

"Argon"—the New Gas Discovered by Lord Rayleigh and Professor Ramsay.

A large audience assembled January 31 in the theater of the University of London to hear Professor Ramsay read the paper on "Argon, a New Constituent of the Atmosphere," communicated to the Royal Society by Lord Rayleigh and himself. The London Times says:

The meeting was noteworthy as being the first devoted to the discussion of a single subject and thrown open to the general public. In a former paper it had been shown that nitrogen obtained from chemical compounds is about one-half per cent lighter than atmospheric nitrogen. A great many experiments were described made upon nitrogen obtained from various sources. The details of these experiments have no interest for the general public, but the result is to show that nitrogen, from whatever chemical source it may be derived, has a constant density, differing from the density of atmospheric nitrogen by a constant quantity. It whatever way the atmospheric nitrogen may be separated the result is the same, and it was to solve the interesting problem thus presented that Lord Rayleigh and Professor Ramsay embarked upon the laborious experiments which have led to the discovery of a hitherto unrecognized substance. As that substance exists in great quantity in the atmosphere, it is decidedly singular that it has been so long overlooked, and all the more so when we consider that it was undoubtedly isolated by Cavendish, although neither he nor those who have followed him observed the significance of the irreducible gaseous residue from his classical experiment. When the discrepancy in weights between chemical and atmospheric nitrogen was first encountered, attempts were naturally made to explain it by contamination with known impurities, but finally it became clear that the difference could not be accounted for by the presence of any known impurity.

By considerations drawn from the ratio of specific heats, the authors are led to regard argon as a monatomic gas like mercury, and its atomic weight is therefore not 20, but 40. The substance is thus removed from among electro-negative bodies like fluorine, where its density would seem to locate it, to a place among such metallic bodies as potassium and calcium. This gets rid of a serious difficulty, but involves the hardly less formidable one of grouping it with such apparently dissimilar bodies as those just mentioned. In this dilemma the authors are almost disposed to regard

argon as a mixture of two unknown elements. However, balancing arguments for and against, they seem, on the whole, to incline to the belief that argon is a single element; but the conclusions which follow are, they admit, of a somewhat startling character. Many attempts have been made to induce it to combine, but they have all as yet proved abortive. In dealing with a substance of so absolutely inert and exceptional a character speculation must necessarily proceed upon rather abstract lines. So far as we have reached at present, argon stands entirely unrelated with any other substance in nature, and every theory of its constitution must accordingly be accepted with extreme caution. As to its physical properties, we have a little more information. Its solubility in water is relatively high, being $2\frac{1}{2}$ times as great as that of nitrogen. Its spectroscopic examination has been conducted by Mr. Crookes, who contributed a supplementary paper dealing with that portion of the subject. It has two distinct spectra, as has nitrogen itself. But while the nitrogen spectra are of different characters, one being a line and the other a band spectrum, the two spectra of argon are of the same type. According to Professor Olszewski, of Cracow, the critical point of the new gas is—121 degrees; the critical pressure, 50.6 atmospheres; the boiling point, —187 degrees; the melting point, —189.6 degrees; and the density of the liquid, 1.5.

Professor Armstrong, President of the Chemical Society, said that the case for the existence of the new constituent was strong, though it had not been brought forward in such logical order as it might have been. There was a body of evidence that there is in the atmosphere a constituent which has long been overlooked. Nitrogen was regarded as a very inert form of matter, and apparently argon was like it, only more so. Conceivably it was diatomic; the atoms might be so firmly connected as to take no notice of anything but each other. The spectroscopic evidence did not justify the conclusion that argon is a mixture of two gases—a point upon which Mr. Crookes evidently wavered.

Professor Rucker, President of the Physical Society, said that beyond all question a new constituent of the atmosphere had been discovered.

Lord Rayleigh observed that, though not unaccustomed to difficult investigations, he had never had a harder task than that which he had carried through with the assistance of Professor Ramsay. He discussed shortly the evidence which seemed to him and

his colleague to lend high probability to the belief that the new substance resembles mercury in being monatomic. He found it difficult to conceive how two atoms could be so intimately combined as to suit a diatomic theory of its constitution, but did not deal with the difficulties involved in supposing it monatomic.

Lord Kelvin joined the presidents of the Chemical and Physical Societies in congratulating the authors on the brilliant success of their investigations.

Remarkable Volcanic Eruption.

