Scientific American.

A WEEKLY JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES

VOL. VI.---NO. 18. NEW YORK, MAY 3, 1862. NEW SERIES.

Improved Turbine Wheel.

The word turbine is from the Latin *turbo*, a top, and it was applied by Morin to a certain class of water wheels. He defines the term as meaning " wheels with vertical axes capable of moving when immersed in the water of the lower level." About twenty-five years ago these wheels began to come into use in this country, and they are now the most popular for general manufacturing purposes of any wheel that is made. The steadily-increasing demand for turbines has led to many improvements in their construction, the most important of which have been illustrated in our columns. The accompanying engravings are designed to illustrate certain modifications in the turbine, invented by Titus H. Russell, of Northfield, Vermont.

Fig. 1 is a vertical section of the wheel with its surrounding case. The water is received from the flume into the vertical cylinder, A, and passes down through the wheel, D ; in its passage turning the wheel, and thus imparting motion to the machinery with which it may be connected. The wheel, D, is framed of a central hub, *f*, outer rim, *g*, and buckets, *h*. Over the wheel is placed a series of stationary chutes, to guide the water in a proper direction into the buckets. The form of the chutes, and that of the buckets, is clearly shown in Fig. 3. The chutes are so shaped that the water enters them in a vertical direction, and is gradually deflected by their curved form, so as to strike the buckets in a direction perpendicular to their sides. The buckets are curved in the opposite direction. The formation of the proper curves in the chutes and buckets, in order that the water may expend its full force upon the wheel, and may then leave it freely without retarding its motion, has been one of the most complicated problems ever presented to mechanicians, and it has received a great deal of attention from some of the most highly-cultivated intellects in the world. In this wheel the sides of the chutes are made parallel at their lower ends, while those of the buckets converge, as represented.

One of the improvements secured by this patent is the arrangement for opening and closing the gate, and supporting it upon the chute case. This is shown in Figs. 1, 2 and 4. The upper surface of the chute case has recesses, *o o o*, Fig. 4, leaving raised rings, *p p*, and radial ridges, *q q*, on which the gate rests. The gate is a ring, L, Figs. 1 and 2, with openings through it of the same size as the upper ends of the chutes, and when the gate is turned so that these openings may register with the chutes, the water will flow into the wheel, but when the gate is so turned that the closed part of the gate is over the chutes the water is cut off from the wheel. The gate is turned by means of the rack, *r*, upon its edge, which meshes into the pinion, *s*, upon the shaft, M′. This shaft rises up through the case, and has a hand wheel upon its upper end. The openings, *t t*, through the gate are enlarged at their upper ends so as to guide the water freely through the gate.

Fig. 1

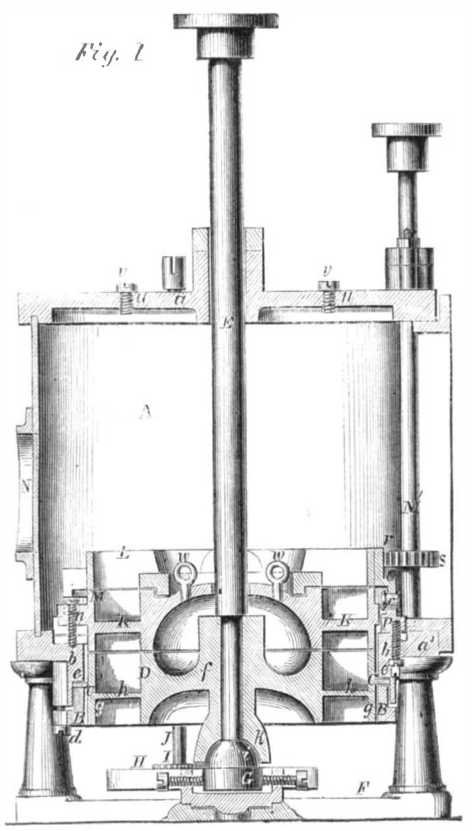


Fig. 2

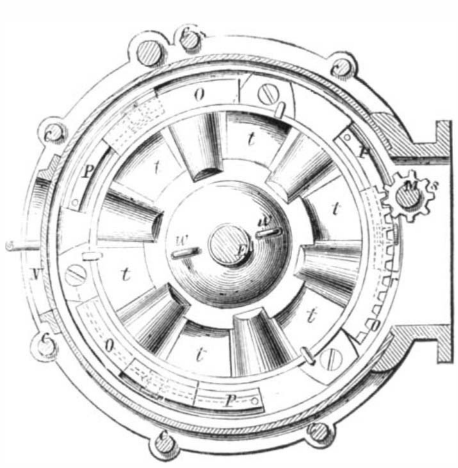
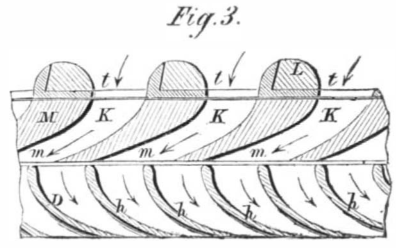


Fig. 3



RUSSELL'S IMPROVEMENT IN TURBINE WHEELS.

Fig. 4

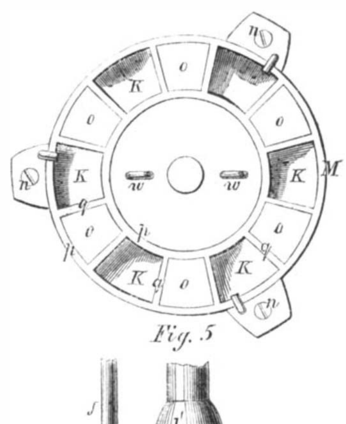


Fig. 5

Another feature in this invention is the device for raising or lowering the wheel whenever this may be required, in order to secure the uniform wear of gearing connected with the wheel, or for any other purpose. This is effected by the peculiar construction of the step on which the shaft of the wheel is supported. This is shown in Figs. 1 and 5. The shaft is made concave at its lower end, and rests upon the hemisphere, *i*. The lower surface of the step, G, is formed in a series of inclined planes, *j j*, which rest upon corresponding planes, *k k*, on the upper surface of the bed, F, below. It will be seen that by turning the step, G, the shaft, and, with it the wheel, may be raised. It is turned by means of a geared segment fastened rigidly to it and meshing into the pinion, I, upon the shaft, J. The shaft rises through the case of the wheel, and has a slit upon its upper end, for the reception of a lever.

A fourth feature in this invention is a mode of packing the wheel, in order to prevent the loss of water by leakage. A flanch, *a′*, Fig. 1, is secured by bolts to the lower edge of the case, A, and has a lip, *b*, projecting downward, as shown. To this flanch a ring, B, is secured by screws, *d*, and the packing, C, of india rubber or other suitable material, is placed between the upper edge of the ring, B, and the shoulder *e*, in the lip, *b*, of the flanch, *a′*.

The gate rests on friction rollers, *c′*, so that it may be turned very easily.

A man hole, F, is made in the case, A, to facilitate the examination of the interior whenever this may be desirable.

In case the wheel should be obstructed by sand or other material the simple raising of the gate in the manner described will probably allow the obstruction to escape.

The patent for this invention was granted through the Scientific American Patent Agency, March, 18, 1862, and further information in relation to it may be obtained by addressing Titus H. Russell, Northfield, Vermont.

We learn from the London *Ironmonger* that Capt. Blakely will exhibit a 500-pounder cannon ; the Mersey Steel Works, a 600-pounder, and C. Krupp, of Eissen, Prussia, a rifled steel 250-pounder, at the Great Exhibition of Industry.

An alloy composed of 600 parts copper, 312 of zinc and 18 of iron, by weight, is said to be very tenacious and capable of being forged.

Oak timber loses about one-fifth of its weight in seasoning, and about one-third of its weight in becoming perfectly dry.

NOTES ON MILITARY AND NAVAL AFFAIRS.

THE SITUATION.

The movements of the army are going forward all along the lines with great activity. Gen. McClellan is in front of Yorktown with a very large force, and is rapidly carrying on all the operations that usually attend a siege. The place is very strongly fortified, and is, no doubt, defended by a large force. The work of reducing it must necessarily go forward slowly and with great caution. Skirmishing is almost constantly going on, and one very severe fight on Warwick Creek has taken place, in which Vermont troops bore a distinguished part. They suffered considerable loss, but behaved gallantly. It is alleged that the Commanding General was drunk at the time, and failed to support the brave men who were engaging the enemy's works at disadvantage. A great and decisive battle seems inevitable at this point, and public expectation in regard to the result is fully awake.

The forces of Gen. McDowell are now occupying Fredricksburg, Va. The advance was made on the place by the brigade under command ot Gen. Augur, who conducted the march from Warrentown, a distance of some twenty miles, with skill and discretion. Skirmishing was kept up all the way, the enemy retreating, and upon reaching Falmouth, opposite Fredricksburg, crossed the Rappahannock and destroyed the splendid railroad bridge, to prevent the Union forces from reaching the city. The city authorities proposed to surrender the place, only with a view to protect private property.

Fredricksburg is a fine city of about 10,000 inhabitants, at the head of tide water on the Rappahannock river, some 65 miles north of Richmond, to which it is connected by railroad. The exports of grain, flour, tobacco, &c., are valued at $5,000,000 annually. Washington's mother died there in 1789.

Gen. Banks is rapidly pushing his forces down the Shenandoah valley, toward Staunton, driving step by step the forces of Gen. Jackson, who was so signally defeated at Winchester. Gen. Banks may soon reach Lynchburg, on the Southwestern Railroad, if he pushes on with his accustomed vigor. Our success now depends very much upon the vigor of our generals in marching their men. If Burnside, Banks and McDowell can steadily push forward their respective columns still further into the interior, Jeff. Davis will soon be effectually shut up in Virginia.

Gen. Fremont is stirring about in his Mountain Department, in pursuit of the enemy who are flying around in guerilla bands. We wish him abundant success in capturing these troublesome fellows.

Gen. Halleck is at work like a beaver reorganizing his army, ready to pounce upon Gen. Toutant Beauregard—and will move upon his works with solid battalions, which we think cannot be resisted successfully. We think it a great misfortune that himself or Gen. Buell had not been on the field a short time previous to the battle of Pittsburg Landing. The fighting of our generals was brave and heroic, but their management it seems to us could not have been worse.

SIEGE OF FORT MACON, N. C.

Considerable progress has been made in the preparations to attack Fort Macon, near Beaufort, N. C. These preparations, however, are attended with great difficulties and labor; all the siege materials have to be carried by steamers fifteen miles to the head of Slocum's Creek, and then hauled one mile to the railroad station at Havelock. At the latter point they are placed on platform and baggage cars, and by the aid of mules are slowly hauled to Carolina City. Here there is a turn-out and short track leading to a wharf on the edge of Bogue Sound, where the guns, mortars and ammunition are received on board of flat boats and conveyed across the sound to Bogue Beach, a distance of one and a half miles. When these heavy guns and other ponderous *materiel* are on board the flats, the labor of transporting them to the desired place of operations has but just commenced. The Sound is so shallow that it can easily be sounded by wading knee-deep for more than half the distance across—a narrow channel, containing only some five or six feet at high water, intervening. Having reached the opposite shore at a point four miles due west of Fort Macon, a wide marsh must be crossed, in which the wheels of artillery carriages sink to the hub; and when this obstacle has been overcome, a continuous line of sandy knolls is reached, extending to the fort. These sand hills are covered by a stunted growth of bush and briar, in which the wheels sink to the axle, and requiring a very great force to move the massive loads. There is a good reason to believe that the force inside of Macon is not adequate to the effective working of the guns, and this is being daily weakened by desertions. It is certain that no important movement will be made until Beaufort is open to the entrance of our ships.

OCCUPATION OF APALACHICOLA, FLORIDA.

On the 3d of April the city of Apalachicola was successfully occupied by our naval forces. This gives us another important point in Florida. The capture was effected by the gunboats *Mercedita* and *Sagamore* with but little opposition. A few shell dispersed the troops who were in arms there; and the non-resistant portion of the population were found in an almost starving condition. The blockade had effectually cut off supplies on the seaboard, and their resources from inland were not sufficient to maintain the ordinary comforts of life. Under these circumstances it is not to be wondered at that the people should proclaim loyalty to the Union and accept the protection of Commander Stellwagen.

GEN. M'CLELLAN AND THE SECRETARY OF WAR.

The Boston *Commercial Bulletin*, in discussing the military operations on the Potomac, says:—"This recent exposé of the plans of certain parties in Washington, has very fully answered the query that has been put by one man to another on 'Change during the past ten or fifteen days, 'Why does not Gen. McClellan do something?' Everything in a business line has been at a stand still, in the anxious expectation of hearing from the great army of the Potomac. There is every reason to believe that if Secretary Stanton had carried out, on his part, the plans arranged between himself and Gen. McClellan, previous to the departure of the latter from Washington, Yorktown and Richmond would have been ours ere this." It is said that Gen. McClellan was opposed to Gen. Banks's army crossing the Potomac. His idea was to clear out the batteries on the river and then move his forces at some point nearest to Richmond and thus assail that city before the army at Manassas could reach it. Instead of this, report says, Mr. Stanton ordered Gen. Banks to cross the river, which set the Confederate army at once in motion toward Richmond. We attach no great reliance to these reports, but it has appeared to us from the start that the new Secretary of War did not intend to say much in favor of McClellan if he could help it. The American people are tolerably acute and can interpret many things without the aid of Delphic Oracles, and they will not feel easy to see civilians undertake to out general their generals in an underhand manner. Gen. McClellan has the lives of his men as well as the cause of the country on his heart, and we think he does not intend needlessly to sacrifice either to suit impatient clamor. Gen. Scott, in a recent speech at Elizabeth, spoke as follows—the language is both impressive and significant:—"There are two men who can be depended upon under all circumstances and in every emergency —I mean Gen. McClellan and Gen. Halleck. There is no doubt they must take things as they meet them, and they have great opposition to contend with; but McClellan is at this moment at the very work his heart loves, and which will call forth all the abilities of his powerful mind—that of trenching, engineering and besieging. And in regard to Gen. Halleck, he will do his work like a soldier. There can be no fear of these two able soldiers doing any base or disloyal act. They are honest to the core, and will never betray their country." It seems to us about time to stop this clamor about our generals.

INTERESTING MISCELLANEOUS ITEMS.

We have received a private letter from a Federal officer who was one of the first to enter Fort Pulaski, after its surrender. He describes the effect of the fire upon the fort as terrific. A breech was made nearly large enough to admit a coach and four, and all about inside and out were seen evidences of destruction. Our correspondent speaks highly of the effect of the James projectile, and expresses his want of confidence in the present system of fortifications. Another correspondent writing from London says the recent "naval contest between the *Monitor* and *Merrimac* has put us all on the tenter hooks." All England is terribly excited over the affair.

Since the beginning of the year we have taken from the enemy the following catalogue of battery and field guns:—

Mill Spring	10	Shipping Point	6
Fort Henry	17	Evansport	7
Roanoke Island	42	Newbern	10
Elizabeth City	5	Fort Marion	5
Bowling Green	49	Winchester	2
Fort Donelson	65	Island No. 10	83
Bird's Point, Mo.	6	By Gen. Pope	124
Columbus	15	Fort Pulaski	47
Fort Clinch	14	On vessels	10
Pea Ridge	13	Miscellaneous	15
New Madrid	17		
Total			583

For some time past a wrought-iron gun carriage of large proportions has been in the process of construction at the Watertown, Mass, Arsenal, to be used in connection with a 500-pound gun, and is to be completed within a short time. The carriage alone will, it is said, weigh tenty-five tuns.

Important Experiments on Iron-Plated Targets in England.

By the steamship *City of New York*, which reached this port on Tuesday, April 22d, we have news of an important experiment at Shoeburyness looking to the establishment of an iron navy for Great Britain. The London *Times* contains an account of the experiment with a gun of large size and great caliber. It says it "showed at every discharge that our best and hitherto-considered invulnerable forms of ironsides were, so to speak, almost as easily penetrated by a shot as if the targets had been of timber." The *Times* adds:— "After all our labor and all our expense, after having made beyond comparison the finest and strongest iron frigates in the world, we now find that opposite a large muzzle-loading gun the best of our ironsides can be as easily riddled and sunk as wooden sailing vessels."

This discovery, recently made, is due to the keen and wholesome rivalry between the War Office and the Admiralty, the former striving to devise irresistible artillery and the latter to build invulnerable ships.

There has been an immense variety of experiments on every conceivable form of target and upon every possible combination of iron and wood, iron and india rubber, iron and wire, iron and hemp and every section of the American *Monitor* has been erected and fired at at Shoeburyness, and proved to be as vulnerable almost as timber, and that no chance may be neglected, a target is being made of railway bars dovetailed and riveted together in the same ingenious manner as the coating of the *Merrimac*, and this also will be tried in a few days, and beyond a doubt with much the same results that attended the *Monitor* target.

During a recent experiment a target, exactly of the same materials and strength as the *Warrior's* broadside, was subjected during the whole of one day and part of a second to a most tremendous fire, but the concentrated volleys flew off a hail of iron splinters. The target grew almost red hot in parts, but no missile passed beyond its iron armor.

The *Warrior*, therefore, and iron ships were justly deemed invulnerable. Sir W. Armstrong has a letter in the *Times* explaining the principle which has rendered the last experiment successful in penetrating and smashing iron plates.

The smooth bore gun has a velocity excelling that of the rifle gun by more than quarter. A smooth-bore gun has been made by Sir W. Armstrong, length fourteen feet, weight twelve tuns, and it was tried against the *Warrior* target in presence of the Duke of Cambridge, the Duke of Somerset, and other high officials of the Admiralty and War Office.

The first shot was 156 pounds, and was fired at a distance of two hundred yards, with a charge of 40 pounds of powder. This solved all doubts; the iron mass was shattered into crumbs of metal and the teak splintered into fibers literally as small as pins.

An increased charge was next tried, and the shot passed not only through the plates, teak and through the inner skin, but buried itself in the massive timbers that supported the target. These two shots were quite conclusive as to the power of the gun.

Sir W. Armstrong says that a gun of twelve tuns weight fired with a charge of fifty pounds of powder, will break through the side of the *Warrior*, or the strongest ship afloat. The *Times* remarks that no weapon of offence or defence seems left to us now so effective as a large armor-clad and very swift steam ram.

The British Navy and the Armstrong Gun.

[From the London Engineer.]

The *Times* insists that the exploits of the Confederate steamer *Merrimac* (or *Virginia*, as she is really named by the Confederates) have reduced the effective strength of our own navy to two ships of war, or at the most to those few fighting ships which are heavily plated with iron. It may not be easy to refute this conclusion, but it is certain that, for any purpose of attack upon iron-plated ships, the fate of the *Cumberland* and *Congress* involves the fate also of every one of our Armstrong guns. If there be any exception it must be the 150 ℔. smooth-bore Armstrong, which is being persistently magnified into a 300-pounder, merely for the reason that it is intended to throw a bolt of that weight from it when, and only when, it shall have been rifled for the purpose, and presuming the gun does not burst in the attempt. A battery of 7-inch Armstrongs, throwing 110 ℔. shot, might shower away all day upon a properly plated ship without doing it much harm, for it has been incontestibly proved by the War Office authorities that, at the range at which naval actions are sure to be fought, the 68 ℔. smooth bore guns have much greater destructive power than the Armstrongs, even when firing wrought iron-shot. If wrought-iron puddled steel, or Bessemer or other steel shot, truly formed and having but a slight windage, were fired from a 68-pounder gun, the effect upon the iron plates struck would be even greater than with the present 8-inch cast iron shot ⅛-inch or more smaller than the bore of the gun, and often breaking to pieces upon the object struck. But the *Merrimac* and *Monitor*, which hammered away at each other with so little effect, mounted still heavier guns, the last named vessel mounting two of a pattern in great favor in the American navy, to wit:—11-inch Dahlgren guns, throwing 184 ℔. wrought-iron shot. Now, as it has been proved by trial that the Armstrongs are inferior in power to the 68 ℔. smooth bores, and as even 11-inch smooth bores produced so little effect upon a cheaply built iron plated ship, what could the Armstrong have done? Nothing at all, unless a shot could, now and then, have been got into the enemy's port holes. The conclusion is obvious that much heavier guns are required, and Sir Cornewall Lewis stated in the House, only the other night, that Sir William Armstrong had only that day brought forward a proposal for the manufacture of a gun capable of throwing a round shot of 300 ℔. or a rifled bolt of 600 ℔. This gun, of course, will be a wrought-iron gun. But what are we really to expect from large wrought-iron guns? The mediæval engineers made enormous wrought-iron bombards, one of which, 19-inch or so in the bore, lies a wreck on the top of Edinburgh Castle. These bombards appear to have burst in almost every instance. In 1840 or thereabouts Messrs. Fawcett, Preston, and Co., we believe—at any rate a Liverpool firm—made a large wrought-iron gun for the United States' government. It was named the "Peacemaker," and was placed on board the *Princeton*, whose machinery was planned by the now famous Swede, Captain Ericsson, the engineer, who, with Mr. Braithwaite, built the *Novelty* for the Liverpool and Manchester contest, and who has brought forward novelties ever since. Well, the Peacemaker was loaded and fired, and exploded on the spot, killing the United States' Secretary of War, and two or three other Government officials, who had assembled to witness the trial. Then we had Mr. Nasmyth's wrought iron gun, which broke down; Mr. Mallet's mortar followed, and that gave out also; then came the great Mersy gun, which soon showed symptoms of unsoundness; and others of the same material were found, on trial, not to answer. At last, Lord Derby's government gave us the monopoly of the Armstrong gun. The smaller sizes may have held together tolerably well, saving the vent pieces, which appear to fail in all the Armstrongs, but the larger ones, as is becoming pretty well known, require very careful handling to avoid accidents, and for their own safety, as well as that of the gunners, the less often they are fired the better. They do not generally go all at once, but several have "started" in the coils, during the first trials, and the whole experience with them thus far shows that they are liable to early infirmity. The so called 300-pounder gun, made at great cost, and with a smooth bore to take a 156 ℔. shot, has only fired a few rounds, and yet Sir William proposes to go on in the construction of still larger guns upon the same system, with all its uncertainties. Mr. Lynall Thomas's large wrought iron gun which threw its shot upwards of 10,000 yards, or 5¾ miles, the greatest range, probably, ever attained, lies burst in two in Woolwich Arsenal, Mr. Whitworth's guns have burst, and it is extremely doubtful whether any known plan of forging wrought iron guns of great size can be depended upon. Even if they do not burst, the chase, as long as it is made of wrought iron, and finely grooved, must wear rapidly and a visit to Woolwich will soon convince any one how great are the difficulties in this respect. So far, we have confined our remarks upon the Armstrong gun chiefly to the body of the gun itself. But the breech-screw and vent-piece appear to be constantly failing, and if Sir William casts aside his breech-loading system and takes up the old plan of muzzle-loading, as he appears to be doing, we shall have very little to show for the enormous sums which that gentleman's career has cost the nation. It needs no Sir William Armstrong, come from Elswick, to teach us how to make wrought-iron muzzle-loading guns, provided only we keep clear of the "shunt" plan with its excessive windage.

