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IMPROVED BAND LOG SAW MILLS.

The gradual yet rapid depletion of the American forest and lumber regions the past few years, the increase in consumption of nearly every kind of lumber into the thousand-and-one articles into which it is so cheaply and easily converted, has led to a growing scarcity and very material increase in price of nearly every variety of hard and soft wood lumber, especially that used in coach, cabinet, car, and house-building purposes.

To supply the enormous and growing demand, large shipments and importations of mahogany, ebony, red and white woods, and white and yellow pines, are constantly being made from South America, Mexico, Canada, and California. It is said that the single article of black walnut lumber, which twenty-five years ago brought only about $25 per thousand feet at the mills where cut, to-day, in the lumber market, commands from $75 to $150 per thousand feet, while in some localities very choice and evenly-sawed lots command still higher prices than these, and in fact is already quite a difficult article to obtain.

This scarcity has become so serious a question that attention has already been turned to the question of devising better means for reducing the logs and deals into boards, and by the use of a thinner saw blade produce a greater per cent of good lumber, and save the enormous kerf wastage, said to be from 15 to 20 per cent in most circular and other mills.

Any machine or tool that will effect such a saving in the making of lumber is a cheap investment at most any price, and especially is it so in the sawing of the fine and higher grades of lumber. The old adage, "the best is the cheapest," is particularly applicable in this case, whether the price be high or low. In these days of improvement, he who would best succeed must have the best. Profits in lumber making, like many other things, seem to go with those having the most approved appliances and best facilities. Particularly true is this in sawing lumber. Here a constant loss either in quality of product or amount of production, according to running expenses, puts the owner at a disadvantage as respects more enterprising rivals, and frequently determines the question of his success or failure.

Any one can see at a glance that a few hundred feet more or less a day; a few cents per thousand difference in the expense of production; the effect upon the market value, or even ability to sell at market prices, due to even or uneven sawing, very soon amounts to more than the first cost of the machinery. On the one hand, disappointment and failure; on the other, success and competency follow.

Believing this matter one of no little interest to a large number of our readers, we take pleasure in laying before them an engraving made on the spot by our artist, also a description of a new band log saw mill (both front and rear views) designed for sawing black walnut and other high priced lumber, as it was seen running in one of our Western saw mills.

It is from the establishment of the celebrated American wood machinery builders, Messrs. J. A. Fay & Co., of Cincinnati, O., well known, we think, to most of our readers.

The machine proper, except the carriage, is mounted on a heavy cast iron sole plate which sustains and supports all the operative parts. The operator, without changing his position, has entire control of the mill, and can start or stop it, change the feed, or vary the direction of the carriage at will. It is massive and substantial, wheels 72 inches in diameter, and arranged so the saw can be made to run on any portion of the wheel almost instantly. The guides—upper and lower—are those peculiar to all of the Fay & Co. machines, having a wheel to receive the back thrust of the saw, and lateral supporting side guides or packing plates to suit the thickness of the saws; the upper guide is also so arranged that it can be raised or lowered instantly to any desired size of log, and yet will always remain in a true vertical line with the lower one—a very important feature. The carriage head blocks and set works are the most improved known. The log is set with the greatest ease and convenience, and with unerring accuracy. The set works are arranged to be operated in the most expeditious manner. The carriage runs on friction rolls. The side supports are arranged so as always to secure an even thickness of the last board. Rests at the same distances apart as the side supports afford a decided advantage over ordinary mills in edging up boards and splitting plank into scantling.

The nearness together of blocks saves any change or moving of head blocks in sawing logs of different lengths. No calculation is required to leave the last board of the desired thickness.

The operator and assistant stand at the sides of the carriage, where logs can be easiest handled, and where the proper set, when slabbing, can be determined. The position of the sawyer has the further advantage of enabling him to cut different grades of lumber in the same log into the most suitable dimensions.

A single improved dog quickly operated holds securely any size of logs until nearly finished. Sliding dogs can be quickly applied to hold the last board without tearing or otherwise injuring the lumber.

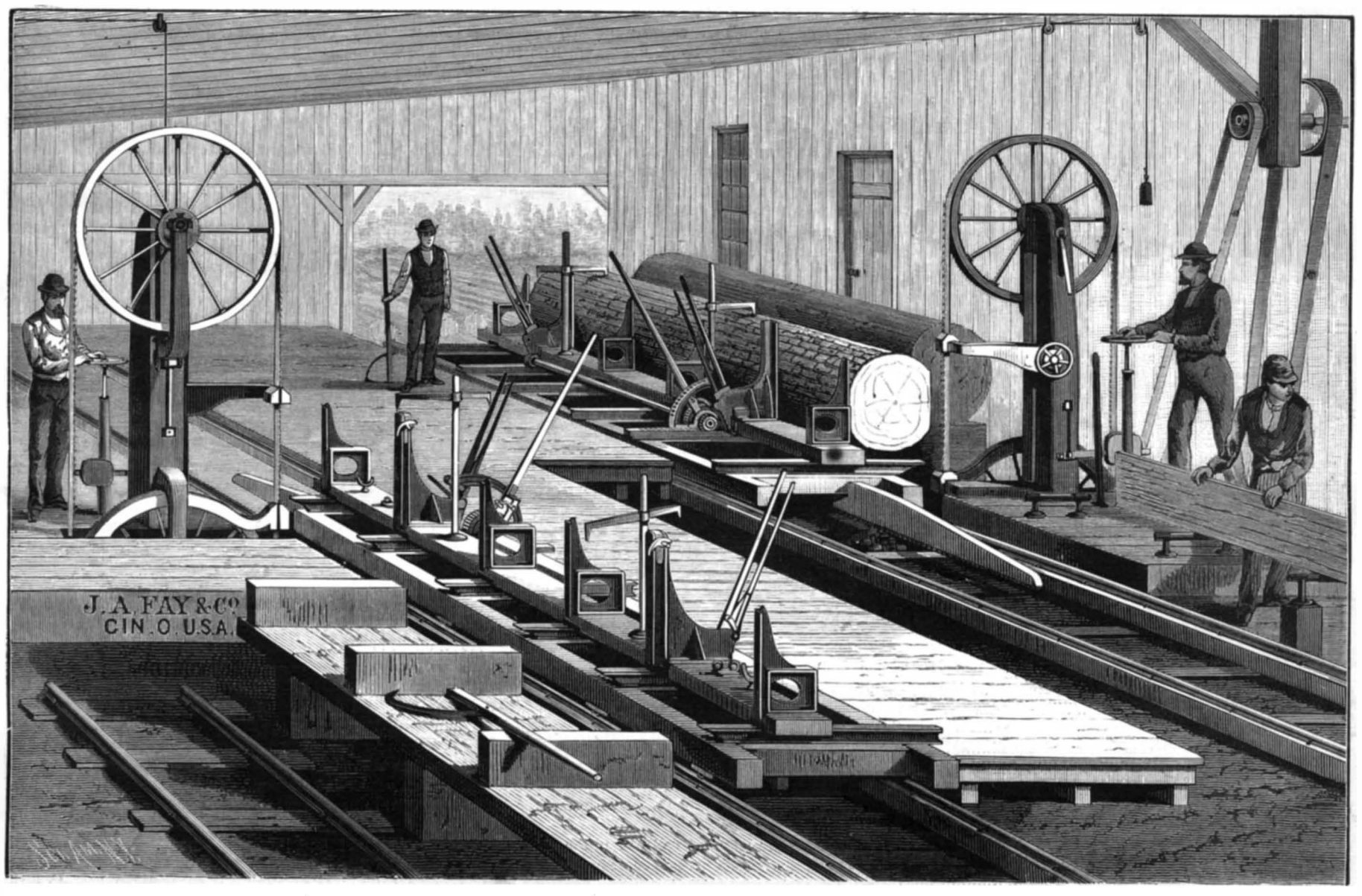
The carriage can be run close to the rear of the mill building. Every part is most thoroughly constructed, and the working parts are all readily accessible. The blade is usually four inches wide and No. 18 gauge, and removes a kerf of one-sixteenth of an inch.

The enormous saving in lumber over other saw mills by this machine we leave to our readers to compute, feeling it will be worth their most careful investigation.

Any further particulars can be had by addressing the makers, Messrs. J. A. Fay & Co., Cincinnati, Ohio.

Bring Out another Gun.

England has just finished a ram that is supposed to be almost invincible, the United States Government has been trying a torpedo that may blow the ram to pieces, and a Pittsburg man has been experimenting with a new breech-loading rifled cannon of unusual power. That old problem about what would happen if an irresistible force should meet an immovable body will yet be put to the test if inventors go on improving their guns, torpedoes, and armored vessels.—*Philadelphia Ledger.*



J. A. FAY & CO.'S BAND LOG SAW MILL.

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NEW YORK, SATURDAY, AUGUST 13, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 298,

For the Week ending August 13, 1881.

Price 10 cents. For sale by all newsdealers.

VENTILATION OF HALLS OF AUDIENCE.

An able and exhaustive paper has lately been presented to the American Society of Civil Engineers, on the ventilation of halls of audience, by Mr. Robert Briggs, C.E. It appears from this paper that a man in health and at rest requires for breathing 480 cubic inches of air per minute. The inhaled air, in American summer condition of 70° Fah. and 70 per cent of hygrometry, or about 1·7 per cent of its volume of aqueous vapor, and 0·04 per cent of carbonic acid, will, when exhaled, be found to contain nearly three times as much vapor and nearly 100 times as much carbonic acid, and to have lost one-fifth of the oxygen inhaled, while the temperature will have risen to 90° Fah. But, contrary to the teaching of some authors, the exhaled air will be about 3 per cent lighter than it was before being breathed. The carbonic acid does not, as some believe, separate and fall to the ground, but it is inseparably mixed with the breath.

Breathing is not the only means through which inhabited air is vitiated; insensible perspiration adds one-fifth or more to the carbonic acid sent out with the breath, while an average of about two pounds of water per day evaporates from an adult man at rest and awake, and both add to the contamination of exhaled air.

Now, if it be accepted that air is unfit for breathing after having once been in the lungs, it seems that about one-third of a cubic foot of air per minute is required by each person. The internal temperature of the body being nearly 100° Fah., it is essential that the surface should radiate heat, and that the air thus heated should pass off. Small portions of ammonia and gases, with floating organic matter, dust, and smoke in the air, with the probability that the origin of disease is only found in the germs of living organisms that subsist on the decomposing organic matter suspended in the atmosphere, are important facts in estimating the quantity of air required for perfect ventilation. It seems, therefore, that at least four cubic feet per minute are required, and that this quantity would amply ventilate a single person if it could all be devoted to his use exclusively.

Passing now to the subject of practical ventilation of halls of audience, it appears that each individual of an audience cannot, by known means, be supplied with his quota of four cubic feet per minute, which would, if made to pass upward along his person while standing, serve to perfectly ventilate him; it further appears that in a room continuously occupied by persons in health, or at least not affected with offensive diseases, as much as 30 cubic feet of air per minute must be properly introduced for each individual. A desirable capacity for the chamber seems to be 1,000 cubic feet of room for each person, but audience halls average no more than 200 to 300 cubic feet to the person, and therefore contain only about six to ten minutes' supply of air. This smaller capacity does not seem to be a very important defect, provided a systematic supply of air, at a proper temperature and in a desirable state of humidity, is properly introduced and distributed. The last part of the problem, as here stated, is the important difficulty to be overcome.

The system of air introduction through perforated floorings is in operation, and has been for twenty-four years, at the Houses of Parliament, London, although it is thought to be "embarrassed in its action by singularly unmechanical and insufficient apparatus for warming and supplying the air."

In other systems the standing difficulty is the establishment of local currents which produce unpleasant sensations in those persons who are exposed to them, and the desideratum has been and still is to supply an effective quantity of agreeably tempered air in such a way as to be imperceptible to the audience.

As regards the comparative effects of gas and electric lighting we are told that "the vitiation of air by electric light, arising from the slow combustion of the carbon, is too insignificant to form any element in considering the ventilation." The ventilation of churches that are heated by furnaces in the cellars beneath the audience can be partially done by removal of air at or near the floor, but no large ventilating shaft from the upper part of the room is admissible as a means of natural ventilation.

Natural processes can be only partially successful in ventilating codience rooms. Success "can only follow the complete adaptation of mechanical appliances and apparatus, as well as of structural arrangements, to the ascertained wants and requirements of the individual composing an audience."

Fans of the disk pattern are recommended as being from 10 to 15 per cent more effective than the common incased fan. The speed of the fan should be such as to impel the air in the ducts at the rate of 600 feet per minute, while the ends of the ducts should be fitted with baffling boxes so that the air may leave the box at a velocity not exceeding 120 feet per minute at a distance of one foot above it.

Box coils, as they are called, consisting of horizontal pipes inclosed in a chamber, are best for indirect heating (ventilation); while vertical coils, though less efficient by 20 per cent, are preferable for office heating.

The efficiency of well exposed steam pipes with steam at 36 to 40 pounds pressure is given as 3 cubic feet of air heated from zero to 100° Fah. per square foot of surface, or 5 cubic feet from 50° to 70° or 80°

For direct heating by coils placed in the rooms to be heated one square foot for each 80 cubic feet of space within the walls of an exposed room, but special provision must be made for doorways and open passages.

The cross section of steam supply pipes should have one circular inch area for every 500 feet of effective heating surface, enlarged $\frac{1}{400}$ for each foot from the point of first distribution or branch from the main. The condense water or return requires one half as much. Flow mains should rise vertically to some point where they can be drained or trapped, and then descend half an inch in 10 feet to the end.

Boilers of the common tubular form require one square foot of heating surface to each 9 square feet of coil surface or radiators, or one square foot of grate surface to 270 of radiating surface, the grate and heating surface of the boiler being as 1 to 30.

Chimney flues 50 feet high should have an area one-tenth of the grate surface, and 100 feet high one-twelfth. The maximum quantity of coal consumed will not exceed 8 pounds per square foot per hour, while for six months in the year 20 to 30 pounds per 24 hours per square foot will suffice.

A fan delivering 20,000 to 40,000 cubic feet of air per minute will require from 20 to 60 pounds of coal per hour. No allowance need be made for steam to drive the fan where buildings are warmed and ventilated, as the exhaust steam will be utilized for heating purposes.

The author says, "steam heating apparatus in all its details, as used in America, is peculiarly American," and "as practiced here, is not fully known or used in England or France, and but little more known in Germany."

BUTTON-SET RIVETING FOR BOILERS.

"Button-set riveting," which means forming the zone of a globe on the rivet by means of a concave "set" and a sledge, has been generally regarded with disfavor by boiler makers, but it has been long used by oil tank builders, enabling them to erect large tanks with astonishing rapidity and at correspondingly low cost for labor. The fine appearance and general good character of this work led enterprising boiler makers, who were not in condition to warrant the expense of steam riveting machines, to clandestinely try this method on steam boiler shells, and it has at last found favor among reputable makers, who now employ it openly, and they are supported in it by most people who understand the difference, except perhaps professional hand riveters, whose occupation is injured by its adoption.

We take the following from an interesting report by Mr. Wells to the recent convention of Railroad Master Mechanics at Providence, on the subject of "set riveting," as compared with "steam" and "hand riveting" of locomotive boilers. The plan of "set" riveting consists in placing upon the inserted hot rivet a set, mounted upon a handle, as smiths' sets, flatters, and hot chisels are, and having a cavity of the shape and dimensions of the desired head in its lower end, and "driving" the rivet by strokes from one or more sledges upon the other end of the set, a heavy holding iron being used to meet by its insertia the force of the sledges. The weight of the set described is 2½ to 3 pounds, of the sledges 9 to 10 pounds, while the holder or anvil placed upon the other end or head of the rivet is about 60 pounds, and held firmly against the work by the short arm of a stiff lever of the first order.

The skill required for this work is readily acquired by laborers of ordinary intelligence, and consists merely in properly placing the holder, holding the set squarely on the rivet, and delivering fair blows upon its upper end. The first blows serve to upset the body of the rivet in the hole more effectually than blows struck with light hammers directly on the rivet point, and 24 blows in all, at the rate of about 80 per minute, finish the "setting" of the rivet, and half a dozen blows upon a "flatter" placed on the lap near the rivet completes one rivet, except a few blows more on the set to give the head a nice finish according to the taste of the workman.

Thus are driven on the shell of a boiler 30 rivets per hour, or an average of 22 on all parts, including changing bolts, drifting holes, and adjusting the work. Hand riveters average about 125 rivets per day of twelve hours and a half, or 10 per hour, under similar conditions. The report shows that the riveting of a locomotive boiler containing 1,722 rivets will occupy 65·85 hours, at a total cost for labor of $44.77, or an average of 2·64 cents each rivet, against which stands 5·84 cents each for rivets driven by hand at the rate of 10 per hour. The difference in favor of set riveting is shown to be 54 per cent in cost and 51 per cent in time. From the drawings exhibited, showing sections of laps riveted by the two methods as well as by steam riveter, it appears that "set" riveting is the most perfect in the matter of the rivet filling the hole. The remarks by members that followed the report indicated that no discussion was possible, since all seemed to think favorably of this method, and the president of the convention thought, that being the case, it ought to be adopted at once.

THE TORPEDO STEAM ALARM.

For several days the torpedo steamer Alarm has been stationed at Yonkers, on the Hudson, where trial has been made of the new propelling and steering machinery with which she has been fitted.

This vessel, and the novel system of torpedo warfare provided for in her construction and equipment, were described and illustrated in detail in the SCIENTIFIC AMERICAN of March 17, 1877. The Fowler wheel, which had been adopted to fill the double office of propelling and steering, did not prove entirely satisfactory. It enabled the boat to turn quickly in small space, but it did not give speed enough.

Accordingly an appropriation was made by Congress to change the driving machinery, and the Mallory propeller was substituted. The tests now being made are chiefly to determine the efficiency of the new system. With the Fowler wheel but seven knots were made. With the Mallory propeller a speed of eleven knots has been attained, two of the four boilers being used, and her commander, Lieut. R. M. G. Brown, expresses the opinion that twelve knots can easily be accomplished—in plain English, about two thirds the speed a vessel of this character ought to have to make her effective against modern war vessels.

As a steering apparatus the propeller is evidently a success. The vessel can be stopped without reversing the engine, and can be made to spin as upon a pivot. Whether the lack of speed is due to the plan of the vessel or to lack of power in the propeller does not appear.

The Alarm is 172 feet long, including a 32 foot ram. Her beam is 26 feet 6 inches, and drawing 11 feet of water she displaces about 700 tons. She is intended to fight bows on, and in addition to her ram and torpedo equipment she carries one large gun in the bow. It is an ordinary 22 ton smooth-bore. The Alarm is intended chiefly for coast defense, and if her speed were increased fifty per cent., and her cannon changed to a heavy breach-loading rifle, she would be really formidable. Her torpedo equipment appears to be entirely satisfactory.

