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Improved Camp Chest.

The two accompanying engravings are pictures of the same thing, though one represents it as a table spread with a cloth, set with dishes, and supplied with seats for three persons, while in the other it appears as a moderate-sized box or chest. Though this chest is only 31 inches in length, 14 in width, and 10 in depth, and weighs but 40 lbs., it contains the following articles: 3 web-seat camp stools, made of the best hickory, and folded together; hatchet, saw, carving knife and fork, 3 flasks, that will, in the aggregate, hold one gallon; tea caddy, coffee caddy, wash bowl, dipper, 8 plates, 4 knives and forks, 4 each of table and tea-spoons, tea and coffee pot combined, with a strainer; frying pan, pot for boiling, 3 drinking cups, sugar and milk bowl, cruet stand for pepper, salt, mustard and vinegar, with mustard spoon and cork screw combined; 1 apparatus for boiling tea or coffee, and fuel for 20 meals; 2 table cloths, and 2 towels.

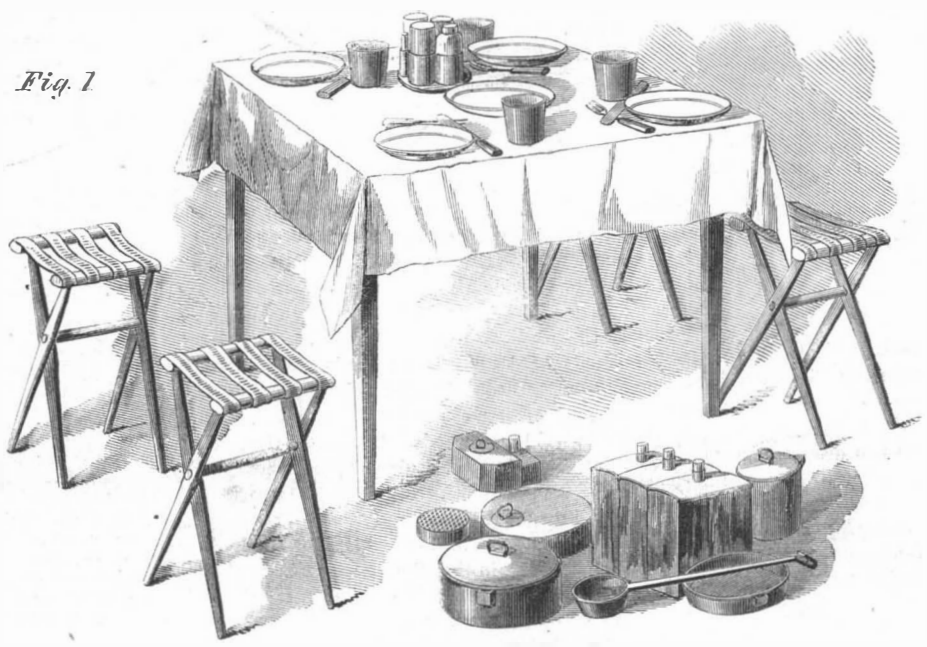


Fig. 1

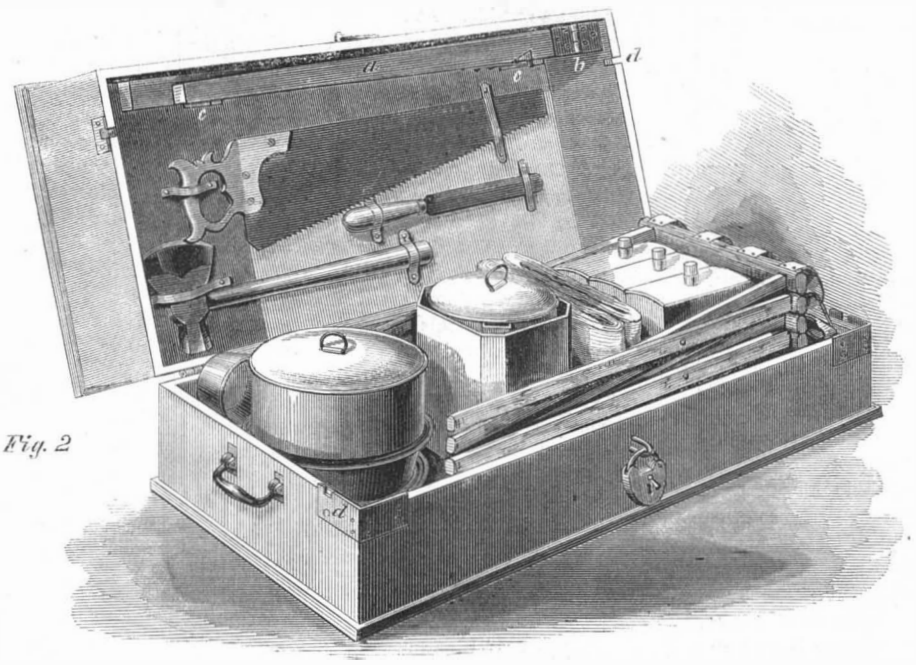


Fig. 2

PARR'S CAMP CHEST.

The principal novelty of this invention consists in the arrangement for securing the legs to the box in such manner that they will fold snugly inside to close the box, and will support it firmly when it is used as a table. The legs, *a*, Fig. 2, are attached to the inside of the box by the hinges, *b*, so that when the box is opened, the legs can be turned down to support it as a table. The latch, *c*, upon the side of each leg, can be turned down into the notch, *d*, thus holding the leg very firmly in its place.

This camp chest is not intended for soldiers, merely, but will be found quite as well adapted to the use of hunters, fishers, picnic parties, and excursionists generally.

We are informed that it has been examined by President Lincoln, ex-President Fillmore, Gen. Mansfield, Gen. Meigs and other competent authorities, who have given it their fullest endorsements.

Mr. Parr, who seems to be fertile in getting up convenient things, has also invented a canteen case, which, like the camp chest, has a cruet stand for pepper, salt, vinegar and mustard; mustard spoon and corkscrew combined, knife and fork, spoon, tea caddy, drinking cup, apparatus for boiling tea and coffee, with fuel sufficient for 20 meals. This light, convenient and useful article is inclosed in a leathern case, nicely finished, and is designed to be suspended from the shoulder by a leather strap in the same manner as the cartridge box.

Altogether, these arrangements of Mr. Parr are unique and useful, and as such we can recommend them to the soldiers of our army.

The patent for this invention was granted June 25, 1861; and further information in relation to it may be obtained by addressing the inventor, George Parr, at Buffalo, N. Y.

Resistance of Cast-Iron to Internal Pressure.

The following are some extracts condensed from a paper, lately read upon this question, by Mr. John Briggs before the English Association of Foremen Engineers.

There is a limit to the pressure which should be put internally to cast iron, and there was a limit also to the *thickness* of metal to be used for cylinders of hydraulic presses. Such a statement might, at the first blush, appear to be irrational. The general opinion is, that the thicker the iron the greater its resistance to pressure when the bore remained the same size. This he believed not to be the case, and Mr. Joseph Bramah had long ago the same opinion. At the time that one of the press cylinders employed in raising the tubes of the Britannia Bridge had burst asunder, a workman, once in the employment of Messrs. Bramah, thus wrote to the *Mechanics' Magazine* (Sept. 29th, 1849):—"At Bramah's we never found presses in constant work stand more than three tuns (6,720 lbs.) on the square inch, and the greatest pains were taken to obtain the most approved kinds of iron—mixed qualities—to cast cylinders from. I have seen press cylinders stand 7,000 lbs. and even 8000 lbs. on the square inch under proof for a short time; but we never could trust them to work with so much, and cast iron then was far superior to that of the present day. Increasing the thickness of the metal in press cylinders was seldom successful. I have known metal seven inches thick stand as well as that of 10½ inches, for presses with rams 10 inches diameter. The thicker the metal, the greater appeared to be the difficulty in getting it equal and homogeneous throughout."

The experience of Mr. Briggs was of a similar character. He considered that many cast iron cylinders were cast too thick under the supposition that they were strong in proportion to their thickness. There is a limit to the strength of all cast iron cylinders, as it relates to their thickness, and efforts should be made to obtain thinner castings, as they were more uniform in strength, more dense, and better calculated to sustain pressure.

The general conclusions arrived at by Mr. Briggs were as follows:—Three tuns per circular inch he considered to be the bursting pressure of press cylinders. The maximum thickness of metal, when all due care had been exercised in its composition, should not be more than the radius of the bore of the cylinder. Two tuns per circular inch was a safe pressure to work up to, and this he should pronounce to be his own standard.

It appears to us that puddled cast steel is far su-

perior to cast iron for hydraulic presses and all cylinders subjected to great internal pressure—not excepting cannon.

THE WAR.

THE GRAND ADVANCE.

We briefly mentioned, in our last, that the long-anticipated advance of the grand central army which has been entrenched south of Washington had at last commenced. This column was under the command of Brigadier General Irvine McDowell, of the regular army. The main body of the secessionists is strongly intrenched at Manassas Junction, twenty-seven miles outhwest from Alexandria and about thirty from Washington. A letter from one of the secessionists in the entrenchments, written on the 7th of July, represents the works extending for fourteen miles, and very thoroughly constructed under the direction of the educated engineers who have deserted the United States service to fight against the government. If his statements are correct, these intrenchments are quite as formidable as the famous lines of Torres Vedras, north of Lisbon in Portugal, behind which the Duke of Wellington bade defiance to the ablest of Napoleon's marshals.

Our army consisted of sixty regiments and constituted by far the most formidable military force that has ever been mustered on this continent; unless, indeed, the secession force directly opposed to it may be greater. It was organized in five divisions, arranged in the usual order of right and left wings and the center.

The long-expected order to move forward was telegraphed from Gen. McDowell's headquarters, at Arlington Hights, to all the division and brigade commanders of the grand army, at two o'clock in the afternoon of Tuesday, July 15th, and was communicated to the different corps during the brigade parade held in the course of the evening. The order was received by all the troops with the most enthusiastic demonstrations of satisfaction. The regimental commanders were instructed to hold their commands ready to move at 2 P. M., the next day, provided with cooked rations for three days. Accordingly, the greatest activity prevailed on the morning of the 16th, throughout the encampments, from the northernmost post, near the Chain Bridge, to the southernmost, near Alexandria. Tents were taken down and tied up, wagons loaded, arms put in order, ammunition dealt out, rations cooked, &c.

At noon everything was in readiness, and precisely at two o'clock the fifty thousand men composing the grand army about entering upon the great work of sweeping secession out of the Old Dominion, were moving from their different positions toward their respective destinations.

The army moved southwesterly by four roads, its east and west portions being some eight miles apart at the start, but concentrating towards Centerville, three miles from Manassas Junction. Gen. McDowell went forward at the head of the second division forming the center. This division had in advance one regiment deployed as skirmishers, their lines extending from half a mile to two miles on each side of the road to guard against an ambush. Then followed one regiment of infantry, then a company of flying artillery, consisting of six rifled cannon, each drawn by four horses, and each gun followed by an ammunition wagon, also drawn by four horses. Then came two regiments of infantry, completing this brigade. Another brigade, somewhat similarly organized, followed in this division, with a long line of baggage wagons in the rear. The whole line occupied some miles of the road, and was several hours in passing a given point. As the column moved up and down the hills of the broken country through which the march lay, the rumble of the artillery, the long lines of bayonets glistening in the sun, and the perpetual tramp of the soldiers, are said to have produced a scene singularly impressive. Some of the inhabitants fled on the approach of the army, many gazed on sullenly, and a few continued quietly cultivating their fields as the troops marched by.

The other three divisions moved along their respective roads in about the same order, while one division was left in the rear as a reserve.

As the army moved towards the southwest, the enemy's pickets fell back before them on their main lines. On the 17th our troops entered the village of Fairfax Court House, eighteen miles from Alexandria and nine from Manassas Junction.

THE FIRST FIGHT AT BULL'S RUN.

On the 18th the first division arrived at Bull's Run, a small stream running through a valley three and a half miles from Manassas Junction, and here a brisk skirmish took place.

At eleven o'clock General Tyler proceeded to make a reconnoissance in force with Captain Ayres' (late Sherman's) battery, four companies of cavalry and Col. Richardson's brigade. Advancing up the road to Bull's Run for about two miles, the column came to an opening, after passing through a long stretch of timber, when sight was caught of a strong body of the enemy. General Tyler immediately ordered Captain Ayres' battery to advance and open on them, which they did from a commanding elevation. Eight shells had been thrown, when suddenly a volley was fired upon us from a hidden battery, about a mile down the road. Some of the enemy's grapeshot struck among the cavalry, that had in the meantime been drawn up in a body on a hill, killing two horses and wounding two of the troopers. Two more shots were then fired by the rebels, to which our rifled peices responded with about fifty shot and shell, directed wherever a trace of the enemy was visible. Two of Parrott's rifled twenty pounders then came up, and immediately joined in the action. The Parrott's gun is made of rimmed wrought iron, with rifle bore. With a single pound of powder they throw a shell of twenty pounds two and a half miles. The enemy having retreated into the woods, our batteries stopped firing, and the Second Michigan was ordered to deploy as skirmishers on the left of the road, and advance into the woods. They gallantly moved on, and, having entered the timber, they had hardly been out of sight five minutes when a most lively exchange of musket shots took place for a few minutes. Suddenly a succession of whole volleys, evidently discharged by large bodies of men, were fired. The remainder of Colonel Richardson's brigade was then ordered ahead. The three regiments advanced towards the woods, and drew up in battle array in front and on the right of the timber. Meantime the exchange of musket shots continued in the liveliest style in the woods. Companies G and H, of the First Massachusetts Regiment, and some companies of the Twelfth New York Volunteers, were then also ordered into the timber; and at the same time the cavalry and two howitzers advanced to the edge of the woods, the firing in the timber being kept up in the interval. Our howitzers then threw some grapeshot into the timber, when at once a terrific series of volleys of musketry were poured out from the woods upon the troops outside. At the same time a battery commenced playing upon us from an elevation in the rear. Shot of every description flew about our troops for some minutes like hail; but they being fortunately, nearly all aimed too high, hardly any one was struck outside the woods. A retreat was now ordered, when infantry, cavalry and artillery fell back behind our battery on the hill. The Twelfth New York, and a portion of the First Massachusetts broke ranks, and scattered in different directions, in their hasty retreat for some distance through the woods, in the rear of the battery. The remainder of the brigade formed behind the battery. At this juncture Colonel Sherman's Third Brigade, headed by the Sixty-ninth New York Regiment, appeared. Our battery again opened, and kept up a raking fire for nearly an hour which was vigorously replied to by the enemy. Their balls and shells struck the houses in front of which the battery was stationed several times, and raked the woods in the rear for nearly a mile. Some of their shot were picked up and proved to be from Hotchkiss rifled cannon. After a cannonade of about an hour a retreat was ordered, and our entire forse fell back to Centerville.

THE BATTLE OF BULL'S RUN.

After the skirmish of the 18th, our forces were advanced ready for an attack on the secession batteries at Bull's Run, and this took place on the 21st. All through this beautiful summer Sabbath the hostile thousands of these brave young Americans, scattered over some five miles of one of the loveliest regions in the world, were sending shot, shell, grape, canister, shrapnell and musket bullets into each other's bodies, the fight finally resulting in one of the most disgraceful panics and flights on the part of the Union forces that is recorded in the annals of war.

From the accounts received up to the time of going to press, we are unable to form any clear picture in our minds of the details of the battle, and shall not therefore make the attempt to convey any to our readers. The leading events, however, are known, and can be briefly stated. Our forces started upon their march at 2½ o'clock in the morning, and advanced to the valley of Bull's Run, which they reached at about 6. Across the valley the enemy could be seen drawn up in line of battle. On our side the firing was commenced by a large rifled cannon, and soon became general along the whole line of nearly five miles. The infantry advanced and attacked the enemy's batteries, carrying all but two of them in the course of the day. In the rear of the infantry, the engineers were busy in constructing bridges across the stream for the passage of the artillery, when, near sunset, an order was given to retreat. At this instant a panic arose among the teamsters in the rear, which was soon communicated to a portion of the volunteers.

The contagion spread, and in less than ten minutes a part of our army was flying in the utmost disorder. Everything was abandoned. The wounded were deserted in the hospitals, and the only thought was of individual safety. Guns were thrown aside, and blankets and knapsacks were lost and trampledupon. Some of the artillery shared the panic; the guns were cut loose, and the gunners used the horses to escape the more swiftly. Those on foot begged piteously to be allowed to share the horses of those who rode. Many strove to clamber into wagons, and were pushed back by the bayonets of those who occupied them.

A large portion of the army, however, maintained its order with a heroism and coolness worthy of veterans. The First Ohio regiment, under Col. McCook, recently Teacher of Infantry Tactics at West Point, made the last stand in the field, and the retreat was covered by the Rhode Island troops and Colonel Blenker's German regiment, from New York, in admirable order.

A considerable portion of our artillery was temporarily abandoned, but nearly all was afterward recovered.

During the eleven hours' fighting under the broiling sun, the New York city troops were particularly distinguished, though all our forces fought with a desperate and steady valor that has never been surpassed. Mr. Russell, the correspondent of the London *Times*, says that our infantry charges eclipsed even the famous British charges at the battles of Alma and Inkerman. As nearly as we can make out from the present accounts, the teamsters and straggling skirmishers ran away, spreading frightful stories of defeat, while the great mass of the army fell back in good order upon its positions. All that courage could do to retrieve the blunders of their leaders was performed by our soldiers.

Our troops fell back to the positions which they occupied before the battle, where they are being rapidly reinforced.

Very false accounts of this battle were telegraphed over the country on Monday and Tuesday, representing it as a complete rout and dispersion of the whole army, causing considerable gloom, but nerving the spirit of the people with additional resolution and firmness. By Tuesday night, 60,000 additional volunteers had been accepted by government among those which had been previously offered and declined. General McClellan has been ordered to Washington, it is supposed to take the command of the army there, while Gen. Banks supersedes Gen. Patterson. The effect of the engagement will be to cause the war to assume larger proportions, and to be more protracted.

RETAKING OF ONE OF THE VESSELS CAPTURED BY THE JEFF. DAVIS.

The schooner *S. J. Waring*, mentioned in our last among the vessels which had been captured by the privateer, *Jeff. Davis*, arrived in this port on Sunday, July 21st, having been retaken by the black steward, with the assistance of one of the seamen.

When the *S. J. Waring* was taken by the *Jeff. Davis*, her captain and mate were taken off, but the colored steward, two of the seamen and a passenger were left on board. The steward having discovered, by a con-

versation which he heard, that it was the intention of the prize master, Capt. Amiel, to sell him into slavery as soon as the schooner arrived in Charleston, determined to make a desperate attempt to retake the vessel. He proposed his plan to the two sailors who belonged to the schooner, but one of them refused to have anything to do with it. The other one, however, a young German by the name of William Stedding, agreed to assist, and these two men undertook the bold task of overcoming the whole prize crew.

The following account of the successful execution of their enterprise is given by the passenger, Bryce Mackinnon. After narrating the events of the capture, substantially the same as already published, he says:—

The schooner was headed for Charleston, or some inlet on the coast near that port. We were not put in irons, but were used with as much kindness as we could expect. The steward continued to cook and provide for us, and our men worked the vessel. I became quite intimate with the officers, and expected soon to be a prisoner of war in Charleston, though we hoped we might fall in with a United States vessel, and be rescued from our captors. Thus we got on quietly on our way southward until Tuesday, the 16th inst., when we were 50 miles south and 100 miles west of port, and thought we might get in the next day.

What followed, I did not anticipate. It is true that now, when I look back, I remember that Amiel had congratulated himself upon the valuable prize he had found in the steward, whom he vowed was worth a cool thousand on Meeting street, Charleston. And I further remarked that, on several occasions, Tillman, the steward, shook his head and muttered, "Dem fo'ks nebber git to Charls'n;" but I supposed then that he was expecting, like the rest of us, to meet with a friend in one of Uncle Sam's cruisers.

It was a bright moonlight night, was that of Tuesday, so pleasant that I remained on deck till 11 P. M., later than I usually did. The steward had turned in at 8, as was his habit. Our trunk cabin projected about three feet above the main deck, and was entered by a companion way in the middle of the forward end. When I went down, the mate was nodding on the cabin roof, just in front of the wheel, in a half recumbent position. Behind him stood Wm. Stedding, one of our old crew, at the wheel. Milnor, the South Carolinian, lay asleep on a pile of sails at the foot of the foremast. McLeod, another of our men, with Dorsey, the Jerseyman, were asleep in the forecastle. The cabin lamp was burning on the table when I went below, and Capt. Amiel lay snoring in his berth in his stateroom, sound asleep. In the stateroom on the other side of the cabin slept the steward and second mate, the former on top, the latter in the second berth, the third and lowest sleeping place being unoccupied.

The weather being sultry, the doors of the staterooms had been taken off, so that not only were the rooms open from the cabin, but my room, in the rear of the captain's opened into his, the door between being also down. I took my coat and vest off very leisurely, and swallowed a draught of cherry brandy before getting into bed, so that I should think it was 11:10 when I retired. It could not have been more than 10 minutes later when I was awakened from a light sleep by a peculiar sound in the captain's room, which I knew instinctively could only have been produced by an ax cleaving Amiel's skull. No sooner did the "thush" strike upon my ear than I leaped out of bed, and leaning against the door casing in the partition, saw the steward dart through the twilight—for he had extinguished the light—noiseless as a cat across the cabin toward the second mate's room. I also saw, at the same glance, Capt. Amiel rise from his berth and attempt to follow him; but the blood blinded him, and he fell to the floor, with a horrid gurgling sound in his throat. All this was but the work of a second. The cleaving of the skull, like a flash from a gun preceding the report, was followed by a weak, faint cry, like that of a sick child, and the gurgling in the throat. I knew then that his wound was mortal. Stooping sideways, the steward entered the second mate's cabin, and once more swung his ax, but not so effectively.

The mate started up with a "G—d d—n you, don't strike me again," and clutched at the steward's breast, but eluding the wounded man, he ran on deck, to where the man lay near the wheel-house, and keeping his axe behind him demanded "what all this noise was about?"

The mate who had been aroused by the outcries of the captain and mate, had raised himself up on his elbow, and stared at the steward in a half stupid, half fascinated way, not seeing the pistol which Stedding the man at the helm, had pointed at him for use in case of necessity. As he turned his face toward the steward, the latter drove his weapon home into the base of his skull. Stedding and the steward then tumbled him overboard. He rose on the wave, with a hoarse cry, when about two lengths astern, the water having raised him, but he must have soon gone down to his long account.

