the surface. Thus, a pound of iron extended so as to have double the surface will be rusted in half the time, with one-hundredth the surface in one-hundredth the time. Suppose the pound of iron to be originally in the form of a ball and that we divide it successively into balls smaller and smaller. The surfaces of balls are to each other as the squares of their diameters, while their weights are as the cubes of their diameters, and the ratio of the surfaces to the weights is constantly increasing as the division goes on. It is evident that by so dividing and increasing the surface a point might be reached where the heat would be generated by oxidation more rapidly than it could leak away, and that thus the ignition temperature would be reached, when combustion would ensue.

This is no speculation. I can prove the facts by actual experiments, dividing the iron and exhibiting it taking fire, with far less labor than I have put on this article. Prussian blue is a compound of iron, nitrogen, and carbon. If it be heated to a bright red heat in a tube or crucible from which the air is excluded, till fumes cease to be evolved, the iron is left finely divided. When the apparatus is cool the iron may be taken out and on exposure to the air it will immediately take fire. Ordinary lead is not easily set on fire. But get it in fine powder! Fill a small vial with tartrate of lead, fit in a clay stopper, set the vial in a sand crucible, imbedding the vial in sand, and subject the whole to a low red heat for half an hour. The vial now contains lead powder, the particles of which are prevented melting together by other fine particles of carbon. This lead powder takes fire as soon as it is brought into the atmosphere. Dissolve phosphorus in bi-sulphide of carbon, and dip a piece of cloth or paper in the solution and expose it to the air. Instantly as the solvent has evaporated, the phosphorus (now left finely divided) takes fire. I might describe hundreds of similar experimental illustrations, but I hasten to the cases of spontaneous combustion which occur in the ordinary routine of life.

Ninety-nine hundredths of these cases originate from the oxidation of linseed oil. This oil in a paint pot has little surface exposed compared with its whole mass, and the heat generated is diluted over the whole body of the oil, radiates into the air, etc. When the paint is spread on wood, the oil oxidizes rapidly and heat is correspondingly produced but being in contact with the conducting wood it is carried away. But if the wood were a non-conductor and no heat were radiated the oil would speedily take fire. When the oil is mixed with sawdust or spread on cotton wool, paper, or clothing, and the mass is kept away from strong currents of air, spontaneous combustion ensues. A painter rolls up his greasy overalls in a bundle, throws them in a corner or on a shelf and the house is set on fire: dozens of cases like this have occurred in this city. Linseed oil is so remarkable in this way that I think it might sometimes be made available for kindling a fire where matches and other conveniences are not at hand.

The spontaneous combustion of nitro-glycerin, gun cotton and pyrotechnic compounds may be brought within the category of oxidation. But in all these cases the oxygen is not supplied from the air. It is part of the substance itself, and is gradually eliminated to the part which is combustible. A complete explanation of these cases would extend this article beyond reasonable limits.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

The Menhaden Oil Mania.

Messrs. Editors:—The time was once when those engaged in the manufacture of Menhaden oil were looked upon with disgust by those who considered themselves the "Upper Ten" of society. But now how great the change! Whether the exalted have become abased, or the abased exalted, deponent saith not, but certain it is that it has taken the form of a mania second only to the petroleum excitement. This business, which about fifteen years ago was in its infancy, has now become one of the "institutions" of our land and is not confined to our vicinity but is spreading north and south with astonishing rapidity, and the finny tribes are disturbed in their most secret haunts. While fifteen years ago there was but one factory in this vicinity, today there are perhaps twenty or more, and nearly all of them prospering, as we should think by the extensive preparations being made for the coming season. A novel plan has originated here, to follow the fish with the change of season. Two large steamers have been fitted with necessary apparatus for extracting the oil, and have cruised the past season from Maine to Virginia in search of the "miniature whale." This plan is attended with extra expense and difficulty and we think has hardly been profitable so far, but with proper care and more experience may yet be made remunerative. It certainly has the merit of originality and perseverance, and merits success. About three years since, a company from this place started a factory in the state of Maine. Since that time other companies hearing "fairy tales" of the success of the pioneer works, have located in that vicinity, and now they are nearly as numerous as here. We certainly wish them all success, but fear that the large number engaging in the business will eventually ruin it for all. But in this we may be mistaken. The oil as now made is used largely for outside painting and is considered by many superior to linseed. Forming a smooth glossy coat on the surface of the wood, and being sold at a much lower price than linseed, it is getting into general use. It is also used by rope-makers and curriers of leather, as it is much cheaper than other oils and answers their purpose as well. The refuse of the fish is considered an excellent fertilizer, and is used in large quantities on the Island, and also in Connecticut and Massachusetts. It is also an important component in the manufacture of phosphates, containing a large amount of ammonia, which is necessary to certain crops. But perhaps we have written enough on this subject, our object in writing this article being to enlighten your readers concerning a business of which comparatively little is known. A.

