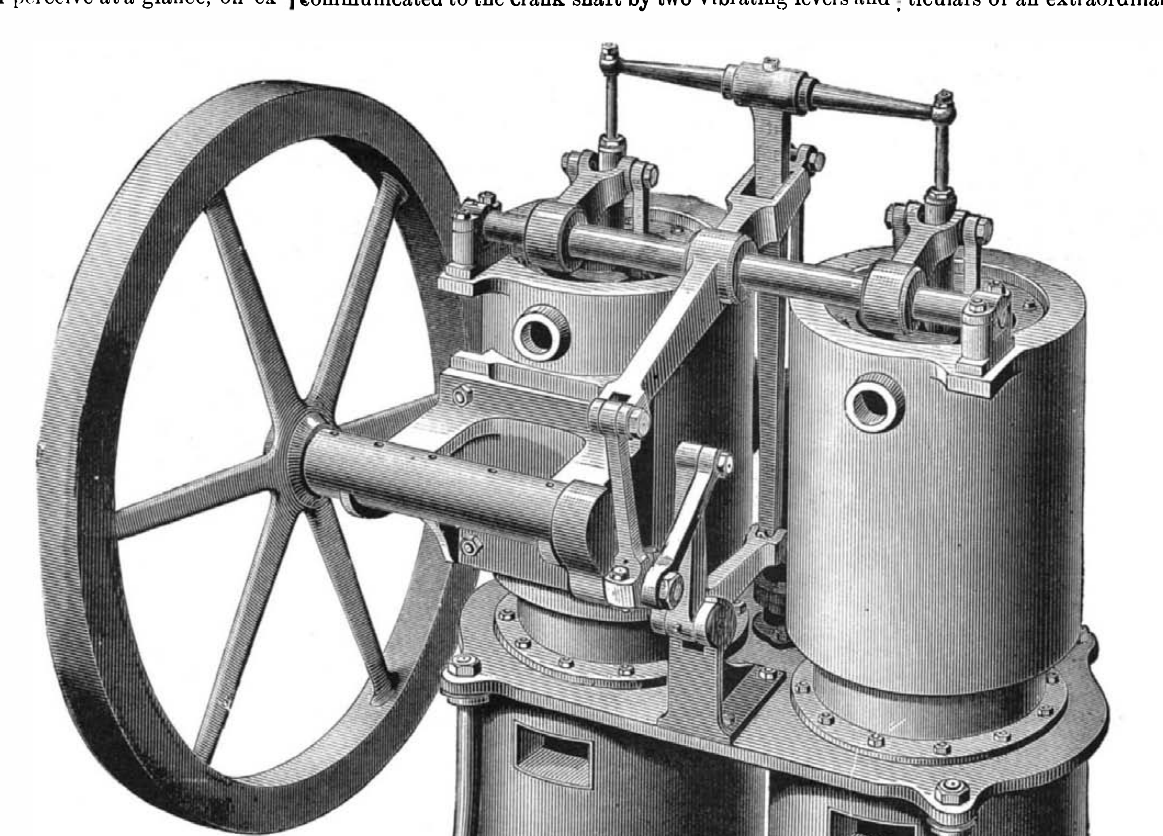
BROWN'S CENTER-TURNING ATTACHMENT FOR LATHES.

ERICSSON'S DUPLEX CALORIC PUMPING ENGINE.

Our professional readers will perceive at a glance, on examining the accompanying engraving of this engine, that its principal features are identical with those of Ericsson's solar engine, illustrated in the SCIENTIFIC AMERICAN, August 2, 1879. In the solar engine the heater attached to the end of the working cylinder receives its caloric from the concentrated and reflected rays of the sun, while the corresponding part of the pumping engine is heated by a gas flame, or by radiation from a coal fire. In either case the working piston is actuated by atmospheric air, alternately expanded and contracted, within the working cylinder, by means of a hollow plunger less in diameter than the working cylinder. This plunger, composed of light steel plates, is caused to move up and down in such a manner that, just before the up stroke of the working piston commences, the air is transferred to the heater, and its tension thereby increased, while just before the down stroke of the piston the air is transferred to the opposite cold end of the working cylinder, where its tension is greatly reduced. It should be observed that the working cylinder is surrounded by a water jacket, through which cold water is circulated, by the simple plan of attaching the delivery pipe of the water pump to its bottom, the exit being formed at the top.

The mechanism actuating the hollow plunger by which the air is transferred from the heater to the cold end of the working cylinder and then back again, will be readily understood by referring to the engraving. The energy of the working pistons, operating at the top of the cylinders, is communicated to the crank shaft by two vibrating levers and a central beam secured to a common beam center. It will be seen that the vibrating levers are connected with the pistons of the working cylinders by vertical side links, while the long end of the central beam imparts motion to the crank of the fly wheel shaft by a vertical connecting rod. The short end of the beam actuates the water pump, the valve chamber of which is partially seen between the jackets of the working cylinders. The two hollow plungers are moved by light steel rods passing through stuffing boxes in the top of the working pistons and connected to a common crosshead. The latter is operated by a vertical lifting rod, which passes freely through an opening in the central beam. By means of a bell crank actuated by a short connecting rod coupled to the crank pin of the fly wheel shaft, the necessary reciprocating movement is imparted to the lifting rod.

It is scarcely necessary to observe that the application of two working cylinders, the pistons of which operate *simultaneously*, does not affect the principle of the engine, since the mechanism employed for developing the motive energy, by alternately expanding and contracting a given volume of air, is essentially alike in the single and duplex caloric pumping engines. Both classes are manufactured by Messrs. Tompson, Sterne & Co., of Glasgow for Great Britain, and by the Delamater Iron Works, New York, for United States.



CAPTAIN ERICSSON'S DUPLEX CALORIC PUMPING ENGINE.

Monkey, Dog, and Rats.

A London paper of recent date gives the following particulars of an extraordinary match at rat killing. "Hollinwood, near Manchester, was the scene of a rather novel rat killing match the other day, between Mr. Benson's fox terrier dog, Turk, and a Mr. Lewis' monkey, for £5. The conditions of the match were that each one had to kill twelve rats, and the one that finished them the quickest to be declared the winner. You may guess what excitement this would cause in the 'doggy' circle. It was agreed that Turk was to finish his twelve rats first, which he did, and in good time, too, many bets being made on the dog after he had finished them. After a few minutes had elapsed it now came the monkey's turn, and a commotion it caused. Time being called, the monkey was immediately put to his twelve rats, Mr. Lewis, the owner, at the same time putting his hand in his coat pocket and handing the monkey a peculiar hammer. This was a surprise to the onlookers; but the monkey was not long in getting to work with his hammer, and, once at work, he was not long in completing the task set before him. You may talk about a dog being quick at rat killing, but he is really not in it with the monkey and his hammer. Had the monkey been left in the ring much longer you could not have told that his victims had been rats at all—he was for leaving them in all shapes. Suffice it to say the monkey won with ease, having time to spare at the finish. Most persons present (including Mr. Benson, the owner of the dog) thought the monkey would worry the rats in the same manner as a dog does; but the conditions said to kill, and the monkey killed with a vengeance, and won the £5, besides a lot of bets for his owner.

THE GOLDEN EAGLE.