Then the steward came down to the cabin, where I still stood, while Stedding remained, pistol in hand, to guard the deck. The captain cried faintly twice to me by name, "Help me—help me," but he was past help. Another swishing blow of the ax, and he did not repeat the cry. Then the steward returned to the second mate's cabin, where, seated on a pile of starch boxes, his legs drawn up, and his head between his knees, was the half stupified man. Again and again the ax fell, and again and again the cry "Don't do that," fell on my ear, each time fainter than the last. Stedding now came down, and the steward and he took the corpse of the captain by the feet, and dragging it up the companion-way, tossed it overboard. Meantime, I had got some irons out, hoping to intercede to save bloodshed. Stedding and the steward once more came down, and each taking the second mate by the shoulder led him out, from the place where he had crouched on the starch boxes. He seemed to walk, with their assistance, as they went up the companion-way, but his head lay a pulpy mass upon his shoulder, and a moment after a loud splash alongside told the fate of another of the privateers.

There were three persons on board who knew nothing of all this. The two privateer sailors, and Donald McLeod, one of our sailors, whom I subsequently learned would not join the steward and Stedding in the attempt to recapture the vessel. Handing me his pistol, Stedding went forward and roused Milnor, the South Carolinian, a young man of two or three and twenty, from his sleep at the foot of the mainmast, and called him aft. Not seeing his comrades when he came into the cabin, he was much frightened and begged for life. The steward told him he would not kill him, but iron him, and his fate would depend upon his good behavior; he wanted to spill as little blood as possible. He willingly held out his wrists for the irons. They then went forward to the forecastle and called the other privateer, Dorsey. Upon learning the condition of affairs he begged for his life, which they promised to spare if he would assist in working the ship and be true and faithful, to all of which he agreed.

The steward now took command, and the schooner headed for the North, with a fair wind. None of us knew anything of navigation, but we trusted to good fortune and the land to enable us to make out our course. The South Carolinian was released from irons the next morning, and proved a very useful and willing fellow in working the ship.

On Friday, the 19th, at 8 o'clock in the morning, we made the land, which became quite distinct by noon, and we kept on our way with good weather, sounding our way as we went. Of course we had to be vigilant. Two of our hands might turn upon us at any moment, and McLeod was not faithful; for three days before we got in he went forward and slept with them in the forecastle. Stedding, Tillman, and I managed it so that two of us were on deck all the while, and always aft of the other three. The men on watch carried the two pistols, and the one that slept always kept one eye open, lest we might be attacked. On Sunday morning, at 9 o'clock, we got a pilot off Sandy Hook, and soon after hired a tug for $60 to tow us up to New York, where we arrived about 4 P. M., truly thankful for our great deliverance.

The steward's name is William Tillman. He says that he was born of free colored parents in Milford, Delaware, and is 27 years of age. His parents moved to Providence, R. I., when he was 14 years old, and he has since called that place his home. He has followed the sea for ten years, and has been in the employ of Jonas Smith & Co., No. 227 Front street, by whom the schooner was owned, for the last three years. He is of medium hight, rather strongly built, crisp hair, of nearly unmixed negro blood and bears in his countenance an expression of honesty, strong common sense, with some touches of humor.

ANOTHER PRIZE RECAPTURED.

One of the vessels captured by the steamer *Sumter* has also been retaken. This is the brig *Cuba*. She was seized at the south of the island of Cuba, and a prize crew of five men put on board; the captain, J. D. Strout and a few of his crew being left on board to work the vessel. On the 8th of July, while the vessel was off the west end of Cuba, Capt. Strout formed a plan, in connection with his mate and steward to retake her, which succeeded; the mate and steward seizing the arms of the sailors and marines forward, while Capt. S. took care of the officer. They made a desperate resistance, but the plans were too well laid.

They arrived safely in this port on Monday, the 22d of July, with the prize crew as prisoners.

TIRED OF WAITING.—The New Orleans *Delta*, of the 11th inst, says that "the further persistence of the Confederate States in endeavoring to obtain a recognition of our nationality is useless." It also says that the British Ministry has not the courage nor inclination to apply to the Confederate States the rules which it has uniformly applied to other nations. Too much importance has been assigned to the idea that France and England would break the blockade to get Southern products. The editor proposes to recall the Commissioners and to reject the resident Consuls of all powers which will not recognize similar officers of the Confederate States abroad.

MANUFACTURE OF HEAVY ORDNANCE FOR THE GOVERNMENT.—The Boston *Traveler* states that the South Boston Iron Foundry now employs two hundred operatives in the manufacture of heavy ordnance and projectiles for the government. Some of the machinery is kept in motion the whole twenty-four hours, so urgent are the demands. The *Traveler* adds:

At this foundry are now making not only twelve and thirteen-inch shell for mortars, but shell for ten-inch Columbiads, and shot and shell for twelve and six-pounders, with canister and grape. From two to three hundred of shot and shell are made per day, and about twelve guns per week. Many persons suppose that mortars and heavy ordnance are cast hollow ready, after finishing, for use. This is a mistake. The gun is cast solid and then bored.

It is reported that Mr. Burton, formerly of Harper's Ferry Armory, and latterly of the Enfield rifle manufactory in England, is now in Richmond, Va., making rifled muskets for the secession forces.

Chemistry of the Comet.

We take the following from the London *Chemical News*:—Probably few of our readers are ignorant that a most brilliant member of this erratic celestial family is now a conspicuous object in the northern heavens. It first made its appearance on Sunday, June 30th, after sunset, when, as the clouds cleared away, it was suddenly discovered shining as bright as a star of the first magnitude, and almost rivalling the magnificent comet of 1858 in brilliancy and development of tail, while it far surpassed it in the diameter of nucleus.

An opportunity which perhaps may never occur again is thus allowed for physicists to become acquainted with the intimate constitution of these mysterious visitors. On the occasion of the last appearance of so brilliant an object, in 1858 philosophers could do little more than examine it through their telescopes, and wonder, and speculate on its constitution. Since then, however, science has made rapid strides, and we are at the present time in possession of methods of analysis vastly more searching and powerful than any known previously. Chemists can now analyze, in the most rapid and accurate manner, almost everything which is visible to the human eye. It matters not whether the body possesses a tangible substance or not—whether it is close at hand in the test tube, or millions of miles away; if it only fulfills the one condition of emitting light, it is almost certain to reveal the secrets of its composition when submitted to the new development of spectrum anlysis.

The actual metallic constitution of the sun has already been shown by this means; that of the fixed stars is also being ascertained in the same manner, and we really hope that the present opportunity will not be allowed to pass without the beautiful method of spectrum analysis being applied to determine the elementary constitution of cometary bodies. The apparatus required would not be more than is already in the hands of many scientific men. A large telescope, equatorially mounted, would, from some experiments of our own upon this subject, seem to be necessary, in order to obtain sufficient light to illuminate the field of view. The spectrum apparatus being placed in proper adjustment, the luminous image only requires to fall on the slit and along the axis of the collimating tube for the fixed lines in the cometic spectrum to be instantly visible. A small and temporary arrangement, hurriedly fitted up, has been sufficient to satisfy us of the existence of fixed lines in the spectrum of the light emitted from the comet at present visible, but they were too faint to admit of identification. This experiment should at once be repeated with larger and more powerful apparatus. Many important questions would thus be finally settled. If the comet shone merely by reflected light from the sun, the ordinary solar fixed lines would be the only ones visible. If, however, as is most probable, some of its splendor is due to native light, the spectrum would as readily reveal whether the nucleus or the tail were in the solid or vaporous state; if the former, it would give a continuous spectrum, while if it were a vapor, the spectrum would be disconnected, and the new lines in it would at once disclose the elementary bodies to which they were due. It is, however, impossible to foresee all the valuable information on the obscure subject of stellar chemistry which could in this manner be obtained. We trust that, having pointed out this most promising field of observation, the rich harvest of facts with which science can thereby be enriched will not be allowed to escape for want of able observers.

SMALL and irregular castings may be rapidly and effectually cleaned from sand by being placed in a slowly revolving drum. Small bronze statues are cast in this manner: The mold is placed on the mandrel of a lathe, the metal poured in, and the mandrel made to revolve. The centrifugal action of the mandrel throws the metal to the circumference of the mold, and thus very accurate thin hollow castings are produced.

DURING some experiments lately made in Vienna, it was ascertained that the guns used by the Austrian infantry could be discharged fifty-five times in nine minutes and a-half, with gun-cotton. The cartridge was put into the barrel without the use of a ramrod. The results with this class of gun are said to have been highly satisfactory.

Boilers and Boiler-Plates.

The following useful information on this important subject is from a paper read before the Association of Foremen Engineers by Mr. Ramsell, and published in the last number of *Newton's London Journal :—*

Mr. Ramsell stated that twenty years' experience in the construction of steam boilers had given him some practical knowledge of his subject, and that, therefore, he had little diffidence in speaking upon it. He had long ago become convinced of the necessity of adopting a different principle to that usually acted upon in the manufacture of boilers; and a very important point was to do away with "stays," as used for strengthening them. More especially, he referred to marine boilers, and instanced, in the following order, three principal evils attending the employment of stays :—First, the obstruction they offered to the effectually cleaning of the boilers; second, the increased amount of incrustation induced by them; and, third, the water and steam space they occupied. The fracture of the steel boilers of the *John Penn* S. V., which came especially under his notice last year, prompted him to give more consideration to the subject. In those boilers, the number of stays rendered necessary by the thinness of the plates, made it almost impossible to clean them out, while the cracking of the plates at the sides of the fire-boxes completed their ruin. The steel boilers were, eventually, and after a very short trial, removed from the *John Penn*, and their places were supplied by iron ones.

Having witnessed this, and many other instances of the evils of stays, Mr. Ramsell stated that he had come to the conclusion that iron plates, for boilers, might be so prepared as to give them strength, to a great extent, without adding to their thickness, or much to their weight. This object he proposed to effect by producing corrugations or indentations of any shape in the middle of each plate, and leaving plain surfaces on their outer edges, for the purpose of riveting them together. Plain surfaces for manholes, and the attachment of pipes, would also be left where necessary. The corrugations or indentations might be made by rollers or presses, as found most desirable or applicable to the particular size or shape of the boiler to be made. He had provided and used both rollers and presses for the purpose, and had experimented upon the plates produced by them. One series of experiments he would give them the details of, they having been made in the presence of Mr. Miles, of the firm of Humphreys and Tennant :—

Two plates, made from ¾-inch bowling iron, the center of the plates being only ¼-inch thick. Length and breadth from center to center of rivets, 5 feet by 3 feet 4 inches. Surface exposed to pressure, 6 feet 6 inches by 3 feet 5½ inches—equal to 22 square feet. At a pressure of 20 lbs. per square inch, or equal to 28 tuns 5 cwt. 2 qrs. 24 lbs. on the whole surface, it expands in center of plate, 1-32 inch.

	T.	C.	Q.	LBS.		
At 30 lbs., or =	42	8	2	8	it expanded	1-16 inch.
" 40 "	56	11	1	20	"	3-32 "
" 50 "	70	14	1	1	"	1-8 "
" 60 "	84	17	0	16	"	3-6 "
" 70 "	99	0	0	0	"	1 "
" 75 "	106	1	1	24	"	1 1-4 "

A full ¾-inch boiler plate, flat, with a surface of 3 feet 4 inches, by 3 feet 2½ inches, from center to center of rivets, expanded in center of plate as follows :—

At a pressure of 5 lbs. ₱ sq. inch.		3-32 inch
" 10 "	.. ..	1-4 "
" 15 "	.. ..	5-16 "
" 20 "	.. ..	3-8 "
" 25 "	.. ..	7-16 "
" 30 "	.. ..	1-2 "
" 35 "	.. ..	9-16 "
" 40 "	.. ..	5-8 "

These results demonstrated the superiority of plates manufactured on the corrugated or indented plan. The author did not confine himself, in the patent which he had secured, to any particular form of indentation, nor to whether these should project on one or both sides of the plates. He simply maintained that his process imparted additional strength to ordinary plates, while it tested severely the quality of the metal, without waiting for the pressure of steam to do it. In one steel plate of the *John Penn*, 10 feet by 2 feet 6 inches by 3-16-inch thick, 72 stays were employed : in one of his of the same dimensions, 9 such stays only would be necessary. In the back of the boiler of the same vessel, 320 stays had been used, whereas 70 would have given equal stability in the same space in a boiler of his construction.

Other facts of a similar character were mentioned by Mr. Ramsell, who illustrated his paper by drawings and models, which were handed round for the inspection of members. On the conclusion of the paper a discussion arose, Mr. Aydon taking exceptions to some of the statements made, and putting several pertinent and practical questions respecting the originality of the plans propounded. Mr. Stabler, Mr. Owbridge, Mr. Jones, and others joined in remarks favorable or otherwise to Mr. Ramsell's views, while the chairman admitted that much light had been thrown upon a very important, and, indeed, vital matter, in connection with steam boilers, and thought that further experiments should be made as to the strength of the plates. Mr. Ramsell met all the objections, and courted further examination at his works at Deptford.

Fire Shells.

Capt. J. Norton, in a communication to the London *American*, states that shells filled with molten iron, if kept for a few minutes "over time," become cold and perfectly harmless as hot shot. Respecting his own fire shells he describes them as follows :—"I charge my shells with phosphorus dissolved in bisulphide of carbon, which does not become damaged by time, or passing through water. I can make them of type or fusible metal, both of which are brittle, and become fragmented without the aid of a bursting charge. On striking the ground or a plank of timber, the fragments, being coated on the inside with the liquid, burn with intense heat for a long time. The shell may, moreover, be charged with pellets of wool, which, being saturated with the liquid, each will burn till consumed, and its ashes glow with fire for some time after. My light muzzle-loading rifled field-gun is well calculated for throwing these incendiary shells so as to strike the ground a short distance in front of a hostile battery, where on striking the ground they become fragmented, and the blazing segments are thrown forward among the gunners and horses of the battery. They would operate in a similar manner on striking the inside of the embrasures, or the port-holes of a man-of-war."

Corrosion of Lead in Water Pipes.

The Boston *Medical and Surgical Journal* contains the following important information on the above subject, which is of deep interest to almost every person. It says :—

Mr. J. R. Nichols calls attention to a source of danger attending the use of leaden pipes used for the conveyance of drinking water, which seems to have been hitherto disregarded. Even if it be admitted that the water which is supplied to the city of Boston from Lake Cochituate, like that of most New England ponds, be such that it may be safely used after having passed through lead pipe under ordinary circumstances, it would nevertheless be wrong to infer that this water can be employed with entire safety at all points of delivery, without first inquiring whether special conditions may not exist in some localities by which the character of the water may there be changed. Having observed several instances in which the inmates of a single house had suffered from lead disease induced by the use of aqueduct water, while the inhabitants of other parts of the city, supplied with water from the same original source, were unaffected, and having in one instance detected the presence of considerable quantities of lead in one of the cases first mentioned, while no reaction for lead could be obtained from a specimen of the same aqueduct water taken from another locality, the author proceeded to inquire into the cause which produces this lead impregnation in certain houses or districts, while the general waters of a supply remain unaffected. He has noticed in the leaden pipes removed from cess-pools, sinks and wells, that the intensity of corrosive action had been in a great measure confined to the sharpest bends and depressions in the pipe, while in some instances other portions remained intact. "I have in my possesion," he says, "a section of supply pipe, removed from the aqueduct of a neighboring city, in a portion of which corrosive action had proceeded so far as to cause leakage. The part thus acted upon was confined to an acute angle, and there is evidence to show that the plumber, in placing it in position, bent it in the wrong direction, thus creating the necessity for another turn in the opposite. This pipe had doubtless been subjected to two violent turns, which seriously impaired the homogeneity of the metal. An examination of lead pipe removed from buildings will certainly show that where there has been any perceptible amount of decomposition, it has been confined to the angles and depressions in its course. There are three causes or agencies which may perhaps be sufficient to produce these results :—1. The disturbance in the crystalline structure of the metal by bending, whereby its electrical condition is changed and voltaic action promoted, giving rise to chemical decomposition. [Together with the galvanic action which must be induced wherever connections or faucets of copper, or alloy, are fastened to the leaden pipe, or where a crack or fissure in the latter has been filled with solder.] 2. The presence of organic matter, such as fragments of leaves, and impurities pervading all pond waters, and which may be detained in angles and depressions of the pipes. 3. Corrosions may be produced in lead pipes by the accidental presence of pieces of mortar. Where mortar is present, the lime would assist in oxydizing the metal, and also aid in the solution of the oxyd. Considerable portions of fresh mortar are frequently deposited in lead pipes, during the erections of buildings. When the family commence the use of the water, it holds the salts of lead in solution, and its presence may be detected for months. The process of oxydation, which is retarded or prevented altogether by the presence of neutral salts in water, could not be materially interfered with under the conditions considered. It is obvious, if these observations and conclusions are correct, that much care should be exercised in placing pipes in position in buildings. In those leading to the culinary department, angles and depressions should be avoided. Violent twists and turns should not be permitted, and during the erection of houses, the open ends of protruding pipes should be carefully closed. Assuming the general fact that pipes, conveying the waters of our New England ponds, become coated and protected by an insoluable lead salt, the question arises, how long before this protection is secured, or, how soon may a family commence the use of water passing through new pipes, with safety? In view of the manifest danger from local disturbances, the most sensible reply would be, never. A section of new lead pipe, immersed in Cochituate water one hour, at a temperature of 65° Fah., gave a decided lead reaction with sulphydric acid. Removed and placed in six fresh portions of water one hour each, the waters, when tested, give similar results. The experiment continued during two weeks. Varying the time of immersion in fresh portions of water from one to ten hours the lead indications continued, although at last feeble. These results are sufficient to show that individuals or families should not commence the use of water flowing through new pipes, until considerable time has elapsed, and much water contact secured."

THIRTY YEARS' WORK.—Since 1831 the British have laid down, at a cost of £330,000,000 ten thousand miles of railway, along which they now carry 150,000,000 of passengers every year at a distance of 2,000,000,000 miles, besides an incredible amount of minerals and merchandise. During the same period there have been laid 10,000 miles of telegraph with 50,000 miles of communicating wire, by which there has been given to the people of that country something like an earthly omnipresence. In doing this they have been accomplishing a work more stupendons and likely to be more useful, than any works of which there is record in the history of the world—more stupendous than the mightiest industrial achievements of Rome, Greece, or China. During the same interval of time they have increased there navigation fourfold, and that part of navigation, which was the most important, namely, steam vessels, have multiplied fourteen fold.

The Origin of Coal.

Various opinions have been put forth respecting the origin of our coal measures. The following is by R. Hunt, F. R. S. (author of "the Poetry of Science"), in a late article in the *St. James* (London) *Magazine :* It has been somewhat too hastily said that coal is formed directly from wood, and that much of it is found to retain its woody structure. There is great doubt on this point. That wood may be *eventually* converted into coal is admitted—but in changing, it entirely loses the form of wood—retains no evidence of fiber. It may, under the influences of heat and moisture, be converted into a bituminous mass, which is eventually consolidated into coal ; but we cannot discover any evidence of wood being transmuted directly to coal. The remains of woody trees found fossil in the coal measure strata may become limestone, may be iron ore—certain it is they are never coal. The probability is, that the coal mass itself was produced from cactus-like plants, from club mosses, or peat mosses, or from aquatic plants, either marine or fresh-water.

The vegetable mass, whatever may have been its origin, from which our beds of fossil fuel is derived, may have been formed from plants which grew on the spot where we now find it, and the *under-clay*, as it is called, is supposed to be the soil in which the plants grew ; or it may have been removed by the waters in a plastic state, floated out into the deltas or seas, and eventually, in obedience to the law of gravity, have sunk to the bed of the then existing waters.

Knowing that many of these coal beds are now several thousand feet below the surface, we have either to suppose—if we adopt the first hypothesis—a gradual subsidence of the earth to the depth at which the coal is now found : or, if we prefer the second, to imagine the filling up of the seas, after the coal has been deposited, by enormous beds of sandstone or of shale. Sir Henry de la Beche describes a section near Swansea having a total thickness of 3,246 feet ; in this there are ten principal masses of sandstone, one of these 500 feet thick. They are separated by masses of shale, varying in thickness from ten to fifty feet. The intercalated coal beds, sixteen in number, are generally from one to five feet thick—one of them, which has two or three layers of clay interposed, attaining nine feet.

Taking this instance only, we learn that there have been sixteen different formations of coal ; that these have—each one of them—been covered up with hundreds of feet of sandstone and shale. The subsidence of the earth's crust is surrounded with difficulties of no common order—the filling up an ancient sea to the depth of more than 3,000 feet requires conditions which we can scarcely conceive to have existed—and in either case we seem to require ages of repose, during which a beautiful Flora drank in the sunshine, followed by ages during which sand was deposited, bearing down with it but little evidence of there being any vegetable life. Science has advanced far into the secrets of the earth's changes ; but let us not deceive ourselves by supposing we have as yet heard the voice of Nature proclaiming the true phenomena of our coal formations.

COPPER SMELTING.—*The Ontonagon* (Lake Superior) *Miner* states that the representatives of the French company have been making investigations among the mines of the Ontonagon district in relation to the establishment of smelting works, and that the result of their investigations will undoubtedly be the early erection of such works. The fuel used will be wood. In June, the Isle Royale Mine, turned out 65 tuns of copper, the Franklin 80, the Pewabic 85, the Quincy 140, and the Huron, Hancock, and Portage 22 tuns, making an aggregate of 396 for the month.

Correspondence

The Growth of Copper Vegetation.

MESSRS. EDITORS:—If in these days resounding with the rumbling of the drum and the clangor of the musket, there should be left a few men willing to listen to the soft and quiet teachings of nature and science, I should like to draw their attention to a natural phenomenon, a chemico-physical curiosity which I had a chance to observe the other day, and which, though small in its compass and unpretending in its appearance, may be the starting point of important discoveries, and therefore seems to me to call for a public record and the close attention of scientific men.

A few days ago I paid a visit to friend, Mr. Aug. Partz, at his laboratory, No. 25 Howard street, New York. He is a chemist of rare knowledge and experience and an inventive genius of high order. He has been for some time busily engaged in experiments on the galvanic reduction of different metals and their alloys, and claims to have been perfectly successful in reducing the latter to an extent hitherto unknown. In one of these experiments he met with the curious fact which I am about to relate. Having had a couple of plates, one of them of steel with a thick coat of copper, hanging in a solution of copper, through which a galvanic current of considerable quantity was passed for about twenty-four hours for the purpose of reducing that metal on the plates, he observed a singular deposit of the same material outside of the solution, bearing vegetable forms.

