## RECENT AMERICAN INVENTIONS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list on another page :—

*Veneer Cutter.*—This invention consists in suspending the table or platform which carries the logs from two or more pivots inserted in disks or arms attached to the ends of rotary shafts in such a manner that by imparting to said shafts a rotary or oscillating motion, the log carrier receives a compound motion around the centers of said shafts and in a direction parallel to a line drawn through said centers, whereby the operation of cutting is considerably facilitated. Invented by John Sperry, of New York city.

*Cork-Cutting Machine.*—The object of this invention, by John Power, of Boston, Mass., and A. J. Bailey, of Charlestown, Mass., is to obtain a machine by which cork stoppers for bottles and other vessels may be cut with a single knife at one operation. To this end, the invention consists in the employment or use of a reciprocating knife, in connection with a rotary mandrel, arranged in snch a manner that the mandrel will have a continuous rotary motion, in one and the same direction, imparted to it by the reciprocating movement of the knife, and the latter, during its movement, be automatically adjusted so as to rough off the cork during its movement in one direction, and to give the finishing cut during the other movement in the opposite direction.

*Photographic Album.*—The object of this invention is to adapt metallic mats to the leaves of photographic albums, and to this end it consists in securing such a mat in place by providing it with a flanch which is interposed between the outer sheet of card board or other material which forms either surface of the leaf and the middle or back piece or body of the leaf, and held in place by the union of the said outer sheet with the said middle or back piece or body. E. D. Griggs, of Waterbury, Conn., inventor.

*Photographic Apparatus.*—This invention consists in a certain arrangement of moveable supplementary lips or flaps attached and fitted to the lid of a trunk or box, whereby the said trunk or box may be converted expeditiously into a "dark room" of about double its size. It also consists in a certain combination of a vessel for containing developing solution, and a fountain or vessel of water, and a certain system of valves in connection therewith, whereby the flowing of the said solution over the plate and of the water for washing of the said solution are controled by the hand of the operator outside of the "dark room," and the said solution and water are caused to be delivered on to the picture by the same tube or conductor, so that the water may wash away all trace of the solution from the said conductor after the developing of a picture, and so prevent the staining of the next picture. Patented by N. F. English, of Hartland, Vt.

*Brick Machine.*—This invention, patented by John J. Alvord, of Tecumseh, Mich., consists in a novel and improved clay-tempering device, rotary mold wheel and screw feeder, so constructed and arranged that the whole process of molding and pressing bricks is performed by mechanism having a rotary motion, the working parts being so arranged as to admit of a quick movement without the liability of getting out of order or becoming deranged in any way.

### Steam for Locomotive Boilers.

[From the London Engineer.]

With regard to the material of locomotive boilers, there is an increasing disposition to employ steel instead of iron. Under the name of homogeneous metal, Messrs. Shortridge, Howell, and Co.'s mild steel has been for some time successfully used in fire-box plates on the Scottish Central Railway, and Messrs. Cammell and Co.'s steel has been similarly used, for a long time, for fireboxes on the Great Western Railway of Canada. On the last named line two boilers for heavy freight engines have been made throughout of the same steel, and have been in constant and satisfactory use for upward of fifteen months. Indeed, with steel of a very mild quality, or, in other words, a steel containing only a very small amount of carbon, no possible difficulty could be apprehended, for not only is such steel as tough as copper, but it is as workable in the fire as the best iron, whether the object be flanging or welding. Neither, we believe, has boiler steel caused any trouble in the case of locomotives by reason of any expansion peculiar to itself, or in any way different from the ordinary expansion of boiler iron. When the steel boilers of the steam vessel *John Penn* were removed, it was said that their failure was owing to the excessive expansion of the steel. This was most improbable in itself, for the expansion of steel is not known to vary to any extent from that of wrought iron. It was more likely that an unsuitable quality of steel was used, perhaps puddled steel, or, at any rate, a variety containing too much carbon, and, for that reason, brittle. The very largest class of land boilers—worked, too, at 100 lb. pressure per square inch—are now made from Bessemer steel, and nothing is heard of any difficulty in the way of expansion. For fireboxes especially, we believe the mild steel plates, which are now furnished by the best makers at a price below the average of the various prices for Lowmoor iron plates, will be found even better than copper, offering greater endurance with much less weight, and at less than one-sixth of the first cost, when the difference of thickness is taken into account. For tubes, too, there is no reason, that we know of, why steel should not entirely supersede brass, especially as ordinary Staffordshire iron tubes have been already found to answer a good purpose in coal-burning engines.