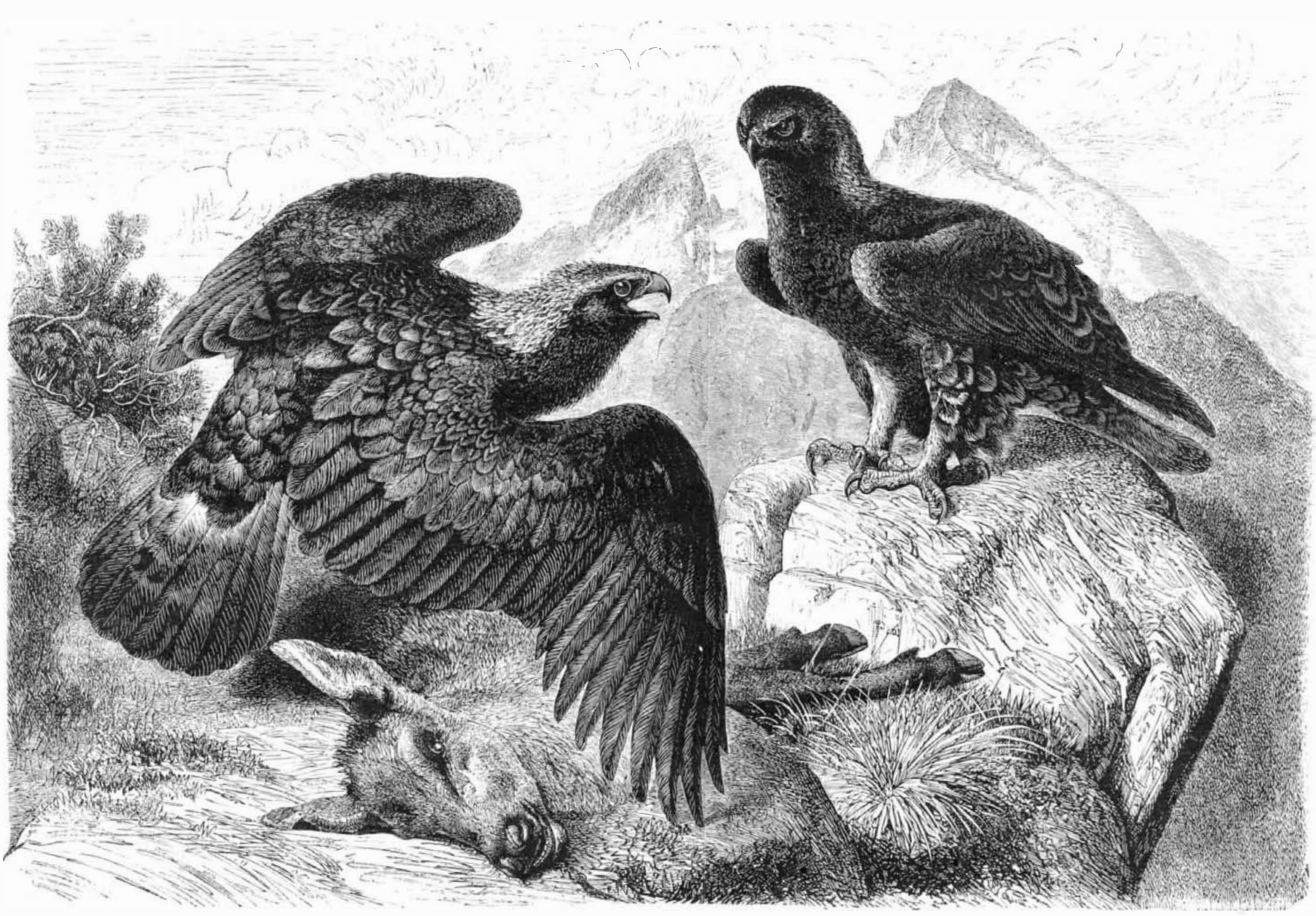
One of the finest of birds, says Wood's "Natural History," is the well known golden eagle. This magnificent bird is spread over a large portion of the world, being found in the British Islands, and in various parts of Europe, Asia, Africa, and America. The color of this bird is a rich blackish-brown on the greater part of the body, the head and neck being covered with feathers of a rich golden red, which have earned for the bird its popular name. The legs and sides of the thighs are gray-brown, and the tail is a deep gray, diversified with several regular dark-brown bars. The cere and the feet are yellow. In its immature state the plumage of the golden eagle is differently tinged, the whole of the feathers being reddish-brown, the legs and sides of the thighs nearly white, and the tail white for the first three-quarters of its length. So different an aspect does the immature bird present that it has been often reckoned as a separate species, and named accordingly. It is a truly magnificent bird in point of size, for an adult female measures about three feet six inches in length, and the expanse of her wings is nine feet. The male is less by nearly six inches.

In England the golden eagle has long been extinct; but it is still found in some plenty in the highlands of Scotland and Ireland, where it is observed to frequent certain favorite haunts, and to breed regularly in the same spot for a long series of years. Their nest is always made upon some elevated spot, generally upon a ledge of rock, and is most inartistically constructed of sticks, which are thrown apparently at random, and rudely arranged for the purpose of containing the eggs and young. A neighboring ledge of rock is generally reserved for a larder, where the parent eagles store up the food which they bring from the plains below. The contents of this larder are generally of a most miscellaneous description, consisting of hares, partridges, and game of all kinds, lambs, rabbits, young pigs, fish, and other similar articles of food. An eagle's nest might therefore be supposed to be an unpleasant neighbor to the farmers, but it is said that the birds respect the laws of hospitality, and, provided that they are left unmolested, will spare the flocks of their immediate neighbors and forage for food at a considerable distance.

In hunting for their prey, the eagle and his mate mutually assist each other. It may here be mentioned that the eagles are all monogamous, keeping themselves to a single mate, and living together in perfect harmony through their lives. Should, however, one of them die or be killed, the survivor is not long left in a state of widowhood, but vanishes from the spot for a few days, and then returns with a new mate. As the rabbits and hares are generally under cover during the day, the eagle is forced to drive them from their place of concealment, and manages the matter in a very clever and sportsman-like manner. One of the eagles conceals itself near the cover which is to be beaten, and its companion then dashes among the bushes, screaming and making such a disturbance that the terrified inmates rush out in hopes of escape, and are immediately pounced upon by the watchful confederate.

The prey is immediately taken to the nest, and distributed to the young, if there should be any eaglets in the lofty cradle. It is a rather remarkable fact, that whereas the vultures feed their young by disgorging the food which they have taken into their crops, the eagles carry the prey to their nests and there tear it to pieces, and feed the eaglets with the morsels.

When in pursuit of its prey it is a most audacious bird, having been seen to carry off a hare from before the noses of the hounds. It is a keen fisherman, catching and securing salmon and various sea fish with singular skill. Sometimes it has met with more than its match, and has seized upon a fish that was too heavy for its powers, thus falling a victim to its sporting propensities. Mr. Lloyd mentions several instances where eagles have been drowned by pouncing upon large pike, which carried their assailant under water and fairly drowned them. In more than one instance the feet of an eagle have been seen firmly clinched in the pike's back, the bird having decayed and fallen away.



GOLDEN EAGLE.—*Aquila chrysaëtos.*

Packing Fruit for Conveyance.

The various packages of specimens which we receive from a distance show the defects of imperfect packing on one hand, and the perfection to which it may be carried on the other. The essential requisite for successful conveyance is to have the fruit incased so tight in the box that no shaking or jarring will cause it to rattle. A box of grapes was sent us; the bunches had been neatly placed in it, and some unoccupied space left in the box above the fruit. In a few hundred miles transit, it had been shaken or turned over perhaps a thousand times, or at least often enough to reduce all the grapes to a shapeless mass of pulp. If a number of bunches or specimens are sent, each should be wrapped separately with cotton or other suitable material, so that every jar and motion will carry fruit and packing all together. We received lately a small box of grapes. The bunches had been placed in the bottom, and the space in the box above compactly filled with newspaper. Here the packing and fruit were separate, and the berries were all more or less beaten and injured. If the bunches had been incased inside the packing, no trouble would have occurred. In another instance, the value of good packing was shown on the receipt of a few specimens of peaches from a distance of a thousand miles. Each peach was first wrapped in a few thicknesses of soft paper; then with cotton half an inch thick; this again with paper, and the whole placed in a box with a compact lining of paper, half an inch or more thick on each side. The fruit has doubtless had many tumbles in the mail bags, but it came without any injury whatever.

Soft fruit will of course fare worse than hard, but the latter may be easily spoiled in packages of much size. An instance—a half barrel of Bartlett pears were well put up, the pressure of the head holding all firmly together. But a single mistake spoiled the whole; the packer placed a handsome but soft pear among the rest in filling, and this soon giving way on the journey, and becoming a shapeless mass, left a vacancy in the barrel, loosening the rest and causing all to rattle, bruise, and spoil. There are some skillful cultivators of fruit from whom we occasionally receive specimens, which, through good packing, always come in perfect condition.

In this connection the premiums offered this year for the best packed boxes of fruit at Covent Garden, London, are worthy of mention. The competing specimens were to be delivered from a distance not less than twenty miles. In this country of long distances this should be greatly extended. The first prize was awarded for a box of grapes, the box being lined with soft, dry moss at the bottom, covered with a sheet of tissue paper; on this the grapes, which weighed 18 pounds, were placed. The sides were similarly treated. Two and a half dozen peaches were packed in a shallow box, the fruit first wrapped separately in paper, and then packed firmly with wadding. Strawberries were packed in mulberry leaves, a mode adopted by all the competitors. In the package of grapes which received the second prize, they were tied to the sides of the box with tissue paper and a layer of wadding beneath; but it strikes us this treatment would not be a guard against the tumbling over which occurs on railroads. The second prize peaches were firmly packed in wadding only. We obtain this information from the *Garden*. If prizes were offered in this country at our fairs for the best specimens of packing extra fine fruit for market, it would unquestionably be the means of effecting important improvements, and such exhibitions would be examined with great interest by fruit growers.—*Country Gentleman.*

Dangerous Toys.