But in order to make the description as instructive as possible, I will first refer to all the external conditions of the phenomenon. The solution of copper was contained in a flat capsular vessel, standing upright on its narrow side, and the plates on which the reduction was to be made, were suspended in the solution perpendicularly, and fastened to the conducting wires which passed through two oblong wooden borders forming in this way the cover of the vessel. Between the upper margin of the plates and these covers was an empty space of about half an inch, the copper solution only reaching to the margin of the plates. Now, when Mr. Partz removed the plates, they having been exposed to galvanic action as above stated, he observed that a singular vegetation of copper had grown between the upper margin of the one plate (the steel one with the copper coat) and the wooden cover. It was fastened with its roots on the inside of that margin (within the copper solution) and rising from there and outside of the solution in the empty space above mentioned, in the shape of a little tree, consisting of a stem and a crown which seemed to owe its formation to the circumstance that the upward growth had been checked by the inside of the cover, and forced to spread along this. By detaching the plate from the cover and wires the little tree broke into three parts, the roots remaining attached to the plate, the stem and the crown. The two latter parts I saw myself, and on examination through a magnifying lens, found the stem to consist of a collection of smaller stems slightly curved and bent, and in their formation and outlines reminding one very much of the branches of the grape vine, while the crown proved to be a conglomerate system of fine spiral threads or fibers, bearing a close resemblance to the tendrils of the grape and other vines—a mass of spirals of different size and length, the larger ones three-eighths of an inch long, but all of the most regular form and elaborate elegance.

Beside this principal growth there were a few smaller ones, some consisting of mere spirals rising from the margin of the plate. Repeated experiments had the same result, but it became evident that a certain quantity of the electric fluid was required, for when the tangent-galvanometer showed a current of half this quantity only, the phenomenon would not make its appearance.

Now here it struck me we have something entirely new—some new hint at the mysterious connection between organic and inorganic matter, some new fact which may perhaps lead to the discovery of hitherto unknown laws of nature concerning the formative principle of life. We see here the product of a chemical process consisting of an elementary substance pure metal, but bearing forms—the spiral—which we believed to exclusively belong to organic nature, especially the vegetable kingdom; and the whole growth not deposited within the metallic solution but outside of it, two circumstances decidedly excluding the assumption of the process of crystallization which must necessarily go on in the mother liquid, and is never known to take organic forms. Moreover—and this, as the crowning fact of all, we reserve to the last—Mr. Partz asserts that the principal acid used for the solution of the copper was an organic acid, the tartaric, the acid of grapes and other fruits! This phenomenon, therefore, presents the highly interesting fact of a fibrous structure, purely metallic in substances and vegetable in form, grown out of a solution half organic and half inorganic, not by crystallization, but probably by capillary attraction (the mechanic law of the growth of plants) and imitating in its outlines and features those of parts of the very same plant, the acid principle of which is the same acid which acted as the chief solvent part in the mother solution of the metallic growth! Very curious and striking coincidences indeed! That the way by which the arrangement of the particles of this metallic vegetable provided was that of capillary attraction, is so far not based on actual observation, but may be inferred from the vegetable forms and fibrous structure, and the fact that the top of the little plants was found to be moist.

It may not be superfluous to refer, in this instance, to the interesting experiments made of late by Prof. Wiedemann, in Germany, on the magnetization of iron and steel wires twisted during or after the passage of a voltaic current, by which the poles change or are reversed according to the side to which the wires are twisted. This discovery may throw a new light upon the tendency of certain plants to spiral action, some to the right and some to the left side.

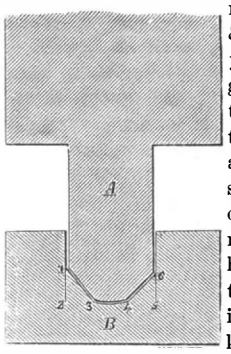
The observations we have communicated here of spirals of inorganic matter appearing under the action of the galvanic current, look exactly as if they had some close relation to the facts ascertained by Prof. Wiedemann. Let our scientific experimentors collect as many facts as possible, and there is strong hope that we shall soon see another piece of the mysterious veil of nature lifted before our mortal eyes!

DR. G. BLOEDE.

Brooklyn, July, 1861.

Steps for Mill Spindles.

MESSRS. EDITORS:—My plan for the lower point of upright shafts in mill spindles, &c., is this, which I think you will understand at a glance: The distance from 2 to 3 and 4 to 5 is to be greater than from 1 to 2 and 5 to 6; and the straight part of the spindle point, A, does not quite fill the box, B, leaving room for the expansion by heat; you will perceive that the hotter it gets, the looser it runs. I have used this kind for three years, and find it far better than many other kinds I have used for the last fifteen years.



E. B. BARNS.

Crampton, Pa., July 10, 1861.

[We confess that we are unable to "see at a glance" that the more this spindle heats, the looser it will run. Still, as our correspondent says that long trial shows his step to be a very superior one, we have an engraving made of it for the benefit of the millers and millwrights among our subscribers.

At the Metropolitan Mills, in this city, where fourteen run of stones are in constant operation day and night, the engineers, after numerous experiments, have settled upon the following plan for mill steps: The lower end of the spindle, for a foot or more, is turned down to about two and a half inches in diameter, and a steel rod about an inch in diameter is inserted into its axis. The hole in the box is about ten inches in depth, the spindle fitting into it so as to run easily. Beneath the lower end of the spindle, which is perfectly flat, are placed two or three flat pieces or disks of steel, the diameters of which are the same as that of the spindle. These disks revolve one upon another, but with a motion less rapid than that of the spindle, the spindle's motion being divided among them. Thus, the wear of each of the rubbing surfaces is diminished, and the danger of heating avoided.—EDS.

Saving of Fuel in Steam Navigation.

The London *Mining Magazine* contains the following on this important subject:—

The Peninsular and Oriental Company pay annually nearly £1,000,000 for coals; and their efforts, therefore, are constantly directed to the development of machinery that will do the most work with the least consumption of fuel. Speed in ships with great power is always attainable; but the cost of an extra knot on a sea-going steamer is sometimes enormous, and companies have found that, like other things, speed may be bought too dear.

By the application of the superheating apparatus to their vessels, the company have already effected a considerable saving of fuel. With one applied by Mr. Penn to the *Valetta*, the consumtion has been reduced from 60 to 40 tuns per day. With a new ship—the *Mooltan*—however, the company are trying to achieve still greater results, and by certain modifications in the plan of the machinery, hope, with only four small boilers, engines of 400 horse-power, and a consumption of one tun of coal per hour, to make this vessel average a speed of 10½ knots per hour. To average this upon all her runs, she must be able to do 12½ or 13 knots in anything like fair weather. In a preliminary trip, she averaged a little over 9 knots, and in a run of 24 hours only consumed 20 tuns 10 cwts. of coal. This was an almost astonishing success. The fuel used was patent, so that a count tally of every block put on could be kept. For nearly 7 hours, only 4½ tuns were used; and while the screw was going at 59 revolutions, and the engines indicating between 1,100 and 1,200 horse-power, the vessel going through the water at nearly 10 knots, not a complete tun, it is stated, was used in any single hour. A saving of 30 or even 25 per cent on the consumption of fuel in sea-going steamers means an equal saving in the number of men required for stoking and in stowage space for cargo.

To economize such an amount of fuel would give the Peninsular and Oriental Company a clear gain of more than £200,000 a year on their expenditure for coal alone, setting aside the gain in reduced labor and increased stowage. Altogether, the *Mooltan* will go to sea with a greater amount of modern improvements in her than any vessel which has ever left our shores; and her success, if success it be, will open up quite an era for steam navigation.

Purifying Oils.

The *Photographic News* (London) states that sulphide of carbon has lately been applied to the purification of oils with much success. It has a great affinity for fatty bodies, as may be shown from the fact that when the bones of which ivory black is made are treated in the usual manner, only five per cent of fat is obtained; treated with sulphide of carbon, they yield twelve per cent. Immense quantities of soap are wasted in extracting grease from wool; treated with the sulphide, the operation is more efficacious, economical and expeditious. Oily seeds treated with the sulphide yield 10 to 22 per cent more oil than by the old processes; besides, the oil is purer and entirely free from glutinous matters, and requires no purification; besides, the oil contains more stearine and margarine, and consequently yields a harder and better soap.

The mode of operating is very simple; the fatty matters and the sulphide are mixed together in a closed vessel, and the sulphide allowed to filter off, carrying with it the oil; the receiver is converted into a distilling apparatus; steam is introduced, the sulphide passes off, leaving the pure oil behind. The sulphide can be employed over again.

M. PELOUZE, of Paris, has made known a curious reaction with chloride of calcium. Acted upon by steam at a sufficiently high temperature, chloride of calcium is decomposed, producing a considerable quantity of hydrochloric acid. The transformation is so quick that he was first tempted to believe that it offered a new process for the manufacturr of hydrochloric acid on a large scale; but further experiments go to show that the production of acid was only abundant at the beginning of the reaction; that to maintain it required the expenditure of a considerable quantity of steam, and consequently, of fuel, so that the manufacture ceases to be economical.

CATHEDRAL OF MEXICO.—The gorgeous Cathedral in the city of Mexico is the largest religious structure on the American continent. It is 500 feet long, 420 feet wide, and capable of holding 30,000 persons. The high altar, raised from the floor on an elevated platform, exhibits a profusion of candlesticks, crosses, and other ornaments of solid gold or silver, and is crowned by an image of the Virgin decked in jewels, estimated at the value of more than $2,500,000; and all other parts of the church are a perfect wilderness of columns, statues, shrines, fonts, &c.

Who Invented Gunpowder?

BY JOHN TIMBS

"From the earliest dawnings of policy to this day," says Burke, "the invention of man has been sharpening and improving the mystery of murder, from the first rude essay of clubs and stones to the present perfection of gunnery, cannoneering, bombarding, mining" The imputed universality of the class of invention may account for the difficulty of tracing the special practice of it in the composition of gunpowder with certainty to any period or nation. The evidence is conflicting, and it ranges from several centuries before the commencement of our era to the claim of the German monk of the fourteenth century, of whom a commemorative statue was erected so lately as the year 1853.

The earliest account extant on the subject of gunpowder exists in a code of Gentoo laws, where it is mentioned as applied to firearms; this document, being of some fifteen centuries before Christ, is thought by many to have been coeval with the time of Moses! The notice occurs in the Sanscrit preface, translated by Halhed, and is as follows:—"The magistrate shall not make war with any deceitful machine, nor with poisoned weapons, nor with cannon and guns, nor any kind of firearms." Halhed observes:—"The reader, no doubt, will wonder to find the prohibition of firearms in records of such remote antiquity; and he will probably hence renew the suspicion which has long been deemed absurd, that Alexander the Great did absolutely meet with some weapons of this kind in India, as a passage of Quintius Curtius seems to ascertain. Gunpowder has been known in China as well as Hindostan far beyond all period of investigation. The word 'firearm' is literally translated by the Sanscrit *agnee-aster* (*agnyastra*), a weapon of fire In their earliest form they are described to have been a kind of dart tipped with fire, and discharged by some sort of explosive compound from a bamboo. Among several extraordinary properties of this weapon, one was, that after it had taken its flight, it divided into several separate streams of flame, each of which took effect, and which, when once kindled, could not be extinguished; but this kind of *agnee-aster* is now lost."

Dutens has selected many passages from Greek and Latin authors favorable to the opinion that gunpowder was known to the ancients. He mentions the attempt of Salmoneus to imitate thunder, and of the Brahmins to do the same thing; but his most remarkable quotation is from the life of Apollonius of Tyana, written by Philostratus, showing that Alexander was prevented from extending his conquests in India because of the use of gunpowder by a people called Oxydracæ, who repulsed the enemy "with storms of lightning and thunderbolts, hurled upon them from above." Philostratus is not remarkable for veracity; but taking into consideration the records of Oriental history, and the fact of pyrotechny having been cultivated from time immemorial in India and China, his assertion does not seem improbable. In India and many other parts of Asia, niter occurs in great quantity, spread over the surface of the earth. Dr. Scoffern, the experienced writer on this subject, supposes a fire lighted on such a spot; the most careless observer must have noticed the effect of the saltpeter in augmenting the flame; if then, attention having been directed to this phenomenon, charcoal and saltpeter had been mixed together purposely, gunpowder would have been formed The third ingredient, sulphur, is not absolutely necessary; indeed, very good gunpowder, chemically speaking, can be made without it. Sulphur tends to increase the plasticity of the mass, and better enables it to be made into and retain the form of grains.

It has been said that gunpowder was used in China as early as the year A. D. 85. Sir George Staunton observes that "the knowledge of gunpowder in China and India seemed coeval with the most distant historic events. Among the Chinese it has at all times been applied to useful purposes, as blasting rocks, &c., and in the making of fireworks; although it has not been directed through strong metallic tubes, as the Europeans did soon after they discovered it." In short, there can be no doubt but that a sort of gunpowder was at an early period used in China, and in other parts of Asia; and Barrow's statement that the Chinese soldiery make their gunpowder, and every soldier prepares his own, is highly characteristic of the people. Against the claim of the Chinese to the invention, it is urged that the silence of Marco Polo respecting gunpowder may be considered as at least a negative proof that it was unknown to the Chinese in the time of Kublai-Khan.

There is nothing in the history of these people, nor in their "Dictionary of Arts and Sciences," that bears any allusion to their knowledge of cannon before the invasion of Ghengis-Khan, when (in the year 1219) mention is made of *ho-pao*, or fire-tubes, the name of cannon, which are said to have killed men, and to set fire to inflammable substances; they are said, too, to have been used by the Tartars, not by the Chinese, and were probably nothing more than the enormous rockets known in India at the time of the Mohammedan invasion, (*Quarterly Review*, No. 41).

Numerous documents, however, show that gunpowder was known in the East at periods of great antiquity; whence it might have been introduced into Europe, either through the medium of the Byzantine Greeks, or by the Saracens into Spain. In a paper read about fifty-five years since, before the French Institute, M. Langles maintained that the use of gunpowder was conveyed to us by the Crusaders, who are stated to have employed it at the siege of Mecca in 690: he contended they had derived it from the Indians.

Mr. Hallam considers it nearly certain that gunpowder was brought by the Saracens into Europe. Its use in engines of war, though they may seem to have been rather like our fireworks than artillery, is mentioned by an Arabic writer in the Escurial collection, about the year 1249. The words that are thought to mean gunpowder are translated *pulvis nitratus*. The Moors or Arabs, in Spain, appear to have used gunpowder and cannon as early as 1312; and in 1331, when the King of Granada laid siege to Alicant, he battered its walls with iron bullets, discharged by fire from machines; which novel mode of warfare (says the the chronicle) inspired great terror. And when Alonzo XI., king of Castile, besieged Algesiras in 1342-3, the Moorish garrison, in defending the place, employed *truenos* (literally *thunders*); which a passage in the chronicle proves to have been a species of cannon, fired with powder. And Petrarch, in a passage written before 1344, and quoted by Muratori, speaks of the art of making gunpowder as *nuper rara, nunc communis* (recently rare, now common).

Another authority traces gunpowder to the Arabs, but at an earlier date than hitherto mentioned; and seeks to identify it with an invention of much earlier antiquity. The celebrated Oriental scholar, M. Reinaud, has discovered an Arabic MS. of the thirteenth century, which proves that compositions identical with gunpowder in all but the granulations were, and had been previously, in the possession of the Arabs; and that there is every probability they had obtained them from the Chinese, in the ninth century. Many of these were called "Greek fire;" and comparing the account of Joinville, of the wars on the Nile in the time of St. Louis, with the Arabic recipes, there can be little doubt that we are now in possession of what was then termed "Greek fire." Mr. Grove, F.R.S., who has investigated the subject experimentally as well as historically, concludes that the main element of "Greek fire," as contradistinguished from other inflammable substances, was niter, or a salt containing much oxygen; that "Greek fire" and gunpowder were substantially the same thing; and that the development of the invention had been very slow and gradual, and had taken place long antecedent to the date of Schwartz, the monk of Cologne, A. D. 1320, to whom the invention of gunpowder is generally attributed: thus adding to the innumerable if not unexceptionable cases in which discoveries commonly attributed to accident, and to a single mind, are found upon investigation to have been progressive, and the result of the continually-improving knowledge of successive generations.

It was long the custom to attribute the invention of gunpowder to our philosopher, Roger Bacon; but a passage in his *Opus Majus*, written in 1267, proves that instead of claiming the merit of the discovery, he mentions gunpowder as a substance well known in his time, and even employed by the makers of fireworks; and he minutely describes a common cracker. In his treatise *De Secretis Operibus Artis et Naturæ*, he says, that from "saltpeter *and other* ingredients we are able to make a fire that shall burn at any distance." In another passage he indicates two ingredients, saltpeter and sulphur, and "Lura nope cum ubre," which is a transposition of the words "carbonum pulvere" (charcoal in powder). At the period when Bacon lived Spain was the favorite seat of literature and art. Bacon is known to have traveled through Spain, and to have been conversant with Arabic, so that he might have seen the manuscript in the Escurial collection, which is as least as probable a supposition as that he saw the treatise of Marcus Græcus. Some fifty years later, 1320, is the date claimed by the Germans for the invention due to their monks, Bartholdus Schwartz, in whose honor a stone statue has been erected in the town of Freiburg, where he was born; and in reply to earlier claims to the invention, it is maintained that to Schwartz is due the merit, because he did not learn the secret from any one else.

Nearly two hundred years before this date, Humboldt states that a species of gunpowder was used to blast the rock in the Rammelsberg, in the Hartz mountains.

Authorized statements negative the assertions by Camden, Kennett, and other writers, that no gunpowder was manufactured in England until the reign of Elizabeth. Its first application to the firing of artillery has been commonly ascribed to the English at the battle of Cressy, in August 1346; but hitherto the fact has depended almost solely on the evidence of a single Italian writer, and the word "gunners" having been met with in some public accounts of the reign of Edward III. The Rev. Joseph Hunter has, however, from records of the period, shown the names of the persons employed in the manufacture of gunpowder (out of saltpeter and "quick sulphur," without any mention of charcoal), with the quantities supplied to the king just previously to his expedition to France in June or July, 1346. In the records it is termed *pulvis pro ingeniis;* and they establish that a considerable weight had been supplied to the English army subsequently to its landing at La Hogue, and previously to the battle of Cressy; and that before Edward III. engaged in the siege of Calais, he issued an order to the proper officers in England, requiring them to purchase as much saltpeter and sulphur as they could procure. Sharon Turner, in his History of England, has also shown, from an order of Richard III. in the Harleian MSS., that gunpowder was made in England in 1483; and Mr. Eccleston (*English Antiquities*) stated that the English both made and exported it as early as 1411. Nevertheless, gunpowder long remained a costly article; and even in the reign of Charles I., on account of its dearness, "the trained bands are much discouraged in their exercising." In 1686, it appears from the *Clarendon Correspondence*, that the wholesale price ranged from about 2*l.* 10*s.* to 3*l.* per barrel.

John Evelyn, of Wotton, Surrey, asserts that his ancestors were the first who manufactured gunpowder in England; but this must be regarded as the reintroduction. His grandfather transferred the patent to Sir John Evelyn's grandfather, of Godstone, in whose family it continued till the civil wars. As we stroll along the valley in which lies Wotton Place, we are reminded that upon the rivulet which winds through this peaceful region was once made the "warlike contrivance." Evelyn, in a letter to John Aubrey, dated Feb. 8, 1675, says that on this stream, near his house, formerly stood many powder-mills, erected by his ancestors, who were the very first that brought that invention into England; before which we had all our powder from Flanders. He also describes the blowing up of one of these mills, when a beam fifteen inches in diameter, at Wotton Place, was broken; and on the blowing up of another mill lower down, towards Sheire, there was shot through a cottage a piece of timber, "which took off a poor woman's head as she was spinning."

THE MANUFACTURE OF GUNPOWDER AS CARRIED ON AT WALTHAM, ENGLAND, IN THE ESSEX MARSHES.—First, as to the ingredients. The saltpeter (principally imported from Bengal) is boiled in large pans, evaporized, and crystallized; and the charcoal is prepared from the alder and willow, which abound in the neighborhood. These processes are conduced in buildings at some distance from the gunpowder mills, whither the materials are carried, by water, in covered boats, to the works. There the saltpeter, brimstone and charcoal are ground separately in mills, each consisting of large circular stones slowly revolving on a stone bed. Next the ingredients are conveyed to the "mixing-house," where visitors wear overshoes. Here, in bins, are the saltpeter, brimstone and charcoal, weighed in the exact proportions; saltpeter 75, brimstone 10, and charcoal 15, in every 100 parts. Of the three ingredients, 42 lbs. are placed in a hollow drum,

which revolves rapidly, and contains a fly-fan, which rotates in an opposite direction; in about five minutes a complete mixture is effected, and the charge is received in a bag tied over the lower orifice of the drum.

The "composition" is next taken to "the incorporating mills," and is now a combustible compound, to obtain its explosive power by the ingredients being thoroughly incorporated. The mill consists of a pair of circular stones ("runners"), weighing about 3½ tons each, and slowly rolling over the powder which is placed on the stone bed of the mill, surrounded by a huge wooden basin. The powder is previously damped, as it could not be safely ground dry; about seven pints of water ("liquor") being added to the charge of 32 lbs. of powder, during 3½ hours, the time of grinding. To insure this with precision, and to obviate the chance of any irregularity in a clock, the water-wheel, which works two of these mills in one house, also marks its revolutions on a dial, so that the attendant can never be mistaken in the time the charge has been "on"—a most important point, where the over-grinding of the too-dry powder might cause it to explode. Sometimes, a portion of the wood-work of the roof, or mill, becoming detached—such as a cog of the wheel—and falling into the pan, acts as a skid on one of the runners, and by friction produces heat enough to cause a mass of powder to explode. As a protection, over each house containing a pair of mills is suspended a flat board, which, in case of an explosion, is first blown upward, and being connected by wires with a cistern of water over the fellow mill, upsets the same, and drowns the gunpowder. The attendants are as little as possible in these mills, and only work by daylight.

