

tion the drum and pistons are desired to rotate; the inner orifices of these parts are elongated, see *a a*, extending from the piece, *C*, to a line drawn diametrically through the axis of the drum, *D*, as shown in Fig. 3, admitting steam or water on both sides of the pistons after they have passed the packing piece, *C*, on the induction side, until they pass the upper ends of the ports, and *vice versa* on the eduction side. Thus the pistons are only operative during that half of their revolution in which they present the greatest surface between the drum, *D*, and the cylinder, *A*. The drum, *D*, is set into the inner periphery of the cylinder sufficiently to give it a bearing across the greatest width of the opening made for packing piece, *C*, so that the guides, *F F F*, and pistons, *G H G H*, rotating concentric to the inner periphery of cylinder, *A*, pass the packing piece, without danger of its obstructing them, the packing, *g g*, is prevented from springing out of place by its bearings at both ends upon the outer periphery of the recesses, *l l*.

Patents for this invention have been procured through the Scientific American Patent Agency in the United States, England, France and Belgium; the American patent bearing date October 16, 1860. Further information in relation to it may be obtained by addressing the inventors, Kenyon and Theodore Cox, at No. 22 William street, New York.

NOTES ON MILITARY AND NAVAL AFFAIRS.

BATTLE AT PITTSBURG LANDING—ANOTHER IMPORTANT RAILROAD MOVEMENT.

No official report of this awful battle has yet appeared, but enough is known respecting it to justify the conclusion that it was by far the most terrific engagement ever fought on this continent, and perhaps one of the greatest of modern times. The Federal forces under Gen. Grant amounted to about 35,000 men, while those of the enemy are estimated at from 75,000 to 100,000 under command of Generals Albert S. Johnston, Beauregard, Bragg, Polk and others, the very best officers in the Confederate army. The forces of these several generals were all combined for the purpose of making a desperate attack upon our comparatively small force with the hope of destroying Gen. Grant's army before Gen. Buell's reinforcements could reach the scene of action. Our forces were thus surprised on Sunday morning by overwhelming forces of the enemy, who succeeded in capturing a portion of Gen. Prentiss's brigade, including the General himself.

The engagement raged with unabated fury all that day, the Confederates steadily pushing back our forces, but meeting with an occasional repulse, until it seemed at nightfall that the whole Federal force would either be captured or utterly routed. The fight, as described by an eye witness, was most terrible. It seemed at times as though legions of demons had been let loose to fight and kill and to drink each other's blood. The fortunes of war were decidedly against our forces up to 4 o'clock on Sunday afternoon. The enemy had driven our forces back some distance from their encampments, and had captured several of our guns, and the day seemed to be nearly lost. At the critical moment the advance guard of Gen. Buell's army appeared on the eastern bank of the Tennessee, and during that eventful night crossed, and our forces prepared to engage the enemy early in the morning. During all this time two wooden gunboats were firing upon the enemy near the river's bank, and did valuable service, breaking his line and compelling a change of attack on the following morning.

The battle was renewed early on Monday morning, under the immediate command of Gen. Buell. His various divisions, under Generals Nelson, Crittenden, McCook, McClernand, Wallace and others, steadily drove back the enemy after a severe and bloody engagement. Our camps and lost guns were recaptured, and some rebel artillery taken, and the enemy being defeated, fled back to his entrenchments at Corinth, where he must either fight very soon or flee to some other position.

Major General Halleck is now in command of the army in person, and has signalized his disposition to push forward the attack by sending an expedition to the rear of Corinth, on the Mobile and Ohio Railroad, destroying two bridges—one measuring 121 feet and the other 210 feet span—but without any lives being lost.

The list of killed and wounded at the battle of Pittsburgh is not reported, but must be very great on both sides.

The first impression that strikes the mind seems to be that our advance at Pittsburg was in a bad position to resist the attack of a superior force, and it appears, in spite of the bravery of our generals on the occasion, that they did not show vigilance or skill in their preparation to meet a sudden attack. We do not like to criticise the acts of these brave men, but somehow we think there was a want of care, when we know they were surrounded by spies in the midst of the enemy's country. After all, however, that victory is ours, let us rejoice and give thanks.

IMPORTANT MOVEMENT—ADVANCE INTO ALABAMA.

