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THE MANOFACTURE OF WINDOW GLASS WITH NATURAL GAS.
There is probably no industry among the many that have.been benefited by the utilization of natural gas in which the results have been so as in the manufacture of glass. For a number of years past, American glass has been undoubtedly inferior to the product of European factories, and has consequently occupied but a secondary position in the estimation of American builders and architects. The foreign manufacturers, and particularly those of France and Belgium, have hitherto manifested a superior dexterity in the handling of their materials. They seem to have held the secret of either neutralizing the effect of impurities in their fuel, or of burning it in such a manner as to get the minimum disadvantage from their pres-
ence. This has been due partly to greater experience (influence must be ascribed to the use of natural gas. in the industry and partly to a better construction of In the manufacture of window glass, the results have urnaces. In some of the more perfect plants, crude been particularly gratifying, many important buildings uel has been abandoned and manufactured gas used being now fitted with American glass which but a few nstead, thus giving them in advance the advantages years ago would have demanded the imported. The of natural gas, with the important exception, however, metamorphosis of the crude material into a clear and of its cheapness and almost total freedom from sulphur. brilliant pane of glass involves so many interesting These circumstances made imported glass synonymous with best quality.
That these conditions have now so far changed that our own glassmakers can compete with the best foreign producers, and can even honestly claim certain points of superiority for the home product, is a subject for hearty congratulation. The improvement has been effected, in a measure, by the more complete mechanical
points that we have illustrated the process, choosing the works of Messrs. S. McKee \& Co.; at. Pittsburg, as a typical establishment.
The manufacture of sheet glass depends for success upon the closest attention to details, and its history is therefore one of delicate manipulations. It is a very easy matter simply to make glass, for it is nothing more than a double silicate of oda or potash and an (Continued on page 183.)


THE MANUFACTURE OF WINDOW GLASS WITH NATURAL GAS.-BLOWING.

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NEW YORK, SATURDAY, MARCH $20,1886$.

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## TOO MOCH IDLE CAPITAL.

There are in the city of New York forty-five national banks with a capital aggregating forty-five million four hundred and fifty thousand dollars. The statement made by these institutions on the first of March showed that there was due to their depositors two hundred and nine million seventy-one dollars. Add to this enormous sum the millions in the vaults of the banks organized under our State laws, and with private bankers, as well as the great sums held by our Trust and Insurance companies, and it is evident that there is a great deal too much unemployed capital lying idle in this city.
If this large sum and the surplus funds in our other monetary institutions throughout the country could be put into circulation, it would give an impetus to all kinds of business, and bring about that condition of prosperity for which the public have been looking for the past few years, and are now realizing only in part.

## PROPOSED AMERICAN EXHUBITION IN 1889.

It was in the year 1789 that the Constitutional Government of the United States was established, with Washington as its Chief Executive. The inauguration of the first President was celebrated in the city of New York. As this ceremony ushered in what will probably always be regarded as the greatest century vouchsafed to the nation, it has seemed highly fitting that its centennial should be commemorated by suitable observances in the same city which saw the birth of the new republic. It has therefore been proposed by the General Assembly of the State of Tennessee that such a celebration should be held in 1889 in the city of New York, and that it should take the form of a great National and International Exhibition of Science, Art, Industry, Manufactures, and the Agricultural, Mineral, and other $r$ ?sources of the United States, since this would seem to be the most fitting memorial of the intellectual and material progress made by a young people under a century of popular government.
The joint resolution passed by the Tennessee Legislature provides that such an exhibition shall be recommended; that its importance be commended to the President, with the request that he bring it to the attention of donsres, that the people of Tennessee prepare a suitable State exhibit; and finally, that the Governor be requested to forward a copy of the resolution to the President and to the Governors of the several States and Territories. The occasion is one of such great historical importance, and the celebration proposed seems so eminently suitable, that we trust the movement started by the patriotism of Tennessee will receive the undivided support of her sister States and Territories, of the National Government, and of the President. Three years h ive already passed since this proposition was first brought forward. Three years remain in which to act. The history of former exhibitions shows that this time is not so long that any of it can be wasted. This should be particularly borne in mind when the importance of the occasion, as well as the competition offered by other exhibitions already organized, both demand that the attractions shall be greater than ever before if the celebration is to be such a success; as will satisfy the national pride.

## Fluid Extract of Camellia.

Within the space of a few months, Dr. E. R. Squibb has called the attention of the medical profession to the fluid extract of camellia, or tea, which has been thus proposed to take the place of guarana and coca. He states that the testimony in regard to the effect of tea, coffee, Paraguay tea, and kola nuts is all of a similar character to that given with regard to coca. Each of these substances appears to have come into use independently in widely separated countries, in order to produce the same effects, namely, to refresh, renew, or sustain the physical and mental organism; and it is a curious surprise to find that after they had been in use for a very lengthened period, and although each came from a different order of plants, the same active principle, namely, caffeine, could be extracted, in different proportions, from all of them.
It is even more curious to find that for centuries past a plant called coca, yielding a different principle, has been in use for a similar purpose, the effects of which, says Dr. Squibb, differ but little from caffeine, "simply producing a similar physiological effect in much ply producing smaller doses."

Comparing the power of these drugs in their tendency to counteract sleep, or promote wakefulness, the author found that three grains of caffeine were equal to three fluid drachms of the extract of coca, and to seventy minims of the fluid extract of camellia These seventy minims of the latter extract equal seven ty grains of tea, and this yields a little over two grains of caffeine. These are Dr. Squibb's figures.
Latterly, Dr. J. B. Andrews has reported on a long series of experiments with fluid extract of camellia and hydrobromate of hyoscine in the treatment of insane
patients. With the first of these drugs he noticed a
remarkakle uniformity of action, the pulse being decreased from ten to twenty-four beats under the influence of various doses, while the force and tension were invariably increased. The full influence of the remedy was experienced in half an hour to one hour after administration. After remaining stationary for about half an hour, the pulse began to increase in frequency, and regained its normal condition in the course of another half hour, the effect of the drug disappearing in about three hours after taking it. It was used clinically in a number of cases, as a heart tonic, with favorable results.

## Now Use for Cold Air Machines.

Most persons have heard of the process for facilitating the drilling of artesian wells through strata of quicksand by freezing the quicksand with liquids brought to a very low temperature, and circulated through pipes introduced through the well tubing. La Reoue Industrielle gives an account of an ingenious modificatipf this process, put in practice by a Swedish contractor for his own benefit, which deserves to be kept in mind for future occasions. The contractor had undertaken to drive a tunnel through a hill, on which stood a number of large houses. As the excavation went on, it was discovered that the surface of the hill was underlaid in many places with masses of gravel mixed with sand, and saturated with water, which ran out immediately into any excavation made in it. The escape of any considerable quantity of this material from under a building would infallibly ruin the building; and the foundation was so soft that the tunnel could not be lined with sufficient rapidity to prevent serious escapes. To underpin the houses from the level of the tunnel would have been a costly undertaking, and the contractor was obliged to have recourse to his wits for a solution of the problem. Fortunately, these did not fail him. It occurred to him that, if the wet gravel could be frozen, it might be worked as well as a hard material; and he considered whether it might not be possible to throw a stream of cold air upon it from one of the cooling machines now so often used. Inspired with this idea, he crossed the sea to England, and bought a Lightfoot ice machine, which he brought back with him and set up in the tunnel. The result surpassed his expectations. Before the cold blast the quicksand became a rock, which could be cut and worked easily and safely, and within a few weeks he passed under two five-story houses with out experiencing any trouble.-Amer. Architect.

## Fatal Effects of Alcohol.

According to Dr. Richardson, alcohol cuts down by disease, in England and Wales alone, 1,000 persons a week. What, adds the Dactor, if any other cause of mortality did the same? What if 1,000 persons per week died, in the same area, from the bite of the rabid dog or the snake, by the swallowing of arsenic, opium, or prussic acid? What if some thousand persons a week were known to be killed by the secret devices of the slow poisoner, who, under the guise of friendship, went about and instilled into his victims some subtile drop which led to the shortening of their life and to the production of lingering organic fatal disease? What, indeed, then would be the cry and the action? Why, all through the ranks of the great profession of medicine there would be a tumult of labor and toil, such as never before was seen, to remove the calamity Men would be ambitious to be first to discover by ex periment, by experience, the cause of so fearful an evil, and to remove it instantly; while he who won the victory over the calamity would be extolled as illustrious, and, crowned with honor, become a household word from among the children of Esculapius. Yet here one single cause making this deadly havoc, a cause well known and easily removable, in spite of its evils and in face of its easy removal, is permitted to re main in sight with a majority of the army of medicine looking on in apathy, pitying us "poor foolish fanatics" who are exercising our limited powers to uproot it, and some, with the rest of the world, so sharing the calamity as to become copartners in the destruction which follows from the participation.

## Frozen Fishes.

On Nov. 18 a fishmonger of Paris, M. Heydendare, received from Gonda (the center of fisheries in the region about Rotterdam) a large consignment of fishes packed and preserved in ice. They could not have been caught later than the 16th, and were probably caught on the 15th. On unpacking, a jack was seen to move its gills slightly, and the idea occurred to wash it with fresh water, and immerse it in a vessel. In a few hours the fish was in its normal state, and very lively. M. Heydendare sent it to the Trocadero Aquarium, where it is to be seen now; it is a fine animal, about 2 ft .4 in . long. Here, then, is a case of a fish out of water more than 48 hours (probably 3 days), packed with little care, along with dead fish and pieces of ite -traveling thus. 280 miles, and coming to life again. able to maintenance of the vital functions.

## PHOTOGRAPHIC NOTES.

Photographing by the Aid of Magnesium Light. Mr . Goodwin, before the Glasgow and West of Scot land Amateur Photographic Association, recently explained a simple way of burning magnesium powder for taking photographs at night, which we find reported in the Brit. Jour. of Photo. A long camera stand is turned upside down, and the legs tied firmly together a horizontal arm of wood about eight inches long is lashed as near the top as possible, and at the end of this is supported a small tin funnel, beneath which is a ring of cotton wick wet with alcohol. When in use, the stand is further raised by being placed on a bench or chair, and, everything being ready for the exposure, the wick is lighted, and the magnesium powder, mixed with two parts of fine sand, is poured into the funnel; a magnificent sheet of flame results, and the negatives obtained were very soft, the light having been thoroughly diffused. A thimbleful of magnesium powder with twice the amount of sand is sufficient for an exposure.
Photographing Colored Pictures.-Many experiment have been recently made in this branch of photography, more especially in Germany, which it is probable will shortly result in the formulation of a valuable process for accurately copying colored pictures, such as paintings, chromos, etc., in the true relation of the respective tints.
One class of experimenters believe that it is necessary to mix some dye like eosine or azaline with the emulsion, in order to secure the best results; others show that an ordinary commercial dry plate may be utilized by immersing in a bath of azaline. The film thus becoming impregnated with dye is as sensitive as if the latter was contained in the original emulsion. In either case it is suggested that a pale yellow screen of glass be affixed at the rear of the lens in the camera, when daylight is employed, in order to counteract the effect of the blue rays. Dr. H. W. Vogel, one of the early experimenters, says recently in the Photographishe Correspondenz, translated in the British Jour. of Photography, that he tried photographing on plates sensitized with azaline by lamplight, as follows:
I had two gas burners (Argand) at hand, which I placed right and left at a distance of about eight inches from one of my colored tables.
The direct light from the flame was screened from the lens by sheets of tin.
The lenses were of the stereoscopic class, with four inches back focus, without stops.
The first experiment showed at once that azaline plates with this illumination had a sensitiveness far beyond what I had expected.
Two minutes' exposure proved to be much too long.
I reduced the exposure to one and a half minutes, and finally to fifteen seconds; even with this short exposure the plates appeared to be overexposed, and the egatives were so vigorous that they took a long time to print.
An exact comparison with daylight showed that through a dark yellow glass screen at one o'clock in the afternoon of Dec. 7 , in clear weather, six seconds was necessary to give a well exposed picture of the color table; so that in fact it is possible to obtain by lamplight, without a yellow screen, an image with true color relation, with an exposure only two and a half times as great as that with daylight and a yellow screen.
The photograph by lamplight had almost exactly the same relation to the colors as that by daylight. For photographing colored bodies by artificial light a new way is thus, by means of azaline plates, opened.
Further, the interesting fact is established by these experiments, that an azaline plate is more sensitive by lamplight than an ordinary dry plate with the same emulsion.

Quicksilver Production and Trade, 1885
Mr. J. B. Randol, of San Francisco, gives the following information:
California is the only State in America where cinnabar is mined in paying quantities, and where the production of quicksilver from that ore is worthy of otice.
The year 1885, like the three years preceding, has been unsatisfactory in production and price.
In 1881 , when 60,851 flasks of $761 / 2$ pounds each were produced, the price ranged from $\$ 27.90$ to $\$ 30.75$ a flask; in 1884, 31,913 flasks produced sold for from $\$ 26$ to $\$ 35$; and last year the product, 32,073 flasks, realized $\$ 28.50$ to $\$ 32$. With this large decrease in pro-duction-nearly one-half since 1881-there has been no corresponding rise in price, which, united, have caused the quicksilver industry to be almost entirely unprofitable; for, with deeper mining, the expenses have largely increased, and the ores have also become scarcer and poorer.
In this condition of affairs, all the mines would be compelled to cease operations were it not for the $a d$ valorem duty of 10 per cent placed on the quicksilver produced by cheap labor at the rich mines of Almaden, Spain, and Idria, Austria, owned and worked by the governments of those countries.
It is not known that any of the ten quicksilver
mines worked in California earned a dividend last year; but it is quite certain that none was paid, and the prospects for the future in that direction are quite unfavorable. To make this industry fairly remunerative, it is necessary for the government to foster it by a duty of not less than ten cents a pound, and even that would leave the strength for survival one of great uncertainty and difficulty.
The total production for 1885 was 32,073 flasks. The New Almaden mine is credited with 21,400 , or 1,400 flasks more than it made in 1884; all the other mines, ten in number, had an aggregate of 10,673 flasks, which was 1,240 flasks less than they together produced in 1884.
The Gaudalupe mine made only 35 flasks, then entirely ceased operations, and is supposed to be permanently closed. The Sulphur Bank mine made a last dying effort to continue a producer; but it is believed its superficial deposits will soon be exhausted, and then one more will be added to the list of closed mines, in which category may also soon be included the Redington, Great Eastern, Etna, New Idria.
The exports by sea from San Francisco were 15,730 flasks, an increase of 829 over the previous year. Ten thousand flasks were sent out of the State by railroad to Arizona, Utah, Idaho, Montana, and Mexico, and it is estimated that about 10,000 flasks were consumed in California and Nevada, leaving the San Francisco market bare of stock at the end of the year.
The
The low price of silver has shut out quicksilver as an article of export to China, and it has also seriously cut down the profits on shipments to Mexico.
Perhaps the exhaustion of the American quicksilver mines, quite sure to come before the year 1900, may yet have an important bearing on the oversupply of silver now agitating the financial and political world; for with the sources of quicksilver controlled, as they then would be, solely by the governments of Spain and Austria, it would be in their power to limit the production, and to greatly increase the price, even to a point above where it would be a loss for the silver mines to mine any but the richest ores. Thus the output of silver could be diminished from all mines except the few having smelting ores.