More hazardous processes, however, follow. The powder thus incorporated is in hard flat lumps, and has again to be reduced to dust in the "breaking-down house," by conveying it down an inclined plane, through rollers, which crush nearly 500 lbs. in the hour. The powder is then taken to the "press-house," and there, between gun metal plates, is pressed in thin cakes to one-third its bulk, by a power of 700 tons in a hydraulic press. The cakes are roughly broken up, and sent in baskets to the "granulating mill," where the powder is again broken down into grains, the size being regulated by sieves. The floor is covered with hides fastened down with copper nails, and the mill can be started or stopped by a rope passing through the wall, which is bomb-proof. The powder is then dried by heat, in the "stoving-room," which is flanked externally by "traversers" (mounds of earth 30 feet thick), to confine explosion, should it happen, as much as possible to one house. Lastly, the powder is sifted in the "dusting house," where the sieves revolve with great velocity; the dust escapes through the meshes, and the gunpowder is drawn off through a short tap, into barrels, for packing. The finest powder is "glazed" by black-lead being shaken up with it; but cannon-powder has not this finish.

UNFERMENTED BREAD.—Take fine flour, six pounds; bicarbonate of soda one and one-eighth of an ounce; pure muriatic acid, one ounce and a quarter; water, three pints; and salt, three-quarters of an ounce; mix the bicarbonate of soda and the salt intimately with the flour, and put the muriatic acid into the water, and then blend the whole in the usual way of making dough. As soon as it is thoroughly kneaded, bake it either in tins or not. Bread thus made has an agreeable natural taste; keeps much longer than fermented or common bread, and is said to be more digestible, and much less liable to turn sour or moldy. We may observe that the chemical action of the acid on the soda disengages gas, which, though it makes the bread "light," disappears in the oven, and that the result of this action is to produce nothing but common table-salt, which can be easily proved by mixing a similar proportion of the acid and the soda in an appropriate vessel, when the well-known taste of common table-salt will be recognized.—*Septimus Piesse.*

Newly-painted Ships Unhealthy.

The carpenter of the American ship *Union*, which sailed last year from London on a voyage to the East Indies, has recovered $100 from the captain in a trial by jury, lately held in London, for injury to his health from sleeping in a bunk which had been newly-painted with white lead. In the course of the voyage he suffered from constipation and an affection of the nervous system, which prevented his hands from being actively engaged in the carpentering business, and he was incapacitated for some time. There was no ventilation in the place, and the paint was represented as very offensive. While at Bombay, the plaintiff states that he asked the defendant to discharge him and pay him off, but defendant refused. On returning to London, the plaintiff consulted a medical man, who stated that he was suffering from the deleterious effects of white lead in paint being absorbed into the system.

INVESTIGATIONS recently made at the naval depots of Chatham, Portsmouth and Plymouth, and the military depot of Woolwich, England, show an amount of peculation, regularly pursued, that beats our republican affairs of the kind "all hollow." No less than $500,000 worth of various articles have annually disappeared, for which no account could be given, from these four places.

CHURCH ORGANS.

We have received several requests from correspondents to give an account of the construction of church organs, and having recently passed through a large manufactory under the guidance of the intelligent proprietor, and having now under our eyes an elaborate illustrated description of the whole process, it would be easy to comply with these requests. We suspect, however, that our readers would not be generally interested in the technical details of the subject, but perhaps an idea of the essential principles of an organ, which we can give in a very few words, may be acceptable.

An organ consists of a series of pipes, which are, in fact, whistles, producing musical notes on the same principle as the whistles made by boys from the bark of chestnut saplings. These pipes have their lower ends inserted into the top of an airtight box, called the "wind chest,' into which the air is forced by a bellows, the pressure of the air being regulated by weighting the bellows. This pressure is made sufficient to support a column of water from two to four inches in hight, varying with the size of the church in which the organ is to be used. The openings from the wind chest into the pipes are closed by valves, which are connected by levers with the keys of the finger board, so that any pipe may be blown by pressing its corresponding key.

So simple is the principle of a church organ; but the science, experience and mystery of the art are embraced in the construction of the pipes for producing the several tones required. Some of the pipes are made of wood and the others of metal; zinc and an alloy called "pewter," being the metals usually employed. A few of the metal pipes are generally gilded and placed in the front side of the organ, forming the most conspicuous portion of the instrument. The wooden pipes are cheap and rough-looking things, being made of four strips of board glued together, so as to form a square tube. Each key opens several pipes of different tones, but tuned to the same note; and the pipes are arranged in series, called "stops," in such a manner that, by drawing a slide, all of the pipes of one series or stop may be opened together. The production of the several tones is a complicated study; for instance, a particular tone for one of the heavy bass notes is produced by one pipe of wood and another of zinc tuned in unison. Other tones are formed by making the pipes flaring, like a trumpet; others with vibrating reeds, similar to those of a clarionet: and others by stopping, or partly stopping, the ends of the pipe.

THE BEST WINE GRAPES.—Dr. Mosier, of Cincinnati, the vine grower and wine maker, thus writes to the *Horticulturist*: "Within the last twenty years I have had under cultivation and trial not less than thirty varieties of American grapes, for vineyard culture, and to furnish wine for the million. I think it will be a long time before we find a grape in all respects better adapted to the purpose than the Catawba. When properly cultivated and well ripened it makes a good dry wine, superior to the generality of Rhine wines, and a sparkling wine comparing favorably with the champagne of France. "For making a cheap red wine, to take the place of the clarets of Bordeaux, no grape that has been tried hereabouts is equal to the hardy and prolific Norton's Virginia Seedling. For choice fancy wines, of a superion grade, I would first place the Delaware, the Herbemont, the Venange, or Minor's Seedling, and the Diana, in the order named. Either of these grapes yield a wine for aroma and delicacy of flavor superior to Catawba, and in my humble judgment equal to any of the best wines Europe can produce; but as they have not as yet been tested for extensive vineyard culture, will remain some time in the hands of amateurs only."

Map of the Seat of War.

J. C. & Rae Smith, engravers and publishers, 71 Nassau street, this city, have published a beautiful colored topographical and military map of Virginia and Maryland, showing the mountains and prominent elevations, the rivers, and the railroads, country towns, &c. Also an enlarged map in detail of the country between Manassas Junction and Washington—the region between Fortress Monroe and Richmond.

SIR PETER FAIRBAIRNS' PATENT.

On another page will be found an illustration of an improvement in rollers for preparing hemp and flax, invented and patented by Sir Peter Fairbairn, of Scotland. The whole improvement consists simply in so cutting the leather with which the rollers are covered as to present the cut edges to the fiber instead of the sides of the leather in the method heretofore in use.

It would at first thought seem surprising that a man in Sir Peter Fairbairn's position, with all his important cares, should consider it worth while to be at all the trouble and expense of obtaining a patent in England, costing some $500, for the sake of securing so trifling a modification as this. But he is a man who has had large experience in patent rights, and has not only learned their value, but has learned how to handle them so as to make his money out of them. When he applied for a patent for this invention he probably knew what he was about.

Indeed, we believe that this is the very class of inventions which are the surest to pay for patenting. While the *great* fortunes are made from great inventions, like the sewing machine, the reaper, the electric telegraph, &c., those which are most certain to pay moderate sums of a few hundred or a few thousand dollars, are modifications in the details of mechanism, made by practical mechanics who see the objections to the machinery in use, and who happen to think of some way of overcoming them.

Modern Calico Printing.

It is comparatively but a short time since the production of designs upon calico was effected by means of hand blocks, made of sycamore or pear tree wood, two or three inches thick, nine or ten inches long, and nine broad. The face of the block was either carved into relief in the desired pattern, like ordinary wood cuts, or the figure was formed by the insertion edgewise into the wood of narrow slips of flattened copper wire, and the patterns were finished with small brushes, called "pencilings."

In engraving, the first kind of roller used was made by bending a sheet of copper into a cylinder, soldering the joint with silver, and then engraving upon the continuous surface thus obtained. An improvement on this consisted in producing the pattern on copper cylinders obtained by casting, boring, drawing and hammering. In this case, the pattern is first engraved in entaglio upon a roller of softened steel, of the necessary dimensions. This roller is then hardened and introduced into a press of peculiar construction, where, by rotary pressure, it transfers its designs to a similar roller in a soft state, and the die being intaglio, the latter, called the "mill," is in relief. This is hardened in its turn, and, by proper machinery, is made to convey its pattern to the copper roller.

This improvement alone reduced the cost of engraving on copper many hundred per cent, and, what is of far greater importance, made practical an infinite number of intricate engravings, which could never have been produced by hand labor applied directly to the roller. A further improvement was made by tracing with a diamond on the copper roller, covered with varnish, the most complicated patterns by means of eccentrics, and then etching. The combination of mill engraving with the tracing and etching processes naturally followed, adding immensely to the resources of the engraver and printer in the production of novel designs. Another point of progress is the tracing of patterns on the surface of rollers, effected by machines made on the principle of the pentagraph.

STEEL CANNON BURST.—A large steel gun lately made at the Mersey Steel Works, Liverpool, England, burst at the seventh round while being tried at Shoeburyness. It had thrown 128 pound shot six miles, but the material of which it was made is stated to have been so defective, that it surprises almost every person that it did not burst at the first round instead of the seventh.

Two English chemists, named Joseph Lardley and R. Clayton, were lately killed at Richmond, Va., by the explosion of a quantity of fulminating powder which they were preparing in their laboratory for making percussion caps.

Manufacturing Ice.

Ice is not only one of the greatest luxuries for many purposes in hot climates, but it has become one of the most useful and necessary preservatives of fresh meats and vegetables during warm weather. Innumerable have been the efforts made to manufacture ice artificially and economically, so as to obtain it in unlimited quantities in those countries where the demand for it is great; but hitherto all such efforts have been very fruitless. The principle which has formed the base of all ice making operations is the well-known refrigerating quality of volatile fluids, by the expansion of which water placed in their vicinity is robbed of its heat, and reduced to a temperature below the freezing point.

The accompanying engravings represent mechanism for applying this principle, for which a patent has lately been taken out in England by James Harrison, of Geelong, Victoria, and a machine has been operated in London with considerable promises of success. The invention consists partly in the employment of a vessel similar to a boiler, with its tubes placed very close together, as shown by the elevated section of the entire apparatus, Fig. 1. Ether is placed in the spaces between the tubes, and a strong solution of common salt is made to flow in a current through the tubes. This solution is not congealable at the degree of cold required for making ice. It is conducted through boxes or molds, Fig. 2, containing water, and being of a lower temperature than 32°, it freezes the water and converts it into ice. A steam engine is required to produce the exhausting evaporative operation, and one of ten horse-power has been employed in London.

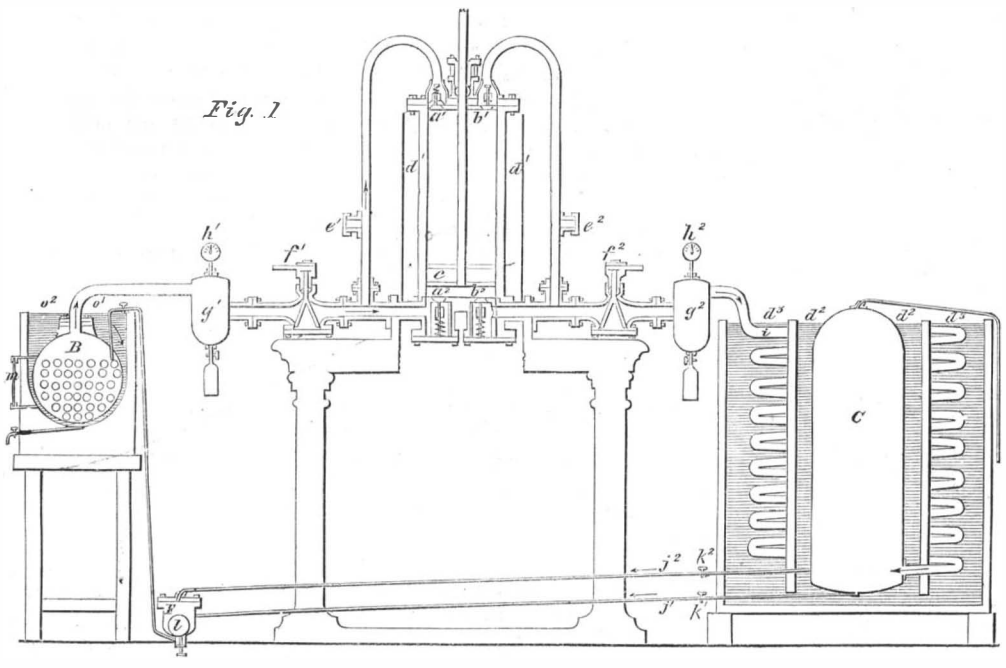


Fig. 1

A vertical pump is placed on the pedestal, and the engine is employed to operate its piston and withdraw the ether from the tubular vessel, B. The vaporized ether is placed into condensers, C, when a stream of cold water on the outside, aided by the pressure inside, reduces it again to a liquid state, to be used over and over again. In this is believed to consist the great economy of the operation, the steam power being the only expense. From the condenser, C, the ether flows back through the passages, F, to B.

The ether, as it evaporates in B, and flows up through the pumps into the condenser, C, carries off a great quantity of heat from a strong solution of common salt in the tubes. The funnel, n, is for pouring in the ether. The vaporized ether is drawn off by the pump passing it through the valves, a^1 a^2, and out of it by the valves, b^1 b^2, into the condenser. The piston, c, is made to work close to the top and bottom of the cylinders; g^1 8^2, are small copper vessels for receiving the oil used in lubricating the piston. Pressure gages, h^1 h^2, are placed on those vessels. The condensing water passes around the vessel, C, into the spaces, d^2 d^3, containing the worm, i, and then up through the overflow pipes. The ether flows back through pipe, j^1, then into the chamber, F. A return pipe, j^2, is for permitting any air that may find access to flow back into C. The cocks, k^1 k^2, are for opening and closing the pipes. India-rubber washers are used at all the joints to make them air-tight, so as to prevent all leakage of ether vapor. By removing the cap, e^1, and shutting cock, f^1, any leak will easily be detected. The surfaces of the tubular vessel, B, is 270 square feet; that of the condensers, C (two or three are used), amount to 260 square feet.

In Fig. 2 the end of the tubular vessel, B, is shown in section, and the strong solution of salt water contained in the tubes (and which is cooled below 32° by the evaporative ether surrounding it) flows, as shown by the arrow, up through the partition, h, between a series of inclined mold boxes, 1 2 3 4 5 6, &c., successively, which contain pure water, The very cold saline solution absorbs the heat from the water, and reduces the water below the freezing point, thus forming ice in the wedge-shapen molds. The molds are of tinned copper. The salt solution is returned by a pump, as shown by the arrow, and does duty over again.

The temperature of the cooling surfaces in this machine has been reduced as low as 23°. In fifteen minutes ice is formed one-quarter of an inch thick; in one hour an inch thick. The principles of refrigeration by evaporation and the condensation of recovery of this ether, in this apparatus, are easily comprehended. It requires full experiments to determine the economy of thus manufacturing ice, but the practicability of it is beyond all dispute. Such a machine as this is not only capable of making ice in hot weather, but it may be applied to cool air to a very low temperature for hospitals. It is also adapted for rendering water very cold without actually freezing it, and it may be carried to the top of a building and made to flow down through a pipe to form a most grateful and cooling cascade in warm apartments.

ARTIFICIAL FORMATION OF ICE.

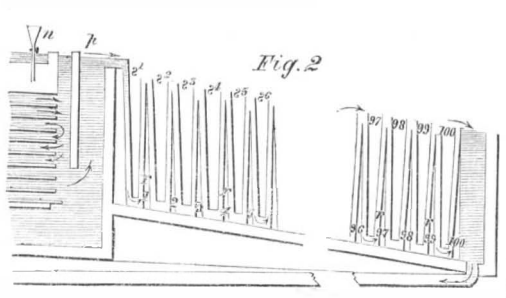


Fig. 2

RECENT AMERICAN INVENTIONS.

Polishing Stone.—Ezra H. Lewis, of Wilbur, N. Y., is the patentee of an improved machine for the above object. His invention consists in using, in connection with a horizontal rotating polishing bed, a vibrating or reciprocating bar, which is placed on the bed, and arranged to operate in connection therewith so as to give a vibratory movement to the stone while the same is being acted upon by the rotating polisher, and thereby cause the stone to be polished more rapidly and perfectly than hitherto, and also enable stones of a given size to be properly acted upon and polished by a smaller polisher than usual.

Constructing Iron Vessels.—The object of this invention is to obtain a mode of constructing iron vessels of navigation that will be much simpler, more economical, more durable, and which will enable vessels to be constructed with less weight of metal than usual. The invention, by B.F. Babbitt, of New York city, consists in the use of metal plates or bars, united or otherwise connected in a reticular manner, the plates or bars being bent or curved so as to form the framework of the hull, and the interstices of the framework filled with sulphur, the latter being poured into the interstices in a fused state, so as to completely fill the interstices and form a solid mass, rendering the hull of the vessel stiff and firm, and also protecting the metal from oxydation, as the sulphur covers the metal, and the former is not affected by either air or water.

Gas Retort.—This invention consists in the construction of a retort for making illuminating gas from resin, oil or other substance which can be introduced in a liquid state, with two upright chambers side by side, one of which, having the feed pipe attached, contains a series of partitions inclined longitudinally in opposite directions alternately, and provided with openings to allow the liquid substance to run from one to the other, from the top to the bottom of the series, so that all may be converted into gas or vapor before passing by an opening near the bottom, to the other chamber, to which is connected the outlet pipe, and in which the decomposition of the vapors is completed. The credit of this invention is due to A. K. Tupper, of Pontiac, Mich.

Veneer Saw.—The object of this invention is to saw veneers and their stuff from wood and ivory with a saw that will perform the work with a much narrower kerf than hitherto, and thereby effect a saving in stock.—To effect this result, L. B. Southworth, of Deep River, Conn., has patented an invention in which the usual "set" which is given saw teeth is avoided, and the latter are expanded or made of chisel form, and have their upper edges provided with a double basil.

Trachea Tube.—The object of this invention is to administer expectorant medicines directly to the trachea or to the nasal organs, so that in catarrhal affections, where the membrane of the throat is inflamed, the proper expectorant or anti-phlogistic remedies may be administered in proper quantities to the parts so affected, without bringing those remedies in contact with the mouth or tongue, as hitherto. The invention consists in a curved tube having a flat flaring double-throated portion formed on one end, the throats of which communicate with the hole through the tube, and a curved mouth piece screwed on the opposite end of the tube, so that this piece can be turned in a proper direction for directing the flaring portion either to the nasal organs or to the trachea. B. Segnitz, of New York city, is the patentee of the above invention.

HAVELOCKS A FAILURE.—Complaints are beginning to be made that havelocks are a failure. The dazzling white renders them conspicuous as marks for the enemy. They flap about the ears and face, interfere with the aim of the wearer, and prevent him from hearing the orders of the commanding officer. A substitute is mentioned which consists of a cork lining to be put into tho top of the hat or cap, which keeps the head cool, on the principle that ice is kept in an ice-house by surrounding it with non-conducting substances.—*Exchange.*

There is no necessity for making havelocks with great ear-flaps. The back of the neck, extending down the spine should be covered, but that is all. Thin cork would make a good lining for a havelock, and it may be applied so as to render it a life-preserver when soldiers are crossing rivers.

SOLDIERS' FEET IN MARCHING.—A correspondent sends the following receipt for making an excellent composition for anointing the feet of soldiers during long marches. Take equal parts of gum camphor, olive oil and pure beeswax, and mix them together, warm until they are united and become a salve. At night wash the feet well, dry them, then apply this salve, and put on clean stockings and sleep with them on. Next day the feet will be in excellent train for marching. Our correspondent proved the great value of this receipt in a journey across the plains to California in 1852.

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IRON-CLAD SHIPS OF WAR IN CONGRESS.

A bill has been introduced into the Senate, in accordance with the recommendation of the Secretary of the Navy, providing for the appointment of a Board of Naval Officers to examine into and report on the expediency of building one or more iron-clad ships of war. Efficient measures should have been taken long ago to carry out such provisions as are contained in this bill, and as we clearly pointed out in the SCIENTIFIC AMERICAN of December 1, 1860, when Congress was then holding its last session. It is never too late, however, to do right, and this movement, although tardy, is in the right direction. This is a most important subject, and all the experience which can be obtained to guide us should be sought after with avidity. It has been brought up several times lately in the British Parliament, and discussed at some length; and in a late speech of the Duke of Somerset, we find a very satisfactory history of the experiments which have thus far been conducted in England.

He stated that the first experiments were with iron plates one inch thick; these the shot broke in pieces with the greatest ease. Chain armor, india-rubber, and hempen matting were next tried; these were also found to be utterly useless. Next they tried Armstrong guns against 4½-inch iron plates, but they found that solid shot sometimes pierced them also. In building iron ships, the Duke stated that "it was a great problem when to stop, because thin iron would not do, and it became a matter of great difficulty how to make such vessels safe. Government, however, had extended its orders, and seven iron-plated ships would soon be ready."

The experiments with 4½-inch iron plates and Armstrong guns have satisfied the British naval authorities that these can resist shells perfectly, and nothing but solid, long-pointed shot, discharged from the most effective, largest rifled cannon can break them. In firing a broadside from the largest class of frigates with 100-pound pointed shot, at an iron-clad vessel, not more than three or four shot would enter the vessel, and these would be so spent as to do but little injury. Such vessels, then, with present experience, are almost proof against solid shot; while against shells, they are perfect proof.

No time, therefore, should be frittered away in tedious technicalities before taking efficient measures to build at least two mail-clad ships of war. The navy is now the overwhelming power which belongs to the government, and we should not fail to adopt every measure to make it more complete. Now is not the time to deliberate in cold debates about the expediency of such vessels; it is not only expedient, but necessary, that they should be built, and we trust that the Senate will pass the bill amended, so as to authorize their building at the earliest date possible.

AMERICAN FIRE ENGINES FOR EUROPE.

The great fire which recently destroyed such a large amount of property in London, is stated to have originated in a few bales of jute hemp which became ignited by spontaneous combustion. It is well known that hemp, cotton, sawdust, and several other substances, are very liable to become spontaneously ignited if saturated with grease. Many fires have been thus caused, and the owners of stores and factories should all be made aware of this fact for the better security of their property. And yet, with all the necessary care which can be exercised, perfect immunity from fire never can be expected. Fires will take place as long as there are combustible materials in the world, and while great care and vigilance may prevent their frequency, the best means should always be provided for their rapid extinguishment when they do occur.