Details of the remarkable volcanic upheaval which occurred recently on Ambrym Island, in the New Hebrides, have been published in the Sydney Morning Herald, furnished by an officer of the British warship Dart, who says:

"We were lying off Dip Point on the morning of the 16th of October last when it broke out. We steered along the southeast coast, and could then see a dense mass of smoke arising near Benbow Mountain, and could hear a heavy rumbling sound just like distant thunder. In an hour we were abreast where the stream of rushing lava was making its way through the forest of trees. As it came on, filling up valleys on its course toward the sea, the rush and roar became louder. Every now and then, amid the dense smoke caused by the lava setting fire to everything, would arise a volume of steam as it rushed into the streams of water. The lava stream must have traveled several miles before reaching the sea, which it did, completely sweeping the cliff away for about 30 yards wide. It rushed into the sea with a tremendous roaring and hissing noise, and sent up an immense volume of steam until it reached a height of 5,000 or 6,000 feet."

A New Treatment of Whooping Cough.

Lyon Medical for January 13 publishes an abstract of an article from the *Medicine Moderne* for December 26, 1894, in which M. De Chateaubourg describes a new treatment of whooping cough, which consists in injecting, subcutaneously, two cubic centimeters and a half of a ten per cent solution of guaiacol and eucalyptol in sterilized oil. After the third injection the fits of coughing diminish noticeably, the appetite returns, and, as the vomiting rapidly ceases and the general condition begins to feel the good effects of the treatment, the whooping cough disappears at the same time. The author reported five cases.—N. Y. Med. Jour.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

BRAKE.—Simon P. Mitchell and Carl L. Schuppe, Van Buren, Ark., and Max B. Schuppe, New York City. These inventors have devised a mechanism which may be set for the control of the brakes from the engine, or operated by the ordinary hand brake shaft, and set by the shaft to operate automatically, the mechanism being applicable to either freight or passenger cars. Pivoted levers are connected with spring-pressed buffers, a rod connecting the levers, while a second set of levers connected with the brakes is engaged by the connecting rod, the rods having one end secured to the levers and their other ends slidably connected with the buffers.

Electrical.

CUT-OFF MECHANISM FOR STAND PIPES.—Robert McGowen, Washington, Ind. Two patents have been granted this inventor, one relating more especially to cutting off the pumping engines when the water reaches a certain height in the pipe, the cut-off being automatically effected by the water through electro-mechanical means, and the devices being automatically reset to normal position after the cut-off has been effected. Connected with the cut-off valve is a magnet and reciprocating bar moved in one direction by gravity, a trigger mechanism holding it elevated, while a counterbalance actuated by the stand pipe overflow releases the trigger. The other invention relates more particularly to cutting off the stand pipe from the water mains which have fire plug laterals, whereby the full pressure in the main may be instantly utilized in case of fire, the stand pipe being again placed in communication with the main when desired. It provides a combined electrically and gravity operating mechanism for cutting off the main from the stand pipe, electro-hydraulic operating means for restoring the mechanisms to their normal position, and mechanically operated tripping devices operated by the cut-off means. The entire operation of turning off or turning on the valve in the stand pipe lateral, as well as the automatic resetting of all of the mechanism, can be effected by a mere turning of the crank of an electromagnet to energize the electric operating devices.

Mining, Etc.

CANDLE HOLDER, CRIMPER, AND CUTTER.—Andrew J. Carter, Alma, Col. This is an improved miner's tool for readily cutting a fuse and crimping a cap, while also affording a convenient candle holder adapted to be driven into the mine chamber or hung on a projection from the wall. It resembles somewhat a pair of scissors with one blade, this portion being adapted to be driven into the timber of the mine, and having spring-pressed handles and jaws with cutting and crimping edges. The candle holder is held on the tool by spring attachment, having at one end an open ring for the reception of the candle, its other end being connected with a guide arm on an upward extension of which is a hook, by which the device may be hung on a projection in the mine.

DUST COLLECTOR FOR METALLURGICAL FURNACE.—Oliver R. Moffet, Grand Falls, Mo. For

treating waste lead fumes to retain minute particles, this inventor combines with a settling chamber a movable strainer, flexibly held to a definite or normal position, with independent means for agitating it and dislodging the dust. The strainer is pivoted and spring-pressed, but may be rocked against the pressure of the spring by a rock shaft and shaker arm. Any desired number of strainers may be set in the settling chamber.

Mechanical.

WOOD TURNING LATHE.—David T. Matthew and Albert T. Collier, Tacoma, Washington. This invention relates to lathes with many spindles for turning polygonal forms, and the improved lathe has a revolvable head with revolvable spindles to engage one end of a series of articles to be turned, while a movable knife frame carries knives to cut on their outermost surfaces. For cutting a large number of articles of a stock pattern, the knives may be set to enable the operator to turn out the work with the greatest rapidity and in the best manner, without the exercise of special skill. The top of the knife frame forms a rest for hand tools, to enable a wood turner to cut small orders of special pattern by hand.