## A Peculiar illumination.

A brilliant phenomenon has been noticed at Beaver Falls and other places in Western Pennsylvania, where natural gas blow-off pipes send out their large volumes of flame into the frosty night air, which has aroused particular interest both from its beauty and the absence of any fully satisfactory explanation.
At those works which receive their supply of natural gas directly from a well, and are running only during the daytime, the gas is permitted to escape into the atmosphere at night, and to avoid the roaring sound is usually ignited as it issues from the top of the blow-off. These gigantic torches light up the country for miles around, the effect being particularly noticeable in cloudy weather, when the glare is reflected. It has been observed that in certain conditions of the atmosphere a vertical, feathery, and very brilliant arrow of fire extends above the flame almost to the zenith. Its greatest brilliance is perhaps at its highest point, where it is described as being quite as bright as a rod of iron at a white heat. The natural pulsations of the gas, as it rushes from the blow-off, affect the outpouring flame, and give the luminous arrow a leaping, flashing motion which adds greatly to its beauty. The observers agree in stating-and the fact is significant-that the conditions necessary for the appearance of the phenomenon depend upon the presence of a frosty atmosphere and an appreciable haziness, or else it is visible either during or in-
mediately preceding a light, fleecy fall of snow, the temperature being somewhat below the freezing point.
Bearing thesefacts in mind, it is not difficult to explain the arrow. The minute crystalline faces of the suspended snow or ice particles catch the light from the burning torch, and reflect the rays in precisely the same manner as the ocean, or other expanse of water, on a moonlight night, gives us a long, silvery path of
reflected moonbeams. This explanation finds further confirmation in the fact that the arrow extends only to the upper limits of the haze, and when the lower atmosphere is clear, begins at some distance above the flame.
cident to the Pont Neuf.
On the moming of December 17, about six o'clock, a serious accident was found to have occurred at the Pont Neuf, the oldest and best known of the Paris bridges. On that part of the structure crossing the narrower of the streams into which the Seine is divided by the island of the Cite, the third pier had sunk, and the pressure of the arches toward the subsidence had torn up the pavement of the footpaths and the causeway. An alarm was given by persons who were crossing the bridge, and traffic was at once stopped by the
police. A large crowd soon collected, and could see
the outer stones of the bridge break off in large masses and fall into the river. Barriers were erected at both ends of the bridge, and the gas pipes crossing it were cut off and rendered secure.
It was found that the part of the bridge which had been injured had subsided 65 centimeters. That part of the bridge which crossed the wide stream is secure, but the other part will have to be entirely rebuilt. The city engineers state that the work will be long and tedious, and that while it is going on it will be necessary to erect a temporary bridge connecting the Quai des Orfevres and the Quai des Grands Augustins. The common proverb, "Solide comme le Pont Neuf," has thus been falsified.-London Times.

## How a Wise Man Built His House.

Many of our readers will find their own experience reflected in the following paragraph taken from the last number of the Central Law Journal, where it is used to illustrate another subject. A gentleman wished to build for himself a nice mansion, and, of course, was exceedingly anxious to have the approbation of his friends and neighbors. So he asked the advice of all. The first said, "Here is a nice site, and I should build such a style of house." The second said, "I don't like that site nor the style of house." The third came along, and was utterly amazed at the selection of the site made by the others, and of their total want of taste in architecture. He said, "Leave off all that here is the most charming spot for a house, and here is the most exquisite plan for a house." And so it went on until the gentleman became disgusted with his advisers, and went and selected his own site and adopted his own style of architecture, and builded a house to suit himself. By a multitude of counselors there is wisdom, but the house builder's experience in seeking the advice of his neighbors found it different, and was probably wise in rejecting all their suggestions, and following the plans his own judgment dictated. The moral here conveyed does not end with locating of a house site or the erection of the building. It will be generally found best to follow one's own impressions and taste rather than to defer to others.

## The Universal Telemeter.

Some interesting experiments were recently carried out on the Thames Embankment with the universa telemeter, a new surveying instrument, the invention of the Abbe Luigi Cerebotani, Professor of Astronomy and Mathematics at the University of Verona. The nstrument consists mainly of two glasses capable of accurate adjunstment, the one acting as the base line, the other, the side of an angle. The direction' of the glasses is gauged by a graded rule, by means of which the distance between the two glasses of observation and the point to be measured is registered, rendering the finding of the required length of line a matter of easy calculation. The stand on which the telemeter is fixed is provided with a drawing board, on which the objects measured can be dotted as the measurements are obtained, thus gradually forming a plan of the country surveyed. The whole is exceedingly simple, and can be worked by any one not posssessing special knowledge. The telemeter has already been tested by Herr Foerster, of the Berlin Observatory, and one is now in use by the German War Office. The instrument seems well adapted to ordinary surveying, although it might possibly be urged that its utility may be somewhat handicapped by the shortness of its base line.

## The Cost of Wheat Production.

The phenomenally low prices for wheat which have prevailed during the past year have directed attention to the details of the cost of producing that grain, and in various States of the wheat section the statistical experts are making calculations to settle the question whether, at the prevailing prices, the culture of wheat can be profitably continued. One of the most interesting reports yet published on this point has been made by the Michigan Secretary of State concerning the cost of producing and marketingth
The average yield per acre is given at 21.98 bushels of wheat, 40.55 bushels of oats, and 70.87 bushels of ears of corn. The yield thus indicated applied to the cost per acre shows an average cost per bushel of $59 \cdot 1$ cents for wheat, 29 . cents for oats, and $21 \cdot 1$ cents for ear corn. The average price of wheat on January 1 , for the State, is placed at about 74 cents, oats 30 cents, and corn 24 cents per bushel of ears. In regard to wheat, the report observes that the "net profit on investment in the southern counties is 38 per cent, and in the northern counties 35 per cent."
P. Orr.\& Sons; of Madras, write that, owing to the terrific rains in India, a good waterproof roofing is very necessary. The writers think the paper tile referred to in the Scientific American of Oct. 31 might be specially adapted to their climate and storms, and suggest that the manufacturers of the article send them suggest that the mal.
samples for trial.

## sAW TOOTH.

The saw plate is of the usual description. The removable tooth consists of a circular plate in which is formed a notch, at one side of which projects a cut ter having a saw tooth point and the smooth cutting knife edges, which are formed on opposite sides of the cutter (as shown in the end view of the tooth and plate), and are bent outward slightly away from each other to bring them into engagement with the wood. These knives project outward beyond the cutting point, so that they will cut deeper into the wood than the point; the point of every tooth removes the material cut by the knives on the tooth in front of it. This construction insures a clean cut, without making any dust. The periphery of the circular part of the tooth and the back of the cutter


## WILSON'S SAW TOOTH.

are provided with a V-shaped groove, which is adapted to receive a $V$-shaped tongue formed on the edge of the circular part of the blade; and portions of the edge of the tooth and of the plate are cut away to admit of placing the tooth in the circular notch before bringing the tongue and groove into engagement with each other. The tooth is held firmly in place by a rivet or screw, part of which enters both the tooth and plate. It will be seen that the tooth can be removed from the plate by turning it through a part only of a revolution. The backward moverrent of-the cutter is limited by the shoulder formed on the plate and against which it rests.
This invention has been patented by Mr. C. J. Wilson, of 114 Clinch Street, Knoxville, Tenn.

## IMPROVED SNOW PLOW.

The accompanying engravings represent a snow plow that can be attached either to the front of a locomotive or to the middle of a platform car. The body


ORMEROD \& CROSKEY'S SNOW PLOW.
will follow the track at curves and may be lifted from the track, and will not interfere with the sway or lurch of the engine. The raising and lowering of the plow may be done by lever or stean power, but it is preferred to employ compressed air, and for this purpose a cylinder is attached to the frame of the plow, the piston being so connected that, when it is operated by admission of compressed air to or its exhaust from the cylinder, the plow will be raised and owered accordingly.
The construction is such that in rounding curves the locomotive will throw the plow into the center of the track. The upper surface of the base portion of the plow is extended to form a lip, which is cut away to span the rails, so that the plow may be lowered to remove the snow from the center and sides of the track, somewhat below the upper surfaces of the rails. The snow and ice are removed from the surfaces of the rails themselves by sharp edges running in contact with them when the plow is lowered for work. For properly guiding the plow body along the track, wear plates and flanges that run in contact with the rails are secured to the lower plate of the base.
When considered desirable, the plow can be mounted in the center of a short car, as shown, in which case the combination uniting the plow and truck can be dispensed with. The body of the plow is attached to vertically movable plates, and is raised and lowered by a piston in a cylinder placed on top of the platform of the car.
The inventors of this plow, Messrs. Thomas Ormerod and A. B. Croskey, of. Leadville, Colorado, claim that by raising and lowering the body of the plow vertically in slides it does not clog up with snow or ice, thus be ing pre

## HANDLE FOR CANS

The handle for fruit, meat and paint cans here shown is folded closely against the side when the can is stored, but can be readily arranged as a handle


## COLEMAN'S HANDLE FOR CANS

when the contents of the can are to be removed The rectangular frame of wire is curved to conform to the shape of the can, to which it is soldered at the middle of its ends, so that it will remain in con tact with the can, and occupy very little room when necessary, the wires can be bent outward to form the handle, as shown in the right hand view. To give the handle additional strength at the point of its attachment to the can, the iron can be bent inward at the middle of the upper and lower sides of the frame, as shown in the lower part of the engrav ing. After serving as a package, the can can be con verted into a conyenient household article.
This invention has been patented by F. W. Coleman, M.D., of Rodney, Miss.

## AUTOMATLC WATER WORKS.

The object of this invention, which has been pat ented by Mr. M. A. Laska, of 148 North Basin Street, New Orleans, La., is to provide water works for automatically delivering water without the use of a motor or other power machinery. One end of the siphon pipe is dipped into the water in the river or bay to a point below the low-water mark, and the lower end of the pipe is passed into a cylindrical cup having a closed bottom on which a packing piece rests. This cup is formed with numerous aperture and with lugs through which passes a rod also passing through guide lugs on the pipe. The upper end of the rod is screw-threaded and passed through a nut held to the pipe. This cup serves as a strainer, and can also be used to close the end of the pipe when the appa ratus is to be put out of operation On the upper end of the pipe is a casing to which the main water conducting pipe is connected. On the casing is a cock, and above it is a neck for attach ing a hose.
The main pipe is conducted underground in the desired direction, and to it are connected numerous branch pipes which conduct the water into tanks or
of the plow is composed mainly of a base portion and wings that meet at the center to form the front flange and is attached to the locomotive in such a manner that it may have both a vertical and lateral movement independent of the locomotive, so that it
cisterns. The bottom of each cistern is below low water mark, and the delivery pipe enters the cistern below the low-water mark, or, if it enters at the top, it must extend below the low-water line, as shown to the left in the upper engraving. When the pipe is carried over an elevation, it is extended below the low-water line at bothends of the bend, and a pipe extends from the highest point of the bend down below the water line, and then returns to the surface of the ground, where it is provided with a cock The inner end of the main pipe is connected with a

laska's adtomatic water works.


## BROWN'S ACME THORN CLIPPER

glass gauge-tube in a cistern. At the wells is a pipe extending to the surface of the ground and connected at its lower end with the delivering pipe. Extending through the vertical pipe is a rod carrying a valve at its lower end and a hand wheel at its upper end; this valve shuts off the supply to the well. When the pipe enters the top of the cistern, the outlet is provided with a float operating a valve, so that if the level of the water in the river should rise to such a height as to flood the country, the float would rise and close the valve, thereby shutting off the water. The pipes are first filled with water through a hose connected with the neck of the casing at the inlet. This starts the siphon, and the water runs into alf the cisterns until the level is equal to that in the river.

## PRUNING IMPLEMENT.

The chisel secured to the upper end of the pole is formed with a lower longitudinal slot and with an upper inclined one. A hook having a cutting edge at the bottom of its prong is arranged to slide on the side of the chisel, and is guided by screw bolts passed hrough the slots. Connected with the lower end of the hook is a rod whose lower end is conrected with an angle lever, the shank of which is passed through a slot in the pole and pivoted to a clip. To the other end of the lever is attached a cord passing over a pulley in the pole, as shown. On the lower end of the rod is a ferrule to receive the upper end of an exension rod, near the lower end of which is a pulley over which the lower part of the cord passes, the end of the cord being secured to a lever pivoted on he extension rod, as shown in the right hand view. The cutting edge of the chisel being placed against he branch to be cut, the lower lever is swung from the rod, thereby moving, by means of the cord, the lower part of the upper lever toward the rod. The hooks are thus pulled downward, but as it is guided
the edge of the chisel, and a shearing cut is made. When the lower lever is released, a spring under the pper one presses the lower part outward and raises the hook. This invention has been patented by Mr. William H. Brown, of Dunedin, Fla.

TESTING BAYONETS AND CAVALRY SWORDS.