Greenport, L. I., Jan. 29, 1867.

Elongated Shot and Shell.

Messrs. Editors:—Capt. Norton, I observe by your paper of the 2nd inst., has furnished you with evidence relating to his claims of priority. The article states that one Richard Airey, Quarter-master General, had seen Capt. Norton's elongated expanding shot and shell, identical in principle with the present Minie bullet, at Woolwich, England, in 1823. The statement does not furnish us with the information required. If Captain Norton claims to be the first to propose the use of elongated projectiles, I refer him to Joe Hunter's French patent dated 1790, wherein he fully describes his compound shot and sabot for rifle guns. A drawing of Hunter's sabot in my possession represents it as formed on a conical based shot like "Sawyers." Dr. Reed's patent is dated 1756 and consists of the application of expanding sabots to elongated projectiles, but he casts the projectile on the sabot. In practice it is found to be very destructive to guns and projectiles, and it is now abandoned.

Major, now Major General, Dyer, in the spring of 1859, proposed to the Ordnance Department the application of expanding soft metal sabots to the base of projectiles, being the converse of Dr. Reed's patent.

Mr. Thomas Taylor, of Washington Arsenal, claims to be the first to render the Dyer system practical. The advantages of Mr Taylor's improvement are of much importance Shot and shell may now be fired over the heads of troops without danger, as the sabot never strips. Brig.-Gen. John Gibbons says—page 120, Artillerist's Manual, 1863—"the importance of applying the rifle principle to guns of large calibre is too evident to need explanation, and many and various have been the attempts made to succeed in it, but up to the present without any degree of certainty, although much progress has been made. The importance of the question is much enhanced by the fact that the moment a successful plan is discovered, the great problem of concussion and percussion shells is solved. That a way will sooner or later be discovered, there can be but little doubt. Large projectiles, being made of iron, cannot of course be forced into the grooves of the gun like the leaden ball of small arms."

"Attempts have been made to cast on the outside of the cylindrical part of the shot some softer metal such as lead or composition to take the groove and give the necessary rotation, but it has invariably been found that although these metals take the groove at first they are immediately torn to pieces and off the iron part of the shot by the force of the powder. The increase of the force in powder cannot be calculated upon like any other motive power, and because a leaden projection of .01 of an inch will hold in its position a common rifle ball of 2 oz. in weight when acted on by 60 grains of powder, it does not follow that the same effect will be produced when these elements are increased a hundred times—much less when they are increased one thousand times, in a great many inventions of the day."

Mr Taylor's improvement consists in the application of a soft, tough and yielding alloy, and in so constructing the sabot that a portion of the gases is employed to compress the body of the sabot upon the base of the projectile, while another portion is employed to expand the sabot into the grooves of the gun, causing the shot to rotate and ensuring great accuracy of flight. One of the Smith Family.

Washington, D. C.

Artesian Wells.

Messrs. Editors:—In your issue of January 26th, in an article on "Artesian Wells," D. C. says, "Beneath the blue limestone there exists a heavy formation of sandstone, very compact in its structure, and not likely to have any reliable water-bearing strata. It is known in the New York Survey as the Potsdam sandstone. This formation rests on the primary rocks, and artesian wells cannot be expected in rocks of that age and depth."

I am happy to inform D. C. that his theory is not altogether correct, as a glance at the geological survey of our State will show you that we are in Ogdensburgh on the limestone formation and not a little above the Potsdam sandstone, yet we have two artesian wells, one at Arnold & Co.'s Brewery that has been flowing for six or eight years and is nearly one hundred feet deep. The other is at the Ogdensburg gas works. This latter well is about one hundred and one feet deep, and discharges a stream of about one inch in diameter, with a capacity of fifteen to seventeen galls. per minute, of the purest soft water imaginable. Some of our leading citizens will probably sink another this spring to the depth of three hundred or four hundred feet, perhaps more, on an eminence in our village, to supply their houses. S. S. Blodgett.

