

in the engravings. The valve itself is a simple metallic ring, shown isolated at K, fig. 3; the central orifice fits the eccentric L, and this eccentric is driven by the stud on the end of the crank pin, so that when the shaft is turned around, the valve has an epicycloidal movement over the valve face; opening and closing each port alternately in its passage. This is a very beautiful movement and permits the lead on each piston to be adjusted to any required degree of nicety. The hollow M, in the under side of the valve, is the exhaust passage.

The packing of these pistons is a very simple point, and yet with all its simplicity it is perfectly performed. We are assured that no leakage whatever is visible in the engine when at work. In Fig. 4, where the piston is shown separately, the packing is also shown, and requires but little explanation; the mechanical reader can see that the steel bar N, fits in the slot, O, and is forced out by the spiral springs placed therein. There is also a side plate, which is shown at P, in fig. 2; this is forced inward by wedges behind it; the wedges themselves being attached to a frame which is worked by the set-screw, Q. This plate in connection with the packing, R, makes the pistons perfectly steam-tight against the cylinder cover, and yet easy working in all of their parts.

In Figures 4 and 5, the inner piston, or one on the crank-pin which is of the same area, however, on its steam face as the external one, and the crank shaft, are shown detached. The pistons waste little or no steam at the completion of their stroke, as they work snugly up to each other, and to the cylinder. There are no projecting bolt heads, and the steam ports open directly on to the pistons, thus preventing the waste of steam which occurs when long ports have to be filled with live steam at every stroke. It is difficult to conceive of a more compact or efficient steam engine than this in the same space. There are no "centers" or "dead-points" to the crank, as each piston moves the crank alternately through one-half of its circle, consequently there is never that mechanical loss which is experienced in ordinary single engines between the times of shutting off the steam during one stroke and opening the valve for another. In this engine, we have always nearly an equal pressure upon the crank, depending, however, wholly upon the distance to which the live steam follows before it is shut off. The speed of the piston in feet is not great, as the stroke is so short, but the engines run at an average rate of 150 revolutions per minute.

One of these engines is now working a pile-driver in this city. It raises 2,200 pounds (or one ton) 36 feet in 6 seconds; taking 33,000 pounds raised one foot in a minute as a standard horse-power, the engine in question develops over 22 horse-power; for 33,000 pounds raised one foot in one minute are equal to 550 pounds raised one foot in a second; and 2,200 pounds raised 36 feet in 6 seconds are equivalent to 360 pounds in one second. One-fifth of 550=110 pounds, and three-fifths=330 pounds, or three-fifths of a horse-power for every foot of distance. The whole distance being 36 feet, it is easy to see that by this rule this engine has a power exceeding 22 horses minus friction. The pistons are 56 inches area by 5 inches stroke.

The governor of this engine is peculiar and constructed on proper principles, as it is obvious that if the arms of the governor hang vertically, and are formed at right angles with each other, the movements are positive, and no loss is experienced as is the case with the old-fashioned regulator, where the balls move perceptibly before the throttle valve is changed.

This governor runs at a high speed, and has a short screw-rod at the top which connects with the valve in the chest below; there is also another nut for altering the tension of the spiral spring, S. These nuts enable the speed of the engine to be easily controlled; for by running the nut, U, up or down on the rod, V, the spring is relaxed, or set up so that more centrifugal force is required to affect the balls, and the speed of the engine increases to make up this force; when the spring is relaxed, the reverse occurs. The governor-valve, in the chest before-spoken of, is also changed in its position in a manner not necessary to describe at present.

This engine was patented through the Scientific American Patent Agency in Sept. 1863, by J. B. Root,

of New York; a patent is now pending on the governor.

These engines are made by Benjamin, Root & Co., at Jackson Iron Works, 167 East 28th street, New York, and they can be seen in operation at 155 Duane street, where all further information may be obtained.

The Invention of the Card-making Machine. WHITTEMORE—1797.

We do not rank the card-setting machine among "the most important American discoveries and inventions," and yet we cannot omit it from our account, for it is generally regarded as coming nearest in its movements to the acts of intelligence of any piece of mechanism that has ever been devised. Two delicate needles dart forward and punch the leather; the wire is drawn in from the reel and cut off at the proper length; a fork sweeps forward and bends the wire into the form of the letter U; a pair of pincers seize the bent wire and thrust it deftly into the holes prepared for it; and finally a press rises on the opposite side of the leather and bends the wire at the proper angle to make a perfect card. All of these varied movements go on automatically and continuously, and if a crooked or imperfect tooth is made, the machine instantly stops of its own accord. This last, the stop-motion, is the only material improvement made in the machine from the form in which it was originally devised by its first inventor.