General Mitchel, in command of the third division of the national forces, has achieved one of the most important successes of the whole campaign. The following dispatch, from Huntsville, Alabama, was received at the War Department on the 12th inst., and explains his operations:—

HEADQUARTERS THIRD DIVISION,

Huntsville, Ala., April 11, 1862.

After a forced march of incredible difficulty, leaving Fayetteville yesterday at 12 o'clock, M., my advanced guard, consisting of Twichin's brigade, Kennett's cavalry and Simonson's battery, entered Huntsville this morning at 6 o'clock. The city was completely taken by surprise, no one having considered the march practicable in the time. We have captured about 200 prisoners, 15 locomotives, a large amount of passenger and box platform cars, the telegraph apparatus and office, and two Southern mails. We have at last succeeded in cutting the great artery of railway communication between the Southern States.

Not content with the mere occupation of the town, Gen. Mitchel set to work at once to make the movement effectual, and the last accounts from him state that he had sent out two expeditions from Huntsville on the cars. One under Col. Sill, of the Thirty-third Ohio, went east to Stevenson, the junction of the Chattanooga with the Memphis and Charleston Railroad, which point they seized, 2,000 of the enemy retreating without firing a shot. Col. Sill captured 5 locomotives and a large amount of rolling stock. The other expedition, under Col. Turchin, of the Nineteenth Illinois, went west, and arrived at Decatur in time to save the railroad bridge, which was in flames. Gen. Mitchel now holds one hundred miles of the Memphis and Charleston Railroad.

In this movement—Gen. Mitchel has accomplished great results, viz., that of breaking up the direct line of railway connection between Virginia and the Southwestern States, thus dividing the two Confederate armies in twain, beside securing a large number of locomotives, rolling stock, supplies, &c., which must severely cripple their future movements. They can ill afford to lose a single item in their catalogue of mechanical appliances. Some of our readers may not be aware that the gallant officer who led on this important movement, is none other than Professor Mitchel, the celebrated astronomer.

SKETCH OF GEN. MITCHEL.

The "New American Encyclopedia" furnishes the following sketch of this distinguished man:—

Ormsby M. Mitchel, born in Union Co., Ky., August 28, 1812. At 12 years of age, with a good knowledge of Latin and Greek and the elements of mathematics, he commenced the world for himself as clerk in a store in Miami, Ohio, and afterward removed to Lebanon, Warren Co., where he had been educated. There he received a cadet's warrant, and earned the money that took him to West Point, which place he reached, with a knapsack on his back and 25 cents in his pocket, in June 1825. On graduating in 1829, he was made acting assistant professor of mathematics, which post he held for two years. From 1832 to 1834 he was counsellor at law in Cincinnati, Ohio, from 1834 to 1844 professor of mathematics, philosophy, and astronomy at Cincinnati college; in 1836 and 1837 chief engineer of the Little Miami railroad; and in 1841 a member of the board of visitors of the military academy. In 1845, at the close of a course of lectures on astronomy in Cincinnati, he proposed the establishment of an observatory at that place; and the proposition having been at once carried out, mainly by his own exertions, he became director of the institution. The ground for the building was given by Nicholas Longworth, Esq. The building is of stone, 80 feet in length and 2½ stories high. The principal instrument is the great refractor equatorially mounted and made by Merz and Mohler of Munich. It cost \$10,000, which Prof. Mitchel obtained by subscriptions, mostly of \$25 each, in Cincinnati. In 1859 he became director of the Dudley observatory at Albany, retaining at the same time his connection with that at Cincinnati. Prof. Mitchel is eminent as a popular lecturer on astronomy, and scarcely less distinguished for his mechanical skill, by the aid of which he has perfected a variety of apparatus of great use to astronomy. One of the most important of his constructions is an apparatus at Albany for recording right ascensions and declinations by electromagnetic aid to within 1-1000 of a second of time, and for the measurement with great accuracy of large differences of declination, such as the ordinary method by micrometer cannot at all reach. Prof. Mitchel has carefully investi-

gated the velocity of the magnetic current. Among his discoveries are the exact period of rotation of Mars, and the companion of Antares or Cor Scorpii. The most popular and characteristic of his published writings is "Planetary and Stellar Worlds," a collection of earlier public lectures. He is the author also of a treatise on algebra, and of a "Popular Astronomy." In July, 1846, he published the first number of the "Sideral Messenger," the first periodical attempted in the United States devoted exclusively to astronomy. About the end of the second year it was abandoned for want of patronage. Prof. Mitchel has devoted much time to the remeasurement of Prof. W. Struve's double stars south of the equator. The work was undertaken at the special request of that astronomer, and has resulted in a number of interesting discoveries.

