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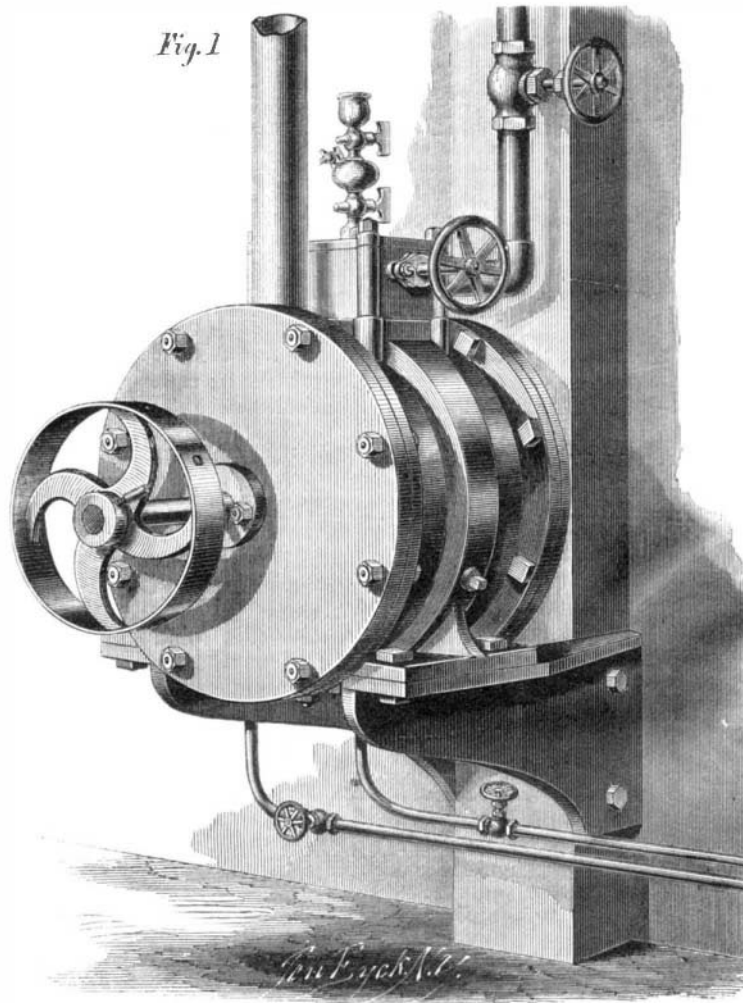
NEW SERIES.

Improved Rotary Engine.