A few years since a manufacturer of these machines, a Mr. Earle, of Leicester, Mass., had a very fine machine on exhibition at the Mechanics' Fair in Boston, when the Rev. Mr. Pierpont came along with a friend and stopped to look at it.

"Here," Mr. Pierpont remarked, "is the machine that more than any other impresses me with the feeling that it must be endowed with thought."

At that time the stop-motion had not been invented, and great efforts were being made to devise it. With this in his mind, Mr. Earle replied:—

"Yes, all it needs to be a perfect sentient being is a conscience."

In the course of that season the stop-motion was perfected, and when Mr. Pierpont passed through the next Fair, he reminded Mr. Earle of the previous conversation. Mr. Earle replied:—

"The defect is now remedied. The machine has got a conscience, and it does just what a conscience ought to do—it stops at the first wrong step."

We have heard a gentleman speak repeatedly of visiting a large card manufactory in New Jersey. While he was talking with the proprietor a man came out of the mill and went off to his house. Some 15 minutes afterward our friend went into the factory, and found a very large room full of machines in active operation, with not a single person in the building to attend to them!

The card-setting machine was invented by Amos Whittemore, who was born at Cambridge, Mass., April 19th, 1759. His father was a farmer, but Amos early showed a fondness for mechanical pursuits, and, on arriving at the proper age, he became an apprentice to a gunsmith. Long before the expiration of his apprenticeship his master confessed that he could teach him no more, and advised him to set up business for himself. Some years later he became interested, with his brother William and five others, in the manufacture of cotton and wool cards, conducting their business in Boston, under the firm of Giles, Richards & Co., and supplying nearly all the cards then used in the country. Amos attended to the mechanical department.

It soon occurred to him that if a machine could be devised to perform the operations, it would supersede a vast amount of hand-labor, and would be of great value. After long and patient meditation the plan had so far taken shape in his own mind that he was ready to communicate his idea to his brother William. This brother encouraged and assisted him to the utmost, and a chamber was set apart for the construction of a model. Here the enthusiastic inventor devoted himself to the perfecting and embodying of his plans with such zeal as frequently to neglect his food and sleep. In the course of three months the machine was so far advanced as to punch the leather, and to cut, bend, and insert the wire; but the bending of the teeth at the proper angle completely baffled his genius, and he began to despair of success. While

his mind was on the stretch to overcome the obstacle, one night during his sleep the idea was presented to him in a dream. Rising early in the morning he hastened to his workshop, and, before he broke his fast, he was able to announce to his brother that the machine was perfected.

Steps were immediately taken to secure a patent, and this was obtained on the 2d of June, 1797. The brothers determined also that a patent should be taken out in England, and that the inventor should visit that country for the purpose. At that time but two vessels traded between Boston and London, and in one of these, the *Minerva*, Mr. Whittemore sailed in the spring of 1799. He was absent a year, his return voyage occupying 59 days.

On the 3d of March, 1809, the patent was extended by a unanimous vote of Congress, for 14 years from the expiration of the first term. In 1812, the Legislature of New York passed an act incorporating the "New York Manufacturing Company," with a capital of \$800,000, of which \$300,000 was directed to be employed in the manufacture of cotton and wool cards. On the 20th of July, 1812, this company bought of the Messrs. Whittemore their patent right, and entire machinery for \$150,000. In 1818, the company sold all of its manufacturing property to Samuel Whittemore, a brother of the inventor, who is reputed to have made a very large fortune in the manufacture of cotton and wool cards.

After the sale of his interest in his patent, Amos Whittemore purchased a pleasant estate in West Cambridge, and retired from active business. Here, after a pure and blameless life, he died in 1828, at the age of 69 years.

MISCELLANEOUS SUMMARY.

PROFITS OF TRANSATLANTIC STEAMSHIPS.—Very few people have any idea of the enormous profits realized by the screw steamship companies in the Atlantic trade. Notwithstanding its numerous losses (averaging more than one a year), the Montreal Steamship Company has made all those who are concerned in it independently rich. The underwriters may have suffered somewhat, although the premiums on a weekly line must go far towards compensating them for one loss, even a total loss, at the end of the year; but as regards the owners and stockholders, the enterprise has been profitable beyond all expectation. The constantly recurring accidents have made the line unpopular in Canada, but there is such a constant pressure of freight both out and home, that the vessels are always full. There are two other screw steamship lines in successful operation between Great Britain and the St. Lawrence, and the merchants of Montreal are starting a fourth.

