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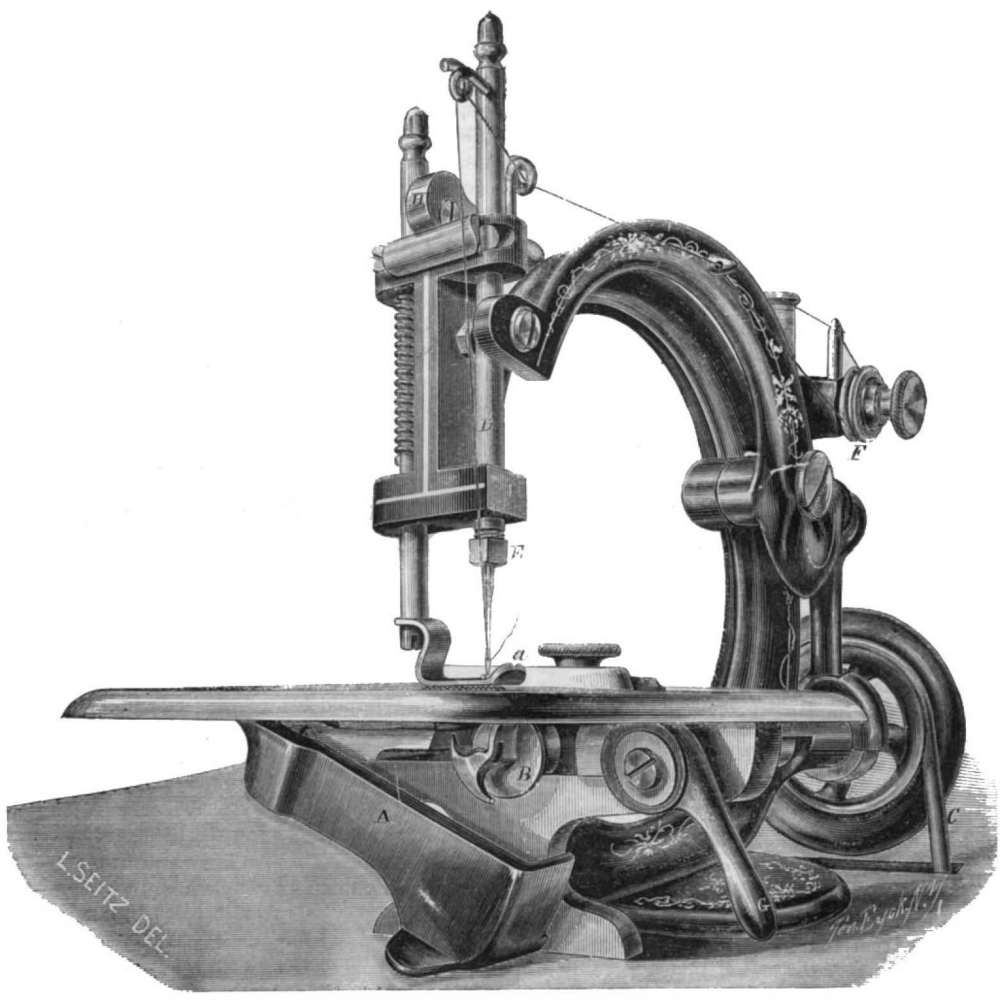
Improved Sewing Machine.

On page 165, Vol. 14 (old series) SCIENTIFIC AMERICAN, we illustrated and described the Willcox & Gibbs Sewing Machine, and after a careful examination of its merits gave it our approval. Since that time it has been much improved, and at the late Fair of the American Institute in this city, took the Gold Medal "for stillness of running and perfection of work."

We therefore present to our readers illustrations of the improved machine, the general appearance of which has not been changed; the design (which curiously enough forms a perfect letter G, the initial of one of the inventors, Gibbs), being well adapted to the requirements of a sewing machine, as it gives the greatest possible space under the arm, and the works being all above the stand are therefore easily oiled and cleaned. Owing to the peculiar construction of the working parts, the machine is rendered perfectly noiseless—a very desirable feature in sewing machines. All the working parts under the cloth plate are covered while in operation by the cap, A, which is hinged at its back end to the frame of the machine by a friction joint. It is shown pulled down in the perspective view, disclosing the feed mechanism and the revolving looper, B. The machine is fastened to the table (which is shown projected only) by a thumb screw from the underside, which screws into the frame of the machine; the latter can thus be readily removed to oil and clean it; to perform this operation it is unnecessary to take it apart, as when the cap, A, is pulled open, the works are all exposed. The machine is driven by a round leather belt, C, which passes over the driving wheel of the machine and down through a slot in the table around the balance-wheel. This latter is prevented from turning in any direction but the right one (indicated by the arrow), or wearing the dress of the operator, by a patented improvement shown in Fig. 2, in which A, is the wheel and B, the standard to which is fastened the dress guard, C; a rubber ball, D, fits loosely in a recess and is kept by its gravity in contact with the rim of the wheel between which and the recess it wedges when any attempt is made to turn the wheel backward. This prevents much trouble and annoyance, especially to beginners. The needle used Fig. 5, which together with the manner of adjusting is the subject of a separate patent, is very short and straight, and is made self-adjusting by means of a groove in its shank and a spline or small steel rib in the hole for it in the needle bar, D, so that it is impossible to insert the needle in any but the right position: the needles being of one length, when they are pushed to the bottom of the hole and secured by the nut, E, are sure to be adjusted properly. The tension on the thread is produced by passing it between two polished glass washers, F, fitted on a screw spindle pressed together by a spring, the pressure of which is regulated by turning the screw. It is very easily understood and managed, and cannot corrode, or get out of order otherwise. The revolving looper, B, by which the stitch is formed, has also been very much improved, and is now a beautiful example of simplicity and perfection in operation.

The hemmer Fig. 3, and the feller Fig. 4, which are also patented, are quite simple and at the same time very effective; and it is claimed that they have this marked superiority over any others, in that they turn the hem or fell to the under side, so that the stitch is on the right side of the work. They are also self-adjusting and it is not possible to set them wrong they do their work with great perfection and celerity. By means of a groove, *a*, in the cloth presser (see perspective view), braid can be sewed on cloth in any desired pattern. The length of

Fig. 2



THE WILLCOX AND GIBBS SEWING MACHINE.

Fig. 5

Fig. 3

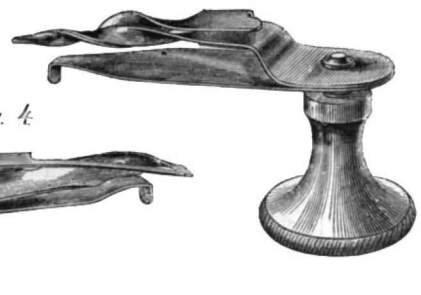


Fig. 4

the stitch is regulated by the lever, G, and the cloth presser thrown off the plate by the cam, H. The stitch made by this machine is new and peculiar; it is called the "twisted loop stitch," and requires but one thread to form it, producing thereby a beauiful, elastic and durable seam, which is so strong that a piece not half an inch long cut from it cannot be pulled apart. It also has this advantage—that it can be easily removed if desired, by unlooping the end of the thread and pulling on it. As a family sewing machine it possesses many advantages; among which its extreme simplicity and quietness and ease of operation are not the least noticeable. We have recently made a trip to Providence, R. I, where these machines are made in large numbers; and from the system pursued and reputation of the makers, we do not hesitate to say that they will stand a great deal of hard usage without injury. Sewing machine operators are not generally the most careful persons in the world (where they do not own their machines), and manufacturers of clothing, &c., will find these desirable in this as well as other respects.

The office and salesroom of the Willcox & Gibbs Sewing Machine, is at 508 Broadway, New York, where a great variety can be found of all styles and prices to suit the public.

Things that Farmers Should Know.

Every thing that tends to increase the profit of farming must directly or indirectly benefit the farmer by raising the value of his land. Every effect has its cause, and there are unfortunately so many preventible losses in agriculture, that I propose one by one to enumerate them.

Animals differ in no degree from ourselves in the appreciation of a dry bed and a dry skin, a warm corner in winter and a cool one in summer. How imploringly will cattle and sheep stand at the field gate in bad weather, when they know there is shelter for them elsewhere. How quickly sheep will avail themselves of a wooden hurdle, a hard road, or even a wheelbarrow or a piece of board to lay upon, so as to avoid contact with the wet ground: to them damp sheets. It is a well known and admitted fact that a saving of one-third in food results from providing shelter when required. Add this gain, or deduct the 33 per cent of loss over fifty-six millions of acres, with their tens of millions of animals, and you are astounded at the sum total.

Exposure, even in dry weather, to a sharp wind, abstracts an immense amount of caloric from the body, which must be made good by the fuel or fat of the food. Even with well-wooled sheep this takes place in degree, and it must interfere with their repose, for we cannot rest well when cold.

It is surprising how easily one may extemporize effective shelter. I find it undesirable to house animals and turn them out in the day; the extreme variation gives them cold. I therefore, after threshing my first wheat, stack the straw, thatch it ready for next harvest, place it on a pasture, surround it at some distance with hurdles, throw down a little straw close to the stack, and make this the night fold yard for my cattle. Here they get their cake, bran or dry food. Bullocks soon establish, by rubbing and grooming themselves, a comfortable arcade of straw on either side, or at each end, according to the wind. Under this they lie comfortably ensconced, free from driving rains or strong cold winds, and in the day time, weather permitting, go to their feeding ground.

The act of grooming themselves gives cleanliness, and stimulates circulation in the skin, and pays well in the health and condition of the animals.

There is no currycomb or horse brush so effective as good strong reedy wheat straw, free from weeds, especially if you have trimmed or shaved the stack. Where reaping by hand is still the practice, a good haulm stack answers well. If farmers knew how cheaply a close shed or covered yard could be erected, and how much it influences and preserves the condition and quality of animals and manure, they would erect them.

I have such a shed, 57 feet long, 35 feet wide, the walls 8 feet high, a single span and space slated roof. This will accommodate 30 two-year old bullocks. I have at present in this shed 27 two-years-old shorthorns. They appear closely packed, but have ample ventilation. It may be called the box system on a large scale.

The straw under them is invariably cut up by steam into two-inch lengths, and readily forms a homogeneous mass. It need not surprise us that strong reedy straw, so cut, readily absorbs urine, for in cutting it gets split and broken; thus the spongy inside of the straw at once absorbs, while the glassy exterior of uncut straw will not absorb. The cost of cutting it by steam power where an engine is on the premises is insignificant.

A dung-heap is thus quickly formed under the animal, free from destructive heating, which would take place with long uncut straw. Many an animal becomes lung diseased and destroyed by the fermenting masses in open farmyards, or even in covered yards, when the early spring sun and an increasing temperature cause heating and decomposition in the long-strawed and less condensed mass, more accessible to aeration than the homogeneous hodge-podge of chopped straw manure. Assuming that the animals are fed, as they ought to be, with cake, roots, meal, bran, and chaff, the dung from this shed, taken direct to the land, will give results that will put to shame the ordinary dung-heap, or even guano. It is always ready for use, and spares the cost and waste of a manure heap. After a heavy crop of tares, I have now a fine crop of cabbage. As soon as the tares were removed, acre by acre, the shed manure was at once carted on, spread, and ploughed in, and the cabbages planted in June. The trench ploughing was very deep, by two horses in the top plough, four horses following in the same track with a second plough—making a thorough rough job of it—in stiff clay. This is the way to grow abundant food for your animals at small cost.—*Prof. Mechi*, England.

The Early "Bombardes."

Professor Pole has written the following to the London *Times*:—

"In 1427, when the English in Normandy made their last assault on the Mont St. Michel, they brought to their aid '*plusieurs machines espouvantables et divers engines de guerre*,' literally:—Several frightful machines and various engines of war, with which, to continue the words of the old chronicler, '*ils dresserent une batterie si furieuse contre les murailles qu'ils y firent bréche*,' literally:—With which they turned a furious battery against the walls and made a breach. Among these formidable weapons were two enormous wrought-iron guns, which, on the repulse of the besiegers, they were compelled to leave behind them, and which have remained on the rock to the present time. Interesting as these pieces of artillery are, both in a historical and a constructive point of view, very little has hitherto been known about them, and I am not aware that any complete and accurate description of them is in existence. During a late visit to Normandy I have endeavored to supply this want, and possibly the following notes may be acceptable to some of your readers.

"I found the guns in a bad state, being choked up with masses of stone, sand, rust, and rubbish, which had probably been there for centuries, and had become almost as hard as conglomerate. However, I contrived to get them tolerably clear, to obtain their dimensions, and to take photographs of them. The guns are of the kind termed 'bombardes,' and are of different sizes. The larger one is 10 inch caliber, 30½-inch greatest external diameter, and 12 feet total length; of which about 8 feet 8-inch belongs to the barrel, or 'chase,' and 3 feet 4-inch to the smaller powder chambers in the rear. The smaller gun is 15-inch caliber and 11 feet 9 inch long. They are true 'built-up' guns, being formed of longitudinal wrought-iron bars, about 3 inch wide, arranged like the staves of a cask, and bound round closely with hoops of the same material. The analogy of this ancient construction with that of the modern wrought iron guns is very curious. I found a projectile in each gun and several others lying about. They are granite balls, roughly spherical, and a little smaller than the bore. Those for the larger gun will probably weigh about 300 pounds each; but if the size of the gun be denoted according to the caliber on the same principle as modern guns for round shot, it must be called a 920 pounder! The breech chamber would hold about 40 pounds of powder. I estimate the weight of the large gun to be about 5½ tuns, and of the small one about 3½ tuns. I have prepared detailed drawings and descriptions, which, together with prints of my photographs, will be deposited at the Royal Museum of Artillery, Woolwich.

"There are two other ancient bombardes in existence, constructed on the same principle—namely, the 'Dulle Griete' of Ghent, and the 'Mons Meg,' of Edinburgh. The 'Michellettes,' as they are called by the people of Mont St. Michel, compared well with these, but have an additional interest in their very early date and positive history, and in the probability of their being of English manufacture. They must have been well made and well served, for they performed successfully the duty required of them, without, so far as I can see, sustaining the least structural injury. So little are they prized by the commune to whom they are said to belong, that the Maire offered to sell them to me if I would fetch them away!"

Dessicated Vegetables.