MR. LAWSON'S BOILER EXPLOSION.

BY S. N. HARTWELL.

In the year 1835, at the request of the Secretary of the United States Treasury, a series of experiments was undertaken by a committee of the Franklin Institute to ascertain causes of unexplained boiler explosions. A small plain cylinder boiler, set in brick, having in each of its flat cast iron heads a small glass window supported by a metal grating, through which to observe the effect of certain manipulations that were supposed to contribute to destructive boiler explosions.

The first experiment was "*to ascertain whether, on relieving water heated to or above the boiling point from pressure any commotion is produced in the fluid.*" In the report of the committee on this experiment is the following:

Experiments were made which showed that on making an opening, even when the pressure did not exceed two atmospheres, a local foaming commenced at the point of escape, followed soon by a general foaming throughout the boiler, the more violent in proportion as the opening was increased. This small boiler (12 inches diameter by 34 inches long, half full of water) "was completely filled with foam by opening the safety valve, which was placed in the middle of the top, and the water violently discharged through the opening of the valve." In regard to the effect on the gauge, they say "the gauge fell always on making the opening."

The committee used also fusible disks of much larger area than the safety valve, by which, on fusing, an aperture 0·95 inch in diameter was suddenly opened. The effect even at low temperatures was the violent discharge of the scalding contents against roof of the boiler house.

A number of experiments followed until the water was entirely exhausted, and the boiler was allowed to attain a red heat, and trials were repeated by injecting water directly upon the hot surface. They say "the result was uniformly a diminished elasticity of the steam."

The interesting and valuable experiments of Mr. Daniel T. Lawson, of Wellsville, recently made and described in vol. xlv., No. 2 (July 9), of the SCIENTIFIC AMERICAN, seem to be a supplement to those of the Franklin Institute made 46 years before, and they add one more to the practical demonstrations of theory.

Probably no well-informed engineer who has given the subject proper attention doubts that Mr. Lawson's experimental boiler would explode as described on suddenly letting out the steam through a two-inch pipe, when the pressure had risen to 380 pounds per square inch. The questions that arise in this connection Mr. Lawson may not be able to answer until more experiments are made. The estimated strength of his boiler being, as he says, about 600 pounds to the square inch, at what steadily increasing pressure under his practical conditions would it have exploded had no shock been produced by the artificial means applied to liberate the steam? And at what pressure would it have given way under conditions of the cold hydrostatic test? At 350 pounds pressure his first experiment failed to explode the boiler, while it did explode at 380 pounds on a second trial. How many shocks equal to the one produced in the first trial would have sufficed to explode the boiler? And how many would have destroyed the boiler? And with what proportional results at lower pressures, say down to practical every-day examples of boilers supposed to be working under one-fifth their breaking load? The term superheated, used by Mr. Lawson in describing his experiment, is, however, calculated to mislead those who are not familiar with boiler temperatures. Water that discharges steam from its surface, or boils under a pressure of 380 pounds per square inch, has a temperature not far from 440° Fah., about the melting point of tin. But according to the accepted meaning of the term this water is not superheated. Its temperature is normal to the conditions, the same as 212° is to conditions of atmospheric boiling.

Superheated water is that having a temperature higher than the boiling point at the given pressure; but to bring it into this very unstable condition experimentally requires very delicate manipulation. Professor Douny, of Ghent, many years ago succeeded in doing so, but it is probable that nine out of ten of his imitators have utterly failed in their attempts to prevent circulation of the water and to exclude air and other impurities. Heat applied to a limited surface of a steam boiler invariably induces circulation, a condition destructive of the desired effect. Perfectly still and perfectly pure water, perfectly deaerated, may be superheated so that a slight disturbance will cause explosive ebullition. But pure deaerated water in motion is not explosive unless the pressure is suddenly removed from its surface, when a sudden escape of contained heat, causing violent action, is the result of the lowering of the boiling temperature. Thus water at 212°, if suddenly introduced into a vacuum, will practically explode, and for an instant fill the vessel with a heavy foam, which will again mostly become "solid water" as soon as its temperature falls to the boiling point under the new condition of pressure. The greater the change of pressure suddenly effected the greater, of course, will be the shock of the disintegration or explosion of the water. Probably a correct estimate of the velocity of the flight of the water at 440° Fah., every particle of which is, in regard to the new condition, surcharged with heat, and springs with lightning speed, would show that the explosive action very nearly resembles that of a fair quality of gunpowder.

In regard to one of the questions suggested above the late experiment in the boiler yard of Sidebotham & Powell, in Philadelphia, an account of which was published in the SCIENTIFIC AMERICAN of July 23, 1881, may be considered another of those valuable practical things that form a common-sense basis for determining the strength of modern structural material, and it throws light on the subject of boiler explosions, which will no doubt dispel some of the vapors that have been raised around the late occurrence at Gaffney's dyehouse. We need more of this sort of thing and less theoretical prediction.

PIONEER CANNING.

BY H. C. HOVEY.

The first successful attempts at canning fish, fruit, and vegetables were made at Eastport, Me., about the year 1840. The honor of this pioneer work (as I am informed by Mr. D. I. Odell, British Vice Consul, Eastport, Me.), is to be shared between Mr. Charles Mitchell, who brought the idea with him from Scotland, and Mr. U. S. Treat, who employed him and furnished the requisite capital to carry on experiments. After working for Treat four or five years, Mitchell was associated with a Mr. Underwood for thirty-six years in canning lobsters at various points from Portland to the Gulf of St. Lawrence, and finally settled down at the Grand Manan.

The original Eastport firm, formed in 1841, was "Treat, Noble & Haliday." At first they canned salmon, clams, and lobsters. Then they put up, in a similar manner, beef, mutton, fowl, corn, etc. At one time large quantities of ox-tail soup were thus hermetically sealed and sent to market. To supply the material ox-tails in great numbers were brought on from Boston to Eastport in crates.

When the firm broke up, which it did in 1844, Noble went to St. John, N. B., and Haliday to Halifax, N. S., each to engage in the fish business. But Treat kept on canning. He bought an island, that bears his name, in Passamaquoddy Bay, where, besides the business already mentioned, he established a large trade in smoked herring, fish oil, and fertilizers, having a steam mill for the purpose. He made heavy shipments, principally to ports in Connecticut. It is satisfactory to our sense of justice to know that each member of this enterprising firm amassed a competent fortune, and enjoyed a fair share of public recognition.

Mr. Treat's superior knowledge and experience becoming known to Hon. S. F. Baird, of the Smithsonian Institution, the latter secured for him an appointment in Japan, at a salary of $5,000 a year, to develop the fishing and canning enterprises of that empire. There he remained for three years, at the expiration of which period he removed to California; where, at the advanced age of seventy-five years, he is associated with his two sons in his old business of canning salmon.

When Mr. Winslow Jones, of Portland, had his celebrated law suit, some years ago, with certain parties in Chicago, who, as he claimed, had infringed on his patent process of canning corn, the defense summoned Mr. Treat as a witness to prove that the process had been in use long before the Winslow patent had been procured.

It is also claimed for Mr. Treat that he originated the canning of oysters at Norfolk, Va., being employed by dealers for that express purpose.

The canning of various products, chiefly marine, is still extensively carried on at Eastport. What is known as "The Eastport Packing Company" is mainly engaged in putting up lobsters, which are caught in immense quantities from Cutter to Point Lepreau. They pack only the claws and tails, grinding up the bodies and shells for use as a fertilizer; thus wasting nothing. One hundredweight of live lobsters, costing the company but one dollar, will make eighteen one pound cans, selling in New York at one dollar and a half per dozen.

Men who learned the art of canning in what is geographically, but not otherwise, "the last town in the United States," conveyed the mysteries of the business to the remotest portions of the land; until now the trade in canned goods has become one of the most lucrative and important branches of industry in America, furnishing employment for thousands of people.

GALVANIZATION OF AN ENGINE PISTON.

Mr. P. Paul, an engineer, makes known through the columns of our French contemporary, *Le Genie Civil*, a curious accident which happened in 1880 in the shops of Fleury's Boiler Works at Cette. The feed water of the steam generator depositing a large amount of incrustation, Mr. Fleury was advised to throw into the boiler fragments of zinc, the disincrusting property of which is well known. After a few days the motor, notwithstanding its frequent lubrication, began to work with difficulty. The iron piston griped strongly, and before long it became almost impossible for the engine to work at all. On taking the mechanism apart to examine into the cause of the trouble the piston was found to be coated with a heavy layer of copper, which, upon turning the piston in a lathe, was found to be thickest in those parts that had been submitted to friction.

The explanation offered by Mr. Fleury is quite plausible. The boiler was connected with the engine by copper pipes. The particles of zinc carried along by the steam constituted, then, with the metal of the pipes, an infinite number of small galvanic couples; hence the transportation of the copper by the piping to the piston, which principally attracted it because of its continual motion exerting an attraction as a mass upon the molecules, the fixation of the latter being facilitated by the heating produced by friction.

Mechanics' Fair in Boston.

From the statement of Mr. Charles Slack, at a recent meeting of the Massachusetts Charitable Mechanics' Association, it appears that its various enterprises are getting on well, and that the mason work on the new exhibition building, which was begun on March 1, is now completed, and goods will be received as per programme. It is arranged that among the other interesting exhibits there will be one of special interest by "the Boston Manufacturers' Mutual Fire Insurance Company. They will exhibit a large collection of apparatus for saving and protecting property at fires, and of articles which have been through fire. Small brick structures will be erected outside the building for the practical trial of some fire-proof materials. Altogether, the managers of the exhibition are well satisfied with the prospect."

William S. Hudson.

William S. Hudson, locomotive engineer and inventor, died at his residence near Paterson, N. J., July 20. Mr. Hudson was born in Derbyshire, England, and served his apprenticeship with Robert Stephenson, builder of the "Rocket." Soon after coming to this country he was employed to begin the manufacture of locomotives at the Auburn State Prison, but the project failed for lack of competent workmen. Mr. Hudson then became master mechanic of the Attica and Buffalo Railroad, afterwards merged in the New York Central.

In 1852 he removed to Paterson, to take charge of the Rogers Locomotive Works. Very many important improvements in locomotive construction are due to Mr. Hudson's skill and inventive faculty.

The Need of a Hand Reel for Silk.

Some months since the attention of inventors was called in this paper to the growing need of a light hand reel for unwinding silk cocoons. The president of the Women's Silk Culture Association (1328 Chestnut street, Philadelphia) informs us that the demand is still unsupplied and urgent. A rough model of a reel is now at the rooms of the association, and inventors are desired to develop the idea of it into a satisfactory machine. A large number of persons have taken up the work of raising worms, and a proper reel for unwinding the cocoons would meet with a ready and growing sale. The reel should have a wheel 72 inches in circumference, and should be compactly built. It must also be inexpensive to meet with favor from the class now becoming interested in the culture of silk.

The association has established a school for teaching the art of raising and feeding silk worms, and they believe that if the industry were properly introduced silk culture would not only prove of great importance to our manufacturing interests but would furnish remunerative employment to thousands of poor families, particularly women. The demand is chiefly for reeled silk, and the lack of a suitable hand reel is the only drawback to the good work.

Italian Poison Antidote.

M. Bellini, of Florence, advocates the use of iodide of starch as an antidote for poisons in general, and, as it has no disagreeable taste and is free from the irritant properties of iodine, it can be administered in large doses; also, without fear in all cases where the poison is unknown. It will be found very efficacious in poisoning by sulphureted hydrogen gas, the alkaloids and alkaline sulphides, ammonia, and especially by alkalies, with which iodine forms insoluble compounds; and it aids in the elimination of salts of lead and mercury. In cases of acute poisoning an emetic is to be given before the antidote is administered.

IT is reported that a considerable deposit of specular iron ore has lately been discovered near Acworth, Ga. It is said that scientific men pronounce it to be of high grade, free from phosphorus and sulphur, and strongly magnetic, while the bed is well located for treatment of the ore on the premises, as well as convenient for shipment to market.

AGRICULTURAL INVENTIONS.

An improved seed planter has been patented by Mr. Julius Holekamp, of Comfort, Texas. The object of this invention is to improve the construction of the seed planters for which Letters Patent No. 236,223 were issued to the same inventor January 4, 1881, in such a manner as to make them simpler in construction and more convenient and effective in use.

An improved potato assorter has been patented by Mr. Charles O. Morris, of Trenton, N. J. This device is intended for assorting potatoes into two or more grades. It is simple and effective.

An improvement in horse rakes has been patented by Mr. Sam T. Ferguson, of Minneapolis, Minn. This invention relates to certain improvements in horse rakes of that form in which curved spring teeth are attached to the rake head, and the latter is rocked on its journals to dump the rake by being drawn forward by a link attached to the lower bent end of a hand lever.

Solidification of Ether.

It is a curious fact that, for a long time, chemists pronounced the solidification of ether an impossibility. Even so great an expert as Thenard, after repeating the unsuccessful experiments made by Fourcroy and Vanquelin, found that ether still remained liquid even when submitted to the intense cold represented by 99° of the Centigrade thermometer. More recently, Franchimont has proved that, though Thenard's assertion is correct as regards pure ether—or what is termed anhydrous ether or absolute ether—the results are very different when the ether contains, as is very frequently the case, a certain quantity of water. Thus, it appears, ether that contains a little water, but no alcohol, produces small crystals when submitted to a temperature of 31°, and, as the cold increases, these crystals do not augment in size or quantity; they are simply crystals of ice.

Another Prehistoric Man.

Some human remains, evidently of great antiquity, says the *Academy*, were discovered a few months ago at Carabacel, near Nice, and have been reported upon by a local scientific committee, as well as examined by M. de Quatrefages. The bones had not been artificially interred, but were found embedded in a deposit of calcareous clay, at a depth of about nine feet from the surface. This deposit was irregularly stratified, and contained a mixture of pliocene and eocene shells, showing that it had been formed by the reconstruction of the pre-existing strata. Of the bones the most remarkable is the lower jaw. This is sufficiently characteristic to enable De Quatrefages to refer it to the Cro-Magnon type. The fossil man of Nice, therefore, belongs to the same race as M. Riviere's skeleton from Mentone, both being probably of Paleolithic age.

BENDING MACHINE FOR IRON AND STEEL.

We give an engraving of an improved bending machine made by Messrs. Williams, White & Co., of Moline, Ill. It is intended for bending iron or steel bars or plates between dies. The variety of shapes that may be bent on this machine is practically without limit. It is adapted to agricultural, railroad, and engineering work, and in many operations it may replace the drop press. The dies may be very readily changed, and the work is easily placed and removed. It is rapid in its operation, and effects a great saving in labor.

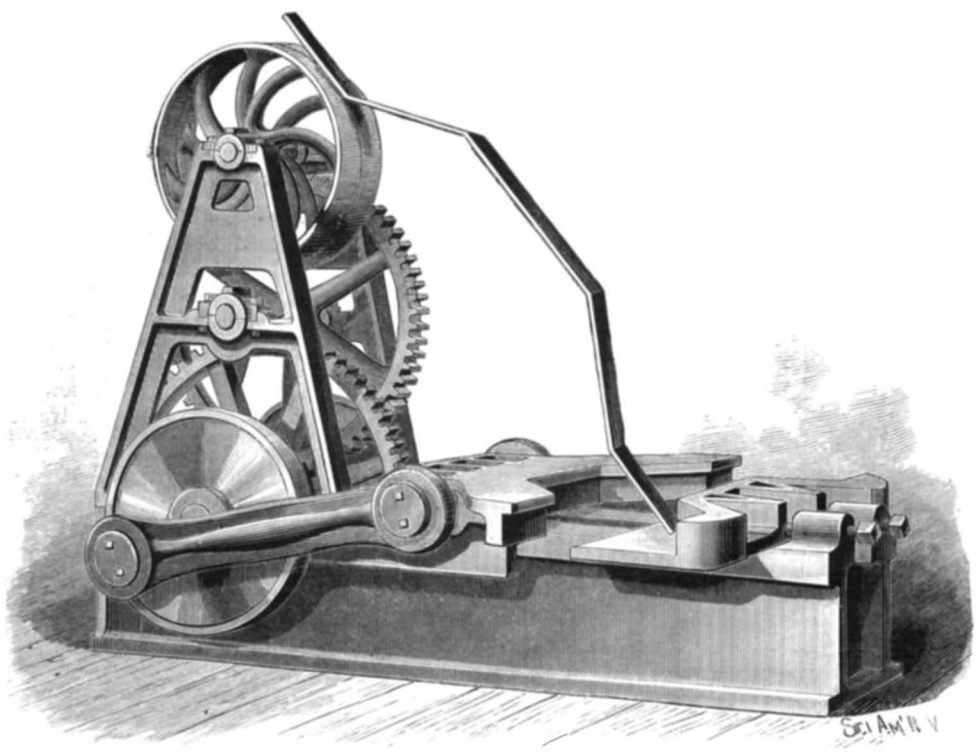
The operation of the machine can be readily understood by reference to the engraving.

The crosshead carrying the movable die is reciprocated by the cranks, which are moved by a train of gears driven by a belt from the line shaft or other source of power.

The crosshead moves seventeen inches and makes one stroke while the tight and loose pulleys make eight revolutions, thus giving the dies very great power over the work.

The particular dies shown in the engraving are for bending the arches of freight car trucks.

The machine is highly recommended by a large number of agricultural manufacturing works, and is in use, giving entire satisfaction, in several engineering works. Further information may be obtained by addressing Messrs. Williams, White & Co., Moline, Ill.



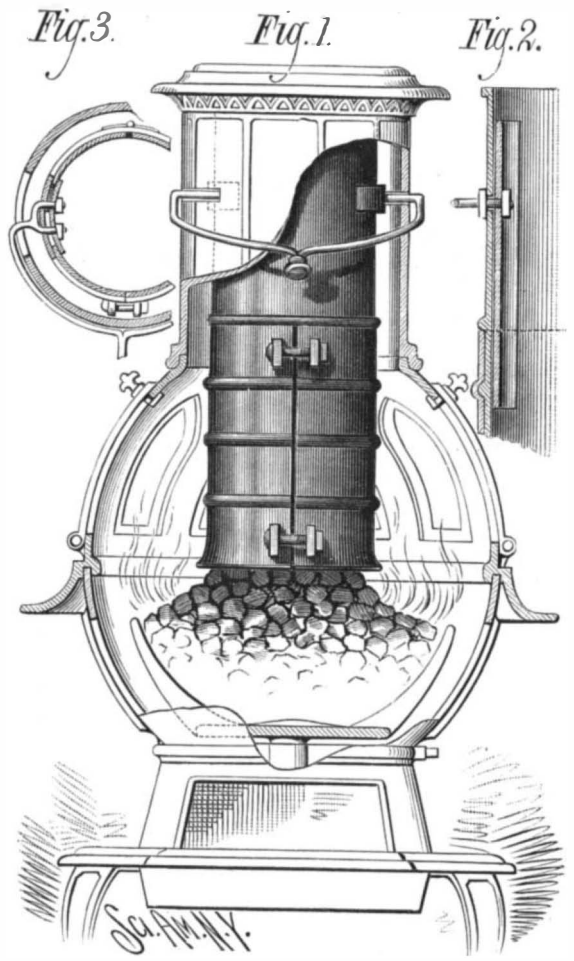
WILLIAMS, WHITE & CO.'S BENDING MACHINE.