HOTEL ELEVATORS.—It appears from the proceedings of the Institute of British Architects, that the principle of hydraulic lifts is being successfully applied in the place of steam-power in many cases. The Brighton Hotel contains a machine which, moved by the weight of water with a sufficient head, raises the visitors and luggage from the lower story to the upper, which is seventy-seven feet from the ground. The elevator in the Fifth-avenue Hotel is operated by steam. At the Grand Hotel in Paris, the elevators are put in motion by means of Lenoir's gas-engine, which is said to perform its office with economy and cleanliness, and requires very little attention.

HUMBURG GOLD STORIES.—A correspondent of the Chicago *Tribune* has seen a reliable gentleman just from Idaho, and he says the story about that fifteen millions in gold awaiting transportation is all bosh; and adds that there is not gold enough dug out in the whole territory to pay the expense of getting the emigrants back home, and that all the big stories telegraphed from St. Paul and New York, just before spring opens, are the fabrications of speculators to get up a rush of deluded emigrants.

THE PORTLAND SUGAR HOUSE was established in 1845. From small beginnings the business has year by year increased, until this is now the largest molasses house in the country, with a capacity of three hundred barrels of sugar daily, giving employment, when in active operation, to over three hundred men, with a monthly pay-roll of \$7,000. During the last year 34,582 casks of molasses were consumed, and the sales of sugar amounted to 53,730 barrels, or 13,611,855 lbs.

A NEW DIFFICULTY.—The *U. S. Gazette* says:—"Nickel cents at the Mint are growing very scarce. When the Government first commenced the use of nickel as a material for coin, it made a profit on the coinage. The old-fashioned copper cent was too cumbersome, and the nickel penny was an agreeable change. Since the Government adopted the use of nickel the article has risen largely in value. All metals have risen in price. Nickel is found in Germany, but the supply to the Mint is mainly derived from Litchfield, Conn. The prospect is that after awhile the Government will find difficulty in procuring sufficient for its requirements, and some substitute will be rendered necessary. Meanwhile the demand for cents, at the United States Mint, is most pressing, and not half of it can be satisfied. The fear is that the Government will not be able to obtain nickel at such a rate that it can furnish a hundred cents or a dollar as it now does."

PRESERVATION OF GUM AND STARCH PASTE.—The paste made by gum tragacanth and gum arabic, which is so extensively used by the apothecaries in this country, acquires, particularly during the warm season, a very unpleasant and even offensive odor in consequence of fermentation, which soon commences on exposure to the air. Oil of cloves, alum and other essential oils and salts are frequently added to counteract this tendency, with but partial success, the volatile oils merely hiding to a certain degree the effusive odor developed, and retarding the fermentation incompletely. For some time past I have availed myself of the antiseptic property of creosote, which may be added to these pastes recently made, until its odor is faintly apparent. The result is their perfect preservation, no offensive odor being disengaged, and their adhesiveness is not impaired by keeping them for months.—*John M. Maisch, in American Journal of Pharmacy.*

SUGAR-MAKING FROM SORGHUM OR IMPHEE.—Messrs. C. O. West & Co., of Martinsville, Ohio, say:—"There have been several samples of sugar produced by different individuals in this vicinity, on a very cheap and simple plan, viz:—Take the most thorough granulated sirup on hand, and place on a strong linen cloth, suspended by the corners at a slight swag; prepare a vessel underneath to catch the drips, then introduce pure cold water in falling drops on the grained sirup in the cloth, stirring at the same time thoroughly, so as to cause the water to come in contact with every particle of grain; continue the process of washing in this way until the waxy or gummy tendency is destroyed considerably; then apply a press to hasten the expulsion of the liquid part, leaving the grain in the cloth, which may be put into a vessel, and will soon dry and crumble ready for market by stirring."