Previous to the year 1885, the long triangular Mar tini-Henry bayonet was tested by being sprung over a bridge two inches high, as depicted in our sketch (No. 1). The point of the bayonet was held in a shoe, the center of the blade rested on the bridge; the socket was then pressed down till it was level with_the point. The bayonet had to stand
this test without receiving a permanent "set." This test was considered suffici till the campaigncl nt till the campaign in the Soudan showed the necessity for a more severe test. The bayonet now instead of being sprung over a bridge, is bent down over a curved block of wood (Fig. 2), on all thre sides, which tests every part of the blade from point to shoulder; if it stands this without receiv ing a "set," it is then struck two or three times on each face on a solid wood block (Fig. 3), this is with the object of testin the temper and quality of metal, and for detecting flaws. If the bayonet stands this test, it is finally subjected to the twisting test (Fig. 4). In this the socket is placed in a revolving disk with a weight of 80 pounds attached to it, the point being held stationary; the bayonet is twisted through an arc of a quarter of a circle, and on being released must re cover its figure.
Cavalry Sword, Pattern 1885. -The tests for this sword are also extremely


1. The "Bridge" Test (old style) for Triangular Bayonets
2. The "Curve" Test (the method adopted during the past two years)
3. The "Twisting" Test for Bayonets.
4. The "Striking" Test for Cavalry Sword Blades

TESTING BAYONETS AND CAVALRY \&WORDS AT THE ROYAL SMALL ARMS FACTORY ENFIELD. (Fig. 5). The blade
the above brief description, it will be seen that it is al- ed inside as well as outside, so as to be properly bal most, if not quite, impossible for either a cavalry sword anced. The largest step of the cone is 3 ft .6 in . in diaor a triagular bayonet which is either too soft or too hard to be pased into the service-Iondon Graphic

SCREW CUTTING AND SELF-ACTING SLIDING GAP LATHE. meter and the smallest step is 22 in in diameter. The face plate is 9 ft in diameter with an internal whee cast on the back. The gar, frame is of massive proportions, and is arranged to swing 15 ft . in diameter We give an illustration from Engineering of a screw. $\left\lvert\, \begin{aligned} & \text { portions, and is arranged to swing } 15 \mathrm{ft.} \text { in diameter } \\ & \text { and } 4 \mathrm{ft} \text {. clear of the face plate in front. The bed is } 20\end{aligned}\right.$ ft . long, 4 ft . broad, and 20 in. deep, and is arranged to slide from 12 in . to $61 / 2 \mathrm{ft}$. from face plate. The leading screw is of steel, and is $1 / 2 \mathrm{in}$. in diameter; it is accurately cut to Whitworth standard thread. The motion for driving the leading screw for general work up to 10. ft. diameter is communicated through the shaft crossing the gap frame; but when the work is over 10 ft . in diameter the motion is carried around the end of the gap frame by shafts with beve gearing, the shaft crossing the gap being then with drawn
The shifting headstock is fixed in alignment with the running head by slid ing in T-slots planed out of the bed, and having V-lips in which the headstock is fitted. Four bolts from these T-slots secure the headstock in position when turning.
All the gearing of the lathe is carefully designed and of ample strength for eavy duty; the arms wheels are all of the box pattern, and all teeth of the wheels, including the change gears, are machine ut from solid lanks, so as
 detect fiaws. The rigidity of the blade is then tested by by Messrs. John Lang \& Sons, Johnstone, Eng. The no backlash, and the nearest possible approach to placing it in a machine (Fig. 6), and bringing a weight fast headstock is 6 ft . long and is in one casting to the noiselessness of action.
pressure on it of 32 pounds; it must support this weight ground line, where it is securely bolted to the gap The internal wheel on the back of the face plate, and without devia from the straight line. Its elasticity frame. The head is 6 ft ' 6 in wide at the base, and is the bevel feed motion, are cast from machine cut pat is next tested in the same machine (Fig. 7). A weight carefully designed to resist the various strainsto which terns, having a correct form of tooth. The gearing is ing the of 40 pounds is applied, depressketch. the blade has to weight being released, is then finally tested round a curved block of wood (Fig. 8), on both sides. After all these tests the blade should remain absolutely straight, without having received a permanent set. If it is set in the smallest degree, it is cast out. From
it is subject
it is subject. The spindle is of steel and has a front journal ter by 15 in . long.
The cones on the spindle The cost of smallpox to Tennessee during the past and counter five years is estimated by the State Board of Health to gear are turn- be $\$ 141,619.91$.

Longevity of Butterfiles.
A correspondent of the Times, referring to Sir Johrı Lubbock's discovery of much greater longevity of ants than has hitherto been believed, thinks that the same may be true with regard to the butterfly, although the common notion is that the butterfly's life is a short and merry one. The correspondent, who writes from Bournemouth, then relates the following incident
"On August 15 last a fine peacock butterfly flew into our house through the garden door, and was caught and put under a large bell glass. On the following day another came in, and was also put under the glass. They were supplied daily with fresh flowers and a few drops of new honey, which they evidently much en joyed. No. 1 died during a suddenly cold night; No. 2 lived until yesterday, December 14. Whenever the sun shone upon their cage, which was placed on a table near a large window of plate glass, they opened their beautiful wings and flew about vigorously, occasionally resting on a flower to thrust their trunks deeply into its corolla, or standing over and suck up the drops of honey. The extraordinarily sensitive nervous system of these little beauties was indicated by the most rapid vibratile trembling of the wings directly the sunlight or the scent of fresh flowers reached them. When the sun was not out, they usually remained perfectly still, with their wings closed, especially selecting to hang on the under side of a leaf They showed great intelligence in distinguishing the freshly gathered flowers and in deciding that honey was the right thing to eat, and I have seen one of them scramble with considerable difficulty across his cage through a tangle of leaves and stalks, determined to get to a particular leaf on which he wished to hang After some unsuccessful attempts to reach it, he hooked it down with one foot, then held it with another, unti he could get the rest of his legs upon it, having done which he appeared satisfied, shut up his wings, and hung himself upon it, topsy-turvy, to rest. If he failed to do what he wished with one leg, he immediately tried another, appearing to think that, having six at his disposal, it was foolish to waste much time on any one. But he only used his most anterior pair on very special occasions. How long each butterfly had lived before it was caught I do not know, but No. 2 lived in its glassi cage 121 days."

## Infinence of Hot Drinks on Digestion.

Various opinions are held by the public, and we believe by medical men also, on the effect of hot drinks on the digestion of food. This matter has lately been investigated by Dr. V. E. Nyeshel, of St. Petersburg. The plan he adopted was to make use of twenty patients in the surgical wards of the Obukhoff Hospital, suffering from fracture of the fibula, contusion of the foot, and such like affections, and dividing them into two sets of ten each, to find out first, by a three days experiment, the length of time an ordinary meal of soup, meat, potatoes, and black bread required for digestion. For this purpose the stomach tube was employed at periods varying from five to seven hours and a half after the meal, and the condition of the con tents of the stomach examined. In all the cases complete breaking down appeared to have taken place in about six hours and a half. The exact time required by each individual for the digestion of the specified meal being noted, further observations were made on a subsequent day, the patients in the first group being given after the meal hot tea, at a temperature of from $40^{\circ}$ to $75^{\circ} \mathrm{C}$., the quantity taken varying from two to eight tumblerfuls. The contents of the stomach were drawn off at the time when, as former experiments had shown, digestion would, under ordinary conditions, have been complete. The result was that, when not more than three tumblerfuls of hot tea had been swallowed, it was found that diges tion had progressed just as well as without it, but a larger quantity of hot tea appeared distinctly to retard the digestive process. The second group of patients were given a meal simi lar to what they had had before, but hot. On examining the contents of their stomachs, no difference could be detected between the rate of digestion of hot and cold food. The author found that by painting the pharynx with a 5 per cent solution of hydrochlorate of cocaine the tube passed easily and quickly.-Lancet.

## Extracting Teeth with the Pistol

Old Dr. Monsey extracted teeth by fastening a strong piece of eatgut securely to the tooth, to the opposite end of which he affixed a bullet. With this bullet and a full measure of powder, a pistol was charged, and when the trigger was pulled, the operation was performed effectually and speedily. Once a gentleman who had agreed to try the novelty, and had even allowed the apparatus to be adjusted, at the last moment exclaimed, "Stop, stop, I've changed my mind!" "But I haven't, and you're a fool and a coward for your pains," answered the Doctor, pulling the trigger. In another instant the tooth was extracted, much to the timid patient's delight and astonishment.

MICROSCOPIC OBSERVATION OF VIBRATING RODS. by aeo. m. hopkins.
A metal rod fixed in a vise at one end, with a silvered glass bead attached to the other end, constitutes Sir Charles Wheatstone's apparatus for the study of the transverse vibrations of rods.
By vibrating a rod arranged in this way Wheatstone was enabled to obtain an almost infinite variety of symmetrical and beautiful luminous scrolls.
It is a simple matter to repeat Wheatstone's experi-


VIBRATING ROD MOUNTED FOR MICROSCOPIC OBSERvaitor.


## CURVES TRACED BY VIBRATING ROD

ment with the apparatus alluded to, but it is not always convenient to do it
A vibrating rod permanently mounted in a cell and arranged for observation with a microscope is shown in the annexed engraving; Fig. 1 representing the mount in perspective, Fig. 2 showing it in section, Fig. 3 showing the rods detached from the mount.
To an ordinary $3 \times 1 \mathrm{in}$. glass slip is connected a paper tube $\frac{5}{18} \mathrm{in}$. internal diameter and $11 / 4 \mathrm{in}$. long, well blackened on the inside.
The cement is applied carefully, so as to have the glass clean and cPear withifn the tube. To a cork fitted to the open end of the tube is cemented a wire spiral formed of about 4 in . of No. 40 spring brass wire. The diameter of the spiral is $\frac{8}{82} \mathrm{in}$. The end of the spiral next the glass slip terminates in a straight arm $1 / 4 \mathrm{in}$. long, upon the end of which there is a minute bead of black glass. A smooth bead is secured by first fusing borax on the end of the wire, then touching the borax while in a fused state with a thin thread of black glass, then breaking the thread a short distance from the end of the wire, and finally fusing it by gradually pushing it forward into the flame
until a perfect bead of the re-
quired size is formed.
The cork with the spiral is in-


THE DIAMOND LEARNER'S TELEGRAPH INSTRUMENT.
serted in the paper tube with the bead arranged centrally with reference to the tube, and only a very short distance below the glass.
By placing the mount thus prepared under a 1 in . or 2 in . objective, and allowing light to fall on the bead from one direction, it will be noticed that the black glass bead is rarely at rest, the bright pencil of light reflected from it continually describing curves of various forms. Stepping on the floor of the room in which the microscope is located is generally sufficient o set the spiral into active vibration.
Rapping on the table on which the microscope rests will cause the bead to describe intricate curves.
By striking the side of the paper tube with more or ess.force, different figures will be produced
Illuminating the bead from two points produces parallel curves.
While this mount is perhaps not strictly a micro
scopic object, it may nevertheless be viewed to advan tage by the microscope.

## The Electric Light in the British Navy

A trial has just been made at Portsmouth of an installation of the electric light which has been fitted on board the Imperieuse by Messrs. Siemens Brothers \& Company, who are also about to provide similar in stallations on board the Warspite, Edinburgh, Colling wood, and Rodney. The lights on board the Imperi euse comprise 375 incandescent lamps of 20 candle power, which are disposed so as to illuminate all parts of the ship, including the engine rooms, stokeholes, and magazines; and also a couple of search arc lights placed at the bows and at the stern, and which are each equal to the power of 25,000 candles. The cur rents are generated by three Siemens dynamos, on the combined and self-regulating principle, each of which is driven by one of Willen's compound two-cylinder engines, which is fixed to the same bed plate as the ma chine which it drives. The number of revolutions per minute is 400 . The machines are interchangeable, and can be connected or thrown out of action by a simple switch arrangement. One of the machines supplies the search lights, and another is equal to maintaining 320 of the incandescent lamps aglow, which is considered as many as will be necessary as a rule to be alight at the same time. When the whole of the incandescent lamps are required to be lighted at the same time, two dynamos will be demanded for the several leads, other wise one will be kept as a reserve against accidents The arrangements have been superintended on behal of the company, says the Naval and Military Gazette, by Mr. Collings, and the preliminary trial during the day and after dark proved very satisfactory.

## Shying Horses.

This trick or vice is generally the effect of nervous timidity, resulting from an excitable temperament. It is aggravated by improper handling. To punish a horse for shying introduces a new cause of fear. The horse will be more alarmed and show more tokens of fear at the prospect of a whipping than at the imaginary object of danger in the road. Hence one bad habit is confirmed by the introduction of another. It is impossible to whip terror out of a horse or pound courage into one. Kindness and gentle persuasion are the best weapons to correct the pernicious habit of shying The less fear exhibited by the driver, and the less notice taken of the shying by using harsh means, the sooner it will be given up. A careful, experienced horseman can generally detect an object likely to cause a nervous horse to shy, and by word or touch will en courage him to pass it unnoticed. When this fails give him time to look at the object of his fear; pat him and coax him up to it, then take him past it two or three times, till he takes no notice of it.
When defective sight is the cause of this bad habit it s incurable, and if the eyesight is failing, the horse for ordinary driving and riding will be perfectly useless A mare we knew that had gone quietly in harness for two or three years, suddenly took to jumping the white stone crossings of an ordinary macadamized street, as if they were water brooks. In three months she was stone blind.

## HE DIAMOND LEARNER'S TELEGRAPH INSTRUMENT

The leading feature of the instrument here shown consists in so forming the sounder, anvil, and key that they have a diamond-shaped cross section, and in so making the base of the sounder and of the an vil that when set up the two form a diamond out line. The magnets of the sounder are inclosed in metallic cases, and the various metallic portions of the instrument can be made to present the ap pearance of either gold, bronze, or brass. The black baseboard is of wood.
This instrument-designed by the Novelty Elec tric Company, of 5 th and Locust Streets, Phila delphia, Pa.-presents a unique and attractive ap pearance.

## Toads as Bee Eaterm.

The toad may be useful in kitchen gardens as a slug and insect destroyer; the freer you can keep your apiary from his presence, the better. Toads will wait at the foot of a hive to seize any honey-laden bee that may happen to fall to the ground on itsreturn from foraging, and one bee master, says a correspondent of the London Graphic, saw over a dozen little workers captured in the space of half an hour by an old fat fellow, who darted out his tongue with wonderful celerity immediately he saw a bee on the ground. The bees had been collecting pollen, and many of them, being heavily laden, were unable to reach the floor board of the hive.