At the outbreak of the great rebellion Prof. Mitchel promptly offered his services to his country. He was educated at West Point, and in thus early espousing the cause of his government he doubtless felt that he was defending his paternal guardian. He received the commission of a Brigadier General of Volunteers, and has shown in all his operations a wonderful degree of energy and determination. From our personal knowledge of Gen. Mitchel we feel well assured that the grass will not grow under his feet. The President, in appreciation of his valuable services, has promoted him to the rank of Major General.

Huntsville, the scene of Gen. Mitchel's gallant exploit, is a fine town of about 5,000 inhabitants, 116 miles southeast of Nashville. It contains many handsome brick buildings, among which are the Court House, which cost \$45,000, and stone banking house, which cost \$80,000.

MILITARY ENGINEERING—GUNBOAT CANAL.

After Gen. Pope's forces had taken the enemy's works at New Madrid, which lies below Island No. 10, he sent over the river a Corps of Engineers to ascertain whether or not it was practicable to establish batteries opposite the island, with a view to enfilade their works on the Kentucky shore. The corps spent three days in swamps, and reported that the project was impracticable. Some new project must be started to meet the emergency, and to Col. Bissell, of Rochester, N. Y., belongs the credit of supplying it—another evidence of the ready ingenuity of our loyal mechanics and engineers. The project was thoroughly executed and deserves notice. Col. Bissell stated that he could, by hard labor, get steamboats through the bayous, and by that means land our forces nearly opposite New Madrid, and take all the enemy's works in the rear. A correspondent of the Rochester Union, who was in Col. Bissell's regiment of engineers, says, in regard to the project:—"Tools we did not need, for the regiment carries every thing, from the heaviest ropes and screws down to fine steel drills for unspiking guns. Our route was about twelve miles long, of which two miles were through thick timber, and the remaining ten through narrow, crooked bayous grown up full of brush and small trees. We have cut our way right through, the track being fifty feet wide, in which thirty feet are required for the hulls of the boats. The timber is cut four feet below the surface of the water. In one short stretch we cut seventy-five trees thus deep, not one less than two feet through. The machines were rigged from rafts and our lowest flats, and worked each by about twenty men. In the first place three large launches went ahead to cut out and push out of the track the underbrush and driftwood; then three rafts followed, on which were the men, who cut down and cut off the trees; then the saws; then two large barges; then one of the steamboats. Very large lines were provided to run from the capstan of the steamboat and haul out by snatchblocks what the men could not handle. Then followed the rest of the fleet, men being engaged all the time converting the flatboats into floating batteries. From the river to the levee the distance is about 500 feet; here the water was shallow and the route full of stumps; it took one whole day to pass this. Then the cut in the levee. Here the fall was over two feet, and the rush of water was tremendous. The largest boat was dropped through with five lines out ahead. Then a corn field, overflowed from a cut in the levee. Here was something of a channel cut by the swift water, and we got along well nearly a quarter of a mile, to the woods; here was the labor—two straight and long miles to the nearest point in the bayou. This it took eight days to get through. Then Wilson's Bayou, then East Bayou, then St. John's Bayou, which empties into the Mississippi at New Madrid. If you have never seen a Southern swamp you have no idea how thick it is; a New York elm swamp does not begin. It sometimes took twenty

men a whole day to get out a half sunken tree across the bayou. Such a place as that kept us all back, as none of the rafts or flats could get by, and all had to wait. The water, after we got into the wood, was about six feet deep, with a gentle current setting across the peninsula. In the East Bayou the current was tremendous, and the boats had to be checked down with heavy head lines. Here we found some obstructions, caused by drift heaps; but cutting off one or two logs would start all down the current. This is the hardest job I have ever seen undertaken, but Col. Bissell is so far down now as to call it successful, for we are in sight of the fences on 'tother side of Jordan.' "

A simple device was adopted for sawing off the stumps below the surface of the water. After the tree was chopped off above the water, an upright plank was fastened to the stump, and near the upper end of this plank a light frame was attached by a pivot. The sides of this frame consisted of two diverging rods extending down into the water to the depth at which the stump was to be cut. To the lower ends of the rods a saw blade was attached in a horizontal position, and by swinging the frame on its pivot the stump was sawed off. The saw, being limber, sagged sufficiently in the middle to form an arc of the circle described by the oscillation of the frame.