IMPORTANT TO CIVIL ENGINEERS.—At a meeting held on the 22d ult., in this city, by a number of civil engineers, it was resolved to organize an American Institute of Civil Engineers, the object of which shall be to facilitate the acquisition and diffusion of a knowledge of engineering science; to create and maintain a proper professional spirit among its members; to elevate their standard of acquirements and advance their interests. It was further resolved that an adjourned meeting be held on the 16th day of March, 1864, in the Engineer's office of the Pittsburgh and Steubenville Railroad, corner of Hand and Liberty streets, Pittsburgh, where it is expected that every civil engineer will be present to join a permanent organization.—*Pittsburgh Chronicle.*

AIR IN SIPHONS.—A correspondent writes us saying that in the event of air collecting in siphons it can be removed by putting an air chamber on the pipe at the highest point; the air will then collect in the chamber instead of the pipe, or else to attach a cock to the siphon and pump the air out through it and a pipe with a lifting pump. These methods are obvious to every one, and have been advised by us before, but we have been assured that they do not remedy the evil.

A BURGLAR-PROOF vault has been invented, in which a space between two of the plates is filled with iron balls about one inch in diameter, perfectly loose. The plates cannot be drilled through, as a drill must strike one of those balls, which would rotate with the tool, instead of submitting to the perforating process. One of these vaults has been put up in the Chicago Custom-house.

A NEW GRAFTING WAX.—One pound of rosin, five ounces of 95 per cent. alcohol, one ounce of beef-tallow, one table-spoon of spirits of turpentine. Melt the rosin over a slow fire, add the beef-tallow, and stir with a perfectly dry stick or piece of wire. When somewhat cooled, add the turpentine, and last, the alcohol in small quantities, stirring the mass constantly. Should the alcohol cause it to lump, warm again until it melts. Keep in a bottle. Lay it on in a very thin coat with a brush. In a room of moderate temperature, the wax should be of the consistence of molasses. Should it prove thicker, thin it down with alcohol. It is always ready for use, is never affected by heat or cold, and heals up wounds hermetically.

The notes of all the "National Banks" bear on their faces the same gilt ring which is on the new postal currency; this ring is a sure protection against photographing, as the yellow mordant will always "take black."

The new building of Sharpe's rifle factory at Hartford is completed externally, and will be ready for occupation in April. It will cost, with the new engine of two-hundred-and-fifty-horse power, \$100,000, and when filled with machinery the whole will cost \$250,000. Instead of the 475 workmen now employed, room will be given for 1,000. In the third story of the new building is a hall 208 by 40 feet, the finest audience-room in Connecticut.

The *Chicago Tribune* says that a bed of cannel coal has been found in the Minnesota Valley, on the Cottonwood river, a little more than one hundred miles from St. Paul. The bed is eighty-eight feet below the surface where the shaft was sunk, and is six feet in thickness. All indications are that immense coal beds exist in that locality. A company has been organized in St. Paul to work the mines.

RECENT SOUTHERN INTELLIGENCE.

The following items are collated from a file of Southern papers recently received at this office:—

The *Daily Progress* (published at Raleigh, N. C.) pays the following compliment to the members of the Confederate Congress:—

Congress has adjourned, and we suppose the members will soon be coming home, provided the faro dealers of Richmond, to whom some of them have been such good patrons, have left them enough or will lend them enough "promises to pay" to square their wash-bills and get out of town. The Congress is dead and may we never see its like again!

The *Richmond Examiner* (of February 22nd) contains the following market quotations:—

Flour is now held at \$225 to \$230 per barrel for superfine, and \$240 to \$250 for extra. Corn meal, \$27 to \$28 per bushel. Corn, \$25 per bushel.

Bacon is very scarce, and only selling in small lots at \$5 50 to \$6; lard, \$5 to \$5 50; butter, \$6 50 to \$7; beef, \$2 75 to \$3; poultry, \$3 per lb.—supplies very light.

Apples, \$90 to \$100 per barrel; onions, \$35 per bushel; potatoes, \$9 to \$14; peas, \$30 to \$35; beans, \$38 to \$40 per bushel.

Hay, \$20 per hundred—scarce.

All groceries are higher. For sugar, holders are asking the extraordinary rates of \$10 to \$12 per lb.; sorghum molasses, \$33 to \$35; coffee, \$12 per lb.; rice, 60c. to 70c.; tallow candles, \$6 per lb.; vinegar, \$6 per gallon; cider, \$8. Even salt has advanced, and is now going off freely at 30c. per lb. The stock has been diminished.

Whiskey is quoted at \$80 to \$100 per gallon; apple brandy, \$65 to \$80.

The tobacco market is active, and prices tend upward.

Leather is very scarce, and since the conscription of tanners, under the new military bill, a further advance in prices is anticipated.

The prices of fuel are unchanged.

