[For the Scientific American.]

GEOMETRICAL CHEMISTRY.---REMARKABLE DISCOVERY BY PROFESSOR HENRY WURTZ.

In France, our centennial year has been honored by the discovery of a new metal, to which its Gallic discoverer, Du Bois Baudrian, has given the name of gallium. But 1876 was destined to higher chemical honors at home, for it has witnessed here not merely the discovery of a new element, but the revelation of a new theory of chemistry, and the evolution of a new codeof laws for its working. If the expectations of their author, Professor Henry Wurtz, shall be justified, a grand revolution in theoretical chemistry is at hand, in comparison with which that of Laurent and Gerhard was insignificant. One thing is certain: chemistry is still but a collection of generalizations. We have no theory of chemistry, as Dr. Crum Brown recently said, although we are struggling towards it. Here Professor Wurtz comes to the rescue, offering us a theory which promises to explain many facts heretofore imperfectly understood, to correct our so-called rational formulas, to upset our theory of types, and to open new avenues of research.

Professor Wurtz begins by demonstrating mathematically the relative diameters of molecules in solids and liquids. Hitherto molecules have always been compared in a gaseous state, but he proposes to compare them as liquids or solids, and, as far as possible, at the temperature at which ice begins to melt, or just below 32° Fah. His first remarkable discovery was that the relative volumes of various simple substances, in a solid or liquid state, whether elements or compound radicals, as found by dividing their equivalents or atomic weights, as we are wont to call them (multiplied by 1,000 to avoid fractions), by their specific gravities, were perfect cubes of whole numbers.

Now it is well known that solids, whether cubes, spheres, or polyhedra, are to each other as the cubes of their diameters: hence, thought our New Jersey chemist, the cube roots of these figures represent the diameters of our molecules.

For instance, the diamond has a specific gravity of about 3·555. The atomic weight of carbon is 12; if we divide 12,000 by 3·555 we have 3,375, which is the cube of 15; hence the molecule of carbon in the diamond has a diameter of 15.

The volume occupied by a molecule of carbon when in combination is, however, not constant, being usually 8,000, or 20^3. The molecular volume of hydrogen is still less constant, but generally a perfect cube.

Oxygen alone retains a constant volume, namely, 5,184 (the cube of 17·3075) and hence Professor Wurtz takes this as his standard for all other values.

In his memoir, published in a late number of the *American Chemist*, he adduces numerous examples to prove the truth of this discovery, showing that, whatever space an element occupies in a liquid or solid, at 32° Fah., that space or volume can be represented by a perfect cube, whose root of course is the diameter of the space, be it cube or sphere. Such, in brief, is the distinguishing feature of the first part of the new discovery.

Strangely enough, this law holds good for compound radicals as well as elements, and we find NH_4 and CN following the same law, as if they were simple bodies. This one fact enables us to distinguish true radicals when in combination; and beside confirming the well known and generally received theory that ammonium and cyanogen are compound radicals, it convinces us that water, H_2O, is a real compound radical like cyanogen.* Another startling result of this law is that we find that CH_2 is also a compound radical, while ethyl, methyl, and amyl, the so-called alcohol radicals, are not radicals at all. Instead of writing alcohol as we now do, $\left.\begin{matrix}C_2H_5\\H\end{matrix}\right\}O$, or water in which an atom of hydrogen is replaced by ethyl, we should write it H_2O, $2CH_2$, or two molecules of the hydrocarbon radical CH_2 with one molecule of the water radical. One of the practical applications which can be made of this slight change is to calculate the quantity of alcohol in water (if above 24 per cent), directly from the specific gravity. Professor Wurtz says that this illustrates the fact that hydrometer tables can now be constructed for every aqueous liquid or solution with absolute accuracy.

Allotropic forms of the same element occupy different atomic volumes. This leads him to believe that there are eleven allotropic forms of phosphorus, and offers a convenient method for studying allotropism.