Vegetables and meats deprived of moisture and submitted to severe pressure, will remain unchanged and preserve their natural taste for a long period in any climate. A very large business is now carried on in this city in the way of dessicating vegetables for the army and navy, at Nos. 327 and 329 Stanton street, by the New York Dessicating Company—Theo. C. Shechill, Superintendent. About 150 persons are employed in the establishment, and the quantity of vegetables dessicated this year will amount to 56,000 baskets tomatoes; 442 tuns string beans; 8,000 bushels green peas; 15,000 barrels turnips; 30,000 barrels carrots; 23,000 heads cabbage; 12,000 barrels potatoes; 20,000 barrels onions; 100 tuns parsley, and a moderate quantity of some other vegetables. The vegetables are picked, cleaned, cut up and grated; they are then dried and deprived entirely of moisture, after which they are formed into flat cakes, under severe hydrostatic pressure. A cake weighing 7 lbs., contains sufficient vegetables to make 42 gallons of good soup. They are excellent for sea voyages, and large quantities have been furnished on army contracts for soldiers in the field and invalids in the national hospitals.

Mutilated Currency.

There is a prevailing disposition among small dealers, indeed, among business men generally, to repudiate all the small postal currency that have pieces torn off of them, or which have been torn and mended. They imagine that such notes will not be redeemed by the Secretary of the Treasury. They are in error. A Treasury order issued some time ago substantially announced that such notes would be rejected, but a more recent Treasury announcement has been made to the effect that all such notes will be redeemed, provided one-fifth of a note be not missing, and that it be apparent that a mended note has been repaired with the piece torn from itself, and is not made up of pieces torn from two or more different notes. There is no excuse, therefore, for refusing to accept in trade notes that are slightly ragged, or which have been honestly repaired. They are as valuable as notes perfectly new, and will as readily find, when the time comes, a just redemption.

PATENT OFFICE FEES.—The Patent Office fees fell off to the amount of some eight thousand dollars after the secession of Southern States, but for the past year receipts have been equal to the expenditures. Under these circumstances the commissioner has estimates for appropriations for an enlargement of the library, which, in works of certain kinds upon science, is very complete. An appropriation is also asked for lighting the body of the old Patent Office structure after the style which has been adopted at the Treasury. The management of the Patent Office under the administration of Commissioner Holloway has been very satisfactory. He has ever shown a most liberal spirit toward inventors.

STOVES made of soapstone have been introduced at Quebec. They are said to throw out a mellower and more uniform heat than iron; the material of which they are made is very abundant in the mineral region south of the St. Lawrence.

MISCELLANEOUS SUMMARY.

THE United States iron clad steamer *Winnebago* left St. Louis on the 20th October, on a trial trip, under the command of Chief Engineer James W. King, U. S. N., Superintendent of Iron clads in the West. She was operated on seventy-two consecutive hours, the engines making sixty-seven revolutions per minute, and the propellers 112 revolutions. With this speed of screw, the vessel sailed nine miles an hour in smooth water. The *Winnebago* is the first of four sister propellers launched, and considerable anxiety was therefore manifested in the result. It is gratifying to know that everything worked satisfactorily. The vessel is of iron, 220 feet long, 56 feet wide, and 7 feet deep. She has two fore-and aft bulkheads, and six thwart-ship bulkheads, all water-tight. She has two turrets, one Ericsson and the other Ed's patent The latter turret differs from Ericsson's, among other things, in having a portion of the shell entered down to, and the whole weight of the turret resting on spheres at the bottom of the vessel. The guns are placed on a huge platform, loaded in the hold, and raised in the turret by steam power. They are also run out by steam ; the recoil is received on steam cylinders, and the whole apparatus, guns and all, is operated by one man (an engineer), no other person being needed in the turret. The loading is accomplished by loaders below the turret, in the hold.

WHY SEMMES AVOIDS THE VANDERBILT.—The London *Shipping Gazette* says that, in commenting upon the probable consequences of an encounter with the *Vanderbilt*, Captain Semmes, of the *Alabama* speaks thus of his own ship :—He said that although the machinery of the *Vanderbilt* would be a good target in fighting with a steamer, it is not easy to escape from having a broadside. He found that to be the case with the *Hatteras*. Although he disposed of her pretty easily, it was as much as he could do to prevent her from giving him a broadside. The plan he adopted with the *Hatteras* was to use his large Blakeley gun from the stern of his ship, and that gun did the work. The gun is an eighty five pounder, and he thinks that his only chance with the *Vanderbilt* will be to use it upon her machinery. His opinion is that the *Vanderbilt* has very much greater speed than the *Alabama*, and that it will be impossible for him to get away from her. He does not intend to go and look for her ; but says that if he has to fight her he will do his best.

ANNIVERSARY ADDRESS OF THE AMERICAN INSTITUTE. —The annual address before the members of the American Institute was delivered on the 11th instant by the Hon. Charles P. Daly, at the hall of the Historical Society, this city. The subject was "The Origin and History of Institutions for the Promotion of the Industrial Arts." The orator, Judge Daly, is a very finished and fluent speaker, and chained the attention of the large audience of ladies and gentlemen until the close. We regret that we have no space for a fuller report.

QUALITIES OF SCREW PROPELLERS.—It is worthy of remark, in designing screw propellers, that those wheels which have a medium proportionate diameter, a medium pitch and proportionate fraction of the pitch in surface, or in length of the hub, give better results than extreme diameters, very quick pitches, and large working or superficial area on the blades. Experiments, carefully conducted, prove the truth of these statements.

USING DUMMIES.—The recent experiments with "dummy" engines upon the Frankford and Southwark Passenger Railway, proved entirely successful, and the Company is now having built a number of these engines for use on the branch of their road from Berks street station to Frankford. Two engines have been completed and are now running regularly upon the road.

A SMOOTH and beautiful finish to the handles of brooms, rakes, hay-forks, and other articles of a similar nature is now imparted by a machine specially devised for this purpose. Such an one can be found illustrated on page 328, current volume.

THE death of De Vigny, one of the more gifted of the literary men of this generation in France, is announced.

THE VENTILATION OF MINING TUNNELS.—One of the great expenses incurred in running tunnels of any great length is for ventilation. Where it is necessary to sink air shafts every few hundred feet, the cost and delay will prove a serious drawback upon such enterprises. The plan last adopted in the Latrobe (Cal.) Tunnel seems to be working admirably, avoiding much of the great expense, and at the same time answering the purpose better than the ordinary air shaft. When this tunnel had reached a length of only a few hundred feet, it was found necessary to sink an air shaft, and at F street another ; at this point the bottom of the shaft was closed up with the exception of a hole about ten inches square, through which passed a wooden box flume of that size, by which the air is conducted into the further extremity of the tunnel. The draft is so strong that no other air shaft has yet become necessary, and it is thought no more will be required. A candle held at the mouth of the flume will be instantly extinguished. Throughout the whole of the great distance which this flume supplies with air the tunnel is cool and pleasant, and a person can breathe with almost as much ease as in the open air.

THE ACCIDENT ON BOARD THE PATAPSCO.—The explosion of a shell or cartridge within the turret of a monitor, either by penetration from the outside or by accident, has been regarded as one of the severest disasters to which they could be subjected. The *Patapsco* has had this experience—one of the cartridges for her 8 inch rifle gun, as I mentioned in my last letter, having accidentally exploded whilst being rammed home. Fortunately, the result was not as disastrous as might have been expected. No damage was done to the guns, the turret or its machinery. Two guns's crews were in the turret at the time. Two men, who were handling the cartridge when it exploded, were blown to pieces, their remains being scarcely distinguishable. All others in the crew were thrown from their feet and stunned, more or less, but not seriously injured. Lieut. Rince was rendered senseless and deaf for several hours.

DEFICIENCY IN THE CORN CROP.—In regard to corn, it is estimated that the crop falls short of that of last year, 137,540,588 bushels. The crop of 1862 is estimated at 586,704,474 bushels, exported 11,680,342. Leaving for domestic consumption 575,015,132 bushels, or 125,860,238 bushels more than has been raised this year. If the same amount shall be exported this year as last, then we have the actual deficiency of 137,540,580 bushels. The present unsettled state of our currency, and the high rates of exchange, render it more than probable that a larger amount will be exported in exchange for foreign goods or gold.

THE ADVANTAGES OF SINGING.—Singing is a great institution. It oils the wheels of care—supplies the place of sunshine. A man who sings has a good heart under his shirt-front. Such a man not only works more willingly, but he works more constantly. A singing cobbler will earn as much money again as a cobbler who gives way to low spirits or indigestion. Avaricious men never sing. The man who attacks singing throws a stone at the head of hilarity, and would, if he could, rob June of its roses, or August of its meadow larks.

AT Manchester, N. H., the cotton mills extend for miles, lofty, compact, and handsome buildings, surrounded by a population of twelve thousand persons, all connected with the factories. Handsome streets, commanding brick buildings, and an air of excessive neatness and comfort prevailing everywhere, give indisputable evidence of prosperity and contentment. Some, if not all of these establishments, have since the war made enormous profits—one of them in particular has realized a million of dollars net within the last twelve months.

CHOCOLATE, the flour of the cocoa-nut, was first introduced in England from Mexico in 1520, and soon became a favorite beverage in the London coffee-houses.

CONVERSATION.—The first ingredient in conversation is truth ; the next is good sense ; the third, good humor ; and the fourth, wit.

THE manufacturing establishments at Cohoes, N. Y., pay Government taxes to the amount of over twenty-five thousand dollars.

OBSTRUCTIONS IN CHARLESTON HARBOR.—One of the *Catskill's* boats, whilst on picket lately, cut away four of the barrel buoys which support the first line of rebel obstructions in the channel, between Sumter and Moultrie. They are large, heavy casks, thickly tarred, and anchored in groups of three or four together, at intervals across the channel. They support a heavy hawser, to which is suspended substantial nets, designed to foul the propellers of the Monitors. Not much importance is attached to these obstructions by our navy, and the rebels do not themselves probably depend upon them. Those further up the harbor, across the Middle Ground channel, are of a more serious character. Another exchange says :—"The recent high tides have swept out of Charleston harbor the much-feared and talked-of 'obstructions.' These last float up high and dry on the beaches of Morris and Folly Islands, and are instantly seized by the men and converted into firewood and tent frames. Four full-sized pine trees, 50 feet long, are lashed transversely with spars, at distances of 14 feet apart. These rafts were fastened together, and marked in series by upright poles across the north channel of Charleston harbor. Attached to them were torpedoes, made of lager beer kegs, fitted with conical ends of wood, and filled with powder, into which a wire was inserted. Behind these were linked railroad bars, some of which, entangled with the raft, have also been driven ashore.

PARAFFINE.—Paraffine possesses certain properties which render it useful in the laboratory. It may be advantageously substituted for oil in baths, as it endures a high temperature without evaporating or emitting any unpleasant odor. Filtering paper, after being soaked in it, may be kept several weeks in concentrated sulphuric acid without undergoing the slightest alteration. From this property of paraffine it may be advantageously applied as a coating to labels on bottles containing strong acids ; fluoric acid, even, does not act upon it, except it be heated. Paraffine appears also to be useful in preserving fruits. Apples, pears, &c., coated with it retain all their freshness during several months.

DISCOVERY OF A SAND-IMBEDDED TOWN IN FRANCE. —A singular discovery, it is said, has been made on the French coast, near the mouth of the Garonne. A town has been discovered buried in the sand, and a church has already been extracted from it. Its original plan shows it to have been built near the close of the Roman empire. The original paintings, its sculptured choir and capitals, are adorned with profuse ornaments, which are attracting a large number of visitors. This is all that remains of those cities described by Pliny and Strabo, although the Gulf of Gascony abounds in ruins of ancient cities.

RAPID RAILROAD CONSTRUCTION.—Gen. D. C. McCallum, formerly Superintendent of the Erie Railroad, is now Government Engineer of Railways. Lately there was accomplished, under his direction, a feat without a parallel in railroad construction. The thirty miles of railroad recently destroyed by Lee's army, was rebuilt ; and, in doing so, the ties were prepared, and the main track and switches laid, 600 feet of bridging (some of which was 60 feet in hight), twenty culverts and ten water tanks, constructed, all within the space of three weeks !

QUEER.—Two eminent English writers on mechanical subjects, D. K. Clark and Zerah Colburn, are sparring over the authorship of certain ideas on the theory of boiler explosions ; said ideas being utterly devoid of practical value, or tending in any manner to clear up the cloud of mystery which hangs over the cause of disasters arising from the use of steam.

IT is said that pumpkins fed to milch cows have a tendency to dry up or diminish the quantity of milk, but if the seeds are removed before feeding, the flow of milk will be augmented.

ANOTHER new metal has been discovered by a Swedish chemist, M. Bahr, in a mineral resembling or thite, found in the isle of Roensholm. He has given it the name of *wasium*, and the mineral he calls *wasite*.

THE Austrian Government has recently purchased machinery for making rifles, of a firm in Hartford, Conn.

FIFTY tuns of grapes passed through Detroit, one day last week.

NOMINAL HORSE POWER.

Of all the absurd terms to be met with in the vocabulary of mechanical arts, that of "nominal horse power" is perhaps the most absurd. Particular measures and weights bear, very properly, individual appellations, which, if not invariable in their meaning in a general sense, are so in particular instances. Thus, the term "pound," individually, does not, it is true, invariably denote one certain measure of the force of gravitation; different merchants employing it in various senses, according to the kind of trade they carry on. The pound of the jeweller is one thing; that of the corn merchant another. Yet the troy weight of the one can never be confounded with the avoirdupois weight of the other. The phrases "troy weight" and "apothecaries' weight" are understood throughout the length and breadth of the kingdom, and are rarely, if ever, confounded with each other. Measures of length are still more definite. A foot is equally a foot with the carpenter and the engineer, the worker in stone and the worker in iron, all over the kingdom. A two-foot rule which can be used in London is equally serviceable in Manchester and Liverpool, Hull or Glasgow. Our engines are bought and sold at the rate of so much per nominal horse power; and it is certainly strange, considering the enormous sums which annually change hands in the trade, that there should be no fixed and definite meaning in the expression. Not only does it convey no idea whatever of the power of any steam engine, but it fails equally in expressing size. Were this all, its use might be pardonable; but, on examination, we find that nearly every center of manufacturing industry attaches a special value to it, different to that which obtains elsewhere; a nominal horse power meaning one thing at Leeds, another thing at Glasgow, and something else at London; even different makers employing the phrase in distinctive senses, according to their individual proclivities.

