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Liquid Measuring Apparatus.

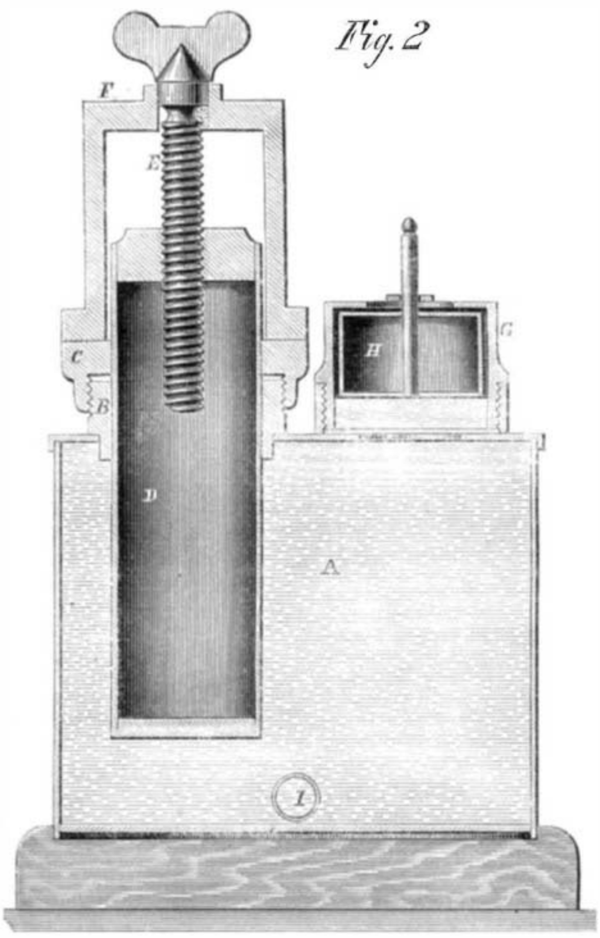
The canning of oils for exportation, especially coal oil and spirits of turpentine, has grown within a few years into a business of great magnitude. The difficulty of procuring a vessel not liable to leakage or breakage has been overcome by the invention of the can shown in Fig. 5, which is known as "Pratt's Improved Patent Can." This can is of rectangular form, with corrugated sides and ends, which method of construction, with the peculiar process of manufacture, gives great strength with the least material, and provides for the most compact and convenient storage. This can is the subject of three patents in its form, and of others in the process of construction.

It was found, in preparing oils for shipment, that much care was required to get the exact amount in each, and also to adapt the measure to the different standards of liquid measure in use in this and other countries. These requirements and difficulties led to the contrivance of the apparatus seen in the accompanying engravings.

Fig. 1 is an external view of the measure, with its appendages, and Fig. 2 is a vertical section. Figs. 3 and 4 show the faucet and cock. A is the measure, made of sheet metal, and of any form desired. The measure is air-tight. On the top there is a metallic collar, B, on which is a ring or annular nut, C, designed to form a stuffing box for the cylinder, D, which may be solid or hollow, but should not be open. It is raised or lowered into the vessel, A, by means of a screw, E, which turns in a thread cut in the upper part of the cylinder, D, and passes through a yoke, F. By lowering or raising the cylinder, it is evident the capacity of the measure may be adjusted. By thus varying the capacity of the measure the measurements of different countries may be compensated for, and also the difference in bulk occasioned by changes of temperature.

Fig. 1

Fig. 2



APPARATUS FOR MEASURING LIQUIDS WITH PRECISION.

Means for the escape of the air during the process of filling are afforded by the chamber, G, and valve, H. The chamber connects with the interior of the vessel, A, by an opening under the valve, H. This valve is rather smaller in diameter than the interior of the chamber, sufficiently so to allow of the escape of the air around its sides, and through the opening at the top of the chamber, as the vessel fills with liquid, and forces it out.

The oil or other liquid with which the measure is filled enters it at the bottom through the pipe, I, from the tank or reservoir. This pipe is of bent form—an obtuse angle—as seen plainly in Fig. 4, and having a two-way cock, J, at the angle; in Fig. 4 the passages in the cock are seen as open to each branch of the pipe. A chamber, K, projects from the angle of the pipe, I, and its wide end is closed by a plate, L, having two holes, as seen clearly in Figs. 3 and 4. M is a plate attached at its lower part by a pivot to the plate, L, moved by the handle, N, and guided by a pin working in a curved slot. To the plate, M, are firmly secured two curved nozzles, seen in Figs. 1 3 and 4. The bent pipe is not seen in Fig. 1.