For the silicates, as well as in the more complicate formulæ of organic chemistry, the laws of Wurtz will be of great value in establishing the true formulæ. The striking changes that he proposes in the formulæ of some of our old friends will make us hesitate to adopt his theories until their truth is more fully established in all their details, lest further investigations reveal new laws which can still further modify the formulæ. For example, although ice has the formulæ of H_2O, as at present, he would write free water in its liquid state as $H_{10}O_5$; the peroxide of hydrogen he writes $H_{10}O_{10}$, hydrochloric acid H_2Cl_2; and to common salt he is obliged to give at one time the formula Na_2Cl_2, at another $NaCl_4$, at another NaCl.

We have already stated that the molecular volume of oxygen ever remains constant, while those of other elements vary as they pass from one form of combination to another. Hydrogen is especial Protean; elements that are, like oxygen, more acidic or electro-negative vary the least, those that are most basylic or electro-positive vary the most. The volume assigned to a molecule of hydrogen in water is $6,408=(18{\cdot}574)^3$. In hydrochloric acid there are two molecules of hydrogen, one having a volume of 13,824, the other of 15,625, which are the cubes of 24 and 25 respectively. In hydrocyanic acid, he puts the hydrogen volume still higher, namely, 29^3; in ammonia gas, N_2H_6, he puts three hydrogen molecules at 18^3 and three at 19^3. This same changeableness follows so many elements as to be quite confusing to the reader, but perhaps it is all right. It is not given to every man to see great truths so clearly as Kepler and Wurtz. and even Kopp taught this apparent inconsistency. Here, however, there is a law that seems to regulate this condensation; when one molecule combines with another, or with several others, it tends to assume the same volume, or nearly the same, as that of some molecule already present. Thus, when hydrogen combined with chlorine, whose molecular volume is 24^3, it became respectively 24^3 and 25^3. When combined with nitrogen, which is 20^3, it became 18^3 and 19^3, as stated above. The result of this is that we sometimes have, in a complex molecule, a regular series of consecutive cubes. It is worthy of mention in this connection that, although the molecular volumes vary, it is, with the exception of hydrogen and some heavy metals, within narrow limits; nor do the volumes of different elements differ much among themselves. The cube root, or diameter of the molecular volume, as Wurtz calls it, is for chlorine generally 24, sometimes 28; for bromine and iodine, 28 and 24; sulphur, 24; selenium, 28 and 24; carbon, 20 and 15; nitrogen, 20; silicon, 23; hydrogen, 16 to 28; aluminum, from 19 to 23.

In 1855, H. Kopp carefully studied the subject of atomic or molecular volumes (*Ann. Chem. Pharm.*, xcvi, 1, 153, 303.) For liquids and solids, he necessarily obtained, in general, the same results as Professor Wurtz, the molecular volume being the quotient obtained by dividing the atomic weight by the specific gravity. In the case of a non-condensible gas like oxygen, the molecular volume must be calculated by tedious methods from their liquid compounds. And here these two investigators differ widely; but Kopp, like Wurtz, attributes, as we said, variable volumes to the gases, including oxygen, even giving, as Wurtz does, different volumes to the same element in the same molecule, and fails to recognize the fact that these volumes, when multiplied by 1,000, are almost perfect cubes. As Kopp also overlooked the simple test above given for compound radicals, he made no changes in the rational formula of alcohols, ethers, and other organic compounds; hence he exerted no such influence on chemical notation as Professor Wurtz's theories will do, if adopted.

It is idle to speculate on the ultimate fate of this discovery. Chemists will hesitate, we think, to accept a theory based on facts derived from a course of reasoning capable of yielding diverse results in different hands, and requiring such ingenious manipulations to make its conclusions harmonize with known facts. The corner stone of the new edifice is the molecular volume of oxygen, which is strangely enough not a perfect cube, but three times the cube of 12. What this curious coincidence may mean, Wurtz confesses himself as yet unable to understand. The manner in which he obtains the magic number 5,184 is as follows: The specific gravity of peroxide of hydrogen, as found by Thénard, is 1·452; Wurtz applies certain corrections which raise these figures to 1·4642. For reasons which he fails to state, but apparently to favor his theory, he calls it 1·4665 at 32° Fah. The equivalent of H_2O_2 is $(2\times1)+(2\times16)=34$. Dividing 34,000 by 1·4665, we have 23,184 as the molecular volume. From this we subtract the molecular volume of water, 18,000, which gives 5,184. In tabular form:

H_2O_2	; 34,000 ÷	1·4665	= 23,184
H_2O	; 18,000 ÷	1·0000	= 18,000
Oxygen			= 5,184

Whether this discovery of Professor Wurtz is equal, as he believes, to the discovery by Kepler of his great laws, we leave to our readers to judge, and for the future to demonstrate.

E. J. H.

* The atomic weight of H_2O is 18; multiplying by 1,000, and dividing by the specific gravity of ice, 0·91674, gives us 19,683, a perfect cube of 27. This is also the diameter of a molecule of H_2O in the alcohols. Hence the reason for taking the densities at the point where ice begins to melt, the volume of liquid water, 18,000, not being cube.

Photo-Printing on Wood Blocks.

The negative is, of course, taken in the usual way; but as it must be reversed on the block it should be taken through the glass, that is, the film side should be next the door of the slide, the thickness of the glass allowed for in focussing, and the spring of the slide kept from the film, in any of the well known modes. To prepare the block, dissolve five grains of chloride of barium in about half a drachm of sulphate of barium. This is then gently rubbed over the surface of the block—first with the finger and then with the ball of the thumb—so as to produce an even, thin coating, which result is easily obtained after a little practice. A coating just sufficient to whiten the surface will be found enough. Or the two salts of barium, in very fine powder, may be intimately mixed, and, by a circular motion of the finger, applied to the block, when sufficient will be found to have adhered to answer the purpose. The barium chloride is converted into silver chloride, and the surface rendered sensitive as follows: Six grains of pyroxylin is dissolved in half an ounce of ether and two drachms of alcohol; then twenty grains of silver nitrate is dissolved by heat in two drachms more of alcohol, and added. This should stand till clear, and will keep well if light be excluded. The silvered collodion is poured on and off the block in the ordinary way, and may be dried either spontaneously or by artificial heat. In consequence of the rigidity of the block the progress of printing cannot be examined in the usual way; but with a moderate amount of practice there is little difficulty in hitting the proper time without examination. By a method we have lately adopted, the progress may examined from time to time, and the block returned to its proper place with ease and certainty.

The printing should not be deeper than the finished image is intended to be, as it does not seem to lose anything in the fixing, but rather appears to get a little deeper. On removal from the frame, the surface of the block should be brought into contact with a solution of hyposulphite of soda in a flat dish, and moved about on the surface for a few minutes, when it will be found sufficiently fixed, requiring only to be washed with a gentle stream of water and set up to dry. Or if it be desirable to get rid of the thin film of collodion, it may easily be dissolved off by a mixture of ether and alcohol before the application of the fixing solution.—*British Journal of Photography.*

Cunning of the Adder.

A correspondent of the Milwaukee *Sentinel* states that, over thirty years ago, in Leeds, Greene county, N. Y., his attention was one day attracted by the plaintive cry of a cat. Looking into a garden, an adder was seen near the cat. The cat seemed to be completely paralyzed by fear of the adder; she kept up the plaintive cry, as if in great distress, but did not take her eye off the serpent, or make any attempt to attack or escape. Soon the snake saw that human eyes were observing him, and he commenced to crawl slowly away. "I then," continues the writer of the narrative, "concluded to release the cat from its trouble. I took a garden rake and put it on the snake's back, and held it without hurting it. As soon as I had the snake fast in this position, it raised its head, flattened it out, and blew, making a hissing noise, and something resembling breath or steam came from its mouth. When that was exhausted I removed the rake, and the adder turned over on its back, lying as if dead. With the rake I turned it over on its belly again, but it immediately turned on its back. This was repeated several times. At last it was taken out of the garden, laid in the road, and we all retired to watch its movements. It commenced to raise and turn its head slowly (looking about the while) until entirely on its belly, and started at full speed for a little pool of water in the road, from which it was raked out and dispatched."