During the first few years of his career as an engine builder, Watt adhered almost exclusively to one particular speed of piston per minute, only departing from it in exceptional cases, when engines were constructed out of the usual routine of the shops. He was not long in business, however, until he discovered that the term "horse power" conveyed too vague an idea to answer the purposes of a vastly extended trade. He accordingly instituted some experiments at one of the London breweries with the largest and strongest horses which he could obtain. A finely-turned brass pulley was affixed to the edge of a well; over this pulley a carefully-made rope was run, one end descending the well, where it was attached to weights, altered as occasion required, while the other end was drawn forward by a horse, which thus raised the weight. From the results obtained from this, and some other experiments, Watt determined the power of a strong horse to be equal to a weight of 33,000 pounds, raised one foot in one minute; the horse being capable of maintaining this exertion for eight hours per day. This was the highest average obtained from the most powerful horses. Watt's first boilers were worked at an extremely low pressure, not more than 2 pounds or 3 pounds on the square inch above the atmosphere. His machinery was not very perfect; and the pressure on the pistons of his earlier engines seldom exceeded 10 pounds on the square inch. Newcomen's engines had an available pressure of not more than 7 pounds or 8 pounds on the inch. Those who bought from the Soho firm, could scarcely be induced to believe in the possibility of obtaining anything much over this; and as there was a doubt amongst the public, Watt gave them the benefit of it; and determining that his customers should receive even more than they bargained for, he magnanimously adopted the highest possible standard of horse power, and the lowest of steam pressure; and thus the Soho nominal horse power was measured by a piston moving at a speed of 128 feet per minute, under a pressure of but 7 pounds to the square inch. Other firms, however, quickly started into existence, who found it expedient to depart both from Watt's standards of speed and pressure, and in consequence different estimates of nominal horse power were adopted in different districts, and continue in force at the present moment. The standards adopted are, in many instances, simply ridiculous. Thus, at Leeds, a nominal horse power means 30 circular inches of piston area, without regard to either speed or pressure; while at Manchester 23 square inches are regarded as the proportion. The weight of a fly-wheel, or the thickness of a cylinder, might be selected as measures of the actual work performed with equal propriety. In Glasgow and London, pressure is employed as the standard; the mercantile value of a steam engine being calculated by an assumed pressure of 7½ pounds to the square inch at the former place, and 7 pounds at the latter, the regulation piston speeds being settled by empirical rules which bear little or no relation to practical results. Those adopted by the Admiralty may be selected as an example. The speed is supposed to vary with the stroke. With a 4 feet stroke the piston speed calculated on is 196 feet; with 5 feet stroke, 210 feet; with a 6 feet stroke, 228 feet; with a 7 feet stroke, 231 feet; with an 8 feet stroke, 240 feet per minute, and so on. It is almost needless to say that these velocities are seldom or never really adhered to. The average pressure maintained in the boilers of our Navy may be taken somewhere about 18 pounds to the square inch. If to this we add 12 pounds for vacuum, and deduct 4 pounds for wire-drawing and loss, the actual working pressure per square inch of piston becomes nearly three times the nominal pressure. It is thus that the indicated power of marine and other engines exceeds the nominal many times. How many, depending, in a great degree, on the good faith of the firm contracting for the machinery and not at all on the stipulations of the contract! There are various instances in our Navy and mercantile marine where similar ships attain very different velocities with engines of the same nominal horse power, made by different firms; the speed depending not on the nominal but on the indicated power. Setting the general public aside, we thus find that the Government, by purchasing engines at the rate of so much per nominal horse power, place themselves completely in the hands of the manufacturers. The naval architect may calculate that 2,000 effective horse power is sufficient to drive a particular ship at a certain speed. Engines of 400-horse power nominal are ordered, in the expectation that they will work up to the required power. Whether they do or not rests with the makers. If they develop a force of 1,200 horses only, the designer of a ship is disappointed, but no blame can attach to the makers of the machinery. There are engines at this moment in the Navy giving out eight times their nominal power; many others only three; the first cost of the machinery being as nearly as possible the same in both cases. It is not strange, when we consider these things, that so many of our ships have failed to realize the speeds predicted for them.

A simple remedy exists for this state of affairs. Let the purchaser stipulate how many indicated horse power he requires, and pay for his engines by that standard. Such a course would be found, in the long run, beneficial to all parties. Many firms are at present excluded from the Admiralty work because their reputation is not established; and the Government, having no check over them under existing arrangements of purchase and sale, fear to employ them, lest the indicated should not sufficiently exceed the nominal horse power. The sooner steam engines are bought and sold by real instead of ideal standards, the better. The words "horse power" are seldom or never used in connection with the locomotive; yet purchasers always get exactly what they want. Imaginary and arbitrary measures of either size, capacity, or power, are certain to lead the unwary and inexperienced astray, and are unsuitable to the advancement of the age.—*Mechanic's Magazine.*

British Pig Iron Trade.

The following statistics, taken from the *Miner's Journal*, London, will show that the iron trade of Great Britain was very prosperous last year:—

"The computed make of pig-iron in England and Wales, last year, was 2,863,469 tuns against 2,763,390 tuns in 1861, 2,889,752 tuns in 1860, 2,752,354 tuns in 1859, 2,530,564 tuns in 1858, 2,740,387 tuns in 1857, 2,705,877 tuns in 1856, 2,390,650 tuns in 1855, and 2,273,243 tuns in 1854. The make in Scotland last year was computed at 1,080,000 tuns against 1,040,000 tuns in 1861, 1,000,000 tuns in 1860, 960,000 tuns in 1859, 990,000 tuns in 1858, 910,000 tuns in 1857, 820,000 in 1856, 822,000 tuns in 1855, and 775,000 tuns in 1854. The total make for the United Kingdom consequently advanced from 3,048,243 tuns in 1854, to 3,943,469 tuns in 1862. The number of furnaces in blast last year was 556, against 568 in 1861, 589 in 1860, 503 in 1859, 617 in 1858, 626 in 1857, 621 in 1856, 590 in 1855, and 554 in 1854. A large increase has thus taken place in the production, without a corresponding augmentation in the number of furnaces, the make of each having much increased. The average price last year was 53s. per tun, against 49s. 3d. per tun in 1861, 53s. 6d. per tun in 1860, 51s. 10d. per tun in 1859, 54s. 5d. per tun in 1858, 69s, 2d. per tun in 1857, 72s, 6d. per tun in 1856, 70s. 9d. per tun in 1855, and 79s. 9d. per tun in 1854. Of the 556 furnaces in blast last year, 436 were in England and Wales, and 120 in Scotland."

Scotch Pig Iron Trade.—As Scotch pig iron is celebrated for its fluidity, and is so much used in America for fine castings, the condition of the trade is always a subject of interest to our founderymen. At present the price in our markets is nearly double what it was five years ago. The quantity manufactured this year up to the end of September was 854,000 tuns, of which 455,000 tuns were exported, and the demand was better than it had been for ten years previously. The annual rate of yield for each furnace is about 8,400 tuns. The price per tun first quality in Glasgow is £3 7s., or about $16 75 gold.

Refining American Petroleum.

The following extracts are from the *Philadelphia Coal Oil Circular*:—

"The methods practiced by persons engaged in refining the American Petroleums are as different as those in use for the purification of the oils distilled from coals. Some employ acids and alkalies, others use alkalies alone, and steam is applied at various degrees of heat. Some of the oils produced by those means are of good quality, others are inferior, and do not ascend the wick of the lamp in sufficient quantities to afford a constant light. In others, the illuminating principle, by some change effected on the carbon, is partially destroyed, and in almost all the odor is disagreeable. The oils from some of the wells contain traces of chloride of sodium, others carbonate of soda in quantities, sufficient to affect their treatment. The denser oils, or those which contain too much carbon to admit of being consumed in lamps without smoke, are excellent lubricators, either mixed or unmixed with animal oils.

"It will be perceived by the foregoing statement that it would be a difficult task to prescribe a mode of purification to meet the requirements of the oil refiners. Neither the petroleums nor the oils distilled from them contain creosote, or cabolic acid, and other impurities which contaminate the oils distilled from coals and coal shales; their purification, therefore, is simple and comparatively cheap.

"When the proof of the oil is not below 38° Fah, distillation with water, or by the use of steam, will most frequently render the lamp oil of good color, and its illuminating properties will be of the highest order. Before the heavy oils, or those below proof 38° Fah., are submitted to any treatment, it is necessary to give them a preliminary distillation, by the aid of common or superheated steam, and the distillate should be separated into two parts, all below proof 38° Fah., being set aside to be treated for lubricating oil, and a further portion to be added to the illuminating oil. Washing the lighter part of the charge with a solution of caustic potash or soda, is useful. A final distillation over a weak solution of either of those alkalies will generally render the oil pure. The heavy parts of the oil may require agitation with equal parts of sulphuric acid and water, followed by an alkaline wash and then distillation. It is only the most impure oils, and those from the wells of certain localities that require the use of acids, which, like the strong alkalies, when used in excess, greatly impair the illuminating properties of these hydro-carbons. The lighter the oils the lighter will be their color. At proof 45° Fah., they are colorless. At proof 42° Fah., coloring matter begins to appear in the distillate, and continues to increase until the charge is exhausted. In order to present the lamp oil of a light color, some refin-

ers have sent it to the market at proof 45° Fah.; but it should be understood that such oils are much more inflammable and liable to explode than those at proof 46° Fah. Color, in this instance, should be sacrificed to safety. A valuable property of all the before-mentioned oils, consists in the fact that they never become rancid or ferment. Indeed they become improved by age, and gradually lose their unpleasant odor."

INVENTIONS AND DISCOVERIES ABROAD.

Aluminum Bronze Pens.—R. Pinkney, of London—a manufacturer of metallic pens—has applied for a patent for pens made of aluminum and copper alloys, as a substitute for those made of steel and gold. He states that an alloy composed of 95 per cent aluminum is of a fine gold color; and another composed of 7½ per cent of copper is of a beautiful green color. Aluminum bronze is very ductile, and is suitable for undergoing the rolling and hammering operations through which steel and gold pass in the making of pens.

Aluminum Bronze Powders and Leaf.—A patent has been taken out by J. Erwood, of London, for manufacturing powders of aluminum bronze to take the place of common bronze powders and Dutch metal leaf, to be applied to paper-hangings, gildings, &c. Aluminum bronze is composed of 90 parts copper and 10 of aluminum, and is of a beautiful yellow color. It is rolled, annealed and beaten until it becomes as thin as foil or leaf, in which condition it can be used for common gilding. To reduce it to powder the foil is stamped and ground in the same manner that common bronze powders are reduced from tin and brass. The foil or leaf and the powders are applied to ornament paper-hangings by pressing and dusting them upon varnished surfaces.

Brown Aniline Color.—Red, purple, blue and green aniline colors, with all the pale shades dyed on goods, with limited quantities of such substances have been produced, but no good brown colors had been obtained. A patent has been taken out for manufacturing such colors by R. T. Monteith, of St. Malo, France, and R. Monteith, of Manchester, England. They take what is called aniline red (a substance now well known in commerce) mix it with a dry salt of aniline and submit the mixture to a temperature of 390° Fah., in a close vessel for about six hours. The product thus obtained is of a brown color and part of it soluble in boiling water, and another part only soluble in alcohol. The brown coloring matter thus made is suitable for dyeing wool and silk in a bath of hot water.

G. De Laire, of Paris, France, has also obtained a patent for producing an aniline brown color, by submitting aniline violet, red or blue, mixed with the hydrochlorate of aniline to heat, in a close vessel for several hours. The two patents are almost similar in character.

Separating Potatoes of Different Sizes.—A machine for separating potatoes of different sizes, by the employment of riddles having meshes of different sizes, has been patented by H. Mackinder, of Lincoln, England. The machine has a hopper similar to a common fanning mill, and it has a series of inclined riddles under it. The potatoes are placed in the hopper and the riddles receive a vibrating motion, like the screens of a grain separator, when the smaller potatoes and dirt pass through the smaller meshes of the first riddle while the larger ones are conveyed to the lower riddles with the larger meshes. A series of small rollers pass underneath the riddles and prevent any of the potatoes from sticking in them. All the clean potatoes are conveyed by inclined spouts into sacks hung below the riddles.

Securing Corks in Bottles.—Messrs. Miller & Struthers, of London, make bottles designed for soda water and strongly effervescing beer with a hole pierced through the neck under the rim. When the cork is driven in it is fastened by simply thrusting a small metal pin through the holes. This mode of securing corks avoids the use of cord for tying them down, and the pin can readily be withdrawn with a pair of nippers to uncork the bottle.

Roasting Coffee.—In order to prevent the loss of aroma, W. Symington, of London, roasts coffee in a close vessel, which has a funnel that conveys the volatile oil, which contains the aroma, into a receptacle containing cold ground coffee, and where the aroma is absorbed. All the roasted coffee, after it is ground and becomes cold, is exposed for a short period in the absorbing chamber.

Washing Wheat.—Considerable attention seems to have been lately devoted in England to the cleansing of wheat by washing. Two patents have been taken out for grain-washing machines, by J. Walworth, of Bradford, and B. Wren, of Stockton-upon-Tees. The wheat is agitated by an archimedean screw while passing through a cylinder in which a current of water flows, and after being washed it is carried by wire conveyers to dryers through which pass currents of air driven by a fan. In one of the machines steam heat is employed to dry the washed grain. Flour and meal of a superior taste are said to be made from washed grain. The washing operation of grain adds expense to the manufacture of flour, but the improvement effected may deserve all the trouble and expense connected with it.

Smelting Iron Ores.—A novel method of preparing iron ores for smelting has been patented by John Cameron, of Lancashire, England. The ore is first analyzed to ascertain its composition. If there is considerable sulphur in it, this is driven off by first roasting, then for every equivalent of oxygen in the ore, one equivalent of carbon, in the form of coal, coke or charcoal, is added, and one equivalent of lime as flux is added for every equivalent of silica in the ore, and a portion of lime is also added to neutralize the sulphur in the coal. These substances are all ground together (the ore, coal and lime) and made into a pasty condition with water, then formed into blocks, which are dried and afterwards smelted in a cupola blast, or reverberating furnace. By the common mode of smelting ore, the lime, coke and ore are mixed together in the rough, and thus fed into the blast furnace. In several instances, however, the ore, flux and coke, have been ground dry and fed into the furnace. It is stated that by grinding the materials wet they are more intimately mixed together; and when smelted, a more complete separation of the impurities in the ore is effected, and a superior quality of iron is produced. If the oxide of another metal be mixed with the ore thus prepared, a superior alloy is said to be produced.

The Nature of Fermentation.