A Brooklyn chemist was fatally poisoned recently while preparing the ingredients for the well known "serpent's eggs." Usually he mixed the ingredients of this dangerous plaything in the open air, knowing the poisonous nature of the vapors of mercury liable to be given off during the work, as well as when the eggs are burning. On the fatal day he melted the ingredients in his house. The retort cracked in the process, and knowing the consequence he warned his wife and children to run for the yard. He followed, crying that it was all over with him, as he had breathed enough of of the fumes to kill him. He died the next day.

Natural Gas in Quebec, Canada.

The natural gas well in Maskinonge County, Quebec, is attracting considerable attention. Recently quite a gathering of prominent Canadians assembled at St. Pierre to witness tests of the illuminating power of the gas and to hear the report of a chemist who had been commissioned to examine the well. He reported the gas to be protocarburet of hydrogen, easily and cheaply convertible into the best illuminating gas. The capacity of the well is considerable—from 35,000 to 40,000 cubic feet a day.

NATURAL PONDS FOR THE CULTIVATION OF CARP FOR PRIVATE USE.

We received some months ago (through Mr. Eugene Blackford) a number of scale carp which were raised by Mr. Rudolph Hessel, the curator of the government carp ponds at Baltimore. When we placed them in the pond they measured from 2½ to 4 inches in length, and greatly to our astonishment (when drawing off the pond recently), we found that these carp had, in many cases, increased to 16 inches in length.

We are now having this natural or wild pond thoroughly overhauled and constructed according to the instructions published by Mr. Rudolph Hessel. Having received so many demands for information on the subject of carp ponds, we republish Mr. Hessel's instructions for the benefit of our readers.

In establishing carp in natural ponds it is first necessary to ascertain the following points:

1st. Is there sufficient water for all purposes all the year round?

2d. Is the ground, soil, aquatic plants, and water favorable for culture?

3d. It is important to examine the soil minutely in order to ascertain its vegetable and mineral qualities.

If points 1 and 2 have been satisfactorily settled, the ground must be examined as to whether it will allow the collected water to penetrate, and whether the ground is sandy or loamy. Above all, measure the depth of the stratum and be assured that it is sufficiently impermeable to withstand the pressure of the water and to hinder its oozing through, and so prevent the drying up of the pond.

A rocky, gravelly ground is not appropriate for carp culture. Sandy ground with a considerable mixture of loam, clay, and humus, is of small use. I speak here of large ponds of considerable extent. Small ponds with a sandy bottom may be improved by supplying them with loam. Loam is a mixture of a small per cent of sand and a larger quantity of clay. If such ground contains some marl, or better, some elements of humus, it is of the greatest advantage.

Too much humus or dissolved peat is injurious. Water which runs through bog meadows or oak woods is not of much use, because it contains too much humic acid and tannin, which impart a mouldy flavor to the fish. The most favorable water is that which comes from rivers and brooks.

Rain water, particularly during the winter, when frozen over, takes a mouldy taste, which is communicated to the fish, as does the water from bogs also.

Spring water, direct from the ground, ought to be conducted for at least a few hundred yards through wide shallow ditches in order to obtain more nourishing components from air as well as earth, and above all, to be warmed by the action of the sun.

Ponds must not be too deep, as the water will be too cold, and will harbor fewer insects, larvæ, and worms, which form part of the carp's food. A depth of 3 feet is sufficient for the center of the pond. Toward the outlet sluice it may be from 6 to 8 feet, but only for an area of from 200 to 1,000 square feet. In the depths of this "collector" the fish seek their resting place for winter, as also in summer when the water becomes too warm. The outer part of the pond should not be deeper than 1 foot for a distance of 70 to 100 feet.

Toward the center of the pond a cavity is dug 2 feet deeper than the rest of the pond; this also serves the fishes as a resting place in summer and winter. This cavity is called a "kettle." From the entrance of the pond to the other end, where the collector and the outer sluice are situated, two or three ditches 2 feet in depth and 4 feet in length must be made; these ditches cut the deeper "kettles" transversely as far as the collector. These ditches are intended to carry all the fish into the collector when the pond is being drained. The collector is nothing but a place from 20 to 40 feet in length and breadth, near the outer sluice, and is 1 foot deeper than the rest of the bottom of the pond. This collector must be cleaned out every year, or the fish will become too much soiled by the mud. The inflow of water into a pond should never be direct, as, for instance, a brook falling into it, as this often causes the water to suddenly rise, carrying into the pond injurious fishes. The inlet sluices from the stream must of course be of a strong and practical construction, and they ought to be provided with gratings to prevent other fish from intruding. It will also be found very useful to construct a hatching place on some flat and sunny spot near the bank; that is, a so-called cut in the land, measuring 40 to 100 feet in length and from 30 to 50 feet in breadth, and having a depth of from 18 inches to 5 inches. This cut should be planted with aquatic plants, and ought to be the only place where the carp can ascend from deep water in order to deposit their eggs conveniently on the plants and engage in the spawning process. As soon as this has taken place the entrance to the cut is closed with a net, so that the eggs cannot be eaten by the fish. See Fig. 1.

The carp also has the disposition to swim toward the inflowing water, by which means it is drawn away from its proper feeding places. The water should be conducted into the pond sideways from the stream; and if it should be a small brook only it may be turned off entirely and carried alongside the pond, from which point the latter can be easily supplied with water.

It is an indispensable condition for the culture in ponds, according to established rules, that they be so constructed as to allow of being thoroughly drained, so that the fishes may be taken out without any difficulty.

On account of the required outlet sluices, etc., the fact must be kept in view, that newly constructed dams will sink ten per cent after a lapse of time of little more than a year, unless it has been solidly made. The dam should be sodded. For the draining of the pond, at the "fishing out" season, it should have an outlet at the lower end, if no other advantageous arrangements can be made for the purpose. The use of woodwork for the channel should be avoided, its durability not being sufficient. The most desirable construction would be that the outlet consist either of masonry work or water pipes, which may be made either of clay or iron. This channel or pipe must be so made that it can be closed tightly or opened again readily if needed, and must be provided with two or three fold gratings to prevent the escape of the fishes upon the opening of the sluice. At the same time there should be an outlet channel, several feet in breadth, at the side of the pond to allow the water to run off. This must also be secured by grating, but should be kept open always, so that in case of continued rainy weather or sudden and violent showers of rain or thunderstorms, no overflowing of the banks or dams may be possible through the unexpected rising of the water in the pond.

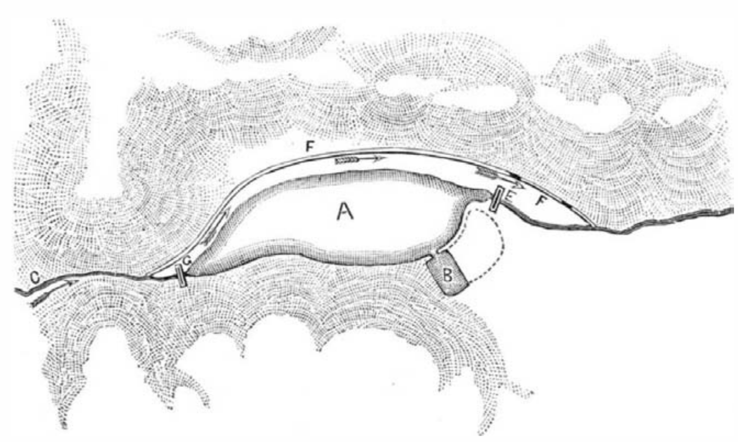


Fig. 1.—Plan of natural pond.

Explanation of Fig. 1.—A is the pond, B is the cut or breeding pond. The dotted line contains the water having a depth of only 5 inches; B is the water of 1½ feet in depth; F F is the outer ditch to prevent an overflow of the pond; G is the inlet sluice; and E is the outlet sluice.

P is a natural pond; its extent is about 150 feet to 200 acres. It is formed by a dam, D, about seven to eight feet high, crossing a valley, and thus collecting the water of a run flowing there. Before D is a deepening, C, the collector. In the dam, D, there is an outlet leading to another deepening, the so-called outlet collector, O C. The purpose of this collector is to retain fish that may have passed through the outlet when opened. It is provided with a screen or netting, C D. Upon the bottom of the pond, P, is the collector ditch, which conducts the fish to C when the water is let out, and thus prevents them being caught in the mud. R is the run of water which, to prevent overflow, has to be conducted around the pond in a separate ditch, leaving an inlet at J protected with screens.