Ogdensburgh, New York, February 9, 1866.

Bridging the East River.

Dear Scientific:—You are growing more portly and more handsome as you grow older. You are a pearl of great price—a perfect mine of wealth. I hailed you when a "little shaver" many years ago. With increasing admiration I hail you now. Long may you wave for the benefit of the great engineering and industrial interests of our glorious land. Our country abounds in periodicals, but we have only one Scientific American.

Among the very many engineering enterprises discussed in your columns I have been much interested in the Broadway problem, which, it appears to me, is drawing to a practical solution in the grand project illustrated and described in a recent number of the current volume.

I see also that the bridging of the East River is looming up and various suggestions being elicited. In this line we have a most splendid achievement in the bridge thrown across our beautiful river between this city and the city of Covington, on the Kentucky side. It is a magnificent structure and commands the admiration of all that can appreciate the wonders of science.

In regard to bridging the East River it occurs to me that if we keep up with the spirit of the age and make proper use of the achievements of science, the proposition is not as chimerical as many might suppose. We are starting into a new era when steel will displace the great feature of this age and crowd iron out of ten thousand places in which for years we have held it to be supreme. I have not time nor data at hand to do so, but I trust some engineer will think sufficient of the suggestion to make a calculation of the difference in favor of steel over iron; estimating to drive iron completely out of place where strength and lightness of material may be required.

Another suggestion. I would propose a bridge exclusively for foot passengers as a preliminary experiment toward the final solution of the grand project. J. A. C.

Cincinnati, Ohio. Feb. 11, 1867.

Compasses on Board Iron Ships.

Messrs. Editors:—Your correspondent H., who wrote on this subject, page 122, appears not to understand the difficulty in question; he seems to think that the compasses are spoiled in the course of time by the effect of the iron in the ship, and says that fresh needles would always indicate the magnetic meridian. This is not so, but the iron of the ship itself is influenced by the magnetism of the earth is magnetized to a certain weak degree, strong enough however, to reach every compass on board, old or new. The magnetic meridian on board an iron ship, and even on board a wooden vessel by the influence of the iron used in its construction, is not the true magnetic meridian of the earth, and every compass will of course stand in the magnetic meridian as it is on board the vessel. Many years ago (some 40 or 50, if I am not mistaken) an attempt was made by Barlow, in England, to neutralize this magnetism of the ship's iron, by a contrivance called Barlow's correction plate: it consisted of an iron plate or steel magnet, placed in such a position, after repeated trials, in relation to ship and compass, that it counteracted the influence of the ship's iron; this however was only partially successful, as the magnetism of the iron is not the same in all portions of the ship, but shifts, by the induction of the earth's magnetism, when turning the ship around. The last correction is by Ritchie in Boston, lately patented, and appearing successful; he places his needle, floating on a liquid, above the vessel, finding a place where the influence of the different iron parts of the vessel neutralize each other. It has sometimes happened that a wooden ship was struck by lightning, and all the iron on board became so strongly magnetized, that the compass needle pointed always to the same part of the ship, in place of standing in the earth's magnetic meridian. The only disturbance the compass needle itself is subjected to, is either to lose its magnetism altogether, or to have its poles reversed, the north pole pointing south, and vice versa; but any compass needle of elongated form will always stand in the magnetic meridian, as it is at the place where the compass is situated, which meridian will often not correspond with the earth's magnetic meridian, in the same way as the earth's magnetic meridian in very few places corresponds with the astronomical meridian.

P. H. Vanderweyde M. D.

Philadelphia, Feb. 15, 1867.

An Inventor at the North Pole.

Messrs. Editors:—It may not be uninteresting to you, and your many thousand readers, to hear a few facts in regard to one of our countrymen, showing what perseverance and energy can accomplish.