The Ancestor of Man.

In reference to the question, from which of the quadrumana did man originate. Professor Haeckel, in his recent work "The History of Creation," gives his opinion that the human race is a small branch of the group of *catarrhini*, and has developed out of long since extinct apes of this group in the old world. And when on this subject, he refers to Professor Huxley's remarks, which show that man is, nearly as much as the ape, a four-handed animal; for various tribes of men, the Chinese boatmen, the Bengalee workmen, and the negroes when climbing, use the great toe in the same manner as the monkey, and therefore the possession of only a single pair of hands is not to be looked on as a characteristic of the human race. He also points out a fact, necessary to be observed by unscientific people, namely, that none of the manlike apes are to be regarded as the parent of the human race, but that the apelike progenitors of the human are long since extinct. In concluding his work, Professor Haeckel remarks on the desire of some who are not actually opponents of the doctrine of descent. "They wait," he says, "the sudden discovery of a human race with tails, or of a talking species of apes." But such manifestations. the author observes, would not furnish the proof desired; and unthinking persons would be provided with as satisfactory (?) arguments as they nowadays employ in hurling their defiance against all who are evolutionists.

Russian Hardware Manufactures.

The Russian edge tools differ from those of other countries in some peculiar shape. The common spade, for instance, is made chiefly of wood and simply tipped with iron; it is of small size, rounded at the edge, and has a plain curved handle. The ax is much larger than that manufactured by other nations, and is used, too, for all kinds of carpenter work—answering, in fact, as a plane, a hammer, and even as a saw, the last tool being rarely used by the Russian mechanic, for he can wield the ax more readily, and cut through thick logs of wood with incredible precision and rapidity. Samovars are a leading article of the Russian metal industry, these being a kind of tubular boiler, with little charcoal furnaces; they are used for making tea; the material is copper, which is almost exclusively used among the well-to-do classes for cooking utensils: tinware, hollow cast iron vessels, and pewter being but little in vogue. Horseshoes are produced by hand at the rate of some 30,000,000 annually. Bell making is carried on with especial success, the bells being remarkable for their immense size and richness of tone. Harness fittings of European pattern are made, but only in very limited quantities, those which are used upon Russian harness being of considerably different construction.

Indelible Ink.

Two fifths of 1 lb. tartaric acid are dissolved in 61 cubic inches hot water; in one half of the solution dissolve $\frac{1}{5}$ lb. oily anilin; add the other half, and then $\frac{1}{5}$ lb. chlorate of potassium. Allow the solution to cool and subdue until next day; filter from the bitartrate, and bring the liquid to the density of 7° B. Thicken sufficiently with gum arabic, and add to each cubic inch $\frac{1}{25}$ lb. copper sulphate, dissolved in a little water. This ink may be at once used for printing muslin and other fabrics, upon which the black color will be perfectly developed by bleaching liquids Chlorate of copper is also used for writing upon zinc used for signs and labels exposed to the weather.

Empty Empires.

Chambers' Journal has taken to discussing the question of who owns the North Pole. Its ownership, we think, if it be found at all, will probably be acquired by either the United States or England, and either the stars and stripes or St. George's cross will wave over the possible patch of earth, according as some Yankee explorer or Captain Nares first plants his foot on it. As to either banner staying there, that is another matter. We fear the indigenous inhabitants, —walruses, polar bears, and chance Esquimaux—will laugh the eagle and the lion to scorn, and no tidings of either monitors or Woolwich cannon will induce them to allow either starry flag or meteor banner to remain, after it is left to their tender mercies.