Road Locomotive.

A road locomotive for war purposes, constructed by Bolle, was recently tried in presence of Count Moltke and several other authorities. The machine drew five guns with their carriages completely equipped, the load amounting to 800 cwt. The journey lasted about three hours and a half, with one halt. The locomotive itself weighed 575 cwt., and it is capable of drawing 3,000 cwt. The expense is about two marks an hour. The velocity was equal to that of a troop of infantry, but might be much increased.

EXTENSION MAGAZINES FOR COAL STOVES

The engraving shows an improvement in magazines for coal stoves, recently patented by Mr. Dewitt Van Evera, of Maquoketa, Iowa. The invention is intended to facilitate the use of different kinds and sizes of coal in the same magazine, and to insure the proper feed of the coal to the fire box. The improvement consists in forming, upon the lower portion of the stationary part of the magazine, a number of circumferential exterior ribs or beads corresponding to in-



VAN EVERA'S EXTENSION MAGAZINE FOR COAL STOVES.

ternal grooves in the movable portion of the magazine, so that the latter can be moved up or down, so as to lengthen or shorten the magazine, and permit of a greater or less depth of fire in the fire pot of the stove. The movable part is made in two halves and fastened together with bolts, so that it may be readily separated and adjusted to any desired height.

By means of this construction the stove may be regulated or burning different quantities of coal for apartments of different sizes, or for different seasons of the year, thus avoiding the necessity of changing from one size of stove to another, and in fact adapting one sized stove to a wide range of requirements.

This magazine has an attachment for loosening the coal, so that it will readily pass down into the fire pot. This part of the invention is clearly shown in Figures 2 and 3, which are respectively and vertical horizontal sections of the magazine.

The device consists of two curved plates, suspended on opposite inner sides of the magazine from a curved horizontal bail, which is provided with a handle extending through the front of the stove. By oscillating this bail the curved plates are moved so as to dislodge the coal should it become clogged.

The different sizes of stoves are commonly made and graded or adapted to particular sizes of coal, and each has a particular capacity which cannot be greatly varied; and when it is attempted to increase or diminish the capacity of the stove by dampers alone, gas is liable to escape and explosions frequently occur. The invention shown in our engraving obviates all this.

The advantages of these improvements will be apparent without further description. Any one having had much experience with coal stoves can readily see that the invention is based on sound common sense.

Beans.

M. Pauchon has made a series of experiments with beans, on the influence of the color of seeds on germination. He finds, in order to reach the same visible stage of development, a black or violet seed absorbs more oxygen than a white or yellow one, though a more rapid germination is observed in the latter. On the other hand, the quantities of carbonic acid exhaled by white seeds are found to be greater than those from the dark, sometimes even double. These differences are considered to prove that dark or violet seeds are better conditioned from a physiological point of view. In the natural state, that is, when the seeds germinate in light, the conversion of legumin into asparagin must go on much more easily in the colored seeds than in the others. "The more frequent and pronounced pigmentation of seeds of northern lands is, therefore," says M. Pauchon, "a favorable circumstance for the growth of these organisms, under the peculiar light conditions to which they are subject."

Railroad Train Accidents in June.

There was, according to the *Railroad Gazette*, a total of 73 train accidents in the United States, in the month of June, 1881; thirty-one persons were killed and seventy-eight injured; 20 accidents caused the death of one or more persons; 17 caused accident, but not death, while in 36 cases, or 49·3 per cent of the whole number, there was no injury to persons recorded.

The Pasteurization of Beer.

As far as we are aware, this method of preserving beer has not yet been practically applied in this country; this is the more surprising when we consider the enormous quantities of beer that are exported from this country, the value of which depends on its power to resist the changes produced by ferments under the influence of high temperatures, such as are found in many parts of the world where English beer is shipped to. When Pasteur made his grand discovery that the various fermentative changes in saccharine fluids are due to distinct organisms, each kind producing distinct and characteristic products, he also offered practical suggestions for the preservation of fermented fluids by destroying the organisms which produce the deleterious changes. The most serious results are produced in beer by the lactic and acetic ferments, and Pasteur suggested that beer might be preserved indefinitely if these ferments could only be destroyed or rendered inactive. Experiments in this direction proved that a temperature of 140° Fah. is sufficient to kill nearly all the lactic and acetic ferments, especially in the presence of a quantity of alcohol, such as is found in beer. It seemed, then, that for the practical application of this idea, all that was required was to raise the beer for a short time to the above temperature, but there are many difficulties in the way of carrying this process out. The beer must be inclosed in a hermetically-sealed vessel, otherwise there will be a loss of carbonic acid gas, as well as of alcohol and hop aroma; therefore nearly all attempts at pasteurization of beer have been made on beers in bottle. The usual method of proceeding is to place the well corked bottle of beer in a vessel of water the temperature of which is gradually raised to about 140° Fah., and the bottles of beer are maintained at this temperature for about fifteen minutes. There ought to be no difficulty in carrying this process out, the chief risk being in the bursting of the bottles, which cannot be prevented entirely. The pasteurization of beer has been carried out on a large scale by several Continental and American brewers, and successful results have been obtained. In order to obviate the breakage of glass bottles, it would seem preferable to heat the beer in bulk in a large hermetically closed metallic vessel, and subsequently, if necessary, to transfer it to bottles-taking care to prevent all introduction of germs during the bottling process. Our export beer trade is unfortunately not sufficiently flourishing for us to neglect any point which gives the foreigner an advantage, and in the matter of the pasteurization of beer many foreign brewers are decidedly in advance of us.—*Brewers' Guardian.*

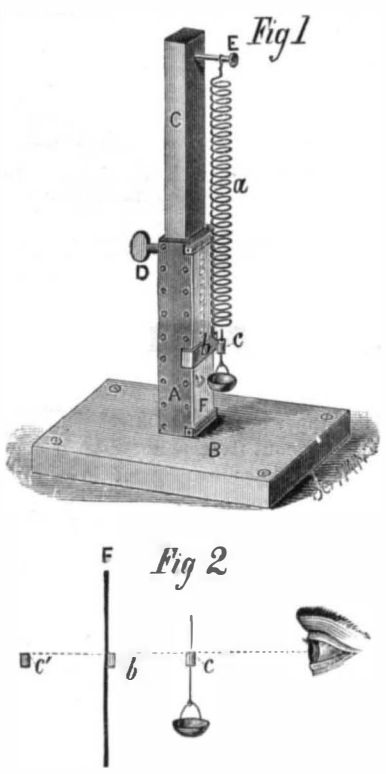
A SIMPLE BALANCE.

The want of an inexpensive balance, sensitive enough to weigh very small quantities of matter accurately, frequently makes it impossible for those of slender means to engage in assaying or any quantitative chemical work. The simple and easily constructed contrivance described below will supply this want. With a little practice and care weighings can be made on it that will compare favorably in point of accuracy with the more elaborate and costly analytical or assay balance.

The hollow pillar, A (Fig. 1), is made of strips of perfectly dry, light wood, three-eighths of an inch thick, two inches in width, and twenty-eight inches in length, smooth finished inside and out, and joined at the edges and secured with screws. It is firmly fixed in a perpendicular position on the heavy wooden base, B, by mortising. The square wooden rod, C, thirty inches long, is planed and smoothly finished so as to snugly fit and slide easily in the hollow pillar, the screw, D, serving to hold it securely in any position.

A strip of good plate glass mirror, two inches wide and twenty-eight inches long, is secured in position against the face, F, of the pillar, A, by small brass bands at top and bottom. The slide, *b*, of thin, hard brass, one inch wide and three and a half inches long, is bent so as to slightly pinch the sides of the pillar and be moved easily up and down before the mirror. A spring, *a*, of fine hard brass wire is suspended before the mirror from a brass pin or screw, E. From the bottom of this spring is suspended a slender wire three inches in length, in the middle of which is fastened a small white bead, *c*. A scale pan, one and a half inches diameter, preferably of nickel-plated brass, is attached to the end of the wire. The base, *b*, may be secured by screws to a table. The mirror surface should be as nearly perpendicular as possible.

The method of using the balance is as follows: The substance to be weighed is placed in the scale pan, and the rod, C, is drawn up until the tension of the spring is sufficient to suspend the pan with its load before the mirror. As soon as the vibrations cease the eye is brought on a line with the top of the white bead, *c*, and its reflection in the mirror, as in Fig. 2. The slide, *b*, is then moved up until its upper edge just touches the line of vision between the bead and its reflection without disturbing the slide, *b*, the substance is then transferred from the scale pan, and small standardized weights put into its place until sufficient weight has been introduced to bring the bead again fairly on a line with the edge of slide and reflected bead. The weights in the pan correspond to the weight of the substance.



If the spring is gently handled in changing the substance for the weights no appreciable change takes place in its tension, but to avoid any chance error it is best to return the substance to the pan after the weights have been removed, and note if the bead returns to the first position marked by the slide.

In making these weighings the weights should be put into the pan as soon as the substance is removed, and *vice versa*, no interval being allowed.

This balance is not intended to weigh a greater quantity of any substance than thirty grains, though with stronger wire spring it can be made to weigh ounces nearly if not quite as accurately as an ordinary balance. The rod, C, can be made to move smoothly if it sticks by rubbing it with a little powdered talc or soapstone.

CRYSTALLINE ALBUMEN IN PUMPKIN SEEDS.—Pumpkin seeds contain an albumen which may be easily obtained in well developed octahedral crystals. The proteine contained in the seeds consists chiefly of such crystals. Crystalline albumen is distinguished from the amorphous variety by a far smaller proportion of ash and of phosphoric acid, and by higher proportion of carbon, nitrogen, and sulphur.

VENTILATED BATH BOX FOR CHEMICAL AND PHOTOGRAPHIC PURPOSES.

Every photographer knows or ought to know the exceedingly poisonous character of the fumes rising from the cyanide of potassium bath used in fixing photographic negatives and ferrotypes. These fumes are nothing more nor less than prussic acid, the most subtle and deadly poison known. Usually the poison is so diluted with air as to be very slow in its operation. Nevertheless it acts continually

MACURDY'S VENTILATED BATH BOX.

on the operator, gradually undermining his health, producing premature decline. The engraving shows a compact and efficient device for avoiding all this by inclosing the cyanide bath in a small box provided with a ventilating tube communicating with the external atmosphere.

The box is provided with glass sides, one of them forming a door which can be opened or closed at pleasure. When open it forms a hood, which prevents the fumes from escaping into the room, while it admits of viewing the plate as it lies in the bath.

The invention will be readily understood by reference to the engraving, and it will be appreciated by all photographers. It is a thing that has been needed, and should meet the approval of every operator.

Further information may be obtained by addressing the inventor, Mr. J. C. Macurdy, P. O. box 426, Boonville, Mo.

CONDENSED MILK.

In answer to a number of correspondents who have asked how condensed milk is prepared we give the following:

When the milk is brought into the factory it is carefully strained, placed in cans or pails, which are put into a tank of water kept hot by steam coils. When hot it is transferred to larger steam heated open vessels and quickly brought to a boil. This preliminary heating and boiling has for its object the expulsion of the gases of the milk, which would cause it to foam in the vacuum pan and, also to add to the keeping quality of the milk by destroying the mould germs. A second straining follows, after which the milk is transferred to a vacuum pan, where, at a temperature below 160° Fah., it boils and is rapidly concentrated to any degree desired. The vacuum pan employed is a close vessel of copper, egg-shaped, about six feet high and four and one-half feet in diameter. It is heated by steam coils within, and by a steam jacket without—inclosing the lower portion. In one side of the dome is a small window through which gas illuminates the interior, while on the opposite side is an eye-glass through which the condition of the contents may be observed. The pan is also provided with a vacuum gauge and test sticks. Much of the milk used in cities is simply concentrated without any addition of sugar. The process of concentration is continued in the vacuum pan until one gallon of the milk has been reduced to a little less than a quart—one volume of condensed milk corresponding to about four and three-tenths volumes of milk. The following table of analyses by Dr. Waller shows the composition of several brands of this condensed milk sold in New York city:

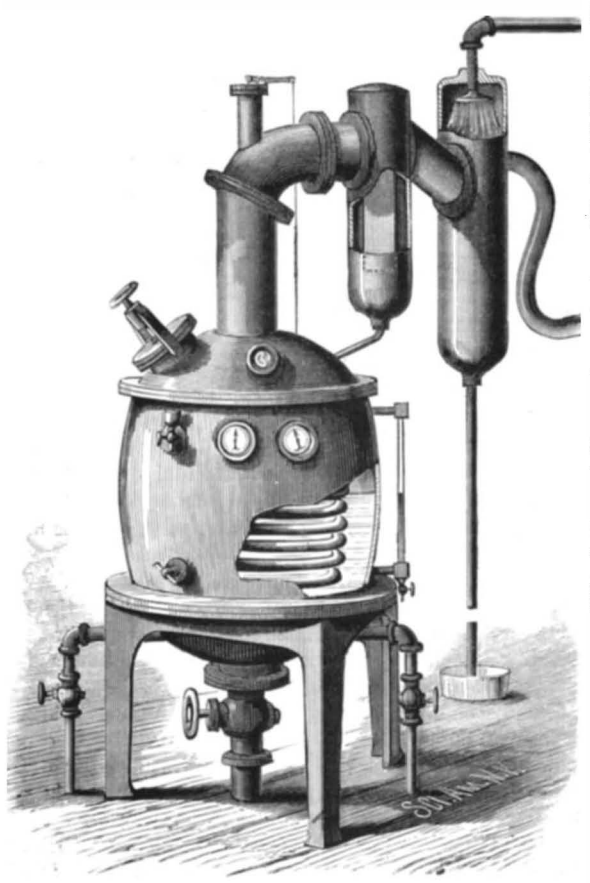
	American.	Eagle.	New York.	National.
Fat	16·29	14·36	14·28	13·97
Casein	17·26	15·07	13·96	14·02
Sugar	10·64	11·64	13·90	10·44
Salts	2·77	2·10	2·00	2·33
Water	53·04	56·83	55·86	59·24
	100·00	100·00	100·00	100·00

The average composition of fresh cow's milk is as follows:

Fat	3·799
Casein (and albumen)	4·369
Sugar	4·543
Salts	0·635
Water	86·660

Condensed milk intended to be preserved for any length of time has an addition of pure cane sugar made to it during the boiling, and is usually put up in sealed cans. This sugared or "preserved" milk, when properly prepared, will keep for many years. The following analysis of this "preserved" milk will serve to indicate its composition:

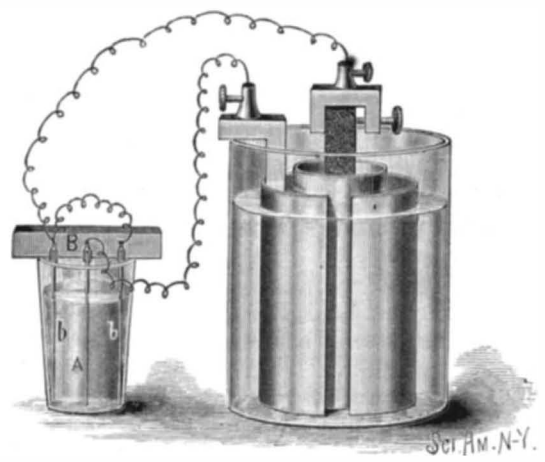
Fat	9·55
Casein (and albumen)	10·26
Milk sugar and cane sugar	53·34
Salts	1·91
Water	25·94



VACUUM PAN FOR CONDENSING MILK.

ELECTRO-ASSAY OF COPPER ORES.

The average copper ore is difficult to assay by fire. The results, even where great care is exercised in the various manipulations, are rarely exact or trustworthy. The ordinary wet methods of analysis are rather complicated, slow, and expensive, good work requiring the facilities of a chemical laboratory.



ELECTRO-ASSAY OF COPPER ORES.

Correspondents who have asked how to test copper ores will find the following method simple, expeditious, and sufficiently accurate for all practical purposes.

The operations are, reduction of the ore to a uniform powder, sampling, decomposition and solution in acids, separation of the soluble and insoluble portions, decomposition of the dissolved copper salts, and separation of the copper by means of electricity.

A representative sample of the ore is reduced, by pounding and grinding it in an iron mortar, to a powder, the whole of which will pass through a wire gauze sieve of 100 to 120 meshes to the square inch. This powder is well mixed together, and a sample of one third ounce is taken for assay. The sample is put into a porcelain dish or cup, and enough hot water is stirred in (with a glass rod or clean slate pencil) to form a thin paste. About two ounces of strong nitric acid is then gradually added, and as soon as the first strong reaction has quieted somewhat the dish or cup is set in a pan and surrounded with hot water. The treatment with acid is best conducted out of doors, so that the abundant fumes may escape without injuring anything or poisoning the air. If too much acid is added at first the action is apt to be violent and some of the contents will be lost through spattering. The water in the pan, as it cools, should be replaced by hot water if it is not convenient to keep fire under the pan. When the disengagement of red fumes ceases, usually in the course of half an hour, the liquid portion (or as much of it as can be without disturbing the sediment) is decanted into another porcelain dish, which is placed in the water bath. More acid—an ounce or more, if required—is poured over the undissolved residue, and the dish containing it allowed to remain on the water bath another half hour. The partly evaporated acid solution, first decanted, is then carefully washed back into the dish containing the sediment with a little hot water, and the liquids allowed to evaporate to complete dryness over the hot water bath. Over the dry residue half an ounce of strong sulphuric acid is poured, cautiously, and the mixture is stirred until fumes are no longer given off. Then one ounce of cold water is stirred in, and after a few minutes' standing two ounces of

hot water are added, the mixture stirred, and the suspended matter allowed to settle.