In the organic kingdom, four elements, namely, carbon, hydrogen, nitrogen and oxygen produce a wonderful variety of compounds according to their chemical combinations. The changes which many organic bodies undergo are due to what are called "ferments." This change is effected upon a grand scale in some of the arts, especially that of manufacturing beer. Beer is made from barley, the latter having undergone an organic change called malting. This consists in moistening the barley, and subjecting it to heat in a warm apartment until the grain germinates, when the oxygen of the air acts upon the gluten of the grain and causes it to ferment slightly, and then it acts upon the starch of the grain converting it into dextrine, and finally into sugar, when the malting is completed. All malt has a sweet taste, which is due to the grape sugar developed from the starch of the process described. In South America where the action of germination by malting is not understood by the natives, saliva is used as a substance for acting upon the starch of maize as a ferment to convert it into sugar. Beer is made in South America and in the South Sea Islands, from maize fermented by the saliva of women. The brewer in making beer converts the sugar of his malt into another product by fermenting it with yeast. The sugar undergoes a chemical change called venous fermentation by which alcohol is developed. Two equivalents of oxygen combine with one of carbon in the sugar, forming carbonic acid gas, which escapes during fermentation. In all these changes produced by ferments upon organic bodies the change is a continual degradation. The complex and highly-constituted organic molecule of the grain is under the influence of these ferments continually changed and continually becoming degraded or becoming simpler, until it is converted into three simple bodies as the final result—carbonic acid, water and ammonia. In this alcoholic fermentation as it is termed, sugar, which contains thirty-six atoms of carbon, hydrogen and oxygen, is changed into two simple bodies—alcohol and carbonic acid. This carbonic acid is so simple that it is not capable of being changed further under the ordinary influence of ferments of this kind; but the alcohol is still complex, and if exposed to the air it undergoes an alteration. A ferment which is often employed is what is known as the "vinegar plant;" under the influence of this ferment the oxygen of the air attacks the alcohol and it becomes vinegar or acetic acid. Here is a change of another character produced upon it and still a degradation of the original substance.

New Steam Carriage.

An ingenious mechanic, Mr. S. H. Roper, of Roxbury, Mass., has invented and put in operation a new steam wagon or buggy for common roads. It is thus described:—An ordinary four-wheel carriage has a boiler, of about sixteen inches in diameter, in the rear, with the lever regulating the steam and speed, extending over the seat in front. Beneath this boiler is the furnace, and in the rear of the boiler is a small water tank. The steam gage is on a level with the driver, and he can at a glance ascertain the amount of steam pressure. The whole machine is of two horse-power. Two persons take their seats in the carriage, and off it starts, the driver guiding with one hand the front wheels, by means of a crank, and with the other hand he can regulate the speed of the engine or stop the carriage in less time than a pair of horses can be brought to a halt. Coal sufficient for one day's running can be carried beneath the seat of the carriage, and although the speed attained is that of the fastest horse, the expense of running the carriage is estimated at one cent per mile, while in operation, with the additional virtue of not costing anything in the way of feed and stabling when not in use. Lately, when the carriage was exhibited, the engine carried but fifteen and twenty pounds of steam, and yet it taxed the powers of the horses present to keep pace with its speed. The carriage and engine do not weigh more than seven hundred pounds. No difficulty was experienced in turning sharp corners or in backing.

The Rothschilds.

The following announcement appeared in the English papers a fortnight ago:—"Baron Gustavus Rothschild, of Naples, has retired from business, with a fortune, it is said, of £6,000,000 sterling ($30,000,000.) There are now in Europe but four houses of Rothschilds, in London, Paris, Vienna and Frankfort," The Neapolitan branch of the great house of Rothschild was the least wealthy and influential of the five branches of it; but assuming that the realized capital of the remaining four, upon which the managers could at any time retire, as Baron Gustavus has just done, is four times that of the Neapolitan, it would amount to the enormous sum of $150,000,000! This is the *lowest* estimate—how much *below* the truth it is we have no means of ascertaining. Indeed, we doubt if it be exactly known by the fortunate holders themselves. The annual interest on such a sum as this, at six per cent., would be $9,000,000, or $24,657 a day. The wealthiest nobleman in England is the Marquis of Westminster, whose daily income has been estimated at $5,000, which is one-fifth less than that of the individual members of the house of Rothschild. This famous banking firm is one of the great Powers of Europe.

Great Railroad Establishment.

The London and Northwestern Railway Company's Works at Crewe, near Liverpool, England, form an immense establishment. They cover seventeen acres of ground, and 30,000 square yards of the space are occupied with shops. Rails are made on the premises for the railroad, and a great number are made of Bessemer steel; others are formed with the top and bottom of steel and the middle part of iron. About 15,000 tuns of rails are made annually. The smithy for forgings covers an area of 5,000 square yards. Fifteen steam hammers of various sizes are required, and there are 100 smith's hearths. The engine wheels are solid wrought-iron forgings. In the boiler shop 120 locomotive boilers and 100 new engines are made annually. No less than 1,100 engines are required as stock for the road.

Correspondence

Review of Low Pressure Condensing Engines as applied to Steam Vessels.

Messrs. Editors:—On page 234, current volume of the Scientific American, I notice an article in reference to the two great iron-clad ships, *Puritan* and *Dictator*, giving a description of their machinery, which is alike in both vessels. They have two cylinders of 100 inch bore and 4 feet stroke of piston. The propellers are 21 feet 6 inches in diameter, with a lead of 32 feet. The writer remarks:—"We do not suppose that twenty miles per hour will be got out of them as stated, but we do think that three-fourths of it is not too much to expect when their models and engines are considered. If the engineers of those vessels gave such information from a practical knowledge of "cause and effect," they certainly have made a great error in their calculations, as the facts and figures will show. The velocity and travel of pistons of low pressure condensing engines have been fully demonstrated in Europe and America, and engines of such proportions never have and cannot make, on an average, over 35 revolutions per minute. Taking this figure as the number of revolutions the engines of the *Puritan* and *Dictator* will make per minute, with 32 feet lead of screw, we have a travel of screw in the fluid nut of 1,120 feet per minute or 67,200 feet per hour: equal to 12 miles, 3,840 feet Now, deducting from this one-fifth or one-fourth, for the slip of the screw [by far too much.—Eds] (which varies a little, according to the model of the vessel), we have a speed to the vessel of not more than about ten miles per hour. If we compare the practical results of the *Great Eastern* with her double power and two modes of propulsion (side wheels and propeller), we shall see that either one of them would produce about the same speed without the aid of the other. Her propeller is 24 feet in diameter with a lead of 44 feet. Her propeller engines have 4 feet stroke of piston, and at 35 revolutions per minute, she would have a travel of screw of 1,540 feet per minute, or 92,400 feet per hour: equal to 17 miles, 2,660 feet. Deducting the slip, her speed would be about 15 miles per hour, and she would cross the Atlantic from Liverpool to New York, a distance of 3,300 miles, in nine days—a thing she has not yet accomplished, notwithstanding she has the additional aid of paddle-wheels, of 56 feet in diameter, with engines of ample power to drive them; thus proving that she has never come quite up to 35 revolutions per minute. The rebel steamer *Alabama* has a propeller of 14 feet diameter and 21 feet lead of screw. She has two cylinders of 54 inch bore, and her engines have a stroke of piston of only 17 inches, and probably make 75 revolutions per minute, which would give a travel of screw of 1,575 feet per minute or 94,500 feet per hour: equal to 17 miles 4,740 feet per hour. Deducting the slip (one-fifth) we have 14 miles 1,680 feet, as the actual speed of the vessel per hour. The great number of revolutions have been obtained by shortening the stroke of the piston to 17 inches, and this is the great secret, and only one, for the extra speed she has attained, which has given her such renown as the fastest propeller afloat.

As the stroke of the piston is shortened the number of the revolutions are increased, and as it is lengthened the revolutions become less. The *Alabama*, with a stroke of piston 17 inches and 75 revolutions, makes a travel of piston 189 feet per minute, while a low-pressure condensing paddle-wheel engine, of 80-inch bore and 12 feet stroke of piston, makes only about 18 revolutions per minute; but the travel of piston is 432 feet per minute. In the one case the piston has to travel 189 feet and be reversed 150 times per minute, and in the other the piston has to travel 432 feet and be reversed only 36 times per minute.

The *Great Eastern's* engine has a 4 feet stroke of piston, and travels 280 feet in making 35 revolutions, and the piston must be reversed 70 times per minute. The *Himalaya* has two cylinders of 84-inch bore and 3½ feet stroke of piston, which would travel 266 feet per minute in making 38 revolutions, and the piston must be reversed 76 times.

It will be seen by the above comparisons that the velocity and travel of piston becomes less as the number of revolutions is increased, from the fact that the shorter the stroke of a low-pressure condensing engine the greater the exhaustion of power, caused by the great number of times the piston is reversed; because from one-fourth to one-third of the power is employed in the lead of the valve to admit steam into the cylinder before the piston reaches the end of the stroke. This lead forms a steam cushion to stop the momentum of the piston and all the weight attached to it. Without this loss of power such engines would break down in a short time, and do break down when the lead of the valve is lost to any extent. But this is a loss of power, or rather an exhaustion of it, in the right direction; for the speed of the vessel depends upon the number of revolutions per minute the engine can make, and the shorter the stroke of piston the greater the number of revolutions given to the propeller.

The *Alabama's* engine has the shortest stroke of piston, makes the greatest number of revolutions per minute, and has the greatest speed; and in no way can the velocity of the low-pressure, complicated condensing engines be increased to give a greater number of revolutions to the propeller, except by gearing, which is sometimes done, or by following the example of the *Alabama* in shortening the stroke.

With all this knowledge before them, some of our marine engineers will give you the dimensions of their engines, the size and lead of the propellers, and tell the public that they can make the vessel run eighteen or twenty miles per hour, when in fact the vessel can go only about one-half that distance; because engines like those of the *Puritan* and *Dictator*, although their velocity and travel of piston is a little over one-half greater than that of the *Alabama*, cannot make one-half the number of her revolutions; and as they can give only one turn to the propeller to each revolution of the engine, it is impossible for the vessel to have a speed much greater than we have shown by our calculations. Engineer

Washington, D. C., Oct. 31, 1863.

[We give place to our correspondent's criticism of our article on the engines of the *Puritan* and *Dictator*, but do not by any means assent to the ground he takes. He begins by an assumption; correcting us for stating that fifteen miles per hour is not too much to expect from the ships in question, and shows why they cannot by taking a very low piston speed for the engines as ground work for his argument, and this added to a fabulous amount of slip in the screw very nearly establishes our correspondent's theory. Unfortunately, the slip of a well-constructed screw propeller seldom averages higher than 12 or 13 per centum of its speed, and even this varies considerably with the pitch; the finer the thread or helix of the propeller is, the less slip or loss of useful effect in propulsion takes place—all other things being equal. As the engines themselves have never had a pound of steam applied to them, we submit that it is premature in our correspondent to calculate from these premises what the speed of the ships will be. The concluding paragraph of our article read thus—"what piston speed will be got out of them remains to be seen." It is a very simple thing to multiply certain figures together when the sums are given, but it is not so easy to set down the piston speed of new and untried engines. We will, however, make a prophecy on our own account, and although we desire to state that we know no more than our correspondent, or even the builders, as to what the speed of piston will be, we will set down 50 revolutions per minute as the maximum, not the medium, which the engines will attain, under favorable circumstances; which will give a speed, minus one-fourth slip, of nearly 14 miles an hour for the screw. This we do from a knowledge of what such engines ought to achieve. Our correspondent cites the case of English vessels and the piston speeds they attain; he should know that the average piston speed in this country is much higher than abroad, and while the rebel steamer *Alabama* is quoted as having a probable speed of screw which should drive her through the water at the rate of 14 miles an hour, the cylinders being 54 inches bore and 17 inches stroke of piston, it should be borne in mind that this is not *de facto* proof of such speed being attainable by her. The new gunboats in the navy have a piston stroke of 18 inches only (the first four built we mean) in a cylinder of 30 inches, and they achieve from 80 to 90 revolutions, and on occasions over 100 per minute, with ease, with a screw of the same pitch as the *Alabama;* not 14 miles an hour, or anything like it

As our correspondent asserts that the piston speed of such engines as the *Dictator's* has been fully demonstrated in this country, perhaps he will be kind enough to tell us where there are any screw engines of that size now running here? An Italian frigate went on an extempore trial trip recently, and in the new and untried condition of the engines, just as they came from the machine-shop almost, 42 revolutions of the screw were obtained with 15 pounds of steam and the throttle but one-eighth open; these engines are 84 inches in the cylinder by 45 inches stroke, and the slip of the screw was hardly 19 per cent of its speed: not one-fourth even in a new engine.

It is improper to make positive deductions and assertions from possible performances of vessels and engines. There are such things in engineering science as positive and negative slip in screws and paddle-wheels, and a ship may actually run away from her screw—beat her own time in fact; such feats are rare, and we recall only one instance at the present time—that of the steam sloop-of-war *Niagara*, in 1858. Calculating the actual speed of ships from the travel and slip of the screw, independent of other considerations, is about as proper as it would be to reckon how fast a man could run from the length of his legs. A vessel may churn away at a dock and make 40 revolutions per hour and never advance an inch; the winds and tides are opposing elements, and exercise an influence which must be taken into account in the problem.—Eds.

Preserving Cider.

Messrs. Editors:—As it is now cider time, I desire to call attention and make inquiry of others, as to the use of the sulphite of lime for preserving cider, or preventing its fermentation. As you have published the recipe, I may state that the directions are: Half an ounce of the sulphite to the gallon of cider. Last year I followed your directions with a barrel of pure juice, which I obtained from a farmer, and the consequence was that I spoiled my cider. There was too much of a good thing, and the cider tasted exactly like that which is left in a tumbler after saleratus has been dissolved in hard cider—a common practice among country people. I have since conversed with at least two other parties who had also used the sulphite, and they both state that one-fourth of an ounce per gallon is plenty. I should be glad to hear from others who have tried it, that we may know how it operated with them. Suppose the cider is already in a tolerably fair state of fermentation when the sulphite is applied, will that make any difference—and if so, what? W. C. D.

Washington, D. C., Nov. 5, 1863.

[It would stop the fermentation.—Eds.

Cellar Floors—Saving Fuel.

Messrs. Editors—Some months ago I requested your advice regarding the dampness of my cellar floor, caused by mixing the cement with coal ashes; and you recommended me to sprinkle cement, combined with half the quantity of sand, over it when damp. I did so, and the effect was a complete cure for the evil. While writing, I am reminded of another matter, which is worth a notice in your very valuable paper, in these times of high-priced coal. I have tried quite a number of modes to economize the consumption of anthracite, viz: by the air-tight principle of front door, dampers in the pipes, registers in the doors, and putting the doors ajar—all of which plans have their objections; the latter causing the air in the room to be drawn through the stove and pipes by the vacuum in the chimney, involving great loss of heat, &c. This winter I have adopted a different mode of moderating the fire in my heater in the cellar, which thus far has succeeded well. I have made an opening near the ceiling in the chimney, and carried a 6-inch pipe to the air outside, and I also provided it with a close damper, thereby relieving the vacuum in the chimney without loss of heat in the stove. I find the heating powers to be much increased—caused, I suppose, by the heat of the fire impinging against the side of the sheet-iron work of the stove. At all events, I find a lessened consumption of fuel and a greater amount of heat than before, and the stove requires less attention.