The Americans have for a long time made 11-inch guns weighing 135 cwt., and, we believe, they have proved very successful. If the War Office authorities are not yet prepared to forge their guns out of the solid from perfectly homogeneous steely-iron ingots which can be produced at less than £7 10s. a tun, they might, at least, invite the ironmasters to produce large cast-iron ordnance from the best cold blast irons. The Americans have cast 22-tun guns with 12 inch and 15-inch bores, throwing, the one a 425 ℔. rifled shot, and the other a solid ball of the same weight. These were cast hollow and with provision for cooling the metal with great uniformity throughout the whole mass. Our stake in the matter of ordnance is too great to allow ourselves to be tied down by the prejudices if not the interests of a single man, who has never yet produced a really powerful gun. Before closing this article we would observe that Mr. Whitworth's 80-pounder, fired with 14 ℔. of powder, sent its shot entirely through the 4½-inch vertical iron plates on the sides of the *Trusty*, nearly two years ago. We note this fact here as bearing upon what we said, last week, of the Armstrong and Whitworth guns, to the effect that neither had ever sent a shot through a 5-inch plate inclined at an angle. This is perfectly true, but the Whitworth gun, offering but little resistance to the escaping shot, has the most nearly approached such an exploit.

The Washington Navy Yard—Testing Heavy Artillery, &c.

[From the Washington Correspondence of the N. Y. Times.]

It is well known to all who have read or have witnessed exhibitions of gunnery in our American service, that one of the greatest places for testing heavy guns is at the Washington navy yard. A battery has been constructed, and guns mounted, to test their strength, and to prove the range and elevation of artillery. Previous to the commencement of the present contest, only occasional practice was required; but the exigency of the times has accelerated movements, and guns are fired daily at the battery, under the supervision of experienced and practical men. To Commander John A. Dahlgren, United States Navy, our service is indebted for his great practical skill, his extensive knowledge of ordnance, and his untiring energy in searching out and testing every new theory adapted to gunnery. A more cautious man we have never had, which the following incident shows: After the success of the *Monitor* over the *Merrimac* it was suggested that Capt. Dahlgren should at once go to work and manufacture 20-inch guns. With characteristic prudence, he informed our legislators that such a thing could not be done without testing them gradually, which could be accomplished by increasing the size inch by inch, and by taking sufficient time to prove them; but to have them made at once the projected size it would be highly dangerous to use them. Perhaps not four in the whole delegation of Senators and Congressmen know even the rudiments of artillery; hence, it were better for them to follow the advice of a practical man, who has devoted nearly all his life to the science of gunnery in all its branches. This practice battery mounts six or seven rifled guns of various caliber, besides inventors have been kindly allowed room for their ordnance, for the purpose of testing it. The day your correspondent visited the battery a new steel gun, manufactured at Fitchburgh, Mass., was being tested. It was a Sawyer 10-pounder, made for the purpose of testing his projectiles. Mr. Sawyer was present himself, and brought a number of his projectiles of various caliber, which were fired from the different guns in battery. In consequence of the blockade of the Potomac being raised, not more than sixty shots can be fired per day, as vessels are continually passing up and down, and great caution has to be used, Capt. Dahlgren allowing no shots to be fired when any vessels are in sight between the two points, and the consequence is that sometimes the gunners cannot fire scarcely once an hour between sunrise and sunset. When the wind does not blow too hard, a canvas screen or target is put up at about 1,600 yards distance, and the firing is directed at that, often with great accuracy. The 9-inch Dahlgren gun is fired quite often with various projectiles, and every gun manufactured must be submitted to a thorough test before being placed in battery or on shipboard, consequently when once thoroughly tested the gun may be considered safe in proper hands. The old theory of bursting guns to test their strength has long since exploded, and more attention is paid to the casting of iron and the relative strength of gunpowder, which show by gradual experiments the safety and utility of the ordnance used. The 9-inch and 11-inch shell guns are cast at the West Point and Fort Pitt foundries, the latter foundry turning out the best guns manufactured in the Union. There are some at the yard manufactured at the Tredegar Foundry, in Richmond, Va., but these guns are not safe, and it will be remembered that most of the heavy rebel ordnance used at Columbus and Fort Donelson, which burst, were from these latter works. The beautiful brass boat howitzers, with wrought-iron carriages, were manufactured at this yard, under the immediate supervision of Capt. Dahlgren, and for a light gun are the handsomest and best in the service. But one of the greatest objects of curiosity to be seen on the gun battery is the English rebel gun. This immense gun, which stands second in battery, was manufactured at the Low Moor Works, in England, bearing on its surface the date of 1861. It is a rifled iron piece, with heavy wrought band shrunk on the breech, and weighs something over 10,000 pounds. It was fired a few times at a distance of 1,700 yards, but there was a great variation in the shots, some falling as short as 1,200 yards. It has not been thoroughly tested, but it is the opinion of the Captain that it is not altogether safe, and he increases the charges very moderately, not firing it often. It was captured at the Evansport rebel batteries, and when found had its muzzle plugged with shot wedged, and spiked with rat-tail files. It is said that the workman employed to spike it worked two days at it, and after all did not do his work effectually.

The daily practice of young men—ordnance students—at the gun battery, brings forth for the navy many scientific gunners. The gunners for the navy are supplied from this school, which is scientifical as well as theoretical, as every one has a chance of promoting himself by prompt attention to his business. The strictest attention to business is required, and a daily practice from sunrise to sunset cannot fail, in a short time, to make a man accurate and perfect as a marksman.

The Armament of the "Merrimac."

Capt. Blakely writes to the London *Times*:—"It may interest your readers to know that the *Merrimac* carried 7½-inch rifled cannon, which threw bolts weighing 120 ℔s., the charge of powder being 21 ℔s."

It will be remembered that Capt. Blakely is the patentee and manufacturer in England of that mode of making cannon first invented by Prof. Treadwell of this country. The core is made of cast iron or steel with an exterior hooping of wrought iron. A number of these guns have been sold to the Confederate States, and one of them was the most efficient of all the cannon employed against Fort Sumter. It is probable that those on the *Merrimac* were furnished by Capt. Blakely, so that his statement of their dimensions may be relied on as being precisely accurate. The Parrott guns are constructed on the same principle.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The regular weekly meeting of the Association was held at their rooms at the Cooper Institute on Wednesday evening, April 17th, the President, Prof. Joy, in the chair.

SALTING THE STREETS.

Prof. SEELY—There was one point made by Dr. Gardiner at the last meeting which perhaps ought to have been considered at our first discussion of this subject—that is, whether we want snow in New York city. In regard to that I would say that for those who have the means to purchase fine horses and sleighs, and the leisure to indulge in the recreation, sleigh-riding is a very agreeable luxury. I like it very well myself. But I cannot afford to indulge in it, and I have no doubt that in this city there are a thousand persons like myself in this respect to one who can enjoy sleigh-riding; and I think that the few should be willing to give way to the many. Even for those who have sleighs the streets are not very good places to ride in, and most of those who indulge in the recreation go into the suburbs or out of town. This subject has recently been thoroughly investigated in Philadelphia. It being proposed to prohibit the use of salt on the railrods, a committee was appointed by the city government to take testimony and fully investigate the matter. The College of Physicians and the Board of Health were both called upon for their opinions, and all citizens interested were invited by public notice to present their views. The testimony was very contradictory, but it seems to me that the preponderance is decidedly in favor of the practice. The strongest opinions are in opposition to it, but these are generally given by those least competent to judge. The College of Physicians made a series of observations for the guidance of their judgment. Dr. Rogers tested the temperature of the salt slush in many places, and he walked through the streets with a thermometer in his hand, carrying it about three feet above the ground. He found the slush but very few degrees colder than the snow—three, four, five and in one case eight degrees colder; and the temperature of the lowest stratum of the air was in no case any lower than that at the hight of five or six feet. Both Boards gave their opinion in favor of allowing salt to be used, and no physician objected to it.

Since the last meeting I have very fortunately had an opportunity of making some experiments myself. We had a slight fall of snow and I prepared some mixtures of it with salt in different proportions and observed the temperatures and the rate of melting. I placed in my laboratory 4 tin cans, all of the same size—6 inches in diameter and 8 inches in hight. In each of these I placed 20 oz. of snow, carefully weighed. In one of the cans which I call No. 1, I mixed with the snow 10 oz. of salt, in No. 2 I mixed 1 oz., in No. 3 one-fifth of an ounce, and in No. 4 I left the snow pure without any mixture of salt. It will be seen that in No. 1 the proportion of salt was 50 per cent of the weight of snow; in No. 2, 5 per cent and in No. 3, 1 per cent, the last being about the proportion in which it is used in the streets. I tried the temperatures of the mixtures with a thermometer at several periods during the day, with the following results:—

	A. M.				P. M.			Salt.	Snow.
	9·15	9·45	10·45	11·45	12·45	1·45	4·00		
Temp. of air,	47°	50°	52°	55°	58°	56°	60°		
Can No. 1, temp.	—4°	—3°	—1°	18°	*30°	39°	48°	10 oz.	20 oz.
Can No. 2, temp.	0°	5°	7°	18°	21°	27°	43°	1 oz.	20 oz.
Can No. 3, temp.	4°	19°	22°	28°	28°	30°	*31°	⅕ oz.	20 oz.
Can No. 4, temp.	32°	32°	32°	32°	32°	32°	†32°	0 oz.	20 oz.

* No Snow. † Much snow still unmelted.

The 4° below zero entered in the memorandum as having been observed at 15 minutes past 9, A. M., is a mean from observations in different parts of the vessel. In some parts it was —6°, which was the lowest temperature noted. The snow was unfortunately damp, and it was impossible to mix the salt with it as thoroughly as would have been desirable. It will be seen from the table that No. 1 was all melted at 12.45, P. M., and Nos. 2 and 3 at 4 o'clock, P. M. When I left at 6 o'clock a considerable portion of the snow in No. 4 remained unmelted. The temperature was in this case reduced much more than it would be if the salt was sprinkled upon the surface of snow lying upon the ground. Here the salt was all through the mass, and could obtain heat only at the outside, while if it wa sprinkled upon the surface it would form a thin sheet which could readily obtain heat from the air above and from the ground below. This would also cause the snow to melt more slowly in my experiment than it does upon the ground. I have no doubt that one per cent of salt, if judiciously used, will carry off the snow in one-fourth of the time in which it would usually be removed by our winter weather. I am still of the opinion, Mr. President, that the use of salt under intelligent direction, for the removal of snow, will tend to promote the comfort and health of our citizens.

Capt. BARTLETT—Mr. President, this is simply a question of dryness. If you wet your boots with salt water they will remain moist a long time, but if you wet them with fresh water they will soon dry. [The gallant Captain then cited many facts drawn from his experience in the navy to show that the wearing of wet clothes is exceedingly injurious to health.]

Prof. SEELY—It is true that clothes wet with sea water will remain moist longer than if wet with fresh water; but this is not the case with salt and water. There are salts in the sea which absorb and retain moisture, but chloride of sodium is not hygroscopic.

Mr. FISHER—Mr. President, I took the ground, on a former occasion, that people were willing to pay for luxuries, and that it would be better to cart the snow out of the streets; but as we have a great park in which the snow is carefully kept in the best condition for sleigh-riding, perhaps it would be best for those who would enjoy this luxury to go to the Central Park, or to the suburbs, while the snow may be removed as quickly as possible from the streets. [The speaker then made an argument in favor of using steam on the city railroads and on common roads.]

Mr. EBBETT—Mr. President, I appear here on the part of the railroads, or at least one of them—the Sixth Avenue. I have had a great deal of experience in using salt, and in attempting to clear the track without it. The railroads do not desire to use salt for their own profit, but simply for the convenience of the public. When the tracks are obstructed with snow, we are obliged to double our teams and run half the number of cars, thus cutting off nearly half of our receipts while our expenses remain the same. This crowds the cars and forces a great many people to walk when the walking is the most disagreeable. I have been up three nights in succession, working day and night, to get the tracks clear so that we can make our regular trips. Nothing creates so much dissatisfaction as a failure to make our trips in time.

The great number of horses that were injured in February, last year, were not injured by salt. The last time that salt was used was on the 1st of February and the horses were injured on the 8th. I remember the day very well. In the morning there was a dense fog, so dense that it was impossible to see across the street. At noon the sun came out for a little while, and then it grew suddenly very cold. At night it was some six or seven degrees above zero. Our horses that worked in the forenoon were uninjured, but of those that worked in the afternoon 61 were found the next morning to be lame, some in one foot and some in another. The injured feet were white and presented the appearance of having been frozen.

There are men on our road who have worked many years, always standing in the water when salt is used to melt the snow, and none of them have been injured. I brought along one of our starters, Mr. More, a man of delicate health, who will give his experience.

Mr. MORE—I have worked on the railroad, and for the last six years we have used salt for removing snow. I stand at the station 12 hours in the day, from 6 o'clock in the morning till 6 at night. I used to be much subject to colds, but for a few years have been quite free from them. I think that standing in this salt water is a good thing for the health.

The subject of surface condensers was selected for a fortnight hence, and the meeting adjourned.

THE quantity of rice consumed in the rice-eating countries of the East has been estimated at three ounces per day for each person, or seventy pounds per year. The population of these countries is estimated at 671,343,916 souls, and the rice crops at 62,-176,062,000 pounds, 50 per cent greater than the Indian corn crop of the United States.

ANILINE has not been obtained from petroleum; thus proving that the latter does not contain benzole from which aniline is made.

THE DISCOVERIES OF 1861.

At the close of each year for several years, David A. Wells, A. M., has published a volume containing an account of all the important discoveries in science and art made during the year. The periodicals of England and the continent of Europe, as well as of this country, are carefully watched, and the mention of every new discovery is extracted. The book usually contains about 400 pages, and a copious index renders it a most convenient work for reference.

We have already mentioned the appearance of the volume for 1861, and we now select some of the most interesting of its items, which will give a good idea of the character of the work:—

CRYSTALLINE STRUCTURE OF IRON INDUCED BY VIBRATION.

The spontaneous change forged and rolled iron undergoes when submitted to continuous vibration, is productive of so much critical danger, especially in the case of railway machinery, that an investigation into the best means of remedying the resulting evils has been viewed as an engineering question of vital importance. Among others, Mr. Schimmelbuch, of Liege, has undertaken the subject, and the following is an epitome of his investigations: A bar of pure unalloyed iron was struck by a hammer three times in a minute for six consecutive weeks; at the expiration of this time it broke into three pieces. Before the experiment the bar was a good specimen of fibrous iron; after, on the contrary, its fracture exhibited a brilliant crystallized structure, resembling that of antimony.

A bar of iron alloyed with nickel, submitted to the same treatment, underwent no change.

A very simple means exists of recognizing this changed condition of iron, so dangerous in its consequences. Pure iron, when magnetized by contact, loses its magnetic properties immediately the needle is detached. On the other hand, iron combined with minute quantities of some foreign body, such as carbon, oxygen, sulphur or phosphorus, remains magnetized. The efficacy of this simple test has been established by repeated experiments.—*London Photographic News.*

Under the patronage of the Austrian government M. Bourville has also recently instituted a course of experiments with a view of throwing some additional light on the subject of the induction of a crystalline structure in wrought iron through vibrations.

M. Bourville's apparatus consisted of a bent axle, which was firmly fixed up to the elbow in timber, and which was subjected to torsion by means of a cog-wheel connected with the end of the horizontal part. At each turn the angle of torsion was twenty-four degrees. A shock was produced each time that the bar left one-tenth to be raised by the next. Seven axles were submitted to the trial. In the first the movement lasted one hour, 10,800 revolutions, and 34,400 shocks being produced; the axle, two and six-tenths inches in diameter, was taken from the machine and broken by a hydraulic press, and no change in the texture of the iron was visible. In the second, a new axle, having been tried four hours, sustained 129,000 torsions, and was afterward broken by means of a hydraulic press; no alteration of the iron could be discovered by the naked eye on the surface of rupture, but, tried with a microscope, the fibres appeared without adhesion, like a bundle of needles.

A third axle was subjected, during twelve hours, to 338,000 torsions, and broken in two; a change in its texture and an increased size in the grain of the iron were observed by the naked eye. In the fourth, after one hundred and twenty hours, and 2,588,000 torsions, the axle was broken in many places; a considerable change in its texture was apparent, which was more striking toward the center, and the size of the grains diminished toward the extremities. In the fifth, an axle was submitted to 23,328,000 torsions, during seven hundred and twenty hours, was completely changed in its texture; the fracture in the middle was crystalline, but not very scaly. In the sixth, after ten months, during which the axle was submitted to 78,732,000 torsions and shocks, fracture produced by a hydraulic press showed clearly an absolute transformation of the structure of the iron; the surface of rupture was scaly, like pewter. In the seventh and final case, an axle submitted to 128,304,-000 torsions presented a surface of rupture like that in the preceding experiment: the crystals were found to be perfectly well defined, the iron having lost every appearance of wrought iron.

NEW KIND OF ELECTRIC CURRENT.

When pure water flows through a porous body, an electrical current is elicited; a fact established by experiments, says M. G. Quincke, which may be stated concisely in these terms :—

Some thirty layers of thin silk stuff were placed over each other and attached over one tube of the apparatus; another tube was then adapted against the former, and the part separating them covered thickly with sealing-wax. Owing to the wide pores of the silk, considerably more water flowed through, under equal pressure, than when the clay plate was employed. The linen was used in the same manner.

The other substances were applied in the form of powder, in a glass tube of the diameter of the above tubes. The ends of these tubes, the length of which varied, according to the substance employed, from twenty to forty-five millims., were ground flat, and over them were placed disks of the silk stuff spoken of, to prevent the flow of the fluid carrying away particles of the substance under examination. In the case of Bunsen's coil, the tube was closed with plates thereof.

Platina was made use of in the spongy form, iron as filings. The glass had been reduced to powder on an anvil. Ivory and the various kinds of wood were employed in the form of sawdust. It was endeavored in vain to press water through a porous plate of wood, for the plate had to be luted in dry; and on becoming moist, even if cut perpendicular to the direction of the fibres, it warped so much that it broke the sealing-wax or the tube.

The direction of the electric current was not changed by adding acids or solutions of salts to the distilled water, but it was considerably weakened thereby.—*Poggendorff's Ann.*

ELECTRICITY GENERATED BY EVAPORATION.

Mr. Palmieré, in a note in the *Cosmos* (Paris), states that in order to obtain electricity by condensing vapors, he had some water in a capsule of platina, not insulated, made to boil slowly. He collected the vapor upon a platinum refrigerator, at a hight of about two feet above the surface of the water, and by means of a condensing electroscope soon convinced himself that the vapor manifested positive electricity. Encouraged by this result, he sought to discover the negative electricity in the capsule of platinum which contained the water in a state of vaporization. Having isolated the capsule, and put it in connection with a condensing electroscope, he concentrated the solar rays on the distilled water in the capsule by means of a lens about a foot in diameter. He thus obtained a superficial ebullition, hardly visible, and also indications of negative electricity in the capsule. He afterward varied the mode of experimenting, and operated on different liquids.