In the winter of 1849-50, the writer of this was a resident of Cincinnati, Ohio. I chanced to make the acquaintance of a young man who was engaged in the business of casting brands for stamp tools, by a peculiar process of his own, using type for patterns. For want of better occupation, I engaged to take orders for him; his wife was making wooden dolls. Time passed, he engaged in the steel press engraving, and built up a good business. Onward, was his motto. Next I find him printing and publishing the "Penny Press" of Cincinnati, using the first (I think) hot-air engine used in the West. In all this time he had been reading all the works on Arctic exploration that were to be had, and he then conceived the gigantic scheme of another trip to the Polar seas, and through the aid of Mr. Grinnell, of your city, he was enabled to carry it out, and to-day is ice-bound amid the regions of an Acrtic winter. And that man is Charles F. Hall. The man who seventeen years ago was molding his little types in Miles Greenwood's foundery is now known throughout the world. Comment is unnecessary. O. V. Flora.

Madison, Ind.

The French Fire Alarm.

Messrs. Editors:—The French fire alarm mentioned in the issue of Feb. 9th as having been invented by Robert Houdin, is not new, as the undersigned while engaged in the manufacture of Telegraphic Instruments in Boston in the year 1858–1859, made a number of these instruments for the Hon. William Whiting, (late Solicitor to the War Department,) for use at his residence in Roxbury, and operated in connection with an Electro-Magnetic Burglar Alarm precisely in the manner

described as the invention of Houdin. The name of the instrument as given by Mr. Whiting was an Electro-Magnetic Thermostat, and was first invented and put into practical use by that gentleman.

JUSTIN HINDS,
Supt. Salem Machine Co.

Salem, Mass, Jan. 31, 1867.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

DITCHING PLOWS.—John T. Miller, Iowa Falls, Iowa.—This invention consists in an arrangement of the cutters and wings of a plow or machine for cutting trenches in wet land, forming by one application of the draft of a powerful team, a ditch about two feet deep, thirty inches wide at top and twelve inches wide at bottom, while the soil and earth removed from the ditch, are laid up in a ridge or embankment on both sides by the wings of the plow. The whole construction is strong, simple and cheap, and especially adapted to the use of the farmers on the Western prairies.

APPLE PARER, CORER, AND CUTTER.—W. A. Coe, Greensboro, N. C.—This invention relates to a machine by which apples may be quickly pared, cored and cut into pieces without removing the apple from the fork.

SUB-SOIL ATTACHMENT FOR PLOWS.—R. J. Wheatly, St. Johns, Ill.—The object of this invention is to obtain a simple and efficient attachment for plows which will pulverize, loosen, or lighten up the soil at the bottom of a furrow made by the plow, and still not increase the draft of the plow to such a degree as to prevent a team from operating or drawing it with facility, when the attachment is set to penetrate into the earth at its greatest depth.

CORN PLANTER.—W. J. Hobson, Savannah, Mo.—This invention relates to a corn planter of that class which is designed for planting the corn or seed in check rows. It consists in a novel and improved seed-dropping mechanism, the arranging and operating of the same, whereby the machine may be used on rough or uneven ground and the seed dropped or planted in check rows, without the previous furrowing of the ground.

COTTON SCRAPER.—Turner Saunders, Memphis, Tenn.—This invention consists in attaching a scraper to a plow in such a manner that the cotton plants may be plowed or bared off, and scraped at one operation. Hitherto the cotton has been plowed or bared off with an ordinary turning plow, and a scraper afterward used, the latter implement being rather difficult to manage and not permitting the earth to be scraped evenly from the plants. This improvement admits of the two operations specified being performed simultaneously and with the greatest facility, thereby effecting a great saving in labor and preparing the work in a more perfect manner than usual.

CONSTRUCTION OF PLOWS.—W. D. Long, Wheatland, Pa.—The object of this invention is to produce a single plate of steel or iron rolled or formed in such a manner that the plow when finished will be thicker at these parts where it is subjected to the most wear, and the plow be capable of being constructed at a very moderate cost.

EXTRACTING STUMPS, RAISING STONES, ETC.—J. M. Gleichman, Evansville, Ind.—This invention relates to a machine for extracting stumps, raising heavy stones, logs, etc., and conveying or transporting the same to any desired place, and consists in the employment of one or more levers arranged in connection with a tackle and windlass, and a frame mounted on wheels, whereby stumps may be extracted with the greatest facility, heavy stones and logs raised and transplanted or conveyed from place to place, with but a very moderate expenditure of time and labor.