Fig. 3

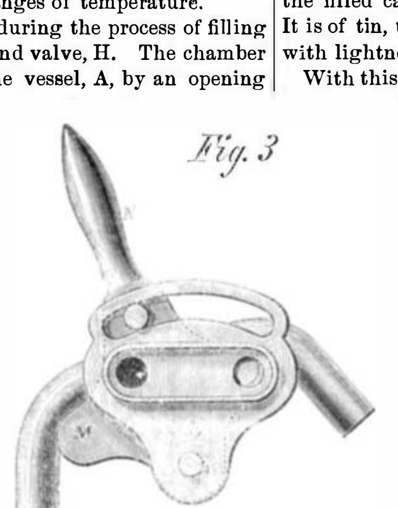
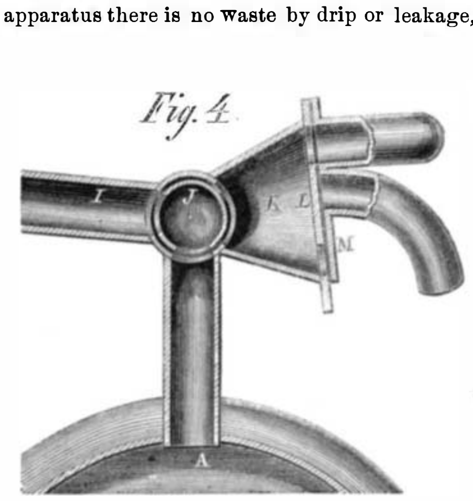


Fig. 4



The operation is as follows: Suppose the measure, A, to be empty, and the operation of canning to be commenced. The two-way cock, J, is turned in the position seen in Fig. 4, so as to permit the flow of oil from the tank or reservoir into the measure, A, and, as it fills, the air escapes up through the chamber, G, the valve, H, being down. When the measure is filled it is indicated by the valve stem, the valve being raised so as to close the aperture in the top of the chamber, G. The measure being filled, the plate, M,—Figs. 3 and 4—is turned so as to bring one of the nozzles into the aperture of the can to be filled. The position of the nozzles, when thus in use, is shown in Fig. 3, the dark aperture in the plate, L, being in connection with the depressed nozzle. The two-way cock being turned, communication between the tank and measure is closed, and that between the measure and can to be filled is open. When the measure, A, is empty, the plate, M, is turned so as to raise the depressed nozzle, and depress the other into another can, and the process of measuring is repeated while the filled can is being soldered. (The can is seen in Fig. 5. It is of tin, the sides corrugated, which gives great strength with lightness.)

With this apparatus there is no waste by drip or leakage, all differences in measure standards and variations of temperature are adjusted, and the filling from the bottom insures accuracy impossible to be obtained when measures are filled from the top. It was patented through the Scientific American Patent Agency, Sept. 17, 1867. All further information relative thereto may be obtained of the owner of the patents, Charles Pratt, manufacturer and dealer in oils, 108 Fulton street, New York.

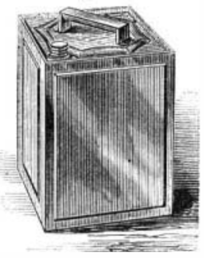
ANILINE---ITS HISTORY, PROPERTIES, AND PREPARATION.

Aniline was discovered in 1826 by Unverdorben. The original method for its preparation was by digesting indigo with hydrate of potash, and subjecting the resulting product to distillation. Aniline was also obtained from the basic oils of coal tar; but the process which is now employed for its preparation is a remarkable instance of the manner in which abstract scientific research becomes, in the course of time, of the most important practical service. It was Faraday who first discovered benzole; he found it in oil gas. After this it was obtained by distilling benzoic acid with baryta, which result determined its formula, and was the cause of its being called benzole. After this, Mansfield found it to exist in large quantities in common coal-tar naphtha, which is the source from which it is now obtained in very large quantities. Benzole, when studied in the laboratory, was found to yield, under the influence of nitric acid, nitro-benzole. Zinin afterwards discovered the remarkable reaction which sulphide of ammonium exerts upon nitro-benzole, converting it into aniline. And, lastly, Bechamp found that nitro-benzole was converted into aniline when submitted to the action offerrous acetate. It is Bechamp's process which is now employed for the preparation of aniline by the tun. Had it not been for the investigations briefly cited above, the beautiful aniline colors now so extensively employed, would still remain unknown. When Mr. Perkins discovered aniline purple, nitro-benzole and aniline were only to be met with in the laboratory; in fact, half a pound of aniline was then esteemed quite a treasure, and it was not until a great deal of time and money had been expended that he succeeded in obtaining this substance in large quantities, and at a price sufficiently low for commercial purposes.