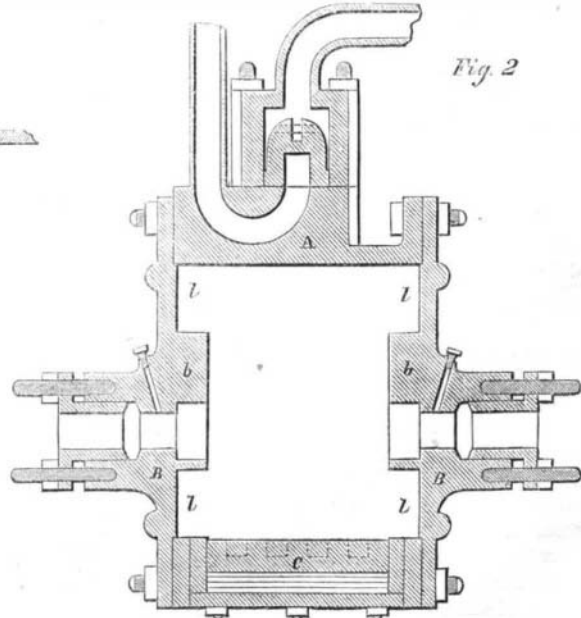
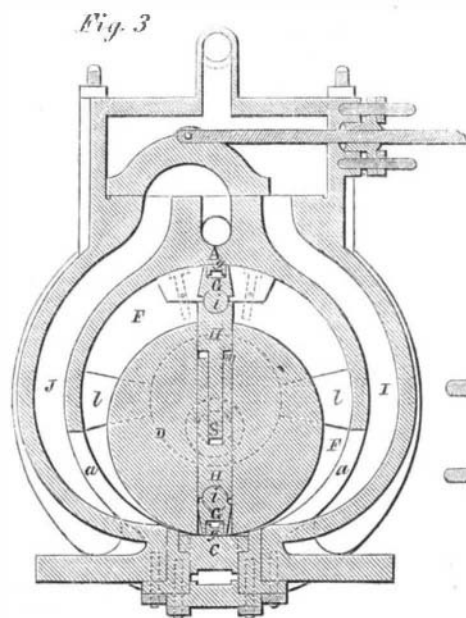
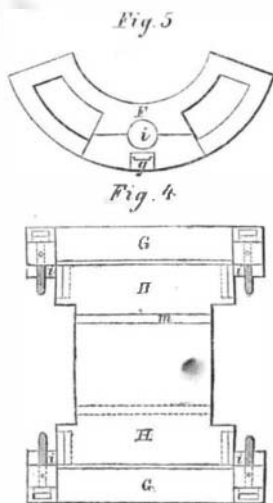
It is manifest that a rotary steam engine possesses, in theory, important advantages over an engine with a reciprocating piston. By a rotary motion a much greater velocity may be obtained, and hence far greater power may be derived from a machine of given weight. The motion is more regular, and the strain upon the parts is less; requiring less weight in the bolts and braces by which the engine is secured. These advantages have long been perceived, and a vast amount of study has been devoted to the task of overcoming the obstacles in the way of making a rotary engine work with economy and success. It is surprising that the principal one of these obstacles is simply mechanical; being nothing more than the difficulty of packing, then revolving drum. There is no difficulty in packing the end of the drum, and none in packing the side, but where the two packings meet at the corner the parts soon wear so as to leak. Mr. Fairbairn declared some years since that he believed this difficulty would never be overcome.

The accompanying engravings illustrate a rotary engine, which is believed to be free from all material objections, and to be practically successful in every respect.

Fig. 1 is a perspective view of the engine, the drawings being made from an engine that has



heads, B B, eccentric to the cylinder, so that the outer periphery of the rotating drum may work in contact with the packing piece, C. *b b* are circular bosses on the inner surfaces of the cylinder heads, B B, concentric with the cylinder, A. The rotating drum, D, fits snugly between the faces of these bosses, and has its ends packed, as shown in Fig. 3. F F F F are arc-formed guide plates, fitting in the recesses, *l l*, between the bosses, *b b*, and the inner periphery of the cylinder, A, and are as nearly semicircular as the eccentric motion will allow, so that their ends may meet as they pass the center of the packing piece, C. To the centers of the opposite guides are attached the pistons, G H G H, as seen in the Figs. 3 and 4, each composed of two pieces, G and H. The portions, G, have their outer faces fitted to the inner periphery of the cylinder, A, with packing, *g g*, and permanently fastened to the said guides; thus they are kept in constant contact with the inner periphery of the cylinder, A. The portions, H H, are fitted to slide in the radial groove, *m*, in drum, D, with their edges packed, as seen in Fig. 4, and are connected to the guides by means of the bolts, *i i*, fastened upon their outer ends, and fitted to the concave recesses in the inner sides of the portions, G G, as shown in Figs. 3 and 4, thus allowing the



KENYON AND THEODORE COX'S ROTARY ENGINE.

been in operation a year in the basement of the *World* newspaper office. Fig. 2 is a longitudinal section. Fig. 3 is a crosssection, and Fig. 4 is a longitudinal section of the revolving drum and its at-
 tachments. Similar letters refer to the same parts in all the figures.
 A is the cylinder, D the rotating drum, secured to the shaft, S, which works in bearings in the cylinder.
 parts, H H, to be radial to the drum, D, and the parts, G G, radial to the cylinder, A, throughout their entire revolution. I and J are induction and eduction parts, according to the direc-

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 boxplatform 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 "Sidereal 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