

dows. The kitchen and its apartments are trimmed and wainscoted with Michigan pine and finished natural.

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Affinity and What it Signifies.

Beeton says the word affinity appears to have been employed for the first time by Barkhausen, a German chemist, in his "Elements of Chemistry," published at Leyden in 1703. The elder Geoffrey issued the first table of affinities fifteen years later; and more extensive tables were afterward compiled by Wenzel, Bergmann, Guyton, Morveau and other chemists of the last century. Affinity or chemical attraction is the force which causes the particles of dissimilar kinds of matter to combine so as to form new matter. This definition indicates the differences between affinity and cohesion, which is another modification of molecular attraction. Cohesion merely binds similar particles into a mass; affinity brings about the combination of heterogeneous particles and causes them to lose their individual properties. The change of characters which follows the action of affinity is very wonderful. For example, the inflammable metal sodium unites with the suffocating gas chlorine, and the compound thus produced is chloride of sodium, or common salt, a substance which does not bear the slightest resemblance to either of its components. Chemical combinations do not take place indifferently, but in accordance with certain strict rules or laws. One substance will unite with another in preference to a third, or in some cases in preference to any other. This preference is denoted by the term elective affinity. By means of this discriminating action of affinity some combinations may be decomposed. If, for instance, there be a substance (x) composed of two elementary bodies (a and b) which

have a slighter affinity for each other than one of them (a) has for a third element (c), then if we bring this third body into connection with them under the requisite conditions, the one (a) which has the greatest affinity for it will leave the other (b) and unite with it to form another compound (y). The decomposition of water by red-hot iron illustrates such a case; for if water, which is composed of the elements oxygen and hydrogen, be passed through a tube containing iron filings heated to redness, its oxygen will unite with the iron to form a kind of rust, and its hydrogen will be set free. In every case where one constituent is expelled by a new body, and thus liberated, the decomposition is said to be the result of single elective affinity; but when two substances, each consisting of two constituents, act reciprocally upon each other so as to produce two new compounds, the decomposition is referred to double elective affinity. This double reaction takes place when chloride of phosphorus is thrown into water. The chlorine leaves the phosphorus and unites with the hydrogen of the water to form hydrochloric acid, while the remaining elements, phosphorus and oxygen, enter into combination and produce phosphoric acid. An idea formerly prevailed that the affinity between any two substances never varied, and great labor was bestowed on the preparation of tables exhibiting the precedence of affinities. Modern chemists, however, do not regard affinity as a fixed and regular force, and the tables alluded to are now considered of no use. The attraction of one body for another is greatly modified by the circumstances under which the two bodies are brought together. Alteration of temperature is one of the causes which influence the force of chemical attraction. When metallic mercury is heated nearly to its boiling point, and exposed in this condition to the air for a lengthened period, it absorbs oxygen and becomes converted into a dark red crystalline powder. But the same oxide of mercury, when raised to a still higher temperature, parts with its oxygen, which leaves the mercury in its original metallic state. Insolubility and the power of vaporization are potent disturbing influences. They interfere in almost every reaction and frequently turn the scale when the opposing affinities

are nicely balanced. Thus when a solution of lime in hydrochloric acid is mixed with a solution of carbonate of ammonia, a double reaction ensues; carbonate of lime and chloride of ammonium being generated. This result is brought about mainly by the insolubility of the carbonate of lime. Again, a mixture of dry carbonate of lime and chloride of ammonium, when heated in a retort, gives a sublimate of carbonate of ammonia, while chloride of lime remains behind. In this instance the great volatility of the new ammoniacal salt determines the nature of the decomposition.