Messrs. Lancaster & Co., sold to-day, gold coin at \$22 for one; silver coin, \$20; foreign coin, \$21½.

CANNOT HELP IT.—The *Daily Journal* (of Wilmington, N. C.), under the above caption, informs its patrons that it "cannot help" putting its subscription price up to \$30 per annum. Think of that, ye newspaper patrons who consider \$3 per annum a large price! The same paper says there has been a great decline in household commodities, and that sugar and tobacco declined one dollar a pound in a single day. Wilmington must be a good place for speculators. In that city, also, common brown sheeting is quoted at \$6.12 per yard.

\$50,000 REWARD.—Mr. Henry Hart and five other mercantile firms advertise, in the *Wilmington (N. C.) Daily Journal*, that "they will pay fifty thousand dollars reward for the arrest and conviction of any person or persons who, on the night of the 8th of February, set fire to the cotton stored in their yard"

Either they must have a valuable stock of cotton to afford so large a reward, or else they do not very highly value the currency in which they propose to pay the reward—probably the latter.

The *Confederate* (published at Raleigh, N. C.) contains the following:—

A GOOD SIGN.—There was no meeting of the "Agitators" in this city last night, as has been for some time contemplated. We welcome this as an omen of good. God grant it may be an indication that the leaders see the evil of their course, and are commencing to retrace their footsteps. If so, every good citizen in the land will rejoice.

The "Agitators" referred to above are the "Unionists" of North Carolina who have openly avowed their wishes to return to their former allegiance. The suspension of the *habeas corpus* act, and the relentless rebel rule under which they live, with the persecutions they suffer and with which they are threatened has intimidated the "Agitators" for the time being; but there is a smouldering fire in the breast of a majority of the people of North Carolina which will break out at no distant day, and then Jeff Davis and his co-traitors must look out for their necks.

TOO GOOD TO BE TRUE.—We have information from a lady just out from Knoxville, says an exchange, that the notorious Wm. G. Brownlow died in that city a few days since. There are but few we know of who have ever heard of this vile traitor and renegade, who will not regret that in dying a natural death he cheated the gallows of its due.—*Richmond Whig.*

It is good that it is not true that Parson Brownlow died at Knoxville lately. He has been sick, but we are happy to learn that he is out again, and engaged in stirring up the loyal citizens of East Tennessee to stand by the "old flag." We wish the editor of the *Whig* was the same sort of a "vile traitor" as he terms Mr. Brownlow.

THE BETTER DAY THE BETTER DEED.—The rebel Congress has appointed the first of April as the day on which one-third of the value of Mr. Memminger's currency will be "repudiated." The sufferers by the act of confiscation probably think this day to have been chosen in compliment to themselves, the victims of perhaps the hughest practical joke ever played off on All Fools' Day.

TO MACHINISTS AND OTHERS

Let all those interested in the mechanic arts, and in the manufacture of machinery, recollect that on Monday, the 28th of March, only one week from this, the Metropolitan Fair will open. In offerings to the good cause for which this Fair was started, mechanics and engineers must not be behind any other department. A building 150 feet long and 37 feet wide has been erected expressly for machinery. Let it be filled to its utmost limit. This much is due, not only to the cause, but to our inventors, machinists and manufacturers. For circulars or special information address A. W. Craven, Engineer, the Chairman of Committee on Machinery, Croton Aqueduct Department,

Rust Joints.

Very many persons have heard of the term "rust joint" as applied to steam engines, but do not know its significance. A rust joint is one made by cast-iron borings with urine, or salt water and sal ammoniac without the urine. In using this material when two flanges are to be joined, there is a short rib or ring cast on the face of the flanges; said rings being brought in contact with the screw bolts. There is then a space all round in which the wet borings are to be driven as tightly as possible with a steel drift, clear up to the outside of the flange. This makes a perfectly tight joint, but it must not be driven in cold weather, as the borings freeze and render the joint liable to leak; neither must any grease be allowed to touch the faces of the flanges or the borings; if this is not cared for, the joint will not rust fast and the work will be spoiled.

A Substitute for Eggs.

As a matter of general interest, we will state that corn starch is an excellent substitute for eggs for culinary purposes; one spoonful of corn starch being reckoned equal to a single egg.—*Philadelphia News.*

[A substitute for any article must have some quality in common with that which it supplants. Eggs are only useful to make cakes or cookery light; their other qualities, such as enriching food or making it more palatable, are subordinate. Starch is no substitute for albumen, and cannot in any way supply the place of eggs.—Eds.]