The liquid is next filtered through a small piece of good filter paper adjusted in a glass funnel, the filtrate being collected in a small clean vessel of porcelain or glass. The residues are shaken up repeatedly with small quantities of clean water, the washings being thrown on the filter, and the filtered liquid allowed to mix with the clear acid copper filtrate. The dish containing the residues, as well as the filter, must also be rinsed with a little water, so that none of the copper liquid may be lost by adhering to them. If these operations have been properly conducted all the copper will be contained in the filtered liquid. The decomposing cell into which this liquid is next placed is shown in the illustration.

The cell is an ordinary flat-bottomed drinking glass. The strips, A, *b*, and *b*, are of thin platinum foil, three inches in length and two in width. Over the upper end of each piece a strip of lead foil is doubled, with the battery wires inserted and pinched between the lead and platinum.

The lead-bound edges are forced into slits in the strip of wood, B, which suffice to hold them firmly enough in position. The outer strips, *b* and *b*, are joined by wires and connected with the positive pole of the battery, the middle plate, A, being connected with the zinc pole. Two cells of any of the common gravity form of battery used on telegraph lines may be used, but a single element of the bichromate (carbon) type is preferable and more convenient.

In using the decomposing cell the plate, A (minus the lead binding), is first heated to redness for a few moments to cleanse it, then weighed and slipped into position, with as little handling as possible. The battery being set up and connected properly, the acid solution of copper is poured into the glass, the plates immersed in it, and the decomposition allowed to proceed undisturbed until the liquid has lost its color, and a drop of it, when brought into contact with a drop of strong ammonia water on a white porcelain surface, no longer develops a perceptible blue color. The plates are then lifted out, with care if the deposited copper does not adhere firmly, and the liquid in the glass is decanted and replaced by boiling water. This cleanses the plates, and the heat imparted by it causes them, when taken out, to dry quickly. The plate, A, is at once detached, with any filaments of copper which may have separated in the cell, and weighed. This weight, minus weight of platinum, corresponds to the weight of metallic copper in the sample of ore taken. If the sample weighed one-third of an ounce avoirdupois, multiply the weight in grains of copper found by 13·714, to convert it into terms of pounds per ton.

Iron, zinc, nickel, cadmium, and other minor impurities, may be present in the copper solution, but so long as there is any copper present no considerable quantity of any of these is likely to be thrown down with the copper from the acid solution with one cell of battery.

Large Schools of Sperm Whales.

Several incoming shipmasters have reported seeing schools of sperm whales working southward along the New Jersey coast, of late. Captain Sawyer, of the bark Ibis, just arrived from Pensacola, reports "two miles of blackbacks and water spouts" off the Carolina coast, July 16. He said to a *Sun* reporter: "It was on Saturday and Sunday when we encountered these sperm whales going south or southwest, as if to round Hatteras. They were going very slowly, backs above the water, and were spouting all of the time. They were strolling along in groups, sunning themselves half an hour at a time, and then taking a header, and coming up to spout.

"First we met two schools of about 100 each, I should say. Occasionally they frolicked and flopped about heavily in a sort of dignified and elephantine sport. More followed, and the next morning, Sunday, we saw more. Altogether there were over 700 on the picnic. We passed within 500 feet of two big fellows, but they seemed preoccupied and didn't notice the ship. I don't think they knew we were there."

"Had you any means of capturing them?"

"No; and it did seem a pity to have so much valuable sperm oil indolently swimming away from us. There were some big whales there too. I said to Limerick, one of my men here, 'Now, there's a fellow that's worth $2,000,' and he must have been, and there were bigger ones in the school. It would have been a harvest for a whaling ship. A million dollars in sperm whales is too good a haul to let go by, but we couldn't do anything. Occasionally I've seen a sperm whale cruising along as far south as Savannah, and once in a while I've heard of whale ships off about there. But I never saw so many whales at one time before anywhere."

It will be remembered that the Bermudas used to be the center of the sperm whale fisheries of the North Atlantic. Of late years the pursuit of whales has been almost abandoned, and they seem to have multiplied rapidly.

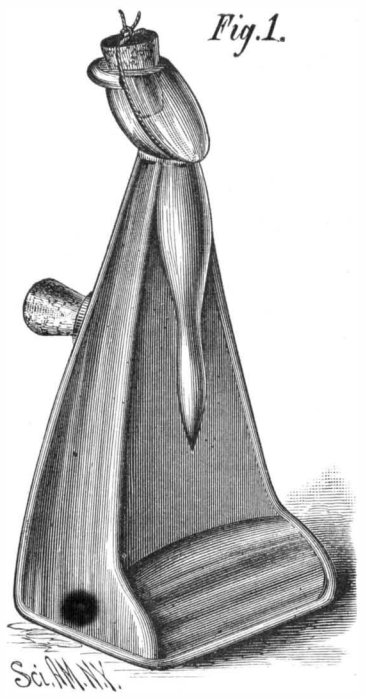
Birch Bark Rubber.

It is said that a dense black gum may be obtained from the outer layers of the birch tree bark by distillation, which possesses all the ordinary properties of gutta percha, and has the additional merit of resisting the deteriorating influence of air and the corrosive action of acids. This advantage makes it useful as an ingredient of India-rubber and gutta percha, which it renders far more durable. Whether these statements are true remains to be proved.

A NOVEL BOTTLE.

Dr. J. B. Moore, of Philadelphia, in *Druggists Circular*, has said that "it often happens, in dropping a medicine from a bottle a little too full or with a badly formed lip, the most steady and practiced hand can with difficulty drop a dose even with a near approach to accuracy." . . . "To the nervous and careworn attendants who are so frequently found in the sick chamber the task of dropping medicines becomes doubly irksome and annoying, and especially when it has to be done, as in cases of lingering illnesses, day and night, sometimes for weeks at a time. Besides, it is sometimes impossible, no matter with how much care and judgment the dropping is performed, to prevent the number of the prescription and the directions on the label from being defaced, if not entirely obliterated, as is often the case, and the outside of the bottle becoming stained and bedaubed with liquid, and especially if it be any of the stronger acids or iron preparation; and the trouble does not stop here, for the hands are liable to be stained, and the clothing, the furniture, or any damageable article that the medicine may come in contact with may be ruined or soiled."

Fig. 1.



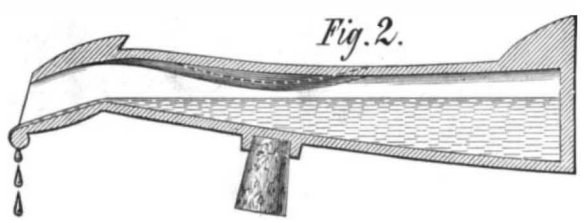
GOLDSMITH'S IMPROVED BOTTLE.

In the ordinary prescription bottle, during the act of dropping or pouring, the liquid is often two-thirds above the lower lip, and hence the air cannot find ready entrance, and either dropping or pouring becomes difficult and vexatious. In the improved bottle the liquid level (even when full) is always on a level with the lower part of the neck. Its inclined side and crooked neck form double inclined planes, which, with its shape and the airway, make it a complete dropper, obviating all the objections to the ordinary bottle. The liquid will not, during the act of pouring, "run back" outside to deface the label, the hands, or furniture. The shape secures steadiness; but should the bottle topple over a cork inserted in the recess on the inclined side will prevent breaking or spilling of the liquid, and the cork thus used will afford support and aid as a rest on dispensing medicines.

This bottle may also be used for table sauces, for perfumery, for patent medicines—for any purpose for which the ordinary bottle is employed

It does away with the necessity of purchasing a dropper, which takes time and trouble to adjust in the ordinary bottle, and which, besides the expense of first cost, is liable to be out of place or lost. In the new bottle the dropping feature is a part of the bottle and goes with each one, while the bottle can be made at a cost (not above that) of those imperfect and annoying ones, now in daily use by millions of people. It will become a necessity in every household.

Fig. 2.



The bottle has a conical or pyramidal shape, so that the greater part of the weight of the liquid in the vial will be concentrated at the base of the same, thus giving the bottle or vial a much better bearing and protecting it from being thrown over as easily as the bottles in use at present. This bottle has an inclined neck, with a lip or a bead at the lowest point of the edge to facilitate pouring the liquid from the vial in single drops. If the neck of the vial is inclined the flow of the liquid can be controlled much better than if the neck is straight. As is shown in Fig. 2, the liquid rests mainly on the inclined side of the bottle, and as it cannot flow up this inclined surface very small quantities of the liquid can be drawn by slightly lowering the neck of the vial. The vial is provided with an air channel for conveying air into the interior of the vial to prevent bubbling of the liquid. The air can pass through this channel from the neck to the extreme rear end of the vial. The cork is secured in the neck of the vial by means of a cord or wire, catching on a projection of the neck of the vial. For further information address the inventor, Mr. W. T. Goldsmith, 64 Corn street, Atlanta, Ga.

Correspondence.

A Remedy for Sea Sickness.

To the Editor of the Scientific American:

Having noticed from time to time the different remedies suggested for sea sickness, I concluded to give you my experience through two voyages of several days' duration, one during particularly rough weather. My first sensation on reaching the ocean was that of being in a very high swing. The same sensation of nausea immediately exhibited itself. It struck me at once that probably the same means adopted to overcome the sickness in the swing would prove effective on the sea, that was, to force the swinging. I therefore watched the motion of the steamer, and as she was about to descend I made an effort as though to force her down. Continuing this for a short time the feeling of nausea disappeared, and I had no recurrence of it during either voyage, separated by several months' duration. I have no idea that every one could be so successful, but I fully believe that nearly any one with a little determination and strength of stomach can easily overcome sea sickness by this means.

W. E. F.

Helena, Montana, August, 1881.

How to Prevent Car-Safe Robberies.

To the Editor of the Scientific American:

The late robbery of the safe of the express company on the Rock Island road leads me to offer the following plan to prevent such cases: The safe to be provided with combination locks; the safe to be locked by the express company's agent at New York city on leaving that place; the numbers of the combination to be telegraphed to agents of the express company at Chicago, San Francisco, and any intermediate places; the safe to be opened by them on its reaching their places. The messenger in charge of the car, not knowing the combination, could not, even by compulsion, open the safe, nor could it be opened by any practicable means except at the proper places.

WALTER L. SMITH.

Weston, Mass.

MISCELLANEOUS INVENTIONS.

An improved device for thawing out sink spouts has been patented by Mr. Amos Stevens, of Fairfield, Me. A pipe of considerable less diameter than the sink spout is passed through this spout and is as nearly in the middle of the spout as possible. The upper end of the inner pipe is slightly tapered outward, and passes through and is fastened to a slotted plate forming a strainer. This plate supports a cup fitting into the upper beveled end of the inner tube. If the water in the sink spout freezes, hot water is poured into the cup, from where it flows through the inner pipe and thaws out the sink spout in a short time.

Mr. George O. Denison, of Waterloo, Ind., has patented an improved bag holder made low in front and high in rear to expedite the filling of the sack and prevent the grain from running out at the rear of the bag holder. It is provided with suitable hooks adapted to be inserted into the upper end of the sack to secure it to the bag holder. The holder is partly supported by a coil spring.

An improvement in horseshoes, patented by Mr. Sebastian K. Minton, of Des Moines, Iowa, consists in the combination with halves hinged together at the toe and having their upper faces beveled inward of the toe calk, having a hole and slot, and heel calks having right and left screw threaded holes, by which the heel of the shoe may be expanded.

Mr. William T. McLean, of Sidney, Ohio, has patented an improvement in that class of earth scrapers the body of which is made of thin sheet steel with wooden backboard, the lower edge of which has always heretofore been secured to the scraper by means of rivets passing through the bottom of the scraper in such a manner that the rivet heads soon wear off by abrasion and let the backboard loose, which wholly disables the scraper for further use until repaired. The improvement consists in the construction and arrangement of the devices for more perfectly securing the wooden back to the steel body without the use of rivets.

An improved drag saw has been patented by Mr. Samuel Clemens, of Rockport, Ill. The invention consists in having the saw blade pivoted at one end of a lazy-tongs connected with the framework of the apparatus, and in having a hand lever pivoted to the said framework and connected with the lazy-tongs by means of a pitman to operate the lazy-tongs.

An improved sand guard for car axle boxes has been patented by Mr. Henry Roth, of New York city. The object of this invention is to improve the construction of the sand guards for which Letters Patent No. 235,298 were issued December 7, 1880, to the same inventor, in such a manner as to make them more effective.

An improved wagon step, patented by Mr. Henry F. W. Koehler, of St. Joseph, Mo., consists in a novel arrangement of a cam lever, a slotted crossbar, two connecting bars, and a step or steps, all arranged in a frame attached to the wagon body. By this means provision is made for lowering the steps for use or turning it up out of the way by moving the lever in one direction or the other.

Modern Bows and Arrows for Sport.

The increasing popularity of archery as a summer pastime has brought the bow and arrow once more into common use and made their manufacture an industry of considerable importance. In a long review of the development of archery clubs and the modes of shooting practiced in and about this city, the *Sun* furnishes the following information touching the construction and cost of materials used:

The best bow is one made of yew. Some yew bows that are very costly look crooked to the eye. The skillful archer, however, explains that they are quite straight. It is true that a bow may bend in and out in little irregular curves, but it is called straight all the same, because the artist who made it has allowed the grain of the yew to take its own course around knots, and has not weakened the bow by attempting to smooth it down. These strips of yew wood, from five to six feet long, and properly tipped with horn, may be worth $100 apiece, and they cannot be bought for less than $20 apiece. It is so difficult to get a piece of yew of equal quality throughout, that when a good piece of the wood, three feet long, can be obtained it is split, and two of the pieces are spliced. This gives a guarantee that each half of the bow will have equal degrees of elasticity at the corresponding parts.

You may either have a "self" bow or a "backed" bow. A self bow may be spliced in the middle, but it must be made all of the same kind of wood. A good backed bow is made in this way: A piece of dark snake wood, mottled and lined by nature like the back of a serpent, and very beautiful when polished, is trimmed into shape as if it were to be the sole material for the bow. It is elastic, but it is not strong. One side of it is trimmed into an oval or semi-circular shape, but the opposite side is trimmed flat. Upon this flat side is glued, in the most careful manner, a tough slat of hickory. This gives the bow strength, for when the bow is bent the snakewood must contract upon itself, and the hickory, being on the back, must stretch. Such a bow is worth from $9 to $12.

It is very important that the wood of a bow be properly seasoned. It should not be too dry. If the wood is too dry the first thing an archer knows he will find a chrysal in it. When he finds a chrysal in his bow, he must wind about the bow over the chrysal a fine string saturated with glue. A chrysal is a small crack in the bow, which is liable to enlarge and ultimately to cause fracture. It is a mistake to suppose a bow when at rest should bend a little backward. It rather should "follow the string" a little. Otherwise it jars the arms when the arrow is discharged, and should the string break the bow is apt to break. The wrapping of plush about the bow in the middle, where it is grasped when bent, is called the handle. The upper edge of this handle is placed about an inch above the middle of the bow. When the "weight," that is to say the power it takes to bend a bow, is to be tested, the handle is placed in the hook of a steelyard and the string loaded until it is drawn down twenty-eight inches for a gentleman's bow, and twenty-five inches for a lady's bow. Gentlemen's bows usually range from forty-five to sixty pounds, and ladies' bows from eighteen to thirty-five pounds.

Arrows in weight range from two shillings and three pence, lowest weight for ladies, to five shillings and six pence, highest weight for gentlemen. The method of weighing, or rather of recording the weight of arrows, has been handed down from early times. They were weighed against silver money, and great care was exercised then, as now, in making them of accurate weights to suit different persons and different bows.

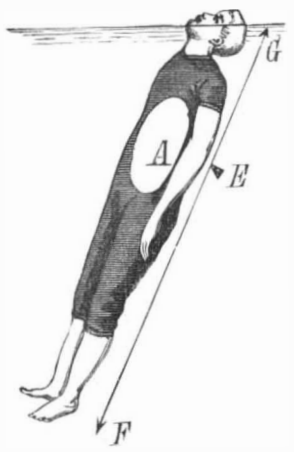
An arrow is made up of the "pile," or metal point, the "stele," or shaft, the feathers, and the "nock," or notch, of horn. It may be "barreled" (largest in the center), 'bobtailed" (larger at the point than at the feather), "chested" (larger at the feather than at the point), or "straight" (of even thickness throughout). Arrows may be "self," that is, made of one piece of wood, or they may be "footed" with a piece of hard wood at the pile end. The finest arrows are said to be of red deal, footed with lancewood. When the arrow is laid in position it should be at right angles with the string, although some archers think they can cause the arrow to take a higher or lower flight according as they nock it lower or higher on the string.

At the recent third grand annual meeting of the National Archery Association in Prospect Park, July 12, 13, and 14, the distances for ladies varied from 50 to 60 yards, and for gentlemen from 50 yards to 100 yards. The number of arrows fired by one contestant in a match varied from twenty-four to seventy-two.

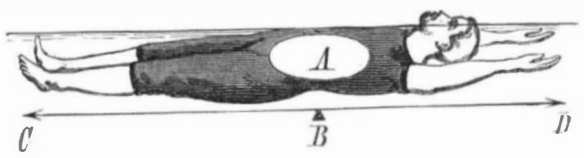
Froward, an English archer, is said to have shot an arrow from a 63-pound self-yew bow 340 yards.

THE SECRET OF EASY FLOATING.

The first lesson which the bather should learn is to float without effort on the surface of the water. The art of floating is set down as the first requisite, for several reasons. Even the most expert swimmer is liable to have his powers of endurance put to a test so severe that the art of resting on the water without effort may be of vital value to him; while to him who knows nothing of the art of swimming the ability to float securely is manifestly his only hope of



safety in case of accident on the waters. And the special merit of floating supine, as the first lesson in swimming, lies in the fact that it can be practiced in shallow water. Floating in a walking position, "treading water," is easy to learn, but it presupposes tolerably deep water; and the beginner is apt to have little confidence in the buoyancy of the unfamiliar element. Having learned to rest at ease on shallow water, the bather is able to float into deeper water without losing confidence, and can thus pass by rapid and easy stages to swimming on the back, or through the practice of treading water to the art of swimming in the customary way, face forward.



Any one who has sufficiout resolution to assume the posture represented in the large engraving can float securely, even in tolerably rough water, absolutely without muscular movement, and with very little fatigue. A still more restful, though slightly less buoyant posture, is with the arms bent and the hands clasped under the back of the head.

The philosophy of the buoyancy of this posture is illustrated in the smaller cuts. The blank space, A, includes the lungs and other buoyant portions of the viscera. The quantity of air in this part of the body but little more than suffices to float the body. With the arms extended the body is, so to speak, balanced as upon a fulcrum at B; the natural tendency of the feet to sink is counteracted, and the body floats with the mouth and nose well out of water. With the arms at the sides, as in the other small cut, the preponderance of weight is below the center of buoyancy, the feet drop, and considerable effort is required to keep the nose and mouth from being submerged, either by throwing the head back, as shown in the cut, or by paddling with the hands. It is true that a very slight movement of the hands by a practiced floater suffices to keep the feet from dropping and the body horizontal; but that little effort, if long continued, is fatiguing, and is pretty sure to be unskillfully made by a novice.