The coloring matters obtained from aniline are numerous; they are the following: Aniline purple, violine, rese ine, futschine, alpha aniline purple, bleu de Paris, nitrosophenyline dinitraniline, and nitro-phenyline diamine.

Pure aniline is a colorless liquid, very astringent, having an aromatic odor and an acid burning taste, slightly soluble in water, very soluble in alcohol and ether. Its specific gravity is 1·028, It does not freeze at —20. It boils at 262·4° Fah., and distils unchanged. When warmed it dissolves sulphur and phosphorus. It is a powerful basis, combining with acids, and forming salts, which in general are soluble. It decomposes salts of protoxide and peroxide of iron, and the salts of zinc and alumina, precipitating from them the metallic oxides. It precipitates also the chlorides of mercury, platinum, gold, and palladium, but does not precipitate the nitrates of mercury and silver. Aniline easily oxidizes, turning yellow in water, and in time becoming resinified.

Fig. 5



When aniline dissolved in hydrochloric acid is acted on by chlorine, the solution takes a violet color, and on continuing the current of chlorine, the liquid becomes turbid and deposits a brown-colored resinoid mass. In distilling the whole, vapors of trichloraniline and trichlorophenic acid pass over.

A solution of the alkaline hypochlorites colors aniline violet blue, which turns rapidly red, especially in contact with acids. A mxture of hydrochloric acid and chlorate of potash acts on aniline, the final result of the action being chloranile $C^{12} Cl^4 O^4$, but in the course of the reaction several colored intermediary bodies are formed.

If a solution of chlorate of potash in hydrochloric acid be added to a solution of a salt of aniline mixed with an equal volume of alcohol, and care is taken to avoid an excess of the hydrochloric solution, a flocculent precipitate is deposited after a time of a beautiful indigo blue color; this precipitate filtered and washed with alcohol contracts strongly, and passes to a deep green. The filtered liquid has a brownish red color; on boiling it, adding fresh quantities of hydrochloric acid and chlorate of potash, a yellow liquor is obtained, which deposits crystallized scales of chloranile.

An aqueous solution of chromic acid gives, with solutions of aniline, a green, blue, or black precipitate, according to the concentration of the liquors. When a small quantity of an aniline salt is mixed in a porcelain dish with a few drops of strong sulphuric acid, and a drop of a solution of bichromate of potash is allowed to fall on the mixture, a beautiful blue color appears after some minutes, which, however, soon disappears.

Diluted nitric acid combines with aniline without adhering to it immediately; but after some time nitrate of aniline crystallizes in the form of concentric needles, the mother liquor turns red colored, and the sides of the evaporating dish become covered with a beautiful blue effervescence. When a few drops of strong nitric acid are poured upon aniline, it is immediately colored a deep blue; on applying heat the blue tint quickly passes to yellow, a lively reaction is manifested, which results in the formation of picric acid, or trinitrophenisic acid.

Potassium dissolves in aniline, disengaging hydrogen, while all becomes a velvet-colored pap.

The method which appears to be the most rational, and which deserves to be tried, would consist in treating the tar as condensed in gas works with hydrochloric or sulphuric acid diluted with three or four times its volume of water. Mechanical means for affecting the intimate mixture of the tar with the acid might be easily contrived, but in the absence of any special contrivance, the end may be obtained by half filling a barrel with the tar, adding one-fifth or one-sixth of its volume of acid, and rolling and shaking the barrel until the acid has taken up the bodies with which it is able to combine; the whole might thus be run into a cistern, where by degrees, the watery liquid would separate from the tar.

The same acid liquid might be used over and over again until the bases have nearly saturated the acid. A very impure aqueous solution would thus be obtained, containing the hydrochlorates or sulphates of ammonia, and all the other organic bases contained in the tar, such as aniline, quinoline, pyrrol, picoline, pyrrhidine, lutidine, toluidine, cumidine, etc.