WHAT IS HEAT LIGHTNING?

The flashes of lightning often observed on a summer evening, unaccompanied by thunder, and popularly known as "heat-lightning," are merely the light from discharges of electricity from an ordinary thunder-cloud beneath the horizon of the observer, reflected from clouds, or perhaps from the air itself, as in the case of twilight. Mr. Brooks, one of the directors of the telegraph line between Pittsburgh and Philadelphia, informs us that, on one occasion, to satisfy himself on this point, he asked for information from a distant operator during the appearance of flashes of this kind in the distant horizon, and learned that they proceeded from a thunder-storm then raging two hundred and fifty miles eastward of his place of observation.—*Prof. Henry.*

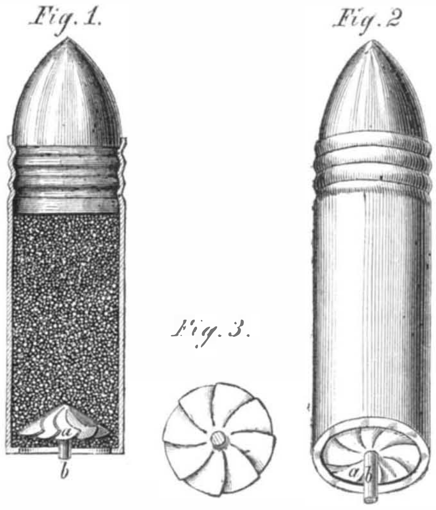
MAGNETIC PHENOMENA.

M. Ruhmkorff has the following notice in the *Comptes-Rendus*, vol. 1, p. 166:—"If a stay (bride) of soft iron be pressed against one of the poles of an artificial magnet, the soft iron is observed to become hard, and it is more difficult to file. If the stay be removed, it loses its hardness and resumes all the properties of soft iron."

THERE is a native California wheat, the kernels of which are about three times larger than the common kind. It shape is more like a rye kernel, being longer in proportion to its breadth than common wheat. It ripens very early, grows from five to six and a half feet high, and has heads averaging ten inches long.

MAYBERRY'S CARTRIDGE.

The usual mode of loading muskets in modern warfare is for the soldier to bite off the end of his cartridge, pour the powder into his gun, then insert the bullet and ram it home with the ram rod. Quite serious evils are found to result from the practice of biting off the cartridge; portions of the powder will scatter into the soldier's mouth in the excitement of action, the niter in which is sure to produce sores; while the repeated biting of dry paper added to the dust and fatigue of the battle excite an almost intolerable thirst. We recently called the attention of inventors to this subject, and we now illustrate one of the best inventions that has been called out by our suggestion. It consists of a very slight modification in the cartridge as ordinarily constructed.



This cartridge is made of paper with the base perfectly flat as represented in the engravings, of which Fig. 1 is a horizontal section of the cartridge and Fig. 2 a perspective view. Through the base a hole is cut of a size nearly as great as that of the base, and this hole is closed by a disk of peculiar construction, represented in Fig. 3, and at *a a*, in Figs 1 and 2. Two disks of moderately stiff paper, each cut with curved radiating divisions as shown in Fig. 3, are attached at the center to a light wooden pin, *b*. This disk is a little larger than the hole and after it is pressed into the cartridge it expands by its own elasticity and closes the opening. The cartridge may now be rammed to its place in the gun, and when the pin, *b*, strikes the bottom of the bore, it will force the disk inward and permit the powder to flow out so as to be fired by the cap.

Besides obviating the evils spoken of, this cartridge effects a notable saving of powder. In tearing open the ordinary cartridge a few grains of powder are frequently spilled upon the ground, but with this improvement all is poured into the gun. The saving of only a few grains to each cartridge, in all the millions that are used, is a matter of no small importance.

Application for a patent for this invention has been made through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventor, J. C. Mayberry, at White Rock, Ill.

The Atlantic Telegraph.

[From the London Mechanics' Magazine.]

Several months ago we called attention to this most important enterprise as being in a condition, solely for want of the means of raising capital for its completion, which was anything but creditable to a country so familiar as ours with contention against physical difficulty; and we then indicated it was one of those peculiar works to which the moderate and well-guarded aid of government would be specially applicable. We are extremely glad to see that a movement is now being made in this direction. The government of the United States, stimulated no doubt by the forcible manner in which recent untoward events have brought before them the necessity for rapid communication with Europe, and by consciousness of the lapse that has been committed in remaining torpid so long, while the means of realizing that communication in the most perfect manner has lain at the very door, have addressed a special dispatch to their Minister here upon the subject. They express a warm desire to co-operate with the government of this country in such financial or other arrangements as shall secure the means of bringing once again, and this time permanently, we trust, into action that wondrous agency which in 1858 startled the whole civilized world by its successful though short-lived operation.

The American government do not stop even in their desire to coöperate with Her Majesty's government in the establishment of this good work. Notwithstanding that the most practicable route will give possession to Great Britain of the entire control of the cable at both ends, they desire to enter into engagements whereby the Atlantic Telegraph and its communications shall be guaranteed from all violence and wilful damage, even in the untoward event of a war between the two countries.

Conduct so unselfish and so courteous can surely meet with but one response from the British Cabinet. We feel that Parliament, with scarcely a dissentient, would agree to the small amount of risk that has been named as sufficient to resuscitate this enterprise in conjunction with America. We believe we are right in stating that it has been intimated that a guarantee, under careful regulations, of about 2 per cent from each government on a capital of £700,000 would suffice upon which to raise the entire amount. Even this small guarantee, we believe, would never be called upon for a shilling. The blunders and mismanagement that have characterized several of these deep sea cables which have proved failures have been so fully discussed in these columns that we need not further allude to them than to say that these evil days are now happily passed away, as we trust, for ever. That good and durable cables can be made, and laid, and worked in permanence, the Toulon-Algiers and Malta and Alexandria lines attest. Messrs. Glass, Elliot & Co. have just published a list of the lines made and laid by them, which shows that every cable which that firm has ever made and laid is at this moment in active operation, except two inconsiderable lines recently broken by anchors, which can be repaired with the greatest facility.

The long time that has elapsed since the original cable gave way, has been turned to good account by the Atlantic Company in the investigation of all the circumstances attending deep-sea cables; members of the company, among whom were the chairman and late Secretary, were chosen by the government as members of the commission appointed by the Board of Trade to examine and report upon the whole subject; and these circumstances, in combination with the vast improvements effected by the Gutta-percha Company in the preparation of their insulating substance; the invention of other substances of a similar character, said to be even superior to that material when sufficient time shall have elapsed to test their durability in the sea; and the continually-increasing experience of contractors in laying cables, lead to a well-grounded belief that the next attempt to span the Atlantic ought to be and will be a perfect success.

It would be idle to dwell upon the enormous results that would arise to the benefit of commerce, of government and of civilization generally, from the constant and regular flow of instantaneous communication between Europe and America. The connection of the Foreign, Colonial and War Offices, and of the Admiralty, with their respective correspondents on the other side of the Atlantic would, without any other consideration, perfectly justify our government in extending their warmest aid, consistent with prudence, to the carrying out of the Atlantic Telegraph Company's enterprise in the best manner, and at the earliest practicable period.

IN the ruins of Herculaneum the excavations are carried on actively. Toward the latter end of December last two lions were found in that town, half a metre long, and carved in marble. The style was Grecian, of a high order of art. Other interesting objects have been recovered, such as fragments of buried wooden furniture, chairs, boxes, coffers, constructed of bamboo or cane, grindstones, &c.

SHODDY is made of old carpets and blankets, and is frequently mixed with long wool and spun into filling. Noils is a name for the short wool which is combed from the long wool when the latter is employed for making worsted and kerseys.

Correspondence.

The Philosophy of Projectiles—Large and Small Shot—Shells and Solid Shot.

Messrs. Editors :—Perhaps there is just now no other subject of so much interest to the mechanical philosopher, and to the country, as that of improvements in gunnery. While this subject occupies the public mind, I will point out what appears to be an error in the direction of those improvements, and will attempt to show that they are tending toward the use of projectiles that are proportionately too heavy to produce the greatest effect.

For a gun of over 6-inch caliber I do not believe it possible that a shot of greater length than one diameter, or of heavier metal than iron can in any case be the most efficient, and for a gun of over 10 inch caliber a round shot of iron, if solid, is too heavy to give the best results.

In trying to show the truth of these propositions, I hope to be pardoned for using a style of illustration rather more familiar than scientific. I enter upon controverted ground and will try to make myself fully understood.

While attempting to prove that solid shot of over 6 inches diameter and of greater length than one diameter, or of heavier metal than iron, is too heavy to be projected from a gun with sufficient velocity to attain either the longest range or be the most effective at short range, I respectfully call the attention of your Chatham, C. W., correspondent, who in his letter, published in the Scientific American of April 12th, advocates the use of lead for cannon balls of every size. And let me also ask the attention of all who are disposed to censure Capt. Dahlgren's caution in forbidding the use of the solid wrought-iron shots in the large guns on board the *Monitor*.

Now to proceed with the argument.

We will first suppose a gun of one-inch caliber and of sufficient strength to permit the firing of round shot, at a given high velocity. To produce this velocity the projecting force acts upon one circular inch of surface, and drives before it two-thirds of an inch of solid metal. A ball being equal to a cylinder of the same diameter and two-thirds of that diameter in length. Next we suppose a two-inch caliber and a round shot to correspond, in which case we have a surface equal to four circular inches for the action of the projectile force. This ball, however, when reduced to a cylinder is double the length of the first, so that we have here twice the amount of metal for each inch of surface, and to impart to it the same velocity we must double the pressure. This double pressure, if applied to the one-inch gun, would require the strength of that gun to be doubled, and when applied to the two-inch caliber, where the diameter is doubled it requires four times the strength of metal. This proportion holds good for every size of gun. When we double the diameter of a ball we quadruple the amount of surface exposed to projectile force, and double the weight of metal to be projected by each inch, and, as a consequence, double the pressure is required to impart a given velocity, and four times the strength of gun to bear it.

When we apply this principle to a cannon ball of twelve inches diameter we have a surface of 144 inches for the action of the force, and eight inches as the length of cylinder the ball will make, or eight inches of metal to be projected per each inch of surface.

With this idea let us return to the small gun, and I submit to the judgment of every gunner whether this eight-inch bolt of iron is not at least sufficiently heavy. Can we conceive of a force acting upon a single inch of surface that would eject this mass with a velocity equal to that attained by a shot from one of our best rifles, or that would throw a bolt of lead of equal size with greater force than one of iron. Indeed, when viewed in this light even the iron bolt appears so heavy as to render it impossible to burn a sufficiency of powder, in so small a chamber, to project it with any great velocity. And yet the same pressure required to impart to this shot any given velocity is required to give the same velocity to a twelve-inch round shot; the only difference being in the area of surface, in which they bear the same relation to each other as the squares of their diameters.

For firing this bolt, the small gun would require twelve times the strength necessary for firing a one-inch round shot, and for firing the twelve-inch ball the gun must be twelve times this strength, or 144 times the strength of the small gun using the round shot.

This is calculating upon the usually-accepted theory that the strain on a gun is in proportion to the diameter of its caliber, when, in truth, it may be in proportion to the diameter of the center of strength of the metal, which varies with the thickness.

These considerations are perhaps sufficient to satisfy most minds that a round iron shot is at least heavy enough for a twelve-inch gun, but those not yet convinced can go further, and suppose a bolt, for a twelve-inch gun, equal to two round shots, and apply this to the one-inch gun. We have then a shaft sixteen inches in length, equal to twenty-four balls corresponding with the caliber of the gun. When thus presented the common sense of every one must reject it.

It must be remembered that the effect of a shot depends more upon its velocity than upon its weight, the *vis viva*, or force of impact increasing only with the weight directly, but as the square of the velocity; so that if we double the weight, we but double the force, while if we double the velocity we quadruple the effect. But if we loose half the velocity by doubling the weight we have lost one-half the force. So much for the theory.

But the principles here advocated do not rest alone upon unsubstantiated theory. They may almost be said to have been demonstrated by experiment, for in all the tests that have been made of the effect of shot on heavy iron plates, I believe nothing has yet been found more destructive than round iron shells filled with materials much lighter than iron; and in no single instance have elongated bolts given the results confidently anticipated by their advocates, and the larger the guns used the greater has been the failure. In the experiments made at Shoeburyness, England, in October, 1861, to which you allude on page 212 of your current volume, shells filled with sand, weighing perhaps not over 50 lbs., fired from 68-pounder smooth-bored guns, proved as destructive on the massive plates as solid bolts, weighing 200 lbs., fired with 16 lbs. of powder from 100-pounder Armstrong guns.

There is, however, still another point of some importance to be considered. It is claimed that a much longer range may be attained with the large shot. To this I answer, that experiments with large guns have not yet proved the justice of such claim. In our army and navy practice we throw shells as far as solid shot; and I venture to predict that for very heavy ordnance, such as now proposed by the Navy Department, shell will be the most effective form at any range and for every purpose. They can be projected at a velocity that will more than compensate for the greater atmospheric resistance. As regards this resistance the difference between the round shot and the bolt is not so great as might at first be supposed. The axis of the long shot does not long remain parallel to the line of flight, but retaining the plane of the gun from which it was fired, it, on the descending curve of its course, is thrown across the line at a continually increasing angle, until its displacement becomes more than that of the round shot. And furthermore, it must be remembered that the resistance to a large ball is not in the same proportion as to a small one. That while the weight, and consequently the *vis viva* of a flying ball, increases as the cube of the diameter, the increase in resistance is but as the square. And while a ball of one-inch diameter, containing but one spherical inch of metal, displaces an area of one circular inch of air, and a ball of twelve inches diameter an area of but 144 inches, although the latter contains a mass of metal equal to 1,728 of the former, showing the resistance to the large ball to be but one-twelfth of what must be overcome by the small one, in proportion to weight. So the best shape for avoiding atmospheric resistance appears to be of much less consequence to a large than to a small shot. A ball of wood, with a diameter of twenty inches, though weighing but half an ounce to the cubic inch, would, with the same velocity and elevation, sustain the resistance longer and attain a greater range than a common musket ball of lead.

It then appears, both from theory and experiment, that, for all guns over 32-pounders, a sphere is the best shape for a shot, and that iron is a heavy enough metal, and too heavy for solid shot for a 200-pounder.

To make a shot effective it must have velocity, to give it velocity it must have surface for the force to act upon, for even gunpowder is not omnipotent. To give sufficient surface to a ball, when large, it must be made hollow and filled with a substance lighter than iron. The less elastic the filling the more effective will be the shot.

Carrying out these principles, I have no doubt that a round shell of twenty inches diameter, containing some 500 or 600 lbs. of iron of sufficient tenacity, and filled with sand, or with water, can be fired from a gun of forty tuns weight with sufficient force to crush in the side of any iron-clad vessel that has yet entered the imagination of the boldest projector.

Hoping these views of the subject may tend, in some slight degree, toward giving the right direction to experiments, I submit them to your readers.

E. S. Wicklin.

Washington, D. C., April 16, 1862.

History of Turbine Water Wheels.

Messrs. Editors :—A large number of inventors in the United States claim to have made new and important inventions in the construction of turbine water wheels, but none of the wheels which they have produced are useful unless the vortical motion of the inlet water is obtained in shutes, or guides, under the full pressure of the head. The water guides must be so arranged as to make the water assume a direction coinciding with the rotation of the wheel, and then discharge at an angle of 180° to that of the water entering the wheel, whether the discharge be at the center, periphery, bottom, top, or at any angle that may be chosen. The result is, in fact, the same in all other cases, the intention being to produce the full and united powers of the centrifugal force with the reaction of the water on leaving the discharging orifices of the wheel, let it be done by spiral chutes, circular guides, involute chutes, spiral spouts or helical guides. All such guides are intended to produce the same result, and do in fact produce the same result, to a greater or less degree, according to the mechanical construction, proportions and arrangements adopted by each builder. This has been clearly demonstrated by the Fairmount tests, in Philadelphia.

The Messrs. Parker were the first and original inventors of the turbine water wheels, and also of the draft boxes—their invention being the result of circumstances which almost compelled them to seek some new water motor for their mills. Necessity caused them to engage in their experiments on reaction wheels, which resulted in the accidental discovery of the advantages of the vortical motion of the water, and the application of the same to reaction wheels. This was the discovery which has resulted in the production of the many turbines now in so general use in this country.

Austin Parker conceived the idea of the draft box, which is, without doubt, the most important and valuable discovery in the principles of hydraulic motors ever made, and the Scientific American is the only scientific journal that has ever given the full credit to the Messrs. Parker for this valuable discovery.

After the first Fourneyron wheel had been abandoned in Philadelphia, Uriah A. Boyden, Esq., of Mass., took hold of it and became very celebrated for his knowledge of and success with the Fourneyron turbines, but from their great complication, and the very great cost of construction, they are only used by large and wealthy manufacturing corporations in the Eastern States. Mr. Boyden has never used the draft boxes in connection with the Fourneyron turbine, he preferring to set the wheel down below the level of the tail water, and prepare a costly pit. Another serious difficulty with them is to get a step to stand the great pressure and friction of the wheel.

The Jonval turbine is also a complicated machine, and, although not as costly in its construction, the difficulties of getting a step to stand is greater than with the Fourneyron turbine, but as they are always used in connection with the draft boxes they are much easier got at, and more readily repaired, and are, unquestionably a preferable motor, both in coefficient of effective power and in mode of construction, and, although they are liable to the same objections as the Fourneyron wheels, of being easily broken or stopped up by blocks getting into them, yet they are much easier repaired.

The Parker turbines, although they are not quite as efficient as the Jonval turbines, yet from their extreme simplicity they are relieved from objections that can be urged against other turbines. They are not liable to get out of order nor wear on the vertical step. When used on a horizontal shaft—which is decidedly preferable in almost all cases—they are so simple in their application to the machinery that the actual power given to the machinery is really as great as that of the Fourneyron or Jonval turbines, and the cost of construction not generally near so great.

There are many builders of turbines who do not understand the subject. Their wheels do not yield over fifty or sixty per cent, whereas similar wheels built by persons of scientific and practical attainments, yield at least seventy-eight, eighty-five and ninety per cent; hence it is that there is such a diversity of opinions by our people relative to the various turbines—some condemning them, others praising them. O. H. P. P.

Wrought-Iron Manufacture.

MESSRS. EDITORS:—In your issue of the 12th inst., under the heading, "Manufacture of puddled wrought iron direct from the ore—a new process," you very truly say that "every improvement in its manufacture, whereby its cost is reduced, is of general importance;" but in your statement that the process carried on at the works of Mr. Rogers is new, and "entirely different from any other," is not so true, as you can find by referring to the patents of the very parties who you say have had "partial success in some instances, and many failures in others;" in fact, you will find, by referring to your own columns, Vol. VIII. (old series), page 171, that the process in use at the works of Mr. Rogers is not new by any means. Mr. Rogers may have invented an apparatus by which he can carry on the process of deoxidizing iron ores. If so, and if it shall be practically proved that it does the work better, more economically, and is more permanent than any other, he has made a valuable discovery, which should be adopted generally, and, no doubt, will be, for I think the manufacture of wrought iron is soon to be enormously increased in our country; but before Mr. Rogers can expect to have his plan of deoxidizing adopted, the iron men will require more light than you have given them, in the article referred to above. The object of this communication is to get the additional light recorded in your valuable journal, which, of course, Mr. Rogers will not object to.

You didn't tell your readers of what the cylinder, used by Mr. Rogers in deoxidizing his ores, is composed; but, from what you did say, I come to the conclusion that it must be made of wrought iron. If I am correct in my conclusion, I would ask what will be the effect of keeping the cylinder at a red heat continually, which must be from 1,000° to 1,200° Fah.? Will it not oxidize and scale sufficiently to make it unserviceable very soon? Any blacksmith will tell you that must be the result.

Mr. Renton, who, no doubt, is one of the parties you refer to as having been partially successful, first used iron cylinders, set in a vertical position, to contain the ore while being deoxidized, and he applied the heat on the outside of the cylinders, the same, as you say, Mr. Rogers does. Mr. Renton found, in a short time, that the constant high heat soon so oxidized his cylinders as to make them entirely useless, and consequently the use of iron was abandoned. Mr. Rogers may have some way to make his cylinder proof against their liability to oxidize; if so that is important.

You say, "the object of this roasting operation is the deoxidization of the ore, out of contact with the atmosphere." This is nothing more than was done by Harvey, Satter and Renton. You also say, "the impureties in the ore melt in the puddling furnace, are separated from the iron, and flow down into the spue hole in the form of slag." The same was the result with the plan of Harvey, Satter and Renton, and, if I mistake not, the plan of Harvey and Satter had a provision for getting rid of the deleterious sulphur and other gases, generated by the deoxidization process, that neither Renton nor Rogers has, and which would seem to be a very important matter. You further say, at the works of Rogers "no skilled laborer is required, except at the puddling furnace." The same is the fact with regard to the plans of Harvey, Satter and Renton.