The handle of my damper is plated, and extends to the parlor above, obviating the necessity of going down into the cellar to regulate the fire. Yours, &c.

F. W. ROHRMAN.

Philadelphia, Nov. 18, 1863.

Progress of Astronomy.

(For the Scientific American.)

Few, if any, of the sciences have made greater progress during the nineteenth century than that of Astronomy. At the beginning of the present century, only six planets were known to astronomers, which was but one more than was known in the days of Hipparchus. But what a change has been made in less than sixty-four years! At the present day we can name eighty planets which have been discovered in this brief period, seventy-nine of which were found by means of the telescope, and one –Neptune —by the far-reaching analysis of the mathematician. The telescope has also disclosed to us a new ring and a new satellite to the planet Saturn.

In the department of cometary astronomy an immense number of discoveries have been made. Up to the year 1812 but one comet was known (Halley's) to have been observed at two successive appearances, but before the close of the year 1858, nine had been added to it, whose periods of revolution varied from three and a half to seventy years. In addition to these, astronomers, by their untiring industry and vigilance, detected about twenty, whose periods of revolution were from one hundred to upwards of ten thousand years, and nearly one hundred whose orbits were sensibly parabolic.

Stellar astronomy has not been neglected by astronomers. To Sir William Herschel belongs the credit of first detecting the existence of Binary systems among the fixed stars. Some of the binary stars have made two revolutions around their common center of gravity since their first discovery by Dr. Herschel, and many have completed one and are far advanced on their second revolution. At this time there are upwards of one hundred pairs of stars known which may be properly called binary; and every year and almost every month some astronomer announces the discovery of a new pair. It is now a well-ascertained fact that these binary stars are suns, each revolving around their common center of gravity.

Lastly we come to theoretical astronomy. Within the past ten years a new set of "Tables of the Moon" has been published by Dr. Hansen, from his own theoretical investigations, and which are far superior to any others previously constructed. Leverrier has recently published new tables of the sun, Mercury, and Venus. These tables enable us to calculate with almost perfect accuracy celestial phenomena which occurred twenty centuries ago. Astronomy is wholly indebted to the telescope for the rapid strides which it has made during the last two centuries. The multitudes of comets and planets have all been found by means of the telescope; and had it not been for the accurate observations of the planet Uranus, made with telescopes, which furnished astronomers with data for their theoretical investigations, Neptune would never have been seen by mortal eye.

H. P. TUTTLE.

Newport, R. I.

Blue Color of the Sky.

MESSRS. EDITORS:—On page 262, of the SCIENTIFIC AMERICAN, occurs the lamest conclusion for London science that ever turned up. If you wash a black horse with whitewash, he will be blue; and if you wash another black horse with a thinner coat of whitewash, he will be darker blue. This is the whole story of the cause of the blue sky. The dark region beyond the atmosphere is here the black horse, and the atmosphere is the whitewash. The atmosphere interposes between the eye and space, and causes the latter to appear blue, which is always lighter near the horizon, because a thicker stratum of air interposes horizontally than perpendicularly. The transparency and consequent purity of the atmosphere can always be known by the degree of intensity of blue above. After a thundershower, the sky is a much deeper blue than it was before it.

Those countries (France is one) which have the bluest sky, have the purest atmosphere; and those with the palest blue (England is one) the contrary. This is the reason why some prefer the moon of Naples to the sun of England. Yours, &c.,

J. MUMA.

Hanover, Pa, Nov. 9, 1863.

Concerning Belts.

MESSRS. EDITORS:—Suppose I have two pulleys of different diameters; say, for instance, one 5 feet, the other 2; the centers of the shafts ten feet apart: what must be the length of belt necessary to put them in running order, and how is the result arrived at?

I have a theory in regard to it, and I would like to know if it is correct; also whether it is new or old. It is this:—I take half the difference of the diameter of the two pulleys, adding to the smaller and subtracting from the greater; thus making them equal. Then take twice the length between the centers of shafts, and add to that half the circumference of each pulley:—thus two pulleys, one 5 feet diameter, the other 2 feet, are equal to 2 pulleys, each 3½ feet diameter $10\times2+10\cdot9956=30\cdot9956$, which I suppose to be the length of belt.

FRANK E SNOW.

Bridesburg, Pa., Nov. 8, 1863.

[ANSWER.—We have inserted your letter, as there may be others who have fallen into the error you have. Your theory is incorrect, for the reason that you do not consider the slope or inclination a belt has in passing from a pulley of large to one of a small diameter. The matter is much more intricate than one would suppose, but a full explanation can be found on page 38, Vol. I (new series) SCIENTIFIC AMERICAN, and also on page 84, Vol. II. The quickest way to find out the length of a belt is with a tape line strung over both wheels; that saves time and labor. —EDS.

How Fortunes are Made in the Navy.

Several valuable prizes have recently been finally adjudicated, and the money will be ready for distribution in the course of a week or ten days. Among them are the *Memphis*, the *Britannia* and the *Victory*. The former was captured by the United States steamer *Magnolia*, and yielded the snug sum of $510,914 07, after paying the expenses of adjudication. Acting Volunteer Lieut. Wm. Budd, is the happy man who takes as his share $38,318 55, his vessel not being attached to a squadron at the time of the capture, and his share being three twentieths of the half awarded to the captors. All the officers on this vessel belonged to the volunteer service, and their several shares amount to a handsome sum. The sailors, too, come into a small fortune for them; the seamen getting $1,736 86 to each, ordinary seamen, $1,350 88, and the landsmen, $1,157 91. The *Britannia* and *Victory* were captured by Commander R H. Wyman, of the *Santiago de Cuba*; the former yielding the sum of $169,695 72, and the latter $299,998 45, making $469,694 17—the captures being made within the space of a week. It will be noticed in this case that while the officers get liberal shares, the seamen each receive $897 67: ordinary seamen, $698 12; and landsmen, $598 40. Another steamer was captured about the same time, which has not yet been adjudicated—making altogether a very handsome sum.

The Navy is in immediate want of seamen, and with such chances for fortunes it is amazing that the want exists for a single day. All will agree that "Jack" is reaping a reward for his services.

Reduction of Silver Waste.

The London *Journal of Photography*, states that a method has been discovered for reducing waste silver solutions, which promises to be practically valuable. It is based upon the fact that ammoniacal sub-chloride of copper precipitates completely and perfectly pure silver from a solution of the nitrate of silver, to which a slight excess of ammonia has been added. The ammoniacal sub chloride of copper is prepared by dissolving five parts of the black oxide of copper and four parts of finely divided metallic copper in chlorohydric acid. When the whole is dissolved an excess of the strongest liquid ammonia is added, which produces a clear solution. If it be used to reduce an old photographic bath, add ammonia to it until the oxide of silver is redissolved, then pour in an excess of the copper solution, collect the precipitate of pure silver, and wash and dry it. The same reagent may also be employed for reducing the silver in an old hyposulphite bath of a photographer, but to it a very little ammonia must be added, the mixture must be greatly diluted, and a considerable period of time is required for the finer metallic particles of silver to settle to the bottom of the vessel.

The Confederate Rams in England.

Inquiry shows that the Government has been taking most extraordinary precautions to prevent any attempted departure of the rams. On Tuesday afternoon H. M. S. *Heron* arrived in the Mersey and took up a position in front of Messrs. Laird's dock, in which the least forward ram, *El Monastir*, is lying. The *Heron* did not anchor, but passed her cable through the side of the ferry buoy, so that it might be slipped at a moment's notice. In this position she now lies, with her fires banked and steam up. Marines were landed and sent on board *El Monastir*. Messrs. Laird's workmen were ordered off the vessel, which remains in the exclusive possession of the marines. No one is allowed on board, and the workmen's tools have been sent ashore. About the same time an additional force of marines was sent on board the other ram *El Toussoun*, and all the workmen, with their tools and appliances, were ordered ashore. In her case also, no person is permitted on board. The gunboat *Goshawk* continues to be moored ahead of the ram. It is understood that the iron-plated frigate *Prince Consort* is on her way to Liverpool, but it is difficult to ascertain whether this is correct or not. The authorities are very reserved. H. M. S. *Majestic* is already in the Mersey. These hostile preparations created much consternation, and it is believed Messrs. Laird deem the seizure altogether illegal. The other vessel seized by Government, the *Alexandra*, still lies in the Toxteth Dock, Liverpool, under embargo. Her case will come before the Court of Appeal early in the approaching term.—*Liverpool Courier.*

[The majesty of the law must be the real safeguard; setting a wooden ship to "guard" a ram is like putting a sheep to protect a bulldog.—EDS.

Dummies.

The Philadelphia and Frankford Railroad Co., have, for some time past, agitated the subject of employing dummies for the road, instead of the little horse-cars now in use. The track of the new road, which has been recently constructed in the middle of the plank road leading to Frankford, prevented the employment of these engines sooner. The road was built strongly and substantially, and a line of cubical stone blocks braced against the rails, to prevent them from slipping, extended along the entire track. When the dummies were placed upon the road, the stones were found to be elevated too much for the engines, and workmen were employed to break them down. Recently the dummies ran between the city and Frankford, more as a matter of experiment than for a permanent thing. They succeeded admirably. Up hill and down they ran with the same ease as on a direct track. The shortest curves were turned without difficulty, and when stopped on the curve no trouble was experienced in starting. The usual time between the city and Frankford is forty-five minutes. The dummies did it in nineteen. They have the front platform enclosed, are a little longer and higher than the present cars, and are heated by pipes set in the floor, under the feet of the passengers. An alarm bell is stationed on the top of the engine. The company at present employs three, and more are building.

[A pair of horses that eat their own heads off, take the labor of three men, one to drive, another to feed, and another to *doctor* them, are much better than dummies—in the opinion of our city railroad men.—EDS.

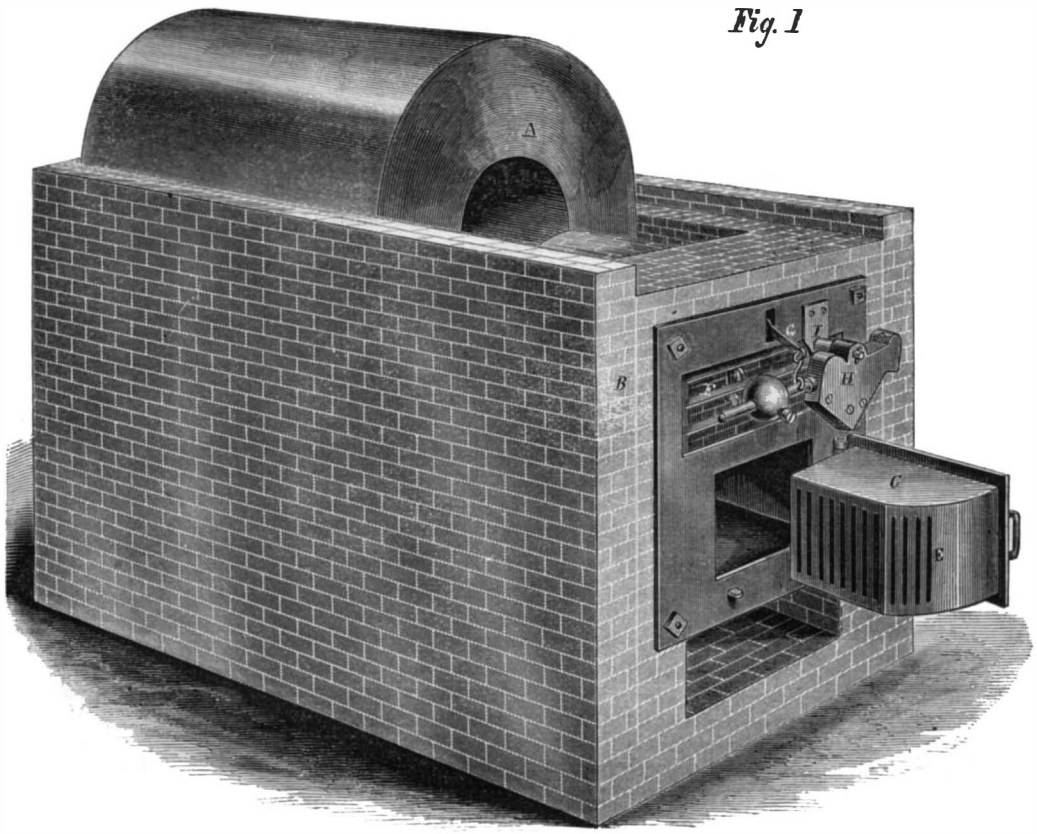
LARGE PAIR OF IRON SHEARS.—A pair of shears weighing 24 tuns has been built at Birmingham, England, for the Russian Government, to be used in large iron works in the neighborhood of St. Petersburgh. It has a power of pressure equal to 1,000 tuns, and can cut to pieces a bar of cold iron half a foot square. The blades are of cast steel and they are operated by hydrostatic pressure. These shears are said to possess double the power of any set heretofore constructed.

Improvements in Burning Fuel.

At a time like the present, when every combustible in use in the arts is largely increased in value, and in view of the universal ignorance of the proper management of fuel which prevails, it is important that those interested should give attention to all apparatuses which promises to reduce the expense of fuel by lessening the quantity consumed for specific duty. Fully one half the coal put into furnaces of the ordinary kind is wasted because the process of combustion is not thoroughly developed, and the gases which might be utilized and made to impart heat, are carried out of the chimney unconsumed, to mingle with the atmosphere in the shape of smoke and invisible vapors. On some of our Sound and river steamboats the gases are burnt, not in the boilers, but at the top of the smoke pipes, some sixty feet therefrom, creating an intense heat, which is not only wasted but tends to injure the pipes by burning them out.