BOX MAKING MACHINE.—Abner Carey, Cairo, Ill. This is a machine which holds the ends and centers, if any are used, in position, while nailing on the sides and bottom of the box. It has a top plate with transverse slots for the reception of the box ends, there being in the plate movable clamping bars to clamp the ends in place. The several parts are always held in proper position for nailing without gaging or mailing, enabling the operator to rapidly complete the work.

Agricultural.

CULTIVATOR.—Rene A. Boudreaux, Pugh, La. Two side plows are employed in this cultivator to hill or ridge the earth around the roots of the plants, the plows being readily adjustable as to height and distance from the beam. Near the heel of the beam is held a sweep adapted to break up the center of the row between the plants, a colter following behind in the central furrow to assist in holding the plows to their work. This cultivator is adapted for use upon sugar cane, corn, cotton, and other crops planted in rows.

COTTON CHOPPER.—Nicholas H. Newton, Rusk, Texas. This is a machine for cultivating and at the same time thinning out the rows of plants. It has semicircular hoes, with tapered cutting edge, adjustably arranged to regulate the depth they shall enter the ground, the hoes being rotated as the machine is drawn forward by a gear connection with the axle, and acting one after the other to remove the surplus plants from the rows, properly spacing them. Adjustable plow blades are supported at the rear to cultivate the rows at each side.

PLOW, CHOPPER, AND PLANTER.—This patent is for another invention of the same inventor, providing a combination machine to open the land and plant and fertilize it, and which may also be adjusted for chopping cotton plants and cultivating rows of plants.

cotton seed is to be planted the distributor is located in the fertilizer chamber, and the furrow opener forms a smooth trough-like trench in which the seed and fertilizer are evenly distributed, the furrows being then covered by the plows at the rear of the machine, the plows also forming furrows at each side of the ridge in which the seed is located.

ROLLER COTTON GIN.—James E. Coleman, Jr., Wade, Ga. This invention relates to gins of the McCarthy type, and provides a simple and durable construction which permits of ready access to all parts for repairs and other purpose. Combined with the ginning roller is a vertically adjustable breast carrying stationary knife with concave knife edge, and operating in conjunction with this knife is a movable knife in two parts, of a combined length approximately equal to that of the stationary knife, the parts of the knife being alternately reciprocated by eccentrics on the main driving shaft. The ginning roller is adjustable relative to the vertically adjustable saddle or breast carrying the stationary knife.

Miscellaneous.

AIR PURIFYING DEVICE.—Charles Peters, Brooklyn, N. Y. According to this improvement an air pump is connected with a reservoir in which is a purifying receptacle having inlet and outlet valves, a vessel held in the receptacle containing purifying substances. As preferably arranged, the air from the compressed air reservoir passes through charcoal and then through cotton saturated with salicylic acid, or other purifying agent, before delivery from the outlet valve. The apparatus is more especially designed for use in beer and ale compressors, for supplying the beer and ale in the keg with pure air.

SPRING WINDING CRANK ARM.—Gustav A. Brachhausen, Jersey City, and Alfred Wolff, Rutherford, N. J. For preventing overwinding and consequent breaking of the springs in music boxes or other instruments, these inventors have devised a crank arm comprising a spindle or shank engaging a shaft which connects with the spring to be wound, there being a crank arm proper on and normally rotating with the spindle, but which will turn independently of it when the spring has been fully wound up. The device is very compact, and such adjustment may be made that the desired maximum tension on the spring to be wound will not be exceeded.

MAGAZINE CAMERA.—August Lundelius, Port Jervis, N. Y. This is a combined magazine hand and detective camera of simple, compact and durable construction, without loose parts or projections on the outside of the casing, although the operator may manipulate it from the outside to make either time or instantaneous exposures, bringing the plates successively into proper position for exposure. The construction permits of filling the camera with simple and independent plate carriers for glass plates or films.

RIBBON HOLDER.—Joseph S. Lyons, Pittsfield, Mass. This inventor has devised a holder or case in which rolls of ribbon of different sizes may be displayed, any of the rolls being conveniently removed as desired. Upon the inner face of the top and bottom board of the case is a longitudinal groove, and in these

grooves are held longitudinal standards on which the rolls of ribbon are supported. The standards have each at one end a tubular portion in which is a spring, by which the standards are held in place, although they may be slid from end to end of the case.

DISPLAY CARD AND HOLDER.—William F. Jones, Baltimore, Md. A large field or backing card, according to this improvement, is provided with an easel support which forms a background for packages, small cards, etc., while on the front face are smaller layers of stiff cardboard, each one in front smaller than the one behind, forming a series of laps in which thin packages or cards may be stuck, more or less covering the main field card. Any one package may be taken from the support without loosening or affecting the support of the others.