It is well known that the London Fire Brigade was composed of a most efficient body of men, but it seems that they were furnished with fire engines which would have been considered tolerable machines in America thirty years ago. Had they been provided with our improved engines, and especially our latest steam engines, the fire referred to would soon have been subdued after it was first observed. The *Engineer* (London) states that one of the hand fire engines in that city throws only about ninety gallons of water per minute; whereas, one of the common American hand engines will throw three times this quantity. A few steam fire engines have been built in London, but they are very inferior to ours, especially their boilers, which take fifteen minutes to get up steam to a working pressure; whereas our steam fire engines can get up steam in five minutes, thus affording evidence that they can generate about three times the quantity in the same period of time, and of course they are thus able to accomplish about three times the amount of work.

The boiler is the most essential part of a steam fire engine. The American boilers have very thin water spaces, and a large heating surface, and they therefore combine compactness with great evaporative efficiency. On the other hand, the English boilers have large water spaces, and they are therefore heavy and clumsy, faults which should always be avoided in portable engines. We advise the authorities of London to have several steam fire engines built after the American style, or what would be better, order a score of such engines from New York.

THE GREAT DEFEAT.

It may be that the great disaster at Bull's Run is not to be attributed to General Scott's arrangements. Large armies are more subject to panics like that which occurred there than small ones are, and when such a panic takes place in an army, the larger the numbers, the greater the disaster. Still, even if the movement had been successful, we have no doubt that Gen. Scott's combinations would have been universally condemned by military authorities.

Napoleon Bonaparte said that good generalship consisted in having a force superior to that of the enemy present at the point of attack, and it was the principal aim of his maneuvers to accomplish this result.

Again: the great importance of fighting behind intrenchments is universally recognized, even for regular troops, and it is many times more important for volunteers.

Now, Gen. Scott had under his command 300,000 men. He chose his own time and place of attack; and he sent 50,000 men against 90,000, the latter posted behind intrenchments which he had allowed them 40 days to construct almost within sight of his headquarters. It requires no technical knowledge of the military art to decide that *that* is not good generalship.

NATIONAL ENCOURAGEMENT TO THE NOVELTIES OF INVENTORS.

"The present war," says the Philadelphia *Inquirer*, "bids fair to stimulate the inventive faculty of the American people as applied to the military arts. The government will, of course, have a number of new devices submitted to it, and among them it must be expected there will be a great deal of trash. Nevertheless, there may be some wheat in the chaff, and the grain may be worth the labor of sifting. We regret to observe some indications of impatience on the part of the authorities at being pestered with these new projects, and it has indeed been said that the government has about concluded to eschew all novelties, and stand in the beaten paths. We trust, however, that a just discrimination will be exercised, and a proper encouragement extended to merit. War may be regarded as an applied science, and it is progressive like all other sciences."

These are sensible and well-expressed opinions respecting one of the most important questions which can engage our government and people in the present conflict. There are always some leading men connected with every government who are satisfied with things as they are, and who have a horror of all inventions, no matter how important and valuable they may be. No charge of such unwise conservatism is brought against any of our government officials, but it is intimated that they have not patience to examine new inventions submitted to them, and that new projects pester them. We believe that it would neither be expensive nor difficult for government authorities to organize measures for promptly testing every invention that may be useful for the government, submitted for their consideration. A special board of competent officers may easily devote several hours every day to experimenting with new inventions presented to government for adoption. We are well aware that the testing of new inventions relating to firearms and artillery belong to the Ordnance Department, and that some very ably-conducted experiments have been made by its officers, but we believe it would be of great advantage to have a fixed board that would test all inventions nearly as soon as they are submitted, so as to decide upon their merits promptly. In times like the present, the public mind is intensely active, and inventors are incited to discover new and useful improvements. The delay of a few days to examine and test a new invention may be of the deepest injury to the country. Commander Dahlgren, U. S. N., in his treatise on "Boat Armament," after comparing breech and muzzle-loading firearms, says:—

> It is not proper to close the road to a full trial of this issue. * * The expenses incurred by the inventors, their great ability, and the excellence of their results, entitle the question to a full and impartial trial. * * Experience will in time supply the full amount of facts required to decide whether the muzzle-loading or breech-loading piece is to be preferred.

We have thus the very highest authority for giving every new invention, claiming the least respectability, a full and fair trial of its merits; and it would therefore be most unwise in government to close the door against new improvements submitted by inventors.

THE MONSTER CANNONS OF AMERICA AND ENGLAND.

The London *Army and Navy Register* describes the new American principle of casting large guns hollow, and cooling them by means of a current of water through the interior. It considers that this invention has introduced a new era in the casting of large iron cannon, and it describes the monster 15-inch gun which was cast at Fort Pitt Foundry, Pittsburgh, and now mounted at Fortress Monroe.

The largest piece of ordnance hitherto made in England is what is called the "Horsfall gun," which is mounted at South Sea Castle, Portsmouth. It weighs 22 tuns, and throws a solid shot of 360 lbs. It has been tested with charges of 50 lbs. of powder and 130 rounds have been fired. At 18° elevation, its range was 5,000 yards. It was cast in the old way, and is unmistakably inferior to the American gun, inasmuch as a crack about three inches in length has already been formed in its chamber. The American gun has already fired 300 rounds, and the most delicate tests have failed to detect the slightest derangement in it.

Rodman's perforated cake powder, which is used for American artillery, is much superior to the English powder. It starts the shot more gently, and the tendency to bursting is therefore not so imminent. With 40 lbs. of powder as a charge, the initial velocity of the shot of the American gun was found to be 1,328 feet per second; and the greatest range attained at an elevation of 28° was 5,730 yards, the shot being 425 lbs. So far as we know, the American "great gun" is the *greatest* gun in the world. It is true there are some old-fashioned Turkish cannon at Constantinople which can throw shot of 1,200 lbs. weight, but the charge of powder which they can take is so small that no vessel passing the forts at 500 yards distance would receive much harm from them. A single shot from the American gun at Fortress Monroe, striking an iron-frigate, would make it reel as if it had received the concentrated kick of 33,000 horses.

HYDROGEN GAS AS A FUEL FOR DOMESTIC PURPOSES.

We have never had any faith in the various plans which have been proposed to use hydrogen gas, obtained from the decomposition of water, for purposes of illumination, because it is well known that the combustion of hydrogen gas produces scarcely any light. On the other hand, it is eminently adapted for heating purposes, as it generates more heat in burning than any other substance in nature. It has also other properties which render it peculiarly suitable for heating dwellings, for cooking and other domestic uses. The product of the combustion being pure water, it is remarkably cleanly, depositing no soot; neither does it generate any gases deleterious to health.

If hydrogen gasworks were established in the upper part of the city, and the pipes lead into the dwellings, our citizens would be supplied with the most luxurious and convenient fuel that it is possible to imagine. For warming the parlors, a series of jets would rise at any desired point through the floor, and when a fire was needed it would be lighted by a match as readily as illuminating gas. The amount of fire would be regulated by a stop-cock, and could be left burning through the night in as small a jet as desired. There would be *no* smoke, and with a small fire no chimney would be needed; but a large fire would probably produce so much vapor that it would collect on the windows and be otherwise inconvenient, so that it would be well to provide for carrying off a portion of it. This might be done by a silverplated pipe, or by having the fire in front ot the grate or opening into the chimney.

The advantages of this fuel for cooking would be even greater than those which it possesses for warming apartments. The outsides of the pots and kettles would remain perfectly clean, and free from soot. The fire could be arranged at just the most convenient hight from the floor, with an iron or porcelain table beneath it to place the kettles upon, and none of these surroundings would collect any soot or be discolored by smoke. The fire could be kindled instantly, and regulated to give any degree of heat required. Several jets might be used, each furnished with its own stop-cock, so that one vessel might be kept simmering just below the boiling point, while another was boiling, and while a third jet, hotter still, was roasting or broiling meat. Numerous other conveniences resulting in the use of this cleanly fuel will suggest themselves, and we pass to a consideration of its cost.

The cheapest mode of obtaining hydrogen gas at present known, is by the decomposition of water by the process of blowing steam into a vessel filled with either red hot coke or charcoal. On page 280 of Vol, III., we illustrated an apparatus in use in the city of Narbonne, in France, for the production of large quantities of hydrogen by this process. An atom of water is composed of an atom of hydrogen, which we will represent by a large O, and an atom of oxygen, which we will represent by a small o, chemically combined together thus, Oo. If water is evaporatad and heated to a pressure of about two atmospheres, and then brought in contact with red hot coke, it is decomposed, one atom, ✻, of the carbon of which the coal is principally composed, combining with an atom of the oxygen of the water to form an atom of carbonic oxyd, ✻o, and setting the hydrogen free.

If an atom of hydrogen weighs 1, an atom of oxygen weighs 8, and at atom of carbon 6. Hence, 6 lbs. of coal will produce 1 lb. of hydrogen and 14 lbs. of carbonic oxyd. But if each atom of carbonic oxyd is brought again in contact with steam, it will decompose another atom of water, taking its oxygen to form an atom of carbonic acid, ✻o✻, and setting an atom of hydrogen free. Hence, 2 lbs. of hydrogen may be produced from every 6 lbs. of coke. As substances, in burning, generate heat in proportion to the amount of oxygen with which they combine, and as 2 lbs. of hydrogen combine with 16 lbs. of oxygen, and 6 lbs. of carbon, burning into carbonic acid, combine also with 16 lbs. of oxygen, it follows that the same amount of heat would be obtained from hydrogen that would be obtained by burning the coke employed to decompose the water and procure the hydrogen, provided there was no change of physical condition. But as carbon is solid, a large portion of the heat produced by its combustion is absorbed in giving it the gaseous form; while the hydrogen, being a gas, yields up all heat resulting from its combustion. But there is an additional consumption of coal in heating the steam to the temperature at which decomposition takes place, in driving the engine to blow a blast of air in the coke to keep it burning, and by combustion with the oxygen of this air. There is also waste of heat by radiation, by the cooling of the heated gases, and in other ways. But it is probable that all of this loss is more than counterbalanced by the economy in using the fuel as compared with other fuels. In an ordinary grate or kitchen range, probably more than nine-tenths of the heat goes up the chimney. The waste of heat by both systems is so large, and so difficult to measure, that the comparative cost can be ascertained only by experiment; it seems probable, however, from the data which we posses, that hydrogen gas will prove to be not only by far the most convenient, cleanly and healthful of all fuels, but also the most economical.

POISON BY LEAD PIPES.

On another page will be found an account of some observations made by Mr. J. R. Nichols, of Boston, on the corrosion of lead in water pipes, to which we invite attention. There is no subject of more importance, especially in cities possessing the inestimable blessings of waterworks, than this. All the salts of lead are extremely poisonous, and, like all the metallic poisons, they accumulate in the system, and, consequently, however slowly they may be introduced, whenever the quantity taken becomes sufficient to act as a poison it will manifest its effects.

The most common form of disease resulting from lead poison is neuralgia, or ethralgia, as it is specifically called. It attacks all parts of the system, though very rarely the head. When its seat is the stomach, it is the painter's colic, caused among painters by the absorption of white lead through the pores of the skin.

The form of the disease coming next in frequency is paralysis. When this attacks the muscles of the forearm, as it is very apt to do, it causes the "wrist drop," so common among painters. One curious law of lead paralysis is that it affects only the extensor muscles, those which straighten out the limbs; the flexors, the muscles which draw up the limbs, remaining in normal vigor.

Besides these, there is a dismal train of diseases that tread in the footsteps of this insidious destroyer, and we have no doubt that if all the persons in our cities, who are suffering from lead poison, were aware of the cause, it would make a very great stir in the community. Probably one great reason of the want of faith in the existence of lead poison and consequent apathy with which the subject is regarded, is the fact that only a portion of the persons who take lead into their systems ever suffer in any way from its effects.

We have long regarded the fact of the salts of lead being insoluble in any particular water as entirely inconclusive in regard to the safety of employing lead pipes for the conveyance of such water. Clay is insoluble; but if a river runs over a clay bed, the water becomes loaded with the mineral, held in mechanical suspension. Chemists, in making their experiments, place a bit of lead in the water, let it lie awhile, and then take it out, and under these conditions none of the lead will remain in the water unless the metal is actually dissolved. But the case is entirely different when water is driven under a high head, with great velocity through a pipe. The feathery particles of the mineral are then washed off and mingled with the water, passing as certainly into the system as if they were dissolved. The statements of Mr. Nichols will be found well worth perusing.

VENTILATION IN HEALTH AND SICKNESS — HOSPITALS.

Professor Pepper delivered a lecture recently at the Marylebone Scientific Institute, London, on ventilation, in which he explained a novel mode of effecting this by an invention which has been patented in England. Thei nvention consists in a series of folds of fine wire gauze, fastened to the top of the upper sash of a window, and made to fold up, so that when the window is closed the gauze is not seen. When, however, ventilation is required by the admission of fresh and the exit of foul air, the top of the window is opened, and the wire gauze screen comes down as much as is desired, thus affording egress for the vitiated and a gentle influx of pure air. The wire guaze frames attached to folding sashes employed in American dwelling houses during summer afford the same facilities for ventilation, but the English mode appears to be more simple and less expensive, and it may be attached to any balanced window sash.

In sick chambers, hospitals and sleeping apartments, a large supply of fresh air is required; but a strong current should always be avoided. The best way of admitting air into such places is by dividing it into numerous fine streamlets, such as through the wire guaze curtains.

Typhoid fevers in the camps of armies are principally due to sleeping in close tents, where a sufficient supply of fresh air is not admitted. Soldiers who bivouac in the open air, with the blue canopy of heaven over them for a tent, never take the typhoid fever. Typhus fever first broke out in Europe, during the retreat of Napoleon's army from Moscow. It originated in the hospitals, which were filled with the sick and wounded soldiers. These places were not sufficiently ventilated, and the atmosphere in them became fetid; the fever became a plague, and scourged almost every city in the Old World.

WELDING STEEL COLD.

It is well known that lead may be welded in a cold state. If a leaden bullet be cut in two parts, and the bright surfaces be immediately pressed together before they have time to oxydize—a slightly twisting strain accompanying the pressure—the pieces will adhere together as firmly as before they were cut.

Mr. Rowell, of this city, gives us an account of steel being welded by a similar process. At the Metropolitan Mills, 267 Cherry street, seven run of stones are driven from a drum on a vertical iron shaft which is ten inches in diameter and fifteen feet in length.

This shaft is supported by two or three plates of steel, formed in circular disks, and revolving one upon another, so as to divide the motion of the shaft between them, and diminish the velocity of the rubbing surfaces. The plates, by their revolutions, of course become worn, so that their flat surfaces coincide throughout, and these surfaces are perfectly bright.

Now Mr. Rowell says that occasionally the great weight of the shaft presses out the lubricating material from between two of the plates, and that when this occurs, the plates are welded together; or, at all events, adhere so firmly that it is impossible to separate them by means of a cold chisel and sledge.

Flax Cotton—Premiums.—The Rhode Island Society for the Encouragement of Domestic Industry offers a premium of thirty dollars for a bale of not less than fifty pounds of the best prepared flax cotton, fit for use on cotton machinery, accompanied with a statement of its culture, production and preparation, including cost of the various processes.

A premium of twenty dollars for the second best bale of the same on the same conditions.

The bales to be delivered at the rooms of the Society on or before Sept. 11, 1861, at Providence, R. I.

We hold these to be important prizes, not on account of the sums offered, as these are small, but for the interest which should cluster around the efforts made to stimulate this branch of industry. The advertisement of the above society will be found on another page. We hope our readers will circulate it among our farmers.

At the close of a meeting of the Ethnological Society, recently held in London, M. de Chaillu, the French-American traveler in Africa, of gorilla celebrity, having taken offence at some remarks made by Mr. Malone, stepped up to him and held his fist in his face, demanding how he had dared to speak of him as he had done, and finished by spitting in his face. The police were called in, and the gorilla-slayer was bound over to keep the peace.

Riflemen's Belts.—To polish enameled leather, take half a pint of the best cream, a quarter of a pint of linseed oil, make them each lukewarm and then mix them well together. Having previously cleaned the leather, rub it over with a sponge dipped in the mixture; then rub it with a soft dry cloth until a brilliant polish is produced.

STEAMSHIP PROPULSION.

A paper read before a late meeting of the Scottish Shipbuilders' Association, in Glasgow, by Orme Hamilton, contains some very useful practical information. He states that for ocean navigation the screw is the best propeller, but that its chief defect consists in a very wasteful expenditure of power when the vessel encounters head winds. In such cases the water appears to be screwed through the propeller instead of the ship being propelled through the water. In those winds, the paddle-wheel is the most economical propeller. In head seas, during adverse winds, screw engines churn away almost at their full velocity, and the consumption of coal is always in proportion to their speed. Mr. Hamilton first noticed this in an ocean steamer of 800 tuns, of which he was the engineer. On one occasion she encountered a gale dead-a-head; the engines continued for some time at full speed, when the headway was found almost nothing. They were then slowed a little, so as to hold the vessel, and thus it was kept in the same spot for about four days. The wind then veered a little, when the engines were increased in speed, and the vessel went forward, making very good time. "It, instead of trying to force a head wind," says Mr. Hamilton, "or holding our own merely until the wind veered, we had gone about two points off the wind, we should have been making a fair passage all the time, instead of wasting both time and coal." This is very usful information to every engineer in charge of screw engines.

In head seas the propeller is liable to be raised out of the water when in the trough of the sea. This causes the engines to *race* in the same manner as those of paddle-wheels, when the latter are raised out of the water. To remedy the evil of racing, Silver's Marine Governor is the most convenient and common instrument that has been applied, but a very simple expedient, in the absence of a governor, was adopted by Mr. Hamilton, which may be of great service to other engineers in like circumstances. While on duty in the south Pacific, in order to save harassing toil consequent upon attending the engines in a heavy head sea, he suspended a weight in a convenient part of the engine room, and confined it in guides, to oscilliate freely fore and aft, but not athwart ships. This weight was connected with the throttle valve lever, and when the ship pitched so as to throw the propeller out of water it operated the oscilliating weight, and throttled the steam. This device not only regulated the speed of the engines in a head sea, but also effected a saving of fuel.

The weight of the machinery in a steamer is of vital importance, and Mr. Hamilton suggests that efforts should be made to obtain lighter, more compact and stronger engines. The very best materials only should be employed; cast-iron should be discarded as far as practicable in all cases, and steel should be substituted for wrought-iron. The weight of marine screw engines may be reduced 25 per cent by using the best materials, and engines of equal or greater strength may be obtained. Taking a piston rod of steel and one of wrought iron of equal dimensions, the former is about 60 per cent stronger. If piston-rods, cranks, shafts, &c., were made of steel, instead of wrought iron, the weight of the machinery could be greatly reduced without impairing the strength. This is a subject which deserves the attention of all builders of machinery. There can be no doubt but a great reduction in the weight of most machinery may be effected by substituting steel for iron.

DOES THROWING WATER ON FIRE INCREASE THE HEAT?

This subject has been for some time attracting a good deal of attention throughout the world, as it has an important bearing on the burning of wet fuel, on the economy of water gas, and other industrial applications; while it possesses peculiar interest from its relations to one of the great laws of chemical physics.

We have received a letter from a scientific correspondent in Providence, requesting us to give our views of the subject, and this we will endeavor to do in a way to make them intelligible to the mass of our readers.

An atom of water is composed of one atom of oxygen, which we will represent thus, o, and one atom of hydrgen, twice as large, though only one-eighth as heavy, which may be represented by a large O; the atom of water combining the two, Oo.

Now, if water, heated to a certain high temperature, is brought in contact with charcoal (carbon) at the same temperature, it is decomposed; one atom of the oxogen, o, combining with one atom of carbon, ⁘, to form carbonic oxyd, ⁘o, and the hydrogen being set free. Both the carbonic oxyd and hydrogen take the gaseous form, and they are both highly combustible. If the hydrogen is brought in contact with oxygen—heat being present—it is burned back into water. Under the same conditions, carbonic oxyd is burned into carbonic acid; each of its atoms, ⁘o, taking on another atom of oxygen, o⁘o—CO becoming CO_2.

This burning of the gasses generates heat, and the question is whether more heat is generated through the decomposition of the water and its subsequent reformation, than would be generated by the simple combustion of the carbon, without the intervention of the water.

Prof. B. Silliman, Jr., in a paper on "the burning of wet fuel in Thmopson's furnace," read before the American Association for the Advancement of Science, at its last meeting, and since published in *Silliman's Journal*, takes the ground that a surplus of heat is thus produced. The last number of the London *Chemical News* also takes the same position. In an article on the recent great fire in London, the editor says: "Every chemist knows what takes place if a small quantity of water is projected into the midst of a large mass of red-hot combustible matter. It is decomposed in presence of the carbon into carbonic oxide and hydrogen, each highly combustible gasses, (we quote literally,) and thereby tending to increase the volume of flame. This, we are satisfied, was the case with a large proportion of the water which was thrown on during the first few days of this memorable fire."

We have seen numerous attempts to trace the loss and gain of heat through the several chemical changes, but they were inconclusive, from want of completeness in the data. The principal portion of the heat absorbed in the decomposition of water by charcoal is that which is expended in raising the substances to that degree of temperature at which the decomposition takes place. Now, what this degree of temperature is has never been ascertained. Mr. Seely, of this city, supposes that it is about 1800° Fahrenheit, and we see that the engineer of the gas works at Copenhagen, Denmark, after a long investigation of the subject, coincides in this opinion, but we have never seen any account of the temperature having been measured.

But the question is easily settled by reference to the law of the conservation of forces, by a process of reasoning analogous to that which condemns all machines that profess to produce perpetual motion.

The question has reference to two processes of burning charcoal. In one, the coal is burned by the oxygen of the atmosphere, each atom of carbon combining with two atoms of oxygen, and producing carbonic acid gas. In the other process, one of the atoms of oxygen is taken from the air and the other from the water, but then another atom is taken from the air to combine with the hydrogen set free from the water, and the quantity of water produced is the same as the quantity decomposed. In the two cases *the original substances are the same and the final products the same.* And they are *in the same physical condition*, provided the water gives up all of its heat, and returns to the temperature which it had before it was thrown upon the fire. In this case the amount of heat generated must be the same as would result from the simple combustion of coal by the oxygen of the air. But if the water goes away in the form of highly-heated vapor, or in the form of vapor at all, then there must be a loss of heat.