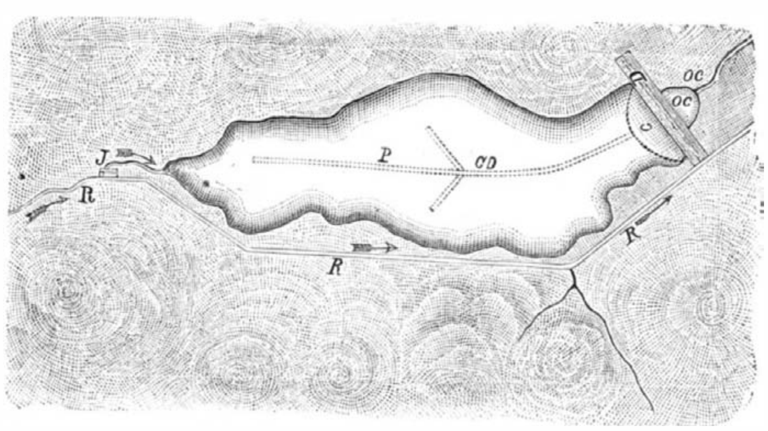


Fig. 2.—Plan of natural pond, showing collector ditches, collectors, and kettle.

A Curious Parasitic Fish.

An interesting specimen of the *fierasfer* has lately been added to the collections of the American Museum of Natural History in Central Park. The fierasfer is a parasitic fish, perfectly white and almost transparent, which inhabits certain holothuria, or sea cucumbers. The specimen in the museum was recently taken on the Florida reef, in the neighborhood of Tortugas. The discoverer was poling a boat along the reef looking for specimens, when his companion at the bow of the boat suddenly called out to him to stop, and diving into the water, came up with an enormous holothurian. He held it over the boat with both hands, and was about to drop it, when, to his amazement, a silvery, tapering fish, about eight inches in length, appeared squirming and twisting from its mouth, evidently forced out by the strong grasp of the man. He held it over a pail of salt water, into which it dropped, and after a few ineffectual attempts to swim, it died. Suspecting that it was a parasitic fish, the discoverer collected numbers of holothurians, and in many of them found the large fierasfer snugly lying in the stomach of its worm-like protector. Every attempt to keep the fish alive out of the stomach of the holothurian failed. Although some were placed in open water, it seemed to affect them immediately. It is one of the most interesting illustrations of parasitic life.

London Milk Supplies.

The books of the railway companies show that nearly 20,000,000 gallons of milk are brought into the city every year. It is estimated that not less than 3,000,000 gallons more are produced within the metropolitan area or brought in otherwise than by railway, making a total of 23,000,000 gallons, which at five pence a quart, represents an annual cost of about $10,000,000.

Are Fish more abundant in Water Containing Lime?

Is hard water favorable to the growth of fish, or do fish make the water harder than it would be? This is a curious question and one having a practical bearing. Pisciculture is attracting more attention abroad since the wonders accomplished here have become noised abroad. W. Weith has been studying the waters of Switzerland both in regard to their chemical composition and the beings that inhabit them, and prepared a paper for the Berlin Fish Exhibition on this subject. He made a large number of quantitative analyses, and arrived at the conclusion that in general, with some exceptions explained by him, the most fish were to be found in those waters which contained the most carbonate of lime in solution, provided, of course, that the other conditions were the same. Weith advances the following plausible theory to account for these facts. The simple carbonate of lime is widely distributed in the soil both on the shores and in the bed of the river, but being insoluble cannot be taken up by the water in its present form. When, however, the water contains an abundance of carbonic acid, which would be produced by the respiration of water animals, the simple carbonate of lime would be converted into the bicarbonate, which readily dissolves in water.

This ingenious theory is sustained by an interesting experiment which he made. Two vats were filled with pure water from Lake of Zurich, and an equal quantity of carbonate of lime put into both; and in one he put some carp. After a while the water in both was analyzed, and he found that the quantity of carbonate of lime in solution had perceptibly increased in the water containing the fish, while in the other it had remained unchanged.

According to this a mere chemical analysis of a river will frequently enable us to guess with great probability whether it contains many fish or not. On the other hand Weith was able to judge of the chemical composition of the water when he had ascertained the quantity of fish in it. His prognostications were afterwards fully verified by direct experiment. An important practical consequence would result from these investigations, if further experiments confirm the suspicion that not only do water animals increase the percentage of lime in water, but the converse is true, that the abundance of lime is favorable to the increase of fish. This is by no means improbable, for water plants require carbonic acid for their nourishment, which is introduced into the water in soluble form along with the lime. The fish produce the carbonic acid, and in the presence of lime it cannot escape into the air, but remains dissolved in the water and promotes vegetable life in the water.

Water plants, however, feed the water animals and render their existence possible. The intimate mutual dependence of animal and vegetable life upon each other has long been known, and now both are upheld by the aid of lime.

Experiments upon a large scale must decide whether it is possible to improve water that flows over a soil free from lime, and hence poor in organic life, by a suitable addition of carbonate of lime and convert it into one that shall afford to vegetable and animal life the conditions necessary for their existence. It may also be questioned whether water too poor in lime to grow fish is worth doctoring to this extent. P. N.

Immigration as a Source of National Wealth.

The enormous annual addition made to our national wealth by the vast tide of immigration now flowing in is discussed at some length by the London *Economist*. The principal part of the paper is well worth reproduction here. The money values we take the liberty of changing to dollars, rating the pound sterling for convenience $5. Taking the average amount of money brought by immigrants at the low figure which the emigrant commission found to be the average fourteen years ago, namely $70 a head, the *Economist* finds that the immigrants of the current year will add not less than $35,000,000 to the capital of the States, and adds:

But of course the value of the immigrants is not to be measured by the altogether inadequate standard of the coin they bring in their pockets. Of infinitely greater worth are the physical vigor and acquired industrial skill of the immigrants themselves. As to the rate at which these ought to be appraised opinion will differ widely, for all estimates of their value are necessarily more or less speculative. We cannot apply to this wealth-producing power the brutal though fairly conclusive test which fixed the value of slave labor, by the price it brought under the hammer of the auctioneer. It is only by indirect and imperfect modes that any idea of its worth can be obtained, and so intricate is the problem that little reliance can be placed upon the most elaborate calculations. For our present purpose, however, it is not necessary that any very minute estimates should be attempted. It will suffice if we give some rough indication of the enormous additions that are being made to the wealth of the United States by this continuous inflow of skilled labor, and to that end let us first look at the composition of the emigrating body. In 1879 it was made up thus:

Males between 15 and 40	46 per cent.
Males over 40	7 per cent.
Males under 15	10 per cent.
Females over 15	28 per cent.
Females under 15	9 per cent.

Now it is probably considerably below the mark to place the average duration of active life in the males between fifteen and forty—the time, that is, during which they will be working with full vigor—at fifteen years. For those above forty an average of ten years does not seem excessive, while, if we calculate that of the males under fifteen one-third will have an active working life, at full adult wages, of twenty years, we keep well within bounds. It is further a reasonable supposition that a sum equal to at least 20 per cent of the wages earned by this body of workers will be realized as profit on their labor, and recent statistics place the average wages of all classes of male laborers in the States at about $625 per annum. On an average, therefore, each actively employed workman may be said to add $125 per annum to the capital of the country; and, taking the duration of active life above estimated, we arrive at the conclusion that the average value to the United States of each man and boy arriving as an immigrant is not less than $1,625. Going now a step further, and assuming the value, as a producer of wealth, of each female to be only a fourth of that of a male, we get an average value for each man, woman, and child of about $1,250. Of course a deduction should be made from this estimate for the scum of the immigrants, who instead of adding to the wealth of the country detract from it. But, on the other hand, a far greater sum must be added as the equivalent for the profit realized from the labor of the children begotten by the immigrants, and also for the fact that many of the skilled artisans arriving in the States are able, by their special knowledge of manufacturing processes, to add greatly to the efficiency of the native labor. If, however, in order to avoid anything like exaggeration, we place the average value as a capital creating force of each immigrant at $1,000, we get as the actual or potential addition to the wealth of the country by such a body of immigration as that now taking place the enormous sum of $500,000,000 per annum. This estimate, we would again repeat, is not put forward with any claims to perfect accuracy. It is simply a rough calculation intended to bring home to the minds of those who may not have thoughtfully considered the subject some notion of the rapidity with which the United States are being enriched by the draughts they are making upon the population of the Old World. But it is some indication that we have not overstated the annual movement of wealth arising in this way that the United States Bureau of Statistics have estimated the growth of capital through immigration in the fifty years prior to 1871, when, of course, the influx was trifling to what it is now, and when, moreover, the quality of the immigrants was much below the present standard, at an average of $125,000,000 per annum.