The whole saving of weight by the adoption of steel for locomotive boilers of the largest class should be between one and two tuns, the cost of moving which in an express engine, is not under 1½d. per mile run, or nearly £200 a year for its ordinary mileage. The whole saving of weight, however, cannot be realized while riveted joints are retained, the strength of which is hardly more than one-half that of the whole plate. For large boilers many makers already employ double-riveted joints, the strength of which is believed to be one-fourth greater than that of single-riveted joints. So, too, plates with thickened edges are used to some extent, as in Messrs. Fairbairn & Sons' engine in the Exhibition. But welded joints are the only means of preserving the full strength of the material, and we do not doubt that boilers welded upon Mr. Bertram's plan will be found the strongest. Locomotive boilers indeed have occasionally been made with the longitudinal seams welded up solid, and we observe that some of the Sheffield steel makers are now making lap welded tubes of mild steel up to a diameter of 3 feet. Presuming that, as these can be made of a diameter of 3 feet, they can be made of any size, they seem to offer an excellent material for the barrel of locomotive boilers, and we shall be glad to hear of their practical adoption. Krupp, meanwhile, is preparing to roll steel of a width of 15 feet., so that a locomotive boiler barrel of the very largest size can be rolled up and welded whole from a single plate.

### Why the Parrott Gun on Board the Naugatuck Burst.

Capt. D. C. Constable, of the *Naugatuck*, has written a private letter to Capt. Faunce, from which we make the following extracts :—

We opened fire upon the battery with our heavy gun, and threw shell and canister from our broadside ones into the woods. Our station was abreast of their rifle-pits, and was only forty feet from the shore, so that their sharpshooters had a fair chance at us. During the fight, and while our heavy gun was performing splendidly it burst; but fortunately disabled but one man. It burst from the vent to the trunnions in two halves, throwing one half overboard on the port side, while the other half was landed on deck on the starboard side. The muzzle forward of the trunnions remained entire, and was thrown forward about two feet. The gun-carriage was destroyed, the pilot-house shattered, part of the upper deck crushed in, and some of the main deck beams started. How, I escaped, God only knows. I was within two feet of the gun when it burst, having just sighted and trained it upon the battery. My speaking trumpet is completely crushed, and a fragment of the gun, weighing about 1,500 weight, fell so close to me that it tore my coat. I was hit on the head by some part of the gun or carriage (I think it was one of the large rubbers), which stunned me for a moment, although I was able to keep the deck and superintend the fighting of our broadside guns (which were well handled under charge of Wilson), until the squadron fell back for want of ammunition, about an hour and a half after our gun burst. After heaving up our anchor I fainted away; but after being cupped behind the ears by the surgeon of the *Arcostook*, who came on board to look out for our wounded, I was able to resume the charge of the deck.

The *Stevens* did not haul off until the *Galena* and *Monitor* set her the example. The *Arcostook* and *Port Royal* dropped down half an hour before we hove up. The *Arcostook* hove up, but the *Port Royal* slipped her moorings. Since I have been in command of the *Stevens*, I have always observed the precaution of having a man on deck to "feel home" the shot or shell after the muzzle of the gun is elevated, for fear that the shot or shell might start while the muzzle is depressed in the berth-deck. At the time the gun burst, this precaution was attended to under my own eye, consequently the bursting could not have been caused by the shot not being "home." In making my report to the Commodore after the action, I requested him to appoint a board of officers to examine into the cause of the bursting. The Board so appointed examined the gun, &c., and report that they find an old flaw extending from the inside of the vent to near the outside surface of the gun, and that, therefore, they consider that the bursting was caused by the gun heretofore having been subjected to severe and protracted tests, &c., and fully clearing me from any want of attention or neglect. This I am glad of.

The iron gun on board of the *Naugatuck*, was mounted amidships, pointing toward the bow, and was loaded from below by depressing the muzzle, which was effected by means of pulleys ingeniously constructed for that purpose. The gun was loaded by means of a moveable charger, which could be raised or lowered at pleasure. The ramming was accomplished by a sort of piston rod on a line with the muzzle of the gun, which is also worked by pulleys, thus affording the celerity of loading and firing every half minute. The gun was capable of throwing a hundred pound shot.