To sum up the matter, I cannot see that Mr. Rogers can have invented any thing regarding the matter, except, perhaps, the screw in his cylinder, and, may be, some new plan of revolving it.

I have no disposition to do Mr. Rogers any injustice in the foregoing remarks, and do not believe I have, but if it shall subsequently be proven that I have I will with pleasure own up. My only aim is to combine and place on record all the facts possible regarding a matter I consider vastly important to the iron manufacture of our country.

MONITOR.

New York, April 18, 1862.

Still Another Answer to "A Young Miller."

MESSRS. EDITORS:—In your issue of March 22d "A Young Miller" asks some questions on the subject of milling, to wit: "A burr millstone 3 feet 10 inches in diameter, and of medium quality, as regards pores or openness, as termed by millers, making 135 revolutions per minute, what amount of draft should the furrows have, and what should be the number of furrows, what their shape, &c., to suit 16 feet length of bolting reel, 30 inches in diameter, one-half No. 9 cloth, balance No. 10? How much ought such to bolt per hour ordinary grist flour? Is a circular as good as a straight furrow? Should said stone be faced to the eye?"

In regard to draft, with the motion stated, my experience would lead me to use 1⅛ inches to the foot, measuring to the first edge of leading furrow, in straight dress, with 13 divisions or quarters with 3 furrows each, making 39 in all. But to bring a stone of this description to its proper working capacity it requires more motion, from 200 to 225 revolutions per minute, in which case I would use 1¼ inches draft per foot, the leading furrow to be 1¼ inches in width at the periphery, and 1½ inches at the draft circle; the first land 2 inches wide at periphery, 1¼ inches wide at the point nearest the eye; second furrow 1¼ inches wide throughout. Second land same as first: third furrow same as second—the furrows at the back edge to be a little deeper than a kernel of the grain to be ground, to be brought up as true as possible to the first or feather edge, which should be the depth of a good heavy crack with a sharp pick, not to be again sharpened until the furrows require to be deepened. I find this a better practice than dressing the feather edge whenever the face is sharpened or cracked. The furrows should be as smooth as possible, in order that the grain should come to the surface of the stone with the greatest facility. If the feather edge is kept sharp it cuts the bran when the wheat is ground properly. If the furrows are rough the flour will be harsh and specky. If the No. 9 cloth is placed upon the head of the reel, the No. 10 cloth followed by proper numbers for middlings, &c., it should bolt from five bushels to 10 bushels per hour, but if the reel should be enlarged to 40 inches in diameter, the size for grist work, with the length given, it would bolt from ten to twenty bushels per hour. The dimensions of the bolt given in the query are too small for capacity of the stone stated. Bolts should always be constructed to correspond with the capacity of the stone, in order to secure a uniform quality of work. In this very particular many grist mills fail by having their bolts on a too limited scale. In my experience I have found that all straight furrows grind cooler than circular; the greater the circle the warmer the meal, owing to the great draft at the eye and also at the skirt. There have been a great variety of circular dresses invented, but I have never seen any that would evenly distribute the meal over the face of the stone when grinding; unless this is done it is difficult to keep the stone in proper condition. The great draft at periphery has a tendency to take from that part its proper portion of meal; as a consequence, small particles of grain are discharged without being properly ground, making a large proportion of middlings, and often much passes off into the feeds, being too large to pass through the middlings cloth. Another consequence of the great draft of the skirts is that having less than its proper portion of meal between the stone brings them to greater wear by rubbing against each other. This is especially the case unless the runner is perfectly balanced, soon destroying the sharp, cutting edge necessary to grind wheat properly. When taken up to be again dressed the face is often found low and glaced, while the breast and eye are high and require facing with the picks. During the past season I have had occasion to take the circle dress out from two run of stone, 4 feet 2 inches in diameter, and replace it with the straight furrows. There were 36 furrows, 18 leading ones, 1-inch draft to the foot, furrows on 6-foot circle, 1¼ inches in width. That substituted 13 divisions, of 3 furrows each, 1¼ inches draft to the foot—in other respects similar to the dress heretofore described. There was a decided improvement in the quality of flour. The yields were greater; also larger quantity ground—from 80 to 100 barrels of flour per day, to each run, while running; the yields being less than a barrel from 4¼ bushels of wheat; the flour being fully up to the various qualities of Michigan flour.

I am well aware that it is impossible to lay down definite rules in regard to millstone dresses, as there is such a great variety of qualities of wheat as well as stone, each of which requires to be treated differently. For spring wheat I do not use so much draft as for winter wheat, as it will bear to be under the stone longer than winter wheat, being of a more harsh, flinty nature. If the stone is faced to the eye I find that the flour has a soft, unnatural feeling, as though mixed with water or grease, caused by being ground too suddenly, and also by being deprived of air, which is necessary to proper grinding. By dressing off the face from the point of the second land gradually deeper, toward the eye, where it should be about the depth of one-fourth the diameter of a kernel of wheat, the grain is gradually crushed and divided, leaving to the remainder of the stone its proper work, namely, to separate the flour from the bran and reduce it to the proper degree of fineness.

OLD MILLER.

Ann Arbor, Mich., March 31, 1862.

Stationary and Floating Revolving Iron-Clad Batteries.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of April 19th Mr. A. G. Johnson, of Troy, N. Y., states that Mr. George Vanderheyden, of that city, invented and reduced to writing, in 1847, a well-matured plan for a revolving turret and battery, composed of iron. If, by the use of the word "invented" Mr. Johnson claims for his client the first discovery of a revolving turret for this purpose, and the only evidence he produces of it is the record he refers to, he may, by a very cursory examination of the records of the Patent Office, discover his mistake. To say nothing at this time of the claims of Capt. Ericsson in this respect, Mr. T. R. Timby, of Worcester, Mass., filed in the Patent Office like claims as early as the year 1843—four years before Mr. Vanderheyden did himself and the public a similar service. An admirably-developed fortification of this kind, gotton up by Mr. Timby, is now on exhibition at the Treasury building, in Washington, a peculiar feature of which is that all the guns are discharged by electricity, and at the option of the person directing the movements of the turret, in a single line of fire. Scarcely any thing in the way of land fortifications can be conceived of more perfect in its character, and we can readily conceive that if stationary fortifications should hereafter be considered desirable the plans of Mr. Timby would meet with much favor. The real question at issue now is between stationary and floating fortifications, and not who is the original discoverer of a principle so old as possibly to be beyond the reach of any patentable process so far as the principle itself is concerned. The immediate want of the nation evidently is effective floating batteries or armor-clad vessels, and if Mr. Vanderheyden or any other ambitious inventor can facilitate the operations of the government in this respect they will be indorsed as public benefactors by anticipation. W. L. B.

THE London papers state the iron plates employed for casing the war vessels in the French navy are far superior to the iron plates made in England.

IN the month of March 12,250 rifled muskets were made at the Springfield armory.

Improved Carbureting Apparatus.

It has been repeatedly stated in our pages that the illuminating power of ordinary gas may be considerably increased by mixing with it the vapor of hydrocarbons which are rich in carbon—like those that constitute naphtha; and we have described some devices for mixing these vapors with illuminating gas. The principal difficulty encountered, results from the fact that the vapors condense at ordinary temperatures and thus fill the pipes or vessels with an oily liquid. Some inventors have attempted to overcome this by keeping the gas warm after the vapor was mixed with it until it was burned, but the plan which we here illustrate is designed for the opposite purpose of cooling the gas before it is brought to act upon the naphtha. As naphtha is composed of several hydrocarbons of different degrees of volatility, if the gas is cooled before it is brought in contact with it the presumption is that only those portions will evaporate that are sufficiently volatile to retain the gaseous form, and thus all condensation in the pipes will be avoided. The plan adopted for cooling the gas is to pass it through a long labarynthine passage formed by placing a series of cylinders one within another, with annular spaces between them.

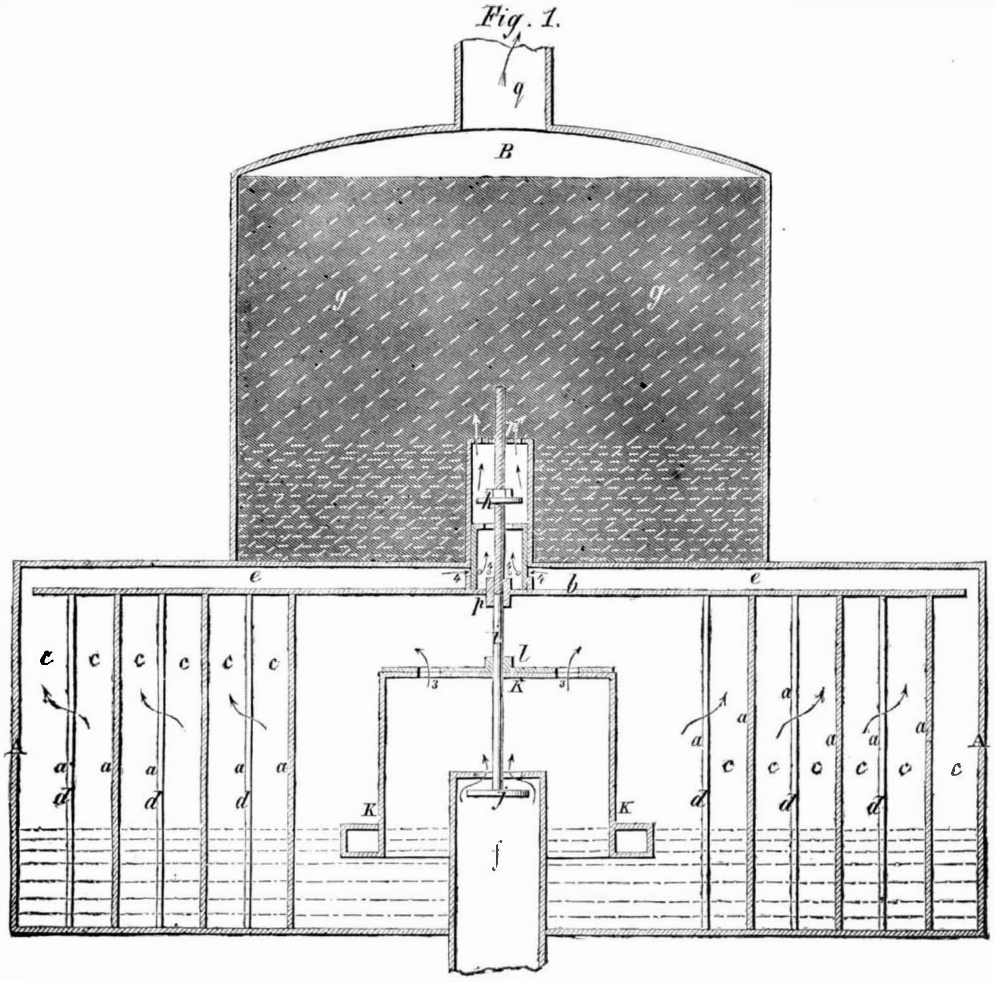
A vertical section of the cooler is shown at A, Fig. 1, and a horizontal section on a smaller scale in Fig. 2. A represents a close sheet-iron cylinder with the gas pipe, *f*, for the induction of the gas entering through the center of the bottom.—Within the cylinder, A, are placed a series of smaller cylinders, *a a a*, one within another, and these are covered by a plate, *b*. Openings, *d d d*, are made through the sides of these cylinders alternately through opposite sides, as shown, so that the gas entering at the center of the innermost may circulate through the annular spaces, *c c c c*, in the directions indicated by the arrows, and may finally pass around the edge of the covering plate, *b*, into the space, *e*, in the upper part of the cylinder, A. Naphtha is kept in the lower part of cylinder, A, so that the gas may here be mixed with some portion of its vapor.

From the upper part of the vessel, A, the gas passes to the vessel, B, which is called the carburetter. This vessel is filled with a porous material *g*, which is kept constantly saturated with naphtha by capillary attraction, exposing a large area of evaporating surface to the gases it passes through. The gas leaves the apparatus by the pipe, *q*.

Any suitable porous substance may be used for filling the cylinder, B, but the inventor prefers that which is sometimes used for filters, and is known as porous carbon. To make this, take of cannel coal, pulverized, 12 parts; pumice stone, pulverized, 8 parts; asbestos, pulverized, 2; sawdust, pulverized, 14; coal tar, 4. Mix and mold into proper form to fit the interior of the carbureter, B, and calcine at a white heat.

The construction of this apparatus furnishes a convenient means for introducing a valve to vary the opening with the variation of pressure, and thus to regulate the flow of the gas. The induction pipe, *f*, rises above the surface of the naphtha in the cooler, A, and is covered by an inverted cup, *k*, which floats upon the liquid. A valve stem, *i*, passes through the axis of the cup, to which it is rigidly secured. Upon the lower end of this valve stem is the valve, *j*, which is larger than the opening in the upper end of the pipe, *f*. It will be seen that any increase of pressure in the gas will raise the floating cup, *k*, and will thus carry the valve, *j*, nearer the upper end of the pipe, *f*, diminishing the opening, and obstructing the flow of the gas. By properly adjusting the dimensions of the parts, this diminution in the opening may be made to lessen the flow to the same extent that it is accelerated by the increased pressure; and thus the discharge of the gas may be rendered uniform. The passage of the gas from the cup, *k*, is also regulated by a register valve, by means of which the size of the openings, 3 3 3, may be varied at pleasure.

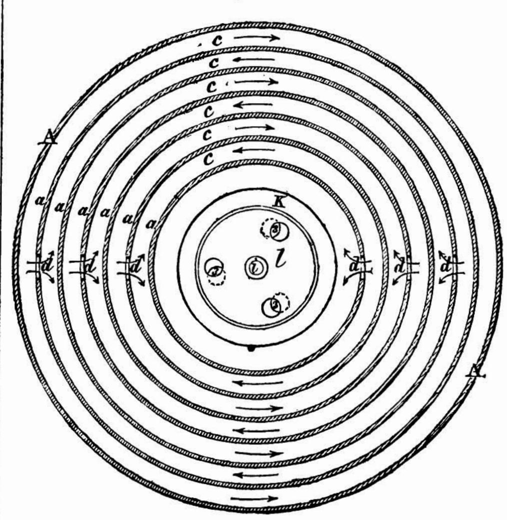
Fig. 1.



BASSETT'S CARBURETING APPARATUS.

Provision is made for giving notice whenever the naphtha in the vessel, A, becomes so nearly exhausted as to require replenishing. This is done by so nearly cutting off the flow of the gas as to materially diminish the light. A diaphragm is placed across the pipe which conducts the gas into the vessel, B, and over this diaphragm is placed a valve, *h*, firmly secured to the valve stem, *i*. As the naphtha in the vessel, A, fails, the valve, *h*, will be carried down by the descent of the cup, *k*, nearly to the diaphragm, and will thus nearly cut off the flow of gas.

Fig. 2



The patent for this invention was granted through the Scientific American Patent Agency, March 4, 1862, and further information in relation to it may be obtained by addressing the inventor, John A. Basset, at Salem, Mass.

New Submarine Battery.

The Boston *Journal* states that the government has contracted with certain parties in that city to build an iron gunboat of between 600 and 700 tuns, to be furnished with Woodbury's Submarine Battery. The vessel will be one hundred and thirty-six feet long and thirty feet beam, and will be built of iron in the most substantial manner. She is to be built at the Atlantic Works, East Boston, and is to be finished, ready for service, in from four to five months. The experiment of firing under water was tested at Simpson's dock at East Boston on the 16th ult.

This submarine battery is described as follows:—The vessel is to be iron-clad and of sufficient tunnage to carry a gun at the bow, one at the stern and as many as desirable amidships. The vessel in action will lie alongside of her adversary, and discharge her guns at a range as near as possible to be obtained. The cannon is fitted into a stuffing box similar to that of the piston of a steam engine; an automatic port hole opens and shuts as the piece is run out or withdrawn. A 12-pounder was fired under water at a target made of spruce plank, crossed at right angles, and heavily bolted and braced, and placed at a distance of ten or twelve feet. The target, says the *Journal*, was penetrated in such a manner as to show that the invention is one of the most important which has been made in naval warfare. As noticed by us a few weeks since, Fulton was the first inventor known to us who experimented with submarine batteries. Within the past two months several plans similar to that of Mr. Woodbury's have been brought to our notice. The most feasible embraces the system of firing the guns under water by electricity.

Tinning Cast-iron Articles.

Many articles, such as bridle bits, small nails, &c., are manufactured of tinned cast iron. Saucepans, goblets and other hollow iron ware, are tinned upon their inner surfaces. They are first scoured bright with sand and dilute sulphuric or muriatic acid, then washed thoroughly in soft water and dried. They are then placed over a fire and heated, when grain tin is poured in and the vessel moved so as to roll the molten tin over the surface. Some powdered rosin is added to prevent oxide forming on the surface of the iron. Hollow vessels of copper and brass are tinned in the inside in the same manner.

Tinning Iron.—Cast-iron articles to be tinned, are first scoured bright with sulphuric acid and sand, then washed in clean warm water, and dried. They are afterward coated with zinc, and a coat of tin is put upon the top of the zinc, by dipping the articles into molten tin. When the tinning operation is finished the articles are placed in boiling water, and allowed to cool slowly.

A street railway 1¾ miles long has been laid down, and is now in operation, in Sydney, New South Wales. The rails and carriages for this street railway were sent out from England by Mr. Train.

Scientific American

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY

At No. 37 Park-row (Park Building), New York

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum—One Dollar in advance, and the remainder in six months.
Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.
Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.
☞ See Prospectus on last page. No traveling agents employed.

VOL. VI. NO. 18.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, MAY 3, 1862.

MANUFACTURE OF ARMOR PLATES--HAMMERED AND ROLLED.

A cotemporary recently stated that a government agent had lately left this country for Europe, for the purpose of obtaining some reliable data in regard to iron plates for casing war vessels.

Whether this be true or not we cannot tell, but we know that it was altogether unnecessary to employ such an agent. The mode of manufacturing rolled armor plates is the same as that which is practiced in rolling common thin plates, only the forge fires are larger and the machinery more powerful, as illustrated on page 229, current volume of the SCIENTIFIC AMERICAN. Thick armor plates are now manufactured at Pittsburgh, Pa., and at Troy, N. Y., and undoubtedly there are several establishments in our country in which, with some alterations in their machinery, as good rolled plates can be made as in any European rolling mill. But another important question arises, namely, "Are rolled armor plates the best?" This has not yet been practically determined. Of the two classes of armor plates, the forged are said to be superior to the rolled, and if this is the case, of course the former should be preferred. An important paper on this subject was lately read before the Institution of Naval Architects, in London, by Capt. J. Ford, in which it is stated that at the Thames Iron Works, in which the plates for the *Warrior* were made, it was conclusively proved that hammered plates were the best. They are made as follows :—Scrap iron of the best description is carefully selected and cleaned, then piled and hammered into a bloom, then rolled into bars 6 inches broad and 1 inch thick. These bars are cut up, piled and hammered into a slab, and several of these are put together, heated and hammered, and so this process goes on until a plate of the full size required is built up. There is no mystery in the manufacture of the best hammered plates. Their quality depends upon the selection of the best material and the employment of skilled and careful workmen. Capt. Ford asserts that plates made from puddled wrought iron are much inferior to the forged plates of scrap iron, and the reason which he gives for this opinion is, that the toughness of iron depends greatly on the amount of working to which it is subjected. He admits, however, that the rolling of the scrap iron into small bars, during the first part of the operations, is a great benefit, because the tendency of hammering is to harden the plates, while the rolling operation of the slabs tends to keep them tough and fibrous through all the subsequent heating and hammering operations.

In rolling 4½-inch iron plates, the final pile that is heated is ten inches in thickness, and weighs seven tuns. The whole of this mass must be brought up to the welding heat, and the operation of rolling completed before the heat is lost. It is scarcely possible to heat such a mass of iron without burning some of it, thus causing scale and blisters to be formed in the plate. In hammering plates, on the other hand, they are built up with smaller heats in the furnace, as only a small portion of the mass requires to be placed in the fire at once.

Such is a brief statement of the defects and merits of the two modes of manufacturing armor plates. All the plates of the *Warrior* and *Black Prince*, amounting conjointly to 1,900 tuns (with the exception of about 100 tuns) were hammered ; those placed on the frigates *Defense* and *Resistance* are nearly all rolled.

We have seen several statements—and Capt. Ford reiterates them—to the effect that a given thickness of iron composed of thin plates has very little resisting power in comparison with the same thickness of solid metal. We have, however, seen no accounts of reliable experiments which fully determine this question. The turret armor of the *Monitor* is made of one-inch plates laid in layers, and as thin steel plates have far greater powers of resistance than iron plates of the same thickness, it is possible that steel armor may yet be found the best to employ.