Good Use for Sawdust.

What shall we do with the sawdust? is a question which puzzles the economic brain of the man who realizes that the utilization of the fast depleting forests is accompanied with an amount of absolute wastefulness simply appalling. "Make it into railroad car wheels," says an enthusiastic inventor of Chicago, who has discovered a means of compressing sawdust, bran, tea, and kindred bulky substances into from one-tenth to one-third of their original bulk. The *Lumberman* some weeks since spoke of this invention in terms somewhat of disparagement, which it subsequently modified on seeing specimens of sawdust and bran compressed into a remarkably small compass. Its credulity is further shaken on being shown a model of a car wheel consisting of an iron rim of seven inches outward diameter by one-half inch thick, fitted with a well proportioned hub, the space between the hub and rim filled with pine sawdust, pressed in so solidly that we are ready to believe the assertion that, resting the iron rim upon bearings, a pressure equal to 23 tons applied to the hub failed to develop any signs of weakness. We hesitate in these days of progress to assert that anything is impossible, and we begin to think that even sawdust possesses elements of value hitherto unsuspected, and that the day may come when the filled grounds adjacent to all saw mills may be seen to have a great value in the mechanical development and utilization of the now useless *debris* placed upon them to get it out of the way. Sawdust car wheels, sawdust brick, sawdust fence posts, railroad ties, and even sawdust window and door frames, wainscoting and mouldings, begin to appear among the possibilities of the immediate future. Sawdust hair pins, watch chains or cases, and sawdust knives and forks, or sawdust shovels, pitch forks, or hoes, will probably not be urged upon this generation, which will remain satisfied with utilizing sawdust in place of the more expensive basswood in the manufacture of hams and cakes of soap, but the field of possibilities is still large enough to utilize a vast amount of this valueless material. Seriously, however, the compression of bran and oats into one-tenth of their original bulk, without injury to the substance, means cheaper transportation, which will enable their shipment to foreign lands at a profit which their bulk has rendered impossible, while with the freight on tea from China, costing about $25 per ton on account of the space it occupies, a compression into one-third its bulk would mean a saving of from three-quarters of a cent to one cent a pound on freight and labor of handling. It is not by any means impossible that we may buy a "brick of tea" in the near future which we can carry home in our vest pocket, or that the housewife may keep her truant husband at home evenings to saw the coffee up into thimblefuls suitable for the preparation of the morning draught.

Verily it would seem that with the recent discoveries of a Rip Van Winkle of the press, who after being absent from home for a year had to have a pilot to show him about the city of his former residence, and who in his absence developed a sixty year stock of pine on the Menominee, and about as large a supply throughout the State of Michigan, there is no danger after all of a timber famine, at least so long as the sawdust holds out.—*Northwestern Lumberman.*

Removal of Stains and Spots.

Matter Adhering Mechanically.—Beating, brushing, and currents of water either on the upper or under side.

Gum, Sugar, Jelly, etc.—Simple washing with water at a hand heat.

Grease.—White goods, wash with soap or alkaline lyes. Colored cottons, wash with lukewarm soap lyes. Colored woolens the same, or ammonia. Silks, absorb with French chalk or fuller's earth, and dissolve away with benzine or ether.

Oil Colors, Varnish, and Resins.—On white or colored linens, cottons, or woolens, use rectified oil of turpentine, alcohol lye, and their soap. On silks, use benzine, ether, and mild soap, very cautiously.

Stearine.—In all cases, strong, pure alcohol.

Vegetable Colors, Fruit, Red Wine, and Red Ink.—On white goods, sulphur fumes or chlorine water. Colored cottons and woolens, wash with lukewarm soap lye or ammonia. Silk the same, but more cautiously.

Alizarine Inks.—White goods, tartaric acid, the more concentrated the older are the spots. On colored cottons and woolens, and on silks, dilute tartaric acid is applied, cautiously.

Blood and Albuminoid Matters.—Steeping in lukewarm water. If pepsine, or the juice of *Carica papaya*, can be procured, the spots are first softened with lukewarm water, and then either of these substances is applied.

Iron Spots and Black Ink.—White goods, hot oxalic acid, dilute muriatic acid, with little fragments of tin. On fast dyed cottons and woolens, citric acid is cautiously and repeatedly applied. Silks, impossible.

Lime and Alkalies.—White goods, simple washing. Colored cottons, woolens, and silks are moistened, and very dilute citric acid is applied with the finger end.

Acids, Vinegar, Sour Wine, Must, Sour Fruits.—White goods, simple washing, followed up by chlorine water if a fruit color accompanies the acid. Colored cottons, woolens, and silks are very carefully moistened with dilute ammonia, with the finger end. [In case of delicate colors, it will be found preferable to make some prepared chalk into a thin paste, with water, and apply it to the spots.]

Tanning from Chestnuts, Green Walnuts, etc., or Leather.—White goods, hot chlorine water, and concentrated tartaric acid. Colored cottons, woolens, and silks, apply dilute chlorine water cautiously to the spot, washing it away and reapplying it several times.

Tar, Cart Wheel Grease, Mixtures of Fat, Rosin, Carbon, and Acetic Acid.—On white goods, soap and oil of turpentine, alternating with streams of water. Colored cottons and woolens, rub in with lard, let lie, soap, let lie again, and treat alternately with oil of turpentine and water. Silks the same, more carefully, using benzine instead of oil of turpentine.

Scorching.—White goods, rub well with linen rags dipped in chlorine water. Colored cottons, redye if possible, or in woolens raise a fresh surface. Silks, no remedy.—*Muster Zeitung für Faerberei, Druckrei, etc.—Chemical Review.*

Deep Drive Wells.

In the vicinity of Antwerp, much difficulty is experienced in obtaining water, owing to the fact of the ground being entirely a deposit of fine sea sand of a "blowing" nature. Mr. Huger, the agent of the Great Eastern Railway Company at Antwerp, has been trying to ascertain how deep the bed of sand extended, and has made his first attempt on a very small scale, employing an "Abyssinian" tube well, only 1¼ inch diameter, and driven by a monkey weighing 75 pounds. With this little tube he has been able to reach to no less a depth than 152 feet, testing the soil at short intervals the whole way down, and demonstrating that nothing but sand extends to this depth. It is now very probable that the attempt will be followed upon a larger scale.

NEW INVENTIONS.

An improved horse-stopping attachment for wagons has been patented by Mr. George W. Blake, of Port Townsend, Washington Ter. The object of this invention is to furnish horse-stopping attachments for wagons so constructed that the momentum of the wagon may be utilized for stopping the horses.

Messrs. Anthony Marschall & Casper L. Marschall, of Evansville, Ind., have patented a harness buckle whose swinging tongue is provided with curved notches and a single point at right angles to the main body of tongue, the point being grooved in front and near its upper end.

An improved child's stocking suspender has been patented by Harriet F. Bowman, of Mattoon, Ill. The invention is designed to avoid the necessity for the use of garters for holding up children's stockings, the bad effect of an impeded circulation, cold feet, and other incidental evils being recognized as due, to a large extent, to the use of tight garters, which, as the child grows, constantly become tighter.

In that class of type-writing machines in which the paper is placed between a printing cylinder and smaller paper-pressing feed rollers, and is held by endless rubber belts, small sheets of paper, such as envelopes, cards, etc., cannot be satisfactorily held and passed around the rollers, thus preventing a general use of the type-writing machines. To avoid this difficulty Mr. John H. Pratt, of Allentown, N. J., has patented a new paper presser for type-writing machines, which carries and holds small pieces of paper, such as cards, envelopes, small sized note paper, etc., to be written upon by the machine.

Mr. Charles J. Le Roy, of Palestine, Texas, has patented improvements in reel spool racks used in retail stores for holding different sizes and kinds of rope coils in a convenient manner for unreeling any required length of rope without disarranging the coil. It consists in a peculiar construction of frame and arrangement of the spools or reels upon the frame to secure a light and compact structure of sufficient stability to support the required number of rope coils.

Early Rising.