CAPTURE OF ISLAND NO. 10—GREAT SUCCESS.

We announced in our last number the capture of this somewhat famous island. The full extent of success may be summed up about as follows:—Prisoners taken; One major-general, two brigadier-generals, seven colonels, eleven lieutenant colonels, fifty-six captains, sixty-four first lieutenants, eighty-one second lieutenants; regimental officers for twelve regiments, about four hundred each; about four thousand privates, six hundred and fifty mules, twelve hundred horses, five thousand stand of arms, twenty-four field pieces—six and twelve-pounders, over one hundred pieces heavy artillery, four hundred wagons, and spades, axes, shovels, wheelbarrows, harness, tents and baggage without limit, together with some nine steamboats, valued as follows:—

Transport Prince, scuttled.....	\$20,000
Transport Ohio Belle, saved.....	25,000
Transport Red Rover, saved.....	15,000
Steamer Yazoo, sunk on bar, but will be raised..	40,000
Steamer De Soto, saved.....	50,000
Steamer Mars, saved.....	45,000
Steamer Admiral, saved.....	15,000
Steamer Winchester, burned.....	20,000
Steamer Champion, saved.....	5,000
Steamer Kanawha Valley, sunk.....	5,000
John Simmonds, gunboat, sunk.....	20,000
Grampus, gunboat, sunk.....	20,000
Mohawk, gunboat, sunk.....	18,000
Floating Battery, eight guns, saved.....	30,000
Total.....	\$328,000
—Of which there was destroyed.....	143,000

Total saved.....\$185,000
To which may be added wharf boat and stores... 50,000

Making a grand total of property saved afloat \$235,000

The capture of this island is one of the most gallant exploits of the war, and reflects great credit upon Commodore Foote, General Pope and all concerned.

FALL OF FORT PULASKI, GEORGIA.

A few days since we received a letter from a soldier, dated Tybee Island, March 20th. He informed us that the forces of General Sherman were busily engaged night and day in planting heavy mortars and rifled guns within 1,000 yards of Fort Pulaski, and expected to open on that doomed fortification in about two weeks from that date. News comes that this attack was commenced on the 11th inst., and after a terrible bombardment of a few hours the fort was surrendered. Col. Olmsted, the Confederate commander, signalled the day previous to the surrender that our fire was so terrible that no human being could stand on the parapet for a single moment. The Savannah Republican states that seven large breaches were made in the walls by the Federal batteries at King's Landing, and all the barbette guns and three casemated guns, on that side, were dismantled. The balls used were conical, and were propelled with such force that they went clear through the wall at nearly every fire, three of which entered the magazine.

The walls of Fort Pulaski are nine feet thick, and if it shall turn out that the breaches were made through the embrasures which are five feet through, the demonstration will be ample that henceforth fortifications without a sheathing of iron are practically powerless against the terrible impact of modern pro-

jectiles. The following description of this fort was written by Mr. Russell, of the London Times, who visited it soon after its seizure by the Georgia troops, May 1, 1861:—

The fort is an irregular pentagon, with the base line or curtain face inland, and the other faces casemated and bearing on the approaches. The curtain, which is simply crenellated, is covered by a redan surrounded by a deep ditch, inside the parapet of which are granite platforms, ready for the reception of guns. The parapet is thick, and the counterscarps are faced with solid masonry. A drawbridge affords access to the interior of the redan, whence the gate of the fort is approached across a deep and broad moat, which is crossed by another drawbridge. The garrison of the fort is 550 men, and fully that number were in and about the work, their tents being pitched inside the redan or on the terreplein of the parapets. The walls are exceedingly solid and well built of hard gray brick, strong as iron, upward of six feet in thickness, the casemates and bombproofs being lofty, airy and capacious as any I have ever seen, though there is not quite depth enough between the walls at the salient and the gun carriages. The work is intended for 128 guns, of which about one-fourth are mounted on the casemates. They are long 32s with a few 42s and columbiads. The armament will be exceedingly heavy when all the guns are mounted, and they are fast getting the 16-inch columbiads into position en barbette. Every thing which could be required, except mortars, was in abundance—the platforms and gun carriages are solid and well made, the embrasures of the casemates are admirably constructed, and the ventilation of the bomproof carefully provided for. There are three furnaces for heating red-hot shot. It will take some hard blows before Georgia is driven to let go her grip of Fort Pulaski. The channel is very narrow and passes close to the guns of the fort.