### Strange Spontaneous Combustion.

The Woodstock (C. W.) *Times* reports a remarkable spontaneous combustion which occurred recently in that place. It appears that at the close of the day's business operations, the practice of the parties in whose premises the case happened, has been to rub the counter with linseed oil, leaving the oil to penetrate the wood during the night, to be cleaned off in the morning. This is done with cotton rags, formed into a ball secured tightly. In the present instance, the rags or balls of cotton cloth after use were left on the end of the counter, unconnected with any substance that would readily take fire, and the only mischief that resulted was the disfigurement of a portion of the counter. But one of the two balls ignited. The inference is that the one that burned was rather more tightly tied. Had the premises been consumed, the origin of the fire would forever have remained a mystery. From this occurrence a lesson may be gathered, namely, that rags saturated with linseed or in fact with coal oil, and allowed to remain in a compact condition, are liable to take fire. The rags in the case under notice had not been long in use, and, with the exception of the oil, were free from any other substance.—*American Railway Review.*

Most animal and vegetable oils have a strong affinity for oxygen, and when their surfaces are sufficiently extended they will absorb it so rapidly as to take fire. But coal oils have no affinity for oxygen, and will not absorb it, hence they are not liable to take fire by spontaneous combustion. This property adapts these oils to preserving metal from rust, and to many other uses.

### Recent Improvements in Lucifer Matches.

The London *Chemical News* says that of matches prepared with ordinary phosphorus, and which consequently ignite readily upon any friction surface, the "Patent Paraffine Matches" of Messrs. Letchford & Co. are particularly good examples. Instead of the objectionable sulphur coating, melted paraffine is used for impregnating the wood and rendering it more inflammable. Such matches are not likely, therefore, to play havoc with the silver candlesticks and bright metallic surfaces often brought near them in actual service. Their power of remaining uninjured by damp is a special character for which this kind of match is remarkable ; in a comparative examination of several different sorts, these only were capable of being ignited after six hours' exposure to a moist atmosphere. On this account they would be particularly suitable for export, and little affected by climate.

THE Portland Company lately shipped to New York a number of iron cars (amounting to about 30 tuns in weight), destined for the Panama Railroad. This company built about all the locomotives for that road, and they have given great satisfaction.

MESSRS. Dunham, Kellogg and Ives, of Hartford, Conn., are cultivating trout on a large scale in a pond in Glastenbury. They have nearly 50,000 of a stock, and when the number reaches half a million the proprietors expect to net $12,500 per annum from them.

DUMPLINGS —In boiling dumplings, or any kind of paste, the cover should never be removed nor the water allowed to cease boiling until the paste is done ; when it should be taken off before it becomes soaked and heavy.

THE Philadelphia *North American* says that shipbuilders in that city never enjoyed more prosperous times. The shipyards are as busy as well patronized tailors' shops on Saturday night.

## Spontaneous Generation.

[Continued from page 343.]

The following account of the researches of Pasteur, respecting the theory of spontaneous generation, was translated and condensed for the *American Journal of Science and Art*, by M. C. White, M. D.:—

FERMENTATION OF URINE.

A flask with an attenuated neck was one-third filled with fresh urine and boiled for three or four minutes and then allowed to cool, with no access of air except what was drawn through a platinum tube heated to redness. When cool, the flask was hermetically sealed, and the inclosed urine was thus exposed only to atmospheric air, deprived by heat of all viable germs. In this condition the urine remained for months without change. Into a flask thus prepared, asbestos charged with atmospheric dust was introduced by the method above described. The flask was kept at 86° Fah., and in about six hours mucedines and infusoria appeared, among which were *bacteria*, *vibriones*, and *monads*, the same as appeared in similar urine exposed to the open air. During the following days lithates and crystals of triple phosphate were deposited, the urine became ammoniacal, and its urea disappeared under the influence of the true ferment of the urine, which Pasteur believes to be organized, and whose germ could only have been introduced in the atmospheric dust in connection with the germs of infusoria and mucedines. When a flask prepared in the same manner had only calcined asbestos introduced, without atmospheric dust, neither mucedinesnor infusoria appeared, neither did any fermentation take place, however long the flask was permitted to remain unopened.

COAGULATION OF MILK.

Fresh milk was boiled in a flask for two or three minutes only, and after being allowed to cool with access of calcined air, as in the preceding experiments, it was hermetically sealed. In eight or ten days the milk was coagulated, but when opened it was found remarkably different from milk coagulated in the open air, for it remained alkaline as fresh milk; but the milk was filled with infusoria, most frequently vibrios about $\frac{1}{500}$th of an inch in length, yet no vegetable productions were detected.