## A Guide to Rose Calture.

Beautiful Roses for All.-We have received the New Guide to Rose Culture, published by the Dingee \& Con ard Co., Rose Growers, West Grove, Pa. (see advertise ment), and take pleasure in recommending it as one of the handsomest and best catalogues of the season.

## ©arrespondence.

## Poisonons Fish at Rotuma

To the Editor of the Scientific American:
In the Jan. 2, 1886, number of your paper, I notice a letter from Mr. Robert S. Swanston, about poisonous fish in Rotuma or Rotuam. He states that " the fact was first noticed on the northwest side of the island, immediately after a hurricane," and that "the cause has gradually spread, moving east about," etc.
It is said by old fishermen that certain fish, sheepshead, for instance, will suck the moss, etc., from the copper-bound ships to an extent that the whole system will become impregnated with copper and the flesh become poisonous.
May it not be that a copper-bound vessel was wrecked on the northwest side of the island during the gale of 1884, and that the time taken for the spreading of the poison was only the time taken for the fish to find their way from the other parts of the island to this feeding ground?
Georgetown, S. C., March 1, 1886

## Light at the Bottom of the Sea.

To the Editor of the Scientific American:
After reading in your issue of January 30 the interesting article written by Ralph S. Tarr under the heading, "How the Ocean Bottom is Lighted," and believing it to be still an unsettled question whether there is light or total darkness at great depths, I have wondered if any of the deep sea explorers have tried photography. It could be easily arranged to lower photographic plates placed at different distances on the sounding or dredge line. If there is light, interesting impressions might be obtained. Certainly it would help to establish the fact of light or darkness. If this method has not been thought of or tried, let your paper suggest it, and some salt water philosopher will try it. A sheet of sensitized paper inclosed in a bottle with an outer removable cover would be very simple, but perhaps not the best, as many more delicate methods could be devised. I offer this simply as a suggestion.
C. Murray.

Springfield, Ill., 'February 2, 1886.

## Diminished Rainfall. <br> To the Editor of the Scientific American :

Your recent editorial on the diminution of our average rainfall recalls statements made to me by the late Major Frank North, who had resided since childhood among the Pawnee Indians. They hold, it seems, a tradition that their ancestors came from the West, where they lived together in towns and cultivated the surrounding country. In time, however, they were compelled to leave their homes on account of a great drought, and migrated eastward. So great were their numbers that, in crossing the mountains, they wore deep trails in the rocky passes over which they journeyed.
The Pawnees boast that at one time they possessed a civilization equal to that of the white man. Major North stated that the sages who preserved these traditions could give no idea of the time of the migration, but from their accounts it must have been a long time prior to the conquest of Mexico by Cortez. One is forced to believe that drought and famine have been more powerful in depopulating the regions of the Colorado and Rio Grande than the marauding Apache or rado and Rio Grande than the marauding Apache or
Ute.
Irvine A. Fort.
NorthPlatte, Neb., Feb. 15, 1886.
Crude Rock oil for Keeping Steam Boilers Clean. To the Editor of the Scientific American:
Crụde rock oil, properly used, will keep a clean boiler. With any kind of water within reasonable fitness for use, it will keep it in excellent condition, and free from scale or moving sadiment; but the crude rock oil will not do all this unless the proper amount of blowing off be done, for it will not compass the neglect of attendants. The proper way to use the crude oil is to send it into the boiler through the feed water, only once a day, and only in very small quantities. One-half an ounce per day will keep an ordinary tubular boiler of fifty horse power as clean as possible; and after a few months of regular use the shell will be found as smooth as a piece of japanned work, provided it was not pitted at the start, and the tubes will be perfectly clean and smooth. The .oil must be introduced into hot water, and for some reason it does its work better under pressure. If any "constant feeding" of the oil into a boiler takes place, the fire seams will commence to leak, for this has been tried; there seems to be a call for only a small amount of the oil, and the small amount must not be exceeded.
Parties who have used this "crude oil" for four to six years have in some cases experimented with the amount, and in every case an excess of oil caused a leaking at the seams, while a small amount produced the most complete cleanliness and immunity from scale. In a large plant under the advisory charge of the writer, the use of the "crude oil" has proved that the writer, the use of the "crude oil" has proved that
it would loosen the scale rapidly; and in the case of an
upright boiler, worked under one hund pounds pressure, the scale became so rapidly freed from its hold on the tubes and firebox sides that a stop became necessary to clear out the leg of the boiler, and over five inches in depth of loosened scale was found in the water leg. In fourteen weeks another installment came out, and the coal consumed fell from 4,800 pounds to 3,200 pounds in the same time, the work done by the boiler being increased.
Some amusing instances might be related of putting in a "gallon of oil" at the cleaning of a boiler, on the supposition "it would last;" or of using tallow or sperm oil, or of some departure from the "crude rock oil," with a bare escape from serious consequences in two cases, and of "leaky boilers" in others.
"Crude rock oil" can be used in any boiler to advantage on the same principle as exemplified in the housewife's dinner pot-the oil or grease coats the surface of cast or wrough iron, and the pot becomes smoother than those not used for boiling greasy meats; but the steam boiler, under pressure and at a very much higher temperature, with a small amount of oil in motion through the circulation, becomes glazed, and being kept so by the minute particles of oil deposited, offers no chance for the scale to lay hold or to maintain a hold if one be acquired.
Many trials of crude oil in this way have been made in the New England States, especially in the large powers of cotton mills and manufacturing concerns and its use is extending.

Thos. Pray, Jr.

## Recent Decisions.

Liability of Cities.-In the case of the city of Henderson $v s$. Weisenberger et al., the Superior Court of Kentucky held that a city was not liable for injuries resulting from the falling of a billboard erected by the proprietor of a private lot and projecting over the line of his lot only the thickness of the board, unless the city had notice that the board was not securely fastened.
Contract with Municipality.-A contract entered into with a municipality, which provides for a certain mode of payment by the city, cannot be changed by subsequent legislation so as to authorize a performance different from that prescribed in the contract, and payments made in conformity with such subsequent legislation will not bind the contractor unless assented to by him. So held by the California Supreme Court in the case of McGee vs. City of San Jose.
Insurance.-An agent was employed to secure certain insurance, which he did. Afterward the insurance company gave notice to the agent of the cancellation of the policy. The general term of the New York Supreme Court held (Von Wien vs. the Scottish Union \& National Insurance Company) that the notice so given was not notice to the insured, and that a clause in the policy to the effect that the insurance broker should be deemed to be the agent of the insured in any tradection relating to the in surance did not affect the question.
Right of State to Prevent Armed Assemblages.-A State of the Union has the right to prevent the armed assemblage of its citizens and their parading as military companies when not organized as such under the laws of the State or of the United States. So held by the Supreme Court of the United States in the case of Presser vs. the State of Illinois. To deny this right, in the opinion of the court, would be to deny the right to disperse assemblages organized for sedition and treason, and the right to suppress armed mobs, bent on riot and rapine.
Sale of Goods.-When a vender sells goods of a specified quality, but not in existence or ascertained, and undertakes to ship them to a distant buyer, when made or ascertained, and delivers them to the carrier for the purchaser, the latter is not bound to accept them without examination. The mere delivery of the goods by the vender to the carrier does not necessarily bind the vendee to accept them. On their arrival he has the right to inspect them to ascertain whether they conform to the contract, and theright to inspect implies the right to reject them if they are not of the quality required by the contract. Pope et al. vs. Allis, decided by the Supreme Court of the United States.
Right of Way.-A railroad company, in enforcing its right of way over the lands of others, and in constructing its road, is bound to leave the adjoining lands and fields which it crosses in the same condition as regards the facilities of cultivation and as concerns the utility of those lands to their owners as they were before the entry of the company. Hence a railroad company which constructs an embankment on the lands of a planter, and thereby stops
up his ditches and other artificial drains, is responup his ditches and other artificial drains, is responsible to such owner for all losses of crops and other damages occasioned by such interruption of his drainage. So held by the Supreme Court of Louisiana in the case of Payne vs. Morgan's Louisiana \& Texas Railroad \& Steamship Company, decided on the 5th January.

Jacob, decided lately by the St. Louis Court of Ap peals, it appeared that in 1871 the plaintiff opened an office for the practice of dentistry in St. Louis, under the title of the "New York Dental Rooms." He advertised under that name, and had it registered. In 1880 the defendant opened a dental establishment two doors from that of the plaintiff, using a sign in size and style similar to the one used by the plaintiff, and"bearing the inscription "Newark Dental Rooms." The plaintiff brought suit to enjoin the defendant rom using this sign, alleging that it was devised to deceive; his customers and deprive him of business. The court granted an injunction, holding that it was apparent that the defendant used the sign to deceive the public and to attract the customers of the plaintiff.
Perils of the Sea.-The case of Pandorf et al. vs. Håmilton, decided lately by Lord Justice Lopes, of the English Court of Appeal, arose upon an action brought by the plaintiffs, as owners of a cargo of rice shipped on board the defendant's ship, for damage to the same by sea water. It was admitted that the damage in question was caused by sea water passing through a hole in a pipe supplying the bath room, which pipe had been gnawed by rats. It was also found that the defendant had taken proper precautions to keep down rats during the voyage, and that they had not been brought on board by the shippers while shipping the rice. The rice was shipped under a bill of lading which excepted "all and every dangers and accidents of the seas." Lord Justice Lopes held that as the immediate cause of damage was the action of sea water, which was itself one of the causes contemplated as an exception, and as the effective cause was the gnawing of the rats, which was as much beyond human control as if the pipe had burst from frost, the whole occurrence must be regarded as a peril of the sea for which the defendant was not liable as a shipowner. There being no negligence on the part of the defendant in not keeping down the rats, such an event, the Lord Justice said, should be taken to be an unavoidable accident, of the same kind as if a swordfish had bored a hole and so let in the sea water. - Bradstreet's.

## Heat from Incandescent Lamps.

Herr Wilhelm Penkert, in the Zeitschrift fur Elektro echnik, gives the following results of his experiments to find the quantity of heat emitted by different lamps, incandescent and other, in an hour:

| Incandescent Lamps: | Units of Heat. |
| :---: | :---: |
| Siemens and Halske. | . .... 427 |
| Edison.. | 355 |
| Swan... | 430 |
| Bernstein. | 153 |
| Gas: |  |
| Siemens regenerative burner | ... 1,500 |
| Argand... | 4,860 |
| Two hole burner | . 12,150 |
| Petroleum: |  |
| Round burner | ... 3,360 |
| Small flat burner. | .. 7,200 |
| Solar Oil: |  |
| Schuster and Bauer's lamp | ... . 3,360 |
| Small flat burner. | ... 7,200 |
| Rape oil: |  |
| Carcel lamp. | ... 4,200 |
| Reading lamp. | ... 6,800 |
| Paraffine candles. | .... 9,200 |
| Spermaceti : | ..... 7,960 |
| Wax.. | ...... 7,960 |
| Stearine ....... | . 8,940 |
|  |  |

With regard to the value of the Bernstein lamp, M. Penkert thinks that it is possibly too low, owing to the fact that in the measurements losses of heat were not absolutely guarded against. The construction of the lamp was such that it could not be entirely immersed in the water employed to determine the heat given out.

## New York Bricks.

The forty-five brick yards at Haverstraw, N. Y., on he Hudson River, 32 miles above New York city, the largest brick making center in the country, with a capacity for making $340,000,000$ bricks annually, turned out $300,000,000$ in 1885, against a like number in 1884. About 2,000 men are employed, besides 300 in the river carrying trade, which keeps 44 barges and 50 small vessels busy. Haverstraw bricks are of ordinary grade, but bring 25 to 50 cents per 1,000 more than ther bricks of like quality, owing to the excellent sand and clay used. They brought an average of $\$ 6$ per 1,000 in New York last season, after paying $\$ 1$ river freight and $\$ 1$ to $\$ 1.25$ per 1,000 royalty to the owners of the land where the yards are located. The works use in a season 42,000 cords of wor heating kilns, at $\$ 5$ per cord; 12,000 tons of coal dust, at $\$ 2$ per ton ; and 4,000 tons of coal, at $\$ 4.25$ per ton; a total cost for fuel of $\$ 251,000$. The total royalties were, as above, say $\$ 337,000$, and wages (averaging $\$ 2.25$ per day), say (six months), about $\$ 776,000$. Two hundred patent brick-pressing machines, costing $\$ 1,000$ each, are employed. The total gross receipts last year are given at $\$ 1,800,000$. This particular industry began fifty years ago. At that time $\$ 3$ per 1,000 was a fair fifty years ago. At that time $\$ 3$ per 1,000
price. Quotations have heen as high as $\$ 9$.

Discovery of a New Nebula by Photography.
MM. Paul and Prosper Henry have recently announced the discovery by means of photography of a new nebula in the Pleiades. It was first photographed on November 16 last, and, though it was again photographed on December 8 and 9, MM. Henry have as yet been unable to detect it by direct telescopic observation. The nebula is about $3^{\prime}$ in extent and "tres-intense." It presents a well marked spiral form, and seems just to escape Maia. Its position is as follows: R. A. 3 h .38 m .57 s. , Decl. $24^{\circ} 1^{\prime} \mathrm{N}$. The question is sometimes asked, Which is the most sensitive to light-the human eye or the photographic plate? This discovery seems to indicate the superior sensibility of the chemical plate.