The hard blows which Mr. Russell speaks of were struck on the 11th inst. with tremendous power and he "grip" is loosened.

IRON-PLATED WAR SHIP "GALENA."

This vessel, which our readers will find described on page 131, present volume, SCIENTIFIC AMERICAN, is now at the Brooklyn navy yard, receiving her armament. She will carry four 9-inch Dahlgren guns, and two 100-pound Parrott guns. Her rig is what is known in naval circles as that of an hermaphrodite brig, viz., brig rigged forward and schooner rigged aft. Since the fight between the Merrimac and Monitor some very important alterations in the plan of construction have been made, by which her strength and power of resistance will be rendered much greater than was at first deemed practicable. The most important of these alterations are, first, the extension of the heavy iron mail over the bow and stern of the boat, instead of using common plates, according to the original design; and, second, the increase to three and a quarter inches in thickness of the mail on the upper wall or shot-proof covering of the fighting deck which protects the batteries. This covering slopes inward at an angle of about forty-five degrees, and the sheathing was to have been but two inches in thickness. The changes, it is believed, will effectually protect the gunners, and render the vessel absolutely impregnable to ordinary projectiles.

CONTRACTS FOR GUNBOATS.

A board appointed by the Navy Department to examine plans and specifications for boats for the Western waters, consisting of Commodore Joseph Smith, Chief of the Bureau of Docks and Yards; John Lenthal, Chief of the Bureau of Construction; B. F. Isherwood, Engineer-in-Chief; Edward Hart, Naval Constructor, and Daniel B. Martin, Engineer in the United States Navy, have recommended that contracts be made with the following parties:—Tomlinson & Hartupee, Pittsburgh, for two iron vessels; Brown & McCard, St. Louis, three wooden vessels; George C. Bestor, Cairo, one wooden vessel; James B. Eads, St. Louis, two iron vessels. The aggregate cost of the eight vessels will be \$1,229,500. We should judge from this announcement that the Navy Department is not yet satisfied with wooden walls.

SIEGE OF YORKTOWN.

Gen. McClellan is busy on the peninsula in his preparations to reduce the strong works of the enemy at Yorktown. Skirmishing is continually going on between the advance guards, and soon we may expect to receive the most stirring intelligence. The fortifications of the enemy are reported to be much more extensive than at first supposed, and his force very large. We have confidence in the triumph of Gen. McClellan; and but that our iron-clad batteries at Hampton Roads are detained there by the harassing presence of the Merrimac they would be able to lend him efficient aid in his great work. It required a bloody siege of nearly one year on the part of the Allied forces to take the works in and around Sebastopol. Let us have some patience now with the operations of our heroic commander.

INTERESTING MISCELLANEOUS ITEMS.

Extensive preparations are making to attack Fort Macon, near Beaufort, N. C. It is garrisoned by about 600 men, and the commander has neither surrendered nor blown up the fort, as previously reported. He is said to be an impulsive man, and promises his men destruction rather than surrender.

Pass-Christian, in Mississippi, on the Gulf, is now in possession of the Federal forces. This point is about 50 miles east of New Orleans on the way to Mobile.

From New Mexico we have reports which are somewhat unfavorable. It is believed that Santa Fé, the capital, is held by Texan forces, and that a provisional government has been established. Time, however, will cure this raid into New Mexico, and before long matters there will return to their normal condition.

The Secretary of the Navy still claims the confidence of the country, and yet, so far as we know, he still holds on to those mechanics and naval architects upon whom he has hitherto relied, and who have, thus far, in a great measure deceived him in regard to iron-clad vessels. We would like to know the name of that naval constructor who turned his back on Donald McKay and pronounced his iron-plated plans a humbug. We wonder if the Secretary of the Navy still trusts him.