LARGE EUROPEAN GUNS AND POWDER.

An inquiry has been made of us respecting the cause of apprehension in the bursting of large guns, such as those of 15 and 20-inch caliber—the latter being 1,000-pounders. The case of the Turks, upon one occasion, firing 1,000-pound blocks from their old guns at Constantinople, against a British fleet, has been adduced as proof against the strength of modern in comparison with old guns. This circumstance apparently tells against the skill of our modern gunmakers, but a little explanation will show that it does not. The strain upon a gun depends as much upon the quality as the quantity of powder used for a charge. Gunpowder consists of a mechanical mixture of three ingredients, namely, sulphur, charcoal and saltpeter. In the olden times these substances were ground and mixed dry, constituting what is called *meal powder*. In the manufacture of modern powder the ingredients are moistened, so as to unite them more intimately together, then the mass is afterward reduced to grains and thoroughly dried. The difference in the two modes of manufacture makes a very great difference in the quality of the powder. Meal powder burns slowly and does not act with a sudden percussive force upon projectiles, while grain powder, on the other hand, ignites suddenly and acts with a quick and great percussive force upon both the gun and the projectile. The strain, therefore, upon the large Turkish guns, using meal power and firing 1,000-pound blocks, was but small compared to that which would have resulted from using the improved grain gunpowder of the present day.

Much of the effective force of gunpowder also depends upon the purity of the ingredients of which it is composed. Impure saltpeter and sulphur made very weak gunpowder. Crude saltpeter and sulphur were formerly used in making powder, now these substances are all highly refined, hence our gunpowder is much "stronger," to use a common phrase.

When gunpowder is allowed to become damp and suffered to remain so for some days, it receives permanent injury, and driving off its moisture will not cure the evil, as a chemical reaction takes place when the ingredients of the powder are suffered to remain in contact for a considerable time in the presence of moisture. The nature of the powder then becomes chemically changed, and it looses its property of exploding suddenly. Cromwell exhibited a practical knowledge of chemistry when he gave the pious, prudent and pithy advice to his soldiers, "Trust in God and keep your powder dry."

PHOTOGRAPHING FROM BALLOONS IN MILITARY RECONNOISSANCES.

Last summer, when Prof. Lowe first commenced his ascensions in his balloon, for the purpose of observing the positions of the enemy, the Photographical Society, of this city, made a communication to the War Department, through their President, Prof. Draper, pointing out the great advantage that might be derived from taking photographs of the enemy's camps from the balloon, and offering their services to aid in carrying the suggestion into effect. The *American Journal of Photography* suggested that the photographs thus taken might be examined under the microscope, and thus the most minute details might be studied at leisure.

Secretary Cameron, in the multiplicity of his public and private affairs, never found time to reply to the communication, and the matter was dropped.

We see that Prof. Lowe continues to make his ascensions, and we suggest to Gen. M'Clellan, or any other officer who may chance to see these remarks, the propriety of calling upon the Photographical Society for the services which they offered last year. Prof. Draper, the President, is a man of European reputation. Prof. Joy is Vice President. Many of the leading members are persons of position in the world of science, and the high character of the society is sufficient warrant that its suggestions are worthy of consideration. Let our military art accept the wonderful aid tendered to it by the most subtle department of science.

TESTING THE STRENGTH OF ELECTRICAL CURRENTS.

The most correct way of ascertaining the strength of an electric current—and, as a consequence, the strength of a galvanic battery of intensity—is by the decomposition of water in a chemical electrometer. This consists of a glass tumbler having a cover of wood and openings in it for a large conductor of copper descending at each side, forming, as it were, two arms, which are brought near one another in the center and not far from the bottom of the tumbler, which contains water. The terminals—*alias* poles *alias* electrodes—of platinum are formed to be the seat of a small glass tube, having a bell mouth at the bottom, but closed at the top. This tube is a gage, and has a vertical scale of figures marked on it. It is filled with water, then placed in the tumbler over the electrodes and under the surface of the water in the tumbler to exclude all the air. The full column of water is now supported in this little tube and it becomes an electrical gage. The wires of the battery forming it (may be those of a telegraphic line) are now connected with the copper wires in the tumbler, and the decomposition of the water immediately takes place. The two gases, hydrogen and oygen, of which water is composed, are now seen to rise up in bubbles from the platinum poles and ascend in a whirling current to the top of the tube. As these gases ascend they gradually displace the water in the tube and force it down into the tumbler. The scale on the tube shows the gradual displacement of the water, and the amount of gas made in a given time, and this indicates the decomposing power of the electric current.

Another method of testing the strength of the electric current is with a galvanometer, which consists of a band of fine insulated wire surrounding a vibrating magnet. When the current is transmitted through the wire it deflects and moves the needle, and its deflection is measured by a scale on the circle.

PHILOSOPHY OF PROJECTILES.

We call attention to the communication of our correspondent, on another page, on the above subject. He has evidently given this subject much thought, and he expresses his ideas in a very clear and forcible manner. He presents his opinions strongly in favor of large shells as being the most effective projectiles against iron-plated vessels, but from all the accounts which we have read, relating to experiments upon iron plates with shells, the latter were always shattered to pieces. The large shells fired by the *Merrimac* against the *Monitor*, we understand, were all broken in pieces. We may be mistaken in these views, but our opinion is the one that is generally entertained. The resisting power of good iron plates against cast-iron shot of every kind, is very great. Sir Howard Douglas, in his work on Naval gunnery, relates, that cast-iron shot fired from 32 pounders at 450 yards distance against butts covered with plates of iron only ⅝ of an inch in thickness, with charges of from 2½ to 10 lbs. of powder were "converted into a cloud of langrage too numerous to be counted." There can be no question but, as our correspondent has stated, "there is just now no other subject of so much interest to the mechanical philosopher and to the country as that of improvements in gunnery."

AN embargo has been laid upon the export of anthracite coal to the Bermudas, Bahamas and Antilles, because smuggler steamers who are engaged in running the blockade have used it, as it emits no smoke. The smoke of a steamer using bituminous coal may be seen far out at sea long before the hull comes in sight.

THE BRITISH NAVY REDUCED TO TWO SHIPS.—We invite attention to the article in another column from the editorial page of the *London Engineer*. Its statements will be found interesting.

THE BRITISH PARLIAMENT ON THE FIGHT IN HAMPTON ROADS.

The operations of the *Merrimac* in Hampton Roads have produced in England a popular flurry, which has pervaded Parliament, and led to a remarkable discussion in the House of Commons. When the subject of iron-plated ships was recently discussed in the Polytechnic Association of the American Institute, we thought that it was the dullest discussion that had ever taken place in that society, but it certainly showed no greater want of knowledge of the subject than was displayed by the British House of Commons.

There is probably no poem familiar to a larger portion of those who speak the English tongue than Campbell's stirring ballad :—

> " Britannia needs no bulwark,
> No towers along the steep ;
> Her march is o'er the mountain waves,
> Her home is on the deep."

When that ballad was written it expressed the sentiment of the nation, and the action of the government was, of course, in accordance with this. But when France commenced the creation of a great navy, with the avowed purpose of rivaling that of England, the English people began to consider the propriety of erecting seacoast fortifications. After very thorough examination and consideration of the subject a number of large forts were commenced, it being intended to employ iron-cased ships in connection with them, as auxiliaries ; as was expressly stated by the commission which planned them. Parliament debated the question deliberately, and finally voted the appropriation, and large sums have already been expended. But when the *Merrimac* ran into two of our old sailing vessels with her iron prow, and sank them, such a commotion was created in Parliament that several prominent members vehemently urged the suspension of work upon the fortifications, regarding it as demonstrated that they are all worthless. Mr. Gregory said—

If the *Warrior* had met the *Merrimac* it was a matter of grave doubt whether the angular-sided vessel would not have overcome her vertical-sided antagonist; but if the *Warrior* and the *Monitor* had met there was little doubt that the smaller vessel would have plunged her shot into the unprotected parts of the *Warrior*, and would, in fact, have overcome the pride of the British navy. Again, how useless would the fortifications of Alderney be before s ch vessels. [Hear, hear.] What could be the use of spending money on fortifications when a battery could come from Cherbourg, sail right in, and knock every ship in the harbor into lucifer matches without receiving the slightest damage? Cherbourg itself was the most notable example of the folly of building these fortifications. He hoped the government would take this tremendous subject into their consideration. If, instead of going about like pottering old pointers, sniffing after the traditions of Blake and Benbow, we accommodated ourselves to the facts which had met our eyes, and make proper use of this salutary lesson, we might be able to diminish our expenditure [hear hear], and to provide an impregnable line of defence, which all the powers of Europe would not be able to break through.

The only point of any force which we discover in the whole discussion was made by Sir J. D. Hay, a man who has served much on committees for testing iron plates, and who probably understands the subject of iron-plated ships as well as any person in the world. He said :—

With reference to the necessity for sloping the sides of iron ships, it was certain that it was quite unnecessary to do so. There was nothing to be gained by sloping the sides of a ship, because by so doing there must be a larger plate to cover the same vertical area. There was no doubt that the iron was better disposed in greater thickness upright than if the same weight were rolled out to cover the same vertical area. It had been tried over and over again. The thicker a good iron plate was the better it was for defence against the effect of projectiles, and a shipbuilder need not be trammeled by any desire to alter the form of his ship by a false idea of obtaining sloping sides when he would get the same thing by building his ship in the best form to perform her duty, and plating her perfectly.

THE RIFLE.

We have received volume XIV. of the *New American Cyclopedia* from the publishers, D. Appleton & Co., this city. Like its predecessors, it contains a large number of interesting and well written articles, among which is one contributed on the above subject by J. T. Hodge, Esq., from which we condense a considerable amount of the following information. A rifle consists of a fire arm, the barrel of which has two or any greater number of spiral grooves cut in the interior. Some barrels have a regular twist, others a " gaining twist." Except for short barrels, Mr. Hodge states that this latter form of twist has no advantage over the regular twist. The object of the spiral grooves, is " to impress upon a tight-fitting bullet, a rotaty motion round its axis of progress and thus keep it in a straight line as it spins forward." It is now unknown where rifles were first made, but they were used in Europe in the 17th century, and in Berlin, Prussia, there is a small rifled cannon having 13 grooves, which bears the date of 1664. It is a breech loader. In the American revolutionary war the English had several 2-pounder rifled cannon the range of which was 1,300 yards, while in accuracy they surpassed all other pieces of that period. It was in the army under Washington, however, that select corps of riflemen were first employed. It is stated that their success led first to the introduction of rifle regiments into European armies. The number of these, however, was but small in the time of Napoleon, and Wellington had only a single rifle brigade, all the rest of his army being equipped with old " brown bess'"—the smooth bored musket. This shows how slow some nations are in adopting good advice, for Benjamin Robbins, a scientific Englishman wrote a treatise called " New Principles of Gunnery" in 1742, in which he described the superiority of the rifle and said " whatever State shall first adopt its use and become proficient in it, must acquire a decided military superiority." It was exactly 109 years after the above advice was given, that the English acted upon it, and had the French not adopted it previously, perhaps old brown bess would still have been doing duty in London among the Queen's guards. The French army was driven to the necessity of inventing an improved weapon, that would obtain a long range, in order to skirmish with the Arabs in Algiers who used very long muskets with a large charge of powder, and who could thus pick off the French soldiers at great distances. M. Delvigne and Col. Thouvenin made improvements in the French rifle, but the best invention was introduced by Capt. Minié in 1847, and it simply consisted of a conical ball, with a hollow space in its rear end. The smooth bored musket had previously been preferred because it was easy to load, whereas a rifle with a solid ball was difficult to load, as the bullet had to fit tight in the grooves and considerable force was necessary to drive it down. The hollow expanding bullet of Capt. Minié revolutionized the whole system, as it enabled the rifle to be loaded as easily and as fast as the old musket. The French army adopted it generally in 1849 and the English in 1851. The allied soldiers were equipped with rifles in the Crimean war, while the Rrussians were armed with the old muskets. The advantages were altogether in favor of the former. It was during this war that the British government established the manufactory of small arms at Enfield, and obtained for this purpose first class machines from America to make the different parts of the rifle. The Enfield rifled musket is nearly similar to the Springfield, U. S. rifled musket. The barrel is 3 feet 3 inches long, and weighs 4 lbs. 2 oz., the whole weapon with bayonet weighs 9 lbs. 3 oz. The caliber of the barrel is 577 of an inch and the twist of the grooves is equal to one turn in 6½ feet. We have not space to say anything respecting breech-loading rifles. Most of those which possess merit have been illustrated in our columns.

The introduction of rifled field artillery is chiefly due, we believe, to the success of the rifled musket. When it was proved that the range of the latter was at least equal to the former and that the gunners of light field pieces could be picked off at a safe distance by an enemy, it became apparent, that some improve ment was required to meet this new state of things in warfare. Louis Napoleon solved the question in a most simple and satisfactory manner, by rifling his light guns and beating the Austrians at long ranges on the field of Magenta and Solferino. Since then England, America, Austria, Russia, Prussia, Spain and Holland, have adopted rifled cannon. What a change has taken place in small arms and artillery in twelve years ! There was not a single rifled cannon used in any army or navy in 1850, and with the exception of a few select rifle corps in the French and other armies, the great mass of soldiers were furnished with the defective smooth bored musket. Now the entire armies of the leading European powers, as well as our own vast Federal army, are armed with the rifle.

The power of rifled cannon firing elongated bolts to destroy fortifications of stone, was exemplified by firing at a Martello tower in England with an Armstrong 100-pounder ; an 80-pounder and a 40-pounder. The distance was 1,032 yards, and both solid shot and percussion shells were used. The wall was 7 feet 3-inches thick. Through it one 80-pounder shot passed into the tower and all the other solid shot penetrated five feet. Ten rounds opened a large breech into the interior, and after a total of 170 shot and shell were fired, one side of this thick tower was completely destroyed. The superior qualities of rifled cannon was also clearly demonstrated at the late siege of Fort Pulaski. The Parrot rifled guns that were used soon made several breaches in the thick brick walls and the garrison was compelled to surrender on the second day. The American government has taken a step in advance of all others in furnishing a select corps, with superior telescope rifles. The facts of accurate shooting by these riflemen, in skirmishing before Yorktown are reported daily. No battery of artillery is safe from them, it is stated, within a distance of 1,000 yards. The English government is also intent, it seems, upon securing a superior rifle to the Enfield musket for the army, and to this end invitations were given for the rifle makers in the United Kingdom to test their different arms at Woolwich, in the early part of last month. Five different rifles were tested at targets situated at 500 and 1,000 yards distant. As we learn by the London *Artisan*, the Whitworth rifle was declared the victor. The *Artisan* says its mean radial deviation was 2·88 ; but what this means, is not stated. There is a great difference of opinion among marksmen and riflemakers respecting the systems of rifling. Whitworth's rifle has a regular twist, but most of the American target rifles are made with a gaining twist. Latterly we have inclined to the opinion that the regular twist is the best. Many improvements will no doubt yet be made in rifles especially as it regards increasing their effective range. Most of the inventors who have devoted attention to the rifle, have looked to improving the breech and the cartridge, not its barrel to render it more deadly at long range.

A 1000-pounder Cannon.

On the 17th of April, 1861, Capt. Rodman made the following report to the War Department :—

The entire success which has attended the manufacture and trial of the 15-inch gun, leaves no doubt of our ability to make reliable guns of even greater diameter of bore than 20 inches, and to maneuver and load with facility, and without the use of machinery, guns of that caliber. A 20-inch gun, one caliber thick, 210-inch length of bore, and 20 feet total length, would weigh about 100,000 lbs. A solid sphere of iron, 20 inches diameter, would weigh about 1,000lbs. A shell, 20 inches exterior diameter, 6·66 inches thick, would weigh about 925 lbs. The ordinary service shell need not be over 3·5 inches thick ; would weigh about 725 lbs., and contain about 38 lbs. of powder, making the total weight of the loaded shell about 763 lbs. Shells only 3 inches thick may be fired without danger of breaking in the gun ; they would weigh about 657 lbs. each, and contain about 48 lbs. of powder, giving the weight of the loaded shell about 705 lbs. Adopting the same method of loading as for the 15-inch gun, nine men, four at each end of the handspike, would load this gun with nearly the same facility that five did the 15-inch gun ; and seven men could load it. The charge of powder to impart the ordinary velocity to one of these shells, would be about 100 lbs. The living force of the service shell would equal that of six 10-inch solid shot, and that of the battering shell would considerably exceed that of seven 10-inch solid shot ; and the destructive effect of such shells, compared with 10 inch shot, upon iron-clad ships and floating batteries, would be in a much higher ratio ; their whole crushing force being brought to bear upon a single point at the same time, while that of the smaller shot would be unavoidably dispersed, as regards both time and point of impact. While, therefore, fully recognizing the principle that the destructive effects of projectiles upon a strongly resisting object, increases in a higher ratio than as their calibers, and having no doubt that reliable guns of larger caliber may be readily made, yet, from the fact that 20 inches is about the largest caliber that can be readily loaded and maneuvered, without resort to machinery, and because it is not deemed probable that any naval structure, proof against that caliber, will soon if ever be built, I propose 20 inches as the caliber next to be tested.

ORIGINAL EXPERIMENTS WITH SUPERHEATED STEAM.

At the meeting of the Polytechnic Association of the American Institute, on Thursday evening, April 17th, the preliminary half hour was occupied by Mr. Rowell in an experiment to demonstrate the fallacy of certain conclusions which the American Institute adopted, in 1850, from experiments of Mr. James Frost. These conclusions were, that steam at a temperature of 212° under the pressure of the atmosphere, when heated apart from water, had its volume doubled by the addition of 4° of heat, and that 12° more of heat gave an increase of an additional volume.

Mr. Frost's experiments were made with a siphon tube, the short leg of which was three inches in length, and closed at the end, while the end of the long leg was left open. He introduced a minute quantity of water into the short leg, and then filled this leg with mercury. The tube was held with the legs extending vertically upward, and the water in the short leg was of course raised by the mercury to the upper and closed end of the leg. The tube was now placed in a bath of salt water—a saturated solution, the temperature of which is 228°. The water in the tube was converted into steam which forced the mercury up the long leg of the siphon, and as long as the steam continued to be generated in quantity more than sufficient to fill the short leg, the excess was forced around the bend of the siphon and escaped through the column of mercury in the long leg.

It was supposed by Mr. Frost and the committee of the Institute that all of the water in the tube was necessarily converted into steam, as it was subjected to a temperature of 228°, while the pressure was only three inches of mercury in addition to that of the atmosphere.

He now placed the tube in a bath of pure water, boiling, when the three inches of steam was reduced to one inch, and with this inch of steam, thus prepared, his experiments were conducted. By placing the tube in a bath of salt water of such strength that it would boil at a temperature of 216°, the one inch was increased to two inches, and by inserting it in the saturated solution at 228°, it was expanded to three inches.

From this experiment Mr. Frost drew the apparently manifest conclusion that steam of 212°, heated apart from water, had its volume doubled by the addition of 4° of heat, and trebled by the addition of 16° of heat. From this law he pointed out the enormous value of superheated steam.

Mr. Frost's experiments having been recently repeated before Mr. Isherwood, Mr. Rowell and others, the suspicion was excited that there was water in the tube together with the prepared inch of steam, and Mr. Rowell devised a modification of the experiment to test this point.

His first plan was to introduce just enough water to make an inch of steam in the tube at the atmospheric pressure. By exceedingly careful measuring and weighing he obtained the proper quantity of water in a delicate glass bulb, which he pushed down through the mercury into the short leg of the siphon. It was here evaporated at 212°, and then the tube was placed in the bath of 216°. But this steam was not doubled by the addition of the 4° of heat. It was expanded only to the extent corresponding to Guy Lussac's law. The same result followed its immersion in the saturated solution of 228°.

Subsequently a different plan was adopted for obtaining just an inch of steam in the tube to experiment with. The tube was placed in the saturated solution in nearly a horizontal position—the open leg being slightly inclined upward—and the boiling was continued until a very little more than an inch of steam remained. On placing the tube now in the bath of pure water, the steam filled just one inch, and on heating this steam to 216° and to 228°, its volume was not doubled and trebled as in Mr. Frost's experiments, but was simply expanded in accordance with the well-known law of the expansion of gases, by which their volume at 32° is doubled by the addition of 480° of heat.

From these experiments Mr. Rowell comes to the conclusion that Mr. Frost had water in his tube, and that the great increase of volume which took place in his steam resulted from the evaporation of this water.

RECENT AMERICAN INVENTIONS.

Letter Box.—This invention relates to a new and improved letter box of that class which are attached to lamp posts, or other convenient fixtures in streets, to receive letters for the general post office. The object of this invention is to obtain a box which will admit of the letters being deposited in it with great facility, and from which they cannot be surreptiously abstracted, and still be exceedingly simple in construction, not liable to get out of repair, nor capable of being choked or clogged, so as to be rendered inoperative, by the insertion of packages or parcels of large size. Invented by J. W. Brown, of New York city.

