New Mechanical Inventions.

A Safety Car Wheel and Lubricating Device have been invented by Mr. Benjamin F. Shelabarger, of Hannibal, Mo. The wheel is cast with a conical or converging flange, which projects a short distance over the axle box. The under surface of the axle box is convex and of the same curve as the inner edge of the flange on the wheel, so that should the axle break the car will be supported by the engagement of the under surface of the box with the projecting flange of the wheel. This flange serves another purpose, that of catching the oil which is thrown out by the jarring of the truck, and conveys the oil so gathered back into the box from the top of the chamber in the wheel formed by the flange, the oil being thrown outward by centrifugal force and led to the box. An inclined flange on the inner face of the box conveys the oil which may fall on the outside of the box to the annular chamber in the wheel formed by the first mentioned flange.

Mr. Theodore J. Palmer, of New York city, has made an improvement in Rocking Chairs, in which the rocking frame acts upon a base part to which it is secured by a spiral spring, and in motion is rendered reliable and uniform by an arrangement of overlapping side pieces, stop pins, and outer swell portions, which secure the position of the rockers upon the base frame, preventing lateral motion, and also tipping beyond a fixed point. The spring holds the chair in its normal upright position when not rocked.

An improved Tunneling and Excavating Machine has recently been patented, which is constructed with a cylindrical case or shield having a concave socket to which the convex portion of an interior case is fitted. The latter carries the excavating mechanism. Within it there are two concentric drums, the outer one of which rotates in contact with longitudinal rollers carried by the case, and the inner one rotates with the outer one and is capable of sliding longitudinally in it, being guided and supported by friction rollers. To the rear end of this drum a chain wheel is secured for receiving the driving chain, and to its front end a series of cutters are attached. A shaft carrying an earth auger is journaled in the center of the inner drum, and there are suitable devices for operating and adjusting the various parts. This machine is the invention of Mr. Hawley N. Cargill, of Grand Rapids, Mich.

An improved Churn is the invention of Messrs. John A. McConnell and Wm. V. McConnell, of Houston, Texas. By suitable gearing the motion from a crank operates a vertical dasher shaft having a head on the lower end secured in a box, and the whole so arranged that the cover and its attachments may be removed without disconnecting the dasher shaft.

Mr. Thomas Percival, of Napanock, N. Y., has invented a Door Latch which is operated by a spring thumb piece projecting over a handle. This latch is also made in reversible form, and may be locked by a key which fits in a key hole in the handle.

Mr. Joseph B. Stone, of Jersey City, N. J., has invented an improved Lock Hinge for shutters, gates, doors, etc., by which they may be securely locked into open position, the novelty consisting of a combination, with a second guide sleeve of the swinging hinge section, of a vertically sliding gravity catch with wedge-shaped ends, that passes over and locks to the fixed pintle bracket of the hinge.

Mr. Wm. Birch, of Salford, Eng., has invented a Machine for Opening, Smoothing, Spreading, and Guiding Fabrics, for the use of bleachers, dyers, calico printers, and others. In it the fabric, after passing through heaters, is led under and over rollers having ribs spirally radiating from the center, and through a governor, which, by springs, regulates the motion.

David P. Sularff, of Mifflintown, Pa., has invented a Mill Feeding Apparatus, by which the grain or grain product is agitated in the hopper and fed downward into the eye of the runner through a tube, by means of a spirally flanged shaft, and then discharged laterally at the bottom of said tube by a ribbed revolving cone. A sleeve is applied to the lower end of the feed tube to regulate the rapidity of discharge of the grain or grain product into the eye of the runner.

Using the Telephone.