Unless one is exceptionally lean or deficient in lung capacity the art of floating with the hands under the head or extended above the head can be quickly learned; and in case of sudden emergency the non-swimmer will find it a certain and easy way of sustaining himself on water until help arrives.

PROPER POSITION FOR FLOATING.

Paste Diamonds.

The Providence *Journal*, which comes from the vicinity of immense cheap jewelry factories, has the following on "paste diamonds," which are simply glass of great purity:

"When imitation diamonds were introduced, it was found that to cut glass precisely like a diamond did not produce the sparkle characteristic of the diamond; therefore to secure this the flat surface on the top of the diamond was made pyramidal on the imitation, and, of course, ended in a point. By certain laws of light this pyramidal surmounting of the glass provided for the required distribution of ray surface to produce the diamond sparkle, or something akin to it. A real diamond is never cut with the pointed apex, and hence it was possible always to distinguish the real from the spurious. But after a time the buying public learned this little circumstance about the cutting process, and other means were resorted to. The glass was cut precisely like the diamond, and the sparkle was given to or provided for it by a coating of white foil applied to the lower side of the glass. The setting of many diamonds is arranged in such a way that the buyer may see the under side of the gem. This was overcome by arranging the setting so as to prevent inspection of this kind, which could not be done unless the stone was dismounted, if we may use that term.

"With these facts known to the buyer of diamonds, he need not be deceived except in the latter case, where the setting hides the under surface, and if he has any doubt about that he can let it alone. But the object of imitation diamonds is not to deceive buyers; if it was they would not be offered for two dollars. No one, however deficient in diamond criticism, need be deceived in buying diamonds. No dealer of any repute ever attempts to sell imitation for real diamonds. No reputable man ever thought of it. His reputation and occupation would soon be gone. There are very few persons who buy trinkets who do not test their wares at other than the buying place, particularly if the gem is a costly one, and it is certain that no one was ever presented with jewelry of presumable worth who did not set out at once to learn its purity and value, and very disappointing it has doubtless been to find in some cases that the gold or diamond was only brass or glass."

A Large Collection of Tobacco Pipes.

A collection of tobacco pipes, now on view in London, is pronounced by the *Times* one of the most interesting of minor art exhibitions. The collection includes specimens of all countries, and belonging to many periods, of the graven images and idols of clay which have been dedicated to the worship of tobacco. From France come pipes of Sèvres made in the national porcelain factory; from Germany old Dresden pipes and the pipe formerly smoked by the giant in the procession of the guilds at Cologne; from Holland several hundreds of the æsthetic clay called "Early Dutch," collected by Heer Van der Want, Master of the Pipemakers' Guild at Gouda. The Dutch contribution includes also specimens of the bridegrooms' pipes, clay ornamented with ribbons, which the farmer of the polders smokes on the day of his wedding and then lays by on the shelf, to be taken down once a year when the anniversary comes round of the momentous occasion. This pipe is regarded with great interest by smokers as an example of the various uses which tobacco serves in calming feelings of ecstatic joy and mitigating the pangs of regret. There are 700 early English pipes; Scandinavian pipes, with modern Runes inscribed upon them; Siberian bowls, the consolation of the exile, made of hard wood and mammoth ivory; Basque pipes, and the costly meerschaum and amber toys smoked by pachas in their seraglios. Ninety-six of the Japanese pipes are in ivory, twenty-four in wood, horn, rock crystal, agate, etc. The carvings illustrate the social life of Japan in its most amusing relations. One pipe which formerly belonged to Enomoto, foster brother of the Emperor, bears the imperial symbols, and the central portion is entirely inlaid with gold. The bowls are extremely small. A pipe contains merely a whiff. A piece of tobacco is rolled up to the size of a pea, and one long, soothing exhalation exhausts it. The smoke is retained for some time in the lungs, as usual in the East. It is no matter of surprise that, according to the narrative of the Earl of Elgin's mission, a Japanese will smoke fifty such pipes in a morning.

From China come the opium pipes, which balance the finances of India—tubes of jade or tortoise-shell, bowls of silver and enamel. Hookahs from India, the calumets of peace and war from North America, the pipes of the Aztecs and the Caribs, the latter called "tabaco," whence the European name of the weed originally consumed in them is said to be derived; pipes smoked at the great "customs" in Central Africa, the sperm whale's teeth carved into bowls, pipes from Caledonia and New Guinea, are also to be seen.

NEW INVENTIONS.

An improvement in curtain fixtures, patented by Mr. Geo. A. Crisson, of New York city, consists in an improved swinging curtain bracket formed of a plate provided with segmental transverse slot, into which a beveled stud of a slide loosely mounted on the guide rod of the window casing and suspended from suitable cords passes, this plate being pivoted at its upper end to this slide.

Mr. Louis K. Derby, of Philadelphia, Pa., has patented an improved beam compass. The invention consists of a T-shaped beam made in sections that are jointed and clamped together, and graduated in fractions of an inch, and having a vernier, which is attached to the sliding leg.

Messrs. Samuel J. Wright and Loftus L. Wright, of Mineral Point, Wis., have patented an improved flood-gate, constructed in such a manner that it will be opened automatically should the water rise above a fixed height, and that the gates, when opened, will offer no obstruction to the passage of float wood or other rubbish.

A convenient device for holding mail pouches or sacks in an open position has been patented by Mr. William J. Taylor, of New Albany, Ind.

Mr. Ottmar Spachmann, of New York city, has patented an improved barrel support, which is so constructed that the barrel can be pulled forward and inclined, so that all the liquid in it can be drawn conveniently, and at the same time this construction permits of placing the barrel upon the support or taking it from the same without any great exertion.

Mr. William F. Trippensee, of Clarence, N. Y., has patented an improved feeding attachment for fanning mills, which consists of a curved feed lever, a connecting rod hinged to the shoe operating connecting rod, a double-jointed coupling for connecting the rod and lever, a stud to fulcrum the lever, and a feed arm or point attached to the curved lever, whereby the feed lever will be vibrated to feed the grain by the up-and-down movement of the shoe operating connecting rod.

Another Improvement in Trotting Time.

The fastest trotter in the world, Maud S., beat her previously "best time" by quarter of a second, at Pittsburg, Pa., July 13. She trotted the mile in 2:10½.

Following is the official record of the time by quarters:

First quarter	33	Three quarters	1:37¼
Half mile	1:05½	Full mile	2:10½

Maud S(tone) is seven years old. Her first famous record was made in Chicago last year, beating St. Julien's 2:13 by a second. Afterwards St. Julien made 2:11¼ at Hartford, and at the fall meeting at Chicago Maud S. beat that record by trotting a mile in 2:10¾. The third quarter-mile at Pittsburg was made in 31¾ seconds, or at a rate which, if maintained, would cover a mile in 2:07.

NEW DOUBLE PLUNGER STEAM PUMP.

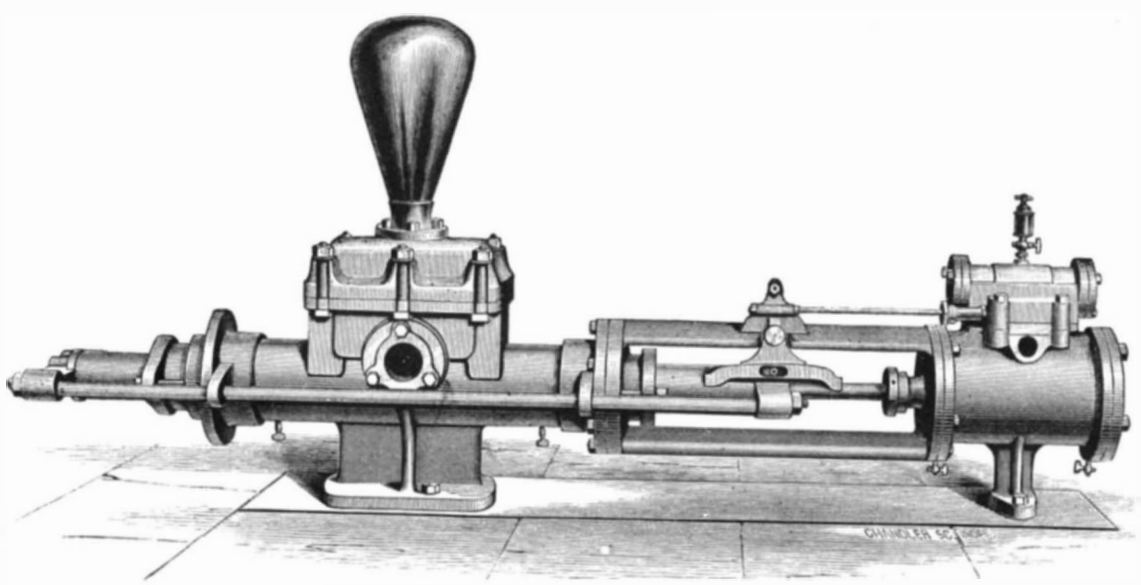
We give an engraving of a new double plunger steam pump for forcing water containing sand, mud, lime, or any impurities which are liable to cut the cylinder of piston pumps. For feeding boilers with hot water this type of pump is preferred by steamboat men, rolling mill and furnace engineers. In ordinary piston pumps the sand or dirt rubbing between the piston and cylinder will wear them. In the pump illustrated the space between the plunger and cylinder allows the free passage of destructive material.

The only wearing point is in the stuffing box, and this can be easily repacked. The plungers are connected by two rods which pass outside the cylinders. It will be seen that it is impossible for any water to pass the plungers from one end of the pump to the other.

The steam valve gear is a new and simple device. The plunger next to steam cylinder has a projecting roller, which passes between the flanges of the cam lever. When the plunger nears the limit of its stroke, the roller passes between the curved flanges near the end of the cam lever, causing it to tilt and shift the auxiliary steam valve, reversing the motion of the main piston and plungers. As the pump starts on the return stroke the cam lever is thrown back into its first position, which brings the auxiliary on its center and closes the ports communicating with the chest piston. By this arrangement there is no chance for steam to blow through on account of the chest piston becoming worn and leaky.

These pumps are also made for pumping out mines, and they are at present working in mines, pumping from a depth of 400 feet. With plungers and stuffing boxes made of gun metal they will resist the action of bad mine water. The water passages are nearly equal to the area of plunger. The valves can be easily taken out.

These pumps are manufactured by Dean Brothers' Steam Pump Works, Indianapolis, Ind.



DEAN BROTHERS' DOUBLE PLUNGER STEAM PUMP.

NOVEL FRUIT PICKER.

The engraving shows a novel fruit picker, patented by Mr. John Sager, and being introduced by Messrs. John Sager & Co., of Thamesville, Ontario, Canada. The invention consists of a long canvas tube attached to a ring at the end of a long handle, A, and two semi circular jaws, D, mounted over the mouth of the canvas tube, and operated by a rod, B, extending down the handle and provided with a thumb-piece.

SAGER'S FRUIT PICKER.

The details of construction can be seen in Fig. 2. The manner of using the implement is shown in Fig. 1. The open end of the canvas tube is placed around the fruit, the semicircular jaws are closed upon the stem by pulling down the thumb-piece, and the fruit is conducted by the canvas tube to the ground or to some suitable receptacle without bruising or injury.

Prof. Winchell on Evolution.

In a recent lecture before the Summer School of Christian Philosophy, at Greenwood Lake, Prof. Alexander Winchell, of the University of Michigan, discussed the speculative consequences of evolution. Speaking of the predicament of those who stake all religious truth on an allegation of the untruth of evolution, in case the method of nature is finally found to be a method of evolution, he said: "At this moment the well-nigh unanimous verdict of the scientific world sustains the doctrine of evolution. This verdict is one of the criteria of truth. Repudiation of it is a hazard which only rashness and ignorance will incur. To stake all religious belief on such repudiation is to throw all of man's spiritual interests upon the hazard of a die. As I understand it, the recognition of a method of evolution in nature's operations does not involve consequences deleterious to a spiritual faith, but is a means, on the contrary, for approaching into closer relations with the immaterial forces of the Divine government of the world. We must first establish a clear conception of evolution. Multitudes of men imagine evolution and Darwinism to be synonymous terms, if they do not even believe them synonymous with materialism, as is so often charged. I conceive the evolution which I discover in nature to be the progressive differentiation of an identical existence. It proceeds from the more general to the more special, from the homogeneous to the heterogeneous. It means that new forms of existence are only older existences transformed and not new beginnings of existence. Every department of the cosmos has had a history, and every present is the outcome of a past. It takes no cognizance of special originations, but only of the history which follows. Evolution, I say, knows nothing of creation. This is not because it contravenes creation, but simply because creation is an event which does not come within its purview. Evolution is the name of a mode of continuance, not of a mode of beginning. It can neither affirm nor deny any mode of origin."

Food for Infants.

The French Commissioners on the Hygiene of Infancy, in awarding the prize in a competition of essayists, report that the conclusions generally arrived at lead to the following recommendations: No child should be reared on artificial food when the mother can suckle it, but such food is preferable to placing the child with a wet nurse, poorly remunerated, and living at her own home. For successfully bringing up an infant by hand, the best milk is that of a cow that has recently calved, or similarly of a goat, to which should be added during the first week a half part of water, and subsequently a fourth or less, according to the digestive powers of the child. Glass or earthenware alone should be used; no vulcanized India-rubber mouthpieces or vessels containing lead ought to be employed.

Growth of Telegraph Monopoly.

The rise and progress of the Western Union Telegraph Company is thus set forth in a prospectus issued by a rival company:

Beginning as the House Printing Telegraph Company, with a capital of $360,000. On the first of January, 1863, by stock bonuses, and the purchases of other lines, its capital was increased to $3,000,000. On the 2d of March, 1863, this was watered by exactly doubling its capital and presenting the additional shares to stockholders, thus raising it to $6,000,000. May 28, 1864, it was further increased, by purchase and extension of lines, $5,000,000, making its capital $11,000,000, and at the same time the whole of its stock was again doubled by an issue of 100 per cent bonus to its stockholders, making its capital $22,000,000. From this period up to January, 1868, it took in the United States Telegraph Company at $3,333,333, and absorbed the American Telegraph Company, with a capital of only $2,000,000, taking it in at $11,818,800, and by bonuses and extensions of lines, etc., its capital was increased to $41,008,800; and recently it absorbed the Atlantic and Pacific Telegraph Company, whose lines cost not more than $2,500,000, and the American Union Telegraph Company, with its lines, which cost little more than $2,000,000, taking them in at $25,000,000, and at the same time issuing a stock bonus of $15,000,000, thus bringing its capital up to $80,000,000. In addition to all this it sank $3,000,000 in the abandonment of the Russian Telegraph, and nearly as much more by the abandonment of the California lines and contracts for lines parallel to the Pacific Railroad, and it also borrowed $5,000,000 for the purchase of real estate in New York, and pays $75,000 per annum rental for the California State Telegraph Company; $85,000 per annum rental for the Illinois State Telegraph Company; purchased a majority of the Pacific and Atlantic, Southern Atlantic, and Franklin Telegraph companies, and guarantee perpetual dividends on the minority of the stock; and recently leased the Northwestern Telegraph Company, and pay a large rental on a stock and bonded capital of nearly $4,000,000, besides rentals of other leased lines, making its capital really about $100,000,000. The increase in the volume of its business and the amount of its earnings have kept pace with its increase of capital, until now its traffic is over 30,000,000 of messages, gross receipts over $15,000,000, and net earnings over $6,000,000 per annum; and all this with no improvement in method and but little improvement in appliances over the first line constructed forty years ago; moreover, this gigantic monopoly, touching and influencing every branch of commerce and industry, is controlled by one man, whose sole object is self-aggrandizement.

DISTINGUISHING SPURIOUS HONEY.—A solution of 20 parts of honey in 60 parts of water mixed with alcohol gives a heavy white precipitate of dextrine if glucose has been added, while genuine honey, if treated in the same manner, merely becomes milky.

ENGINEERING INVENTIONS.

Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improvement in horse powers of that type in which a king-wheel is arranged in horizontal position on a vertical post rotated by lever arms below, which wheel has a rope belt that passes around and drives a speed pulley, from which the power is utilized, while a tension pulley and idler pulley serve to give proper direction and tension to the rope.

An improved form of feathering paddlewheels for steam vessels, whereby the full power of the paddle against the water is utilized for the effective part of its movement, while the carrying of dead water is avoided by the paddles as they pass from their lowest position to the surface in the rear, has been patented by Mr. Joseph F. Breux, of Hardwick, Vt.

Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improvement in automatic car couplings, and it has reference to that class of such couplings in which a sliding block is arranged in the throat of the draw bar, and is pressed forward by a spring past the hole for the coupling pin, and which is made to hold up the coupling pin until the said block is forced back from under the coupling pin by the entering link of the opposite car, when the coupling drops through the link and couples the cars.

An improvement in slide valves has been patented by Mr. William S. Hughes, of Long Island City, N. Y. The main object of this invention is to reduce or prevent the noise made by exhaust steam of engines, which has heretofore been attempted by the use of muffles and similar devices. With the ordinary link motion and slide valve used on locomotives the exhaust edge of the valve must be moved the length of lap and lead before the piston receives steam from the direction in which it has been moving. In other words, the exhaust opening begins before the piston finishes its stroke, and before the steam has fully expanded. The exhaust being also opened suddenly by the quick movement of the eccentric, a wasteful and disagreeable explosion of steam from the cylinder takes place. To remove this difficulty the exhaust steam, instead of being allowed to explode, is gradually released, and without back pressure.

Mr. Abraham O. Frick, of Waynesborough, Pa., has patented an improvement in valve gears for changing the relation of the eccentric to the main crank. It is an improvement in that class of valve gear in which one or more cog wheels are arranged between a rigid gear wheel on the shaft and a loose gear wheel carrying the eccentric.

An improved elevator has been patented by Mr. Henry D. O. Kurrus, of Boston, Mass. The object of this invention is so to construct a passenger elevator that the cage cannot by any accident fall nor be elevated above a fixed point, and will automatically adjust itself to any inclination of the building occasioned by settling, warping, or shrinking.

Liberian Coffee.

The expectations awakened by the discovery of the species of coffee indigenous to Liberia, and its exemption from the blight which has ruined so many plantations of Arabian coffee, seem to have been well founded. Already it has furnished relief to the planters of Ceylon, and there is every promise that it will enable San Domingo to recover the standing it enjoyed fifty years ago as a coffee-growing island. Its productiveness is great, the tree is large and hardy, and the quality of the berry (certainly as represented by that sent to this market from Ceylon) is equal to the best.