Mattress.—The object of this invention, patented to E. F. Bassett, of Seymour, Conn., is to prevent the mattress being matted down or crushed by constant use in one place on its surface, and keep it of a uniform thickness the whole length. The invention consists in making the mattress endless in such a manner that its surface can be changed or moved along every time the bed is made up, or as often as may be required, thus presenting a different place in the surface for the body to rest upon, and keeping the bed of a uniform thickness the whole length.

Ticket Recorder for Railroads.—This apparatus consists of a ticket receiver, register and indicator, so constructed and arranged that with the assistance of a special form of tickets an accurate account may be kept of the number of passengers carried over a road, with the distance traveled and the fare paid by each. The invention operates with unfailing accuracy, and its use involves no additional labor or expense, and causes no inconvenience to the passengers. It thus supplies a want long and seriously felt by railroad men, effectually preventing all fraud against the company on the part of its employés. Patented to E. R. Brown, 413 West Madison street, Chicago, Ill.

Mode of Discharging Vessels.—The principal object of this invention is to provide a convenient means of discharging large vessels used in manufacturing purposes, of either hot or cold liquids. On the first day of April, 1862, the same inventor obtained Letters Patent for the use of a movable cover and attached pipe for discharging vessels by the pressure of steam generated from the liquids within the vessels, but that invention is only applicable for the discharge of liquids while in a boiling condition. This invention consists in the attachment of such a cover and pipe by means of hollow arms or branch pipes to a main pipe for the supply of steam or compressed air above the surface of the liquid in a vessel from a boiler, compressing apparatus or reservoir, the said main pipe being so arranged relatively to the vessel, and the connections of such hollow arms or branch pipes with main pipe being of such character, or the portion of the main pipe to which the said arms or branch pipes are connected, being so arranged and applied as to permit the opening and closing of the cover without disconnecting it from the main pipe or disturbing its connections therewith. By this means the vessel may be discharged of liquids in a cold or merely warm as well as in a boiling condition. Invented and patented by Abel Brear, of Saugatuck, Conn.

Excavator.—This invention consists, first, in the the employment or use of an adjustable plow, frame and caster wheel, arranged in such a way and in such relation with each other that the plow is made to work with a steady motion or movement at any angle or degree of inclination, thereby enabling the machine to operate equally as well in deep cuts, where the plow has a considerable inclination, as in cuts near the surface, where the inclination is but slight. The invention consists, second, in the employment or use of a cutter wheel, constructed in skeleton form and placed in an adjustable frame and used in connection with an endless metallic carrying belt, also peculiarly constructed, and also used in connection with a metallic pressure belt, the above-named parts being so arranged and placed in such relation with each other and the plow that the earth will be cut in slices, carried up in a moving box and in an unbroken solid state to the top of the coulter wheel and on the metallic carrying belt—the latter being operated solely by the coulter wheel in connection with the pressure of the carrying belt itself, which forms the tread or periphery of the coulter wheel. The invention consists, third, in the employment or use of an elastic moldboard arranged relatively with the share of the plow, supplemental pressure belt, coulter wheel and carrying belt, so that the dimensions of the elevating and moving box, above referred to, may be expanded or contracted to conform to the bulk of its contents, and ensure at all times a pressure upon the same sufficient to ensure its elevation; all undue pressure at the same time being avoided. The invention consists, fourth, in a novel arrangement of chains and springs, for the purpose of driving or operating the pressure belt and regulating the pressure thereof; the proper moving of the pressure belt being always ensured, and at the same time time any undue pressure of the same on the ascending slice of earth prevented. The invention consists, fifth, in the employment or use of adjustable coulters and shares applied to the machine and arranged for the purpose of widening ditches or trenches while being cut or formed thereby, obviating the friction which would otherwise be produced in consequence of the earth at each side of the ditch or trench being in contact with the sides of the machine. The invention, consists, sixth, in the employment or use of an adjustable-discharging spout and a rotary pulverizer, so constructed and arranged that the raised earth just previous to its discharge from the machine is pulverized and rendered capable of being discharged upon the ground in lines or ridges at varying points from the edge of the ditch or trench, as may be desired. E. H. Williams, of Clermont, Iowa, and D. R. W. Williams, of Werner, Wis., patentees.

Car Wheel.—This invention consists in a novel way of bracing the hollow-chilled tire or rim, whereby the same will be effectually prevented from crushing on the tread, as is now frequently the case with many kinds in use; the invention at the same time admitting of being cast with a perfect chill of uniform depth. The invention also consists in a novel and improved manner of securing the hollow tire or rim to the body of the wheel, whereby the work aforesaid may be readily performed and in a very secure manner. The invention also consists in combining with the hollow-chilled tire or rim cast-metal wheels having a hollow hub and arms, whereby great strength, with lightness, or a moderate weight of metal, is obtained. The merits of this invention are due to George G. Lobdell, of Wilmington, Del.

Telegraph Sounder.—This invention relates to telegraphs in which a local circuit is used. Its object is to reduce the expense of the local battery, and to this end it consists in the substitution for the spring commonly applied to the lever of the sounder or register, of an electro magnet, which is brought into operation by the recoil movement of the armature of the relay magnet. J. C. Smith, of New York city, inventor.

Statistics of Human Life.

The total number of human beings on earth is now computed in round numbers at 1,000,000,000. They speak 3,064 now known tongues, and in which upward of 1,100 religions or creeds are preached. The average age of life is 33⅓ years. One-fourth of the born die before they reach the age of 7 years, and the half before the 17th year. Out of 100 persons only six reach the age of 60 years and upward, while only one in 1,000 reaches the age of 100 years. Out of 500 only one attains 80 years. Out of the thousand million living persons 330,000,000 die annually, 91,000 daily, 3,730 every hour, 60 every minute, consequently one every second. The loss is, however, balanced by the gain in new births. Tall men are supposed to live longer than short ones. Women are generally stronger proportionately than men until their 50th year, afterward less so. Marriages are in proportion to single life (bachelors and spinsters) as 100 : 75. Both births and deaths are more frequent in the night than in the day. One fourth of men are capable of bearing arms, but not one out of 1,000 is by nature inclined for the profession. The more civilized a country is the more full of vigor, life, and health are the people. The notion that education enfeebles and degenerates the human frame is not borne out by fact.

LIEUT. WHIPPLE, in his memoir of travels in California, states that there is a spring of cool, sweet water in San Diego county, not far from the desert, which has no power of quenching thirst.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING APRIL 15, 1862.

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 2, 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.

34,933.—William Ackerman, of Flint, Mich., for Improvement in Machines for Cutting Trees and Logs:

I claim the combination of the crank shaft, H h, gear wheel, I, sliding frame, C c E F, ribbed shaft, D, and rotary cutter, G, constructed, arranged and operating substantially as and for the purposes explained.

[In this machine cutters having a continuous rotary motion are employed to fell trees or sever logs. The cutters are advanced automatically, at a speed which may be varied to suit the requirement of different kinds of timber.]

34,934.—M. L. Baker, of Mannsville, N. Y., for Improvement in Machines for Gathering and Binding Grain:

I claim the arrangement of the bar, B, and teeth, e, passing through said bar, with the head, C, link, f, treadle, D, curved bars, E, and frame, A, as shown and described.

[The object of this invention is to expedite the raking up and binding of cut grain into sheaves from the swath. The invention consists in the employment or use of an adjustable rake and stationary bars, placed on a hand-wheel frame, and so arranged as to effect the desired result. The inventor's present address is Adrian, Lenamee county, Michigan.]

34,935.—E. F. Bassett, of Seymour, Conn., for Improved Mattress:

I claim an endless mattress, B, constructed substantially as shown and described.

34,936.—Wm. Boynton, Jr., of Auburn, N. Y., for Improvement in Churns:

I claim the stationary shaft, A, in combination with the double arms, e e, the revolving shafts, k k, and the cross bars, h h h h, operated as fully set forth and described.

34,937.—J. R. Bradley, of Ironton, Ohio, for Improvement in Converting Cast Iron into Wrought Iron and Steel:

I claim the use of the several substances set forth in the foregoing specification, substantially in the order, manner and relative qualities set forth, for the purpose of more effectually and thoroughly converting cast iron into malleable iron or steel, as stated respectively.

34,938.—J. W. Briggs, of Cleveland, Ohio, for Improved Stitching Machine:

I claim the combination of the eye-pointed needle, A, the vibrating arm, C, strap, D, and treadle, with a feed mechanism, when the several parts are constructed and arranged as described, and for the purposes set forth.

34,939.—E. R. Brown, of Chicago, Ill., for Improvement in Ticket Recorders:

I claim the combination of the hand rod, a, drum, g, index, l, bell, v, and ticket receiver, c c2, or their equivalents, constructed, arranged and operating substantially as and for the purposes set forth.

34,940.—J. W. Brown, of New York City, for a Letter Box:

I claim, first, The valve, F, in combination with the chamber, E, cylinder, D B, and semicylinder, C, the cylinder being provided with the openings, a b, and all arranged for joint operation, as and for the purpose set forth.

Second, The toothed or serrated edge, n, of the opening, a, of cylinder, B, when used in connection with the semicylinder, C, and cylinder, D, provided with the chamber, E, and valve, F, for the purpose specified.

34,941.—Hiram Burk, of Mineral Point, Ohio, for Improvement in Mining Drills:

I claim, first, The combination of post, A, drill, C, and its rocking and feeding journal, D, substantially as set forth.

Second, The combination of the holding cap or head piece, E, screw drill, c, with its rocking and feeding journal, D, with the post or stand, A, said parts being arranged to operate in relation to each other, as and for the purposes set forth.

34,942.—W. B. Burns, of East Saginaw, Mich., for Improvement in Sawmills:

I claim the vertical rods, G G, and gibs or cross pieces, H H′, connected and arranged as shown, to form the saw gate or sash, in combination with the two carriages, L L, and the adjustable gang saws, I, placed at each side of the gate and fitted in the gib, as shown, for the purpose set forth.

[This invention relates to an improvement in that class of sawmills or sawing machines, which are provided with reciprocating saws, and designed for sawing lumber direct from the rough log. The object of this invention is to obtain a machine of the class specified, which will admit of two logs being sawed simultaneously, one at each side of the saw gate or sash, so that the superior and indifferent qualities of stuff contained in each log may be sawed therefrom, and kept assorted or separate from each other, and stuff of different thicknesses also be sawed from one and the same log by a plurality of saws.]

34,943.—Charles Chinnock, of Brooklyn, N. Y., for Improvement in Beer Measures:

I claim, first, The use of a float, to separate the liquid from the foam, in combination with a beer measure, substantially as described.

Second, The application of an index to the float in the same combination by which the quantity of liquid in the can is accurately indicated and measured, independent of the froth.

34,944.—W. A. Clark, of Bethany, Conn., for Improvement in Bullet Molds:

I claim the mode of operating the cut off of bullet molds, made to slide longitudinally by a lever, substantially as and for the purposes set forth.

34,945.—S. S. Crocker, of Lawrence, Mass., for Improvement in Machinery for Cleansing Paper Pulp:

I claim the combination of the large and small receptacles, arranged to operate together, substantially as and for the purpose specified.

34,946.—John Dillingham, of Turner, Maine, for Improvement in Wood-saw Frames:

I claim the combination and arrangement of the dogs or catches, K L, with the double saw frame, when constructed and operated, in the manner and for the purpose specified.

34,947.—Joseph Ditto, of New York City, for Improved Water-proof Coating for Cloth, Felt, &c.:

I claim combining india-rubber and the residuary gum, separated from stearine, to form a water-proof coating, for the purposes described.

34,948.—F. N. DuBois, of Chicago, Ill., for Improved Machine for Amalgamating Gold:

I claim, first, The conical feed valve, C, with its attached water pipe, 1, substantially as described and for the purpose set forth.

Second, I claim the swinging vibratory sluice, D, possessing the distinctive feature of its being swung upon the center, from which the bottom of the sluice is struck, substantially as described and for the purpose set forth.

Third, I claim the use of conical feed valve, C, and sluice, D, in combination with the cylinder, A, for the purpose of completing a new and useful process in amalgamating gold, substantially as described and set forth.

34,949.—W. H. Dutton, of Utica, N. Y., for Improvement in Skates.

I claim, first, A skate provided with a runner, A, having its bottom or face of convex form, a transverse section of which is a section of a circle, and provided with longitudinal blades or edges, a, at a suitable distance apart, and extending its whole breadth or width, substantially as described.

Second, The pawl or hold fast, C, applied to the skate, substantially as shown and described, to operate as and for the purpose set forth.

34,950.—C. S. James, of Providence, R. I., for Improvement in Expanding Sabots for Hot Shot:

I claim the making of a case for firing hot shot, with an expansible packing ring, or the equivalent thereof, in combination with a cavity, or the equivalent thereof, at the forward end, so that it can be connected with a hot shot, substantially as and for the purpose specified.

34,951.—A. A. Freeman, of Philadelphia, Pa., for Improvement in Portable Sewing-thread Spool Holders:

I claim a portable spool holder, consisting of the attaching pin, f4, the spring stem, f4, the spring plate, d, and arm, e, the same being arranged and combined together, substantially in the relation to each other described and set forth, for the purpose specified.

34,952.—Carlos French, of Seymour, Conn., for Improvement in Corrugated Spiral Car Springs:

I claim a car or carriage spring wound into a spiral form, and having corrugations running in the direction of the spiral, said corrugations being formed in the plate in advance of the winding, by which means I produce a much lighter spring, without detracting from its strength, substantially as described.

34,953.—Conrad Furst, David Bradley and John Lacey, of Chicago, Ill., for Improvement in Horse Rakes:

We claim the slide and socket, M and P, arranged in combination with the rake head and axle, in the manner and for the purpose specified.

34,954.—Curtis Goodwin, of New Brunswick, N. J., for Improved Cord Winder:

I claim the post, with gudgeon and cap, made with a tapering square, so as to adjust itself to a variety of sizes of balls or rolls of twine, rope and cordage, substantially as set forth in the specification and drawings.

34,955.—J. S. Gage and P. D. Beckwith, of Dowagiac, Mich., for Improvement in Seeding Machines:

I claim, first, The lever, G, slotted plate, O, fulcrum pin, a, pin, n, vibrating lever, E, connecting rods, d d, friction arms, b b, friction rollers, c c, with the cam surface, J, and driving wheel, B′, when combined and arranged to operate in the manner and for the purpose set forth.

Second, Forming the ends of the hub, m, of each furrow wheel of unequal diameter, and having the small end of the hub of one wheel fitted to work within a recess in the large end of the hub of the adjoining wheel, in combination with the axle, C, substantially as described, for the purpose set forth.

[This invention consists in a novel device for throwing the seed-dropping apparatus in and out of gear; also, in forming the ends of the hub of each furrow wheel of unequal diameter, and having the small end of one fitted to work in an annular recess in the large end of the hub of the adjoining wheel, whereby any dirt which may be lifted by the wheels is prevented from falling into the bearings of the same, and a great saving is thereby effected in the cost of keeping the machinery in repair, and in the power required to operate the same.]

34,956.—I. M. Harshbarger, of Brandonville, Va., for Improvement in the Manufacture of Soap:

I claim the employment or use of gum ammoniac and burnt copperas, when the same are mixed together with borax, spirits of hartshorn, sal soda, water, and ordinary hard or soft soap, substantially in the manner and for the purpose shown and described.

[This invention consists in the employment or use of burnt copperas and gum ammoniac, in about equal quantities, in combination with hard white soap, sal soda, spirits of hartshorn, borax, alcohol and water, in varying proportions, for the purpose of producing toilet soap, or for the purpose of doubling the quantity of common lye soft soap.]

34,957.—John Haworth, of Manchester, England, for Improvement in Street Railways:

I claim the employment, in combination with each other of the flat-grooved central rail, c, the adjustable guide wheel, C, running within said rail, and the flat rails, a a, as shown and described.

[This invention consists in the laying down of three lines of rails, the center one having a groove in which a perambulator or guide wheel attached to the car runs, and thereby keeps the main wheels of the car upon the two outer rails, which are flat and flush with the pavement or roadway. This track offers no obstacles to ordinary traffic.]

34,958.—John Heaton, of Flushing, N. Y., for Improvement in Raising or Lifting Weights:

I claim, first, The lever, A, formed of two parts, a b, connected by a joint, B, arranged as shown, to admit of a rope, E, passing through it, and to clamp the rope as the lever descends, and to release the rope and slip over it, as the lever is raised, for the purpose specified.

Second, The combination of the lever, A, rope, E, upright, C, and base plate, D, all constructed and arranged for joint operation, as and for the purpose set forth.

[The object of this invention is to obtain a simple and economical device to assist in raising or lifting weights; one which may be readily applied to its work, be portable, and adapted for general or common use among mechanics, farmers, &c., and where the cumbersome and expensive machines constructed for such purpose would be impracticable.]

34,959.—Daniel Heilig, of Nebraska City, Nebraska Territory, for Improvement in Stoves:

I claim the combination, with a stove and furnace, constructed and operated as described, of the metal coils shown in Fig. 9, the concentric boilers, with their steam pipes, shown in Fig. 5, the water reservoir, D, and the baker, as shown in Fig. 6, the whole being combined and operated together, substantially as set forth.

34,960.—R. C. Helm, of New Brunswick, N. J., for Improved Method of Producing Diagonal Cloth:

I claim the method described of preparing or producing what is known as diagonal cloth, or cloth in which the threads of the warp and weft are caused to occupy a position diagonal to each other, by the use of two rollers, one of which is placed obliquely to the other, or by the use of two parallel rollers, when the cloth passes from one to the other, in an oblique direction, substantially in the manner described.

34,961.—Selah Hiler, of Harlem, N. Y., for Improvement in the Manufacture of Gun Barrels:

I claim manufacturing barrels for muskets, rifles, or other hand firearms, of iron or steel, by the combined operations, substantially as specified.

34,962.—Daniel Holmes, of Chelsea, Mass., for Improvement in Rolling or Frictionless Journals:

I claim, first, The enlarging of the ends of the rollers, C C′ C C′, so that the velocity of their peripheries shall be just sufficient to secure a rolling motion on the inside of the flanges, D D′.

Second, The combination of the flanges D′ D, and the enlarged ends of the spool from rollers, C C′ C C′, to secure rolling motion, by means of which the principal rollers, B B′ B″, &c., are held in place, substantially as and for the purpose set forth.

34,963.—W. H. Hoyt, of Bethel, Conn., for Improvement in Apparatus for Felting Hats:

I claim, first, The adjustable endless apron, B, and pressure or feeding plate, K, with or without roller, Q, in connection with a rubbing cylinder or rotary rubber, S, arranged for joint operation, substantially as and for the purpose set forth.

Second, The peculiar construction of the rubbing cylinder or rotary rubber, S, as shown and described, to wit, having plates, k, of segment form, hinged to flanches, m, or their equivalents, on a rotary shaft, and acted upon by springs, n, in order to give the necessary pressure intermittingly to the hat body, as set forth.

Third, The combination of the inclined board or chute, T, with the adjustable apron, B, rubbing cylinder or rotary rubber, S, and pressure or feeding plate, K, as and for the purpose specified.

[This invention consists in the employment or use of an adjustable endless apron, feeding plate and a rotary pressing or rubbing cylinder, placed within a suitable box or case, and so arranged that hat bodies may be felted and shrunk to the desired dimensions in a very perfect manner, and with but trifling labor on the part of the attendant.]

34,964.—H. C. Hutchinson, of Cayuga, N. Y., for Improvement in Lamps:

I claim the device of a perforated guard or screen, to be placed upon or within the central flue of a kerosene lamp, by which the lamp is better enabled to hold the flame.

34,965.—C. T. James, of Providence, R. I., for Improvement in Sabot for Explosive Shells:

I claim a case for firing spherical shells, which case is formed with a cavity in the forward end for receiving and holding the shell, and provided with expansible packing on its periphery, to be expanded by the force of the discharge, in combination with a hole or holes, or equivalent passage through from the cavity for the shell, to and through the rear end, all substantially as and for the purpose described.

34,966.—A. S. Jones, of Joliet, Ill., for Improvement in Mill Stone Picks:

I claim the head, B, having recesses, b, in the upper or outer surfaces of its lips, a, the spring, E, strap, C, provided with the screw, D, or its equivalent, and the cutters, F, provided with the projections, h, at their inner ends, all being combined and arranged substantially as and for the purpose set forth.

[This invention relates to an improvement in that class of mill-stone picks in which adjustable cutters are inserted in heads or handles. The object of the invention is to obtain a head or handle which will admit of very thin cutters being employed and securely fastened in position, whereby the pick may be kept in perfect working order with very little trouble, and a far more durable and economical implement obtained for the purpose than any hitherto constructed.]

34,967.—George Jones, of Peekskill, N. Y., for Improved Window Sash Adjuster:

I claim the combined application of the curved metallic spring, rod and gage, constructed in grooves in the sides of the window sash, to the moving and adjusting of the sash within the frame, by means of which both the upper and lower sash may be moved up and down in the frame at pleasure.