VAPOR OR GAS STOVE.—Harry H. Kelley, Elyria, Ohio. This invention provides a simple and durable construction designed to utilize the heat from the burner to the fullest advantage for cooking and for heating a warming oven. It consists principally of an annular heating chamber under the stove top and surrounding the burner, the chamber having at its inner wall inlet openings for the heat and hot gas, there being an adjustable perforated curved band or damper for regulating the size of the openings.

BATH ROOM BRUSHING MACHINE.—Edwin Walkers, Amawalk, N. Y. According to this invention a framework to be fastened to the side of the bath tub has vertical guide ways in which vertically sliding brushes may be reciprocated by a pivoted lever having forwardly projecting handles, streams of water at the same time flowing down in the path of the brushes from faucets near the top of the frame. The improvement is designed to enable the bather to conveniently rub, scrub, and wipe dry the back of his body, the water being turned off and the brushes covered with towels for the drying operation.

THRILL COUPLING.—Delbert B. McCapes, Vermillion, South Dakota. This is a cheap and simple device, attached to the carriage axle by the usual clip, and having at its front end forwardly projecting arms between which the thrill iron is held. It is readily applied, and holds the thrill or pole so that it cannot become accidentally displaced, although readily released when desired, while it also prevents rattling.

GATE.—William B. Whittenberg and Augustus L. Hawkins, Georgetown, Texas. This improvement provides for two separate pivoted gate sections adapted to be conveniently opened and closed by means of cords extended to posts a little distance off at each side of the roadway, there being at the ends of the cords counterbalanced weights. The latches are adapted to support the gates laterally at their meeting edges.

PLUMBER'S FORCE PUMP.—George W. Aldrich, Brooklyn, N. Y. This is a pump for forcing water through a sink or spout to remove obstructions, and is easily applied to the ordinary escape of the sink, bath tub, wash basin, etc., for clearing the passage. At the lower open end of the pump barrel is a hollow cone, around the lower edge of which is a rubber packing, and the barrel has ports at its sides which may fill with

either water or air. The piston is operated until the obstructions are removed.

FOOT GEAR PATTERN.—Adolf Ehrenreich, New York City. This invention consists principally of a main or foundation plate forming the outlines of shoe patterns, and slides held adjustable on the main plate give outlines for various parts of the pattern. The improvement is readily adjustable for any size and style of shoe or other foot gear.

PENCIL OR PEN HOLDER FOR SLATES OR DRAWING BOARDS.—Philip E. Hannum, Cartersville, Mo. The improved holder appliance consists of a case attached to the end strip of the frame, preferably by means of clamping flanges. The case has different compartments for the reception of a knife, rule, erasers, etc., and on its cover are serrated sections for conveniently sharpening a pencil.

CAROUSEL.—Milton T. Weston, Kenton, Ohio. This is a merry-go-round in which a number of carriages are made to revolve around a central point through the exertions of the occupants of the carriages. It is of simple, strong, and inexpensive construction, designed to be perfectly balanced in operation, and having an operative mechanism comparatively free from friction.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

FEBRUARY, 1895.—(No. 112.)