What is called the nascent state is one very favorable to chemical combination. Thus, carbon and nitrogen refuse to combine with hydrogen under ordinary circumstances; but when these gases are nascent or newly evolved, as when they are simultaneously liberated from some previous combination, they unite readily. Some remarkable decompositions are referred to a peculiar modification of chemical force, to which the term disposing affinity has been applied. The preparation of hydrogen from zinc affords a familiar example of such decompositions. A piece of polished zinc put into pure water remains perfectly bright for any length of time and manifests no power of decomposing the liquid. On the addition, however, of a little sulphuric acid the metal becomes oxidized and hydrogen is freely disengaged. The acid dissolves the oxide as fast as it is produced, and thus keeps the surface of the metal exposed to the action of the water. This function of the acid is perfectly intelligible; but its decomposing influence, under which the oxide is first formed, is not well understood. Affinity is generally much stronger between bodies which are very unlike each other than between bodies which are closely allied. Thus, potassium and sodium tend strongly to unite with chlorine and iodine, but the bodies of each pair do not attract one another with sufficient force to enter into combination. The discoveries of Faraday and others have established the fact that whenever two substances unite to form a compound, they are in opposite electrical conditions, one being electronegative, the other electropositive. This and other facts go to prove that chemical affinity is a particular modification of electrical attraction.—The Humanitarian for October.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM OR GAS TURBINE.—Gustaf M. Westman, New York City. For the use of steam or compressed gas expansively, to insure a full utilization of the power and reduce the friction to a minimum, this inventor has devised an improved turbine in which the fluid is discharged tangentially from the periphery of the wheel. The wheel is arranged horizontally and a stationary disk connected with the motive agent supply has a series of passages, each terminating at its outer end in a series of channels discharging the motive agent to the inner ends of buckets discharging the motive agent at their outer ends tangential to the periphery of the wheel, the channels standing at angles to the passages, and approximately at right angles to the walls of the buckets.

AUTOMATIC STEAM VALVE.—Lyman A. Hotchkiss, Perry, Pa. For use in connection with automatic injectors for steam boilers, this inventor has devised a valve for automatically stopping the passage of steam upon certain action of the water in connection with which the valve acts, controlling the action of the injector according to the condition of the water in the boiler. The movement of the main valve is effected by a compound auxiliary valve working in auxiliary chambers, the operation of the auxiliary valve being effected by means of a float, and when a sufficient quantity of water has been injected into the boiler the lifting of the float stops the flow of water.

Railway Appliances.

OIL RESERVOIR FOR CAR JOURNALS.—Charles E. Harrison, Nebraska City, Neb. In oil reservoirs placed beneath the journals on cars and locomotives this invention provides improved means for maintaining a tight dustproof joint between the edge of the reservoir and the journal, the reservoir being also made adjustable to fit it in the usual reservoir, whatever its depth. The invention comprises an oil holder fitting within the casing and having its upper edges flanged outward and fitting the bottom of the journal and its bearing brass, a feeling wick engaging the journal, and a spring beneath the cup holding it in close contact with the journal at all times.

Bicycles, Etc.

BICYCLE HANDLE BAR.—Edward Q. Norton, Daphne, Ala. To prevent numbness of the hands and promote a more equal development of all the muscles in riding, this invention provides a finger rest or bearing on which the fingers may rest, instead of gripping the handle in the usual way, whenever there is an easy stretch of road. A wire or rod is bent to form a ring-like clamp fitting around the handle bar and forming a frame to encircle plates of wood or rubber in which are individual seats for the balls of the fingers, the clamp being also made to embrace the post, holding the device firmly to the handle bar.

BICYCLE RACK.—Walter G. Parsons, Englewood, N. J. This rack is especially designed for use in baggage cars and other places where space is limited, leaving the floor space of cars available for trunks and other baggage. Cross bars are removably supported just beneath the roof of a car, and upon these are slidably held lengthwise bars carrying hooks held at different angles adapted to support the bicycle, the arrangement

permitting of considerable adjustment, for supporting the wheel so that it will not come in contact with the baggage, preventing the bicycles from becoming entangled with one another, and facilitating the removal of any particular wheel when desired.