There is an old tradition in the United States navy of a dispute between representatives of the two nations over a bit of ground just about as useless as the north pole would be. Two men of war, respectively English and American, met many years ago among the South Sea Islands. Volcanic eruptions in that locality were rife, and the navigators of vessels hardly dared close their eyes at night for fear of new reefs and shoals appearing, regarding which the charts were literally "at sea." The American ship had been in the neighborhood longer than the English one, and therefore her skipper knew something of the marvelous tricks which the land occasionally played. Hence he was not at all surprised to discover one day looming up before him an island, where, according to all accounts, there should be open sea. The Englishman sighted the land at the same time, and in a few minutes a well manned cutter shoved off from his gangway and pulled for the shore. The American captain likewise sent a boat, and a lively race ensued to see which should first reach the land. As the English boat got into shallow water, her officer jumped overboard, and was followed by some of his crew, who splashed up to the beach. By the time the American boat had landed, the English flag was floating from a boat-hook stuck up for a staff, and a red-coated sentry was calmly walking to and fro beside it. The English captain then sent word over to the American vessel that he had taken possession of that island in the name of the King of Great Britain. The American captain, however, claimed first discovery, and sent back a counter message that that island belonged to the people of the United States. Before morning a storm arose, and both ships worked hard to keep off the lee shore, but when the day broke, there was no lee shore to avoid. The island had gone, and with it flag and sentry. A convulsion similar to that which raised it above the sea had caused it to sink again; and two astonished captains might have been seen navigating their vessels over its former site, vainly searching for the beautiful island which each intended to present to his grateful country, and thus secure to himself imperishable renown.

NEW BOOKS AND PUBLICATIONS.

CONTRIBUTIONS TO THE NATURAL HISTORY OF KERGUELEN ISLAND, made in connection with the United States Transit of Venus Expedition, 1875—76. By J. H. Kidder, M. D., U. S. N. Part II. Washington, D. C.: Government Printing Office.

This pamphlet contains some interesting information, especially as to the *fauna* of the remarkable island which forms its subject.

THE AMERICAN NEWSPAPER DIRECTORY, containing Accurate Lists of all the Newspapers and Periodicals Published in the United States, Territories, the Dominion of Canada, and Newfoundland. New York city: George P. Rowell & Co., 41 Park Row.

A new edition of Messrs. Rowell & Co.'s handsome volume is now before us; and the steady increase in its number of pages shows us that the newspaper industry is not suffering from contraction. The advertising world is well acquainted with the usefulness of this manual; and it maintains its reputation for accuracy, except in one very glaring instance. It understates the circulation of the SCIENTIFIC AMERICAN about 15,000 copies; and it does not mention the SCIENTIFIC AMERICAN SUPPLEMENT at all.

THE COAL TRADE, a Compendium of Useful Information. By Frederick E. Saward, Editor of the "Coal Trade Journal." New York city: F. E. Saward, 111 Broadway.

An excellent handbook of the whole subject of coal, describing all the mining regions, the various qualities of the mineral, the working of collieries here and abroad, the rates of freight, and all other particulars. It is illustrated with maps.

THE FANCIER'S JOURNAL.—All young people and many old ones take an interest in poultry, pigeons, rabbits, birds, and other pets of various kinds. The above-named weekly publication is a journal in which all such persons are interested, as it treats these subjects in a clear and practical manner, with a thorough knowledge of breeding, rearing, feeding, etc. Each number contains information of great value to poultry raisers, dealers, and fanciers. It is published weekly at Hartford, Conn., and is furnished to subscribers for $2.50 a year.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED RAILROAD SIGNAL.

Ira Robbins, Hughsville, Pa.—This invention consists in erecting along the foot of a mountain or hill (where there is danger of a land slide) a series of posts between which suitable panels are bottom-hinged so as to connect with signals near a railroad track. Unless a slide takes place, the panels remain in position and the signals are not displayed; but should one occur, any approaching train is notified in time to slow up and avoid danger.

IMPROVED ROTARY ENGINE.

Thomas C. Orr, Enfield, Ill.—The pistons are pressed back in the hub by the abutment for passing it, and are pressed out against the case after passing it by steam which passes from the steamway into the hub behind the pistons. The latter are a little larger at that end to insure sufficient pressure to overcome the pressure on the outer end. A spring is used with each piston to keep it out when steam is not acting on it.

IMPROVED MACHINE FOR PUNCHING METAL LATHS.