By evaporating this solution almost to dryness, and then distilling with an excess of milk of lime, the bases would be set at liberty. Ammonia as the most volatile, would be disengaged first, and might be condensed apart, and by raising the temperature higher and higher, the organic bases would be disengaged. Aniline would be found among the liquids distilling between 302° and 482° F.

The manipulation of the tar, however, is a disagreeable operation, and presents many difficulties; it is therefore preferable, in many cases to distil the tar first, and operate on the most pure and limped distilled oil.

Aniline, because of its high boiling point, is never met with, in the light and volatile liquids when first distilled from tar. The most of it is found in those which distil between 302 and 356°. These, according to Hoffman, contain about ten per cent of organic bases, mostly aniline and quinoline. The oils which distil above 482°, contain mostly quinoline and very little aniline.

The following process for extracting the two bases form the oil and separating them is due to Hoffman. The oil is agitated strongly with commercial hydrochloric acid. The mixture is then allowed to rest for twelve or fourteen hours and the oil is separated from the acid; the latter is treated again by fresh quantities of oil until nearly saturated. The still acid solution is filtered to retain the oil interposed mechanically. It is then placed in a copper still and supersaturated with an excess of milk of lime. At the moment of saturation an abundance of vapors are given off, and the head must be quickly fixed on the still. Heat is now applied so as to obtain a quick and regular ebullition.

The condensed product is a milky liquid with oily drops floating on it. The distillation is carried on as long as the vapor has the peculiar odor of the first part distilled, or the condensed product gives the characteristic reaction of aniline with chloride of lime.

The milky liquid is now saturated with hydrochloric acid; it is then concentrated in a water bath; and lastly, decomposed in a tall narrow vessel by means of a slight excess of hydrate of potash or soda. The bases set free, unite and form an oily liquid which floats on the alkaline solution. This is removed with a pipette and rectified. The rectified product is aniline, sufficiently pure for industrial purposes, especially if we set aside the part distilling about 392° or 428° Fah., which is principally composed of quinoline.

To obtain aniline perfectly pure, the neutral oils forming part of the oily layer must be completely removed. This is done by dissolving the whole in ether, and adding dilute hydrochloric acid which combines with and separates the bases and leaves the oil in solution in either. The acid solution is then decanted, decomposed with potash, and submitted to careful fractional distillation. If the products are gathered separately in three parts, the first will contain ammonia, water and some aniline; the second will be pure aniline; while the third portion will contain mostly quinoline. An alcoholic solution of oxalic acid is now added to the impure aniline, which precipitates oxalate of aniline, as a mass of white crystals, which are washed with alcohol, and then pressed. The salt is then dissolved in a small quantity of water, to which a little alcohol is added. From this solution the oxalate crystallizes in stellated groups of oblique rhomboidal prisms. These crystals are decomposed by a caustic alkali, to set free the aniline, and when this is distilled, water at first passes, then water charged with aniline, and lastly, at 359° Fah., chemically pure aniline.—*Dussauce.*

The Chinese Coast.—Preparations are being made for the erection of a complete system of lights and beacons along the Chinese coast. Up to this time fifteen points have been chosen.

EARLY HISTORY OF AN INVENTOR.

Rev. Jedidiah Morse, of Charlestown, Mass., was the father of S. F. B. Morse, the inventor of the telegraph, and of Sidney E. Morse, of the New York *Observer*. From a memoir of his father, lately published by Sidney E., we derive the following interesting particulars of the family and of the distinguished inventor.

The first Sunday school ever organized in this country is stated to have been founded at Charlestown, Mass., in the church of which Rev. Jedidiah Morse was pastor. The first superintendent of that school was the inventor of the telegraph, S. F. B. Morse. His brother writes as follows:

"In 1811, my elder brother, Samuel F. B. Morse, having manifested an unconquerable desire to become an artist, my father sent him to London, placed him in the British Royal Academy, then under our countryman, Benjamin West, and maintained him there for more than four years, and until the close of 1815, when he returned to Charleston after having received at the hand of the Duke of Norfolk, the gold medal of the Adelphi Society for his model of a statue of 'The Dying Hercules.' his first attempt at sculpture; and from Mr. West high commendations for his paintings, exhibited at the Royal Academy under circumstances which did not allow his competition for the prizes.