In a recent pamphlet on the cultivation of Liberian coffee in the West Indies, Dr. H. A. A. Nichols says that its immunity from blight is of the utmost importance to the welfare of Dominica and the neighboring colonies, both English and French, for there is now nothing to prevent the islands of the Lesser Antilles from being once more large coffee-supplying countries. In Dominica the cultivation of coffee may be said to be re-established, although it is only yet in its infancy, and the productiveness of the Liberian trees is a matter of astonishment to those of the older residents who remember the coffee estates of forty years ago. The Liberian coffee plant is much larger than that of Arabia, being indeed in its native state a small tree. It has several other characteristics which render its cultivation different from that of its Arabian congener, and give it several advantages, all in favor of the planter. Its leaves are much larger; it flowers for several months, so that flowers and berries may be found on the same plant, and the berries are twice the size of the ordinary coffee bean. The ripe berries do not fall from the tree, like the ordinary coffee plant, but remain on the tree, without detriment to their quality, for weeks, an important feature, where it may be difficult to procure the labor necessary for speedy gathering.

SEVRES VASE.

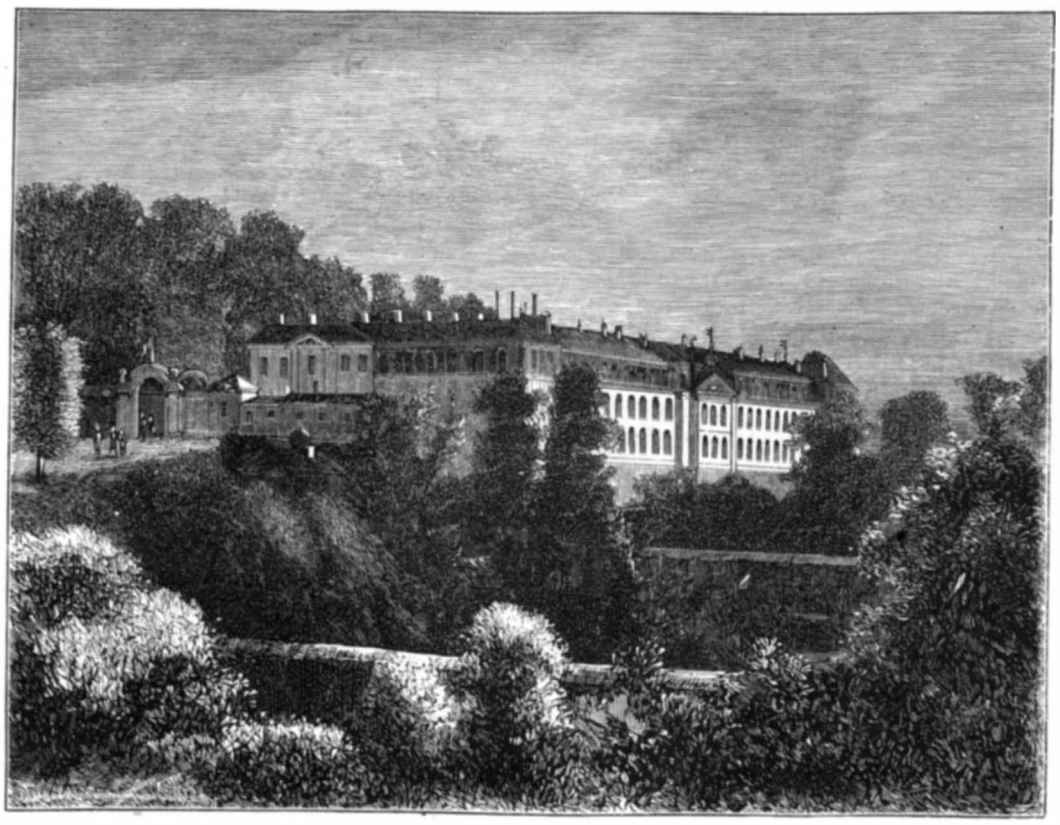
The Imperial Manufactory at Sevres has unquestionably taken the lead in pottery art work, not only in the designs in general, but in the unique and artistic ornamentation.

SEVRES VASE.

The engraving presents an example of this work which differs from other vases illustrated in these pages, both in respect to its configuration and its decoration.

THE SEVRES PORCELAIN FACTORY.

We give an engraving of the celebrated porcelain factory at Sèvres. We have frequently given illustrations of the beautiful wares from these works, and have outlined the history of the porcelain industry, giving some of the leading facts. This porcelain factory was removed from Vincennes, in 1756, to its present picturesque site in Sèvres, on the left bank of the Seine, six miles from Paris. It stands between the hills of Meudon and St. Cloud.



THE PORCELAIN FACTORY AT SEVRES.

The great reputation of the Sèvres factory is due to the employment of the highest artistic skill, both in form and decoration. A very large number of artists are employed, and the work has no equal.

The Selenium Cell.

At a recent meeting of the Physical Society, Dr. James Moser, read a paper expressing his opinion that the well known action of the selenium cell in Professor Graham Bell's photophone is not so much a mechanical, physical, or chemical one as it is a microphonic action. The cell is usually composed of metal plates cemented together by annealed selenium, and having wire electrodes. Dr. Moser, therefore, argues that the junction between the metal and the selenium is what electricians term "a bad joint," or in other words a microphonic contact. The varying beam of light from the photophone transmitter, falling upon the cell, expands and contracts the metal plates or the electrodes by virtue of the heat rays, and thereby tightens and slackens the microphonic joint. This has the effect of undulating the current of electricity which flows through the cell, and causing the modulations of the voice to be audible in the telephone. Dr. Moser showed that with copper plates the selenium cell was really a pile of copper, selenite of copper, and selenium, built up in order, and he compared it to the thermoscope of Professor Hughes and Mr. Edison, in which a number of little cakes of carbon are arranged end to end in a glass tube with brass filings between. When a current is sent through this combination it becomes very sensitive to heat rays falling on it, owing to the expansion of the carbons by heating and the consequent closing of the microphonic joints between them.

An Ancient Mat.

At a late meeting of the San Francisco Academy of Sciences, Mr. B. B. Redding presented, from Captain Mellon, an interesting fragment of a prehistoric mat or garment with a piece of wood attached, found in a deposit of salt, seven feet below the cap rock of the Belding ledge, on Virgin River, six miles above its junction with the Colorado, in Lincoln County, Nevada. Mr. Redding said it was probably very old indeed, and was knit by hand from the inner fiber of some tree. He believed only one similar case had been found in Louisiana, where, like this one, it was directly over a bed of salt; and that was among bones of the mastodon and fossil elephant, thus clearly establishing its great antiquity.

He has written to learn if the cap rock was formed by accretion, or if a land slide could possibly have occurred in the vicinity. If it came where found by the ordinary sedimentary process, and not by any cataclysm, it is a most valuable proof of the vast period of time during which man has existed on this continent. It may be thousands of years since this work was woven, and it has only been preserved to come down to our day by the immediate presence of extensive salt beds. This will add to the rapidly accumulating evidence of the great antiquity of man on the American continent. It will be interesting also to know whether the mat is a specimen of weaving, matting, or knitting.

Quebracho Wood.

Mons. F. Rhem has lately communicated a paper on the "Quebracho Wood" to the *Société Industrielle du Rouen*, from which the following particulars are extracted:

This wood belongs to the family of the Asclépiades, and comes from America. Being very hard, and composed of a great quantity of interlaced fibers, the tannin it contains is different from that of chestnut or of oak. Gelatine precipitates this tannin out of a water solution with a flesh color, while salts of protoxide of iron give an ash-gray precipitate, and the peroxide salts a dirty greenish coloration. When boiled with weak sulphuric acid, the tannin is not converted into gallic acid. According to a German chemist, quebracho wood contains 18 per cent of tannic acid. The bark of this wood contains an alkaloid analogous to quinine. Extract of quebracho, now much used in wool dyeing, giving a yellow shade with a tin solution. It gives even shades, resembling those of cutch, if used with bichromate of potash, but its principal use is for obtaining blacks, for which the wool is given first a bottom of the extract, then passed through iron, and dyed with the quebracho; this, in these conditions, can replace cutch. Solutions of quebracho wood, or extract, will only keep limpid if heated to a certain temperature, but get turbid on cooling. Dyeing experiments, with the dry quebracho extract, as manufactured by a French firm, in comparison with cutch, have proved the former of more value, since, with a lower price, it possesses a greater richness of coloring matter. Three series of trials were made, one by passing the cotton prepared in a quebracho or cachou bath through bichromate of potash, the second through iron, and in the third the patterns were passed through iron and then chromed. In all cases the same results were obtained, showing the advantage of the quebracho over cutch, in spite of a slightly more grayish shade of the colors obtained with the former. The same

results have been got by printing mordants on calico, aging, dunging, and dyeing with quebracho extract or cutch; in all cases the quebracho shades being identical with those of cutch, not only for the tone of color, but also in regard to fastness.

STEAM BOILER NOTES.

We learn from Chief Engineer McDougal's annual report for 1881 that the French decree relating to inspection of stationary steam boilers requires that all new boilers pass a test which consists of subjecting them to hydraulic pressure superior to the working pressure allowed, to be maintained during the examination of every part of the boiler. As a general rule the pressure to be double the working pressure, but never to be less than 7 pounds nor more than 85 pounds above such pressure. There must be two safety valves, so loaded that the steam will escape at maximum limit, which is stamped upon the boiler in a conspicuous place, together with the date of the last test.

The area of each safety valve (two on each boiler) must be sufficient to prevent the pressure exceeding the limit, whatever may be the intensity of the fire.

Every boiler must have a pressure gauge *in good order*, marked plainly to show the point that must not be exceeded by the pressure; a check valve, a steam stop valve on the boiler itself, and two water gauges independent of each other, one of which must be a glass gauge, so constructed that the tube may be readily cleaned, and its casing conspicuously marked for the low water level.

All boiler plates (not in separate superheaters, or small, and so located that they cannot become red hot) exposed to the flame on one side must be in contact with water on the other side.

The registry of all "fixed" boilers must be made before they can be put to work. It must show the origin of the boiler, the place where it is fixed, its shape and heating surface, its official and special number, and the purpose for which it is used.

A table is annexed to the decree that shows the temperature of the water in any given boiler when working at limited pressure, and all boilers are classified by multiplying their capacity in cubic meters by the temperature in excess of the atmospheric boiling point in degrees centigrade. Boilers giving a product greater than 200 are denominated first class; those from 50 to 200, second; and those at or below 50, third class.

Boilers of the first class must be fixed in one story buildings, and if not protected by heavy walls, 50 meters must intervene between them and any dwelling house, but in no case are they to be nearer than 3 meters, except when located with their top line 1 meter or more below the ground line.

Boilers of the second class may be fixed in workshops of any kind if no part of them are dwellings.

Boilers of the third class may be placed in shops or dwellings, provided the furnace is half a meter clear space from neighboring houses.

Portable boilers, or such as do not require special fixing or setting in brick, must, in addition to the above, be provided with an engraved plate, on which plainly appears the owner's boiler number and his business address. The attendant must be able to show a copy of the registry declaration whenever required to do so.

All the regulations, except those specially applicable to stationary, apply also to locomotive boilers, but some special rules relating to the rights of locomotion are provided.

Detached vessels that may be heated by steam to above the atmospheric pressure of a capacity greater than 22 gallons (English) must also be registered and stamped, and the test pressure must be 50 per cent in excess of the working pressure, but never more than 57 pounds per square inch. They must be provided with safety valves that will, when lifted, prevent the pressure from rising above that indicated on the stamp.

Tanks in which water is confined at high temperatures, serving as storage reservoirs of power or heat, are subject to the same rules as receivers of steam.

Users of steam apparatus must see that they are kept in good working order, and report to the official engineer any important repairs that are made after inspection.

In case of accident, by which injury to any person is caused, the owner or his representative must at once report to the local police and the government inspecting officer, who will proceed as soon as possible to the scene of accident, and report to the *Procureur* of the Republic and the Chief Engineer, who will inform the proper magistrate.

The building must not be repaired nor the fragments of the exploded boiler removed or altered before the engineer makes his official inspection.

In 1878 there were 79,071 land boilers and steam vessels under surveillance in France, of which 32 exploded during that year, or nearly 1 in 2,200, while there were among marine boilers in the same year 1 explosion in every 614 boilers.

J. McM. asks: "Is there any difference between the bursting and explosion of steam boilers?" It may be said in response that by common acceptation among engineers bursting means rupture, while explosion implies rupture, but it is also accompanied by detonation. The terms as applied to bombshells are used indiscriminately by many writers. As applied to steam boilers "bursting" may be considered a rupture from internal pressure, and "explosion" the loud noise and flying to pieces of the boiler after the rupture. This last will always occur with ordinary working pressures if the initial rupture is of sufficient size and suddenness to instantly relieve the contained water of pressure. Every elementary atom of the water then gives up its quota of steam, which causes an expansion of the mass of such suddenness that it may be characterized as explosive.

Another correspondent asks: "Does it take more fuel to run an engine with steam at a given pressure than to keep the same pressure without running the engine?" A. Yes. To maintain a given pressure already existing in a steam boiler no fuel at all would be required when no steam is withdrawn from or condensed within the boiler. Banked fires will usually keep up the pressure even in unprotected boilers when the engine is stopped.

Steel boilers appear to be making slow progress in France, as shown by a paper recently read by M. Jourdain before the Societe des Ingenieurs Civils. In response to an inquiry by the president of that body, M. Jourdain, whose paper discussed the subject of boiler inspection associations, stated, according to *Engineering*, that a certain number of makers were employing steel plates for parts directly exposed to the fire, but that he did not know of any stationary boiler constructed entirely of steel. As M. Jourdain is in a position to be well acquainted with French practice, we conclude that our neighbors are greatly behind us in the use of steel for steam boilers.

A large steam pipe connecting the boilers with the engine at Foster & Merriam's shop in Meriden, Conn., is reported to have recently burst with a noise like the explosion of a cannon. John Leary, who was in the vicinity, was badly scalded, and a boy named Doran was knocked senseless. The engineer is reported as saying that the pipe was too tightly bound in the brickwork, hence the explosion. If he had told us that water had collected in the cast iron pipe and had cooled during the night, so that unequal expansion occurred on opening his valve in the morning, he would have made a reasonable statement. Many a cast iron pipe has done so before.

Striking Oil in a Titusville Garden.

A dispatch to the New York *Sun*, dated Titusville, Pa., July 16, says that a month or so ago, Sebastian Haehn, a blacksmith, living in Mechanic street, this city, was spading in his garden after a heavy rain. As he turned up the earth, he noticed that little pools of crude petroleum formed in the cavities made by the spade. He dug a pit four feet deep. It filled up with oil to such an extent that he dipped out five barrelfuls. The oil was of excellent quality, and Haehn sold his five barrels to the Octave Oil Refinery. Week before last, Haehn dug another "well" in his garden. It responded with a yield of two barrels an hour. The well attracted great attention. It produced eighty barrels, and then ceased to flow. The excitement over the novel oil territory died out soon afterward.

On Monday last, the news spread through the city that Haehn had opened another well in his garden, and that it was yielding at the rate of thirty-six barrels a day. Hundreds flocked to the scene of the new oil operations. The well was located in the southwestern corner of Haehn's potato patch. With a large tin hand pump, the owner was taking out of the "hole" two barrels of oil an hour. His previous well had also started again. From that, one of Haehn's sons was taking oil at the rate of twenty barrels a day.

Immediately following this strike of the lucky blacksmith, a great demand for leases of adjoining gardens arose. Such an oil field had never been heard of before. Without capital, and with no tool but a shovel, an operator could sink a well and strike the "sand" in half an hour. The right to dig on four feet of a man's garden became worth $5 bonus and one-quarter of the oil. For three days Mechanic and adjacent streets have been thronged with excited spectators of the new operation in oil production, and parties anxious to get a "piece of the territory."

On Tuesday night, Theodore Avery, who had a coal yard adjoining Haehn's garden, put down a well. At the depth of four feet he struck oil. The yield was a barrel an hour. He has put down four more wells since. The five wells were yesterday yielding eight barrels an hour.

The success of the Haehn and Avery ventures led to a wide extension of this strange territory. A vacant lot on Washington street, southeast from Haehn's, was yesterday the scene of active operations. Three producing wells were put down. The rest were "dusters." Captain Pickering went to "wild-catting" under a shed near the Buffalo, Pittsburg, and Warren Railroad track, south of Haehn's. He dug to a depth of eight feet, and got a well good for ten barrels a day. Two wells were put down on the ground of the Octave Refinery. At five feet oil was found. One of the wells is pumping twenty-five barrels a day. The McKeown Garden, east of the refinery, was leased by J. P. Thomas, William McKenzie, and J. M. Brinton. Thomas took the northern half of the garden. He got two five-barrel wells of excellent green oil. The other parties struck oil, but it was of a red hue, and had the appearance of being mixed with tar. In the gardens along the east side of Washington street, several wells "came in" as good producers, but the oil was of an inferior quality. All the property along Oil Creek, between Washington and Franklin streets, has been leased by A. J. Kraffert. He will develop it on a large scale. The original Haehn territory maintains its yield, and is being further developed. Haehn has made a trench all around his garden and one through the center. In these the oil collects rapidly. The operator is putting up tanks to receive his oil, as there is a great scarcity in barrels. Haehn's garden is now yielding one hundred barrels a day. He expects to increase it to two hundred. The oil is worth, at the refineries, $1.10 a barrel. The price of one barrel defrays all the expense of putting down a well. Operations are carried on day and night. That part of the city is lighted up all night by the flaming torches of the oil men. The weird scene is witnessed nightly by hundreds of people.

There are no indications of any decline in the yield of this oil, and Haehn, the lucky discoverer of the field, is laying away not less than $100 a day as clear profit.

There are many theories in regard to this unheard-of presence of petroleum in large quantities so near the surface. One is that the oil is the leakage of tanks and pipe lines, which has sunk into the earth until it reached the gravelly deposit, in which it is now found in pools. Another is that this deposit has been forced up from the true petroleum sand stratum by some unknown agency, and caught and retained in the stratum where it now lies.

MECHANICAL INVENTIONS.

An improved cotton press has been patented by Mr. Charles E. Macarthy, of Forsyth, Ga. This invention relates to certain improvements in presses for baling cotton or other analogous material, of that type in which the box is made to revolve, and the follower is forced down in the same by the action of a screw stem. The improvement consists in the peculiar means for throwing the screw stem and follower to one side of the mouth of the box, to permit the packer to have free access to the same to pack the cotton therein.