## DESIGN FOR A SUMMER GARDEN HOUSE.

Our engraving, for which we are indebted to Architelctonische Rundschau, illustrates a much admired
as a notansexample of the complete carelessness possible in this direction, that the handsome residence of a neighbor got on fire three times within one month, and that on each occasion the narrowly escaped destruction was directly traceable to defective construction. In the first instance, fire was due to wood placed in connection with a steam boiler, and in the other two cases was caused by joists or beams brought in contact with chimneys when the house was built. In these cases sufficient heat reached the timbers to cause ignition.
There are many buildings in all parts of the country to-day where.alittle hotter fire than usual in furnace or grate will do just the same thing. Every householder should assure himself that no such danger menaces his own home or warehouse. Continued contact of wood with hot brickwork or heated currents of air will eventually cause combustion. There is but one remedy, and that is to remove the conditions. If a
were taken to avoid them. Now, however, they have been so well illustrated, together with the large possibilities of defectiveness in flues and chimneys, by a very complete list of catastrophes, that an intelligent builder-by which we mean not only the man who builds a house, but the man who has it built as well -must keep this experience in mind, and see that none of these fatal conditions is repeated in his own Wincture.
With twenty-seven recognized causes of fire, and any number besides, not classified, there are not a few otherwise careful persons who despair of the value of precautions, and trust the whole matter to fate and a heavy insurance. The wisdom of providing funds necessary for rebuilding is certainly commendable; but aside from any economic reasons why valuables should not be permitted to be thus quietly consumed, those who have gone through the ordeal of a fire, at either home or place of business, know of a


DESIGN FOR SUMMER HOUSE.-BY PROF. C. SCHICK, KARLSRUHE.
design for a summer refreshment house or casino, by Professor C. Schick, of Karlsruhe.

## The Origin of Fires.

In speaking of the origin of fires, Dr. Nichols states that present investigations show that the number of fires attributable to incendiarism is much less than is generally supposed. Spontaneous combustion is another cause which has heretofore been brought forward on a great many occasions, when the real trouble has been in defective or careless construction. While dwelling houses in the United States are burning at about the rate of one every hour, and mills, hotels, stores, and barns are vanishing in proportion, it is worth the consideration of every householder to know whether his own premises are inviting destruction from fire, or whether they are reasonably secure from the ruin brought, by that element. In the fire tables of 1884 , incendiarism is placed at the top of a list of some twentyse ven causes. Next in this fatal list comes defective flues, but it is questionable whether they have been given the rank they deserve. Dr. Nichols mentions
building is already erected, and these fire traps carefully ooncealed, it is a difficult matter to get at the source of danger and see that it is removed; but the difficulty is much less than that of starting anew when fire has carried off the household goods or he "plant" of a well established industry
But while spontaneouscombustion, being impersonal and therefore without the ability for defense, has had a great many sins laid to its door by builders whose volubility exceeded their carefulness, this peculiar process of slow oxidation has still a heavy account against it in the list of fire losses. In one instance, recalled by the same writer, a dwelling house caught fire by the spontaneous ignition of sawdust placed between kitchen floors as a sound deadener. The sawdust alone was safe enough, but when it became saturated with oil from the polishing of the floor above, new con ditions prevailed. The sawdust heated rapidly from the absorption of oxygen by the oil. The temperature speedily rose to such a point that ignition occurred, and flame burst through into the room. For many years the conditions favorable to spontaneous combustion were so imperfectly known that no precautions
there are many things for the loss of which insurance is but a poor compensation.

## Combustion of Copper and Nitrogen.

A curious phenomenon has been observed by $M$. Blondlot, and communicated to the French Academy of Sciences. A disk of platinum and a disk of copper, 0.03 meter in diameter, were fixed vertically in front of each other by help of two platinum stamds. The disks were 3 or 4 millimeters apart, and both were placed inside a bell jar of porcelain, open below. The apparatus was then heated red hot for three hours, by means of a gas fürnace, and although there was no electric current it was found that the face of the platinum disk was blackened with a deposit containing copper and platinum. In short, the copper had crossed from the copper plate to the platinum one. M. Blondlot, by re peating the experiment in different gas, found that the nitrogen of the air was the agent in this transport of matter. The nitrogen combines with the copper, and lodges on the platinum, either incorporating itself with the latter or decomposing in contact with it under the influence of its high temperature.

THE MANOFACTURE OF WINDOW GLASS WITH NATURAL GAS.
(Continued from first page.)
alkaline earth. The iron-master gets rid of the silica in his ores by making it into a fusible silicate of limean opaque glass. The assayer frees his metal from the accompanying gangue by adding suitable fluxes until

all the earthy matter is gathered into a fusible slag, and floats above the metal button as a molten glass. And even nature, when her interior caldron bubbles over in a volcano, shows that she, too, is a giant glass maker. But to make good glass, clear, transparent, colorless, to simulate the purest water of a mountain stream, this requires skill and patience.
These two qualities are demanded in all stages of the operation. The first step is the manufacture of the crucible pots, and in this the glassmaker has a good opportunity to display these qualifications. The pots are made up of a mixture of aह̂out 2 parts raw fire clay, 2 parts burned clay, and 1 part ground pot shells, and require the greatest amount of care. The mixture is ground and thoroughly worked in a long trough, where it is turned once a day for a period of about four weeks. The workman kneads the plastic mass with his man kneads the plastic mass with his from air. If the treatment is imperfect or careless, the entire subsequent work of the crucible will be unsatisfactory. The pots are formed entirely by hand, and in a room the temperature and humidity of which are kept as nearly constant as possible. They are all of one size, $331 / 2 \mathrm{in}$. deep and $421 / 2 \mathrm{in}$. across the top. The thickness varies from $31 / 2$ inches at the base to 3 inches on top, while the bottom of the pot is about 4 inches. The bottom having been first formed, the sides are gradually built up from day to day, the entire process requiring about six weeks. The capacity of the pots is weeks. The capacity of the pots is
from fourteen to sixteen hundred pounds of molten glass. When quite dry, they are placed in small heating furnaces, where the temperature is gradually raised to that of the melting furnace, and when this point is reached they are quickly transferred, and are then ready to receive the raw materials.

At the McKee works there are three


THE MANOFACTURE OF WINDOW GLASS WITH NATURAL GAS.-FLATTENING.
melting furnaces, having a total capacity of 26 pots. the gatherer dips his pipe into the molten bath, each These stand two abreast, one of the furnaces having 10 time getting a little more glass, until at the end he has pots and the other two, 8 each. Round openings in a mass weighing from 15 to 20 pounds. If, however, each side of the furnace permit free access to each pot. The fuel, as everywhere else throughout the works, is natural gas. This is admitted at each end of the furnace, and is mixed with air which has been heated by passing through chambers in the fire-brick arch. A well is built under each furnace to collect the molten glass, should a pot break, and thus prevent loss of material or stoppage of the furnaces. The raw material, or " batch," introduced into the pot consists of: sand, 100 parts, lime, 30 parts; alkali, 40 parts; and a small but varying amount of pulverized charcoal. Some manufacturers make their alkali all sulphate of soda, while others employ a mixture of sulphate and carbonate, in the proportions shown by their experience to be the best.
These are thoroughly ground and mixed together. One-third of the full charge is placed in the pots, and after an interval of four hours a similar amount is
added. With the last added. With the last charge, introduced still pounds of arsenious acid are added. This acts as a bleaching agent, and by converting the iron present into a higher oxide, removes the color to a large extent. At some establishments peroxide of manganese is used for this purpose, but a slight excess will give a pinkish color, and it also has the further dis-
advantage of making the transparency of the glass less durable. When the contents of the pots are quite liquid, and have settled down to a constant level, enough broken glass
 level, enough broken glass
is added to fill the pots is added to fill the pots LAYING IN. completely. The fold of glass formed by these manipulations is turned entire melting occupies about 16 hours. During the into a spiral and worked to the end of the mass. The latter part of this. time, the heat is somewhat reduced ball of glass, red hot, and, if properly gathered, without in order to make the glass less liquid, and prepare it for gathering.
When the fusing period is completed, the surface of the molten "metal" must be freed from all impurities by skimming. For this purpose a fire-clay ring, introduced when the pot is first put into the furnace, floats upon the surface of the bath, and the gatherer, by removing all the scum from the interior of this ring, always has a clear surface from which to draw.
The gathering is done with a wrought iron pipe about five feet long, the end of which is decidedly flared. Toward the mouthpiece, the pipe is surrounded with a wooden handle. The first dip brings out but a small lump of glass. By careful turning of the pipe, this is gotten into symmetrical,oval-form. Three times law or blemish, is now taken to a wooden mould, shown at the right in our illustration of the blowing furnace and by dexterous turnings is formed into a pear-shaped ball. The wood is kept from burning by being continually moistened with water, which, in contact with the red hot glass, assumes a speroidal condition, and looks like so many globules of mercury. The gatherer's duty is now ended, and he hands pipe and glass over to the blower.
Formerly, the melting and blowing furnaces were combined in one, but it has been found more economical to have them separate. The blowing furnace has the same side openings as the melting furnace, and simply provides an intensely hot chamber for controlling the temperature of the glass while being blown The first act of the blower is to grasp the pipe, and with the ball of glass still resting in the mould, blow through the mouthpiece until a large bubble of air is formed in the mass of glass. Then, with alternate blowing and manipulating, he increases the bubble until the mass takes the shape of a large carboy, such as one uses for transporting acids.
The blower now transfers his operations to the platform in front of the blowing furnace, where long openings permit him to swing his pipe-and globe of glass in a pit beneath. Blowing and swinging and reheating, he extends the bubble at the pipe's end, until, in place of the ungainly carboy, with its disproportionately thick bot tom, he has a beautifully symmetrical figure, the shape of an enormous test tube. But during these operations it happens from time to time that the glass flows a little too freely, and the sides of the tube are in danger of becoming too thin. So the blower must occasionally throw his tube into the air and let the glass settle back upon itself. As the tube by this time is about 5 ft . long and from 15 to 18 inches in diameter, one can readily fancy that this apparently playful toss requires great skill and a large amount of muscle. In our illustration we have shown an even larger cylinder, one that-when finished will furnish a pane 66 by 54 inches. The foremost figure of the group, who has thrown his heavy and bulky cylinder into the air with seemingly so little effort, is
the only man in the works who can manage so large a burden, for, in addition to its extra size, it is also double thickness.
When the tube is formed to the satisfaction of the blower, he permits it to become comparatively cool, thrusts the end into the furnace, blows into his pipe, and quickly covers the opening with his hand. A slight report is speedily heard. The confined air, expanding with the heat, has blown a small hole in the end of the tube. Resting his pipe on a suitable support, he gradually turns it around, while the hole grows larger and larger, until he no longer has a test tube, but a complete cylinder. Quickly he withdraws his pipe from the furnace, and allows the cylinder to depend into the pit below until the plastic edge passes to cherry red, and it can be taken away without danger of getting out of shape.
The blower has now finished his part, and he stands before you dripping with perspiration and apparently exhausted. But it takes him only a moment to recover his breath. Already another pipe is in his hand, and he is repeating his heavy labor.
A string of red hot glass adroitly drawn around the cylinder end causes an even crack to separate the neck and attached blowpipe from the cylinder proper Then a hot iron is passed along the interior surface from end to end, and makes a longitudinal crack. As a cylinder, the glass looks as if it were pretty wel ruined, with a crack running its entire length, but the process is only another step in its transformation into a window pane.
The cylinder is now ready for the laying-in furnace. This is in a separate building, and of late years has been made one of the most complete parts of the entire plant. The hearth of the furnace is circular, and is divided into several sectors, separated from each other by fire-clay bridges. As the hearth revolves, these sec tions pass through a corresponding number of compartments, in which the temperature may be varied a pleasure. The first compartment is only moderately heated, and is known as the laying-in oven. In this the cylinder becomes gradually warmed. A partial revolution of the hearth then carries it to the next compartment, the laying-out oven, where the heat is sufficient to make the glass plastic. On the floor of each section of the hearth a large flat stone, made of fire-clay and prepared with the greatest care, so as to be perfectly smooth, is adapted to receive the cylinder. While in the laying-in oven, the cylinder is supported by two brackets at the side of the stone; but as soon as it reaches the laying-out oven, it is removed to the stone, and, the crack being uppermost, is allowed to unfold until it lies open like a sheet of rumpled paper. It is then carried by the revolution of the hearth to the flattening oven, where a workman, as shown, irons out the plastic sheet until it lies perfectly smooth and flat. Further revolutions of the hearth carry the glass, now in a smooth sheet, to the dumb oven, where it slowly cools, and then to the entrance of the annealing oven, next door to the laying-in oven, making the circuit finally complete.
When the comparatively cool sheet of glass reaches this stage of its journey, it is picked up with a large ing fronged fork and placed upon a rod or bar pound an immense improvement over the car formerly used. They handle each sheet separately, and with the receipt of each fresh sheet they move the entire contents of the annealing oven toward the outer end, discharg ing a finished sheet at that end. The glass remains in the oven from 30 to 40 minutes. When discharged,
the sheets are cut into proper sizes and stored in suitthe sheets are cut into proper sizes and stored in suit able frames.
The process is completed. The surface of the glass, just as it comes from the annealing furnace, is remarkably brilliant and as beautifully clean as if it had been washed in hot water and dried with linen. In all
stages of the process the advantages of natural gas become each day more evident. The more intense heat of the new fuel gives a better fusion, while the contamination of the "metal," from particles of coal and cinder, is entirely avoided. It is, however, in the blowing furnace and flattening oven that the most marked advantages are obtained. With coal, the sheets of glass formerly came from the ovens coated with smoke,
and, what was infinitely worse, with a white deposit of sulphur. As these impurities had been gathered while the glass was in a semi-plastic condition, no subsequent washing or acid bath could entirely restore the brilliant surface.
A comparison between new and old glass will make these differences very plain. But perhaps one can best appreciate the influence of gas upon the industry by glancing at the history of those establishments which are not so fortunateas to possess it. So radical, indeed, has been the change wrought by the new fuel, that several important glassworks in other parts of the country have admitted that the competition is too unequal, and have either suspended business or transferred themselves to the shadow of the nearest gas derrick. A number of such migrations have been reported
during the past few months. It is a gratifleation to during the past few months. It is a gratifleation to
examine the products of such firms as the Messrs.

McKee and others who have done so much to advance this industry, and to feel that our architects can now honestly recommend the use of American glass.