The Bell telephone people in this city have adopted the system of renting instruments at $50 per double pair per year for use on local lines, and decline to sell them to users. In order to prevent infringement of their patents they maintain agents whose duty it is to watch for attempts at private manufacture of the invention over certain districts, and on detecting such to require the unauthorized maker to pay the same rent as if he had regularly hired his instrument. This method of managing a patent is rarely successful. The apparatus may be constructed very easily, and at the cost of only a few cents; it is so much a novelty that hundreds will make it, if only to gratify their curiosity, while others having found uses for it will go on and employ it as freely as they would the telegraph. No system of espionage can take account of all such cases, and therefore it probably would be found much more remunerative if the invention were manufactured and sold at a fair profit. This is already done in Germany, a correspondent writes us, where Professor Bell has no patents, and where a pair of instruments can be purchased for six dollars. In England the price demanded is $150, which is obviously excessive. Patentees and patent proprietors make a mistake in endeavoring to gain larger profits by guarding their devices thus closely. There is more to be gained by allowing them to come into the widest possible usage, and by the exercise of reasonable liberality.

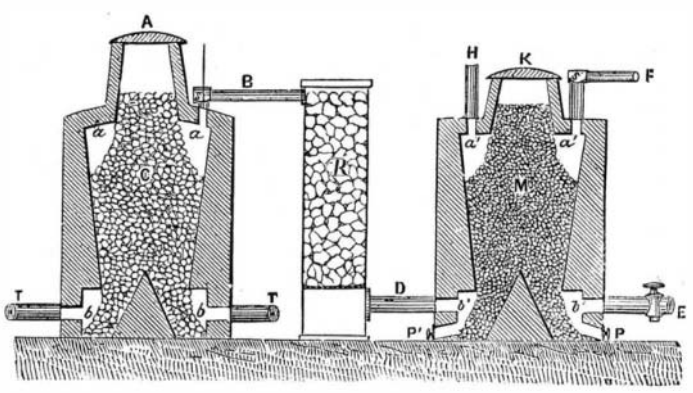


Fig. 1.—M. HENRI GIFFARD'S APPARATUS FOR THE MANUFACTURE OF HYDROGEN IN THE DRY WAY.

Novel Method of Indicating Perspiration.

M. Aubert, the author, has studied the effects of cutaneous disease in modifying the perspiratory secretion. He made use of the following simple procedure: A piece of white paper is applied to the skin, and maintained in contact a few minutes. The sweat, as it issues from the follicles, slightly moistens the paper at points corresponding to their orifices.

A dilute solution of nitrate of silver is then brushed over the paper, and the nitrate becomes converted into a chloride from the chloride of sodium in the perspiration. The chloride of silver blackens upon exposure to light, in this way mapping out the distribution, etc., of the sweat glands. With the aid of this test paper he has studied the secretions in nævus, ichthyosis, pelade, erysipelas, scabies, lupus, favus, herpes, psoriasis, etc.

Aubert's observations enable him to state that, as a rule, irritations of the skin completely suppress the perspiratory secretion, and that after their disappearance some time elapses before the secretion reappears. In cicatrices many of the glands disappear, but those which remain secrete more profusely than before.—*Le Progrès Medical.*

It is announced that Mr. J. W. Ward, of Belfast, has accomplished the feat of observing the satellite of Neptune with a 4½ inch achromatic.

M. HENRI GIFFARD'S NEW APPARATUS FOR THE PRODUCTION OF HYDROGEN IN LARGE QUANTITIES.

Hydrogen is the lightest of known gases. Air outweighs it fourteen and a half times. Hence it is the most favorable gas that can be employed for the inflation of balloons. Illuminating gas is commonly substituted for hydrogen for this purpose, but simply on the score of convenience, due to the readiness with which it may be obtained. The ascensional force of hydrogen is in the proportion of 1,100 to 700 as compared with that of illuminating gas, hence the economical production of the former for aeronautical purposes as well as for industrial uses is greatly to be desired.

A novel apparatus which, according to *La Nature*, solves this problem has lately been devised by M. Henri Giffard, the well known inventor of the Giffard injector. Two devices are proposed, the first working in the dry and the second in the wet way.