34,968.—C. L. Kelling, of Mechanicsburgh, Pa., for Improvement in Coffee Roasters:

I claim the sliding legs, s, in combination with the hasps, a′, projections, t′ t2, and cylinder, a, substantially in the manner and for the purpose specified.

I claim, in combination with the cylinder or vessel, a, and its bottom, p, the enlarged rim, q, having ventilating passages, r, therein, in the manner and for the purpose set forth.

34,969.—Solomon Kepner, of Pottstown, Pa., for Improved Paddle Wheels:

I claim the combination of the pivoted buckles, G G′, latches, I I′, cam, J, and pins, H K L M, arranged and operating in the manner and for the purposes set forth.

[An illustration and description of this invention will shortly appear in our columns.]

34,970.—G. F. Kolb, of Philadelphia, Pa., for Improvement in Camera Obscuras:

I claim a box, A, of any suitable form with the lens tube, B, on one side and the eye tube, K, on the opposite side in combination with the two reflectors, G and F, arranged in respect to each other and to the eye and lens tube, substantially as and for the purpose set forth.

34,971.—T. S. Lambert, of Peekskill, N. Y., for Improvement in Military and Civic Bed Frames:

I claim, first, The combination of the elastic bands, x, with the non-elastic bands, P, substantially as set forth.

Second, The application of the buckles, S, in combination with the bands, for the purpose of regulating their position and condition, substantially as set forth.

Third, The construction and application of the cross pieces, B C, and the plates to which they are attached, substantially as set forth.

Fourth, The mode of varying and fastening the head supports and legs in position, in combination with the frame, substantially as set forth.

34,972.—G. G. Lobdell, of Wilmington, Del., for Improvement in Cast-metal Car Wheels:

I claim, first, Securing the tire or rim, B, to the rim, c, of the wheel, A, by means of the bolts, g, passing through the rim, c, and the inner periphery of the tire or rim, B, and having holes, j, made in the sides of the tire or rim, B, to turn the nuts, i, as set forth.

Second, Counterbalancing the wheel by pouring metal, lead or other suitable metal into the chamber, e, when said metal counterbalance is used or employed with the braces, f, arranged as set forth.

Third, The combination of the hollow wheel, A, and the hollow tire, B, when both are constructed, arranged and secured together, as and for the purpose set forth.

34,973.—A. J. Luckey, of Bradford, Wis., for Improvement in Machines for Cutting the Bands of Grain:

I claim the circular metallic disk, C, having its periphery cut in the form shown and described, when used in combination with the tubular sleeve or guard, B, in the manner and for the purposes set forth and described.

34,974.—Alexander McFarlane, of South Genesee, Wis., for Improved Device for Cutting Marshy Land:

I claim the oblique cutter bars, bb, arranged substantially as shown to admit of the adjusting of the cutters, C, in a vertical and in an oblique position, for the purpose set forth.

[This invention consists in having cutters or teeth attached to a suitable frame so constructed and arranged that the cutters or teeth may be adjusted to work in both a vertical and an inclined position, and the surface of boggy or marshy land, thereby cut so as to render it permeable to air and susceptible of cultivation for the growth of plants or crops.]

34,975.—A. McKissick, of Jordan, N.Y., and C. M. French, of Weedsport, N. Y., for Improved Apparatus for Renovating Feathers:

We claim, first, The combination of the rotating feather receiver, A, of polygonal or other form, in combination with the central steam tube, B, tubular journals, C C′, steam eduction tubes, G, provided with the perforated distributing cylinders, H, and the valves, E E′, arranged for joint operation, substantially as and for the purpose set forth.

Second, The tubular plug, g, and close plug, h, when used in connection with the steam tube, B, and with or without the valves, E E′, for the purpose specified.

Third, The waste tubes, F F, applied to the steam tube, B, as shown, in relation with the feather receiver, A, for the purpose set forth.

[This invention consists in the employment or use of a rotating feather receiver of polygonal or other form, in connection with a steam pipe provided with valves and induction pipes, and fitted in and arranged with the receiver in such a manner that the feathers may be cleansed with great facility and in a thorough manner, and afterward expeditiously and perfectly dried.]

34,976.—H. C. Nicholson, of Mount Washington, Ohio, for Improved Cover for Fruit Jars :

I claim the arrangement of beveled neck, B b, cover, C, ears, D d, ring, F, and a suitable gasket, the whole being combined and operating substantially as described.

34,977.—Wm. Ostrander, I. D. Reeder and Joseph Corduan, of Brooklyn, N. Y., for Improvement in the Construction of Ordnance :

We claim constructing a cannon by winding wire around a tube which has a breech piece inserted and binding the whole together by casting metal upon it, in the manner and for the purposes substantially as set forth.

34,978.—R. L. Peabody, of New York City, for Improvement in Watches :

I claim the combination of the unlocking pin, e, with the prongs of the lever, and of the impulse pin, d, with the notches in the roller, in the manner and for the purposes substantially as set forth.

I also claim the manner of securing the hair spring to the regulator by means of the fixed and sliding pieces, m and n, between which it may be firmly clamped, as set forth.

I also claim the use or employment of the cylindrical and self-adjusting stud, k, when said stud is secured upon the under side of the cock of the balance, in the manner substantially as set forth.

I also claim constructing the staff by making it in two parts, upon one of which the roller, &c., is fitted, and upon the other the pins are turned, for the purposes and in the manner substantially as described.

I also claim the supplementary shaft, s, in combination with the gear of the center shaft for setting the hands, as set forth.

34,979.—Christian Peters, of Wadsworth, Ohio, for Improvement in Shells for Ordnance :

I claim the described construction of ordnance projectiles, the same being charged with leaden bullets, as specified, and provided with an interior magazine of powder, by which the projectile itself is instantly exploded after the discharge of the bullets, as set forth.

34,980.—Abiel Pevey, of Lowell, Mass., for Improvement in Casting Gas Retorts :

I claim the flask constructed as described, when combined with the carriage or truck and its arm, J, and brace, L, pins, K and O, or their equivalents, in the manner described, for giving all the required movements and positions to the flask, with the greatest ease and precision, for the purposes fully set forth.

34,981.—James Platt, of Utica, N. Y., for Improvement in Rotary Engines :*

I claim the arrangement, in combination with the rotating cylinder, the stationary abutment head, and hollow stationary shaft, E, of the two-branched induction and eduction pipes, Q q q' and R r r', and cocks, q* q'* and r* r'*, communicating with the separate passages, m m', of the hollow stationary shaft, all substantially as and for the purpose set forth.

[This invention relates to that class of rotary engines in which the cylinder rotates about a stationary abutment head arranged within it. It consists in a novel arrangement of induction and eduction pipes and passages to provide for the rotation of the engine in either direction.]

34,982.—J. L. Race, of Port Washington, Wis.. for Improvement in Mode of Sustaining and Protecting Couplings of Shafting :

I claim the box, B, fitted within the case, A, and resting on the adjustable support, b, and slide, h, all being combined and arranged substantially as and for the purpose set forth.

[In many machines jointed sheets or rods, which have a rapid motion, are exposed at the outer side, and the knuckles or joints are very liable to catch the clothes of the attendants, and frequently serious accidents occur by persons being drawn in contact with the working parts of the machine. This invention is designed to obviate this difficulty.]

34,983.—G. G. Ray, of Boston, Mass., for Improvement in Pen Holders :

I claim my improved pen holder as made with a metallic or non-elastic guard, C, arranged between the handle, A, and the elastic or rubber pen supporter, B, the whole being constructed and applied together, as and for the purpose set forth.

34,984.—Joseph Ridge, of Richmond, Ind., for Improvement in Coal Oil Lamps :

I claim, first, The mechanical device, M, constructed substantially in the manner and for the purpose set forth.

Second, I claim the diaphram, D, made and applied as described.

And, third, I claim the combination of the device, M, diaphram, D, and short chimney, C, constructed and arranged substantially in the manner shown in Fig. 1, and for the purpose described.

34,985.—H. C. Sergeant, of Cincinnati, Ohio, for Improvement in Gas Regulators :

I claim the application of an adjustable screw, placed in one end of the key of a gas cock, so arranged as to control the amount of opening in the key, as specified.

34,986.—Wm. H. Seymour and Aaron Palmer, of Brockport, N. Y., for Improvement in Rakes for Harvesters :

We claim, first, The combination in an automatic rake, for a harvesting machine of the following elements, viz., 1st, a post or standard capable of turning freely in its bearings ; 2d, an arm secured rigidly to the post and capable of traversing only in a plane perpendicular to it ; 3d, a stationary cam on said arm ; 4th, a rake head capable of revolving freely around said arm in a plane perpendicular to it ; 5th, a roller carried by the arm to which the rake head is attached and capable of yielding freely in its bearings to traverse over the stationary cam and hold the rake head in the proper position ; 6th, a tripping lever upon the rod which carries the rake head, and, 7th, suitable stops or detents upon the front and rear of the platform, to raise and depress the rake at the proper moment, the whole operating substantially in the manner described.

Second, The combination of the stationary cam, h, upon tha end of the vibrating arm which carries the rake with the yielding roller, i, upon the rake rod when operating, substantially in the manner described, for the purpose of holding the rake head up during its forward movement, and of pressing it down firmly upon the grain when raking off.

Third, The combination of the stationary cam, h, the yielding roller, i, and the tripping lever, I, substantially in the manner and for the purpose specified.

Fourth, The combination of the yielding roller, i, with the rake rods, I, as described, for the purpose set forth.

34,987.—Christian Sharps, of Philadelphia, Pa., for Improvement in Metallic Cartridge :

I claim the metallic cartridge case composed of the hollow cylinder, A, with a base, a, of such a strength as to effectually resist the shock to which it is subjected, and of such a thickness that an orifice may be formed in the solid metal of the base for the reception of the detonating compound, and a rod or wire for exploding the same, as set forth, for the purpose specified.

34,988.—J. C. Smith, of Troy, N. Y., for Improvement in Sewing Machines :

I claim the fingers, R, stirrup, v, spool box, B', and spool, W, in combination with feed bar, S, arms, T U p, cam, r, on cross-head, Q, needle, f, and sewing plate, C', arranged in the manner and operating for the purposes fully described and shown.

34,989.—J. C. Smith, of New York City, for Improvement in Electro-magnetic Telegraphs :

I claim the employment, in combination with the lever, C, of the sounder or register, of a second electro-magnet, F F, which is brought into action by the recoil of the armature of the relay magnet, substantially as and for the purpose specified.

34,990.—James Spear, of Philadelphia, Pa., for Improvement in Ash Sifters :

I claim the combination of the ash sieve, A, drawer, B, box, C, with the removable frame, D, when applied to the hearth of a stove, and constructed to operate substantially as described.

34,991.—C. D. Stevens, of Mendota, Ill., for Improvement in Apparatus for Evaporating Saccharine Juices :

I claim the arrangement and construction of the boiling and evaporating pans in relation to each other and to the steam boiler, C, substantially in the manner described.

34,992.—J. W. Sykes, of Chicago, Ill., for Improvement in Floating Grain Elevators and Dryers :

I claim combining with an elevating apparatus arranged upon a scow or other floating vessel, an interposed drying apparatus (Wheeler's patent of October 23, 1860, or any other), the whole forming a floating grain dryer and elevator capable of transferring grain from one vessel to another, or from a vessel to a storehouse, or vice versa, and of drying the grain while in the process of being transferred ; and the whole apparatus capable of being easily floated from one locality to another as may be required, for the purpose of elevating and drying the grain.

34,993.—A. C. Twining, of New Haven, Conn., for Improvement in Apparatus for Making Ice :

I claim, first, The combination of the following four things, or any combination substantially the same, viz., the cooling vessel, B B t t F F, the exterior liquid, in A A A, cooled by contact with the preceding, as above, the pump, C, or other equivalent means, by which the said liquid leaves A A A and returns ; also a containing vessel or vessels in which or upon whose contents said liquid is to perform its congealing or refrigerating work.

Second, I claim the employment in combination of a freezing liquid shifted progressively by means of a hose or of pipes, valves, or cocks, substantially as described, from one part to another of a trough or vat with freezing vessels contained therein, so as to create substantially what is denominated the progressive circuit of cold currents ; also, I claim the vat with its troughs, pipes, valves and cocks, such as may be necessary, or any combination or construction substantially the same for effecting that circuit.

Third, I claim the following four parts, in combination for a generator, B B t t F F, of cold, viz., the opening or pipe, S, for introducing the liquid or solution from which vapor or gas is to expand and produce the cold; the pipes, or narrow compartments, t t t, down which the above is to flow by gravity, in thin sheets of liquid; the lower compartment, F F, opening into the pump, D, for removing residuum, and the exterior liquid, in A A A, cooled and made to circulate, all substantially as described.

34,994.—Allen Walton, of Philadelphia, Pa., for Improvement in Apparatus for Mixing Gases :

I claim combining a chamber, or reservoir, A, with Cutchett's Patent Gas Meter, the said chamber being so situated that both the air and gas must pass into and be mixed intimately together, in the said chamber prior to escaping to the distributing pipes.

34,995.—W. A. Wood, of Hoosick Falls, N. Y., for Improvement in Harvesters :

I claim uniting the extension bar to the shoe by means of a socket and pin, so as to underlie the finger bar, that is also united to said shoe, substantially as described.

I also claim the tongue plate, T, provided with a sleeve, k, and sockets, l l, or seat supports, cast in one piece, as described and represented, and for the purpose stated.

34,996.—R. V. De Guinon, of Hudson, N. Y., and G. W. Barclay, of Brooklyn, N. Y., assignors to J. A. Newbould, of New York City, for Improvement in Presses :

First, The bending device, Fig. 10, the shank, 8, being made fast in the plunger, D', Fig. 2, by means of the pin, 12, and having a spiral spring, 3, or its equivalent, working on and around the shank of the fixed bender, 8, and pressing against the bottom of the plunger, D', to keep the movable part of the bender, E E, parallel to the bottom of the fixed bender, 8, except when bending the middle of the blank, and working in combination with the blank carrier, F, and bending bar, H, as substantially set forth.

Second, The bending bar, H, and blank carrier, F, working simultaneously with each other, and in combination with the bending die, 19, the whole being constructed and arranged and operated, as substantially described.

Third, We claim the air chambes, 41, in the bolster, A, Figs. 13 and 17, the small holes, 42, being drilled through the partition, 17, for the purpose of drawing the blank down upon the said partition, by means of an exhaust pump, or its equivalent, as specified

34,997.—D. R. Fraser (assignor to himself P. W. Gates and Thomas Chalmers), of Chicago, Ill., for Improvement in Valves for Steam Engines :

I claim, first, The combinatian and arrangement of the suspended and universally-moving balance-block, E, gravitating frame or packing, D D, and platform, C, of slide valve, substantially in the manner and for the purposes described.

Second, The vertical bolt, F, with spherical seat on its lower end for suspending the balancing mechanism of the valve, substantially in the manner and for the purpose described.

Third, The combination of the vertical pins, I, with spherical ends, and the bolt, F F', and balancing mechanism, substantially in the manner described.

Fourth, The combination of the springs, bolt, F F', pins, I, and balancing mechanism, substantially in the manner and for the purpose described.

Fifth, The combination of the slotted wedge, J, inclined projection, K, connecting arm, M, retaining nuts, c c, and valve, B, substantially in the manner and for the purpose described.

34,998.—F. N. Frost (assignor to himself and Henry Haskins), of New Britain, Conn., for Improvement in Coal Sifter :

I claim the fulcrum guide, n s, door, o, in combination with a sifter, i, substantially in the manner and for the purpose described.

34,999.—A. S. Harding (assignor to himself and A. S. Dodge), of Mount Hope, N. Y., for Improvemeut in Machines for Raking and Binding Grain :

I claim, first, The rotating rake for gathering up and presenting the grain to the clamp, in combination with the clamp, when they are constructed and operated substantially as described.

Second, The combination of means recited, or their equivalents, for seizing the straw to form the band from the box, and passing it around the grain in the clamp.

Third, The combination of means, or their equivalents, for forming the band and securing it around the grain in the clamp and completing the sheaf, substantially as set forth.

Fourth, I claim the arrangement of the lever, c'', the side rod, f'', and the plate, h'', having the hole, g'', for holding the rake's shaft, as and for the purpose described.

35,000.—John Magee, of Chelsea, Mass., assignor to Norton Furnace Company, of Norton, Mass., for Improvement in Cooking Stoves :

I claim my peculiar arrangement of the ash chamber and the oven chute with reference to the hearth, the horizontal grate and the oven, the said ash chamber being constructed with an opening, and such opening being provided with one or more doors, all substantially as specified and represented.

35,001.—J. L. Jones, of St. Louis, Mo., assignor to himself and W. D. Porter, of U. S. Navy, for Improved Defensive Armor for Water and Land Batteries :

I claim, first, Metallic plates, as the defensive armor of ships and land batteries, when the plates have a flange at the edges and have intermediate flanges, and when the plates are applied in two or more tiers or thicknesses, so as to form recesses between them also when the plates otherwise are constructed and applied, substantially as and for the purposes set forth.

Second, The combination of armor plates which have a flange at each edge, and intermediate flanges, and are applied as described, with divided elastic cushions, substantially in the manner and for the purpose set forth.

Third, The combination of two or more tiers of angle plates constructed and applied as described, with intermediate cushions, E, and foundation cushions, D, substantially in the manner and for the purpose set forth.

Fourth, The combination of elastic washer cushions, c, bolts, F, angle plates, A B, constructed and applied as described, cushions, E, and casemate or side of a vessel, substantially as and for the purpose described.

35,002.—Joseph Short (assignor to Charles Short), of Salem, Mass., for Improved Sling for Carrying Blankets and Overcoats :

As a new article of manufacture, I claim the officer's overcoat and blanket sling, as and for the purpose described.

35,003.—H. D. Walcott, of Boston, Mass., assignor to Horace Williams, of Brookline, Mass., for Improvement in Eyelet Machines :

I claim the described improved eyelet set and punch combined in the piece, E, being so pivoted to the jaw, C, that when it is revolved the punch, d, and die, f, attached thereto, will fall on different parts of the jaw, D, substantially as set forth.

35,004.—J. O. Whitcomb, of Brooklyn, N. Y., assignor to Joseph Dodin, of New York City, for Improvement in Sewing Needle Cases :

I claim a needle case having a graduated series of compartments, substantially as described. Also, in combination therewith, the plate, Fig. 3, attached to the bottom of the case, and turning on the common center, n, and having the notch, e, substantially as described.

35,005.—E. H. Williams, of Clermont, Iowa, and D. R. W. Williams, of Werner, Wis., assignors to said E. H. Williams, for Improvement in Excavating, Plowing and Grading Machines :

We claim, first, constructing the endless belts, I M O, of a series of metallic plates, o, connected together by joints formed of eyes, p, which interlock into each other and are so swaged or formed as to receive their pins, q, at the inner sides of the belt, whereby the outer surfaces of the plates will be flush with each other, and projections formed at the inner side of the belts to mesh into toothed pulleys or wheels which are driven by the belts or by which the belts are driven, substantially as shown and described.

Second, The combination of the adjustable part, D, of the frame of the machine, with the adjustable caster wheel, E, and adjustable plow, F, all arranged substantially as shown and described, for the purpose of ensuring a steady movement of the plow at any angle or degree of inclination in which it may work.

Third, The wheel, H, provided with two annular colters, l l, and two or more annular bars, m m, in connection with the endless belt, I, and endless pressure belt, M, arranged in relation with each other and the plow, F, to operate as and for the purpose specified.

Fourth, Providing the plow, F, with a yielding or elastic moldboard, i, attached to the upper end of the share, d, and arranged in relation with the belts, I M, to operate as and for the purpose set forth.

Fifth, The combination of the chains, J J h' h', connected to springs, and arranged substantially as shown, for the purpose of driving or operating the pressure belt, M, from the belt, I, and preventing the belt, M, from being subjected to any undue pressure against the ascending slice of earth, while the chains, J J, are kept sufficiently taut to ensure the perfect operation of the belt, M.

Sixth, The employment of the laterally-adjustable rotating colters, T, and shares, U, arranged and applied to the part, D, of the frame of the machine, and used in connection with the wheel, H, belts, I M, and plow, F, as and for the purpose set forth.

Seventh, The adjustable discharging spout, P, attached to the upper part of the part, A, of the frame of the machine, and in relation with the discharge end of the belt, O, as and for the purpose described.

Eighth, The rotary beater, formed of the rotating shaft, s', and beaters, u', arranged in relation with the belt, O, to operate as and for the purpose set forth.

Ninth, The combination of two endless belts, I M, when arranged relatively with each other, a wheel, H, without the colters, l l, and a plow, F, so as to serve as elevators to carry up the slice of earth as it is cut by the plow.

Tenth, The employment or use of a wheel, H, provided with annular colters, l l, when so arranged as to perform the double function of a rotary colter and a driving wheel for operating the endless belt or belts and other working parts of an excavating machine.