Mr. John Flanagan, of Newburg, N. Y., has patented an improved pipe wrench with an angular stationary jaw, a slotted shank, and an inclined handle made in one piece, a movable jaw having a concaved outer end, and a fastening nut, and a swiveled screw for adjusting the movable jaw, whereby the wrench can be adjusted to grasp pipes of different sizes.

An improved grounding machine for paper hangings and other materials has been patented by Mr. Thomas B. Smith, of West New Brighton, N. Y. The object of this invention is to apply the ground color to paper hangings and other materials rapidly and uniformly. The invention consists in giving to the rotary brushes that distribute the color a longitudinal movement by eccentrics and levers, to insure a uniform application of the color to the paper, and also in attaching the fulcrum studs of the levers to the bearings of the brushes, so that the brushes can be adjusted without disarranging the connection between the levers and brushes.

An improved hub for wheels, which will not shrink and warp, and which is durable, has been patented by Messrs. Alonzo Gandy and Rusinus M. Black, of Freeport, Ohio. The invention consists in a hub constructed with a central ring of wood into which the inner ends of the spokes are mortised, and which is provided with a conical continuation or sleeve toward the outside of the wheel, upon which central ring of wood a flanged ring is placed at each side. These flanged rings are bolted or riveted together, so that the inner ends of the spokes will be held between the flanges. The axle box passes through the central ring and the conical sleeve, and is held in this hub by lugs fitting in grooves in the flanged rings.

The New Comet.

The comet discovered by Professor Schaeberle, of Ann Arbor, July 13 (Comet C, 1881), is now visible through an opera glass, and will soon be to the naked eye. Its identity is still uncertain; most probably there is no record of its previous appearance. It is expected to be one of the most conspicuous comets of the century. Under date of July 22, Mr. Henry M. Parkhurst says: "It may not equal Gould's comet in brightness, for the nucleus may not be brighter than the north star, and yet it is not uncommon for the brightness of a comet after passing its perihelion to much exceed that computed from its appearance before its perihelion passage. It has already developed a tail as marked as that of Donati's comet an equal time before its perihelion passage, and it would now be visible to the naked eye but for the presence of the moon, although perhaps not distinguishable from a star. Up to the 15th of August the comet will be visible in the morning in a direct line between Aldebaran and Theta Ursa Major, being now midway between them. On August 15 it will be near Theta, with its tail pointing toward the north star. It will then cease to be visible in the morning, not rising until after twilight begins. It now sets at the same time with the sun, but will gradually set later, so that it will become visible in the evening before it is entirely lost in the morning. On August 19 it will be near Nu Ursa Major, with its tail pointing toward and perhaps reaching Gould's comet, then visible only in the telescope in the Little Dipper. On August 25 it will be in the constellation Coma Berenices, the tail probably passing over or near Arcturus. Early in September the comet and its tail will both pass below our horizon, still as bright as Coggia's comet at its best."

Prof. Swift says, under the same date: "Of course it is impossible yet to predict with certainty, but it would seem as if it would eclipse the glories of Comet B" (Gould's Comet).

RECENT INVENTIONS.

Mr. Nelson Herrick, of Champlin, Minn., has patented an improved truss for the relief of hernia and for similar purposes. The invention consists in a novel construction of a frame or band for carrying the pads, and a novel construction and combination with said frame and pads of elastic stems or shanks for connecting the pads to the frame.

An improvement in sap spouts has been patented by Mr. George J. Record, of Conneaut, O. The object of this invention is to strengthen sap spouts against injury when inserting them in a tree and removing them therefrom, also to insure security in suspending the sap pails.

An improved bee-hive has been patented by Mr. William K. Lindsey, of Central, S. C. The object of this invention is the production of a bee-hive of simplified construction, and one which is thoroughly protected against worms, ants, and all other creeping insects. The invention consists of the hive constructed with passages in combination with removable plates of glass and springs or similar means for holding the plates of glass in place.

An improved device for attaching the trace to the hame tug has been patented by Mr. Seth D. Bingham, of South Toledo, O. The invention consists in a wedge-shaped or beveled block or plate provided with a stud on its upper surface and with side arms surrounding the longitudinal bars of an oblong frame, so that it can slide in this frame, which has its outer end bent upward, and its inner end is attached to the hame tug. The end of the trace passes through the outer bent end of the frame and rests on the slide, the stud of which passes through it.

An improved cotton elevator has been patented by Mr. William F. Newton, of Valley View, Texas. The object of this invention is to facilitate the delivery of cotton to the gin, and at the same time to remove from the cotton the gravel and other foreign substances that may be in it, thereby preventing injury to the gin and causing it to deliver the cotton in better and cleaner condition.

An improved indicator lock has been patented by Mr. Austin Leyden, of Atlanta, Ga. This invention consists in constructing a lock in such manner that, in applying it to freight cars of railroads and to similar purposes, the car may be locked for through freight, and the destination of the car be indicated by a letter shown on the lock, and so that a way-freight key for the same lock will not open it.

An improved cover for coffee pots has been patented by Mr. John McAnespey, of Philadelphia, Pa. The invention consists in providing the cover with a perforation, which perforation is covered by a housing containing a ball, which acts as an automatic valve for retaining the aroma of the coffee and for admitting air to the pot while pouring the coffee.

An improved horse-detaching device has been patented by Mr. John E. Anger, of Albany, N. Y. The object of the invention is to provide certain improvements in thills which are so constructed that the horse can be released from the vehicle at will, permitting the thills to drop and the wagon to run forward until it meets with sufficient obstructions to check its progress, the thills being prevented from plowing into the ground by cushions attached to their forward ends.

An improved glove-button fastening, patented by Mr. S. Oscar Parker, of Littleton, N. H., has a tubular shank with a sharp edge; in the end of the shank a short tubular piece, having its outer edge turned outward, is driven after the shank has been passed through the glove material. The sharp edges of the shank are also turned outward and into the hollow ring formed at the outer end of the tubular piece by turning the edge outward. Wide washers may be interposed between the shoulders of the button and the glove.

Mr. Joseph Watts, of Coalburg, Ohio, has patented an improved device for preventing the loosening of nuts by continued shocks or vibrations. The invention consists in a nut provided with a projection on the inner surface, this projection fitting in a corresponding aperture in a washer provided with one or more projections on the inner surface, which projections snap into grooves in the outer surface of an additional washer placed against the object held by the bolt, this grooved washer resting against flanges or projections of the object united, or one of its corners are bent over to prevent rotation of this inner washer-plate, and consequently of the outer washer-plate and the nut.

An improved method of ornamenting the surface of jewelry, etc., has been patented by Mr. Willis H. Howes, of New York city. The object of this invention is to facilitate and cheapen the ornamentation of buttons and other articles of jewelry. It consists in coating the surface of the article to be ornamented with borax and water or other flux, applying a layer of suitable solder filings, a layer of filings of gold or other metal, and another layer of solder filings, and heating the article sufficiently to melt the solder and fasten the gold filings in place.

An improved device for registering the games and the points thereof in whist and other games has been patented by Le Roy B. Haff, of Englewood, N. J.

An improved buckle attachment has been patented by Mr. Robert A. Chapman, of Glymont, Md. The invention consists in a U-shaped frame with a loop at the end for receiving the central or end transverse piece of the buckle that is to be held to the strap, the strap being passed longitudinally into or through the U-shaped frame which is secured to the strap by means of rivets or by means of a swinging tongue pivoted on the frame and passing through a suitable aperture in the strap.

Mr. George Bradish, of Bay Side, N. Y., has patented an improvement in burners for burning paint from wood and metal work. It is so constructed that the paint can be softened and removed from a panel without affecting the moulding, and from a moulding without affecting the panel, from surfaces of any shape, and from crevices, and that may also be used for burning the putty from window sash without affecting the sash rails.

An improved snell for fish hooks has been patented by Mr. M. D. Beach, of Litchfield, Conn. The invention consists in a wire stem attached to the end of the snood and provided with a loop that is passed through the eye of the fish hook, and is then closed by means of a nut that is screwed on the stem and over the looped end of the same.

Safety Nitro.

The *San Francisco Bulletin* gives an account of the completion and inspection by its officers and shareholders of the Safety Nitro Company's Works at Pinole Point, on San Pablo Bay:

"In the main building are four furnaces in which sulphur and nitrate of soda are burned for the manufacture of sulphuric acid. The fumes are conducted by means of a pipe 28 inches in diameter into two tanks located on the upper floor of the building adjoining, each of which is 20 feet long, 16 feet wide, and 13 feet in height. Into these tanks steam is introduced by means of a pipe 1½ inches in diameter, leading from the engine-room, some 30 feet distant. The tanks are made of lead, 1-32 of an inch in thickness, and supported by wooden scantlings. From these tanks a 1-inch pipe leads to another building, in which the surface-heater is located. The surface-heater is a flat tank, 18 feet long, 7 feet wide, 12 inches deep, and made of very thick lead. Into this open tank the sulphuric acid is conveyed by means of a pipe, while a fire is continually sweeping over its surface. From the tank the acid is conveyed into an adjoining building, into glass retorts. The acid, after its concentration, is never allowed to cool; the retorts are put to the highest test of heat, after which the acid is allowed to cool and put into carboys. The process is continually in operation. The amount manufactured at present is 120 carboys per day.

In another building are the retorts for the manufacture of nitric acid. Fifteen thousand pounds a day are at present made. Nitro-glycerine is also made. Several experiments were made by Dr. Dean. Eight grammes of black powder were put into a lead cone and set off, without any injury to the cone. He then took a cone, in which two grammes of nitro were put, which, on being exploded, slightly bulged the cone. Taking, however, two grammes of nitro and eight grammes of common black powder, the effect of the explosion was a complete demolition of the cone.

The experiments were considered very satisfactory as establishing the force when mixed and the safety of these explosives when separate.

Large Locomotives for the West.

The Rhode Island Locomotive Works have lately finished and shipped for New Mexico the first installment of an order for ten monster locomotives for the Atlantic and Pacific Railroad Company.

These locomotives when in running order will weigh 60 tons each, and the tanks have a capacity of 3,500 gallons of water. The tenders weigh 35 tons each. The length of the locomotives over all is 60 feet. The cylinders are 20 inches in diameter, with 26 inch stroke. There are four pairs of couple drivers 50 inches in diameter and one four wheel truck. The fire box is 10 feet long and 43½ inches wide. The boiler is 58 inches in diameter, wagon top, and contains 200 2¼ inch tubes. There are a set of steam gauge cocks for the fireman located at the back head of the boiler, and another set for the engineer, inside the cab. The tops of the cabs of these locomotives are higher than the smoke-stacks of the engines used on the Eastern railroads. The height of the smokestacks from the top railing is 16 feet 6 inches. Either hard or soft coal can be burned. The great size and weight of the engines are made necessary by the heavy grades they will have to overcome.

Silk Mills in Philadelphia.

Philadelphia is becoming a notable center of silk manufacture. Sixty silk factories are counted by the *Times*, nine of them spinning mills. The others running looms produce a great variety of silk goods. The product of the sixty mills for the year ending June 30, 1881, was valued in round numbers as follows:

Upholstery coverings	$2,000,000
Chenille fringes and dress trimmings	2,000,000
Other fringes and tassels	1,500,000
Dress silks	500,000
Ribbons	250,000
Total	$6,250,000
Spun silk	1,000,000
Aggregate	$7,250,000

Postage Stamps.

Postage stamps are printed from engraved plates under a hydraulic press on paper especially prepared for this purpose.

Two hundred stamps are printed on one sheet at each motion of the press. The colors used in the inks are ultramarine blue, prussian blue, chrome yellow and prussian blue (green), vermilion, and carmine.

The sheets are gummed separately; they are placed back upward upon a flat wooden support, the edges being protected by a metallic frame, and the gum—composed of an aqueous solution of gum dextrine with a little acetic acid and alcohol—is applied with a wide brush. It dries quickly, and then the sheets are pressed. Each sheet is cut in half, and is then ready for the perforating machine.

This perforating machine was invented and patented by a Mr. Archer in 1852. The patent was purchased by the government for twenty thousand dollars. The perforations are effected by passing the sheets between two cylinders provided with a series of raised bands which are adjusted to a distance apart equal to that required between the rows of perforations. Each ring on the upper cylinder has a series of cylindrical projections which fit corresponding depressions in the bands of the lower cylinder; by these the perforations are punched out, and by a simple contrivance the sheet is detached from the cylinders in which it has been conducted by an endless band. The rows running longitudinally of the paper are first made, and then by a similar machine the transverse ones.

The sheets are finally subjected to heavy pressure, by which the roughness caused by the punching operation and other manipulations is removed.

The Ill-fated Dotterel.

It will be remembered that a few months ago the British ship of war Dotterel, while quietly lying at anchor in the Straits of Magellan, suddenly blew up and sank, only a few individuals of the entire crew escaping alive. None of the survivors had any knowledge of the cause of the explosion; people on shore and on other vessels near by, who witnessed the catastrophe, believed it to have been occasioned by the firing of the magazine in some unknown manner. A British war vessel, with divers on board, has lately been sent to the spot, and a preliminary examination of the wreck has been had.

The divers found the Dotterel sunk in nine fathoms of water, her bows being toward the west and her stern toward the east, but with an open space of about 20 meters between the two. It is believed that owing to the explosion the ship was broken in two, the stern separating from the body of the vessel, all the part of which occupied by the engines is completely knocked to pieces. The base upon which the boilers rested appears still to occupy its proper position, but of the boilers themselves there is not a trace remaining. The whole stern part, from the mizzen mast backward, is intact. On either side of the stern are boats, well secured on their davits, and hanging from the stern is the captain's gig, in a perfect state of preservation. A great many corpses are scattered over the deck, not all of which are complete, and some being only fragments of bodies. Up to the present about fifty have been seen, but the divers have not yet been able to inspect the state rooms, where it is supposed there will be some more. The hull of the Dotterel was almost covered with small fish of different kinds. It is intended to take up the bodies and have them decently buried as soon as the coffins are ready on shore. It is now believed that the occasion of the explosion was the bursting of the boiler, but how that could have reached the magazine is still a mystery, and is likely to remain so, those who might have explained it being the first victims.

A Steam Passenger Catamaran.

The new steam catamaran which John Evertsen, of Troy, N. Y., is intending to put on the route between Westerly and Watch Hill as a passenger boat, lately arrived at Providence, so says the *Journal* of that city. She is of very light draught, of only forty-five tons burden, with hull sixty feet long and beam six feet, and a carrying capacity of over 400 persons. The following are some of the novelties of her construction: First, the propeller, which is hung amidships and between the hulls of the vessel, the power being supplied by a double engine; second, the manner of working the engine, which the pilot does from the pilot-house, where a starting lever and reversing lever are located, dispensing with customary signals by bells, though the services of an engineer are required for all other purposes. There are two decks, main and promenade. On the former, which is elliptical in form, are the cabin, engine and boiler-room, and the steward's pantry, with a broad sheep-path all around, and rail of usual height. A companionway leads to the upper deck, which is broad and open, with only the pilot-house and captain's room to break the space. How fast the boat is, is yet to be shown. The owners claim that this is the first boat of its class to which steam has been successfully applied, four having been previously built, none of which operated satisfactorily.

A Trap for Sheep-killing Dogs.

The Lynchburg *Virginian* describes an ingenious trap devised by a Virginia farmer to capture sheep-killing dogs. Having suffered severely from the depredations of dogs upon his sheep-fold, he built around a number of sheep that dogs had killed an inclosure of rails twelve feet high and about ten feet square at the ground, the sides of the trap sloping inward until an opening was left about five feet square. Any dog could easily climb such a sloping fence and enter the pen, but not even a greyhound could jump out of it. In three nights the farmer captured forty-six dogs, including fifteen or twenty that had never been seen before in that neighborhood. This, after there had been a public slaughter of all dogs suspected of sheep-killing, save one, whose master could not be convinced of his guilt. The trap was built for his especial benefit, and it caught him the first night.

INVENTIONS.

A means for preserving the vertical position of vehicle springs in their up-and-down movement when the vehicle is in motion, and also for preventing the breaking of the springs, has been patented by Mr. August Reinwald, of Gallipolis, O. The invention consists in a novel construction, arrangement, and combination with the vehicle body and springs, of two plates, and devices connected therewith and with the vehicle body and springs.

An improvement in the class of machines adapted for removing stones, dirt, etc., from peanuts, and also for polishing and assorting them, has been patented by Messrs. Charles W. Nicholson and Richard H. Leigh, of Assamoosick, Va. The improvements consist, first, in the construction of the cleaning cylinder, through which the peanuts are passed to remove foreign substances; second, in the construction and arrangement of a spout and chute for facilitating and regulating the action of a blast on the nuts; and, third, in the construction of a flexible belt or apron, which is armed with bristles for use in polishing the nuts.

Mr. James A. Davidson, of Cow Bay, Nova Scotia, Canada, has patented an improvement in instruments for sea-sounding, by which the depth of water is read from a graduated scale upon the instrument instead of by the length of the line. By this invention soundings can be taken while the sailing vessel or steamship is in motion as quickly as if the ship were at rest. The principle upon which the depth is found is by the weight of water due to its height, the weight being equalized by compressed air and the power of a spring. The indicator is provided with a heavy end, which keeps it upright in its descent and confines the air, which becomes compressed until an equilibrium is found, and at that moment a spring closes a valve and stops the admission of water, so that if the indicator becomes inverted or falls horizontally the air cannot escape or take in water.

Mr. John Meissner, of New York city, has patented an improved car brake, which consists of a horizontal frame having bowed or curved end bars and provided with side sockets for holding the brake shoes, the frame being held in position against the bottom of the car by longitudinally movable end clamps or racks in such manner that it is free to accommodate itself to the relative positions of the wheels on curves in the road, said clamps or racks being connected with brake rods or shafts, whereby the frame may be moved longitudinally for applying or turning off the brake.

Levee Building on the Mississippi.