Le Roy Carpenter, Victor Kauffman, and Eason White, Beardstown, Ill.—Two metal rolls have punches for making slits for the plaster; also punches for making the nail holes by which to fasten the sheets on the studs, and a cutter for trimming the sheets. Said rolls are geared together and provided with a hand crank for turning them.

IMPROVED MILLSTONE.

John W. Truax, Essex Junction, Vt.—This invention improves the construction of millstones, to enable them to be more readily adjusted and balanced, and to make them more effective in operation. An illustrated description will be found on page 198, current volume.

MACHINE FOR FORMING SOCKETS ON HAMMERS, ETC.

Charles A. Williams and Joshua F. Williams, Skowhegan, Me.—This is an improved method of punching and forming the handle sockets on hammers, adzes, hatchets, and other tools with one heating. The invention consists in a machine to which is exposed the hammer or other blank after heating, first to the action of a spreading or enlarging die and punch, and then to the action of the perforating and socket-shaping die and punch.

IMPROVED WATER WHEEL.

John Shortridge, Frank W. Shortridge, and Ernest W. Shortridge, Rockingham, N. C.—This invention consists in providing a water wheel with tapering bottom parts below the bottom edge of the buckets, to rest on a turning point, and form an escape box below the wheel.

IMPROVED LOCOMOTIVE FEED WATER HEATER.

Horatio N. Waters, West Meriden, Conn., Milton W. Hazelton, Chicago, Ill., and James K. Taylor, Boston, Mass.—A corrugated tube, through which the feed water passes from the pump into the boiler, is surrounded by a steam jacket, into which the exhaust steam is forced by the back pressure of the nozzle, by means of pipes connecting it with the exhaust pipes. A spoon-shaped projection is provided to catch a portion of the steam and direct it into the jacket. The invention also consist of the method of constructing the corrugated tube for the water, and of a spiral deflecting core in the axis of the corrugated tube to divert the water into the interior portions of the corrugations to facilitate the heating.

IMPROVED RAILROAD TIE.

George D. Blaisdell, Cambridge, Vt.—This tie consists of a cast iron bar, with a box in each end for holding the rail chairs, and a rod extending from end to end of the tie, and securing the chairs in place by clamping plates.

IMPROVED MACHINE FOR MAKING NUTS.

Carl G. Gustafsson, Jönköping, Sweden.—This is an improved machine for making screw nuts of hexagonal and other shapes in rapid and effective manner. It consists of an intermittently revolving disk with dies, into which the nut blanks, cut by shears from the bar, are fed and brought by consecutive punches into the required shape.

IMPROVED WINDMILL.

Jason C. Sparks, Tipton, Iowa.—The wheel with fixed vanes is used, and wheel supports are jointed to the turntable, carrying the tail vane, so that the wheel swings around edgewise to the wind to adjust it to the varying power of the wind and to stop it.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED LAMP COLLAR.

Theodore L. Owen, Geneva, N. Y.—This is a mode of constructing a lamp collar in two parts, to one of which the burner is attached, while the other is secured to the flange of the lamp. The object of the device is to allow of the replenishment of the lamp with oil without necessitating the unscrewing of the burner.

IMPROVED INVALID BEDSTEAD.

Andrew McArthur, South Chenango, Pa.—This consists of a platform, pivoted longitudinally and transversely in a frame, so that the patient can be tilted upright or sidewise, as may be required for comfort. On the lower part are independent jointed supposts for each leg, with bandage appliances, and a windlass and straps for extending the leg in case of fracture or dislocation. The upper part is provided with a bed with edges suitably formed to be strapped around the body of the patient, and in the middle portion are arm rests, contrived for adjusting to different positions for the comfort of the patient when elevated by tilting on the transverse axis.

IMPROVED COFFIN ATTACHMENT.

Samuel A. Hughes, Parker's Landing, Pa.—This consists of a hook attachment to coffins, for lowering them by the ropes or straps, instead of having the ropes or straps pass under the coffins. It is fastened to the handle plates.

IMPROVED PIANO LOCK.