35,006.—Suspended.

35,007.—Abel Brear, of Saugatuck, Conn., for Improved Apparatus for Discharging Liquids from Kettles and other Vessels :

I claim the combination of the movable cover, B, and discharge pipe, C, with a steam or air pipe, D, by means of one or more hollow connecting arms or branch pipes, E E, in such manner as to effect the discharge of the vessel to which the cover is fitted by means of steam or compressed air admitted to the said vessel from the said pipe, D, through the said hollow connecting arms or branch pipes, substantially as specified.

RE-ISSUES.

1,301.—I. D. Condit, of Milburn, N. J., assignee of H. L. Randall, of Roxbury, Conn., for Improvement in Machines for Felting Hat Bodies. Patented April 21, 1857 :

I claim a concave bed for the roll of hat bodies to rest and turn in without changing place while being felted, substantially as and for the purpose specified.

I also claim, in combination with such a concave bed, the mode of operation of the felting instrument, substantially as and for the purpose specified.

I also claim, in combination with such a concave bed, and with the felting instrument, or the equivalent thereof, the means described, or the equivalent thereof, for partially resisting the rotation of the roll of hat bodies in the said bed, substantially as and for the purpose specified.

And I also claim, in combination with the concave bed and the felter, or their equivalents, the mechanism, or the equivalent thereof, for varying the degree of pressure on the roll, and for free access to the bed for putting in or taking out a roll of hat bodies, as set forth.

1,302.—Clement Russell, of Massillow, Ohio, for Improvement in Double-geared Horse Powers. Patented May 1, 1855 :

I claim, in connection with double-geared horse powers, the combined use of a center pin and moving block for allowing the drive wheel to adjust itself to the pinions with which it works, substantially as described.

EXTENSION.

5,509.—Aaron Smith, deceased, late of Bloomfield, Mich., for Improvement in Grain Separators. Patented April 11, 1848 :

First, I claim the revolving rake, constructed and operating as described, for shaking up and separating the straw and the grain, and carrying the straw through the machine.

Second, I claim the motion of the screen in combination with that of the rake, its motion being pendulous and in reverse direction to that of the rake, as described.

DESIGNS.

1,563.—A. C. Barstow, of Providence, R. I., Design for a Gas-burner stove.

1,564.—C. W. Palmer, of Troy, N. Y., Design for a Cook's Stove.

1,565.—W. W. Stanard (assignor to Jewett & Root), of Buffalo, N. Y., Design for a Stove.

1,566.—W. W. Stanard (assignor to Jewett & Root), of Buffalo, N. Y., Design for a Stove.

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.

Receipts.—When money is paid at the office for subscriptions, a receipt for it will always be given ; but when subscribers remit their money by mail, they may consider the arival of the first paper a *bona fide* acknowledgment of our reception of their funds.

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.

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 at this office. Address MUNN & CO., No. 37 Park-row, New York.

PATENTS FOR SEVENTEEN YEARS.

The new Patent Laws enacted by Congress on the 2d of March, 1861, are now in full force, and prove 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 in 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, excepting 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 testimonials 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.

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. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

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 consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees 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 little risk in sending bank bills by mail, having the letter registered by the postmaster. 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 inventio The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

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.

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 the case, inclosing the official letters, &c.

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.

Notes & Queries

E. S., of Conn.—We do not discover any novelty in your proposed plan for constructing iron-plated vessels. It appears to be substantially the same as some others described in the SCIENTIFIC AMERICAN. By referring to our back volumes you will get much valuable information on the subject.

J. G. B., of Mich.—Sal-enixum is a name which is sometimes used in England for salammoniac. A solution of two ounces of alum, two of saltpeter and one of salammoniac is used for "coloring gold." The meaning of "gilder's wax" used by some persons is unknown to us. Another pickle used for coloring gold consists of nitric acid 8 oz., muriatic acid 1 quart, salammoniac 2 oz., alum 1 oz. and water two gallons. The articles of gold are dipt in this for a few seconds then washed thoroughly in pure water and dried. Pale brassy gold may be made to assume a deep reddish shade by using such a pickle or "dip."

H. R., of N. Y.—Dr. Griscom, of this city, is the author of an illustrated work on heating and ventilating buildings.

W. T. C., of Md.—Plaster of Paris, is the common cement which is used for fastening brass burners to the glass of kerosene oil lamps, but it will not answer for cementing the broken glass of such lamps, nor are we acquainted with any cement that will do so and also resist the action of the oil.

G. W. W., of N. Y.—It has been somewhat difficult for us to arrive at the nature of your questions. We understand them to amount in substance to this "What will be the difference of discharge from your wheel into a spout 16-inches deep and as many wide (though the latter is not stated) and into a raceway 4 feet deep from the bottom of the flume? You also state that your water comes to the wheel through a gate of 144 inches area. The discharge of water from a spout is allowed to be about two-thirds of the opening in inches. As your discharge spout has an area of 256 square inches and the inlet only 144 inches, it appears to be sufficient for the discharge of all the water and there will be little or no difference between the spout and raceway. We, however, prefer a deep raceway under the flume of a turbine wheel so as to have plenty of space for the discharge water to flow away freely.

W. A., of Mass.—The solution employed to cement india rubber to leather, is india rubber dissolved in naphtha. It is not, however, suitable for cementing vulcanized india rubber to leather without first heating the india rubber. Gutta percha dissolved in naphtha also makes a good cement.

G. W. R., of Va.—A cement composed of glue, chalk and paper pulp, is sometimes used for making architectural ornaments to be attached to wood. Another cement used for the same purpose is composed of fine sifted chalk, bees-wax and resin. Use equal parts of resin and wax, then melt them and add the chalk until the composition attains the proper consistency. A strong solution of glue and whiting makes a very good cement for ivory.

T. S., of N. J.—A varnish composed of lac dissolved in alcohol and colored with turmeric, is sometimes used for coating brass to preserve it from becoming tarnished. Common sealing wax dissolved in alcohol and colored with lampblack is used to coat the inside of tubes used for microscopes and telescopes.

G. L., of Conn.—The power required to operate a trip hammer is just in proportion to the weight of the hammer, the number of strokes it makes per minute and the lift. A hammer weighing 100 lbs. making 140 strokes per minute and which is lifted twelve inches, takes an engine of about one horse power. If the lift of the hammer is 24 inches it takes four horse power, and so on in the same ratio.

J. P. H., of N. Y.—French polish is applied to wood in several coats like any other varnish. Each coat is allowed to dry, then it is rubbed down with pumice stone, and lastly, finished with fine whiting, and wiped off with a little sweet oil and a piece of silk. We can furnish you with the 3d, 4th and 5th volumes, (new series) for $1 per vol. in sheets and $1 50 bound.

H. R. T., of Conn.—We have never seen the treatise on stationary engines for railways, to which you refer.

H. G. L., of Conn.—The only work published on street railways to our knowledge is that of A. Easton, C. E., 402, Walnut street, Phila.

G. W. H., of N. Y.—We are not acquainted with any vehicle that is better than refined heavy petroleum for mixing with coal tar to be applied warm to coarse castings as a varnish.

H. B. S., of Wis.—The tincture of iodine applied to bunions is said to afford great relief. A strong solution of pearl ash applied to corns, will soften them so that they may be easily drawn out.

P. H. W., of Maine.—As there is friction of water passing through pipes or openings, we have no doubt that you would obtain a greater discharge through your draft box, by having an opening of 40 inches at the bottom than by having one of 30 inches, even if the pipe at the top remains of the same size.

Reader, of S. A., of Penn.—Tide mills are quite common ; there is a very large one near Boston and there are several on Long Island. The wheels are constructed to run either way so as to use the tide both when it is coming in and when it is going out. The objection to this power is its inconstancy.

J. F. C., of Mich.—You can easily calculate the power of your stream yourself; 33,000 lbs. of water per minute, will produce one horse power for each foot of fall, and an ordinary wheel will yield about 70 per cent of the power; a cubic foot of water weighs 62½ lbs. and you get the number of cubic feet per minute passing through your race by multiplying the velocity in feet per minute, by the area in feet of the cross section of the race. The velocity in the race depends upon so many circumstances that you had better measure it. For 4 feet stones 4½ to 5 horse power are allowed for each run.

S. P. G., of Wis.—Your plan of using mirrors for aiming cannon, has already been suggested, but the idea of having the gun aimed at the under side, and having a low iron turret to protect the head of the gunner is new to us.

J. K. W., of Kansas.—Ewbank's Hydraulics, is an elaborate treatise on the subject of water power, wheels, &c. There is great difference of opinion in regard to the best kind of water wheels.

Reader, of Mass.—Wrought iron is made from cast iron, and steel is usually made from wrought iron. Cast steel can be melted and cast, but though wrought iron may be fused, it is no practicable to make castings from it.

A. A. L., of Ill.—The motion of a machine, caused by the natural action of air—which motion would begin on exposing th machine to said action, and continue as long as the air exists, or until the machine was worn out—would not be what is termed a perpetual motion. By perpetual motion is meant the motion of a machine that generates its own power. You will find our views in full on this subject on page 353, Vol. I. (new series) SCIENTIFIC AMERICAN.

SPECIAL NOTICE—FOREIGN PATENT.—The population of Great Britain, is 30,000,000; of France, 35,000,000 ; Belgium, 5,000,000; Austria, 40,000,000; Prussia, 20,000,000; and Russia, 60,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. Nearly all of the patents secured in foreign countries by Americans are obtained through our agency. Address Munn & Co., 37 Park row, New York. Circulars about foreign patents furnished free.

Money Received

At the Scientific American Office on account of Patent Office business, during one week preceding Wednesday, April 23, 1862:—

J. F. R., of N. Y., $10; N. and B., of N. Y., $25; W. J. L., of Ind., $30; D. K., of Mich., $15; J. S., of N. Y., $15; A. I., of Iowa, $25; J. P. S., of Mich., $15; J. L. H., of Pa., $25; E. F. W., of N. Y., $25; J. D. C., of N. J., $15; G. T., of Conn., $15; H. C. R., of Pa., $30; C. L. G., of N. Y., $300; H. V. F., of Ind., $25; J. A., Jr., of Ill., $15; J. H. I., of Ill., $20; C. W., of N. Y., $45; A. K. R., of Vt., $20; A. A. P., of Mass., $20; C. T. B., of N. J., $10; E. P. R., of N. J., $20; J. R. W., of N. Y., $15; J. C., of N. Y., $28; P. P., of N. Y., $25; J. D., of N. J., $15; J. McN., of Pa., $ 0; M. M., of Ohio, $15; C. B. M., of Ill., $15; T. S., of Ohio, $30; W. D., of N. Y., $100; F. C. L., of N. Y., $15; M. H., of Iowa, $25; C. B., of Mass., $25; J. R. R., of N. Y., $15; O. L. R., of N. H., $25; A. H. and J. A. W., of Pa., $35; M. and A., of Wis., $850; G. H. H., of N. Y., $15; J. L. S., of N. J., $15; K. H. E., of Vt., $15; C. D. I., of Wis., $20; P. H., of N. Y., $20; E. B., of N. H., $57; J. N. D., of Iowa, $20; C. E. R., of N. Y., $20; J. H. C., of Pa., $20; J. H. B., of N. J., $35; C. A., of N. Y., $12; J. B. L., of N. Y., $25; J. H., of Ind., $25; F. S. O., of N. Y., $30; J. H. A., of N. Y., $10; J. D., of N. J., $25; S. P. R., of Mass., $15; J. S. S., of N. Y., $25; H. S., of Mich., $25; W. H. McN., of N. Y., $40; S M., of Del., $25; H. K., of Mich., $25; W. C., of Pa., $15; J. H., of Ohio, $25; G. N., of Conn., $25; D. H., of N. Y., $25; J. I., of Pa., $20; W. V. McK., of N. J., $20; I. S. S., of N. Y., $20; E. C., of N. Y., $20; E. Y., of N. Y., $20; J. B., of N. Y., $25; A. S., of Ill., $30; T. O. L., of N. Y., $10.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from April 16 to Wednesday, April 23, 1862·—

F. W. R., of N. Y. (2 cases) ; J. R. W., of N. Y. ; S. & S., of Pa. ; J. H. B., of N. J. ; J. B., of N. Y.; J. C., of N. Y.; N. N., Jr., of N. Y.; O. K. of Ind.; C. A., of N. Y.; A. S., of Ill.; A. K., of Oregon ; A. S., of Ill. (3 cases); A. I., of Iowa; W. G., of Mass.; D. H., of N. Y.; O. L. R., of N. H.; H. V. F., of Ind.; G. N., of Conn.; P. P., of N.Y.; J. H., of Ohio ; S. M., of Del.; J. B., of Mass.; A. H. & J. H. B., of Pa.; J. L. H, of Pa.; H. K., of Wis.; M. H., of Pa.; H. S., of Mich.; J. B. L., of N. Y.; J. S. S., of N. Y.; J. O. L., of N. Y.; J. D., of N. J.; R. B., of Paris.

Back Numbers and Volumes of the Scientific American.

VOLUMES I., II., III., IV., V. (NEW SERIES) COMplete (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1 50 per volume, by mail, $2—which include postage. Price, in sheets, $1. Every mechanic, inventor or artizan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for 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.

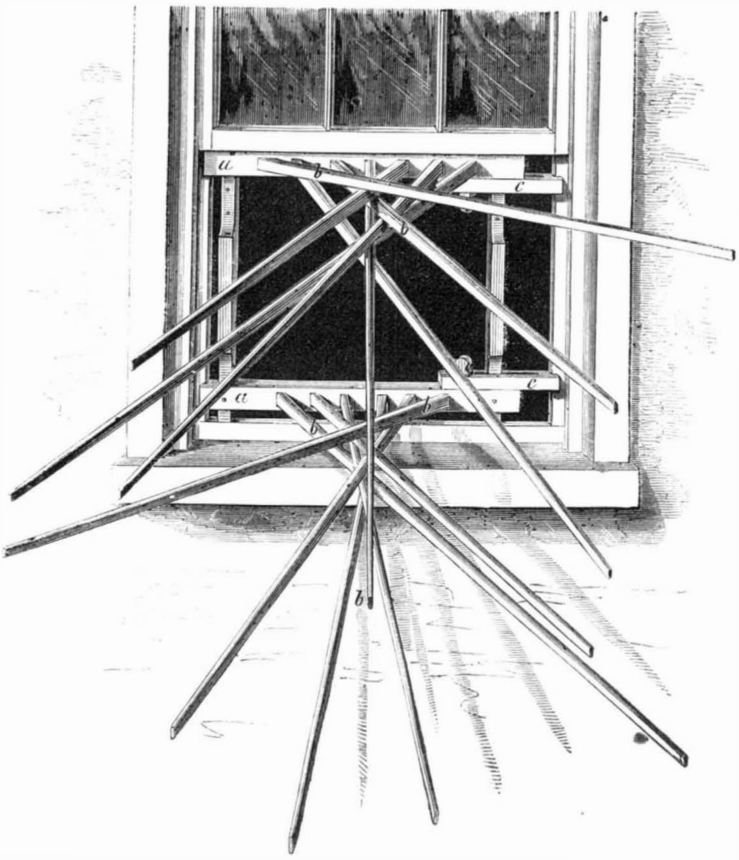
RATES OF ADVERTISING.

Twenty-five Cents per line for each and every insertion, payable in advance. To enable all to understand how to compute the amount they must send in when they wish advertisements inserted, we will explain that ten words average one line. Engravings will not be admitted into our advertising columns; and, as heretofore, the publishers reserve to themselves the right to reject any advertisement they may deem objectionable.

Improved Clothes Dryer.

To persons living in cities and towns, in situations where they can not have the use of yards, one of the greatest inconveniences of housekeeping is the drying of clothes after they are washed. This inconvenience is very effectually overcome by the invention here illustrated, which consists in a series of bars connected with a frame that may be readily placed in a window, so that the bars will extend horizontally out of the window, and afford a good support on which to hang the clothes.

A light but strong frame is made of wood, with mortises through the upper and lower bars, *a a*, of such size as to permit the passage of the slender tapering bars, *b b b b*, the larger ends of these bars being of sufficient size to just fill the mortises. The lower sash of the window is raised, and the frame is fitted into the opening, with the bars, *b b*, extending outward, and spreading apart at their outer ends, as shown; the mortises being made in the proper directions to effect this spreading. The clothes are then hung upon one bar after another, in succession, and secured by pins, when each bar is inserted into its mortise or pushed through it from the smaller end, as the clothes are hung.



M'NEIL'S CLOTHES DRYER.

The frame is secured in the window in a very simple and easy manner. Notches are cut in the ends of the bars, *a a*, to grasp the stop of the window frame on one side, and there are similar notches in the ends of the extension bars, *c c*. When the ends of the bars, *a a*, are placed, the extension bars, *c c*, are pushed outward till they grasp the stop on the opposite side of the window, when they are secured in place by set screws.

The length of the 12 bars, *b b*, combined, is 70 feet; sufficient to hold all the linen of a small family, and the position of these bars, with their spreading ends, exposes the clothes freely to the air. The apparatus may be turned inward in wet weather, or it may be attached to the wall; and when not in use it can be packed away into a very small compass. Being made of wood it can be constructed at very small cost, and will doubtless prove a great convenience to a large number of families.

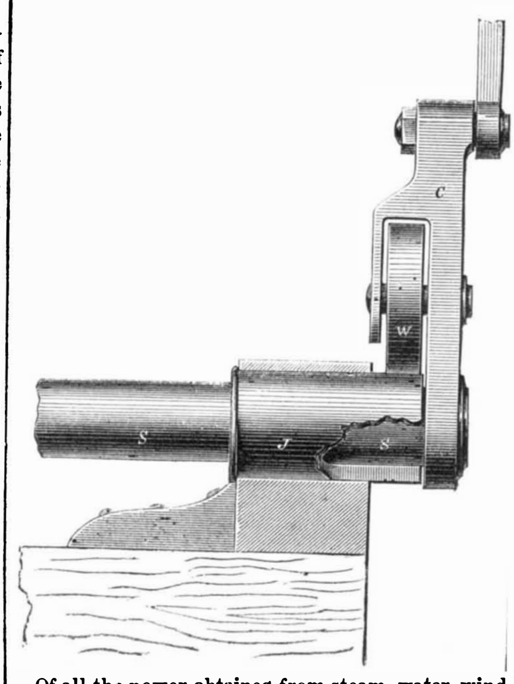
The patent for this invention was granted through the Scientific American Patent Agency, February 11, 1862, and further information in relation to it may be obtained by addressing the inventor, Gordon McNeil, at Chestnut Hill, Philadelphia. [See advertisement on another page.]

CAPT. BLAKELY thinks that a shot weighing 700 lbs. would crush in the sides of any iron-plated ship.

American Fire Engines in London.

We learn from the *Engineer* that a trial of one of the Lee & Larned steam fire engines, built at the Novelty Works, this city, took place on the 24th ult., in London, under the superintendence of Mr. Lee, who went over with the engine. The Dukes of Sutherland and Caithness, and Mr. J. Scott Russell and a large number of other engineers were present. The first performances consisted of a trial with one of the largest London hand engines, manned by 80 of the Granadier Guards. This engine threw a 1-inch jet 125 feet high. The steam fire engine was then tried and in eleven minutes from the time the fire was applied it commenced working with a pressure of 158 lbs. on the square inch, in sixteen minutes the pressure was 140 lbs. on the inch, and it threw a 1-inch jet 145 feet high. The engine is one of the smallest class used in our American cities. Its cylinder is 7 inch diameter, and stroke 8½ inches, the whole weight 3,700 lbs. It ran at the rate of 600 revolutions per minute, and surprised all present who went to see the trial.

BRYANT'S IMPROVEMENT IN CRANKS.



Of all the power obtained from steam, water, wind, and the muscles of animals a very large portion is expended in overcoming the friction of the machinery which is employed to render the power available, and after all the efforts which have been made to reduce the amount of friction, we know of no more inviting field open still for exploration by inventors. So large a portion of the motion of machinery is rotary, that the friction of journals is especially important, and this department has accordingly received a large share of attention. The annexed engraving represents a device invented by Dr. Bryant, of Brooklyn, for reducing the friction in the journals of cranks.

To the inner side of the crank, C, is attached a wheel, W, the axis of which passes through the crank and through the arm or lip prepared for the purpose as shown. The wheel is secured in such position as to bring its periphery upon the outside of the stationary journal box, J, so that it may support the shaft, S, and prevent it from bearing on the journal box, thus rolling round upon the journal box as the shaft rotates.

This invention affords a good problem for examination by all that large class of our readers who are always interested in the philosophy of mechanism. The question is whether there is any practical or theoretical saving of friction by the device. The inventor claims that it substitutes a rolling friction for that of rubbing surfaces.

Steps have been taken to secure a patent for this invention, and further information in relation to it may be obtained by addressing the inventor, J. Bryant, M. D., at Brooklyn, N. Y.

FROM THE STEAM PRESS OF JOHN A. GRAY.