Petitions are being presented to Congress in favor of a ship canal to connect the Mississippi river with Lake Michigan.

The people of the Northwest deem it highly important that the Illinois Canal should be widened to admit the passage of gunboats from the Mississippi to the Northern lakes, (to meet the possible exigency of a war with England.

Another Monster Gun.

One of Rodman's fifteen-inch guns was successfully cast a few days ago at the Fort Pitts Works in Pittsburgh. This is the third casting made of these guns, and the work will soon be regarded as an everyday performance. The process was as follows: The rough casting in the pit weighs about 78,000 pounds, and nearly forty tons of metal were melted for the purpose in three furnaces. The furnaces were fired about five o'clock, and at eight minutes past ten the first furnace was "tapped." A line of troughs or "runners" had been laid from the furthest furnace, some eighty feet, the second furnace, about midway, joining in, and the two streams, emptying, with that from the first furnace, into a large cauldron at the edge of the pit, from which two streams diverged, and, passing around the pit, emptied into the gun on opposite sides of the core barrel. The furnaces were tapped in succession, and nearly all the metal allowed to run out before the next in order was opened. At twenty-four minutes past ten the mold was filled, in just sixteen minutes from the opening of the first furnace, showing that the metal must have poured into it at the rate of nearly two and a half tons per minute.

More Large Guns Ordered.

The Pittsburgh Chronicle says:—"We understand that the Navy Department has ordered the casting of fifty 15-inch Dahlgrens at the Fort-Pitt Works, in this city. The draughts for the moulds, &c., have been prepared by Captain Dahlgren, and it is understood that the guns will be much shorter and thicker than 15-inch Rodman gun. Most of them will be smooth bored, and are designed for use on board the new vessels, of the Monitor style, and others, whose construction has been already directed by Secretary Welles. These guns will weigh, in the rough, over seventy thousand pounds each, and will carry a ball weighing over three hundred pounds. They will doubtless be ready by the time the vessels for which they are intended are completed."

The Madrid Academy of Sciences offers, among other prizes, one for the solution of the following:—To determine the probable errors implicated in topographical plans deduced from two photographic perspective views, taking into account all the sources of error that may possibly exist. The prize will consist of a gold medal, and the sum of 6,000 reals (\$150.) The papers written in Spanish, or in Latin, must be addressed to Don Aguilar y Vela, perpetual Secretary of the Academy of Sciences, Madrid.

Improved Variable Exhaust.

The locomotive steam engine is the result of a long series of discoveries and inventions, commencing in the unknown ages when the expansive force of steam was first observed; but to George Stephenson is awarded the credit of the two important inventions that crowned the series and made the locomotive a practical machine, thus inaugurating the system of railroad locomotion. These inventions were the multitubular boiler which diminished so much the bulk of the machine, and the plan of discharging the exhausted steam into the chimney to increase the draft. Since Stephenson's exhaust was first introduced, many devices have been invented for varying the flow of the steam into the chimney for the purpose of controlling the combustion and regulating the fire. It is conceded by nearly all locomotive engineers who have had any experience in the use of variable exhaust arrangements, that there is a very great saving effected by their proper use; the uniformity of the fire causing an economy of fuel and preventing the destruction of the boiler.

The expansion and contraction of the flue sheet, when cold air has to be admitted by the furnace door, to endure the pressure, is also prevented. The difficulty of getting many of the devices for varying the draft in the furnaces of locomotives to work properly after they have been in use a short time, on account of the sediment or dirt formed by the action of the steam, smoke and ashes, as well as the great difficulty experienced from back pressure, has obstructed their introduction, and has been the cause of their removal in many cases after a short trial.

The accompanying engravings represent a plan of variable exhaust which, after constant use for the past two years, is claimed to have proved itself free from all objections. This arrangement presents a smooth surface and true taper on the inside of the waste-steam pipe, thereby preventing the formation of eddies and avoiding back pressure. There will be no deflection of the steam from the center of the cone if the waste-steam pipes are properly set up. As the waste steam is discharged through one orifice, there is no back pressure created by the changing of the nozzles when working a heavy head of steam. The nozzles can be changed with perfect ease when working full throttle, they are provided with an arrangement which prevents all possibility of their becoming set on their seat. This exhaust gives three sizes of nozzles, the largest being the full size of the waste steam pipe.