The first apparatus is based on two well known chemical reactions, namely, (1) the reduction by carbonic oxide of natural oxide of iron, and (2) the decomposition of vapor of water by metallic iron reduced in the preceding reaction. The system is composed essentially (Fig. 1) of two cylindrical furnaces, C and M. The first is filled with coke, and the second with fragments of natural iron oxide (ore). These furnaces are built of fire brick. Inside are formed recessed portions, so disposed that the coke or ore may be surrounded above and below by annular spaces, *a a*, *b b*, *a' a'*, and *b' b'*, which are always clear, and never choked by the material introduced at A and K. The ore furnace has doors at P P', through which the lower portion of the ore is agitated in case of obstruction.

The coke in chamber, C, is ignited from beneath, and air is blown in through the tweers, T T', causing energetic combustion. The carbonic oxide formed escapes at the annular space, *a a*, passes into the tube, B, and traverses the cylinder, R, which is filled with broken refractory material and wherein the cinders are deposited. The gas is then led by the conduit, D, to the lower part of the ore furnace, M, which it enters by the annular space, *b' b'*, and leaves by the space, *a' a'*. The oxide of iron is reduced and its surface transformed into metallic iron. The gas itself is converted into carbonic acid and escapes by the tube, F, communicating with a chimney. No grate or fire is necessary in the second furnace, as the carbonic oxide is itself hot enough to raise the temperature of the ore to the desired degree.

When the reduction of the ore is effected a current of steam is sent through the mass. The reduced metallic iron combines with the oxygen of the water and the hydrogen is disengaged. To this end the valves, *s'* and *s*, are closed and the steam is introduced by the tube, E. The hydrogen escapes by the tube, H, traverses a powerful refrigerant, and is finally dried in a lime purifier. After this decomposition of the water the iron is oxidized anew. Carbonic oxide is again passed through it, the ore is again reduced, steam is admitted, and thus the operation goes on indefinitely.

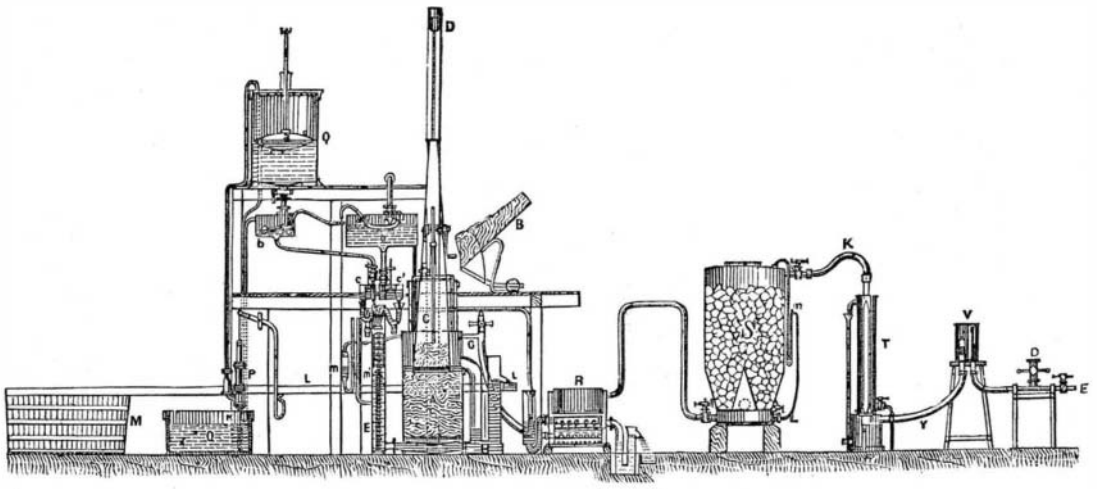


Fig. 2.—APPARATUS FOR THE MANUFACTURE OF HYDROGEN IN THE MOIST WAY.