Of course the majority of the busy members of the community have been "away for change of air and scene," and, equally, of course, the majority have derived substantial benefits—not at the moment apparent, perhaps, but to be evidenced, in better health or more energy, presently. This is, therefore, a good time to speak of such reforms in the management of self as may be expedient. We venture to suggest that those who have not yet made a fair trial of the practice of early rising should do so. With a cup of tea, and perhaps a single slice of bread-and-butter, to wake him at 6 or 6:30 in the morning, a fairly healthy man may go to his study, and enjoy the priceless luxury of two or three hours of work, when his brain is clear and the distractions of the day's ordinary business have not begun to assail him. The practitioner of an applied science, such as medicine, is especially in need of time for reading and quiet thought. In the active hours of the day this is denied him. At night he is, or ought to be—but for the bad habit of reading by night, probably formed in student days—too weary in mind and body to do good work. In the early morning, with his brain recuperated by sleep, and his whole system rested, he is especially fit for labor. Those who do not feel thus on awakening are either the subjects of some morbid state, or the slaves of a habit which, however common, is essentially unnatural. Some of the difficulties which beset the task of early rising are due to want of method in the act of "getting up." It is comparatively easy to rouse one's self instantly, but to not a few of us it is extremely irksome, and almost impracticable, to rise slowly, that is, taking time to think about it. The man who *really* wishes to rise early should get up the instant he wakes, and, if weakly or over forty years of age, instead of plunging into cold water or applying cold to the head to rouse himself, he should, as we have said, take a cup of tea or milk to stimulate the organism before expecting to elicit a reaction by a powerful depressant such as the cold bath or douche. Many persons make a mistake in this matter, and by taking their bath immediately after getting out of bed, lower the vitality instead of raising it. In certain cases it is better to leave the bath until after a walk or a spell of work has thoroughly awakened the organism and called out its energies. Experiences in relation to this and other matters must differ as widely as constitutional peculiarities diverge; but, speaking generally, the early morning is the time for serious work, and those who do not so use it find a poor substitute, and one which is by no means hygienic, in the late hours forced upon them. A man cannot get up early if he goes to bed late; but as between the two extremities of the day, the morning is, on all accounts, the best for brain exercise.—*Lancet.*

A Cure for Night Sweats.

A powder known as *streupulver*, composed of 3 parts salicylic acid and 87 parts silicate of magnesia, is used in the German army as a remedy for sweating of the feet. Recently a Belgian physician, Dr. Kohnhom, tried its efficiency in several cases of night sweating by consumptives. The beneficial effect was immediate and permanent. The powder was rubbed over the whole body. To prevent any breathing of the dust and consequent coughing a handkerchief must be held over the patient's mouth and nose while the powder is being applied.

New Mineral Discoveries.

From the proceedings of the Academy of Natural Sciences of Philadelphia, just published, we extract the following among the mineral deposits recently discovered:

A New Locality for Amethyst.—Mr. W. W. Jefferis announced that amethysts, well crystallized, and of a rich purple color, had been found this spring, for the first time, in the northern part of Newlin Township, Chester county, Pa. They were brought to the surface by deep plowing, and were supposed to be derived from a vein of this mineral.

A New Corundum Locality.—Mr. W. W. Jefferis remarked that a vein of blue corundum, similar to that found in North Carolina, was struck, on the south side of the Serpentine ridge, in Newlin Township, Chester county, Pa., a short time since. The vein is well defined, between walls of culsageeite, in large plates of a yellowish-green color. Over 500 pounds of massive blue corundum has been taken out within ten feet of the surface.

Minerals in North Carolina.—Mr. H. C. Lewis communicated the following list of minerals which he had found near Dobson, Surry county, N. C., during a recent visit to that locality:

Native sulphur, galena, pyrrhotite, pyrite, chalcopyrite, hematite, menaccanite, magnetite, limonite, hausmannite, psilomelane, wad, hornblende, actinolite, asbestos, garnet, talc, steatite, ripidolite, chlorite.

The psilomelane occurred in a bed about 18 feet in thickness.

The magnetite was frequently polar. Native sulphur occurred in cavities in quartzite as a coarse loose powder of rounded wax-like grains, and was the result of the decomposition of pyrite.

It was also stated that rutile occurred in Alexander county, N. C., a new locality.

Fossil (?) Casts in Sandstone.—Dr. J. M. Cardeza exhibited specimens of quartz sandstone (Potsdam ?) which he had found lying loose upon the soil at Dutton's Mills, Pa., in which were oblong rounded casts of sandstone, about an inch in length, and similar to one another in shape. It was questioned whether they might not be fossils.

An Inclosure in Quartz.—Mr. H. C. Lewis exhibited a crystal of quartz from Herkimer county, N. Y., in which, hanging from a bubble which moved in a cavity containing liquid, was a tuft of minute acicular crystals of a pure white color. A microscopical examination had failed to identify them with any known substance. The crystals were similar to those of many organic salts. It was conjectured that they had crystallized out from the liquid. Under a power of 75 they looked like tufts of white wool, and it was suggested that if future investigation failed to refer them to a known mineral species, it might be convenient to give them the name *Erilite* (from Gr. *erion*, wool).

In other cavities in the same crystal there was an amorphous yellowish-brown waxy substance of unknown composition.

Menaccanite and Talc from Maryland.—Mr. Wm. W. Jefferis remarked that in Harford county, Md., near the village of Dublin, there is a vein of green foliated *talc* in the serpentine, which has been opened about 6 feet in length. It has furnished cleavage foliated specimens over a foot in extent. The same vein contains *menaccanite* in tubular crystals, well crystallized. Yellow beryl has also been found there, showing all three in the same specimen.

Sunstone in Labradorite.—Mr. Jefferis stated that on examining a specimen of labradorite in his possession, from the coast of Labrador, he found that in addition to the usual play of colors (blue and green), by turning it in another direction it showed innumerable crystals of göthite, making it a beautiful sunstone, which, he believed, was an unusual thing, and which he had not found mentioned in the books.

Tanning in China.

A writer in one of our foreign exchanges thus describes the Chinese mode of tanning: The skins are put into tubs containing water, saltpeter, and salt. After thirty days they are taken out, the hair is shaved off, and the skins well washed in spring water. Each hide is then cut into three pieces, and well steamed, which is done by passing them several times backward and forward over a steaming oven. Further, each piece is stretched out separately over a flat board, and secured with nails, in order that it may dry gradually and thoroughly in the sun. The smoke of the oven makes the leather black, and if it is required to give it a yellow appearance it is rubbed over with water in which the fruit of the so-called wongchee tree has been soaked. Of the offal glue is made by heating it in pans for twelve hours over a slow fire. The glue so obtained is poured into rough earthen vessels, where it remains three days in order to coagulate. The solid mass is cut into pieces with sharp knives, and carefully laid upon grating-like trays to dry, which are placed in open spaces resembling the Dutch thrashing floors. The time taken in drying varies according to the season of the year; with a northwest wind it will be about five days only, but with a southwest wind as much as thirty or forty days will be required. The dregs from the offal left in the pans, as well as the hair from the skins, are sold to the farmers for manure. At Oak-sha, a village near Canton, there is an extensive establishment for the manufacture of leather, which is well worth a visit. The Mongols in wild parts of the country make clothes from goat skins, which are excellent and durable protection against the cold and wet. When the hair is taken from the skins, carpets and mats are made from the latter. In the south of China the hides are eaten, and the hair is either sold for dung or utilized in various ways in the manufacture of Chinese feathers.

Concentration in Business.

A writer in the *Economist* warns merchants and others against engaging in business foreign to their legitimate vocation. Successful business men, he claims, are of a conservative nature. Like skillful generals, they mass their forces in solid columns, instead of thinning ranks in trying to cover a wide area of ground. Solid battalions resist successfully the fierce onslaughts of the enemy and win the day, while weak columns go down at the first charge of the bayonet. Merchants who concentrate their energies and talents upon their legitimate business and let outside matters alone, keep their affairs well in hand, and are therefore fortified against sudden disaster. When they, however, begin, in addition to selling merchandise, to go into outside speculations, they weaken their forces and try to cover too much ground. A merchant cannot run a store and farm safely side by side, either the one or the other will suffer. Dry goods and silver mines do not mix well together when the same hand guides both. A collision detrimental to one or both interests will sooner or later occur. A manufacturer should not attempt to raise sheep because he uses their fleece in his mills. His business is to see that out of every pound he buys he turns out as many yards of goods as it is possible to do and produce a good fabric. Here is enough to occupy his time profitably, without buying land and going into sheep husbandry. With many business men the trouble is not so much in making money as to keep it when it is made. They are of a restless temperament, never satisfied, always on the *qui vive* eager for speculation and ready to dabble in outside ventures. They speculate in stocks, take a venture in grain or pork, risk largely in wool or cotton, and always willing to subscribe handsomely for the shares of gold or silver mines. Such men lack the power of concentration. With divided mind, divided energies, and divided capital, they are scattered over too wide a surface, and at the first wave of a panic they go down into insolvency and financial ruin.

Not so the business man who steadily pursues his legitimate occupation. He husbands his resources of energy and capital, he gathers renewed strength with the profits of every year, he looks ahead for breakers, and is fortified with a good bank account when disaster threatens the commercial world.