The ease with which this exhaust can be applied, as well as its simplicity of parts and cheapness, must recommend it to the consideration of those interested in the operation of railways.

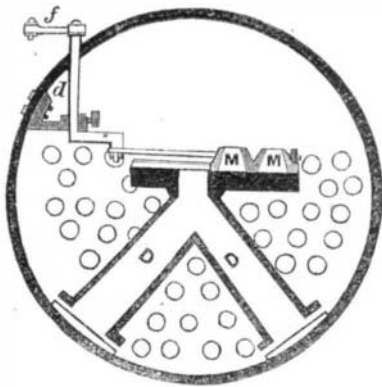
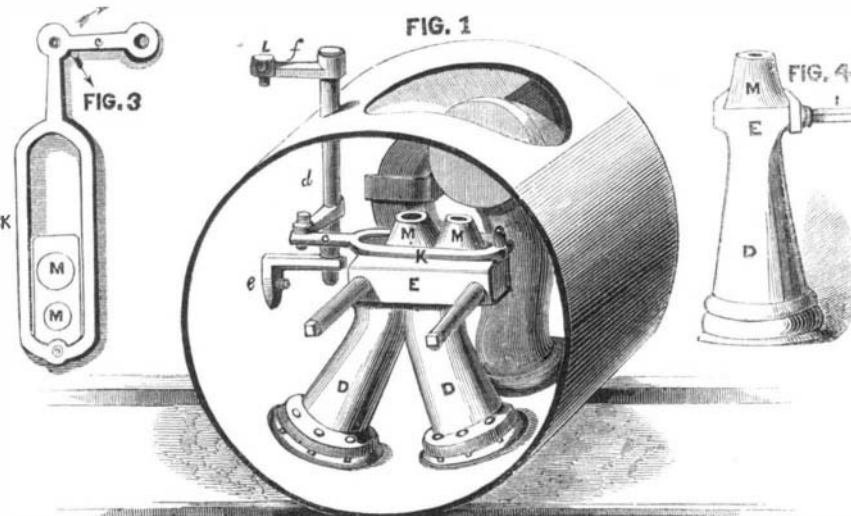


Fig. 1 is a perspective view of the front end of the smoke arch, with the front plate removed, showing the exhaust arrangement in full. Fig. 2 is a cross-sectional elevation of the exhaust pipe, D D, and the nozzles, M M, as well as the arrangement for moving the nozzles. It will be seen by Fig. 2 that the exhaust pipes, D D, both terminate in a single orifice; as the nozzles now stand the steam would be discharged out of an orifice the full size of the exhaust

pipe, but if the first nozzle, M, be drawn over the orifice the blast would be contracted; if the second one is brought over the blast it would be contracted still more, and *vice versa*. Fig. 3 is a plan of the nozzles, M M, and the slotted connection, K, for moving the same. Fig. 4 is a longitudinal elevation of the seat, E, on which the nozzles, M M, slide, being held in their places as seen in Fig. 4; the front lug is detached from the seat, E, but is held in its place by the bolt, I, which, in case the nozzles have any tendency to stick, can be turned outward, allowing the front lug to recede, thereby relieving the nozzles. The bolts, I, extend through the front plate of the smoke arch when found necessary, so that they can be turned from the outside of the arch, which does away with any necessity for opening the smoke-arch door, to loosen the nozzles when they become set; that will not happen but once or twice, and that only when they are first applied.

It will be seen by inspecting the cuts that the upright rocker shaft, d, and attachments are not the

**LATHROP & CO.'S VARIABLE EXHAUST.**

same in Fig. 1 as in Fig. 2; either style of course would do, but the style in Fig. 2 is the cheaper and better.

The patent for this invention was granted Dec. 18, 1860, and any further information in relation to it can be obtained by addressing Geo. W. Lathrop, Weedsport, N. Y.

Criticism on the Turkish Bath.