The Relations of the Government to Chemistry.
In a presidential address before the Chemical Society of Washington, Prof. F. W. Clarke recently reviewed the connection between the laboratory and the Government. While he finds a most encouraging growth in chemistry during the past twelve years, and an increasing disposition on the part of the Government to avail itself of chemical assistance, he also points out certain tendencies which at present menace the highest development of the science.
Nearly all of the departments of the Government are now provided with their own special laboratories, and in some cases it has been found necessary to devote several to the work of one department. With the increasing demands of a large industry, and the growing spirit of investigation, more laboratories will be needed. The development which these necessities involve requires, however, the advantage of a discriminating supervision if it is to afford the highest usefulness. The present chemical "plant" of the Government has not been the result of any definite plan. It is simply the outcome of every-day necessities, and, as such, it is without the organization needed for the prosecution of a great work. Much important apparatus is still wanting, while the scattered nature of the work has made the duplication of other portions necessary. In addition to this serious want of proper equipment, the Government chemists are severally called upon to do a greater variety of work than is compatible with excelence.
To uninformed officials, a chemist is simply a chemist; and as a consequence, problems of the most varied character are distributed among the different workers with an impartiality which would do great credit under other circumstances, but which in the present instance is nothing less than disastrous. The science is already so large that specialization becomes essential to success. With this scattering of effort and multiplication of poorly equipped laboratories, excellence will hardly be possible, for the range of work will be too broad and the appliances too meager. Prof. Clarke, therefore, strongly recommends a concentration of forces in one complete and thoroughly equipped national laboratory, divided into the proper number of departments, and presided over by a corps of skilled specialists. He also favors the union of the chemical and physical laboratories in one building and under one director, with facilities in both for scientific research as well as practical work.

## Lanoline or Cholesterine Fat.

At a recent meeting of the Physiclogical Society, Berlin, Professor Liebreich gave a short sketch of a series of investigations which had engaged him for some years, and had led to the introduction of a new substance into the pharmacopœia. He premised that the denomination "fats" would have to cover more than it had hitherto done, and not merely such substances as were capable of decomposition into fatty acids and glycerine. All substances, on the contrary, would have to be conceived of as neutral fats which contained sebacic acids, no matter with what organic base these were combined. Such a neutral fat was discovered by Herr E . Schulze, in 1869, in the yolk
of the fleece of sheep, and which consisted of a sebacic acid and cholesterine. This cholesterine fat of sheep's wool, or "lanoline," had been studied by Professor Liebreich, as to the method of obtaining it, on account of its excellent qualities in the way of a salve constituent. : It was now being extracted from woolen hairs by means of a centrifugal machine, and had become an article of trade. Professor Liebreich had next investigated the origin of this cholesterine fat, and, with the help of the uncommonly sensitive cholestol reaction of Professor Liebermann, had come to the conclusion that the cholesterine fat contained in the yolk of sheep was derived neither from the sudorific glands nor from the sebaceous glands, nor from the sebaceous texture of the under skin, but was seated exclusively in the hairs and in the epidermis cells. This fact led, on the one hand, to the production of the substance as a kind of manufacture, while on the other hand it induced a very extensive series of experiments respecting the dom. The speaker found it in the epidermis, the hairs, and nails of men, in the hairs of all mammalia he had examined, in the hoofs of horses, in the paws of swine, in the horns of cattle, in the prickles of the hedgehog, in the feathers of fowls, geese, and a large number of other birds, in the plated sheaths of the tortoise; in short, in all horned textures which, with ong and toilsome labor, he had examined. The speaker had, in addition, found the cholesterine fat in the kidneys and the liver of mammalia; yet it was not beyond question that in these organs the cholesterine fat did not proceed from the blood, in which it
was always present in small quantities. It might be conjectured that it would likewise be found in the
intestinal canal, and generally wherever epithelial cells occurred. The constant presence in all epithelial formations of' a particular fat, which was there formed in the keratine cells, rendered it highly probable that the hairs of the mammalia and the feathers of birds owed their elasticity and pliancy not, or at all events not exclusively, to the secretion of the sebaceous or caudal glands, but to the cholesterine fat generated in the horn cells themselves. The quality possessed by cholesterine fat of not oxidizing, or oxidizing only under very rare conditions, rendered it, as was very readily conceivable, most peculiarly adapted for lubricating the skin and feathers. Beyond the property of not becoming rancid, lanoline possessed a whole series of other advantages distinguishing it quite peculiarly as a salve constituent. It absorbed, for example, 100 per cent of water, and by so doing became a soft substance easy to the touch, penetrating the skin with altogether extraordinary facility, and, after but a short rubbing into the cutis, disappeared from view. Professor Liebreich had already prepared into salves a great number of medicamental stuffs by means of "lanoline," and had made experiments with them which yielded entirely satisfactory results. Lanoline, dark brown in a dry state, grew pale like wax in light, and showed other qualities besides, assigning it a place between the ordinary glycerine fats and the wax kind of fats.

## Unconstitutional Tax on ${ }^{66}$ Drummers.s

In the case of Walling vs. the People of the State of Michigan, decided by the Supreme Court of the United States, on Jan. 18th, it appeared that the plaintiff in error was prosecuted in the police court of Grand Rapids, Mich., under a Michigan law imposing a tax upon persons engaged in the business of selling in that State liquor to be shipped from any other State. The plaintiff in error was a "drummer" for a Chicago firm, and was charged in one court with selling liquor at wholesale without a license, and in another with soliciting and taking orders for its sale without a license He was convicted, sentenced to pay a fine, and imprisoned in default of payment. Upon appeal the conviction was affirmed by the Supreme Court of Michigan. The decision of the Michigan court has just been reversed by the Supreme Court of the United States, which holds that a discriminating tax imposed by a State operating to the disadvantage of the products of other States when introduced into the first-mentioned State is in effect a regulation in restraint of commerce among the States, and as such is a usurpation of the power conferred by the Constitution upon the Congress of the United States. The Supreme Court of Michigan held that the tax imposed by the act was an exercise of the police power of the State for the discouragement of the use of intoxicating liquors and the preservation of the health and morals of the people. The Supreme Court of the United States declares that this would be a perfect justification of the act if it did not discriminate against the citizens and the products of other States, and thus usurp one of the prerogatives of the national legislature. The court sums up its opinion as follows: "We think that the act in question ope rates as a regulation of commerce among the States in a matter within the exclusive power of Congress, and that it is for this reason repugnant to the Constitution of the United States and void."

Gresham's Injector.
Among the most interesting features of the machinery department of the recent Inventors' Exhibi tion, held in London, was the new automatic restart ing injector, exhibited by the well known engineer and inventor, James Gresham, of Manchester. It received the first premium, and was selected by the managers to supply the boilers which furnished the steam for the motive power used in the exhibition. Among its most valuable points were its wide steam range, the injector working equally well and reliable at high and low pressures; its instantaneous and perfectly automatic performance, as soon as steam and water were turned on; and its restarting quality, which enabled it to take up the feed water at once, and without any handling of valves, after the supply had been with drawn or interrupted from any cause whatsoever This last feature seems to make the Gresham injector peculiarly adapted for the feed of boilers or trac-
tion and farm engines, and on tug boats and steam tion and farm engines, and on tug boats and steam craft generally, where the supply of feed water is so liable to interruption from traveling over rough sur faces on the one hand, and from the motion of the waves on the other.

The value of the hardware produced in the United States each year is now about $\$ 60,000,000$, and half of it is made in Connecticut. This does not include firearms, agricultural implements, cut nails, or ornamental ironwork. These, with other articles which may be regarded by some as belonging to the list of hardware, would swell the total to far above $\$ 100,000$, 000. The manufacturers of England, France, and Ger mand
many send us about $\$ 2,000,000$ worth annually.

## BOLLEE'S STEAM CARRIAGE

Mr. Amedee Bollee has just sent us a description of a small sized steam carriage that he has recently constructed and experimented with. We present an engraving of the apparatus made from a photograph taken by Mr. Sollier, an amateur at Mans, and, in addition, we give the details of construction that Mr. Bollee sends us.
The carriage frame, which is wholly of iron and steel, is 614 feet in length by $23 / 4$ in width, and rests upon four steel wheels, through the intermedium of springs, so as to prevent jolting. The driving wheels, which are in the rear, are $31 / 4$ feet in diameter, and areactuated by a differential motion, which, on curves, allows the two wheels to assume different velocities. The steering wheels are $21 / 2$ feet in diameter, and are peculiarly mounted, so as to render it impossible for the carriage to overturn, and to make the steering of it very easy.
The generator, which is placed in front, carries all the requisite apparatus. It is of a new system, that permits of a wide heating surface with little weight. It is very easily cleaned. It holds $71 / 2$ gallons of water-a relatively large bulk, that has the effect of keeping the pressure more regular. It easily develops a power of $21 / 2$ horses. On the trial trip the pressure was about one hundred and eighty pounds to the square inch, although the ordinary pressure is only about seventy. While running, the water is fed by a pump, and, during stoppages, by an injector. The motor, which is in the rear, is an expansion and reversible one, and has a power of 1,446 foot pounds.
The passengers, two in number, sit behind the boiler, and the one to the right has within reach all the apparatus necessary to run the engine. The fuel, which is stored at each side of the boiler, suffices for a run of sixty miles. The weight of the carriage, when empty, is 1,430 pounds. It empty, is 1,430 pounds. It
easily ascends the steepest easily ascends the steepest
gradients, and its mean speed is 15 miles per hour. Mr. Bollee has several times obtained speeds of from 21 to 24 miles.
The apparatus may be given various forms and dimensions. In the fancy ones the boiler is in the rear.La Nature.

## The Merchant Navy of th World.

The Bureau Veritas publishes the following statistics respecting the merchant navy of the world in 1885: The total number of sailing vessels in existence that year was 43,692 , with an aggregate tonnage of $12,867,375$; gate tonnage of $12,867,375 ;$
that of steamers was 8,394, that of steamers was 8,394 ,
with a tonnage of $6,719,101$, with a tonnage of $6,719,101$,
making a total of 52,086 ves making a total of 52,086 vessels and $19,586,476$ tons. The largest fleet, naturally, is that of England, with 4,852 steamers, with a tonnage of $4,159,003$, and 14,939 sailing vessels, of $4,714,746$ tons. Next follows France, with 505 steamers, of 498,646 tons, and 2,173 sailing vessels, of 398,561 tons. Germany possesses 509 steamers, with a tonnage of 110,064 , and 2,424 sailing vessels, with 863,611 tons. With regard to the importance of their steam navy, the maritime countries are classified as follows: England, France, Germany, United States, Spain, Holland, Italy, Russia, and Norway, which last country owns 103,792 tons of steam shipping. With regard to sailing vessels, the classification as regards importance is as follows: England, United States, Norway, Germany, Italy, France, Russia, Spain, Sweden, and Holland.

## Use of Sandpaper.

In handling this subject, we expect to tread on the toes of both bosses and workmen. Still, we think a few suggestions will not be amiss." Sandpaper occupies a very important position; and, as it is more frequently used, and in greater quantities, than almost any other single article, it becomes a serious question any other single article, it becomes a serious question
as to cost. The workman, if so disposed, can materias to cost. The workman, if so disposed, can materi-
ally reduce or increase the cost by using the paper up thoroughly or only using it half. We have seen some throw the piece away if only the edge was off the paper; others would use the edges and corners, and the center be good; and others, again, the center, and leave the corners good. That is a waste. As the paper is given to use, it is immaterial what shape you use it in, so that it has answered its purpose. It does no good to pile it up, or stow it away in a box to be used again; except in a very few cases, it never gets used again, and only accumulates for nothing. We generally use ours up until there is no virtue left in it,
and then throw it away, either into the fire or into the
waste box.
Now, we know there are some bosses who never seem satisfied unless they see a box of refuse paper around, and insist that we must use it, because it is to them like getting double service out of it. So they do, but at what a cost! Sandpaper, as bought by them, stands them in the neighborhood of about one-half cent per sheet. Divide that into, say, eight parts, which makes the cost about one-sixteenth of a cent per part. It is used until the cutting edge is off, and then thrown to one side. It has done all that can be expected from one-sixteenth of a cent. Now, to use it again will require at least two-thirds more time than at first. Say a man is getting 20 cents an hour; he can use the eighth part of a sheet up in about from five to ten minutes, according to the condition of the job he is doing. Give m ten minutes, and he has done, say, one-half of a large panel. Now make him do the other half with the same piece of paper, and I think I would not be far wrong when I place the time at half an hour, even if he could do it at all, which I doubt. The question is, Which is the more valuable, the paper or the man's time? In the firstinstance, the man occupies one-third of the half hour at a cost of $3 \frac{1}{8}$ cents in time and one-sixteenth cent in paper. To cover the same amount of surface with the same piece of paper again would bring the cost of the time occupied on the second half to 10 cents, from which might be deducted one thirty-second of a cent for the use of the old paper. In other words, trying to save one-sixteenth of a cent, we have actually lost twenty minutes in time


BOLLEE'S STEAM CARRIAGE.
thirteen sheets of new paper. As I said before, we use our paper as long as there is any virtue in it, and no longer. We turn and cut it up so as to get all there is of service in it, and then cast it away.-Carriage Monthly.

## Electrical Surgery.

A student 22 years old, in the College of Burlington, Vt., slipped on the pavement about two months ago and strained his thigh. He soon lost the use of his left leg and suffered excruciating pain. He came to New York, was placed on a cot in the Post-graduate Hospital, and on January 25, Dr. J. Milton Roberts, a. professor in the institution, performed on him a remarkable operation.
The young man was put under the influence of ether, and Dr. Roberts, with a scalpel, laid bare a portion of the hip bone about three inches wide. Then he called into play a bone cutting machine, invented by himself and called the electro-osteotome. It is worked by an electric battery and can revolve surgical instruments 12,000 revolutions, if necessary, in a minute.
The Doctor attached a small drill to the instrument and cut out portions of the hip bone up to its head, a distance of four inches. These pieces of bone under the microscopeshowed disease. The Doctor then used still larger drills until there was a space large enough to admit the entrance of a man's finger. He now wanted to see the exact condition of affairs inside of the bone. To do so he used a novelty for this class of work-a tiny incandescent electric light, about as big as a pea. This Dr. Roberts introduced inside of the passage in the bone, and the several flashes of light
enabled him to see just where the diseased bone was. Then he took up his drill again, and cut out the diseased bone wherever it was necessary as easily as
if the bone were open before him on an operating table. Dr. Roberts put in a drainage tube to take off diseased matter that might form, sewed up the wound, and applied antiseptic bandages. A hypodermic injection of morphine was given to the patient, and when he recovered from the effect of the ether he was in a satisfactory condition, and it is conjectured that he will in a comparatively short time be able to use his disabled limb.