Amos S. Blake, Waterbury, Conn.—This invention consists in the lock case, formed of two plates, by bending up the side and end edges, and bending over the end edges of the one plate and slipping the other plate into the seat thus formed.

IMPROVED MAT.

Arthur Thompson, Warner, N. H.—This is a mat of excelsior, mounted on and attached to a backing of paper, cardboard, cloth, or sacking, the object being to provide a cheap mat for omnibuses, street cars, and the like.

IMPROVED MEANS OF ATTACHING MAST HOOPS AND SAILS.

Edgar B. Beach, West Meriden, Conn., assignor to himself and H. B. Beach, of same place.—The usual mode of attaching the back of fore and aft sails to the mast hoops is by a seizing between an eyelet in the sail and around the hoops. The above inventor suggests an excellent substitute for this mode of fastening, which consists in two semicircular sleeves of metal, attached to the hoop, and which receive the leech rope in their semicircular portion. A clamping screw passing through both pieces, and the eyelet in the sail fastens all together.

IMPROVED BARBED FENCE WIRE.

Richard Emerson, Sycamore, Ill., assignor to himself and Chauncey Ellwood, of same place.—The invention consists in a fence barb formed of a piece of wire bent into the form of a figure 8, with both end parts upon the same side of the middle part, and with its ends projecting in opposite directions. When the barbs have been adjusted in place upon the fence wire, the eyes are straightened out, forming a bend in the said fence wire, into which the end parts of the barb are pressed, so that the barbs can neither turn nor slide.

NEW HOUSEHOLD ARTICLES.

IMPROVED WASHING MACHINE.

Squire Turner, Sr., Columbia, Mo.—A lower tub is made ring-shaped, and to its inner sides are attached the standards that support the upper tub. A vertical shaft passes down through the centers of the tubs. The bottom of the lower tub is made flat, and in it are placed four rollers, placed at right angles with each other, and each made in sections, which revolve upon a rod, the ends of which are attached to brackets, secured to cross bars. The bars and rollers are connected so that all the rollers and their bars may move together. The bottom of the upper tub is inclined, and in it are placed four conical rollers. Every other one of the rollers has cavities formed in it which carry down air and discharge it among the fibers of the clothes, to be pressed out, together with the water, by the following smooth rollers, removing the dirt and washing the clothes clean.

IMPROVED DISH-WASHING MACHINE.

Edward P. Hudson, New York city.—The dishes are submitted to the action of sponge rollers, and pass to an endless belt, thence to a second set of rollers. They then go to another part of the receptacle, where the water acts like a cushion and conveys them smoothly to the bottom of a strong basket, in which they settle without chipping, breaking, or being otherwise injured.

IMPROVED GRATE.

Francis Z. Hickox, Utica, N. Y., assignor of one third his right to Michael Smith and one third to John Mills of same place.—This is a shaker or stirrer, consisting of a frame fixed to slide forward and backward on vertically inclined ways under the grate, and having teeth projecting up into the fire between the bars, so as to have a forward and backward and up and down raking action.

IMPROVED CHILDRENS' COMMODE.

Allen B. Crowell, West Dennis, Mass.—This combines the advantages of a chair, walking stool, and commode. The chair is arranged within a case, with front and rear doors, closed by a cover that is used as a tray when attached to the front part of the commode. Closets at the sides serve for storing the playthings, while a cross bar at the rear, with extension guards of the side walls, allow the use of the commode as a walking stool.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED MACHINE FOR EDGING LUMBER.

Andrew E. Hoffman, Fort Wayne, Ind.—In using this machine, the lumber is laid upon a table, and is pushed back into the proper position, as indicated by the guide wire. The carriage is then thrown into gear with the proper shaft, and the saw traverses the lumber from end to end. As the saw leaves the lumber, the lumber is turned over and adjusted into proper position to be operated upon by the return saw. As the carriage reaches the end of the frame, the other saw is raised, and the sawyer causes the carriage to move in the opposite direction by throwing it into gear with the other shaft.

IMPROVED WALL.