BUSHING FOR BARRELS.—David F. Fetter, New York City.—The bushing forms a lining for the bung hole or other holes in casks or vats; it is designed to save the wear and tear of the staves, and is secured by means of barbed creases on the outer periphery of the bush, which catch upon the wood and prevent its removal; the extended plate surrounding the bush may be fastened by rivets or screws to the staves if desired.

GRAIN VENTILATING AND DRYING APPARATUS.—James E. Strode, Litchfield, Ill.—This invention relates to an apparatus for ventilating and drying grain stowed away in bulk, and it consists in having one or more air ducts passing through the bin, box, or granary, in which the grain is placed, said duct or ducts being composed of slats arranged one above the other with spaces between, with openings in the sides of the bin, box, or granary for the admission of air into the duct or ducts, whereby the grain will be thoroughly ventilated and dried.

METALLIC HUBS FOR THE WHEELS OF VEHICLES.—James B. Stuart, Bunker Hill, Ill.—This invention relates to an improvement in metallic hubs for the wheels of vehicles, and it consists in a novel manner of securing the spokes in the hub, whereby the spokes are firmly retained in position and rendered capable of being readily detached and replaced by new ones whenever required.

RAKING AND LOADING HAY.—M. S. Rowson, Winhall, Vt.—This invention relates to a machine for loading hay on wagons, while the latter are drawn over the field. The invention consists of a series of rakes attached to endless chains and used in connection with a guide box, a rake and grating or shield, all so constructed and arranged that the hay may be raked up from windrows and elevated upon the wagon or cart to which the device is attached.

SEWING MACHINE.—E. H. Craige, Brooklyn, N. Y.—This invention consists in making the cloth plate of a Wheeler & Wilson sewing machine in three or more parts, one or more of which are movable, so that by taking off said movable part or parts, free access can be had to the feeder and all the parts to be oiled, which in ordinary Wheeler & Wilson machines can only be reached by uncovering the cloth plate. That part of the cloth plate which is situated under the needle consists of a tapering piece inserted in the direction in which the fabric is fed and held in place by the movable part of the cloth plate in such a manner that said edge shaped piece can be readily removed and replaced by another piece if it should be desirable or necessary.

PRUNING SHEARS.—Daniel Campbell, Elizabeth, N. J.—This invention relates to an improvement in pruning shears by means of which a drawing cut is obtained, instead of that obtained by the ordinary shears, which is a great improvement, as the drawing cut, whereby one blade is gradually drawn obliquely toward the cutting edge of another stationary blade, insures a better operation and a cleaner cut.

BORING MACHINE.—O. O. Crawford, Seneca, Wis.—This invention consists in constructing a machine so that the fellies of carriage wheels may be bored rapidly and in the most perfect and unerring manner.

CHURN.—D. O. Blair, Abingdon, Ill.—This invention relates to a churn of that class in which the dasher is attached to a vertical shaft and receives a reciprocating rotary motion by certain devices arranged above the cover of the churn, and the improvement consists in the construction of those parts by which the dasher shaft is revolved, by which the churn is operated in an easy and efficient manner, and which parts are furthermore so arranged that a slower or faster motion can be imparted to the dasher shaft without changing in the least the motion of the lever by which the whole is operated.

MOP HEAD.—Joseph Messinger and H. H. Mason, Springfield, Vt.—This invention relates to a new and improved mop head of that class in which a screw and a ratchet and pawl are employed for operating the jaws and retaining the same in position to hold a mop cloth.

SOWING RICE AND OTHER SEEDS.—Joseph A. Reynolds, Savannah, Ga.—This invention relates to a machine for sowing rice and other seeds which are grown in small drills. The invention consists in the novel means employed for distributing the seed and in an improved arrangement of furrow openers, whereby a very simple and efficient implement is obtained.

PIPE TONGS AND CUTTER.—John Balmore, New York City.—This invention relates to a tool which can be used with great advantage for screwing up and for unscrewing pipes of any description and also for cutting said pipes. It is provided with a swivel hook that catches over the pipe and is hung on gudgeons projecting from the ends of a nut into which the shank of the tool is tapped. The end of this shank forms a cup-shaped point, the edge of which bears against the pipe to be screwed or unscrewed. A hole bored in the center of the cup-shaped point serves to receive the cutter, the edge of which drops into a groove in the inner surface of the hook so that its cutting edge can be set up against the pipe to be cut without turning the cutter.