The following details of actual experimenting with the apparatus are given: In order to produce 32·7 cubic feet of hydrogen there is required theoretically 12,320 grains of water, or say, in practice, allowing for loss 2·2 lbs. The formation of the last amount of steam costs, in Paris, one tenth of a cent's worth of combustible, counting coal at $6 or coke at $8 per ton. This steam, before use, is employed to drive the blower, so that it yields free a certain amount of motive power which should be credited. In order, moreover, to produce 32·7 feet of hydrogen, 8,878 grains of pure carbon are needed to generate (theoretically) the necessary carbonic oxide, or practically about 9,240 grains. To allow for loss, let these figures be increased to 12,320 grains. This amount of coke costing 0·62 of a cent, 32·7 cubic feet of hydrogen costs, in Paris, 0·67 of a cent. Add to this the insignificant cost of ore reduced to powder, etc., and the total maximum cost may reach 1 cent per same amount, or, say, 30 cents per 1,000 feet.

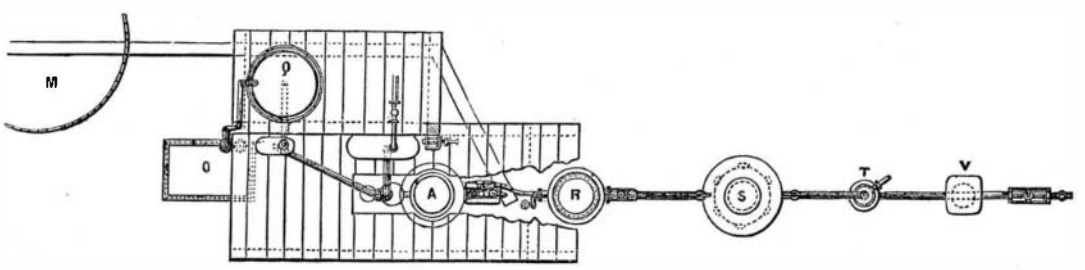


Fig. 3.—PLAN OF APPARATUS, FIG. 2.

M. Giffard's second or wet-way apparatus is no less ingenious than the foregoing. In Fig. 2 the generator, A, is the essential portion in which the hydrogen is made. Iron turnings are introduced by the swinging inclined plane, B. They fall into the large conduit, C, which is disposed like the mouth of a blast furnace and which is hermetically closed by a hydraulic arrangement lifted at the moment of filling by a cord passing over the pulley, D, Fig. 4. The iron turnings fill the interior of the vessel, A, as far as a lower perforated plate forming a false bottom. Water mixed with sulphuric acid enters the lower

part of vessel, A, by tube, E, rises, and attacks the iron. The hydrogen produced escapes by the tube, G. The sulphate of iron in solution runs off by the U-tube, H, and is diverted by the conduits, L L, into a large vat, M. The water as it enters raises, by its effervescence, the iron turnings, and it is said that the elements of the reaction are so constantly in such intimate contact that the production of gas, for equal weight of substances, is thirty times greater than in the ordinary apparatus. The vessel, A, is lined with thick sheets of lead.

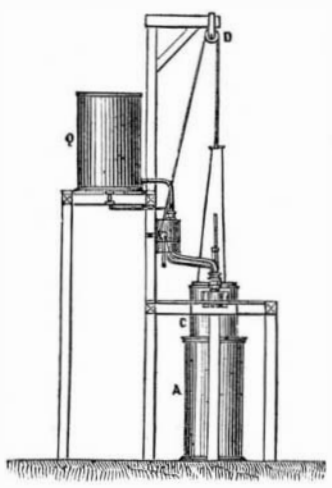


Fig. 4.—Lateral Section of Apparatus, Fig. 2.

The sulphuric acid, before being mingled with the water, is placed in a reservoir, O. A pump, P, raises it into an upper basin, Q, where a float constantly shows the level. A lower tube, having a gilded valve (so that the acid will not attack the metal), leads the acid into a tank, *b*. Water is similarly led to the tank, *b'*. Two floats automatically check the flow of the liquids when a certain level is reached. If the water supply fails, the float in the water vessel lowering, acts by a rod on the acid float and determines the closing of the supply tube for the acid, Fig. 5, so that the entire apparatus works automatically and regularly.