The furnace herewith illustrated is designed to effect a more thorough consumption of the fuel, by graduating the supply of air which enters to sustain the fire, so that the gases are consumed and made to impart their value as heating agents. The mechanical arrangement is as follows:—The boiler, A, is not peculiar, but may be of any form desired; this boiler is set in the furnace, B. There is an iron front to this furnace which has a door, C, and an upper draught opening closed by an arrangement of slats similar to those used on blinds. These slats are all secured to a vertical rod inside of the opening, which, in turn, is jointed to the end of a horizontal lever, G, this lever is connected with a mercury chamber, H, on the pin, I, which is peculiarly constructed, so that when fresh fuel is thrown into the furnace, and the lever turned by hand so as to throw the slats open, the mercury will run down inside of the chamber and gradually close the slats, thus admitting no more air than is necessary to perfect combustion. The door of the furnace is provided with a deep case at the back, and a set of narrow openings on the front, communicating with a series of air passages formed by the vertical pieces, D, set diagonally; the air thus admitted is heated by coming in contact with the hot surfaces, and then passes through small openings, E, at the back of the door into the furnace, where it assists in burning the fuel; the draft being distributed in a series of thin currents, feeds the fire without perceptibly lowering the temperature in the furnace. There are also narrow apertures, J, Fig. 2, opening into the furnace inside of the outer wall and communicating with air passages, so that circulation can also be maintained in this manner for the better consumption of the fuel. Behind the grates there are a series of inclined passages, K, in the bridge walls, L, which are constructed of fire-brick; these bricks become intensely heated in a short time by the action of the fire upon them; so much so, that upon the admission of fresh coal the smoke and gas disengaged therefrom is ignited by them as soon as the requisite quantity of oxygen is furnished through the apertures beforementioned. The grate bars, M, Fig. 2, are also peculiar, and are so constructed that the expansion and contraction are equal. A groove is formed on the top of them through which are small holes, *a*; ashes soon fill up the groove, and the air passing through the holes tends to keep the bars cool and prevent the formation of clinkers, which would destroy them in a short time.

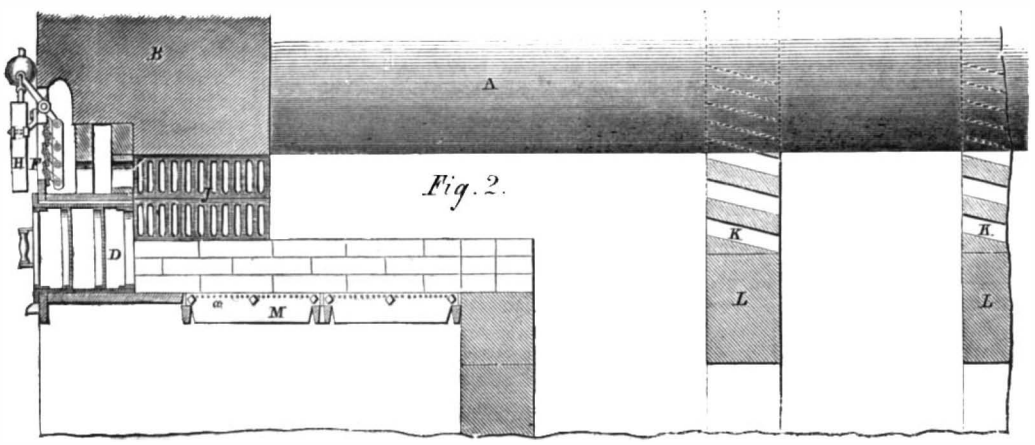
Fig. 1



GERNER'S IMPROVEMENTS IN BURNING FUEL.

These improvements. are adapted to all furnaces and any variety of boiler; either with natural or artificial draught, and independent of or fitted with chimneys. No chimney is needed, however (as the inventor states), and the complete and economical consumption of the fuel is accomplished by the action of the regulator and of the regenerating partitions. The improvements are also adapted to different kinds of coal, bituminous or anthracite, and it is only necessary to regulate the supply of air to reap all the benefit of the fuel. Patent ordered to issue, through the Scientific American Patent Agency, to Henry Gerner, of New York city. Further information can be had by addressing him at No. 20 Bleecker street. (See advertisement on another page.)

Fig. 2.



THE ERICSSON GUN.—The large rifled gun, 13 inches bore, constructed for the Government by Capt. Ericsson, has arrived in this city. The inventor is to receive $5,000 for every pound of powder the gun is able to stand beyond the service charge of 50 pounds, which it is intended to bear. Capt. Ericsson is of opinion that he may be able to burn 100 pounds, and is confident of using a charge of 75 pounds. A cast-iron solid shot, 13 inches in diameter, weighs 302 pounds.

Improved Marine Mail Bag.

A waterproof floating mail bag, invented by Mr. George Mitchell, has been exhibited in the Exchange News-room, Liverpool, under the direction of the inventor. It is a strongly-constructed bag, made of the best "duck," or sail-cloth, thoroughly impregnated by india-rubber (caoutchouc), and consequently completely waterproof. From this quality it is less or more buoyant on account of the quantity of atmospheric air it contains, and so becomes valuable. The specimen exhibited in Liverpool, where we understand it will remain on view for several days, is about three feet long, one foot broad, and about six inches deep. This bag was well filled by a miscellaneous collection of materials, such as may be expected to find their way into a mail bag. They consisted of newspapers, numerous loose papers, a comparatively large number of books, and to give weight in an additional degree, two common building bricks, the whole forming a very heavy mass compared with the size of the bag. The whole, however, was buoyant, and on opening the bag it was found that not a drop of moisture had permeated into it. The inventor also states that he has arranged a means by which the whole contents of a ship's mail-room may be made buoyant, and connected so as to form a raft or buoy in case of necessity.

New Mode of Storing Petroleum.

A model of a proposed plan for the storage of petroleum in the original casks, without leakage, and as a consequence removing the liability to smell, was recently shown at the office of Messrs. Holt & Banner, Sweeting street, Liverpool. Without going into details, we may mention that the leading features of the plan are the sinking of the original barrels in cisterns or tanks of water, so that they may always be submerged. The barrels are introduced into the wells by a shaft with the greatest facility, and when required can be easily recovered. The wood barrels being kept moist by the water, would, it is contended, swell them so as to render leakage impossible. The wells or tanks could be constructed of brick, or in any other way, so that they are capable of containing a sufficient quantity of water. So far as can be judged by the model, the plan appears to possess considerable merit, and is worthy of attention now that the question of doing away with the smell from petroleum is brought so prominently under public notice.

A NEW balmoral shoe factory at Hartford is so arranged that a shoe goes through thirteen different hands and comes out complete in ten minutes.

The Scientific American.

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☞ See Prospectus on last page. No traveling agents employed.

VOL. IX, NO. 22...[NEW SERIES.].....*Nineteenth Year*

NEW YORK, SATURDAY, NOVEMBER 28, 1868.

OPENING OF A NEW CAMPAIGN.

It appears quite evident to all who observe the signs of the times that Generals Grant and Meade are about to open a new campaign, which we trust will inaugurate glorious results. Not exactly following in the wake of these military chieftains, the Publishers of the SCIENTIFIC AMERICAN propose to begin, on the first of January next, a new and brilliant campaign in the fields of popular science, and they hope to give renewed assurance that this journal is fully up to the stirring events of the day. After a flattering success of eighteen years, the SCIENTIFIC AMERICAN will commence a new volume at the time mentioned, being the "Tenth" of the "New Series." The Publishers earnestly appeal to their friends and patrons, far and wide, to reinforce their subscription list by the formation of clubs.

They feel warranted in saying that no better expenditure of money can possibly be made than for a years' subscription to this journal, which is the only one of its class now published in the United States. The Publishers promise untiring devotion to the interests of their patrons. No department of the journal will be allowed to fall behind preceding years; while it will still be their aim to excel in every respect.

Friends and Patrons, we ask with confidence a continuation of your former patronage, and also your influence in promoting a wider circulation of this journal than it has hitherto enjoyed.

Our New Prospectus appears on our back page.

SHAPE OF LASTS, BOOTS AND SHOES.

A favorable change has lately taken place in the shape of the lasts that are employed to give form to boots and shoes. They are not only made broader at the toe than formerly, but also nearly straight on the inner side, with a right line passing through the center of the heel and the arch to the extremity of the great toe. Such lasts correspond more nearly in form to the anatomic structure of the foot. For this reform the public are indebted to Herman Meyer, Professor of Anatomy in the University of Zurich, who published a pamphlet on the Anatomy of the Foot, in relation to the Form of Boots and Shoes, to which we directed attention on page 266, Vol. VII. (new series), of the SCIENTIFIC AMERICAN. The Chinese have been ridiculed for practicing the custom of deforming the feet of their women, by subjecting them to a cramping, dwarfing operation from infancy. But nations of a more reputable civilization have for centuries been as blind to their own shortcomings respecting the feet of both sexes and all classes. Thus it has been customary to make childrens' and ladies' shoes of the form called straight—narrow at the toe, without regard to the form of the foot—so that they could be changed on the feet daily. It has also been customary to make men's right and left boots and shoes more narrow at the toe than the normal size of the foot. Ridiculous ideas respecting the shape of boots and shoes have occasionally been displayed in fashionable circles, and until recently correct ideas have not been entertained by any class. Deformity of the toes of the feet is quite common, more especially among men who have been accustomed to stand and walk a great deal. The smaller toes are usually cramped up and the large toe bent out of line, causing a deformed projection of its joint. These evils are due to the wearing of ill-formed boots and shoes. If we look at the form of a child's foot we notice that the heel is narrow compared with the front part of the foot, where the toes spread out like a fan, and the large one is separated from the second by a small space, and is also in a straight line with the inner edge of the foot. The little foot of a child is very beautiful, and very different from the same foot after having been subjected to the cramping operation of common boots and shoes for fifteen or twenty years. The ancient Greeks, so celebrated for correct ideas in matters of taste, followed nature in their works of art; hence, they have left us the most perfect models in works of sculpture. The feet of their female figures have the great toe slightly parted from the second, and straight in line with the inner edge of the foot, and fashion should conform to this standard in boots and shoes, as a departure from it exhibits an abnormal taste.

Professor Meyer says:—"All feet are perfectly alike in the principles of their mechanical construction, and the only differences in our healthy feet are those arising from varying length and breadth. In the original form of the foot we never meet with those essential differences designated by shoemaker's 'straight or bent feet,' and still less with such variations in which the great toe lies over, or with the thickness of the ball at its root." He attributes corns, bunions, gout, chilblains, unseemly protruberances and growing-in nails to the unsuitable form of the shoes in established use.

Shoemakers and last-makers have been blind to the anatomy of the foot, and the cause of toe deformity so prevalent everywhere. Advertisements, such as "lasts made here according to the shape of the foot" are quite common. In such places lasts are made from plaster casts of the feet. The idea is wrong, as boots and shoes made upon such lasts only tend to perpetuate evils. Lasts should be made according to the normal, not to the distorted, form of the feet. The chief defect in the form of lasts heretofore has been in making them too narrow at the front of the foot, and sloping them from the root to the point of the great toe. Boots and shoes made upon such models, press the great toe upon the small ones, and the joint at the metatarsal bone is thrust out of line, so that it forms a protuberance on the inner side of the foot.

The reform which has commenced in the making of boots and shoes is more in accordance with the anatomical structure of the foot, and we hope will be productive of lasting benefits. Nature, not the whims of fashion, should be consulted in the manufacture of boots and shoes.

RECKLESS USE OF FIRE-ARMS.

Among the common vices of the day there are none more reprehensible than the reckless use of fire-arms, which seems to pervade all classes of the community. We have just read in an exchange of a bullet that came whizzing from some unknown quarter into the shop of a mechanic engaged in business in one of our northern towns; and quite recently we remember having seen another account wherein the experience of one individual in cleaning a gun was set forth. It appears that he adopted a very certain method for discovering whether the weapon was loaded or not: simply putting his mouth to the muzzle, his foot on the hammer, pushing it back, and then attempting to blow through the nipple. Before this latter performance was achieved, the individual lost his life by the slipping of the hammer (as hundreds before him have) and the discharge of the load, which, it appears, remained in the barrel. Such means as these for the end desired strike us as rather foolish; for although the knowledge is obtained, the person experimenting does not have a chance to profit by it. From all parts of the States we may read daily of accidents by the careless use of fire-arms. Only recently two ladies quarrelled in sport, and one, declaring that she was a rebel, the other, in mock indignation, seized a musket and snapped it at her; it was loaded, of course, as weapons seized by chance, or those near at hand, always seem to be; and the ball, although it did not strike anybody, passed sufficiently near the head of the fair "rebel" to give her a realizing sense of her danger.

Fire-arms are dangerous playthings, and there is much sense in Mrs. Partington's advice to the ubiquitous "Ike;" "Put it away; it might go off if it hasn't either lock, stock, or barrel." There are a number of promising young men who are, in their own opinion, remarkably skillful in handling loaded guns. The remonstrances of male friends and the objections of timid female relatives are laughed off or put aside. Guns "never go off" with them; of course not; if by any chance shock or jar enough force was contributed to fire the fulminate, the powder would obligingly refuse to ignite in deference to their dexterity. Another favorite argument with these gentry is, "they know the gun ain't loaded." How do they know it? Why, some half year ago, they fired the last charge at a crow, and of course there can't be a load in it now. Perhaps in the meantime some thoughtless person takes the musket, and placing a charge in it, puts it in the corner handy for some other reckless individual to shoot a little child with "in sport."

Men ought to know that powder and ball cannot be dodged, and that as a rule it is unsafe to point a crooked stick in the shape of a gun at any one. A life once lost by such means as those discussed, ought to be sufficient warning to the whole community for a century; and yet it seems to be of little avail, for every day the long list of persons killed by the careless use of fire-arms is lengthened. Men go shooting, and pull their guns through brier and brake with the hammer at full cock, and call it an "accident" when their friend in front of them is blown to pieces by their carelessness; others take guns out in boats, lay them across the seats, from whence they fall to the bottom of the craft, and in a great many cases explode. This is also called a "remarkable occurrence." It is time that such folly, and worse than folly, should cease. If the only evil that resulted from the reckless use of fire-arms was the death of the fool-hardy individual in fault, it would be no matter; but the case is generally the other way, and innocent persons are maimed for life, if not killed outright, by men playing with loaded pistols, and snapping muskets, presumedly empty, at other people's heads. If public opinion is not enough to restrain persons from a careless use of fire-arms, some legislation ought to be had upon the subject; for as the matter now stands, by far too many persons are yearly killed in this way.

OXYGEN, OZONE AND ANTOZONE.