PROPELLING VESSELS.—Samuel B. Wait, Mariners' Harbor, N. Y.—The object of this invention is to provide a new manner of propelling vessels employing the oar principle at the stern of a ship, said oars being moved in such a manner by machinery that the full power of each stroke is utilized.

ROTARY ENGINE.—Friedrich Fischer, Garibaldi, Iowa.—This invention relates to a rotary engine which is composed of an annular cylinder fitted with a piston which is secured to a piston wheel. The steam is admitted at one side of an abutment in the cylinder and through cavities or channels in said abutment made of two parts which close up by the action of springs and which are forced apart by a wedge-shaped projection or secured to the piston and traveling with the same in such a manner that immediately as the piston has passed the abutment the two halves thereof close up and the steam acts on the piston until the wedge-shaped toe comes in contact with the abutment and forces the two halves thereof back, steam being shut off at the same time until the piston has passed.

WASHING MACHINE.—Charity Pendleton, Iowa City, Iowa.—This invention has for its object to improve the construction of the washing machine, patented July 12, 1859, and numbered 24,754, to which Letters Patent Schedule of additional improvement No. 281 was annexed May 29, 1860.

BEDSTEAD FASTENING.—James Maguire, Trenton, N. J.—This invention consists in the combination of plates or headed pins or bolts with the side rails and posts of the bedstead.

WASHING MACHINE.—William K. Short, J. W. Allen, and J. Craig, Mount Pleasant, Iowa.—This invention has for its object to furnish a cheap, simple, convenient, and effective washing machine, which shall be capable of self adjustment to any desired thickness of clothes.

LIFTING JACK.—Samuel Gulick, Klines Grove, Pa.—This invention has for its object to furnish an improved lifting jack, so constructed as to be adapted to raising heavy machinery as well as carriages and wagons, and at the same time be capable of raising them to a considerable hight.

TAKE-UP FOR KNITTING MACHINES.—Samuel Ward, Amsterdam, N. Y.—This invention relates to the take-up of knitting machines, whereby the action of the take-up is regulated by the tension upon the fabric knit in the machine.

HORSE HOE.—Moses Chandler and John B. Nickels, Kenduskeag, Me.—This invention consists principally in adjustably attaching wings or blades to the standards, and in the combination of pivoted rake heads with the free or rear ends of the wings or blades.

STOVE-PIPE JOINT.—H. M. Clifford, Philadelphia, Pa.—This invention consists in forming the joint, where lengths or pieces of stove pipe are put together without lapping them, and in such a manner that while the joint is equally tight the facility with which the pipe can be put up and taken down is greatly increased.

SPRING BED BOTTOM.—David Manuel, Boston, Mass.—This invention consists in attaching the slats of the bed bottom, by means of slots, hooks, or notches formed in or attached to the under sides of said slats, to coiled looped springs of a peculiar form, and in the combination of rubber rollers with the loops of said springs.

WINDOW-SHADE FIXTURE.—L. A. Tripp, Middletown, N. Y.—This invention has for its object to furnish an improved fixture by means of which window shades may be raised or held in any desired position.

COMBINED TABLE, CUPBOARD, CLOTHES RACK, ETC.—W. M. Baker, Fortville, Ind.—This invention relates to a table, with which is combined a cupboard, a clothes rack or frame, and a rack or frame for the reception of tinware, together with drawers, trays, and a rolling board, in such a manner as to be most convenient for use when so desired, and when not in use susceptible of being enclosed within the body of the table.

SINKING BORED WELLS.—Peter Ollon, Muncie, Ind.—This invention consists in an improvement in the auger and in the manner of hanging and operating the same for the boring of the well.

BOOT CRIMPING MACHINE.—John Joslyn, Canton, N. Y.—By the machine embraced in this invention the leather which is to be crimped, is drawn between two plates having series of circular depressions or cavities in their opposite faces, by means of a suitable shaped former, so arranged as to move between the said plates; the circular depressions working the leather, and condensing such portions of the same as are necessarily filled, as well as materially aiding in the filling process, and causing such a hold to be had upon the leather as it is drawn between them, as to stretch it out to the utmost extent.