BICYCLE TOOL BAG.—Mark R. Marshall, Jr., Bunkie, La. A tool tray which holds the tools ready for use on the bicycle, without the necessity of removing it when the tools are to be used, is provided by this invention. The body of the bag is in the form of a shallow box, provided with straps to facilitate attaching it in vertical position to the frame of the machine, and in the bottom of the body is hinged a tray adapted to swing in and out of the body portion, the tray being divided by partitions into compartments adapted to securely hold the tools when the tray is in either a vertical or a horizontal position.

Electrical.

TELEPHONE REPEATER.—William H. M. Weaver, Macon, Ga. To repeat telephonic sound waves, either of speech or music, this inventor has devised a special arrangement of receivers and transmitters in connection with a common return wire, or earth circuit, forming four circuits, the arrangement being designed to reduce the cost of building lines for long distance work, as the repeaters may be cut in circuit at intervals. By connecting the repeater with local instruments in halls or other public places, mounting apparatus on proper sounding boards, etc., entertainments, operas, speeches, etc., may be listened to by audiences between cities.

Mechanical.

PUMPING APPARATUS.—Charles E. and David M. Newell, Franklin, Pa. A power-transmitting apparatus devised by these inventors is especially designed for the transmission of power from a motor to the pumps of oil or other wells. On a cement base is mounted a block forming a right-angled triangle, a shaft being held perpendicular to the base by sectional boxes, the latter being held to the base and held in position by tie rods. The shaft turns freely in the boxes and is stepped on ball bearings, and fixed to the upper portion of the shaft is a pulley on which is a belt by which power is received, there being also on the shaft an eccentric by which power is transmitted from the shaft by a pitman.

ROCK DRILL.—Albert M. Plumb, Colorado Springs, Col. This invention is for an improvement on a formerly patented invention of the same inventor, rendering the construction more simple, durable and inexpensive, and providing an effective feed and striking movement for the plunger carrying the drill. A spring is coiled around the reduced rear end of the plunger, there being means for changing the compression of the spring upon the plunger and thus regulating the force of the blow, as the plunger is drawn backward by a segmental gear to compress the spring, the disengagement of the gears releasing the plunger to force the drill forward to engagement with the work.

FLUE CLEANER.—George E. R. Roth, enbacher, Bloomfield, N. J. This device has transverse cutters or jaws with bevels inclined forwardly and rearwardly, some of the jaws being perpendicular to the scraper's axis, the cutters of the jaws being adapted to cut into the scale on the inside of the flue as the operator pushes the cleaner inward and at the same time turns it by means of a handle. A following brush removes and

pushes out the particles, steam being afterward passed through the flue by means of a branch connection with a steam supply pipe.

Agricultural.

MOULDBOARD.—Samuel A. Smith, McKinney, Texas. This invention covers an improvement on a formerly patented invention of the same inventor, simplifying the construction and arranging for the vibratory parts of the board being in independent sections, enabling one or more of the sections to be replaced without disturbing other parts or sections. These mouldboards are particularly adapted for use on what are known as "black lands," the mouldboard being given a vibratory action on contact with the earth passing over it, such motion tending to prevent the clinging of the earth to the mouldboard.

GUANO DISTRIBUTER.—John B. Kimbell, Alpharetta, Ga. This distributor for guano and other fertilizers may be readily attached to a plow or other agricultural implement, and consists of a hopper having a ground wheel on one end of the axle of which is a crank arm, there being in the hopper a distributing slide provided with pockets, its ends projecting through the hopper, while an arm on the ends is connected to a pitman which is also connected to the crank arm. The amount of fertilizer to be distributed may be regulated as desired.

HORSE RAKE ATTACHMENT FOR GRAIN BINDERS.—John M. Lytle, White Hall, Md. This attachment is designed to allow the grain to be cured in the swath as it lies loose on the ground, the grain to be then raked up by the machine and bound. The rake comprises an endless elevator having tines in the rear of which are guard rods and a series of rake teeth in the rear of the guards, the teeth having yielding knuckle joints and shanks with tubular extensions within which are spiral springs and rods. The grain passes up between the rake teeth and the guards to be delivered to the binding table or platform of any of the binding devices now in use, the guards clearing the grain from the fingers of the elevator belt.