Philo A. Knapp and Ira S. Knapp, Danbury, Conn.—These inventors propose to construct the walls and partitions of buildings, of boxes without top and bottom, filled with loose gravel. The boxes are placed one upon another and tied, keyed, or otherwise fastened together so as to form blocks, in imitation of stone or other buiding blocks.

IMPROVED STALL FLOOR.

Bernhard Schaefer, Chicago, Ill.—This invention consists of a movable floor, laid on the common stable floor, made of longitudinal wedge-shaped or tapering strips, that are connected by transverse bolts and intermediate wedge pieces at the ends. The floor below the flooring is cleaned from time to time by raising the sections and sweeping the dust away.

IMPROVED SIDE BAR WAGON.

Alfred W. Doty, Windham, N. Y.—This relates to that class of carriages in which the side bars are made in two parts, and connected to the box at the middle or thereabout. The box is let down between the side bars, instead of being mounted above them, as heretofore, the bars being pivoted to the sides of the box.

IMPROVED CHECK BRACE FOR VEHICLE SPRING.

Lewis P. Worrall, Sugartown, Pa.—This is a combination, with a vehicle perch and springs, of brackets having a coupling box at the base, and plates reversely curved at the ends, in order to form a double-acting brace that will allow the springs to come together without striking the perch or body, and without making any rattle.

NEW AGRICULTURAL INVENTIONS.

IMPROVED SEED PLANTER.

John H. Martin, Thomas Bunford, and Stephen S. Ege, Glen Rock, Neb.—This device operates the dropping slide of a seed planter by the advance of the machine. It enables the seed to be planted without its being necessary to mark the ground.

IMPROVED POTATO DIGGER.

James W. Young, Southfield, Mich.—This machine digs potatoes, separates them from the soil, and deposits them in the middle part of the row, so that they will be out of the way of the wheels in digging the next row. It also keeps its own teeth free from vines and weeds.

IMPROVED METALLIC SOCKET FOR FENCE POSTS.

William M. Phelps, Oronoco, Minn., assignor to himself and Daniel McAlpine, same place.—This is a metallic fence post point. Its object is to prevent the post from rotting off, and thus to cause the posts to last very much longer, and to enable any kind of timber to be used for the posts.

IMPROVED AGRICULTURAL BOILER.

Henry L. Humphrey, Frederick H. Humphrey, and Ira G. Humphrey, Monroe, Mich.—This is an improved boiler and furnace for cooking food, scalding hogs, boiling sap, boiling cider, making apple sauce, heating curd for cheese, condensing milk, trying lard and tallow, etc. The fire box is provided with a grate, and from the upper part of its rear end a wide and shallow flue extends back so that the products of combustion may be close to and in direct contact with the entire bottom of the box. Two boilers fit into the box and rest upon a steam borrd. By this construction, the contents of the boilers will be heated by the water placed in the box.

IMPROVED SEED PLANTER.

Alvin J. Branham, Houstonia, Mo.—This is an improved device for operating the dropping bar of a seed planter from the wheel. It may be applied to any planter in which the seed is dropped by slides, so as to make them automatic in their operation.

IMPROVED CHURN.

Jonas Cook, Mount Pleasant, N. C.—The novelty in this lies in the dasher, which includes spiral cross bars, a spiral disk and a circular disk attached to a vertical rotary shaft. The object is to throw the milk into violent agitation and thus produce the butter more rapidly.

IMPROVED CHURN.

Henry B. Ramsey, Rockville, Ind.—This churn is provided with a series of tubes, passing through the churn to a water reservoir at the bottom, to break up the currents of cream, and at the same time to serve as water conveyers.

IMPROVED BAG FILLER AND MEASURER.

Joseph J. Scholfield, Salt Lake City, Utah Ter.—This consists of a funnel-topped, sheet metal tube, with open bottom, and having springs upon the outside to hold the bag up around the tube. It is enough smaller than the bag to be put in it freely. Inside the tube is scaled with lines, showing the different measures, so that, by putting the filler in the bag and shoveling in the grain, the quantity can be readily ascertained, and the grain can be quickly discharged by merely pulling the filler out of the bag.