SELF-WINDING CLOCKS, TIMEPIECES, AND OTHER MACHINERY.—F. G. A. Horstmann.—This mechanism consists of a tube constructed with a metallic piston, packed and cupped with one or more layers of leather or other materials, with a spring for keeping the piston pressed close home on the fluid in the cylinder. The piston works up and down within the cylinder, forming a perfect float or floating bucket. The cylinder is in connection with a vessel containing naphtha, spirits of wine, or other expansive fluid—glycerin or other oily matter being used therewith to prevent the evaporation of the naphtha or spirit. The alternation of temperature acting upon this fluid causes the same to expand or contract, thereby causing the piston to rise and fall, thus producing an impulse or motion either in a horizontal or vertical direction. To the said piston the inventor attaches a rod, and by means of a cross bar he causes a drum or wheel to revolve and carry an endless chain, which is passed over the main wheel of the clock, so that it hangs in a loop on either side, and to each of these loops he attaches a weight for giving the necessary working power to the clock and setting in motion the train of wheel work. This principle is also peculiarly adapted for raising greenhouse or hothouse windows, and for other similar purposes.

DOORS OF SAFES, STRONG ROOMS, AND OTHER RECEPTACLES OF PROPERTY.—J. Jessop and W. Warburton.—The object of these improvements is to prevent or render difficult the introduction of wedges, chisels, or other such means for the forcible opening of the doors or covers of safes, strong rooms, and other receptacles of property. For this purpose, in place of the edge or that surface of such door or cover which closes into or upon the frame thereof being formed straight, or of a series of straight lines, simply fitting close into one another, as is the usual manner, the patentees form the edge around the door or cover and the surrounding frame, with a series of short corrugations, serrations, or teeth, those of the door fitting closely into those of the surrounding frame.

ILLUMINATING GAS AND OIL.—G. McKenzie.—This invention relates to the obtainment of illuminating gas and oil from a combination of coal with shale oil or other mineral oil, and in subjecting the mixture to distillation or decomposition at various heats.

PREPARATION OF PEAT FOR RENDERING IT APPLICABLE TO THE MANUFACTURE OF ARTICLES WHICH ARE CAPABLE OF BEING PRODUCED BY STAMPING, MOLDING, EMBOSSING, OR ROLLING.—T. G. Ghislin.—In carrying out the invention the patentee takes any of the common kinds of peat, and having expelled therefrom, either by the application of pressure, heat or otherwise, such of the watery particles as can be easily removed, he mixes with it ground or comminuted seaweed, with the addition, if required, of any suitable gums, such as india-rubber, gutta-percha, or other substances of that class, or in addition thereto may be added resins natural or artificial, bituminous or albuminous substances, pitch, paraffin, stearine, or other oily and fatty matters; to give a body and firmness to the mass, chalk, talc, sulphur, siliceous, and other earthy matters may be added. Waste fibrous and woody substances may be incorporated with the other ingredients when it is desired to form sheets of the material, as for floor-cloths, and if the surface is intended to be painted, metallic oxides, such as white zinc, or ochre, alum, and other analogous ingredients, may be added.

MANUFACTURE OF ICE TO FIT IT FOR MAKING EFFERVESCING DRINKS, ETC.—O. W. Jeyes.—The inventor partly fills a vessel with the water, into which he forces carbonic acid gas; he then hermetically seals the vessel, freezes the contents into a solid state, opens the vessel and removes the ice, which may be employed in more or less large blocks in drinks to be made effervescin

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters, must, in all cases, sign their names. We have a right to know those who seek information from us: besides, as sometimes happens, we may prefer to address the correspondent by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 50 cents a line, under the head of "Business and Personal."

A. S. J., of N. Y.—The velocity of water issuing from an orifice depends upon the ordinary laws of falling bodies, making proper allowance for change of direction and friction. Thus the velocity due to a fall or head of water of 16 feet is 32 feet per second. If the orifice, in this case, be placed against a current of water of the same velocity, there will be equilibrium at the orifice; if velocity of current be greater, water will rise in the pipe, if less the water will run out. From such data you can calculate the velocity a ship must have to discharge bilge water by means of a pipe which terminates in the outside water, and has its direction turned backward in the path of the ship. In this case the head of water to be considered is the hight of the surface of outside water above the surface of the bilge water.