"In 1816, my brother became the first superintendent of your Sabbath school, and was then proposing to establish himself in his profession in Boston; but, not meeting with the encouragement he expected, he removed first to New Haven, and afterwards to New York, where he became the founder of the National Academy of Design, an institution which, from its commencement in 1826, has had no superior of its kind in America in the promotion of the fine arts, and over which your first superintendent was called to preside, by the annual election of his brother artists, every year for sixteen years, and until he relinquished his profession to devote himself entirely to his electric telegraph, 'the lines of which,' since they were successfully laid between Washington and Baltimore in 1844, have literally 'gone out through all the earth, and its words to the end of the world.'

"Prior to the relinquishment of his profession as a painter, however, your first superintendent was the instrument in the hand of Providence, of introducing into this country that great (I may say the greatest) wonder of our age, the new Art of Photography. Photography, under the name of the Daguerreotype, it is well known was invented by the celebrated Daguerre, a French artist, who exhibited his first collection of specimens to the members of the French Academy of Sciences, in Paris, early in the year 1839. My brother was in Paris at the same time, exhibiting his telegraph to the same persons. Brother artists and brother inventors, thus brought together, each was invited to examine the other's invention; and my brother became earnest in his desire to introduce the Daguerreotype into America. On his return to New York, in April 1839, he inspired me and my younger brother with a portion of his own enthusiasm. He was then entirely destitute of pecuniary means; and after ascertaining what was wanted to enable him to gratify his and our wishes, we removed the central part of the roof of our six story building, covered it with a skylight, furnished the new chamber with cameras and the other apparatus of photogarphy, and, having thus completed the first "tabernacle for the sun" erected on the Western hemisphere, placed your first superintendent there to fix, for inspection through all time, the perfect image of men and things, as the great Painter, from his tabernacle in the heavens, flashed them upon the silvered plates. It was in that chamber that he, who first practiced the art of training in your Sabbath school, in 1816, trained the young men who went forth rejoicing, from New York into every part of our land, to work the wonders, and display the beauties of the new art, eliciting admiration from all beholders, and from the devout the exclamation, which four years afterward, passed in an instant through the wire from Washington to Baltimore, to be recorded there, while it was echoed everywhere, "What hath God wrought!"

It may not be known to all readers that the first message sent by the inventor of the recording telegraph, through his first telegraph line, on its completion from Washington to Baltimore, in 1844, was, "What hath God wrought!"

Galvanic Electricity upon the Muscular and Nervous System.

The effects of the galvanic current on the nerves and muscles of animals, is essentially the same as that produced by frictional electricity, modified, however, in some degree, by the continuous action of it. They are also characterized by the presence of some chemical influence, which excites the organs of taste and sight in a remarkable manner. Very small batteries are adequate to excite the organs of taste and sight, but a large apparatus is needed to produce any perceptible influence on the sense of touch, so as to cause the muscles of the human body to contract, when it forms part of the circuit. Galvani, in his fundamental experiment, touched the nerves of a dead frog's spine and the muscles of one of his thighs with two different metals, and then forming a circuit by a wire between them, the leg became violently contracted. When the nerves of vision are made to form part of the voltaic connection, peculiar luminous flashes will appear before the eyes. The excitement of the organ of hearing under similar circumstances is not less interesting, a roaring sound being heard as long as the wires are kept in place. On closely observing the effect of galvanic electricity upon the muscular and nervous system, three distinct stages in the process are readily seen. First, when the circuit is completed, an electric shock is experienced; next, the continued action of the current causes a series of contractions rapidly succeeding each other; and lastly, when the connection is broken, a less violent shock than before is felt. The shock of the voltaic battery differs from that of common electricity, as the latter is felt far less deeply, affecting only the outer part of our organs, and being exhausted in a moment. The voltaic shock, on the contrary, penetrates further into the system, passing along the entire course of the nerves. The influence of the galvanic current on the nervous system, has been successfully applied to the restoration of persons in whom animation was suspended. By means of it Aldini set in motion the feet of a corpse, caused the eyes to open and shut, and distorted the mouth, cheeks, and the whole countenance. Ure, by completing the circuit through the body of a man recently hung, caused the muscles of the face to acquire a frightful activity, so that rage, despair, and anguish, with horrid smilles, were successively depicted on the countenance. —*Telegraphic Journal.*

Two Curious Plants in California.