## Steel Ships.

As wood, in the construction of ships, was gradually replaced by iron, so iron, in its turn, is giving way to steel. The latter phase of the evolution has been very rapid. It is only seven years ago that steel began to attract attention as a substitute for iron in ship building. Its free use had just then been made possibleon the score of economy-by the perfection of the Bessemer process. But for the triumphant success of that cheap method of steel manufacture, such a thing as a steel hull would have remained the dream of naval architects. Seven years of trial have proved the advantages of steel over iron as a material for ships, as those of iron over wood had been previously demonstrated. The prime cost of vessels is increased by the change, but there is a great gain in durability, which mákesothe use of steel cheaper than that of iron in the long run.
The carrying capacity of a steel vessel is greater than one composed of iron. The tougher metal better stands the tremendous wear and tear of quick voyages. As to comparative safety in collisions with other vessels or with icebergs, the shock can be sustained with less damage to steel than to iron. For every exigency that taxes the strength of a hull, iron is less suitable than steel. It is rare that theory has been so well verified by practice. The position of steel as the material into which the navies of the world are destined to be transmuted in the early future seems now to be secure.
There is no known rival to steel in ship building. If aluminum could be produced as cheaply, its extraordinary as cheaply, its extraordinary
tensile strength and its wontensile strength and its won-
derful lightness would recommend it to such a use. But the great cost of its extraction from the superabundant clay in which it is found puts that use out of the question at present. After all the alat present. After all the al-
leged improvements in its leged improvements in its
manufacture, its wholesale manufacture, its wholesale
price was, at the date of the last government report on "Mineral Resources," not less than $\$ 6$ a pound. And there is no other metal-or other material of any kind-from which steel has anything to fear as a competitor in the creation of a swift mercantile marine or an efficient war navy.
The Clyde statistics for 1885 tell the story of the gain made by steel on iron during the year. Of all the tonnage constructed and launched on the river last year, steel showed a percentage of 48. No further back than 1879 the percentage of steel tonnage produced on the Clyde was only 1014. The proportion of steel to iron hulls has increased with great uniformity from year to year. The experience of the Clyde ship builders may be taken as that of all their craft.
The North German Lloyd now has three new steel steamers under headway at Govan, near Glasgow. The Havre line gives its orders for four more vessels of steel to the St. Nazaire shipyard in France. The descriptions of all these steamers show that they will be splendid additions to the steel fleet already in existence on the Atlantic. This revolution, now so silently but surely progressing, is not confined to Scotland or France. Every country which makes any serious pretensions to ship building assists in the transforming process.-Journal of Commerce.

## California Soda.

Works have been begun at Owens Lake, in California. A portable engine is employed; and as soon as a vat is filled, the engine is moved to another, and the water is left to evaporate from the one that had been filled. This process will be repeated at all the vats until the soda sediment in the accumulating water in the pit reaches the surface. It will take about a year to get a crop of soda by this method, which will bring $\$ 35$ per ton. It is expected that fifty tons of soda to the acre will be annually gathered. The number of vats will be increased till they hold an area of 50,000 acres of soda, the income from which is expected to be nearly $\$ 2,000,000$ a year.

## engineering inventions.

A railroad gate has been patented by Mr. James H. Pollard, of Clarence, Mo. This invention covers a novel construction and combination of parts in a gate, , oo arranged that an approaching train strikes a
projection of a bar pivoted in connection with the rais projection of a bar pivoted in connection with the rails,
whereby the gate is automatically opened by the train, and is closed automatically after the train has passed.
A gate has been patented by Mr. Fred. W. Sensiba, of Talbot, Mich. It is intended especially
for drawbridges, and is hung upon for drawbridges, and is hung upon a shaft which is
rotary reciprocated by connections from another shaft rotated by a weight and held from revolution by the rotated by a weight and held from revolution by
end of a lever, with other novel features, whereby the gate will be automatic in its action so long as the weigh
is wound wound up.
A car seat recorder has been patented Paris, Texas. It is bywaters and John G. Burke, oa seat, the seat being thus divided into two parts, and is conneected by gearing, with the car axle, so that when
depressed by the weight of a pasenger it will record the number of miles traveled by the vehicle while th seat is so occupied.

## AGRICOLTURAL INVENTIONS.

I A two horse hay rake has been patent ed by Messrs. Alexander Anderson and Robert Rutherford, of Brush Creek, Iowa. It is made with a truck the reach frame engaging an annular plate, and a king bolt forming a fifth wheel, and provided with a hinged
tongue, whereby all weight from the rake will be taken tongue, whereby all weig
from the horses' necks.
A check rower has been patented by Mr. Jeremiah C. Butler, of Lexington, Mo. The shaft revolving wheel is secured on, one and the marking
wheel on the other end of a shaft journaled in suitable bearings above the runners, and (the arms of the mark ing wheel are so curved that in leaving the ground they
make a clear and distinct mark, the machine being very make a clear and distinct mark, the mas
simple in construction and operation.

A cotton cultivator has been patented by Messrs. Joseph Wilkinson and Frank Curtin, of Ken tuck, Ala. It is so constructed that front hoes will bar
off and rear ones side up the cotton, while the chopping mechanism intermediate of said hoes will cut the cotton into stands, it being arranged so the frame ? carrying
the cultivating and chopping mechanism may be lower the cultivating and chopping mechanism may be lower-
ed to cause the mechanism to operate in the ground to ed to cause the mect
any desired depth.
A hay rack has been patented by Mr Joseph A. Withrow, of Scranton City, Iowa. Combin
ed with a central bar are transverse bars, adjustable an gled rods, longitudinal bars, slotted curved springs and gled rods, longitudinal bars, slotted curved springs an
clips, with other novel features, so the rack may be clips, with other novel features, so the rack may be
readily applied to wagons for transporting hay and
grain, and adjusted to wagons of different sizes, or it grain, and adjusted to wagons of different sizes, or
may be converted into a frame to receive a canvas cov ering for a wagon to adapt it for use by excursionists etc.

## MISCELLANEOUS INVENTIONS.

A windmill has been patented by Mr Joshua G-Benster, of Duncan, Neb. This invention
relates to solid vertical wheel windmills, and it provide for such construction as to be self-regulating in winds of widely varying force, while it is adapted for a variet
of uses in driving small machines and for pumping.
A gate has been patented by Mr. Geo. A. Grant, of Eddyville, Iowa. It is composed of a num opposite ends secured to a movable upright, the inven tion covering novel features in the construction and operation of such a gate.
A hame tug has been patented by Mr John T. Condon, of Kingsley, Ohio. Its construction is such as to provide a strong pivot and one that prevents
any rotary or twisting movement of the tug, which rests against the roll of the collar, while the tug stands out and will not dig into and wear the collar.
A roller skate has been patented by Mr. James iB. Harris, Jr., of Geneseo, N. Y. It has a
socket arm with an adjustable stop, the arm being fixed socket arm with an adjustable stop, the arm being fixed
to and extending from one of the roller carriers, the object of the invention being to allow persons using rolle A stand for photographic cameras has been patented by Messrs. William H. Lewis and Eras tus B. Barker, of New York city. It is a camera tripod in which the legs, which are composed of three or more
sections, are built up to give a regular tapering and sections, are built up to give a regular tapering and
firmer support for the stand, while the whole is very light and may be packed in small space.
A pen holder. has been patented by Mr. Marshall J. Hughes, of Jersey City, N. J. The han dle is split at one end, and has a clamping screw for
drawing the parts together, with angled clamps for drawing the parts together, with angled clamps for re
ceiving ordinary pens, and arms in the slot of the pen handle, whereby ordinary pens may be used to make parallel lines at such distance apart as desired.
A gasometer has been patented by Mr George E. Johnson, of Albion, Ind. It is designed for
the use of dentists and others, for producing anæsthethe use of dentists and others, for producing anæsthe
sia by nitrous oxide and other agents, and has a dry sia by nitrous oxide and other agents, and has a dry
gas chamber, so the water forming the seal cannot abgas chamber, so the water forming the seal cannot ab
sorb much gas, and the gasometer is small as compared with its capacity.
A mixing and vaporizing device for inhalers has also been patented by the above inventor. It
is for thoroughly mixing anæesthetics, such as nitrous oxicte or laughing gas and ether, at the time they are being used, and consists of a simple apparatus with
chambers connected by bores with a common tube, with chambers connected by bores with a common tube, wit
gauge, regulating screw, etc.
An exhibitor for paper hangings, etc., has been patented by Mr. Lewellen A. Ely, of Muir,
Mich. Combined with an upright rod or tube, with a
sleeve surrounding it, are frames hung on the sleeve, and handles on the sleeve for toning oil cloths, carpets, etc.
A mop wringer has been patented by Mr. Damie laynch, of Glens on the top of a bucketor tub and has two sets of fingers, one made to work toward and within the other to squeeze or wring the cloth of he mop as it is drawn through the two clo
ows or fingers, thus saving time and labor.
An umbrella casing has been patented by Mr Romeo E. Ghezzi, of New York city. It is ormed of a series of telescoping tubes, making a shell to hold the covering and frame of an umbrella together vuickly, serving when so desired as a drip cup for the

An embroidering machine has been patAted by Messrs. Henry E. Schmitz and Edward Aldom, of Brooklyn, N.Y. It is a novel attachment for sewing machines, in which a single thread chain stitch is used dered a strip or length of cord, braid, chenille, beading, other embroidering strip, of any desired colo
A machine for building wire fences has been patented by Mr. William H. Bigelow, of Worthington, Minn. It consists of a platform suitably rying an earth auger and means for driving posts, with s desired on the posts so driven.
A prairie fire extinguisher has been patnted by Mr. Arthur W. Rumsey, of New Kiowa, Kanwhen propelled over the lines of a fire it will beat out and extinguish the fire at each side, and burn a swath or belt around haystacks, buildings, or farms, for pro-
A plastic compound to be used in the manufacture of burial caskets, furniture, etc., has been
patented by Mr. Thomas Law, of Moulton, Iowa. It consists of rosin, blacklead, sulphur, and rubber, melted and mixed together in stated proportions, that will readily mould and harden to make a waterproof and in-
perishable compound, and will also form an excellent ment
A cotton chopper and cultivator combined has been patented by Mr. Joseph L. Murray, of Weimar, Texas. It has a cultivating plow located in
the rear of the choppingapparatus, and in line with the the rear of the choppingapparatus, and in line with the point at which the chopping apparatus cats out
whereby the cut out portion will be cultivated, and mechanism whereby the cultivating plow may be ele-
vated over the stands of plants.
A head screen has been patented by Mr. Horace Garst, of Council Bluffs, Iowa. It is made of mosquito netting or fine gauze, in the shape of a bag,
with a band at its upper end to fit upon a hat body, and a band at its lower end to fit loosely around the neck, with flexible weights at the lower edges, the whole so the hat.
An attachment for rod rolling mills has been patented by Mr. Andrew J. Day, of Pittsburg, Pa.
It is for use in connection with the ordinary form of It is for use in connection with the ordinary form of
rolls, and so designed that the rod, having once been delivered to the bite of the second pair of rolls, will take care of itself until the operation of rolling has been com-
pleted, avoiding the kinking which has heretofore reuired the careful attention of skilled workmen.
A lamp chimney cleaner has been patented by Mr. Andrew $\mathbf{S}$. Reisor, of Reisor, La. It conor loop, with a cla hinged to the bend of the main wire and adapted to be locked on a pad or mop
by means of the slip bar or loop, so it can be conby means of the slip bar or loop, so it can be con-
veniently applied to the inside surfaces of chimneys or lobes.
A feed mechanism for stone sawing machines has been patented by Mr. Francis H. Cook, of Rutland, Vt. It consists of cone-shaped spreaders ar-
ranged beneath the feeding tubes, with defiecting racks ranged beneath the feeding tubes, with defiecting racks
beneath the spreaders, and other novel features, whereby the sand or other abrading agent may be evenly distributed over a large surface, or confined to a particular portion when such delivery is required.
A door lock has been patented by Messrs. Garret G. Ackerson and Julius F. Shy, of St.
Louis, Mo. The key holes for opposite sides of the oor are out of line with each other, and the locking olt has two key bit receiving notches, and there are lso special key hole guard plates, making a simple and strong lock, not easi
through key holes.
A gate has been patented by Messrs. William L. and John C. Wilson, of Cynthiana, Ind. A ver is pivoted to the lower rear part and extends diag onally upward and forward about to the top of the gate,
a draw up rod connecting the lever with the upper rear part of the gate, with other novel features, to prevent the sagging of gates, and to hold their outer ends up
any desired distance from the ground. any desired distance from the ground.
An electric leak alarm for pipes has been patented by Mr. Henry G. Bauman, of Pittsburg, Pa. It consists of a jacket inclosing the joint of a pipe,
with a flexible metallic diaphragm and an insulated with a flexible metallic diaphragm and an insulated contact screw supported near the diaphragm, with elec-
trical conductors connected with the pipe or jacket and with the insulating contact screw, to give alarm in case
A signal horn has b
A signal horn has been patented by Mr Charles A. Volke, of Stapleton, N. Y. It consists of a
tube closed at one end, and with a neck at the other end for connection to a steam or air pipe, the tube having a mouth at one side, below which it is divided by a bridge, making upper and lower chambers, connected by a narrow slit in the bridge,
for varying the tone.
A shutter fastener has been patented
consists of a Iatch adapted to be held in a slot in the rod, and other novel with a spring and sliding jointea be, readily closed, and locked in place when closed, with out extending the arm out of the windows to releas them from their open position.
A beehive has been patented by $\mathbf{M r}$. William O. Vincent, of Newfoundland, Ky. This in vention covers a novel construction and combination of
parts, whereby a hive may be used to receive three disparts, whereby a hive may be used to receive three dis-
tinct swarms of bees, or otherwise the bees can be al lowed to pass back and forth between the brood cham ber and the honey box, and the bees can generally be
A fire escape has been patented by Mr. Theodore D. Jenkins, of Jcrsey City, N. J. A meta box has arms and guides for an escape line, with a lever
arrangement, whereby, when the line is secured by one end in a window, when the lipecured by on end in a window and the other end cast out, one may
place a belt about the person, grasp a lever, and leave the window, t
by the lever.
A floor grinding machine has been patented by Mr. James B. Harris, Jr., of Geneseo, N. Y. A carries a seat for the operator, so that the weight of the latter can be thrown upon the grinding wheel, and the machine will abrade or level surfaces which it is drawn arross, being especially designed for leveling the floor of skating rinks.
A vehicle curtain has been patented by Mr. Joseph E. Bimm, of Dayton, $\mathbf{O}$. The construction
is such that the curtains can be so attached to the vehiis such that the curtains can be so attached to the vehi-
cle top that when not in use they are preserved from injury, and at the same time are ready andhandy foruse when required, and the arrangement is such that the en tire vehicle top, with the curtains, can be made and
A plate joint for stoves or ranges $h$
been patented by Mr. Nathaniel A. Boynton, of New York city. Cast metal plates having parallel ribs are used in connection with sheet or wrought metal plates
having marginal fianges bent to form an obtuse angle with their bodies, and arranged to fit within the grooves formed by the ribs of the cast metal plates, to make the tove or range.
A composition for making sewer invert blocks has been patented by Mr. Samuel A. Miller, of Philadelphia, Pa. It is formed of hydraulic cement,
sand, iron scale, or slag and iron, or steel sludge, the sand, iron scale, or slag and iron, or steel sludge, the
ingredients being thoroughly mixed with as small a quantity of water as possible; the composition is ram med down into a mould, and a mixture of one part of
sand and one of cement 1s applied to the face of the bottom block of the mould, to give a hard and smooth finish to the top surface of the invert block, while the rest of the block is made to have great strength and dura A na to
A machine for making stereotype ma trix impressions has been patented by Mr. Friedricb ing impressions of each line successively on soft paper from which a stereotype cast of the impressed sheet may be taken and used for printing, while an extra copy may also be obtained at the same time on tissue or car-
bon paper. A type case for use in connection with vese mach is has also been patented by the same in ventor, and it holds the types in such a manner that as
soon as they are released from the holder where used for taking an impression, they are automatically drawn back into the place which they had before.