The London *Lancet* contains the following criticism on the much-lauded Turkish steam bath: 'The application of heat and friction bears no relation to cleanliness; the most perfect cleanliness may be attained by soap and water. The stimulation of the skin to renew its epidermal coat by steaming and rubbing is not a process of cleansing, any more than blistering it, or effecting a similar renewal with tincture of iodine. Nature has been so bountiful and provident as to provide the body with the means of resisting great extremes, whether of heat or cold. The processes of life can only be carried on at a temperature nearly invariable, or varying within very narrow limits. To combat cold climates there is a great power of producing heat internally in the body; and to combat high climates the body is provided with an evaporating apparatus—the skin. That profuse perspiration which some gentlemen regard with such triumph, is the protest of nature against their hot chambers. It should be their humiliation. If they could carry out their theories, and act upon the body by heat as they would upon meat, they would indeed produce an alteration of temperature in the tissues which would effect a cure of all diseases—a dead cure; their patient would be *mort guéri*. But, fortunately for themselves, they cannot prevent the compensating balance which nature has placed there to oppose great alterations in the temperature of the body. They cannot remove it; but they may overstrain and crack it. The palpitating heart, the rapidly expanding lungs, may yield beneath the strain, and blood may flow, fainting may follow, or death result. This is what medical practitioners know, and would feel themselves culpable if they lost sight of. Nothing seems more unlikely and undesirable than that the Turkish bath should ever become the

habit of a large portion of our population. It could serve no good purpose for healthy men, and would injure very many unhealthy men.

Cultivation of the Sweet Potato.

The following extracts are from the *Ohio Valley Farmer*, by M. M. Murray:—

Select rolling ground, mellow and warm. Dry but not too barren knolls, well manured, are good. New land, if dry, produce bountiful crops of fine quality. Manuring in the hill or ridge is best where the land is not in first-rate tilth. Plow a shallow furrow, put the manure in and throw up a ridge over it. The soil, in all cases, must be finely pulverized. Throw two heavy furrows together, forming high ridges. Three and a half feet apart, from center to center, is the proper distance. On a small scale in gardens the ridges may be made with a hoe. Mechanics in country villages should cultivate a patch of sweet potatoes. Never work the soil when it is very wet. Keep the roots moist and the tops shaded until planted.

If you have not many to plant, choose the afternoon or evening for planting. The best instrument for planting with, is a mason's trowel. Thrust it lengthwise of the ridge in the center (not across it), a little obliquely, so that in bringing it out and to you it will form a cavity admitting the plant with roots well spread. Withdraw the trowel with one hand, at the same instant you thrust the plant in with the other and let the dirt fall back to its place. Press it compactly at the roots. Severe pressure is indispensable to success. Plant an inch or more deeper than they stood in the bed, so that the stems of the lower leaves may be covered, as then they will

sprout again, if cut off by frost or worms. In ridges plant fifteen inches apart. Plant from the 15th of May until the middle of June, or as early as safe from frost. In southern Ohio, Indiana and Illinois, and throughout Kentucky, they may be planted as early as the first of May, many seasons. An early start is important, but it is best to be on the safe side of the frost.

About ten days after planting, commence stirring the ground to prevent the growth of weeds. Hoe often enough to keep the weeds down. Be careful not to strike with sharp hoes so near the plant as to cut off the young potatoes. When the vines commence running, place a common adjustable cultivator between the ridges, tearing down the sides somewhat, and follow with a shovel plow to replace it. Do not cover the seeds of vines with soil. Dig for immediate use at any time when they are large enough. Dig the crop when the leaves are first nipped with frost. Cut the vines each side of the ridge with an old scythe. Dig with broad-tined forks, by thrusting down between the plants.

The Cotton Manufacture of England.

In the United Kingdom there were, in 1861, in all, 6,378 factories, which contained 36,450,000 spindles; and 490,866 power looms, which engaged 230,564 hand-loom weavers. The aggregate steam power, according to the average indication, and expressed in horse power, was 375,294; and the water power, measured in the same way, 29,339; together, therefore, equal to 404,633 of horse power. The total number of hands employed was 775,534, whereof 308,273 were males and 467,261 females. This gives an average of one hundred and twenty-one hands to each description of factory. The number of children under thirteen years of age attending school was 54,411—namely, 23,863 boys, and 30,548 girls.

A CHANGE.—Not many weeks ago the secessionists expelled from Nashville the venerable Judge Catron, of the United States Supreme Court, for persisting so firmly in his loyalty to the National Government. He is now about to return to that city to try for treason the individuals who maltreated him.