We suspect that both Prof. Silliman and the editor of the *Chemical News*, will change their opinion on a more thorough examination of the subject.

THE NEXT WORLD'S FAIR.—English papers state that the International Exhibition of Industry for 1862 promises to be greater than the first, which was held in 1851. The application now made for space by British manufacturers alone, if all were granted, would require a building three times the size of the one now in course of erection.

Water the Drink for Soldiers.

Mr. Henry Marshall, who was for a long period Deputy Inspector of Hospitals, in the British Army, says:—"By the daily custom of imbibing spirituous potations a new want is created, intemperance is established as a habit, and frequent intoxication is the consequence. The wretched drunkard must now have a large supply of liquor in the morning to recover from the effects of the quantity drank on the previous night. He perhaps has neither money nor credit, and his clothes are then sold at a small portion of their value. Some do not stop here; for, after having sold all their clothes, they will rob their comrades, and with the proceeds of their dishonesty provide the means of intoxication. Confinement follows upon confinement, court-martial upon court-martial, and punishment upon punishment, until the worn-out wretch dies in hospital of the 'horrors,' fever or dysentery; or if he should for a time resist the fatal attacks of disease, his constitution becomes broken down by the combined influence of the poison of spirits, an exhausting climate and repeated attack of illness, so that, in a few years, he is found unfit for further service in India."

The personal experience of Mr. Marshall was decidedly in favor of the superior sanitary effects of water drinking, in hot climates. He says:—"I have myself marched on foot with troops on actual service, in a tropical climate, where the mean temperature is considerably higher than that of Jamaica, without any other beverage than water, and occasionally a cup of coffee. So far from being calculated to assist the human body in enduring fatigue, I have always found that the strongest liquors were the most enervating; and this in whatever quantity they were consumed, for the daily use of spirits is an evil which retains its pernicious character through all its gradations. Indulged in at all, it can produce nothing better than a diluted or mitigated kind of mischief." Dr. Robert Jackson, who was at one time at the head of the medical staff in the West Indies, expresses his conviction that an English soldier, aided by temperance, may be rendered capable of going through the severest military duty in the hottest islands of the West Indies.

Whiskey was unknown among the iron soldiers of Rome, who were the conquerors of the world. Water was their common drink, sometimes modified by weak sour wine, almost resembling vinegar.

Educating the Army---A Good Suggestion.

The following is from a correspondent of the Philadelphia *Ledger*:—

When Freemasonry flourished, and every mason was a working builder or architect, it was a law among them that every ten men were placed under one of their members, who instructed them in the art of building, so that any mason could rise from one class to another, until he attained to the highest honors of his order.

Let it be so with the army. Let the officers and such of the men as are competent, instruct the others, two hours in each day, in the mathematics and such branches as are required in the military profession. This might be made an army regulation. The tone of the army would be elevated, a path opened to talent, and I feel confident that the sin of drunkenness would become one of rare occurrence, for the active mind of man would not drown the noble faculty of intellect in the oblivious draught of the grog shop, when it could find employment in the pleasant paths of knowledge.

Machine to Extinguish the Rebellion.

Our cotemporary, the Philadelphia *Enquirer*, contains the following comprehensive recommendation for putting a speedy termination to the rebellion:—

Our countrymen at large should be encouraged by the government to direct their attention forthwith to the improvement of all sorts of instrumentalities. The records of the Patent Office show that the inventive faculty of the country is in the Northern States. Let our Yankees go to work, and we doubt not but that they will soon be able to turn out some unheard of and undreamed of implement or missile which will sweep our enemies from the face of the earth. Take our word for it, these geniuses will yet produce some patent Secession-Excavator, some Traitor-Annihilator, some Rebel-Thrasher, some Confederate State Milling Machine, which will grind through, shell out, or slice up this war, as if it were a bushel of wheat or an ear of corn, or a big apple.

CANAL STEAM TOWING ABANDONED.—The Buffalo *Express* says that the Western Transportation Company have abandoned the experiment of towing by steam on the canal west from Rochester. It is found that tows of three or four boats are injured by collisions and that a less number does not make towing by steam profitable.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JULY 9, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 4, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

1,736.—Benjamin Arnold, of East Greenwich, R. I., for an Improved Lamp Shade :

I claim the combination of the rings and levers, substantially as described, and for the purpose herein set forth.

1,737.—B. T. Babbitt, of New York City, for an Improved Construction of Iron Vessels :

The combination of the sulphur with the frame work of the vessel, in the manner substantially as shown and described.

1,738.—John C. Baker, of Adams Center, N. Y., for an Improvement in Wheels for Carriages :

I claim the plate, A, provided with the concentric circular projection, B, beveled and corrugated at its periphery, or provided with pointed projections, a, in connection with the annular chain of plates, G, the circular plate, H, and the spokes, F, all arranged as and for the purpose set forth.

[The object of this invention is to construct a wheel in such a manner that any one of its spokes may be removed and a new one inserted in its place without taking the tire from the wheel or disturbing the felloes, the invention at the same time admitting of the wheel being constructed economically and in a very durable manner.]

1,739.—George Barker, of New York City, for an Improvement in Machinery for Making Cigars :

I claim the employment in a cigar machine of adjustable bearing plates or boxes, K L, for the purpose of mounting the rollers in combination with the guiding pins and adjustable screws, or their equivalent, the whole being constructed and operated in the manner and for the purpose set forth.

1,740.—Charles Bartholomae, of New York City, for an Improved Canteen :

I claim, first, The induction opening, d, provided with a fixed funnel, B, in combination with the mouth tube, E, and with or without the air tube, K, when applied to a soldier's canteen, constructed of curved form in its horizontal section substantially as and for the purpose set forth.

Second, The filter, I, when constructed, arranged and used in connection with the mouth tube, E, of the canteen, as herein shown and described.

[The object of this invention is to obtain a canteen which may be worn with greater facility than those of usual construction, more readily filled and more convenient to drink from, and be supplied with an efficient filtering device, which may be used whenever necessity requires. The invention consists in constructing the canteen of curved form in its horizontal section, so as to conform to the shape of the wearer, and having it provided with an induction, or filling opening, with funnel attached, and also provided with a mouth-tube and filter, to effect the desired result.]

1,741.—E. P. Barton, of Batavia, and R. W. Towle, of Bath, N. Y., for an Improvement in Hay Rakes :

We claim the combination of the handles, C C, hinged to the rake head, D, with the bars, B, and arms, E E, when these parts are arranged and operated together in the manner and for the purpose specified.

1,742.—Canfield Blodgett, of Morrison, Ill., for an Improvement in Plows :

I claim the improvement in the construction of the standard, A, in combination with the beam, B, the handles, C, plate, D, and brace, E, all attached, constructed and arranged substantially in the manner described and for the purposes specified.

1,743.—Lewis Boore, of Buffalo, N. Y., for an Improvement in Dry Gas Meters :

First, I claim so operating the valve as that an equal longitudinal and transverse movement will be given to it, so that all points of the valve will move over equal surfaces and describe equal circles for the purpose and substantially as described.

Second, I claim the cross, i i′ i″, in combination and arrangement with the valve, F, and operating crank, for the purposes and substantially as described.

1,744.—C. H. Bradley, of West Chester, Pa., for an Improved Post Office Distributing Table :

I claim combining with the distributing tubes, C C C, on table, A, the semi-circular table, G, and receiving boxes, g g g, arranged and operating substantially as described and shown.

[This invention is intended for facilitating the distribution of mail matters in post offices. It consists in arranging in a semi-circular form a number of clentes, or tubes, inclining outward and downward, from the top of a table to the bottom thereof, and in combining with these inclined tubes a revolving table, having large boxes on it, corresponding in number to the number of inclined tubes used, arranged horizontally under the tubes, for receiving the mail matter, which is passed through these tubes.]

1,745.—J. C. Butterworth, of Providence, and B. H. Arnold, of East Greenwich, R. I., for an Improvement in Converting Reciprocating into Rotary Motion :

First, we claim the use and employment of the combination of the lever, foot-piece and case, substantially as described and for the purpose set forth.

Second, We claim combining the cases substantially as described, so that the levers and foot-pieces shall be made to act by the friction created between the cases, for the purpose set forth.

1,746.—N. W. Camp, of Trenton, N. J., for an Improvement in Skates :

I claim the construction of the skate as specified, that is to say, of two distinct runner portions, B and B′, in combination with a single flexible plate, or sole, b, in the manner and for the purpose described.

1,747.—Jeremiah Carhart, of New York City, for an Improved Propeller Shield :

I claim a shield substantially in the form of an arc of a circle, suspended from the stern of a vessel by rods projecting downwards, without reference to size, placed over the wheel, and in part enclosing and protecting the same, and which thereby partially confines and concentrates the water upon the same, increases its power and also the speed of the vessel, constructed substantially as and for the purposes described.

1,748.—John Case, of Philadelphia, Pa., for an Improved Canteen :

I claim the tube, B, with or without the filtering medium, E, fitted in the cork, C, which is provided with a chamfered side, h, in combination with a canteen, A, provided with a perforated nozzle, D; all arranged substantially as and for the purpose set forth.

[See engraving of this invention in No. 4, present volume.]

1,749.—Richard S. Child, of Philadelphia, Pa., for an Improvement in the Utilization of Coal Tar :

I claim the process herein described of utilizing coal tar, by converting it into roofing cement and lampblack, instead of into lampblack and a worthless residue, or into roofing cement and volatile substances.

1,750.—John Chilver, of Jersey City, N. J., for an Improvement in Molds for Molding Pipes of Plastic Materials :

I claim, first, The construction of a mold with its flat bottom, and its projection, L, whereby the sections of pipe made therein may be readily coupled, and have a continuous base, substantially as herein described.

Second, The combination with the flask of a mold of a core of uniform size and shape from end to end, constructed so as to expand and contract, substantially as described.

Third, the combination of the sectional bed-plate and collar with the flask of the mold and with an expansible and contractable core, combined and operating substantially as described.

1,751.—Neil Clifford, of Brooklyn, N. Y., for an Improvement in Vapor Lamps :

I claim the arrangement of the tubes, C, K, and wick tube, H, when used in connection with the plug, E, and socket, D, placed in the curved part, a, of the tube, C, and in relation with the wick tube, H, and straight or upright portion of tube, C, to operate as and for the purpose set forth.

[This invention relates to an improved lamp of that class in which volatile hydro-carbons are burned, and the burning material vaporized by a supplemental flame, in order to supply or feed the illuminating flame.]

1,752.—J. A. De Maniquet, of Paris, France, for an Improvement in Machines for Twisting Silk :

First, I claim the method of making a continuous regular twist although the slivers or strands may be irregular, and without destroying the elasticity of the material, and without unravelling it, as hereinbefore described.

Second, The method of winding and unwinding by means of an annular spindle, or its equivalent, operating substantially as herein described.

1,753.—Andrew Derrom, of Paterson, N. J., for an Improvement in Portable Huts :

I claim the combination of the sills, A, flooring timbers, B, studs, C, plates, D, and rafters, E, connected by wedge-shaped dove-tail joints; and the divided panels, F F F′, secured to the former by grooves, l, ribs, g, and bolts, k, the whole being constructed and arranged substantially as herein shown and explained, and for the purposes set forth.

[An engraving of this invention was published in Vol. 4, page 352.]

1,754.—P. S. Devlan, of Elizabethport, N. J., for an Improvement in Car Brakes :

I claim the employment of clasping brake levers, D, substantially as herein before described, in combination with the axle, or axles of the truck, and the screw shaft, the whole arranged to operate substantially as described, for the purpose set forth.

1,755.—Andrew Dougherty, of New York City, for an Improvement in Machines for Damping Paper :

I claim the combination of a friction brake, with means, substantially as described, for supporting a roll of paper in such manner that the tension is applied to the periphery of the roll of paper substantially as set forth.

I also claim the combination of a shaft that supports the roll of paper to be unrolled with an equalizing apparatus, the combination as a whole operating substantially as described.

I also claim a damping apparatus which is a combination of a series of cylinders having porous jackets, with means for supplying the damping liquid to them, and for regulating the quantity retained by the wet cylinder that is pressed in contact with the paper substantially as described.

I also claim a rolling mechanism, which is a combination of a shaft, or its equivalent, for holding the roll of paper, with a concave friction roller, so arranged as to impart motion to the periphery of the roll, and with guides for holding the roll in its proper position against the friction rollers, substantially as described.

I also claim the combination of the following members, viz:—

First, An apparatus for supporting a roll of paper and making tension upon the paper.

Second, An equalizing apparatus substantially as described.

Third, A damping apparatus substantially as described.

Fourth, A rolling mechanism substantially as described.

The whole constituting a machine, operating substantially as described, for damping paper from the roll, and delivering it in a damp condition.

1,756.—L. H. Doyle, of Waterloo, Iowa, for an Improvement in Cultivators :

I claim the sockets, D D′, at the back end of the beam, A, with the feet or standards, E E, fitted therein shown, in connection with the bar, F, and braces, h h, arranged to brace the feet, or standards, E E, and at the same time connect the same to the bar, F, at the desired distance apart, substantially as and for the purpose set forth.

[The object of this invention is to obtain an efficient and simple implement for the cultivation of crops which are grown in hills or drills —an implement which will thoroughly pulverize the soil, and render it permeable to air and moisture, and at the same time eradicate all weeds, and be capable of throwing earth either to or from the growing plants.]

1,757.—J. D. Elliot, of Grafton, Mass., for an Improvement in Machines for Folding Cloth :

I claim attaching the pitman to the end of the folding blades, or to the staffs holding the blades at or near the upper ends of said staffs, when applied to a machine for folding cloth, as described.

I also claim the combination of the pawl, G′, ratch, F′, and shoe, a4, with the yielding table of a cloth-folding mechanism, operating in the manner and for the purpose herein specified.

I also claim giving the table a positive motion down in advance of the folding blades for the purpose set forth.

I also claim giving both the table and jaw a positive motion, in advance of the folding blades, for the purpose set forth.

I also claim constructing the jaws, n o, with a roughened surface for holding the folds of the cloth, made substantially as set forth.

1,758.—W. C. Fuller, of London, England, for an Improvement in Gun Carriages :

I claim the particular mode or modes of applying india rubber springs in the construction of gun carriages, as set forth and descrieed.

1,759.—H. A. Gage, of Manchester, N. H., for an Improvement in Machines for Addressing Newspapers :

I claim the mechanism for regulating the impression of the platen, consisting of the lever, F, link, G, and nut, H, on the rod, E, substantially as described.

1,760.—C. P. Geissenhainer, of Pittsburg, Pa., for an Improvement in Cooking Stoves :

I claim, first, The arrangement in cooking stoves, of an air-flue opening under the hearth, for introducing air in the rear of the fire basket, in such relation to the flue for the exit of the smoke and products of combustion, as is hereinbefore described, that is to say:—placing the horizontal smoke flue in the front part of the stove, and immediately under the air flue, for the purpose of increasing the heat of the air as it enters the stove through the flue under the hearth, by extracting the waste heat from the smoke and products of combustion before they escape from the stove.

Second, Constructing the door to the fire-chamber of cooking stoves with a flange projecting from its lower edge, so situated in relation to the hinge, as that when the door is closed a space shall be left between the projecting flange and the grate bars, to catch and return to the fire any smoke or gas that would otherwise escape into the room, substantially as described.

1,761.—John Gibbs, of Brooklyn, N. Y., for an Improved Shade Fixture :

I claim the construction of the adjustable slide with clasp hooks, e, and locking T-shaped hook, g, in one piece, the plate, A, being provided with apertures, c, corresponding to hook, g, and the hooks, e, clasping the sides of plate, A, the whole operating together in the manner and for the purpose shown and described.

[This invention relates to that part of the shade fixture which is attached to the window frame, and used to keep the endless cord under tension.]

1,762.—C. R. Gorgas and Wm. H. Smith, of Wooster Ohio, for an Improved Furniture Caster :

We claim the combination of the socket, B, conical pin, C, cups, G and H, necks, a and b, and roller, D, all constructed and operating in the manner and for the purpose shown and explained.

1,763.—J. W. Graham and J. M. Topliff, of Pittsfield, Ill., for an Improvement in Water Elevators :

We claim, first, In combination with the shaft, a, the loose roll, B, and gears, i f g, and clutch, G h, the whole constructed and operating substantially as described, for the purpose set forth.

Second, We claim the combination of the windlass having reversed helical grooves, with the cords and water bucket, and the device for opening the valve of bucket, the whole arranged and operating as described, for the purpose set forth.

Third, We claim, in combination with the elevating and automatically discharging bucket and grooved windlass, the blank, u, as and for the purpose specified.

Fourth, We claim constructing the bucket with a mouthpiece, p, in combination with its valve and opening mechanism, and a filling valve in center of bucket's bottom as described, for the purposes set forth.

1,764.—Edward Hamilton, of Chicago, Ill., for an Improvement in Breech-loading Ordnance :

I claim the combination of a fixed breech and a movable conical breech, the two being constructed and arranged substantially as described.

I also claim the combination of a movable breech and of a fixed breech, constructed and arranged substantially as described, with a removable stopper for the charging opening, substantially as described.

1,765.—G. H. Hartman, of Fort Wayne, Ind., for an Improvement in Beehives :

I claim, first, The employment, in combination with the box, A B C D, of the trapezoidal removable comb frames, a, the whole arranged and operating as described, for the purposes set forth.

Second, I claim, in combination with the sliding drawer, F, the removable wire gauze frame, c, arranged and operating as described, for the purpose set forth.

Third, I claim making the front of drawer, F, beveled at d, in combination with the decoy entrances, e e e, as described, for the purpose set forth.

Fourth, I claim the peculiar manner described of regulating the entrance, for the purposes substantially as described.

1,766.—Albert Holbrook, of Providence, R. I., for an Improvement in Pickers :

I claim applying a rawhide picker to a pickerstaff, by means of a spring lever provided with a catch, a, operating with the slot, o, of the picker, in the manner as represented and for the purpose set forth.

1,767.—Albert Holbrook, of Providence, R. I., for an Improvement in Pickers :

I claim my improved rawhide picker, as constructed, of one piece of material, and with its two ends folded, interlocked and connected in the manner and for the purpose as set forth.

1,768.—George Ives, of Detroit, Mich., for an Improvement in Ditching Machines :

I claim in the described combination with the colter, H, plow, d, trough, D, and elevator, E, of a ditching machine, the arrangement of the colters, J J, attached to the sides of the machine at a distance in the rear of the plow, and projecting laterally beyond the path of the latter, all as shown and explained, and for the purposes set forth.

[This invention relates to an improvement in ditching machines in which the earth is carried from the bottom of the ditch, as fast as it is loosened, to the back part of the machine by an inclined endless carrier, which deposits the earth on two other carriers, which conduct it off some distance on each side of the ditch out of the track of the wheels of the machine.]

1,769.—Frederick Kesmodel, of San Francisco, Cal., for an Improvement in Apparatus for Taking Casts for Pads :

I claim the described apparatus, consisting of piston, E, mold, A, and elastic diaphragm, B, arranged in relation to each other, and for the purpose of forming pads, as set forth.

1,770.—Dennis Lane, of Plainfield, Vt., for an Improved Method of Setting the Log in Sawmills :

I claim the employment or use of the ratchets, H I J K, having teeth at different distances apart, in connection with the adjustable dog, P, placed on the rod, O, which is provided with retaining pins, h, the ratchets being placed on the shaft, F, having pinions, G G, at its ends which gear into racks, D D, attached to bar, C, all being arranged as and for the purpose set forth.

[The object of this invention is to obtain a means for setting the carriages of sawmills which will admit of a single attendant adjusting the log to the saw, and also operating the brakes for feeding and gigging back the carriage. The invention also has for its object the ready adapting of the parts for adjusting the log to saw boards of different thicknesses.]

1,771.—W. B. Le Van, of Philadelphia, Pa., for an Improvement in Water Gages for Steam Boilers :

I claim, first, So arranging the valve, in respect to the internal rod, I, that the center line of one shall coincide, or nearly coincide, with the center line of the other when the rod or valve, or both, are so constructed that the valve can be operated without disturbing or being disturbed by the rod, as set forth.

Second, So constructing the valves, G in respect to the said internal rod, or the rods, in respect to the valves, that the latter can be operated without disturbing the former, as set forth.

Third, The hollow branch, b, of the steam chest, A, combined and arranged, in respect to the opening of the valve, G, as set forth, so as to afford ready access to the interior of the glass tube, as specified.

1,772.—E. H. Lewis, of Wilbur, N. Y., for an Improvement in Machines for Polishing Stone :

I claim the arrangement of the double-armed reciprocating bar, I eccentric, G, shaft, B, and gear wheel, C, with the rotary plate, F, shaft, E, and pinion, D, in the manner and for the purpose shown and described.

1,773.—John Miller, Jr., of Baltimore, Md., for an Improvement in Machines for Making Paper Bags and Boxes :

I claim, first, The combination of the crosshead, L, lever, F, rock-shaft, D, adjustable arm, C, and fingers, B, constructed and operating substantially as explained, to impart an intermittent feed movement to the strips of paper.

Second, The cutter, G, constructed as shown and described, and operating in connection with an intermittent feeding device, substantially as and for the purpose set forth.

Third, The mold or folder, N, constructed as described, and operating in connection with a suitable plunger, substantially as and for the purposes set forth.

Fourth, The combination of the rotary brush, O, fountain, P, and pressure cams, T, operating to paste or glue the boxes while passing through the molds, as explained.

Fifth, The spring clasps, U V, applied beneath the molds, N, employed to hold the joints of the boxes until set, as explained.

1,774.—William Miller, of Boston, Mass., for a Fire Escape :

I claim having the ladders of fire escapes made of slotted tubular metal, and rounds arranged and operating, in respect to each other, in the manner shown and described.

The combination of the curved rack, E, with the hinged ladder, D, operating pinion, c, and platform, A, substantially in the manner and for the purpose shown and described.