The common theory that milk coagulates in consequence of the formation of lactic acid is an error. It is also shown that vibrios may appear in milk which has undergone ebullition for several minutes at 212° Fah., although urine or a solution of sugar and albumen does not produce vibrios under such conditions. In other experiments the milk was boiled for longer periods under a pressure of 1½ atmospheres at a temperature of 230° or 235° Fah., and the flasks were sealed as before. Flasks thus prepared furnished no infusoria; the milk did not coagulate, however long it remained inclosed in the flasks; it remained alkaline even with the presence of oxygen in the form of calcined air, as stated above; and it preserved apparently all the properties of fresh milk.

Into flasks of milk thus prepared, Pasteur introduced atmospheric dust by the method detailed above, when the milk coagulated, and both animal and vegetable productions appeared as in the milk exposed to the open air. The generally admitted theory of ferments which had of late years received fresh support from the writings of chemists, now appears more and more at variance with the results of experiments. The ferment is not a dead substance without determinate specific properties. It is a being whose germ is derived from the air. It is not an albuminous substance altered by oxygen. The presence of albuminous matters is an indispensable condition of all fermentation, because the "ferment" depends upon them for its life. They are indispensable in the light of an aliment to the ferment. The contact of the atmospheric air is, primarily, equally an indispensable condition of fermentation; but it is indispensable only as being a vehicle for the "germs" of the "ferments."

There are many distinct organized ferments which excite chemical transformations, varying according to the nature and organization of the ferment.

To confute various objections made by advocates of spontaneous generation, Pasteur undertook to determine the relative abundance of organic germs in different localities. A series of flasks were all one-third filled with the same putrescible fluid—a solution of sugar and albumen was employed in most of the experiments. The fluid was then boiled for two or three minutes in the flasks, and the neck of each flask was drawn out to a fine point, and hermetically sealed while the fluid was hot. These flasks were then taken to different localities, and the points of the necks were broken, and the air of the several localities allowed to rush in and fill the flasks. This violent ingress of air carried in, of course, all the dust held in suspension, and all other principles known or unknown associated with it. In this condition each flask was again hermetically sealed, and the whole placed where they were kept at a uniform temperature of 80° to 85° Fah.—a temperature known to be the most favorable for the development of animalcules and mucors. The results of these experiments were not what the principles generally admitted would lead us to expect, but they were perfectly consistent with the theory of the diffusion of germs.

Generally in three or four days the liquid in the flasks was found altered, but in flasks placed in identical conditions were found very different organisms —much more varied so far as mucedines and torulas were concerned than if the liquids had been freely exposed to ordinary air. On the other hand, it frequently happened in a series of experiments that several of the flasks remained absolutely unaffected for an indefinite time, as if it had received only calcined air.

This simple and unobjectionable method of experimenting appears to demonstrate that the cause of so-called spontaneous generation does not exist in the ambient air throughout its whole extent, but that it is possible to take up in a single place and at a given instant a considerable volume of ordinary air which, without having undergone any physical or chemical change, is altogether unsuitable to give origin to infusoria or mucedines in a liquid which is invariably thus altered when it is exposed to the open air. The partial success of these experiments shows that by these movements of the atmosphere there is always brought to the surface of a putrescible liquid in an open vessel a quantity of air sufficient to furnish germs suitable to be developed in two or three days.

It appears that the organic productions in the flasks are more various than if the contact with the air had been free, *i. e.*, the organisms in the several flasks are different. This result might have been expected, for by limiting the rush of air and repeating it with different flasks, a small number of germs would be collected in a limited portion of air, and the growth of these germs would not be obstructed by other germs, more numerous or more vigorous or rapid in their growth, capable of monopolizing the soil to the exclusion of those less vigorous or less rapid in growth.

[To be continued.]