Oxygen is the most abundant substance in nature, and it plays the most important part in the chemical changes which take place in the organic and inorganic kingdoms. It is the active agent of combustion and fermentation. It attacks and decomposes the hardest steel; it maintains the fire upon the hearth, the light in the lamp, and the warmth of the human body. Every one should have some definite knowledge of its nature and properties, as it forms the very breath of man's nostrils. Oxygen is one of the six permanent gases; it was discovered by Dr. Priestley in 1774, and called dephlogisticated air. It is insipid, colorless, inodorous, and permanently elastic under all known pressures and temperatures. The lightest gas is hydrogen, compared with which oxgyen is sixteen times heavier; its specific gravity being 16—hydrogen 1, and 100 cubic inches of it weigh 34.24 grains. The air of our atmosphere contains four constituents; namely, oxygen 21 parts, nitrogen 79 parts, some carbonic acid and ammonia; the two latter are variable, the two former constant. The nitrogen is passive, remaining in an unchanged condition in the air; but the oxygen, the active agent, is ever being consumed and renewed. Water absorbs a portion of it, the rate being three cubic inches of oxygen to 100 cubic inches of water. It is thus fitted for the respiration of fishes; the blood of these creatures in circulating through the gills being aerated by the free oxygen dissolved in the water. It is drawn from the atmosphere into the

lungs of mammals, their blood is acrated by it combining with carbon, and then it is expelled in carbonic acid—a gas composed of two equivalents of oxygen and one of carbon. If the oxygen were suddenly extracted from the atmosphere, every living being would die within the space of five minutes. The air most conducive to health contains only oxygen and nitrogen in the proportions given above; all mixtures of other gases with the atmosphere are injurious in proportion to their quantity and nature. Carbonic acid gas, which is expelled from the lungs and also produced by combustion and fermentation, escapes into the atmosphere and acts as a poison when inhaled in large quantities. The quantity of carbonic acid gas thrown into the atmosphere is continually increasing with the increase of human beings, and the vast quantities of fuel which they consume for manufacturing and commercial purposes. It has been calculated that a thousand millions of human beings annually consume 2,000,000,000,000 pounds of carbon, which multiplied by three will give about the quantity of carbonic acid thrown into the air from this source alone. Still all the carbonic acid which now flows into the atmosphere, forms but a small portion of the great aerial ocean. On the tops of mountains and on the ocean it only constitutes about one-fortieth per cent. in weight of the whole atmosphere. Thus diluted, it does no injury to any person, but in cities and in apartments where there is not a free circulation of air it exists in much greater quantities. The only remedy for this evil is a greater supply of fresh air. What are called disinfectants and deodorizers have no effect upon carbonic acid.

Besides carbonic acid, other organic emanations from putrescent bodies—animal and vegetable—pass into the atmosphere. That the entire atmosphere does not become corrupt is a subject of wonder. The Creator has endowed it with the property of purifying itself, and recent chemical discoveries have thrown much light upon the subject. About twenty years ago, it was discoverd by Professor Schonbein that when electric sparks were passed silently through air, the oxygen was changed in nature but not in essence. It received the name of ozone from its peculiar odor, and much was then said and written upon the subject to no profit. Its character is now better understood, and it possesses such intensely oxidizing and bleaching powers that substances upon which common oxygen produces no effect are rapidly oxidized in contact with air which contains only a small portion of it. It unites with putrescent substances, and it has been called "one of the great scavengers of nature." Permanganate of potash contains ozone, and when dissolved, it is called ozonized water, which has of late been much used in medical practice as a deodorizer. Ozone in the atmosphere is said to be promotive of health, and it is therefore a most important condition of oxygen. The explanation given by chemists of the change which oxygen undergoes in becoming ozone, is that it is pollarized and broken up into two states, called ozone for the negative and antozone for the positive. Dry ozone will not dissolve in water, but when a certain quantity of oxygen is converted into ozone, another portion is changed into antozone, which is soluble in water and forms the peroxide of hydrogen. There are several antozonides, but much has yet to be learned respecting this polar condition of oxygen. It is remarkable that ozone is changed into common oxygen by simply submitting it for a short period of time to a temperature of 500° Fah.; and it is further remarkable that ozone and antozone have the power of neutralizing each other in contact and evolving ordinary oxygen in a pure state. According to Faraday, oxygen is the most magnetic of all the gases, and its various changes of character may be due to its electric or magnetic condition.

RECUPERATION OF THE GLOBE.

The skill and cunning of man is continually busy in turning out machinery whereby the labor of the world is accomplished speedily and successfully. It seems at the present time that there is hardly a trade, or a branch of one, that is not in some way furthered by silent and skillful tools. Amid all this material cause and effect are we in any danger of overlooking the processes nature carries on in the bosom of the earth, and upon its surface, for the rejuvenation of its exhausted forces, and for the sustenance of man as well? The achievements of mind are great, and the ingenuity of our countrymen is of world-wide celebrity; the subtle efforts put forth by Nature are not only interesting, but also inspiring in many senses.

When the thoughtlessness of man would exhaust the generous soil that feeds him, the trees shed their leaves, the trunks fall to the ground and decay, brooks trickle in and moisten the earth, birds drop seeds in their flight, and lo! in a little while the herbage springs rank and luxuriant, coarse grass grows heavily, and the soil fattens and waxes mellow under its rich food. Forests may in time wave over acres of such places, only to be cut down by the axe of the invading settler and turned to account in the economy of the world. Damp, mold, and mildew, convert the acid bark and the fatty woods into a manure or muck that makes the earth throb with renewed vigor.

Are there not new mines also forming? In the dark and silent laboratory of nature, fathoms below the surface of the earth, who shall say what wonders are now transpiring for the future benefit of mankind? It is not wholly idle speculation to dwell upon these subjects, for we read daily of the discovery of silver, of gold, of antimony, coal, oil, and a long list of innumerable other substances, all useful to man. These nature has been slowly gathering in for ages, until the adventurous foot of man roaming through the wilderness strikes upon the hidden treasure and forthwith distributes it to the world. By what mysterious affinity or construction some soils bear gold, others diamonds, and yet others silver or rubies, no man can say; for neither gold nor diamonds have as yet been made artificially, and although the component parts of these minerals and gems are well known, there is wanting Nature's own process of amalgamation to make their production at will a matter of no mystery.

While man exerts his ingenuity to tear down the mineral rocks, or open up the bowels of the land and rend from thence the lumps of coal which are built up from the decay and waste of previous centuries, all over the known world, other mines and other fields and forests are springing forth, or being slowly enriched by ceaseless and never-ending natural operations. Whatever waste goes on is renewed again; if this were not a fact, this generation of men would have starved, and future races would find nothing wherewith to build or sustain life.

THE LABOR MOVEMENTS.

The universal disturbance in and unsettled condition of all classes of laborers and mechanics is attracting much attention among thoughtful persons. The machinists of this city—as intelligent and orderly a set of men as can be found—have asked an advance of 25 cents per day on the former rate paid them, alleging that the prices of all kinds of provisions, &c., have increased at such a rate that they find it impossible te support their families in respectability and comfort. The car drivers and conductors have also come forward and demanded an increase of 50 cents per day, and at the present writing many of the lines have granted the advance. These men work fifteen hours a day for the paltry sum of $1 50, or 10 cents an hour, and are obliged to be on duty in all sorts of weather, hot and cold, without cessation, the week round; certainly justice demands that their labor be valued at higher rates.

The sewing girls and workwomen, generally, have also petitioned for an advance, and have been met in some cases with a ready accession to their appeals; in others they have received the cold shoulder. The Shylocks who get rich from the efforts of these hard-worked and poorly-paid females are proverbial for their meanness and want of principle the world over, and with such a record it is not to be wondered at that they refuse to acknowledge the propriety of the pitiful sums asked for by the operatives. That no person of average health and stature can support life on $2 50 per week, in a fit condition to stand the duty required of them, is a proposition that none will dispute; and we see no reason, except the most despicable avarice, for a non-compliance with the workwomen's appeal. We trust it will not be in vain; and we hope that all the trades at variance with their employers will find their remedy in an amicable and speedy adjustment of the disputed points. Certainly, the sympathies of the community are much prepossessed in favor of the orderly and quiet manner in which the proceedings, so far, have been conducted. Intimidation and threats are unheard of, and the conduct, generally, of the trades on strike, is in marked contrast with similar movements in former years. It augurs well for the spread of intelligence and correct ideas among mechanics that they have abandoned mob law and violence generally. The laws of supply and demand are one thing, and hunger, cold and nakedness, are others; and it is of no use to tell the needy that the value of their services is regulated by inevitable laws. As we previously remarked, we hope that the delay to the interests of the country and private individuals will be speedily and amicably adjusted. Our working classes should bear in mind that they cannot safely attempt to speculate upon the necessities of the Government. In common with all of us they have a strong interest in its success, and its permanence very much depends upon the fidelity of the working classes. Unless they are willing to bear their share of the national burdens they will very soon find themselves deprived of the necessary means to bear their own.

THE COAL QUESTION AGAIN.

The *Herald* of the 13th contains a statement in the form of a letter from a correspondent at Wilkesbarre, Pa., that anthracite coal, which is sold at $11 per tun in the cities of New York and Philadelphia, is sold at the mines for $2 50, and charges complicity upon the companies who transport it to market, they having the whole control of the trade. If this statement be susceptible of proof, it is certainly a singular solution of the coal question, and places it on a very plain basis; the authority we quoted further states that the miners are not overpaid, and that in effect collusion and combination of the lines of railroad between the mines and the principal markets is the key to the exorbitant prices demanded. This the public have long suspected, and the statement about the three hundred and fifty steamers is mere haphazard work. The *New Ironsides* is quoted as burning two tuns of coal per hour—lying still, we suppose; for in reality she burns more in active duty. She is rated at 1600 horse power, which at 4 pounds of coal per horse per hour (a fair average) would give 6400 pounds, and the three hundred and forty-seven steamers in Government employ are charged with burning a million and a half tuns per annum; this is exaggerated, as a little plain figuring will convince anyone. Although there may possibly be the indicated number of steam vessels on the navy register, they are not all in service at once, and it does not seem at all possible that the quantities mentioned are actually required; for these same ships, previous to the war, were engaged in passenger and merchant traffic, and their consumption then, together with that of the foreign trade to Southern ports, would bring the amount of coal used before the war much higher than that now required. Such reckless statements go far toward helping the parties who keep up the price of coal to sustain their demands. The fact that foreign coal cannot be imported at paying rates is well proved by that able and fearless paper, the Philadelphia *Press*, and we hope and look for a speedy reduction in the price of this article of prime necessity. Speculation in the essentials of life is at all times reprehensible, but never more so than when the poor are oppressed beyond measure, and when lives are lost and health injured by reason of the high price of fuel. The paper dealers had to abandon for a time their designs in consequence of the very unfavorable light they were placed in by the Press of the country, and we are confident that the same power has only to make itself heard on this question to effect a reform.

THE Adriatic Mills in Worcester, MASS., are driven by a Corliss engine, which has a belt on it 30 inches wide, 114 feet long and double throughout.

A SPECIMEN of glass work, turned and finished in a lathe, was lately shown at the Great Exhibition, London.

CARBOLIC ACID.

This peculiar substance seems to have almost as many names as the wandering Jew, and, in defectively compiled chemical works, each name is set down as meaning a different substance. It received the above name from its discoverer, Runge, in 1834, and it is now also called phenic acid, phenol, phenic alcohol and the hydrate of phenyle. It may be obtained synthetically as well as analytically. The distinguished chemist Bertholet has made it by passing alcohol and acetic vapors through a porcelain tube heated to redness. It is, however, commonly obtained from the oil of coal tar. When this oil is submitted to fractional distillation, the part which passes over between 160 and 190 degrees of temperature is treated with hot saturated caustic and some powdered potash, and a mass of crystals is obtained which is separated by decantation. When these are dissolved in water the solution separates into two layers; the one light and oily, the other heavy and watery. The latter is separated and treated with hydrochloric acid, which sets free carbolic acid. To make it perfectly pure, however, it is digested with fused chloride of calcium and redistilled twice; when, upon cooling slowly, it forms in a solid colorless mass (C_{12} H_6 O H O). It has an odor resembling creosote, and is sometimes sold for it; but the latter is a distinct substance. Carbolic acid burns with a reddish flame, and boils at 180°. It is slightly soluble in water but very soluble in alcohol, ether, acetic acid, glycerin and some volatile oils. It acts very energetically upon the skin; a weak aqueous solution coagulates albumen, and acts as a strong antiseptic. Putrid meat, fish, and fermenting animal substances instantly lose their disgusting odor when treated with a solution of carbolic acid. It is employed, mixed with plaster-of-Paris, in disinfecting powders, as it arrests fermentation and destroys infection. Weak solutions of it instantly destroy the lowest forms of animal and vegetable life; and ink, solutions of glue, and the juices of vegetables are prevented from becoming moldy by an addition of a very small quantity of it. A strong solution of it kills the eggs of ants, caterpillars and the larvae of flies. When applied lightly to the human skin, the latter smarts for about an hour, the epidermis becomes wrinkled, and remains red and somewhat inflamed for about twenty days. When a very minute quantity of it is taken into the stomach it seems to act upon the nerves, producing insensibility almost instantaneously.

A New Want for this Country.

The breaking up of the system of slave labor in the Cotton States consequent upon the rebellion, opens a new field of experiment for our inventors and mechanics. The cotton, rice and sugar fields are to be cultivated by free labor, and as a necessary consequence, by labor-saving tools and machinery. Instead of the scratchy hoe and mule plow for breaking up the cotton lands, there must and will be steam plows introduced and used. The cotton lands are particularly adapted for the use of the steam plow; being mostly quite level, and the soil strong and compact. These lands having been worked for years chiefly on the surface only, steam plows that will go sixteen or eighteen inches deep, will bring to the surface the elements of fertility so long neglected and unused, and plantations that are now comparatively valueless under the very superficial cultivation of slave labor, can be made mines of wealth to the country. What is now wanted is the steam plow that is best calculated for this service. The population for rending and picking the cotton are all on the lands ready for the service, and under efficient steam plowing and intelligent free labor culture, the crops may easily be doubled. Who has got the best steam plow?—*Railway Times.*

Welsh Steam Coal.

The great demand for Welsh coal which is at present experienced at the port of Cardiff, where some hundreds of vessels are at the present time waiting their "stem," has called some attention to its cause, and it has been found from the daily clearances at the Bill of Entry-office that an immense quantity is being cleared for Nassau and contiguous ports. The advantages of a smokeless coal have been quickly discovered by the Confederates and their friends, who, in order to run the blockade, have found it necessary to employ the fastest steamers instead of sailing vessels. It is well known that Cardiff has supplied a considerable quantity of the coal consumed on board several of the notorious Confederate privateers, and there can be no doubt that a coal devoid of smoke being a great desideratum, the Welsh coal has been found the most suitable. From 30,000 to 40,000 tuns of steam coal are now being shipped from the port of Cardiff monthly.

MANUFACIURE OF ENFIELD RIFLES.