In the Southern coast is a species of the familiar mullen, and of a small species of teazle burr, both of which are peculiar to the Pacific coast. The burr is about as troublesome a member of the *dipsacus* family of plants as the cattle or sheep breeder is acquainted with. From July to October it is met with in the lower countries, covering the alkali or moist soils in hundreds of acres, and presenting a vigorous growth of verdant vegetation at a time of the year when nearly all other plants are bronzed with age or burnt to powder. The California article is a small species of teazle, with from sixty to one hundred burrs, the size and shape of a blackberry, but stuck full of spinous points, which, when mature, catch in the manes and tails of sheep, horses and cattle in great masses, and make the animals present as ludicrous an appearance as quadrupeds can be guilty of, and they are the abhorrence of dogs and cats. Whole bands of *caballada* may be seen on the large ranchos, with their caudal appendages full of these burrs, and giving the herdsman an immense quantity of trouble in the extraction, and on many farms it is the daily occupation of the horseman to trim them from his favorits with his knife or his fingers. In many places they seriously injure the quality of the wool. This troublesome plant grows to the height of some three feet, and with its large, heart-shaped leaves presents a deceitfully inviting appearance to one who is a stranger to its annoyances; for when the burrs are ripe they fall off at the least touch, and are as molesting to the rider as to his animal. It is one of the worst of weeds in a garden, the fruit taking root wherever there is the least modicum of moisture. The only thing good about this disreputable vegetable is the fragrance of the leaves when bruised, which emit an agreeable perfume of mint and lemon.

The member of the California mullen family mentioned is very abundant, not only throughout the Southern coast, but covers hundreds of thousands of acres of land in the plains of the great valley of the Sierra Nevada to the west, where with the *wichapera*, in the fall, it crowds out nearly every herb of the fields. Growing to the height of three or four inches, and spreading out into immense, blanket-like masses, over leagues upon leagues of land, on hill and plain, with its silvered, downy leaves, it makes every appearance at a distance, in the afternoon sun, of extended pools of standing water, and really has deceived many thirsty travelers, strangers to its delusions and vagaries. The leaves are the perfect outline of a heart, and of the size of that of a rose, and when pressed emit a smell of melon faintly mixed with marjoram. Though thousands of sheep may be walking among its masses, I never noticed one of them to feed on it; but as nothing was made in vain, the ground doves love the seed of the plant as much as cows do clover, and on opening their crops in the fall months they are found to be full of the small black seeds of the mullen. It is entirely different from the Atlantic mullen, which carries leaves as large as that of the mustard, with a central stalk three and four feet in height, whereas the mullen member of the California *Verbascum* has a diminutive leaf, and bears no column like the other, but a small trunk like a pepper bush. It is called by the natives *Pollei*, in some places, and in other *Yerba de Cenisa*, from its downy leaves, which are of the color of fresh wood ashes, and in medicine makes an elegant demulcent infusion for fevers and catarrhs, or in mass with hot water as a soothing cataplasm. The immense masses of this curious plant, when stirred by breezy gales of a summer afternoon, will sheen and twinkle with the rays of the sun as if Sol was amusing himself after the heats of the day on a sea of molten silver or silken floss, before he hies to bed behind the mountain peaks to dip his vexed, hot, monstrous red face west of the California Cape Horn in the waves of the ocean—where we will leave him till the cooler dawn.—*Cor. Steamer Bulletin.*

Solar and Lunar Halos.—M. A. Decharme, Professor at the Imperial Lyceum of Angers, observes with much care the great and small solar and lunar haloes and coronæ, and has ascertained, that—1st, At Angers these phenomena are more frequent than is generally believed, thirty-three being observed by him during last year. 2d, In all cases they were followed by rain or snow on the same day, the day following, or, at latest, on the third day. 3d, That in general the rain is the nearer and more abundant in proportion to the brilliancy of the phenomenon. His observations simply confirm the generally received belief of all the weatherwise.

The New Grass which has made its appearance in the Southern States since the war, is called *Lespidosa striata*, and is said to be a native of China and Japan. It appears to be a dwarf clover, very thick set, much relished by cattle, and is a complete exterminator of Bermuda, joint, sedge, and other grasses. It was not seen before the war, and how it was introduced is a mystery among planters and botanists.