## NEW BOOKS AND PUBLICATIONS

A History of the United States, Childs IN 1492, to 1885. By Emery E. Chil
New York: Baker \& Taylor, 1885.
In a space of about 250 pages Mr. Childs has brough together a condensed account of American history, from Orleans. It has been arranged in chronological order and will be found a very convenient reference book The main feature of the work is the careful record which has been made of important inventions, discov eries, the growth of national industries, and other mat est. It is a successful attempt to bring within the est. It is a successful attempt to bring within the
covers of a brief pocket edition about the same information that Professor McMaster has collected in his arger volumes, and will be appreciated by those who
want a complete compendium in the fewest possible words.
The Holly Manufacturing Co., of Lescriptive of the Holly System of Water Works and the Gaskill Pumping Engine used in connection with the system. It is designed to supply water to towns
and cities without the use of reservoir or stand pipe. To maintain the required pressure in the mains, the operation of machinery is continuous; but as the de and for water is subject to constant variations, means so that the amount of water delivered corresponds at any moment with the exact requirements when the pressure in the mains falls below the standard, the re gulator promptly acts to admit steam for a longer period into the cylinders; but when the pressure ex
ceeds the prescribed standard, the action of the reguator is reversed, and less water is pumped. Another and important feature of the system is that by provid ing water under large pressure in the mains; the ne-
cessity of fire engines is avoided. The reports of the performance of the Gaskill engine are highly satis-
factory. The pamphlet will' possess considerable value factory. The pamphlet will possess considerabl
for those interested in projected water works.
Designs for Stables. We have re ceived from W. T. Comstock, of New York, "Thirteen Designs for Stables," being the third of a series of
architectural designs of unusual merit. The plates with specifications and details of construction, will be sent for $\$ 1.00$
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as early as Thursday morning to appear in next issue.

## Deep Sea Wonders

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grandly.
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obert Grimshaw. 18mo, cloth, \$1.00, For sale Munn \& Co., 361 Broadway, N. Y. Guild \& Garrison's Steam Pump Works, Brooklyn, v. Y. Pumps for liquids,

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Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. J. Wood Working Machinery. Full line. Williamsport Iron Co, Iron Planer, Lathe, Drill, and other machine tools of Curtis Pressure Regulator and Steam Trap. See p. 142. Nystrom's Mechanics.-A pocket book of mechanics nengineering, containing a memorandum of facts and C.E., 1 sth edition, revised and greatly enlarged, plates,
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ncy, accurately calculated (as to capacity, etc.), and bilt to meet requirements in connection with all ndustrial Applications of Electricity,
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to be run by Dynamo Currents. All dynamo and motor g to the best of known models for economy and efing to the
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ton, Mass.

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asbestos $\begin{aligned} & \text { moods of all kinds. The Chalmerss-Spence Co., }\end{aligned}$ ${ }_{419}$ East 8 th Street, New York.
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"How to Keep Boilers Clean." Send your address
for free 88 page book. Jas. C. Hotchkiss, 88 John St., N. Y. Barrel, Keg, Hogshead, StaveMach'y. See adv. p.76. Mineral Lands Prospected, Artesian Wells Bored, by
Pa. Diamond Drill Co. Box 43 , Pottsville, Pa. See p. 46. Hercules Lacing and Superior Leather Belting made
by Page Betting Co., Concord, N. H. See adv. page 158. Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers \& Co., Norwich, Conn.
Manufacture of Soaps, Candles, Lubricants, and Glyce-
rine. Illustrated. Price, $\$ 400$. E. \& F N Spon, New
York.
Brass and Iror Working Machinery, Die Sinkers, leeveland, 0 . Split Pulleysat low prices, and of same strength and appearance as Whole Pulless. Yooom $\&$ Son's Shatting
Works. Drinker St.. Philadelphia, Pa Supplement Catalogue.-Persons in pursuit of infor mation of any special engineering, mechanical, or scien
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HINTS TO CORRESPONDENTS
Names and Address must accompar information, and not for pubherction .This is for out
References to former articles or answers shoul



 mincerals sent for examination should be distinctl
marked or labeled.
(1) H. R. writes: We are about to lath and plastera room in basement of store, to be used
a laundry. Can you suggest any way to effectually keep the fumes out of the store? A. Cover the ceiling
upon the beams with tarred roofng paper well lapped upon the beams with tarred roofing paper well lapped,
then fur and lath, or paint the ceiling after plastering.
(2) E. E. S. asks the cause of an engine knocking orthumping when oil or tallow is put in the cylinder? A. Possibly the piston rings are loose or have play between the head and follower. The lubrication
giving them an easy motion, the inletting of steam at each end wo
site shoulder
(3) J. M. H. writes: Why does the iron made now rust so badly and decay, while the iron mad many years ago rusts comparatively but little? A. The
iron made 40 to 50 years ago in the United States was largaly charcoal ircn, and was purer and better than the same grades as made at the present day. our common
iron is flled with slag, and looks coarse and fibrous when rusted to show the grain. There is good iron
matde now at a price, such as the Swedes, Norway, and Ausable horse nail iron.
(4) F. H. L. asks: 1. What are the soft iron castings to be used for the electric machine de-
scribed in SUPPLEMENT, 161 and how are they to be obtained? Are they malleable iron castings? A. The castings referred to are made from soft gray iron. They are better for the purpose than malleable iron. You can probably secure such castings in foundries in your own pose unless thoroughly annealed. 2 Is an armetre wound with several coils much superior to that wound with one, and would it increase the power of the machine described in Supplemment, 161? If so, what number of coils would give the best results, and how would you construct the armature? Would it not be best to use a number of pieces of Norway sheet iron about one gether and keyed on the gether and keyed on the axis, for the core? A. It would be diffccult to construct an armature of the size referred
to, with several coils, although a number of coils would to, with several coils, although a number of coils would
undoubtedly increase the effcieiency of the machine. For a small machine, we know of nothing better than that described in the Surplement referred to. Your form of armature would be very good if for a larger machine than that described. 3. Can you suggest a better pliable insulator than silk coated with shellac varnish? We know of no better insulator than silk or shellac, both, for wire.
(5) G. M. L. asks: How can I make an induction coil, such as are used in medical batteries, also what number of the Sciswtific American or Sur-
PLEmENT contains descriptions for making different coils? I wish to make a coil that will best operate on a Smee battery. A. To make an induction coil for die of soft iron wires three-eighths of an inch in dimeter and 4 inches long. Wind this with 3 or 4 thicknesses of writing paper, or place it in a suitable thin spool; wind on the spool 4 layers of No. 18 magnet wire for the primary. Wrap the primary coil with 2 or 3 layers
of writing paper, and upon this wind 8 or 10 layers of

No. 38 silk covered wire. SuppL
eections for making induction coils.
(6)-J. D. L. writes: I wish to make an induction coil that will give an inch spark. Will one 6 nches long and 3 inches in diameter be large enough per wire; how much secondary wire will I need? How large and how many condenser plates will I need? A. We think your coil will be too small to yilla a one inc park. Better follow directions given in SUPPLEMENT, ize We cannotwithut onsiderable trouble give you detailed information for making a coil to give a spark
vactly one inch long.
(7) G. A. C. writes: In the Scientific merican of July 11, 1885, Note 1, there is a recipe for Now, I wish to know if I can make battery cells of India rubber, say 2 in . square by 4 in . high, and cement with the above, so that they will last. If not, will you
please inform me of a way to make them? A. By em ploying a cement made of gutta-percha, pitch, and
lac, equal parts melted together, you will be able to
cure the corners of your battery cells together, succe fully. We would advise, however, binding the corners with strips of
same cement.
(8) G. S. B. asks: 1. Why does the cloudiness of the air and the number of rainy days in polar regions, while the annual quantity of rainfall decreases in the same direction? A. Because the atmo poles, carrying moisture, which is precipitated from decreasing temperature, until finally, in the higher latitudes, the clouds near the earth are seen only in light drizzling rains. The fogs of the northern lati tudes are mostly produced by the evaporation from the warm sea in contact with or into a cold atmo-
sphere, which condenses the moisture to fog. 2. Why sphere, which condenses the moisture to fog. 2. Why
do fogs and clouds reign supreme in the polar regions except during the winter? A. Although there is much fog on the sea in high latitudes, their supremacy is a sunny climes.
(9) J. D. C.-The belt has no influence upon the regulating power of the fiywheel, whether it puns on the fiywheel as a pulley or on a separate pulley or on a separate wheel or pulley is entirely matter of convenience in arranging the transmission power. The weight of fiywheel and pulley on an en sine shaft at their radius of gyration is the real measu of their equalizing power, although the belting and shafting of pull ditional aid
(10) V. W.-The eyebrows may be darkened permanently by the use of a silver hair dye,
which can be obtained from any druggist. The dealers which can be obtained from any druggist. The dealers preparation to use. For coarse skin, etc., we can only ficin
(11) C. S. asks how to waterproof the tackle and rigging of vessels. A. Either of the follow ingcan be used: 1. India rubber in small pieces 1 ounce,
boiled oil 1 pint; dissolve by heat, then add 1 pint hot boiled oil 1 pint; dissolve by heat, then add 1 pint hot
boiled oil, stir well, and cool. 2. Melt in 1 pint boiled oil 2 ounces each of beeswax and yellow resin. These olutions should be used when warm.
(12) E. W. writes: I have a small engine, 2 inches bore by $31 / 2$ inches stroke. What size A. Your engine will give you a half horse power with 75 pounds steam. You will require a boiler having 10 square feet of heating surface; a cylinder of three-sixteenths inch iron, 16 inches diameter, well riveted, 2 feet long, with 20 tubes 1 inch , heads $1 / 4$ inch. Set vertical toves, with ace lined with firebrick, such as used in tove pipe to chimney. Water gauge and gange cock on side of shell. Take steam from top of shell.
(13) F. W. G. asks: 1. What amount of wits) hold worts or black diamonds (when set in dril stood on rock, and the pressure was downward, from weight of drill rods upon the bit. A. The borts will not crush when the drill rods stand upon them in the rill hole or on ordinary stone, always provided that care is used in letting the rods and bit down, so as not to turn the bit when great weight is on it, which may also tear the borts out of their setting. 2. At what speed are diamond drills generally rotated when or diamond ordinary rock? A. The speed of the periphery minute. 3. What amount of twisting or torsion strain would 3 inch lap-welded gas pipe stand if made from good iron? A. The torsional strength of 3 inch gas
pipe is 4 tons at 1 foot from center. Its safe pipe is 4 tons at 1 foot from center. Its safe working
strain is one-quarter of this. The coupling joint is not considered in this figure.
(14) A member of the House of Repre manner $U$. S., asks the materials, quantites, and he fine polish on shirt bosoms etc. tion is given in answer to query 7 in Scientific been published by us.
(15) J. P. P.-It is extremely doubtful if you can rip $11 / 2$ pine and hard wood with a 6 or 8 inch saw with any speed or comfort. You will find it hard
work to cut half through by foot power. You can abbet with a wide saw or a wabble saw. We can re
commend "Art Furniture Designs," 4to, $\$ 3.00$; East lake's "Hints on Household Taste," 8vo, \$3.00, whic
we can furnish.
(16) E. R. B. asks: Does the bile ever nter the stomach? If so, does it remain long enough to conveys the bile from the liver, opens, not into the stomach, but into the intestine, at a distance of som
inches below. There is normally, therefore, no bile ever in the stomach, but it is abnormally often thrown
backward into it, and thus produces irritation and
 as the termis used; it is the result of it.
(17) J. C. S. asks the materials used in the manufacture of a paint sold under one of the special
trade marks used by paint combinations which the trade has on sale. A. We cannot be expected to know columns, if we did know them. We do not in theide any of them equal to pure white lead and oil. Th spurious whites made to imitate white lead mostly have baryta for their base, mixed with cheap white
earths for bulk. Wye consider them dear to use, cheap to sell.
Minerals, etc.-Specimens have been mined with the results stated.
F. B.-The spe
has no value.

## NDEX OF INVENTIONS

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United States were Granted, March 2, 1886,
AND EACH BEARING THAT DATE.

## 

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## Am

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ns. ................................... 13,06
Battery used as a curative appliance for diseases
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