Miscellaneous.

ELEVATOR SAFETY DEVICE.—Hugh Baines, Brooklyn, N. Y., and Alphonzo E. Pelham, New York City. For elevators which have governors to control the speed of descent, this invention provides improvements with a view of locking the elevator carriage when it travels too fast, or in case the governor gets out of order and fails to act, or in the event of the breaking of the hoisting cable. The shaft has guiding surfaces and a stationary rack, and the carriage has a bar movable into and out of engagement with the rack, mechanism driven by the movement of the carriage causing the bar to engage the rack teeth successively, while a clutch device is connected to the bar and operated by its prolonged engagement with the rack when the mechanism fails to act, the clutch device being adapted for engagement with the guiding surfaces of the shaft.

FIRE BRICKS, ETC.—William H. Brock, Brooklyn, N. Y. For bricks to be used in boiler settings, etc., this invention provides a fire cap or upper part of the setting of simple and durable construction, designed to hold the bricks in place notwithstanding their shrinkage from heat, the invention consisting principally of bricks formed at adjacent faces and ends with registering elongated recesses and keys of corresponding shape,

each extending into and filling the corresponding registering recess of two adjacent bricks. The improved construction may be employed to advantage wherever a strong bond is desired, absolutely preventing any sliding movement of the bricks relatively to the keys or to each other.

FISH HOOK HOLDER.—Horatio H. Garland, Brooklyn, N. Y. This improved holder is designed to facilitate conveniently storing a large number of hooks and their snells in small space, the points of the hooks being well protected and the snells held straight, permitting of the ready removal by the fisherman of any desired hook or snell, without disturbing the others. The holder has at each end forks provided at their outer ends with lugs or projections, the ends of the hooks being passed between the members of the forks and held in place by the projections, while the snells are engaged by an elastic band hooked upon a projection at the opposite end of the holder.

FASTENER SETTING DEVICE.—William Scheuer, New York City. This invention provides a ratchet punch especially adapted for securing buttons, hooks, etc., in the uppers of boots or shoes or other material. The device has a revolving head in which the buttons, hooks, etc., may be carried and from which they may be conveniently disengaged, the head having a timed movement by means of the ratchet to carry the button or hook to the point where it is to be affixed.

BOTTLE CLOSURE.—Alexander McLeod, Brisbane, Queensland. With this stopper it is necessary to break off the top of the neck of the bottle before the cork proper can be removed. The bottle neck has an annular indentation, and the upper portion of the neck, above this indentation, has a recess, in which extend spring arms extending downward from a cap plate on top of the cork, it being impossible to remove the plate and cork until the top portion of the bottle neck is broken off.

NURSING BOTTLE.—Thomas W. M. Worley, New York City. The neck of this bottle has a screw thread and annular bead at the edge, the cap having a thread to engage the thread of the neck, whereby the rubber nipple will be securely held on the bottle neck, and no metal or other substance will come in contact with the milk.

Designs.

KNIFE SHARPENING JAW.—Michael Nielsen and Thomas S. Thomsen, Greenwich, Conn. This jaw is in tubular form, with a peripheral surface which presents a series of annular steps, each having a flat surface and a tapering surface.

PICTURE FRAME.—Isak V. Arvonen, Calumet, Mich. This design consists of a floral wreath apparently resting upon a larger scroll wreath of ribbon type, stars being connected with the floral wreath, and an ornamental inner border, there being also a representation of a flag and an eagle on the flagstaff.

FRAME OR BODY FOR MUSICAL INSTRUMENTS.—Herman C. Levin, New York City. This design is for a twin body with two openings for parallel necks, the necks terminating one short of the other and being disconnected from and independent of each other.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.