[This invention consists in the arrangement of a toothed segment attached to the main ladder, which is hinged to standards or lugs rising from the platform of the truck, in combination with suitable gear wheels, in such a manner that, by the action of said gear wheels on the toothed segment, the ladder or ladders can be raised and retained in an upright or inclined position, as may be desired. It also consists in the arrangement of slotted tubular side rails, in combination with the rounds of the several ladders, in such a manner that the side rails of each ladder guide and strengthen the guide rails of the next succeeding ladder, while, at the same time, the rounds of the inner ladders are supported and strengthened by the slots in the side rails of th next preceding ladder]

1,775.—J. W. D. F. Moon, of Coventry, N. Y., for an Improvement in Thills for Vehicles :

I claim the projecting hook or key, f, or its equivalent, on the rear end of the thill iron, B, fitted into and passing through the opening, e, in the socket iron, A, substantially in the manner and for the purposes set forth.

1,776.—F. A. Morley, of Sodus Point, N. Y., for an Improved Steering Apparatus :

I claim the combination of the screw and connecting piece, D, and single nut, E, screw and connecting piece, D, moving longitudinally and in an opposite direction to nut, E, for operating the rudders of vessels, substantially as described.

And, in combination with the above, I claim the guides and grooved boxes, G G, to accommodate the upward motion of the rudder, as explained.

1,777.—F. A. Morley, of Sodus Point, N. Y., for an Improvement in Potato Diggers :

I claim the combination of the spirally-arranged teeth, I, with the adjustable spirally-slotted cylinder, A, constructed and operating in the manner described for the purpose specified.

1,778.—B. F. Norton, of Manchester, N. H., for an Improvement in Sewing Machines :

I claim the needle bar, F F′, bent laterally, as shown in Fig. 5, jointed needle carrier, L, adjustable guide, H, set screw, M, and spring, N, operating in combination beneath the table, o, the whole constructed and arranged substantially as and for the purposes set forth,

1,779.—Lucius Parker, of Manchester Station, Conn., for an Improvement in Railroad Car Brakes :

I claim, first, The combination of the self-adjusting spring bearings, D, with the main shaft, C, substantially in the manner and for the purposes shown and described.

Second, The employment of the adjustable weight, H, in combination with the main shaft, C, lever, F, shaft, G, and the shoes, K N, in the manner and for the purposes shown and described.

Third, The general arrangement, together and with each other, of the above specified parts, as shown and described.

[The object of this invention is to obtain a brake for railroad cars which may be operated with great facility, and be capable of applying itself in case of the casual detachment of a car, or any number thereof, from a train; the invention also being so arranged that all the brakes of a series of cars comprising a train may be operated simultaneously, and the train stopped within as short a distance as practicable.]

1,780.—Henry Rawson, of Leicester, England, for an Improvement in Machines for Combing Wool :

I claim, first, Combining a comb, z, worked as described, with a comb, a, and a comb, q, substantially as described; and,

Second, I claim the combining of a comb, q, with a comb, z, and bars or plates, r, substantially as described.

1,781.—Charles Raymond, of Brattleboro', Vt., for an Improvement in Sewing Machines :

I claim the bearing off hook, g, when it is arranged in such a manner with relation to the looper, b, that the said parts are enabled to co-operate with each other in the formation of lock stitches, substantially in the manner set forth.

1,783.—Edmund Russel, of Brooklyn, N. Y., for an Improvement in Oscillating Steam Engines :

I claim the spring, f, applied as a means of connecting the cylinder to the frame of the engine and allowing for the oscillation, in the manner and for the purposes set forth.

I also claim the arrangement of the valve, m, stem, i, and the induction and eduction ports, 1 2 and 3, in the oscillating cylinder, applied as and for the purposes specified.

1,784.—J. A. Sabbaton, of New York City, for an Improvement in Dry Gas Meters :

I claim the combination of a series of flexible diaphragms with a conical valve having an inlet passage at one of its heads, and outlet passage at its other head, two lateral ports communicating respectively with the inlet and outlet passages, and turning in a conical valve seat fitted with as many ports as there are chambers in the meter, the whole arranged and operating substantially as described.

I also claim the combination of the said valve and valve seat with an inclosed inlet passage, a supplementary port in the valve seat, and a supplementary passage in the valve, substantially as described.

I also claim the combination of the stems of the flexible diaphragms with conical stoppers and stopper seats, substantially as described.

1,785.—B. Segnitz, of New York City, for an Improvement in Trachea Tubes :

I claim a trachea tube constructed with a central tube, A, curved flaring double channeled terminus, B, and an adjustable mouth piece, C, substantially as shown and described.

1,786.—Christian Sharps, of Philadelphia, Pa., for an Improvement in Breech-loading Firearms :

I claim the spring dog, Q, with its projections, q and q′, in combination with the projection, t, of the guard lever, C, when the said projection, q′, is situated in respect to the underside of the stock and the bent end of the said guard lever as and for the purpose set forth.

1,787.—Daniel Sherwood, of Lowell, Mass., for an Improved Coffee Strainer :

I claim the wire spring, C, formed as shown, and attached to the strainer, A, for the purpose set forth.

[The object of this invention is to attach to the mouth of the spout of a coffee pot a small straining cup for straining the coffee as it is poured from the pot, said cup being so attached that it can be readily removed and replaced at pleasure.]

1,788.—John Sims, of Boston, Mass., for an Improvement in Seed Drills :

I claim the arrangement of the fork, L, slide, J, rockshaft, F, and seed box, E, in combination with a drill plow, O, coverer, P′, and rake, R, for the purposes and substantially as described.

1,789.—H. R. Sloat, of Sloatsburg, N. Y., for an Improvement in Farm Gates :

I claim the combination of the devices described, as shown in Fig. 1, for the purpose of opening and closing a gate in the manner substantially as set forth.

1,790.—B. C. Smith, of Burlington, N. J., for an Improved Railway :

I claim a railway composed of two or more cast iron girders, each girder consisting of a broad plate with the longitudinal strengthening flanges, b b, below, and a longitudinal rib, a, above, when the body of the girder is bedded on to, and the strengthening flanges into, the ground, as described, for the purpose of preventing all liability of the rails to tilt or to be displaced laterally or vertically, and in order to form a cheap and permanent railroad without the aid of sleepers, chairs and spikes, as set forth.

1,791.—C. R. Soule, of Fairfield, Vt., for an Improvement in Hay Rakes :

I claim, first, In hay rakes that are supported upon their teeth, having the extremities of the teeth made or bent, substantially as shown and described, so as to form an enlarged bearing surface and prevent the teeth from digging into the ground, all as set forth.

Second, The movable or adjustable plate, H, having the shoulder or catch, h, at its underside, in connection with the lever, I, and arm, i, or their equivalents, attached respectively to the plate and shaft to admit of the adjustment of the rake teeth, D, to a greater or less pitch or inclination, as may be required, and the facile liberation of the rake to admit of its revolving, as set forth.

[This invention relates to certain improvements in the wire tooth rake, and consists in the use of an adjustable catch, arranged to admit of the rake teeth being adjusted with a greater or less pitch, as circumstances may require. The invention also consists in forming the rake teeth with bent lower terminals, or with balls or knobs, in such a way that they will not catch into the ground, but glide over it just below the stubble, and perform their work very efficiently.]

1,792.—L. B. Southworth, of Deep River, Conn., for an Improvement in the Teeth of Saws :

I claim the forming of the teeth, a, of circular saws, by having the points, 2, of the teeth inclined at an angle of about 45° with the radial edges thereof, said points being expanded or having a burr, 3, formed by burnishing, so as to increase the width of the cutting edges, when said points, 2, thus formed, are used in connection with the double basil at the oblique edges, 4. of the teeth, as and for the purpose set forth.

1,793.—Erastus Stebbins, of Chicopee, Mass., for an Improved Faucet :

I claim connecting the valve, C, to the screw shaft, F, by means of the collar, E, which is screwed on the cylinder, f, of the valve, C, and is connected to the lower end of shaft, F, by the flanch, j, and recess, k, when said collar is used in connection with the packing, h, secured to cylinder, f, and fitted between the cap, D, and the box or projection, d, of the tube, A, substantially as described.

[This invention relates to that class of faucets or cocks in which the valve is operated by a screw. The object of the invention is to dispense with the use of a spring, and open and close the valve by the screw alone, and at the same time have the packing of the cap attached to the screw shaft or stem, so as to admit of the perfect working of the valve, while effectually preventing the escape of water around the cap.]

1,794.—Wm. O. Stoddard, of Champaign, Ill., for an Improved Printer's Chase :

I claim the application of the right and left screws working simultaneously upon side sticks, and the side sticks interlocking as shown, and the combination of the screws and side sticks in this chase.

1,795,—S. Sweeney and S. Parks, of Rome, N. Y., for an Improvement in Double Seaming Sheet Metal :

We claim in machines for double seaming sheet metal, the groove, g, on the roller, a, when the said groove terminates on its outer edge in the elevated portion or inclined flange, h, in combination with the conical roller, b, as and for the purpose set forth.

1,796.—N. G. Swift, of Hart's Village, N. Y., for an Improvement in Machines for Sowing Pulverulent Manures :

I claim, first, The combination of the hopper, E, the roller or rollers, J. slides, Q, scrapers, O O, and pressure bar, M, all arranged for joint operation, as and for the purpose set forth.

Second, suspending the hopper, E, to the axle, A, by means of the rods, F F and H, arranged substantially as shown, whereby the wheels, K L, may be readily thrown in and out of gear, and the rollers, J J, consequently rendered operative or inoperative as may be desired.

[This invention consists in the employment or use of a roller or rollers placed within a hopper and arranged with adjustable slides and with scrapers, as described, so that the discharge of the manure from the hopper may be regulated as desired, and the portions of manure which may adhere to the rollers be scraped off at such a point as not to affect the equal distribution of the manure over the field.]

1,797.—A. H. Trego, of Lambertville, N. J., for an Improved Appararatus for Pulleying Horses :

I claim the employment or use of a breeching, B, applied to a horse in connection with bars, a a, or their equivalents, an upright or pulley support, j, and a loaded cord, l, and forked rod, v, so arranged as to admit of the pulleying or elevating of the horse's tail, substantially as set forth.

[This invention relates to an improved means for keeping the tail of a horse in an elevated state after "nicking," so that the tail may, after being kept elevated a certain period, permanently assume such position.]

1,798.—A. K. Tupper, of Pontiac, Mich., for an Improvement in Gas Retorts :

I claim the combination in the retort of the upright partition, a, the reversed inclined partitions, d d1 d2, on one side of a, and the chamber, B, without partitions on the opposite side of it, all substantially as specified.

1,799.—J. L. Vauclain, of Lafayette, Ind., for an Improvement in Car Axle Boxes :

I claim the provision of a wedged formed cap, C D, and tapering grooves, B, to a car axle box, for the objects specified.

1,800.—J.C. Wightman, of Boston, Mass., for Improvement in Gas Cocks :

I claim the construction of a cock or stop for gas or air of two cylinders joined together and with a communicating passage between them, one of said cylinders being furnished with an adjustable plunger or dispiacer, and a mercury cup, by means of which the flow of gas through the other may be regulated in quantity or entirely stopped, the whole being constructed, arranged, and operating as set forth.

1,801.—J. B. Wilson, of Williamstown, N. J., for an Improvement in Preserving Vessels. Ante-dated June 20, 1861 :

I claim the disk, H, with its gum elastic ring, the bolt, J, with its cross bar, K, and nut, M, and the yielding washer, L, the whole being constructed substantially as described and combined with the tapering mouth of the vessel as set forth.

1,802.—John Young, of West Galway, N. Y., for an Improvement in Washing Machines :

I claim the rollers, D D, provided with elastic material, g, the spring slots, i, and grooved or roughened elastic rollers, I, the whole constructed and operating substantially as described, and for the purposes specified.

1,803.—McClintock, Young, Jr., of Frederick, Md., for an Improvement in Harvesters :

I claim, first, Connecting the finger bar of a grass harvesting machine, to the main frame by means of a beam, F, linked or hinged to and drawn by, the tongue and prevented from swaying laterally, by the brace, c, and main frame, D, as set forth.

I also claim, in combination with said beam, F, so hung and supported, a platform, rake, and rake mechanism, arranged and connected thereto to operate as set forth, for converting the machine into a self-raking grain harvester, substantially as described.

I also claim making a finger bar into two sections, one long one and one short one; the short section being connected to the platform, and removable with it, so that as the platform is attached, to adapt the machine to harvesting grain, or removed to adapt it to the cutting of grass the finger bar shall be correspondingly lengthened and shortened, as has been found advantageous in harvesting the different materials, substantially as described.

1,804.—C. C. Coe (assignor to himself and G. S. Cottman), of Rome, N. Y., for an Improvement in Vapor Lamps:

First, I claim in combination with the pervious cylinder and wick tube the gas generating pan or cup, substantially as described and for the purpose set forth.

Second, I claim combining with the gas generating from the pervious cylinder, burner, outer casing fender and passage ways, substantially as described and for the purposes set forth.

Third, I claim combining with the wick tube and cup the valve, n, substantially as and for the purpose described.

1,805.—John Fowler, Jr., of London, England, assignor to W. P. Tatham, of Philadelphia, Pa. Patented in England July 14, 1858, for an Improvement in Machinery for Plowing and Tilling Land :

I claim mounting on plows or other tilling instruments an apparatus for taking up the slack rope by the pull of the rope drawing the plows or other tilling instruments, substantially as described.

1,806.—John Fowler, Jr., of Havering, and Wm. Worby, of Ipswich, England, assignor to W. P. Tatham, of Philadelphia, Pa. Patented in England July 10, 1856, for an Improvement in Machines for Tilling Land by Steam :

I claim mounting an anchoring carriage on disks or wheels sufficiently thin at the periphery to cut or sink into the land, substantially as described.

1,807.—Ch. Froelich (assignor to Phelan and Collender), of New York City, for an Improvement in Tivoli Tables :

I claim, first, the arrangement of the hinged levers, H, operated upon by buttons, J, in combination with the endless chain, G, with fingers, f, and with the channels, h′ a b, substantially as and for the purpose set forth.

Second, The arrangement of the secondary chain, L, with fingers, n, in combination with the spiral channel, M, and with the chain, G, all constructed and operating substantially as and for the purpose specified.

Third, The arrangement of the sleeve, I, rod, r′, plate, r, and rod, q, in combination with the spring dogs, j and p′, chains, G and L, and with the hinged levers, H, constructed and operating substantially as and for the purpose described.

[This invention consists in the arrangement of an endless chain of fingers acting upon a number of balls, in combination with a series of channels above and below the perforated table, and with levers operated upon by buttons on the edge table, in such a manner that by successively depressing said buttons, one ball after the other is caused to roll on the table and to descend through one of the apertures in the top of said table, and through the channels or gutters under the table top, back to the starting point, while, at the same time, one of the balls remaining in the gutter below is taken up by one of the fingers, thereby enabling the player or players to proceed with the play without interruption; it consists further, in combining with the endless chain of fingers which throw the balls out upon the table, and with the apparatus for operating the same, a column having in its interior an additional endless chain of fingers upon a secondary number of balls, and being provided with a spiral channel extending from the top to the base of the column, in such a manner that, on depressing one of the buttons and simultaneously with the ball thrown out by the lower or main chain of fingers, one of the secondary balls is thrown out at the top of the columns and made to descend through the entire hight of the spiral channel, giving to the entire arrangement the appearance as if the balls thrown out at the top of the column were the same as those thrown out by the main chain of fingers, and, as if the same balls which descend through the spiral channel on the outside of the column, also make a circuit on the table and disappear through one of the apertures in the top.]

1,808.—A. C. Stiles, of Bunker Hill, Wis., assignor to himself and Amos Ewbanks, for an Improvement in Seeding Machines :

I claim the arrangement of the adjustable curved segment bars or share carriers, N N, slides, J, lever frame, K, spring ratchet cylinder, D, and tappet wheel, H, with each other and with the tubes, L, adjustable segment bars or share carriers, R, springs, W, and stampers, V, the whole constructed and operating together, as and for the purpose shown and described.

[This invention relates to that class of seeding machines which are designed for sowing seed in hills, in check rows, and has for its object the preventing of the choking of the seed-distributing device, the perfect control over the operation thereof, so as to insure the seed being dropped at suitable points. The invention also has for its object the ready adjustment of the furrow and covering shares as well as the proper compacting of the earth on the seed and the marking of the hills.]

1,809.—Joseph Reckendorfer, of New York City, and J. C. Richards, of Brooklyn, N. Y., for an Improved Envelope :

I claim the improved self-sealing envelope looped and gummed in the manner described, so as to possess the advantages set forth.

RE-ISSUES.

103.—P. S. Devlan, of Elizabethport, N. J., for an Improvement in Journal Boxes. Patented Sept. 25, 1860 :

I claim the employment of paper pulp or pulp made of any vegetable fibrous material, to form the bearing surface of journal boxes, substantially as set forth.

104.—P.S. Devlan, of Elizabethport, N.J., for an Improvement in Journal Boxes. Patented Sept. 25, 1861 :

I claim forming the bearing surfaces of journal boxes of a composition of vegetable fibrous matter and fine earthy substance, substantially as described.

105.—A. M. Hall, of West Falmouth, Maine, assignor to J. A. Saxton, of Canton, Ohio, for an Improvement in Mowing Machines. Patented Dec. 23, 1856 :

I claim, first, The combination with the heel of a finger beam, so connected or hinged to the main frame of a mowing machine, as that the entire bar can rise or fall, independent of the up-and-down motions of the main frame of a self-adjusting, hinged plate, or auxiliary shoe, for the purposes of allowing the points of the guards or fingers, to freely adapt themselves to the character of the ground over which the machine passes while in operation.

Second, I claim in combination with a self-adjusting auxiliary shoe or plate, as set forth, of an adjusting screw or bolt, for the purposes stated.

Third, The cambination of the adjustable metallic plate, M, with its ears, N N, and otherwise constructed as described, with the heel of the finger beam and main frame, as set forth.

Fourth, The combination of the bent lever, J, and its operating mechanism, and hinged oscillating cutters, j, with a hinged finger beam, for the purposes stated.

106.—W. A. Kirby, of Buffalo, N. Y., and D. M. Osborne, of Auburn, N.Y.. assignees of William A. Kirby, aforesaid, for an Improvement in Harvesters. Patented November 15, 1859 :

We claim, in combination with a cutting apparatus and a platform having a side delivery, and both placed in rear of a line drawn through the front of the main wheel, the raker's seat located at the side of the platform, and arranged so that the raker sits behind the main frame and facing the falling grain, substantially as and for the purpose described.

107.—Elisha Waters, of Troy, N. Y., for an Improvement in Making Paper Boxes. Patented Feb. 2, 1858 :

I claim annular boxes of paper board, constructed by cutting the said board into strips or pieces for the sides, and into parts for the top and bottom thereof, forming the upright angles or corner, one by one, by pressing the said strips or pieces between male and female dies corresponding to and with the angle or corner to be turned or formed, substantially as described and set forth.

Second, The flanches, B and E, formed upon the sides, A and D, by pressing the paper board or strip between dies, in proper form, thus and thereby constructing said flanches to receive and combine the same with the top or bottom of the said box, as described and set forth.

I also claim forming the corners of paper boxes by pressing the same between cold or hot dies, constructed for that purpose, as described and set forth.

108.—S. J. Seely (assignor to C. W. Durant), of New York City, for an Improvement in Iron Railway Cars. Patented April 24, 1860. Re-issued Oct. 2, 1860 :

I claim, first, The application and use of corrugated metal plates to and in the construction of railroad cars and other vehicles, when the said plates are applied and used in a single series or thickness with their corrugations running horizontally, as set forth.

Second, The application and use of corrugated metal plates to and for the purposes named, when two or more series or thicknesses of plates are used, when the outer series of said plates has its corrugations running horizontally, as set forth.

Third, The application of corrugated metal plates, combined with and secured to and upon the angle irons, a b c d, for the construction of the bodies of railroad cars, and other vehicles, as set forth.

Fourth, The application of the said corrugated metal plates and angle irons, combined with the trough irons, E, as set forth and for the purpose described.

DESIGNS.

72.—G. L. Kelty, of New York City, for a Design for Window Shade Material.

Electricity always takes the path of least resistance, and lightning seeks out its road to the earth according to this law with mathematical precision.

Notes and Queries

H. R., of Mass.—You state that your shellac varnish is opaque and brittle. You probably used inferior alcohol to dissolve the lac. Rectified alcohol alone should be employed as the solvent, in order to form transparent varnish. Apply it in very thin coats, and allow each to dry perfectly before the other is put on.

H. J. and E. H. B., of N. Y.—A substitute for transparent mica, for stoves and similar purposes, would be valuable. The principal defect of mica is its laminating quality, it splits so readily into fine scales. We are not acquainted with any substitute for mica that possesses fire-proof, translucent and flexible qualities.

J. P. S., of N. Y.—You ask our opinion respecting the best oil for mowers and reapers, and state that the greatest difficulty which you have encountered, is the quick dispersion of any oil which you have applied to the cogs and knives, "it flies off so quickly." You also state that you have employed expensive castor oil in the expectation that it would stay on longer and be fully cheaper on this account than lard oil. The best lubricators for mowers is a question deserving much attention. It cannot be solved by theory; careful experiments with different lubricators, can alone determine which oil or mixtures of oils and grease is the best. The best lubricators known to us for fine machinery, is pure sperm oil, but you want adhesiveness as well as good lubricating qualities. A mixture of dissolved india rubber and coal oil may be a good lubricator for mowers. Give it a trial.

A. C., of N. Y.—The pulp of potatoes scraped into water cleanses the finest kinds of silks without injury to the fabric or color.

B. G. of Vt.—You can make a good blue ink by taking three drachms of Chinese blue (terrocyanide of iron) and grind it up with one dram of binoxalate of potash and seven ounces of water. Usually about one dram of gum is added to these quantities.

D. A. R., of Conn.—To drive away and keep rats from corn-cribs and granaries, place some gas-tar in them, and daub some in their holes, and they will leave the premises at once. The tar can be obtained at any place where gas is manufactured.

J. A., of Cal.—We think you can obtain Johnson's Practical Draughtsman of W. H. Townsend & Co., of this city. We do not know the price of Silliman's Philosophy. It is published by H. C. Peck, of Philadelphia. We should think it worth about $1,50.

G. H. M., of N. Y.—About 8¾ lbs. of powder are used for a common 42-pound spheroidal shot; much less, however, is frequently used; it all depends upon the range and penetration required.

G. W. P., of Mass.—King's work on Propellers is a valuable one for you to study in order to fit you for becoming a naval engineer.

J. B. W., of Mass.—The mineral which you have sent us consists mostly of iron pyrites, and is of no value.

E. P., of Ohio.—Kaolin will not make a superior hard soap when used as a substitute for rosin, because it is an insoluble substance. Soapstone dust may answer your purpose as a substitute for kaolin.