J. M. S., of Conn.—It was promised by Act of Congress that the diameter of the new five-cent coin should be one-fifth of a decimeter. Our correspondent has measured it and found it to be .81 inch and 5x.81=4.05. But a decimeter is 3 15-16 inches. We have noticed the alleged error before.

C. W. D., of ——.—When an electro-magnet has become saturated no increase of battery power will give it a stronger lifting power. The diameter and length of the wire used for electro magnets should correspond with the intensity of the battery. A current of intensity will move through a fine wire, and low intensity requires a thick and short wire. But the magnetizing power is always proportioned to the total *quantity* of electricity passing through the wire.

J. E. B., of Mass.—The force of a fly wheel, (its power to strike a blow, etc.) is proportioned to the square of its velocity: double the speed implies four times the force. The formula

$$m\ v^2$$

applies to all such cases, m being the weight of the matter in motion and v the velocity. The case of the fly wheel is somewhat complicated from the fact that the weight is not evenly distributed, different parts moving with unequal velocities. Thus, though a rule for calculating the force is simple enough, it is impracticable to obtain the data for its application. It is best in practice to determine the force under a given velocity by means of a friction brake or otherwise, and then to this apply the formula

$$m\ v^2$$

for all other velocities.

R. M. H., of Pa.—The alloy of iron and manganese commonly used in the Bessemer process is produced directly from the ore. In Europe the alloy is known as Spiegeleisen and is produced in Germany. In the United States a similar alloy is found as a residuum in the manufacture of zinc paint from an ore known under the name of Franklinite. This Franklinite "ferro-manganese" can be procured from the N. J. Zinc Co. There is an abundance of ores in America capable of producing "ferro-manganese."

L. G. T., of Conn.—You will find information on the subject of beet sugar in our last issue.

J. W. W., of Ala.—Water is so little condensed by pressure, that even at the depth of five miles in the ocean it would be but a trifle more dense or buoyant than at the surface. The Atlantic Cable is several times heavier than water, and there is no doubt that it rests firmly on the bed of the ocean.

S. R. M., of Pa.—The clarifying of turbid river water by subsidence or spontaneous settling, is cheaper than filtration where a large quantity is needed for manufacturing purposes. We suggest that settling tanks or basins may be more practicable in your case. Perhaps the best filtering medium on the large scale, is simple clean fine sand.

C. C. P., of Ind.—It is a disputed question if genuine diamonds have ever been made artificially. But since we know that diamonds are only a form of carbon we may hope to learn how to produce them. The principal forms or conditions of carbon are: charcoal, plumbago, anthracite, lampblack and diamond. We know how to put carbon into all of these forms except the diamond.

J. L. E., of Pa.—It is said that an excellent way of preserving natural flowers is to dip them for a moment into a solution of paraffine in benzine, or into melted paraffine. By either of these ways the flowers are covered with a thin film of transparent paraffine which excludes the destructive effect of the air. Perhaps some correspondent will give a better process.

R. M. L., of Tenn.—Mica is a natural product, and no solvent for it is known, at least no solvent from which it can be recovered. In its chemical nature and composition it is quite like glass; both are silicates.

W. B. S., of Pa.—A substitute for bricks made of sand and lime is not new. There is a company in this city making such an article which looks very well. . . . . Meerschaum may be mended with glue or shellac.

G. D., of O.—You may find in previous issues several processes for coppering iron. One of the most recent, is to immerse the iron in a solution of tartrate of copper made alkaline by the addition of caustic soda. By practice only can you find the proper method for your purpose.

B. C. S., of Pa.—Civil engineering is taught as a speciality at the scientific schools of Harvard, Yale and some other colleges. In this city there is an excellent school for the special education of engineers under the charge of Prof. J. G. Fox. If you have no embarrassment concerning money you should attend one of these schools; otherwise the best course is to secure a place under some practical engineer.

J. M. P., of O.—The nebulae of Orion have been resolved since the death of Sir Wm. Herschell. The nebular theory of La Place, however still maintains favor with many astronomers. The telescope at Harvard College is without doubt more valuable for all ordinary astronomical purposes than that of Lord Ross.

Business and Personal.

The charge for insertion under this head is 50 cents a line.