Conservatism in business does not allow of a trade far exceeding the bounds of capital employed. Here is also a source of danger. It is never safe to depend upon outside aid to float an extended business. The danger may be delayed when crops are splendid and the country prosperous, but sudden reactions occur frequently in trade, and money grows tight and capital timid. In such seasons the business man who has attempted to cover too much ground is often forced to the wall. Had he kept his trade under wise control he would have passed safely through the sudden flurry. Credit and character are both important in commercial affairs, and are secured only through well directed conservatism. For a man to succeed he must concentrate his powers and abilities, mark out a safe, straight line and steadily pursue it. He will find in the long run that one pursuit furnishes ample scope for all his energies, and if wisely followed will bring appropriate reward.

Boston Founded on a Gold Bed.

An artesian well is now being sunk in Boston, which, according to the *American Architect*, seems to have at least one peculiar feature. The well has been driven rather more than fifteen hundred feet without reaching any considerable spring, although there is a constant moderate flow of water into it, but it seems that at a distance of fourteen hundred feet from the surface a stratum of gold-bearing quartz, twenty feet thick, was reached and pierced. As the city is itself situated on a mass of diluvial clay and gravel, although surrounded on all sides, at a distance of a few miles, by granite and porphyry formations, it might naturally be inferred that the auriferous vein would crop out somewhere about the edge of the basin, and as "bonanzas" twenty feet thick are not only rare but valuable, possibly further attempts may be made to trace the course of the deposit. We are not informed, adds the editor, whether the material brought up by the auger proved to be very rich in the precious metal; probably it was not, but no surprising results could be expected from a random incision into the rock. Whether any one succeeds in making any profit out of it or not, the thought that Boston, alone of large cities, rests upon a plateau of gold ore may at least serve to gratify the vanity of its inhabitants.

Manufacture of Oil Barrels.

The American paper barrel makers are quite confident that barrels produced directly from pulp can be made to take the place of the barrels now used for petroleum. At present it appears to be purely a matter of cost. The barrel factories of the Standard Oil Company turn out daily 30,000 iron bound, blue painted, wooden barrels, costing $1.35 each. The barrels are hooped by machinery, each machine, requiring a man and two boys to attend to it, hooping 1,200 barrels a day. The barrels are also painted by machinery. The saving of but one cent a barrel in cost would save the company $300 a day.

AGRICULTURAL INVENTIONS.

Mr. William W. Hopkins, of Thorntown, Ind., has patented an improved wagon scale, the object of which is to enable farmers to have a convenient set of farm scales for general use, and one adapted to weigh the contents of a wagon in bulk. It consists in the peculiar arrangement of a set of weighing levers fastened to the bottom of the wagon body, and adapted to bear against the bolster, in combination with a graduated scale beam, also carried by the wagon body.

Mr. William I. Ely, of Freehold, N. J., has patented a harvester for cutting cornstalks while standing in the field. It is so constructed as to raise inclined or fallen stalks, cut them, and drop them upon the ground in even bundles.

Mr. Joseph Howard, of Bryan, Texas, has patented an improvement in rolling hopper planters, which consists in the construction and arrangement of the devices whereby the hopper is attached to the beams or frame of the machine.

An improved hay elevator and carrier, patented by Mr. George Rundle, of Palmyra, Wis., consists in certain novel details of construction, arrangement, and combination of a hay fork, a carrier, and devices for raising and lowering the fork and its load and for operating the carrier.

Mr. Robert N. Boston, of Chestertown, Md., has patented an improvement in the class of machines adapted for simultaneously dropping and covering corn and guano or other fertilizer. The corn and guano are placed in separate hoppers, between which is a rotating wheel whose shaft or axis projects into the respective hoppers, and is provided with teeth that agitate and assist the discharge of the contents of the hoppers. The latter deliver corn and guano, respectively, into separate pockets or receptacles, from which they are taken up by cups affixed to the ends of radial arms projecting from and revolving with the aforesaid axis. The pockets and revolving arms are between the hoppers, and a seed spout is located in front of the pockets, so that the seed and fertilizer are delivered simultaneously into the same, and thereby mingled and conveyed into the furrow.

Mr. Joseph P. Prairie, of Raleigh, N. C., has patented a combined cotton planter and guano distributer, which is so constructed as to drop cotton seed and guano at the same time in uniform quantities and cover the seed and guano, and which can be adjusted to drop a larger or smaller quantity of either or both as required.

Mr. William Rucker, Sen., of Murfreesborough, Tenn., has patented a harrow so constructed that it will thoroughly pulverize the soil, will readily pass over obstructions, will not be liable to clog, will level and smooth the ground, and may be adjustable to work at any desired depth in the ground.

A novel combination, with a plow beam, of a clevis, a pivoted bar, a spring, and a supporting and carrying arm, whereby provision is made for raking and leveling weeds, stubble, corn stalks, and grass during the process of plowing, and for allowing the raking bar to yield when meeting obstructions, has been patented by Mr. Chauncey E. Worline, of Radnor, Ohio.

Honors to Sir Henry Bessemer.

The freedom of the city of London was lately conferred on Sir Henry Bessemer, F.R.S., at a special Court of Common Council. In acknowledging the honor thus conferred on him, Sir Henry Bessemer referred to the condition of the steel manufacture before the introduction of his process, and the rapid development of the industry which that process had caused. He compared the total steel production of the country, which did not exceed 51,000 tons a year, to the present output of nearly a million tons, and the reduction of price from £50 to £10 a ton. The document conveying the freedom of the city was presented to Sir Henry Bessemer in a gold casket of very excellent design, appropriately illustrating his process; this casket was the production of Mr. J. W. Benson, of Ludgate Hill.

The Electric Light on a Volcano.

The railway up Vesuvius has been successfully lighted up by fourteen Siemens and Halske electric lamps, and, according to the *Elecktrotechnische Zeitung*, the illumination of the sides and crater of the volcano is grand in the extreme. Eleven of the lamps are placed along the line itself, and the remaining three at the upper end between the terminus and the crater. Various other essays of electric lighting are reported from abroad. For instance, the Brush lamp has been introduced into the anthracite mines of Pennsylvania, and the Place de Paris at Berlin has been lighted by four Siemens lamps erected on poles over 30 feet high, and each having a power of 1,200 candles. The port of Havre will soon be lit by Jablochkoff's system, as also will a new lighthouse at Marseilles.

Patent Brakes on the Car of Juggernaut.

The tendency of science to put intellectual brakes on human errors and superstitions has been demonstrated a thousand times. A pretty illustration of material interference of like sort for the benefit of humanity is furnished in the action of the English magistrate in Pooree, India, who lately compelled the priests of Juggernaut to put patent safety brakes on their famous car before they could have their annual procession. It will be remembered that the car is enormously heavy, and is very apt on down grades to get beyond control and run down large numbers of the processionists.

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.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Chard's Extra Heavy Machinery Oil.

Chard's Anti-Corrosive Cylinder Oil.

Chard's Patent Lubricene and Gear Grease.

R. J. Chard, Sole Proprietor, 6 Burling Slip, New York.

Important to Users of Steam.—Office of H. W. Johns M'f'g Co., 87 Maiden Lane. Hundreds have been deceived by worthless compounds sold by unscrupulous parties for Asbestos Steam Pipe and Boiler Coverings, which have proven unsatisfactory and have cost from 50 to 100 per cent more than the genuine, which are the most effective and economical non-conductors in the world, and are manufactured only by the H. W. Johns Manufacturing Company, 87 Maiden Lane. Be sure and note the address, and send for samples, prices, and estimates of cost of applying, before making contracts.

NEW YORK, October 11, 1880.

We have this day commenced suit against the United States and Foreign Salamander Felting Co. for infringements of our patents for Asbestos Steam Pipe and Boiler Coverings, and we warn the public against using any materials for such purposes composed of, or which purport to contain Asbestos, as they will be held liable for any infringement of our patents.

☞ All infringements will be prosecuted to the full extent of the law.

Wanted—Foreman for Malleable Iron Foundry, familiar with running of air furnaces. Address 2116 Market St., St. Louis, Mo.

Tyson Vase Engine, small motor, 1-33 H. P.; efficient and non-explosive; price $50. See illus. adv., page 316.

Superior Malleable Castings at moderate rates of Richard P. Pim, Wilmington, Del.

Hoop Iron, Cutting & Punching Co., 8 Liberty St., N.Y.

Baldwin the Clothier is accused of borrowing his motto, C. O. D. Some one has discovered it on one of the Obelisks—not yet imported—and stoutly declares that C O. D. was the watchword of Noe and his followers in the ark. It signified, as used there, C—ome O—ut D—ry!