## Practical Value of Scientific Knowledge.

The *Westminster Review* says :—

Some years ago, it was the practice of tin-plate works to throw away a large quantity of black dust formed in the manufacture. In conjunction with the late Mr. Henry, Dr. Percy visited tin-plate works in South Wales, and procured specimens of this dust, which it had been the former custom to throw into the river hard by, and in which Mr. Henry found 60 per cent of tin! Many copper ores contain considerable quantities of gold and silver, which it has not been considered worth while to separate. At some large chemical works, in which sulphate of copper was prepared by dissolving copper in sulphuric acid, an insoluble residue was produced in the process, which had been put aside from time to time, and had fortunately not been thrown away. A small sum was offered by certain persons for this residue; and suspicion having been excited by the quarter from which the offer proceeded, it was declined, and the residue was examined, with the result of finding it to contain £700 worth of gold! It is believed by Dr. Percy that the slags which have been cast out from the furnaces used for the remelting of old copper and the refining of new in the government establishments for the preparation of copper sheathing for ships' bottoms, contain a large amount of the precious metals. There are probably, he states, accumulations of copper slags in some of H. M.'s dockyards, or in their vicinity, which present a more promising field for mining enterprise than many a *sett* in Cornwall or Devon.

## Gigantic Canals in India.

We take the following from the *Mechanics' Magazine*:

From Calcutta we learn that, in anticipation of the future extensive cultivation of cotton in British India, it is intended to form a number of canals for the irrigation of the districts adapted to the growth of the plant. The general scheme proposed by Colonel Dickens, under the sanction of the government, consists in the construction of two main canals leading from a dam, to be fed by the river Soane. These will extend in opposite directions to a distance of ten or twelve miles, when they will branch off into two fan-like systems of irrigation channels, extending on one side to the Kurumnassa and Ganges. There will also be navigation channels for facilitating the transmission of the crops to Benares, to the mouth of the Kurumnassa, to Arrah and to Patna. The aggregate dimensions will be 681 miles of irrigation, and 145 of navigation channels, or in all 826 miles. Through these water will flow at a speed of two miles per hour, while the supply will yield 3,124 cubic feet per second. The dam is proposed to be formed on the plan of the Madras Delta Works. The chief difference consisting in the depth of the undersunk foundations, which Colonel Dickens in his plan suggests, namely, two rows of blocks, 20 feet each in depth, whereas the wells at Madras range from 7 feet to 9 feet only. The principal impediment to the carrying out of the works is their enormous probable cost. The colonel, however, has entered into lengthy calculations to prove that the outlay would be amply compensated for by the enhanced productiveness of the land to be irrigated, and it is likely that a portion, at least, of the scheme will soon be commenced. As to its complete fulfilment we apprehend that that will depend much upon the future phases which the civil war in America may exhibit. The present condition of our own manufacturing districts should plead eloquently for the increased growth of cotton in India, and we should imagine that Lord Elgin could not more worthily inaugurate his succession to the Governor-Generalship than by paying immediate and practical attention to the momentous subject.

## A Banquet in a Sewer.

The London *Express* says :—

On the 5th of May, at the invitation of Mr. W. Webster, the contractor for carrying out that portion of the metropolitan main drainage from Deptford to the outfall at Erith, the members of the Greenwich District Board of Works, and about 500 inhabitants ot the locality proceeded to inspect the line of sewer previous to its being handed over to the Metropolitan Board. About twelve o'clock the company assembled in front of St. Alphage Church, Greenwich, the band of the Volunteer Rifles being in attendance, and the descent, which occupied some time, having been accomplished by means of a long ladder, a novel scene was presented. The immense archway of brickwork, the radius of which is struck from a center of 5 feet 9 inches, giving 11 feet 6 inches in the clear, or diameter, and of circular form, had been provided with a temporary floor for a distance of about one mile, and was lighted on both sides with lamps. The refreshment tables were abundantly supplied. The most interesting portion of the proceedings was the presentation of a testimonial from the inhabitants of Greenwich to Mr. Webster. The chair was occupied by Mr. Bristow, M. P., who presented the address to Mr. Webster, and observed that the sewer in which the large number before him were then assembled was, in his opinion, one of the greatest engineering works of modern times. A similar testimonial was presented to Mr. Jennings, agent to the contractor, who acknowledged the same in suitable terms. Several toasts were duly honored and addresses delivered, and after remaining underground about two hours the company ascended.

THERE are 17 horse railways in Pennsylvania, all in Philadelphia and Pittsburgh. Their cost was $3,240,987; length of roads, 106 miles; number of passenger cars, 427; number of passengers carried for the year, 18,775,225; total earnings, $1,219,721; total expenses, $930,287

A FIRM which has been extensively engaged in the manufacture of boots and shoes, at Lynn, are about moving their business to Chicago. They will employ three hundred hands at the start.