The acid passes from the vessel, *b*, into the vessel, *c*, and the water into *c'*. The flow may be regulated by screw valves. The vessels, *c* and *c'*, have underneath an adjutage of invariable section. By regulating the flow of the liquids in the vessels so that their level remains constant, it is rendered certain that the outflow by the lower adjutage is perfectly regular, Figs. 2 and 5. The water and acid next pass into the cylinder, E, by the U-tubes shown. In this cylinder are shelves over which the liquids fall, thus becoming intimately mingled. Finally, the diluted acid reaches the reservoir, A. At *m m'* are manometers which register the pressure in A and the frictional resistance determined by the flow of the liquid in the tube, E.

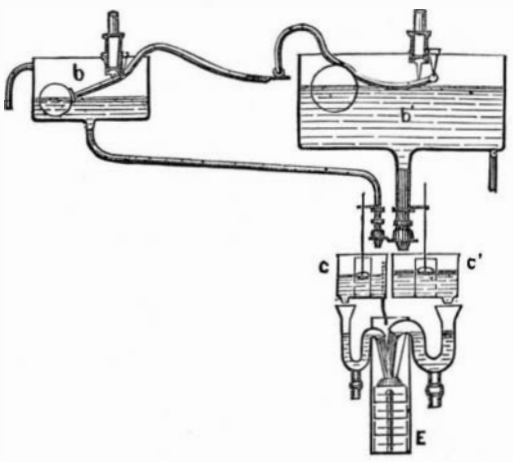


Fig. 5.—Detail of Vessels, *b* and *b'* and the Water and Acid Measurers, *c* and *c'*, Fig. 2.

The hydrogen formed escapes by G, and goes to the washer, R, thence to the dessicator, S, in which quicklime is placed and thence to the refrigerant, T, circulating in a continuous tube cooled by a current of cold water. Finally, by the pipe, Y, the gas reaches the bell glass, V, where there is a new and ingenious arrangement for measuring the supply. It consists of a large copper tube disposed vertically, and in which there is a thin lateral slit. This tube carries a hollow cylindrical valve, S, Fig. 6, which slides up and down without friction. When the gas enters the tube it lifts the valve and escapes by the lateral slit, and raises the valve the more as the disengagement is the more abundant. The height of slit opened is the direct measure of the supply. In the same vessel, V, are placed apparatus for showing the dryness, temperature and acidity of the gas. The liquid resulting from the reaction is saturated with sulphate of iron, which is allowed to crystallize and is sold. Deducting the value of this, the total cost of producing the hydrogen—which is reported to be as pure as it possibly can be made by any industrial process—is about $2 a thousand feet, or about the retail price of illuminating gas in Paris. M. Giffard intends to use the last described apparatus for the generation of the 650,000 cubic feet of hydrogen necessary for the inflation of the immense captive balloon which he proposes to exhibit at the Paris Exposition of 1878.

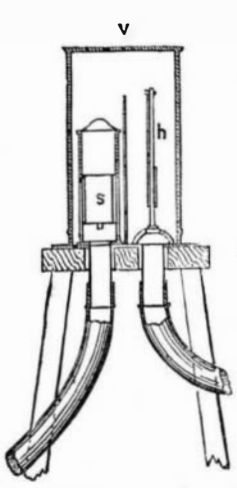


Fig. 6.—Detail of Vessel V, in Fig. 2.

Albuminoids in Foods.

We have already drawn attention, says the *Madras Times*, to the fact that many of the elaborate dietaries that have been drawn up, both in this country and at home, are unreliable, being based on unsound data. We pointed out that, under the method usually followed in determining the percentage of albuminoids, or flesh-formers, *i. e.*, food, it is usual to multiply the percentage of nitrogen found by 6·33, it being assumed that the whole of the nitrogen existed in the form of albuminoids. However, Professor Church, of the Royal Agricultural College, recently showed that this assumption is altogether incorrect—at any rate, as regards many vegetable productions, much of the nitrogen found being in the form of salts that possess no food value. Hence the albuminoids, in analyses calculated by the old method, are stated too high. As the percentage of albuminoids found in a food determines the value, or otherwise, of that food, it will be seen how serious is the error brought to notice. Professor Church appears to have made further investigation, and has discovered, as the following extract shows, some very serious differences in the percentage of albuminoids of certain garden products as determined by the old and new methods. It appears that in many of these products the albuminoids are only about one half what they were supposed to be. Even in grain, the albuminoids are greatly overestimated by the old method. It must be very gratifying to Dr. Lyon and others to find that their elaborate dietaries are altogether worthless. What a use Sir Richard Temple might have made of the facts we have disclosed, had they been shown to him!