H, W., of Ohio.—In Russia very little turpentine or varnish is used in their paints. They use the curd of milk mixed with pigments; it is more durable and less dangerous on account of fires. A very excellent fire-proof wash for outside buildings is made of clay stirred up in water containing about an ounce of potash for every five gallons. This wash is excellent for the boiler rooms of steamboats.

J. R. W., of Conn.—A steam floating ram for destroying war vessels is not new. You will find the description of such a vessel on page 167, Vol. 1, new series Scientific American. Elongated bullets and bolts for rifles are not such modern missiles as you suppose. They have been borrowed from the Genoese cross-bow; and Robbins, the author of a work on gunnery, suggested the employment of such bullets for rifles in 1741. Breech-loading cannon are certainly the most convenient and safe for loading with percussion shell.

R. R. T., of N. Y.—A composition of 9 parts by weight of zinc and 12 of lead, is very good for the expanding bands of iron can non shot. This alloy, for such purposes, was patented by Capt. J. Lawrence, in England, in 1852.

C. S. P., of Maine.—Box is the wood principally used in wood engraving. The logs are sawed in pieces just the length of type, about nine-tenths of an inch. One of the surfaces is made very smooth and covered with a very thin white paste. Upon this surface the picture is drawn with a pencil, and then the engraver cuts out the parts that are to be left white. The block is set in the form with the types and the raised surfaces receive the ink from the roller as it is passed over the form.

B. F. N., of N. Y.—The battle of Marengo was the one at which a portion of the French army fled in such confusion. It was with great difficulty that Napoleon rallied the fugitives behind the division of Lannes.

M. A. W., of N. J.—Good black paint, containing some fine emery, makes a most excellent composition for blackboards used in school rooms. The paint should be put on in three successive coats, each allowed to dry perfectly. The silicate of potash (soluble glass) mixed with the oxyd of zinc makes a good composition for white writing boards for school rooms. It is not so easily put on the wall, however, as the paint. Be careful and use very fine emery, and if you put a coat of varnish on the top of the paint, you must mix some emery with it also.

W. S. K., of Penn.—A battery of small guns forming a stack or organ gun, is one of the oldest forms of a war engine. A few years since Sir John Shaw revived this invention in England, using rifled guns for the old smooth bores. It caused some talk at the time, but it has since fallen into deserved silence owing to defects in its principle of construction.

H. S., of N. Y.—The experiments made with the Armstrong gun at Shoeburyness, Eng., by which iron bars, eight and ten inches thick, placed as a target, were broken, should not be taken as proof against good plates of the same thickness being as easily broken. It has now been ascertained that the bars were imperfectly secured, therefore the experiments were valueless as a guide respecting the resistance against shot of good plates well secured in a ship.

T. Van D., of N. J.—The sample of ore which you have sent to us contains traces of copper, but it will require a quantitive analysis to determine whether or not it would pay to smelt it.

N. M. L., of C. W.—We hope you will use all your influence to obtain a reform in the Canadian Patent Laws, so as to permit the citizens of the United States to obtain Canadian patents. A great number of new and useful improvements for the benefit of Canada would soon be introduced if protection were given to our citizens.

J. T., of Mass.—We advise you to get a tubular boiler of the first quality for your engine. A cheap boiler is generally n expensive and dangerous man-trap and fuel-consumer.

H. B., of Vt.—In casting your bullets always heat the mold before you commence to pour in the lead, or else the bullets will have a very uneven surface. The best formed bullets are struck out of solid lead, in dies, by machinery. Every bullet cast in a mold should be afterwards subjected to a few blows from a hammer in a swedge.

G. P. C., of N. Y.—Cotton requires to be prepared with a mordant for dyeing analine colors, but not silk. The common mordant used is nitrate of lead and corrosive sublimate in solution.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

Invariable Rule.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Patent Claims.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

Binding.—We are prepared to bind volumes, in handsome covers, with illuminated sides, and to furnish covers for other binders. Price for binding, 50 cents. Price for covers, by mail, 50 cents; by express or delivered at the office, 40 cents.

Back Numbers and Volumes of the Scientific American.—Volumes I., II. and III. (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1.50 per volume. by mail, $2—which includes postage. Price in sheets, $1. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding.

New Pamphlets in German.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application to this office. Address MUNN & CO.,
No. 37 Park-row, New York.

INSTRUCTIONS ABOUT EUROPEAN PATENTS, With a Synopsis of the Patent Laws of the Various Countries.

AMERICAN INVENTORS SHOULD BEAR IN MIND that, as a general rule, any invention which is valuable to the patentee in this ountry is worth equally as much in England and some other foreign countries. Four patents—American, English, French and Belgian—will secure an inventor exclusive monopoly to his discov ery among 100,000,000 of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The majority of all patents taken out by Americans in foreign countries are obtained through the Scientific American Patent Agency. We have established agencies at all the principal European seats of government, and obtain patents in Great Britain, France, Belgium, Prussia, Austria, Spain, &c., with promptness and dispatch.

It is generally much better to apply for foreign patents simultaneously with the application here; or, if this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any one who first makes the application, and in this way many inventors are deprived of valid patents for their own inventions.

Many valuable inventions are yearly introduced into Europe from the United State, by parties ever on the alert to pick up whatever they can lay their hands upon which may seem useful.

Models are not required in any European country, but the utmost care and experience is necessary in the preparation of each case.

GREAT BRITAIN.

Patents for inventions under the new law, as amended by the act of Oct. 1, 1852, and now in operation, include the United Kingdom of Great Britain and Ireland in one grant, which confers the exclusive right to make, use, exercise or vend. This is conceded to the inventor, or the introducer, for a period of fourteen years, subject, after the patent is granted, and the first expenses paid, to a government tax twice during its existence—once within three years, and once again within seven. The purchaser of a patent would assume the payment of these taxes.

There is no provision in the English law requiring that a patented invention shall be introduced into public use within any specified limit. Under the Patent Act of October, 1852, the British government relinquished its right to grant patents for any of its colonies, each colony being permitted to regulate its own patent system. If a patent has been previously taken out in a foreign country, the British patent will expire with it.

FRANCE.

Patents in France are granted for a term of fifteen years, unless the invention has been previously secured by patent in some other country; in such case, it must take date with and expire with the previous patent. After the patent is issued, the French government requires the payment of a small tax each year so long as the patent is kept alive, and two years' time is given to put the invention patented into practice.

It should be borne in mind that, although the French law does not require that the applicant should make oath to his papers, yet if a patent should be obtained by any other person than the inventor, upon proof being adduced to this effect before the proper tribunal, the patent would be declared illegal.

BELGIUM.

Patents in Belgium are granted for twenty years, or if previously patented in another country, they expire with the date thereof. The working of the invention must take place within one year from date of patent; but an extension for an additional year may be obtained on application to the proper authorities. Inventors are only legally entitled to take out patents.

THE NETHERLANDS.

Patents are granted by the Royal Institute of the Netherlands to natives or foreigners represented by a resident subject, which extend to a period of about two years, within which time the invention must be brought into use, and upon payment of an additional tax, a patent will be granted to complete its whole term of fifteen years. Unless these conditions are complied with, the patent ceases.

PRUSSIA.

Applications for patents in Prussia are examined by the Royal Polytechnic Commission, and unless there is novelty in the invention, the applicant's petition will be denied; and if it is granted, the invention must be worked within six months afterward. A respite, however, of six additional months may be obtained, if good and sufficient reasons for it can be shown.

AUSTRIA.

Austrian patents are granted for a term of fifteen years, upon the payment of 1,000 florins, or about $500 in American currency. This sum, however, is not all required to be paid in advance. It is usual to pay the tax for the first five years upon the deposit of the papers, and the patent must be worked within its first year. The Emperor can extend the patent and privilege of working by special grant. In order to obtain a patent in Austria, an authenticated copy of the original Letters Patent must be produced.

SPAIN.

The duration of a Spanish patent of importation is five years, and can be prolonged to ten years; and the invention is to be worked within one year and one day.

To obtain a Cuban patent requires a special application and an extra charge.

RUSSIA.

Since the close of the Crimean war, considerable attention has been given to Russian patents by Americans. Russia is a country rich in mineral and agricultural products, and there seems to be a field open for certain kinds of improvements. The present Emperor is very liberally disposed toward inventors, and as an evidence of the interest which he takes in the progress of mechanic arts, we may state that we have had visits from two distinguished Russian *savans*, specially sent out by the Emperor to examine Amdrican inventions. As Russian patents are expensive, and somewhat difficult to obtain, we do not take it upon ourselves to advise applications; inventors must judge for themselves; and this remark applies not only to Russia, but also to all other foreign countries.

CANADA.

Patents of invention are granted only to actual residents of Canada and British subjects. Under the general Patent Law of Canada, an American cannot procure a patent for his invention there. The only way in which he can do so is by virtue of a special act of Parliament, which is very difficult, uncertain, and expensive to obtain. Several zealous friends of reform in Canada are working earnestly to bring about a reciprocal law, but their efforts have thus far proved fruitless.

BRITISH INDIA.

The date of the law, Feb. 28, 856; duration of a patent, fourteen years. Invention must be worked within two years from date of petition. Privilege granted only to the original inventor or his authorized agent in India.

SAXONY.

Duration of patent, from five to ten years. Invention must be worked within one year from date of grant. Careful examination made before granting a patent.

HANOVER.

Duration of patent, ten years; and in case of foreign patent having been previously obtained, an authenticated copy of said patent must be produced. Invention must be worked within six months from date of grant.

SARDINIA.

Duration of patent, from one to fifteen years. Patents for five years or less must be worked within one year, and all others within two years.

NORWAY AND SWEDEN.

Duration of patent, three years, at least; fifteen at most, according to the nature and importance of the invention. Patents for foreign inventions not to exceed the term granted abroad, and to be worked within one, two or four years.

AUSTRALIA.

Date of law, March 31, 1854. Careful examination made by competent persons previous to issue of patent, which, when granted, extends to fourteen years. Imported inventions are valid according to duration of foreign patent. It would require from twelve to eighteen months to procure a patent from the Australian government.

Parties holding foreign patents secured through our agency will be notified from time to time of the condition of their cases.

GENERAL REMARKS.

While it is true of most of the European countries herein specified, that the system of examination is not so rigid as that practised in this country, yet it is vastly important that inventors should have their papers prepared only by the most competent solicitors, in order that they may stand the test of a searching legal examination; as it is a common practice when a patentee finds a purchaser for his invention for the latter to cause such examination to be made before he will accept the title.

It is also very unsafe to entrust a useful invention to any other than a solicitor of known integrity and ability. Inventors should beware of speculators, whether in the guise of patent agents or patent brokers, as they cannot ordinarily be trusted with valuable inventions.

Messrs. MUNN & CO. have been established *fifteen years* as American and Foreign Patent Attorneys and publishers of the Scientific American, and during this time they have been entrusted with some of the most important inventions of the age; and it is a matter of pardonable pride in them to state that not a single case can be adduced in which they have ever betrayed the important trust committed to their care. Their agents in London, Paris, and other Continental cities, are among the oldest and most reliable Patent Solicitors in Europe, and they will have no connection with any other.

Caution.—It has become a somewhat common practice for agents located in England to send out circulars soliciting the patronage of American inventors. We caution the latter against heeding such applications, or they may otherwise fall into the hands of irresponsible parties, and thus be defrauded of their rights. It is much safer for inventors to entrust their cases to the care of a competent, reliable agent at home.

Fees.—The fees required by us for the preparation of foreign applications are not the same in every case; as, in some instances, when the inventions are of a complicated character, we are obliged to charge a higher fee. Applicants can always depend, however, upon our best terms, and can learn all particulars upon application, either in person or by letter.

Parties desiring to procure patents in Europe can correspond with the undersigned, and obtain all the necessary advice and information respecting the expenses of obtaining foreign patents.

All letters should be addressed o Messrs. MUNN & CO., No. 37 Park-row, New York.

CHANGE IN THE PATENT LAWS.

NEW ARRANGEMENTS---PATENTS GRANTED FOR SEVENTEEN YEARS.

The new Patent Laws, recently enacted by Congress, are now in full force, and promise to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from **$30** down to **$15**. Other changes the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, except in reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees, at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering estimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

Testimonials.

The annexed letters, from the last three Commissioner of Patents, we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co. :—I take pleasure in stating that, while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been fully deserved, as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & Co. :—It affords me much pleasure to bear testimony to the able and efficient manner in which you have discharged your duties of Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.

MESSRS. MUNN & Co. :—Gentleman: It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent, c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. Over 1,500 of these examinations were made last year through this Office, and as a measure of prudence and economy, we usually advise Inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park-row, New York.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row New York.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition is composed, for the Patent Office. These should be securely packed, the Inventor's name marked on them, and sent, with the government fee, by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but if not convenient to do so, there is but ttle risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN CO. No. 37 Park-row, New York.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of their case, inclosing the official letters, &c.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Interferences.

We offer our services to examine witnesses in cases of interference, o prepare arguments, and appear before the Commissioner of Patents or in the United States Court, as counsel in conducting interferences or appeals.

For further information, send for a copy of "*Hints to Inventors.*" Furnished free. Address MUNN & CO., No. 37 Park-row, New York.

The Validity of Patents.

Persons who are about purchasing Patent property, or Patentees who are about erecting extensive works for manufacturing under their Patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing Patent, before making large investments. Written opinions on the validity of Patents, after careful examination into the facts, can be had for a reasonable remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited For rther particulars, address MUNN & CO., No. 37 Park-row, New York .

Extension of Patents.

Valuable Patents are annually expiring which might be extended and bring fortunes to the households of many a poor Inventor or his family. We have had much experience in procuring the extension of Patents; and, as an evidence of our success in this department, we would state that, in all our immense practice, we have lost but *two* cases, and these were unsuccessful from causes entirely beyond our control.

It is important that extension cases should be managed by attorneys of the utmost skill to insure success. All documents connected with extensions require to be carefully drawn up, as any discrepancy or untruth exhibited in the papers is very liable to defeat the application.

Of all business connected with Patents, it is most important that extensions should be intrusted only to those who have had long experience, and understand the kind of evidence to be furnished the Patent Office, and the manner of presenting it. The heirs of a deceased Patentee may apply for an extension. Parties should arrange for an application for an extension at least six months before the expiration of the Patent.

For further information as to terms and mode of procedure in obtaining an extension, address MUNN & CO., No. 37 Park-row, New York.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

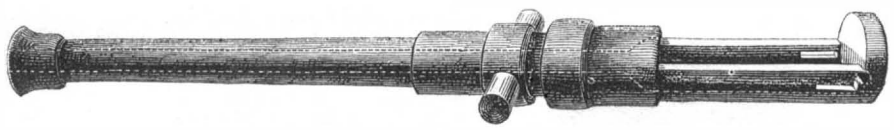
It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

OLD CHINESE WROUGHT-IRON BREECH-LOADING CANNON.

At the establishment of Messrs. McKee & Judson, iron dealers, 457 and 459 Water street, in this city, there is a large quantity of old iron which came from China as ballast in the clipper ship *Flying Scud*, and among it are a large number of old Chinese wrought-iron cannon, several of which are breech-loading. The *Flying Scud* was employed by the British government as a transport during the Chinese war, and was furnished with this quantity of old iron as ballast, and when she came home an arrangement was made for it to remain in her hold, hence its appearance in our port.

All of these wrought-iron cannon are curiosities, but the greatest interest attaches to those which load at the breech. In the first place, they are of great age. Experienced persons on seeing them pronounce them without hesitation one hundred years old, judging from the rust upon their surfaces. Distrusting the accuracy of this criterion, it is still impossible to look at them without being convinced that many years



have passed sinced they were forged. They are of very peculiar fashion, and we give an illustration of one of them from an accurate drawing made for the purpose by our artist.

They are all of nearly the same size, and the dimensions of the one represented are as follows :—Length, 5 feet ; diameter at breech, 7 inches ; diameter at muzzle, 5 inches ; diameter of bore, 2¼ inches.

The bore at the breech is widened by successive cylindrical enlargements, as represented in the dotted lines, and in the rear of this the external shell of the cannon is continued for a length of fourteen inches in the form of a hollow trough open on the upper side. Through each of the sides of this trough is a slot, doubtless intended for a key to hold the breech piece in place. The breech pieces are missing, and whether they were chambered in front to receive the charge, or whether the latter was placed in the bore of the gun, it is impossible to determine.

It is well known that breech-loading cannon were tried in Europe soon after the introduction of the use of gunpowder. Still, this proof of their having been employed by the Chinese so long ago will attract attention at this time.

The muzzle-loading wrought-iron cannon that came out in the *Flying Scud* are considerably larger than those which load at the breech. and the ability of the Chinese to forge these large masses with their little hammers has excited considerable surprise among our mechanics.

It is said to be a universal rule, that in the infancy of the arts great skill is displayed in the use of poor tools, and that as civilization advances better tools are devised, requiring shorter training in those who employ them.

The New Gun-Boat Contracts.

The *Commercial Bulletin* (Boston) directs the attention of the public to efforts that have been made for influencing government to modify the original gun-boat contracts, in order that some of those to whom they have been awarded may fleece the government. It says :—" We suggest that on no consideration should the original contract be modified without stating in writing the amount for each change. If the Navy Department or its agents once encroach upon the contract, and then leave the rest open, every gun-boat built by a speculator will cost probably three times the amount of the original sum specified in the bid. It is a well-known fact that every vessel built for the government in New England navy yards, has cost fifty per cent less than those which have been built in Virginia."

There appears to be a perfect stagnation in scientific discovery ; learned bodies are exclusively occupied in the discussion of trite subjects, among which spontaneous generation, coloring matters from coal tar, the composition of steel, and the composition of comets, attract the most attention.

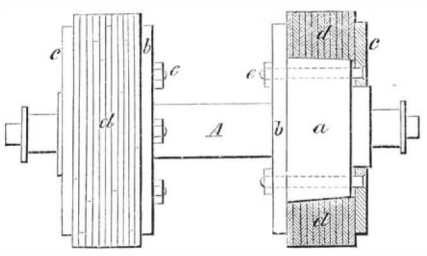
Poisonous Cosmetics.

At a recent sitting of the Paris Academy of Medicine, Dr. Réveil read a paper on the necessity of preventing perfumers from selling poisonous or dangerous articles which should be exclusively left to the responsibility of regular chemists, and not sold without a physician's prescription. "To show the danger there is in allowing the unchecked sale of certain compounds," he said : "I need but state that arsenic, the acid nitrate of mercury, tartar emetic, cantharides, colchicum, and potassa caustica form part of their ingredients. The kind of soap called lettuce soap, which is sold with the announcement that it has been acknowledged by the Academy, does not contain the slightest trace of lettuce. This and other soaps are all colored green by the sesqui-oxyd of chromium, or of a rose color by the bisulphuret of mercury known as vermilion. Some which are cheaper contain 30 per cent of insoluble matter, such as lime or plaster, while others contain animal nitrogenous matter, which having escaped the process of saponification, emits a bad smell when its solution is left exposed to the air. The various toilet vinegars are so far noxious that, being applied to the skin still impregnated with soap and water, they give rise to a decomposition, in consequence of which the fatty acids of soaps, being insoluble in water, are not removed by washing, become rancid and cause a chronic inflammation of the skin. The preparations employed for hair dye under the pompous names of ' African Water,' ' Florida Water,' &c., all contain nitrate of silver, sulphur, oxyd and acetate of lead, sulphate of copper, and other noxious substances. All cosmetics for removing hairs or freckles are dangerous ; the *lait antéphélique*, for instance, contains corrosive sublimate and oxyd of lead. Were a chemist in France to deliver such a remedy to a customer without a regular prescription, he would be liable to a fine of 6,000 francs."

FAIRBAIRN'S IMPROVEMENT IN ROLLERS FOR PREPARING FLAX.

We find the following description of this invention in *Newton's London Journal of Arts and Sciences :*

This invention relates to a novel mode of covering with the leather drawing and pressing rollers of machinery for preparing hemp and flax ; the object being to render such



rollers better able than heretofore to withstand the cutting action of the fibers. The covered rollers of preparing machines have hitherto been generally made by stretching leather around the periphery of iron or wooden rollers, so that the face of the covering leather was presented to the hemp or flax fibers. Instead of thus disposing the leather, it is now proposed to apply the leather to the rollers so that the acting surface will present the cross-grain of the leather to the staple under operation. This arrangement will also permit of considerable wear taking place in the covering leather before the roller will be required to be recovered. The leather used for covering the rollers is stamped out with a suitable cutting tool from stout hides, in the form of rings or segments of circles, according to the diameter of the roller to be covered, and these rings or segments are strung on or placed around the periphery of the flanged roller in a sufficient number of layers to produce, by their combination, a breadth of covering equal to the length of the roller required to be made.

The figure represents a pair of the improved drawing rollers mounted on a spindle, A, one of the rollers being shown partly in section, the better to explain its construction. The roller consists of a metal core, *a*, made slightly conical, and formed with a flange, *b*, at its base. Projecting from the core is a boss to receive an annular plate, *c*, which, when applied, forms the second flange of the roller. The leather rings are cut to fit the core, *a*, and they are slipped on as shown at *d*, so as to cover the whole surface of the core. The annular plate, *c*, is then applied, and, by means of clamping screws, *e e*, which are passed through the plate, *c*, and core and flange, *a b*, the plate, *c*, is caused to bind the layers of leather firmly together, the same being thus griped securely between the flanges of the roller.

The roller, thus constructed, is finished by turning down the leather covering in a lathe, to produce a smooth surface. By this means, it will be readily understood that any desired thickness of leather covering can be obtained, and that great facility is afforded for applying the leather to the rollers.

The patentee claims " constructing, covered rollers in the manner and for the purpose above described."

Productiveness of Fowls.—Experiments to ascertain the comparative productiveness of the different breeds of poultry, have been made this spring in the Zoological Gardens of the Bois de Boulogne. The number of eggs laid by the fowls in that establishment has been immense. It appears that the Asiatic breeds of Nankin and Brahmapootra are the best layers ; the French *Crévecœurs* come next ; the Houdans third ; the La Fleche fourth ; and after them the Dorkings and a Dutch breed. The Nankins and Brahmapootras are also remarkably precocious ; and, according to some breeders, they begin laying in February, and keep on almost to the end of the year.

FROM THE STEAM PRESS OF JOHN A. GRAY.