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2. A residence at East Orange, N. J., recently completed for Geo. R. Howe, Esq. Two perspective elevations and floor plans. A pleasing design. Mr. Jas. H. Lindsey, architect, Newark, N. J.
3. A cottage at Glen Summit, Pa., erected for H. H. Harvey, Esq. Two perspective elevations and floor plans. A handsome summer cottage with some novel architectural features. Messrs. Neuer & Darcy, architects, Wilkesbarre, Pa.
4. A residence at Forest Park, Springfield, Mass. Two perspective elevations and floor plans. A combination of the Colonial style with French chateau features. Mr. Louis F. Newman, architect, Springfield, Mass.
5. "Sunnyside." The residence of Robt. S. Walker, Esq., at Flatbush, L. I. Three perspective elevations and floor plans. An exquisite design. Mr. Frank Freeman, architect, New York City.
6. A picturesque and well appointed residence erected for the late E. E. Denniston, Esq., at School Lane, Pa. Cost complete \$32,000. Perspective elevation and floor plans. Mr. Geo. T. Pearson, architect, Philadelphia, Pa.
7. A residence at Nutley, N. J., recently erected at a cost of \$5,800. Perspective elevation and floor plans. Mr. E. R. Tilton, architect and designer, New York City.
8. A cottage in the Colonial style at Southampton, L. I. Two perspectives and floor plans. Mr. C. H. Skidmore, architect.
9. Hall and Library at Glen Ridge, N. J., erected at a cost of about \$12,000. Mr. Wilbur S. Knowles, architect, New York City. Perspective view and floor plans.
10. A dwelling in the Colonial style at South Orange, N. J. Cost complete \$6,500. Mr. P. C. Van Nuys, architect, Newark, N. J. Two perspective elevations and floor plans.
11. Two views showing a most successful alteration in the Colonial style of the Blinn homestead at Cambridge, N. Y. One view showing the original structure as built over one hundred years ago and the other showing the additions and changes recently made. Mr. H. Inman Furlong, architect, New York City. Perspective views and floor plans.
12. A cottage in the Colonial style at Cushing's Island, Me., erected for Francis Cushing, Esq. Two perspective elevations and floor plans. Cost complete \$2,000. Mr. John C. Stevens, architect, Portland, Me. A unique and picturesque design for a model summer home.
13. A Colonial house at Westogue, Conn., being erected for the summer residence of Arthur M. Dodge, New York City. Perspective view and floor plans. Messrs. Child & De Goll, architects, New York.
14. Miscellaneous contents.—Improved method of manufacturing hydraulic cement.—A complete Pompeian house.—Inventions reduce the cost of building.—Those dreaded draughts. How they are caused and avoided in window-tight rooms.—Fire proof buildings.—The great staircase in the Capitol Building at Albany, N. Y.—Porous glass for windows.—Mexican onyx.—The Manhattan Life Building, New York.—View showing the waterproofing of the walls by the Caffal process.—A traveling lawn sprinkler, illustrated.—Egyptian cement plaster.—Ornamenting glass.—A bridge of concrete.—A new model parlor door hanger, illustrated.

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(6428) B. L. T. asks: 1. Where can I obtain a table giving the safe capacity in amperes of different sizes of German silver wire? A. Use the copper wire table, taking German silver wire of 2-7 times the diameter of the copper wire given as safe. 2. How can I obtain an illustration of the conduit and grip used on the Broadway cable system? A. See SCIENTIFIC AMERICAN, No. 20, Vol. 68.

(6429) A. B. R. asks: 1. Could 2 or 3 cells storage battery be used to run simple electric motor in "Experimental Science," if so, how many plates per cell and what size? To be run 100 hours. A. Yes. Use two square feet of positive plate. 2. In cab of locomotive running, the brass eyethrough which bell cord passes out of cab to engine bell becomes charged apparently with frictional electricity, as it emits sparks when whistle is blown. This occurs at night in very dry cold atmosphere. The eye is insulated by the wood of the cab. Three small air pipes are very close and one large steam pipe about eight inches away. Can you explain the phenomenon? A. It is due to the production of so-called frictional electricity, exactly as in the old-fashioned frictional electric machine.

(6430) C. S. B. asks (1) what size wire to use for 1/2 horse power motor for fields and armature. Also the number of sections for armature and number of loops to each coil? A. See our SUPPLEMENT, No. 600. 2. Can you give me the formula for some compound to use on tape for insulating purposes that will not dry out soon? A. If you add castor oil to shellac varnish, it will dry with extreme slowness.

(6431) H. C. L. asks: 1. Would like to be informed in the SCIENTIFIC AMERICAN how to make a cauterizing cell? A. Any low resistance cell will answer for cauterizing. 2. What is the internal resistance of a standard gravity battery? A. Two to six ohms is a good allowance. 3. Of a Leclanche? A. One or two ohms. 4. What size ports are necessary for cylinder 6 inches diameter, 12 inches stroke, at 40 pounds steam pressure, to make 30 strokes per minute? A. Steam ports 3/4 inch by 4 1/4 inches, and exhaust ports 3/4 inch by 4 1/4 inches, as yours is a slow-running engine. 5. What is the rule for such a calculation? A. A good rule for ordinary speed engines is to make the steam ports 1-15 of area of cylinder, and exhaust ports twice the area of steam ports. Arrange width and length to suit any peculiarities in construction of the steam chest.

(6432) A. S. asks: Which is the best kind of glue to use for sticking paper on cast iron pulleys? A. Cast iron pulleys may be lagged with leather without the use of rivets, by first brushing over the surface with acetic acid, which will quickly rust it and give a rough surface; then attach the leather to the face of the pulley with cement composed of 1 pound of fish glue and 1/2 pound of common glue.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 19, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing various inventions and their patent numbers, including items like Air blowing machine, Air compressor, Alarm clock, and many others.

Table listing various inventions and their patent numbers, including items like Filter, Fire extinguisher, Fireproof floor, and many others.