Professor Church, in addressing the Cirencester Chamber of Commerce, recently said:

"It will, perhaps, be remembered by some members present to-day, that two years ago (December 5, 1875), in my annual report to this Chamber, I touched upon some experiments which had been carried out in my laboratory in order to ascertain the true feeding value of roots. These results were sufficiently startling, but they have since been amply confirmed by German chemists. The chief conclusion which must be drawn from them is this—that the flesh-forming values of many roots, and even of some other vegetable products, has been hitherto greatly overestimated by the ordinary process of analysis. The subject cannot be adequately discussed on the present occasion, but the annexed table will convey some notice of the differences between the old and new results:

Percentage of flesh-formers (albuminoids) in various farm and garden products, according to

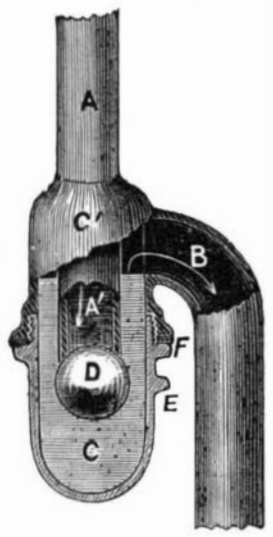
	New Method.	Old Method.
Potatoes	·95	1·83
Carrots	·55	·98
Lettuce	·71	1·53
Orange globe mangels	·48	·90
Cattle beet	·63	1·42
Yellow globe mangels	·59	1·33
Golden tankard mangels	·57	1·51
Long red mangels	·51	1·08
Pearl barley	5·73	6·22
Haricot beans	18·72	22·47

The New Coffee.

We understand that persons interested in the extension of Liberian coffee cultivation contemplate sending out supplies of seed to the different coffee-growing countries, but from what we can learn there is only disappointment in store for them. Liberian coffee can be easily raised from seed at its place of growth, but its culture from imported seed experience has proved to be very precarious, only a small percentage of the seed germinating as a general rule. Mr. William Bull, of Chelsea, who has done much to bring this new and promising variety of coffee into notice, informs us that he has examined thousands of seeds on their arrival from the west coast of Africa, but he found that their embryos had perished. To the botanical student this may perhaps appear a curious fact, but it is not to be disregarded by those who are engaged in coffee planting. The *Coffea Liberica* is so robust, prolific, and altogether so important from a commercial point of view that it would be a pity if its cultivation were retarded by fruitless attempts to raise it from seed. Undoubtedly its introduction is likely to prove most successful where the young seedling plants are imported, and their transmission can be safely effected in plant cases specially designed for the purpose. Mr. Bull's case is employed with success. The plants are kept in boxes and pots, which are fixed in the cases with battens, so that when they arrive at their destination they can be taken out from the cases and transplanted without receiving any check. By this means the Liberian coffee has been sent in large quantities to the East Indies, Brazils, Java, etc., and in Ceylon alone thousands of acres will shortly be under cultivation. Favorable reports have been received from most places where its experimental culture has been started, and its vigorous, hardy nature enables it to grow and fructify where the more delicate species, the *Coffea Arabica*, would infallibly succumb. Whole tracts of land will, in various countries, now become valuable for coffee growing which have hitherto been unsuitable for the purpose, and, in short, the new product bids fair to revolutionize that industry. Writing from Dominica, Dr. Imray says, "If the cultivation of Liberian coffee is gradually taken up here, as I think it will be, there is a future for this little country. There are thousands of acres of splendid coffee land that might be cultivated in this island with no fear of the 'white fly' before the eyes of the planter for the Liberian tree bids defiance to its attacks. Indeed, there is a very eligible field for settlers here, with a little money in their pockets, who wish to cultivate coffee." And these remarks apply to many other parts of the world where coffee growing as an industry is either neglected altogether or in an embryonic stage of existence.—*British Trade Journal.*

PREVENTION OF GASEOUS EMANATIONS FROM DRAINS AND SEWERS.