Mr. William L. Murfee, Sr., in *Scribner's Magazine*, thus describes the modern method of building a levee: The space which it is to occupy is first carefully cleaned off; trees, roots, stumps, logs, weeds, even grass and leaves are removed. Then in the middle of the space, extending longitudinally the whole length of the proposed work, is dug a ditch three feet wide and three feet deep, which is to be straightway filled up again. This is called a mock ditch, or as some people say, a "muck ditch," but why "muck," is one of the things that has not yet been found out. The object of this is twofold—to close all root holes and to mortise the superstructure into the natural earth, thus preventing any sliding under the pressure of the water. As the levee is built of loose earth, its mass coalesces with the loose earth with which the mock ditch was filled, and when the levee has been completed and settled it forms, with the contents of the mock ditch, a homogeneous mass anchored three feet all along the line in the solid ground. The next process is to build the levee. The material is to be taken only from the outside, or side next to the river, and should not be cut nearer than twenty feet from the base of the levee; the earth is carried in wheelbarrows upon run plank. The dimensions of levees have varied from time to time, according to the amount of funds available for their construction. In any case the top of the levee should be three feet perpendicular above high water mark; the base line should be five, six, or seven feet, according to the ratio in force, for every foot of perpendicular height; the top should be level, and as broad as the levee is high. Thus, where high water mark is four feet above the level of the natural bank, the perpendicular height of the levee should be seven feet, the breadth at the top should be seven feet, and its thickness at the bottom 35 feet, 42 feet, or 49 feet, as the ratio of five to one, six to one, or seven to one might be in force. Taking for illustration, a seven foot levee constructed upon this last ratio, it will be observed that with the water standing four feet deep, there will be on a horizontal line 25 feet of solid earth between the surface of the water outside and the air inside, and 49 feet between the bottom of the water without and the air at the natural surface of the earth within. The last but indispensable step in the process of levee building is the "seep water" ditch, which is dug some thirty or forty feet from the inner margin of the levee and parallel with it. The function of this ditch is to receive and conduct away the seep water, or transpiration water, which oozes in considerable quantities through even the most compact of levees. If permitted to remain it would render the ground about the inner base of the levee intolerably muddy, and would operate as a great disadvantage in case of emergency. The seep water ditch must be connected with plantation ditches or otherwise put in communication with the swamp in the rear, so that the water can be carried away. Finally, as a finishing touch to the new levee, it should be planted with Bermuda grass. If tufts of this grass be set two or three feet apart all over the surface of the levee, it will in a year or two cover it completely with a very dense sod, and by its interlacing roots add materially to its water-resisting capacity. When water stands for a long time against a levee, the current and the waves seriously abrade its surface, cutting in sometimes so deep that an inopportune wind storm would assuredly break it. A heavy coat of Bermuda sod is a very efficient preventive of this kind of disaster. I have seen at the end of a long period of high water, a piece of levee deeply indented all along the line, and in some places cut more than half through, while adjoining it was a strip of Bermuda covered levee, subject to the same exposure to wind, wave, and current, which had not apparently lost a pound of earth or a tuft of grass.

Hardening Steel.

The effect of occluded gases in iron and steel is now being carefully studied by metallurgists in general, and a committee of the Institution of Mechanical Engineers recently raised the question in one of its reports as to whether the hardening and tempering of iron and steel might not be produced by the expulsion of occluded gases during the heating process and their subsequent exclusion by the sudden cooling and contraction. Professor Chandler Roberts has undertaken to answer this question, and by heating rods and spiral wires of steel *in vacuo* by means of the electric current, and suddenly quenching them in cool mercury, he demonstrates that steel will harden when there are no gases to absorb. The metal was, of course, robbed of its occluded gases by means of an air pump connected with the vacuum chamber, and the parts which were quenched in the mercury were found to be glass hard, while those which did not reach the cold fluid were found to be quite soft. Professor Roberts, therefore, concluded that gases do not play any part in the process of hardening and tempering. Professor Hughes, who has made numerous experiments on the subject, believes that the temper of steel is due to the chemical union of the iron with the carbon. At low temperatures this union takes place only in a slight degree, and hence in soft steel we have the carbon keeping aloof from the iron; but as the temperature is raised the combination is furthered, until, in the case of gray or glass hard steel, we have really a kind of diamond alloyed with iron. Sudden cooling is necessary to fix the combination, for in slow cooling the carbon separates from the iron. This theory is a very promising one, and is supported by a variety of facts; Mr. Stroh, for example, having observed that when an electric spark passes between two iron contact pieces and fuses them the fused part becomes diamond hard, and will scratch a file.—*Engineering.*

Mosquitoes.

Mr. Ivers W. Adams writes from Bathurst, N. B., to *Forest and Stream*, that he tried a dozen prescriptions for repelling mosquitoes, flies, and similar pests, and found none of them effective until he came across the following, which are dead sure every time:

"Three oz. sweet oil, 1 oz. carbolic acid. Let it be thoroughly applied upon hands, face, and all exposed parts (carefully avoiding the eyes) once every half hour, when the flies are troublesome, or for the first two or three days, until the skin is filled with it, and after this its application will be necessary only occasionally. Another receipt, equally efficacious, is: Six parts sweet oil, one part creosote, one part pennyroyal. Either of these is agreeable to use, and in no way injurious to the skin. We have both of these in our camp with us, and all flies keep a safe distance."

Bells on Sheep.

Mr. James S. Grinnell, writing in the Springfield *Republican* of bells on sheep as a protection against dogs, gives this illustrative experience:

"A good farmer in Leyden, who keeps about a dozen excellent Southdown ewes, always belled, was grieved and surprised one morning to find that dogs had raided his flock, killed two, mangled others, and scattered the rest. On collecting his little flock into the yard after a day's search he found that the tongue was lost from the bell. This was replaced, and never since have his sheep been worried. The experiment is so simple and cheap that it is worth trying."

How to Come it Over Hornets.

Mr. James T. Bell's account, in the Canadian *Entomologist*, of the easy capture of hornets may possibly serve as a useful hint to some agricultural reader in an emergency. The nest was unexpectedly found in a stump during a walk in the Belleville forest:

"A few days after, taking advantage of a cool morning, I sent my two boys to the woods with a small bottle of chloroform and a hard rubber syringe. According to directions, they injected about a drachm of the liquid into the hole, and threw a handkerchief over the entrance. In about five minutes they opened up the nest, when they found the inmates in a perfect state of slumber, and transferred them without trouble to their cyanide bottles. In about an hour they returned, bringing me forty-eight specimens of the insect."

Jetty Lights.

Experiments with the electric light have been lately made by MM. Dalmin, at Barcelona, on the mole or jetty head of San Ramon. Five electric lamps were used, the wire passing to each in succession, but, at the last lamp, instead of returning to the machine, the wire was brought down into the ground and to the sea, at about 8 meters distant, an arrangement (says *La Lumiere Electrique*) completely new and original, and we call attention to it as realizing considerable economy in illuminating with the electric light at a great distance. The electric machine used was one of the Gramme system, a new type patented in October last, and meant specially for division of the electric light. The system, which seems to have given satisfaction, was exhibited in various other parts of Barcelona.

Eruption of Mauna Loa.

Late advices from Honolulu, Sandwich Islands, describe increased activity of Mauna Loa, with great hazard to the port of Hilo. The new outbreak is described by an eye-witness as follows: "About June 22 the old mountain was observed to be more than usually active, the whole summit crevasse pouring forth immense volumes of smoke. By Friday noon the three southern arms had all joined into one, and rushing into a deep but narrow gulch, forced its way down the gulch in a rapid flow. By Saturday noon it had run a mile. The flow was on an average 75 feet wide and from 10 to 30 feet in depth, as it filled the gulch up level with its banks. The sight was grand. The whole frontage was one mass of liquid lava carrying on its surface huge cakes of partly cooled lava. Soon after we reached it the flow reached a deep hole, some 10 or 15 feet in depth, with perpendicular sides. The sight, as it poured over that fall in two cascades, was magnificent. The flow was then moving at the rate of about 75 feet an hour. If it goes through Kukuau, probably all the lower or front part of the town will fall a prey to Madame Pele."

Bishop Coan, of Hawaii, writes from Hilo, under date of June 28: "The northern wing of the line is less than six miles from us, and the southeastern is less than two miles distant, while the center of the line appears the most sanguinary. From the southeast wing the seething fusion has fallen into a rough water channel, 20 to 50 feet wide, which comes down from the main bed of the flow almost direct to Hilo. We found two streams of liquid lava coming down in rocky channels which are sometimes filled with roaring waters, but nearly dry at this time. These two gulches are too small to hold the seething fusion, and the fiery flood overruns the banks and spreads out on either side. The united width of these streams may vary from 50 to 200 feet."

Two days later the venerable Bishop described the lava stream, which was approaching Hilo, as "fearfully active. It is about 50 to 100 feet wide where it is confined in the gulches, but it is sure to spread indefinitely where there is space. By night the sanguinary glow is fearful, like a flaming banner lifted high in the heavens. Some days its progress toward us is one-eighth to half a mile a day. From the town you can walk up to the lava stream in 40 minutes, and return in 30. Thousands of people visit it, sometimes a hundred in a day. I have been up to it, and dipped up the fusion. As it comes down the rocky bed of the ravine the roar of the lava is like that of the Wailuku River in flood, but a heavier and deeper sound; it is the bass, and the other the tenor. Sometimes the sound is like distant thunder. Its explosions and detonations are rapid and startling. I counted ten in a minute. In some places it has overflowed its banks and spread out 200 or 400 feet laterally, burning the jungle and cutting down the trees.

"We now expect the lava stream to enter Hilo Harbor in a few days. What damage it will do there remains to be seen. Should it spread out when it reaches the low and level parts of Kukuau and Punahawai, joining Punahoa, where we live, it may burn many houses and cut our village in two, but Hilo will not be entirely destroyed unless the vast masses of fire that are accumulating upon the mountain slope should come down upon us."

The Hawaiian *Gazette* of July 6 says: "The past week has been one of great excitement in Hilo, in consequence of the renewed activity in the volcanic fires on Mauna Loa. One arm of the fiery stream has pushed itself into the Kukuau gulch, and is within three miles of the village of Hilo. All Hilo may be said to have visited the flow during the last few days. Men, women, and children, some on foot and some on horseback, have made the pilgrimage. As seen on Wednesday, June 29, it presented a view never to be forgotten. A mile above the lower end of the stream the lava was flowing in a liquid, living torrent, some 30 feet wide along its course, consuming everything in its way. From this point about half a mile of the seething, surging torrent could be seen. The belt covered with lava was some 500 feet wide, all hot and liable at any moment to break out into renewed activity. At night the scene was awfully grand beyond description."

Skull Measurements.

Professor Flower, the well-known English anatomist, has published some further results of his researches with reference to the human skull. He states that the largest normal skull he has ever measured was as much as 2,075 cubic centimeters; the smallest, 960 cubic centimeters, this belonging to one of those peculiar people in the center of Ceylon who are now nearly extinct. The largest average capacity of any human head he has measured is that of a race of long flat-headed people on the west coast of Africa. The Laplanders and Esquimaux, though a very small people, have very large skulls, the latter giving an average measurement of 1,546. The English skull, of the lower grades, shows 1,542; the Japanese, 1,480; Chinese, 1,424; modern Italian, 1,475; ancient Egyptian, 1,464; Hindoos, 1,306.

Business and Personal.

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

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) W. Z. writes: I have a glass vase, 16 inches high, 6 inches in diameter, and an eighth of an inch thick. How can I cut this glass into hoops or rings, each measuring 1¼ inches in height? A. Paste a band of thick paper having a smooth edge around the vase so as to mark the line to be cut, and use a good glazier's diamond, the edge of the paper serving as a guide. When cut draw a hot piece of glass rod over the mark, and the ring will separate without breaking. Experiment on a bottle first.

(2) J. C. asks (1) for a recipe for making carbon paper for working the manifold process of copying letters, etc. A. Melt together ten parts of lard and one of wax, and mix with it a sufficient quantity fine lampblack, or lampblack and black lead (graphite). Saturate the paper (unglazed) with this composition, remove excess, and put in a press. 2. Also, how a stylus can be made or got? Will a lead pencil serve the purpose as well? A. A hard pencil will answer, but a stylus of ivory, bone, or steel is preferable.

(3) C. C. L. asks: What is the best machinery in use for manufacturing boneblack? A. A simple crusher, an upright retort furnace, and a variety of sieves constitute the principal part of the plant. See Knight's "New American Mechanical Dictionary," and Hints to Correspondents.

(4) H. E. D. writes: Wood engravers have long felt the want of a simple, reliable, and expeditious formula for photographing on wood for engraving. There are two or three parties that claim to have forms of doing it, but keep them secret. Now, if you could publish anything in the way of a new simple formula, with illustration of special style of printing frame that would be required, you would confer a favor on a number of your readers. A. The subject of photographs on wood for engraving has been treated most comprehensively in the paper by Edward Pocock, in SUPPLEMENT, No. 53.

(5) G. F. asks (1) for a simple method of testing white paints (water colors) to find if they have a lead basis. A. Dissolve a fragment of sodium or potassium in a small quantity of water, add a few drops of dilute sulphuric acid, and hold over the vessel containing the liquid a strip of paper on which is spread some of the moist pigment. If it contains lead it will blacken at once. 2. Will Chinese white (in cakes) turn black by exposure to atmosphere and light? A. If the air contains hydrogen sulphide, yes; not otherwise.

(6) W. K. writes: I want a soft and tough composition that would take the impression of grain from one board to another. A. Try gutta percha softened by hot water or steam; or use fusible metal.

(7) J. N. S. writes: I noticed your advice about using galvanized iron for culinary purposes. I had just purchased a small galvanized wine press, intending to use it also for plum jelly, etc., but never did, as your warning has often been repeated. As the season is now upon us for making up such things, my wife wishes to use the press. Will you please inform me by what simple method I can destroy the coat so as to be safe in using? A. The zinc coating may be removed by scouring with silicious sand well moistened with muriatic acid diluted with three volumes of soft water.

(8) S. G. M. writes: I want to know if there is not some chemical that will fix the lime in whitewash and keep it from washing off by rain and rubbing off by wear. I am aware that milk is used, but it is too expensive here. A. See "A Durable Whitewash," page 52, current volume. Water-glass has been used in this connection with fair results.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

N. D. S.—Traprock and limestone.—S. & P.—Sulphide and arsenide of iron—pyrite and arsenopyrite.—J W. M.—(Two samples). Feldspathic rock, hornblende, and mica schist, carrying a considerable quantity of graphite (plumbago, black-lead.)—E. P.—Your letter contained no minerals, as stated, please send other samples.—L. G. C.—The red is jasper, the other quartz and chalcopyrite—iron-copper sulphide.—Several unlabeled packages of minerals have been received without letters by which we can identify the senders.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 12, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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

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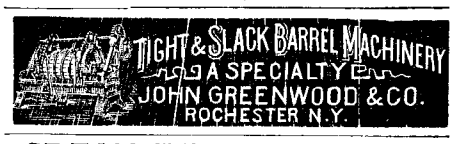

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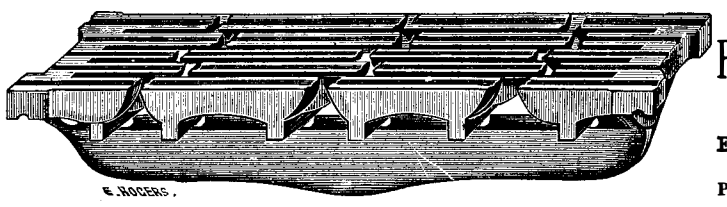

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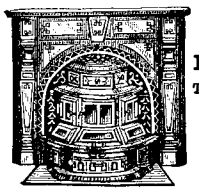

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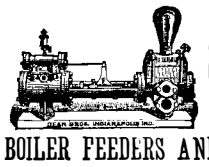

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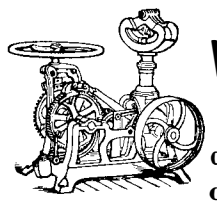

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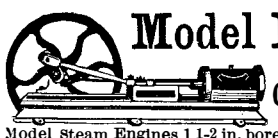

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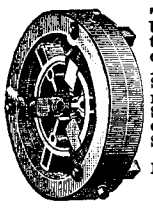

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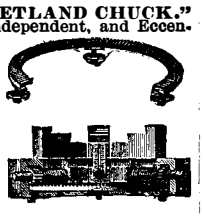

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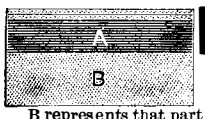

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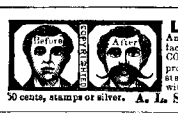

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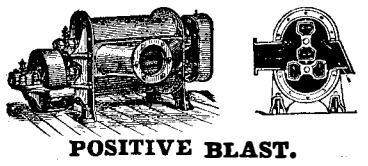

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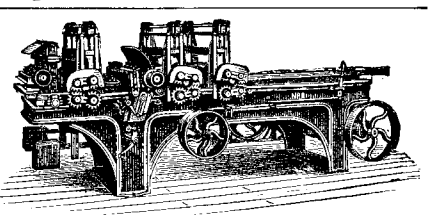

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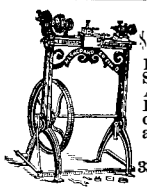

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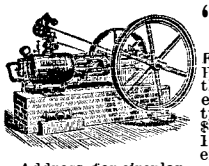

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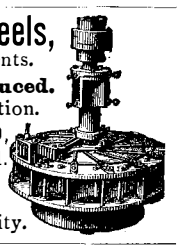

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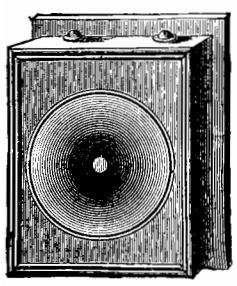

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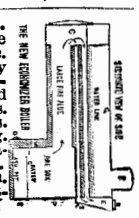

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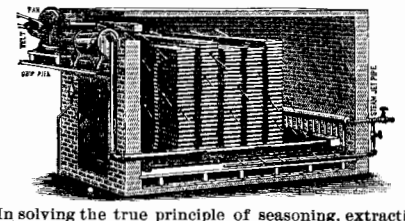

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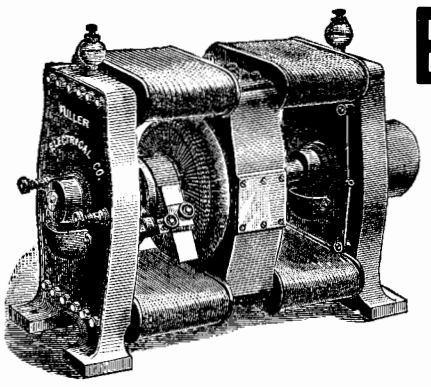

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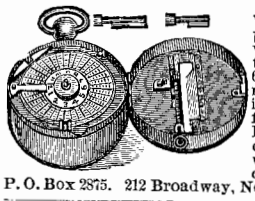

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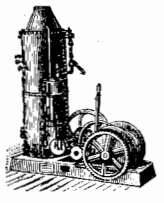

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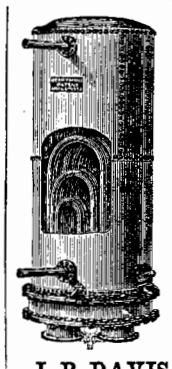

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