The proper slope in writing is at an angle of fifty-two degrees, and the proper pen for the purpose is one of Esterbrook's.

For Sale, for $100, the Patent, Models, and Complete Drawings of a Corn Harvester. N. Hospers, Pella, Ia.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher. Schumm & Co., Philadelphia, Pa. Send for circular.

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

We unhesitatingly pronounce Messrs. Boomer & Boschert's Cider Press the best one in daily use at Am. Inst. Fair. New York Office, 15 Park Row.

Jenkins' Patent Gauge Cock; best in use. Illustrated circular free. A. W. Cadman & Co., Pittsburg, Pa.

Mr. Ely, of Afton, N. J., cut thirteen acres of heavy grass in five hours, July 2, with the Eureka Mowing Machine. It is the best mower made. Farmers send for illustrated circular to Eureka Mower Co., Towanda, Pa.

Parties desirous of contracting for the construction of Wells of extra large capacity, may address P. O. Box 1150, New Haven, Conn.

The E. Stebbins Manuf'g Co. (Brightwood, P. O.), Springfield, Mass., are prepared to furnish all kinds of Brass and Composition Castings at short notice; also Babbitt Metal. The quality of the work is what has given this foundry its high reputation. All work guaranteed.

Leather Belting, Cotton Belting, Rubber Belting, Polishing Belts. Greene, Tweed & Co., 118 Chambers St., N.Y.

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

The Tools, Fixtures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Improved Rock Drills and Air Compressors. Illustrated catalogues and information gladly furnished. Address Ingersoll Rock Drill Co., 1½ Park Place, N. Y.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Packing once tried always used. Phœnix Packing from 1-16 up in spools or on coils. Phœnix Packing Company, 108 Liberty St., N. Y.

Gas Machines.—Be sure that you never buy one until you have circulars from Terril's Underground Meter Gas Machine, 39 Dey St., New York.

Blake's Belt Studs. The strongest and best fastening for leather and rubber belts. Greene, Tweed & Co., N.Y.

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

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

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

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

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

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

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Gun Powder Pile Drivers. Thos. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

For Sale, ready for instant delivery, 16″ x 42″ Corliss Beam Engine, 16′ x 2′ wheel, thorough repair. Price, f. o. b. at tide water, in New England, $1,250. S. C. Forsaith & Co., Manchester, N. H.

Light and Fine Machinery to order. Foot Lathe catalogue for stamp. Chase & Woodman, Newark, N. J.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

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

For Patent Shapers and Planers, see ills. adv. p. 284.

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.

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National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 317.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, Agt., 32 Cortlandt St., N. Y.

For Yale Mills and Engines, see page 316.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 284.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 284.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 284.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 284.

For Separators, Farm & Vertical Engines, see adv. p. 220.

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

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

Silent Injector, Blower, and Exhauster. See adv. p. 317.

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

Clark Rubber Wheels adv. See page 317.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

4 to 40 H. P. Steam Engines. See adv. p. 317.

50,000 Sawyers wanted to send their full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

For Wood-Working Machinery, see illus. adv. p. 317.

Eclipse Portable Engine. See illustrated adv., p. 317.

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Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

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A profitable business for a person with a small capital. Buy a Stereopticon or Magic Lantern, and an interesting assortment of views. Travel, and give public exhibitions. For particulars, send stamp for 116 page catalogue, to McAllister, Mfg Optician, 49 Nassau St., N.Y.

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Notes & Queries

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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.

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(1) L. T. writes: 1. I have an engine, 4½ inch bore by 6 inch stroke, running about 200 a minute. My boiler will hold about three barrels of water. I also have a windmill that works the machinery when there is a good wind, but the wind power is very unsteady, and I would like to know if I cannot compress air into the boiler with the windmill, and run the engine with it A. Yes. 2. The boiler is safe at 200 lb. to the inch. How long would I be able to run the engine before the pressure would drop to 30 lb., which is the lowest pressure we can run with? A. Only for a short time; the actual time would depend upon the amount of work or power your engine was giving out.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

October 19, 1880,

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.

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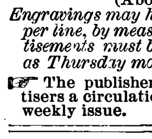

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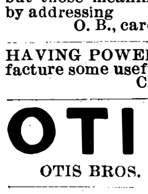

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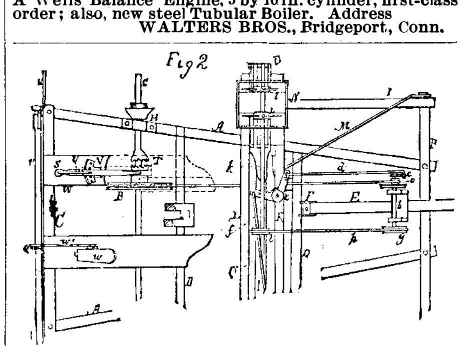

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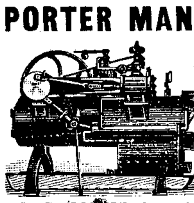

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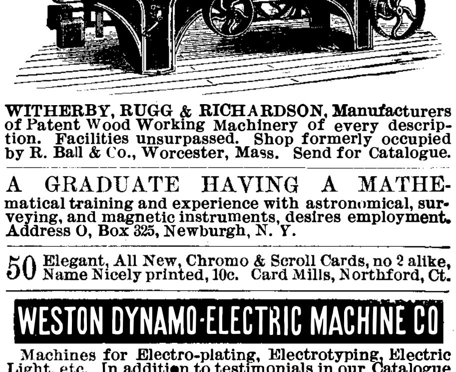

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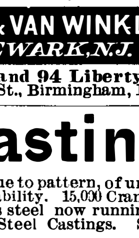

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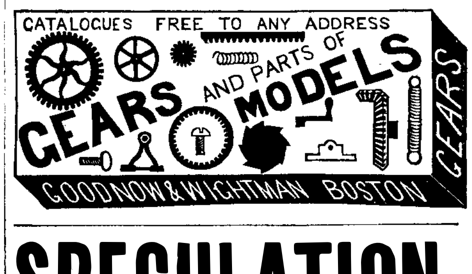

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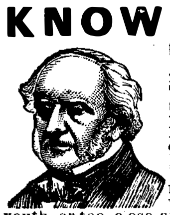

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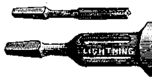

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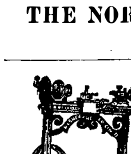

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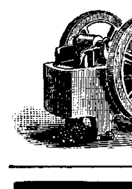

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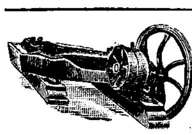

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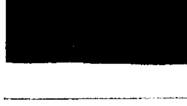

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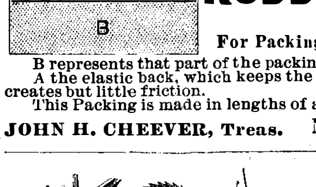

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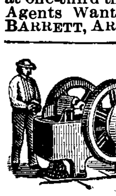

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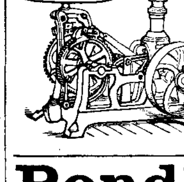

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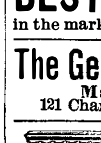

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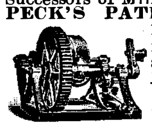

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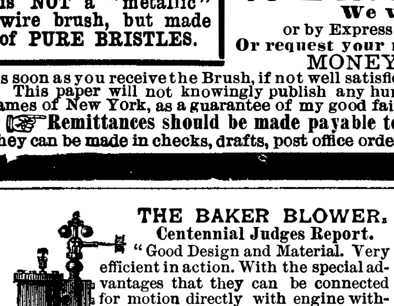

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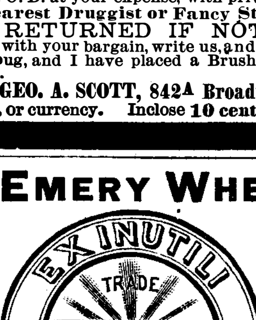

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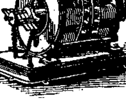

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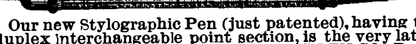

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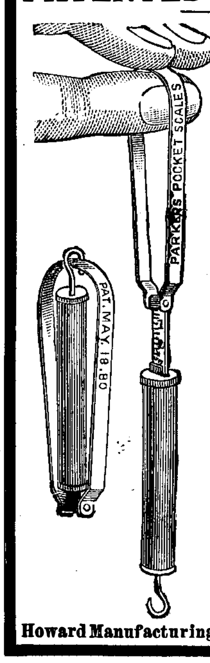

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