Although our bookshelves contain a goodly number of volumes written upon the subject of ventilation, drainage, sanitary laws, and similar important questions, it is nevertheless a fact that the community at large have very crude ideas in regard to them. Hence we too often find imperfect arrangements and defective apparatus in use in houses even of the better class, while among persons of the lower class we too often find that the most stringent municipal laws are necessary to compel people to observe the most obvious rules of decency and hygiene. The injury arising from gaseous emanations from drains and sewers is a subject that should receive more general attention, and one to which sanitary engineers and others should devote studious investigation. There are those who endeavor to counteract the evil by the practical application of simple but effective appliances. Any device that proves to be efficient in preventing the escape of sewer gases should receive the attention it merits from all city officials, as well as from private citizens, on account of its importance in conducing to the health of our cities and towns. The device represented here is both simple and effective as a sewer gas trap. The ordinary S trap and other water seal traps have imperfections in operation which do not occur with the one shown here. It is constructed by Messrs. B. P. Bower & Co., of Nos. 104 and 106 St. Clair St., Cleveland, Ohio, and from the following description and annexed sectional drawing its distinctive features will be readily understood:



The inlet pipe of the trap descends about half way down into the cup-shaped chamber, C, which forms the water seal, the shape of which chamber is such as to render it scarcely possible for it to be emptied by siphonage. The chief peculiarity of the invention, however, is a floating valve, a hollow rubber ball, which, while it permits of the discharge of the waste waters from the closet, sink, etc., thereupon at once seats itself, in virtue of its buoyancy and the impossibility of its finding any other position of equilibrium, against the opening of the inlet pipe, A A', which may be connected with washstand or other fixture. B is an outlet connecting with sewer; C is a cup-shaped chamber filled with water and referred to above; D, a floating valve; E, lug for unscrewing cup; F, rubber flanges.

The utility of this simple device and its superiority to the simple water seal are obvious, for the greater the back pressure brought to bear upon the trap from any cause, the more firmly will the ball valve be pressed against, and the more firmly will it close the only opening through which the sewer gases can enter the house. The passage of sewer gas through the water seal, by absorption and emission, is likewise checked by the valve, which cuts off all communication between the water seal on the sewer side and that on the house side, in the inlet pipe above the ball. While the water in the chamber, C, next the sewer, may charge itself with the gaseous exhalations, that in A' remains unaffected.

In addition, the following incidental advantages are claimed for this device: That from the shape and position of chamber, C, it cannot be emptied and unsealed by siphonage; that it cannot become unsealed by evaporation, since the only free surface of the seal is on the sewer side, which is already fully saturated with moisture; that from the scouring action of the ball, during discharge, the trap cannot become choked with sediment; that the trap is not liable to burst by freezing, since the compressibility of the ball valve allows for the expansion during freezing; the lower section of the water chamber is a glass vessel, so that the operation and condition of the apparatus may be inspected without difficulty.

To secure the full benefit of the scouring qualities of the trap, the makers state that it should properly be put in with a free waste, and that there should not be another trap between it and the sewer, unless ventilated between them. They give preference to the "Jennings" closet (or one similar in construction), in which a solid, weighted plunger is used to close the main discharge, the trap in this case being connected to an independent overflow.

ADVICES from Pittsburgh show that nails have recently advanced in price; but it is not stated whether or not this is due to an expected enactment of a law by Congress making each tenpenny nail a legal tender in lieu of the silver dime.