An interesting paper on this subject was lately read before the Institution of Mechanical Engineers, at Birmingham, England, by Mr. T Greenwood. With respect to the making of the gun stocks, he stated that they underwent twenty-three different operations, from the rough blocks until they were finished. Nineteen of these operations were executed by machinery and four by hand. At Enfield there are two complete sets of machines in operation; these turn out 2,000 gun stocks per week, upon an average. The London Armory Company has also a set of such machines; but Birmingham is still behind the age, in not having a set running. This gun-stock machinery is of American origin. During the Crimean war Mr. J. Anderson, Colonel Burn and Lieut. Warlow, were sent out as a commission to the United States, to investigate the system of manufacturing muskets in the United States Armories, and they made an arrangement to obtain three sets of machines. The machines were made according to this agreement, but after being set up at Enfield they did not operate satisfactorily. Since then some of them were supplemented by others from America, and Mr. Greenwood has also made some machines by which stocks of different lengths are made. The cost of a set of machines complete was £8,000 (about $40,000.) The rifles for the British Government are manufactured at Enfield, and all the operations are conducted in the same manner as at the United States Armory, Springfield, Mass. All the parts of the rifles are interchangeable (duplicates of one another), and they are completed and ready to be put together without the trouble of filing and shaving to secure accurate fitting of the parts, as by the old hand system. The time now required in putting all the parts of a rifle together is only six minutes: this includes the ramrod, bayonet, and the oiling of the stock. All the parts of a guns furniture are taken up from lots of each sort and put into the stock; the only tool used by the fitter up being a hand brace with a screw-driver in it.

More New Ships for the Navy.

Orders were recently received at the Boston Navy Yard for the construction of several new vessels. Two of them, sloops-of-war, will be among the largest of their class ever built for the navy. They are to be named respectively the *Ammonoosuc* and *Pompanoosuc.* It will take at least six months to construct them, and three more to supply the machinery. They will be 345 feet in length, of 3,000 tuns burthen, and draw about 16½ feet of water. They will be sharp, designed entirely for speed, and very light. The armament will consist of seven guns—three 200-pounders and four broadside guns of 8-inch bore. A new iron-clad, to be called the *Quinsigamond*, is also to be built. She will have two turrets, be 382½ feet in length, with a 52 feet beam, and a depth of 18½ feet, and of 3,200 tuns burthen. Two additional sloops-of-war, smaller than the *Ammonoosuc* and *Pompanoosuc*, will also be built immediately.

The Metropolitan Fair.

A large fair is to be held in this city on Feb. 22, 1864, for the benefit of the Sanitary Commission. One recently closed in Chicago netted the handsome amount of $59,000, and it is confidently believed and hoped, that this city will be able to outdo, in generosity and patriotism, the praiseworthy example set by the people of the West. The ladies of our city will have charge of the fair and will solicit contributions from all loyal citizens. All trades, callings and professions should be represented, and in view of so worthy an object the contributions should be lavish. Notice will be given in future of the address to which the articles intended for the fair should be sent.

TRIAL OF O. R. MUMFORD'S PERCUSSION FUSE.

Navy Ordnance Yard,
Washington City, Oct. 29, 1863.

Commander H. A. Wise, *Chief of Bureau of Ordnance, Navy Department:*—

Sir—In compliance with Bureau Order of June 25th, I have to report the following trial of Mr. O. R Mumford's percussion fuse. Five service 8-inch shells, with his fuse fitted to them, were received here from Mr. Mumford, June 22d, and on Oct. 28th one of them was fired, with the following results:—

Gun Practice Experimental Battery, Oct. 28, 1863.

Gun, 8 inch, No. 3, mounted on wood carriage, on platform in front of battery. Charges, Dupont cannon powder. Initial velocity 1,521 feet. Projectiles, 8-inch shell, filled with 2 lbs. powder, Mumford's percussion fuse. Primers, friction. Elevated 3° by quadrant. Aimed at middle screen pole.

Wind N. E. Force 1. Ebb tide 4 ft. 6 in.

No. from Gun.	No. to-day.	Elevation	Charge.	Weight of Projectile.	Insert'n.	Recoil.	Remarks.
			lbs.	lbs.	in.	ft.	
1	3	8	8	53.25	107	3.6	Shell exploded 40 yards from muzzle of gun.

This shell exploding so near the gun, the continuance of the trial was deemed inexpedient, by reason of the great danger to the vessels at the wharf.

On examining the interior of the fuse, it would appear that the copper pin which confines the rear plunger was not strong enough to withstand the effect of the explosion of the charge, and the explosion of the shell in the gun would be the consequence. Also the balloting of a spherical projectile in the gun would be sufficient to explode at least one of the fulminate caps on the surface of the cylinder.

Respectfully submitted,
(Signed) Wm. Mitchell,
Inspector of Ordnance.

Heavy Trade in Canned Provisions.

Few persons have any idea of the extent to which the business of preserving fruit for the army and the trade generally, is now carried on in this country. There are many large firms in the different States engaged in this business, who employ a great many hands, and have heavy amounts of capital embarked. The consumption of fruit, vegetables, and, in many cases, meats and game (where this branch of the business is carried on) is enormous. One firm in New Jersey is thus spoken of in an exchange:—

"The buildings in which the main operations are carried on cover more than an acre of ground, and apart from the branch of canning and preserving, which often exceeds 5,000 cans per day, they often turn out six tuns of assorted jellies, in glass, per week. The product of 50,000 tomato plants, 30 acres of strawberries, and 35 acres of sweet corn, have been used during the present season for canning. During the peach season about two hundred hands, chiefly women, are employed paring and halving this delicious fruit. Choice fruits being in abundance around the establishment, they are enabled to can them fresh from the field and orchard, while they retain their primitive sweetness and natural flavor."

Gisborne's Steering and Engine Signals.—By the use of these instruments the officer in charge of a vessel may, from any position on deck, transmit his orders to the helmsman or engineer, the order appearing instantly in printed letters, and remaining in sight as long as may be required. The signal is accompanied by the ringing of a bell to attract notice. By a single motion of the helmsman or engineer, the officer on deck receives the response to his command; at the same time the movement of the helm is made known with perfect accuracy. The result is made known in all states of the weather.

In the article on the Rifled musket, an error occurs in the type which makes material difference with the sense. In the eighth line below the engraving of the stock machinery, it is asserted that the frame vibrates on a *cutter;* it should read vibrates on a center.

A nautical mile is 6,079 linear feet; the land mile is 5,280 feet.

VIBRATING WATERFALLS.

There are a number of dams which produce vibrations that are very sensibly felt in their immediate vicinities. The cause of these phenomena has been a subject of much discussion upon several occasions. No person in our country, we believe, has devoted more attention to them than Mr. Elias Loomis, Professor of Natural Philosophy and Astronomy in Yale College; and as he is a very careful, persevering, and cautious experimenter, and most candid in what he gives to the public, his opinions deserve great consideration. The *American Journal of Science and Arts* for this month contains an article by Prof. Loomis, detailing his observations and those of other parties on three vibrating waterfalls, in South Natick, Holyoke, and Lawrence, Mass. In 1843, Professor Loomis published an article on this same subject, in which he suggested that the dam itself was the vibrating body and that the vibrations were analogous to those of a stretched cord. The attention of Professor Snell being directed to the subject, he took a different view of the causes of the vibrations, and attributed them to a column of air behind the sheet of water. After an extended series of observations, Professor Loomis has altered his first views, and has come to conclusions similar to those of Professor Snell.

A series of careful observations were made last year by Mr. William Edwards, at the request of Professor Loomis, on the vibrations of the dam at South Natick, Mass. These resulted in ascertaining that the time of a vibration, according to the depth of water on the edge of the dam, was a little less than the time in which a solid body would fall through a space equal to the depth of the water. Thus when the depth of water was 5 06 inches, the time of one vibration was 0.138 of a second, while the time of a solid body falling through that depth was 0.162 of a second.

The dam across the Connecticut river at Holyoke, Mass., is 1017 feet long and 30 feet high. It is formed of square timbers inclined 22 degrees to the horizon. From the crest of the dam the water descends along an apron about 4 feet in length, sloping downward at an angle of 22 degrees. The vibrations on this dam disappear when the depth of water is less than 12 inches, and also when the depth is as great as 80 inches. At Lawrence, Mass., Mr. B. Coolidge, engineer, made a series of observations, as also did Prof. Loomis. In all these, the time of the vibrations was taken, and compared with the time which a solid body would occupy in falling from the same hight; and the number of vibrations of a column of air of the depth behind the sheet of falling water has been calculated. Now as to the conclusions; Prof. Loomis says "it seems probable that the vibrating motion originates in a column of air behind the sheet of water, and that the descending sheet serves merely as a load to retard the velocity of these vibrations." When the edge of the dam is uneven, and when the sheet of water is very thin, an opening will be left for the column of air behind the sheet, and no vibrations are produced. When the sheet of water is very thick, it partakes somewhat of the rigidity of a solid body, and is not acted upon by the column of air behind it with sufficient power to cause vibrations. This theory accords with the views presented on pages 110 and 126, Vol. XIII (old series) Scientific American, by several correspondents in different parts of the country, who had made observations on vibrating dams. Prof. Loomis says, in reference to the form of vibrating dams :—"It is believed that most waterfalls exhibit some degree of vibratory motion at certain stages of water; but in order that these vibrations may be powerful and long-continued, the edge of the dam must be horizontal and quite smooth, otherwise the thickness of the sheet will not be uniform. The sheet will divide in some places before reaching the bottom of the fall, and this leaves an opening in the enclosure which contains the column of vibrating air." According to these views, all dams may be built so as to avoid jarring vibrations.

At a factory in Portland, Maine, nearly 1,000 bushels of potatoes are "concentrated" for the army every day. All the water is absorbed, leaving about five pounds of nutriment to the sixty pounds which a bushel of potatoes averages, and that concentration is ground up, giving it the appearance of Indian meal.

AMERICAN STEAMSHIPS FOR CHINA.

Sometime ago we gave in a brief paragraph an announcement that Mr. John Englis of this city was building two small screw steamers for the China trade. These vessels are now launched and nearly ready to proceed to their destination. They are intended, one for towing in the harbor of Shanghai, the other for outside service and on the Yangtse river. As a large number of American steamers are now in Chinese waters, the most of which have been recorded in the Scientific American, it is not improper to add these latest specimens of our engineering and ship-building skill to the list.

The longest of the two vessels is called the *Vulcan*, and is 130 feet long, 24 feet beam, and 12 feet depth of hold, built of the best material. The engines are two vertical cylinders, of 26 inches bore and the same stioke. They are of the locomotive pattern in design, having link motion and reversing gear; they are also low pressure, having an air-pump worked direct from the cross-head. The propeller is of cast-iron, Hibsch's patent, and is 9½ feet in diameter with 16 feet pitch. The boiler is of the return tubular pattern and has tubes 9½ feet long; the shell of the boiler is 20 feet in length; furnaces 7 feet in length by 8 feet in width. The machinery is all very compact and neatly finished, and is a credit to the builder, Mr. John Dillon of Rondout, N. Y.

The other vessel has two high-pressure engines, 20 inch bore and 20 inch stroke; propeller wheel 8 feet diameter and 13 feet pitch. These vessels are both of very handsome models, and will doubtless achieve a high rate of speed.

Master and Apprentice.

An important opinion, touching the relation of master and apprentice, was recently delivered in one of the Philadelphia Courts. Paul T. Bowen, an apprentice, was bound, with the assent of his mother, to the firm of Cox, Whiteman & Cox, in order "to learn the trade, art and mystery of stove-moulding." The firm covenant "at such times as their foundries shall be in blast" to give him employment, and to pay him $3 50 per week for the time he shall be at work for the first three months, and an increased rate for the balance of his time of apprenticeship. Judge Ludlow held that the indenture was void, because there was no covenant for schooling, because there was no covenant for maintenance, and because the master agrees to do nothing but to pay the apprentice a certain sum, and to teach him the art and mystery of a certain trade.

Novel Attempt to Escape from Prison.

A few days since an ingenious attempt was made by a rebel prisoner to escape from the old capitol prison in Washington. He tore out a board from the side of the apartment in which he was confined in the yard, and after breaking out a bar of his window, ran the plank out and securely fastened it inside, thus making a spring board with which he hoped to jump to the roof of a small building near at hand, and thus effect his escape. The board, however, proved to be a little too springy, and instead of carrying him 12 feet, to the roof he desired to reach, carried him at least 30 feet, and over the building, among the clothes-lines, &c., in the yard, where he was finally secured by the superintendent of the building. We think the Secretary of War ought to order the release of this prisoner, after his lofty tumbling from the spring board.

Go to Work.—The idea of "respectable employment" is the rock upon which thousands split, and shipwreck themselves and all who depend on them. All employments are respectable that bring honest gains. The laborer who is willing to turn his hands to anything is as respectable as the clerk or dapper store-tender. Indeed the man who is ready to work whenever work offers, whatever it may be, rather than lie idle and beg, is a far more respectable man than one who turns up his nose at hard labor, wearies his friends with his complaints because he can get nothing respectable to do, pockets their benefactions without thankfulness, and goes on from day to day, a useless, lazy grumbler.

The Baltimore and Ohio Railroad Company is about to add 200 iron coal-cars to its equipment, in order to meet the demands of the trade.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list :—

Loop Check for Sewing Machines.—The object of this invention is to obtain a loop check which will work equally well for all kinds of work, and which can be applied at small expense to machines now in use, and to this end it consists in a check composed of a tooth of steel or other metal attached to the bobbin ring, in such position that its point is almost directly in line with the needle's motion, and arranged in such manner as to allow the loop to pass off in a backward direction. J. B. Secor, of Chicago, Ill., is the inventor of this improvement. An illustration of the invention may be found on another page of this paper.

Gaiterettes.—This invention consists in a gaiterette or anklet having a spring of steel or other suitable material inserted in the back seam, in such a manner that, by the action of the spring, the ankle of the person wearing said gaiterette or anklet, is braced and supported, and furthermore, those parts of the gaiterette contiguous to the back seam are prevented from creasing and wrinkling, and consequently a perfect fit of said gaiterette is effected. The invention consists, farther, in the arrangemeut of two flaps on the sides of the gaiterette and projecting from its lower edge in combination with the shank strap, in such a manner that the opening through which the heel passes is enlarged and consequently the introduction of the heel is facilitated, and at the same time the lower edge of the gaiterette is drawn up tight to the surface of the shoe and held in close contact throughout; the invention consists, finally, in cutting the shank strap in the form of a trapezoid, that side next to the heel being the longest to correspond to the varying width of the sole, in such a manner that an even strain is exerted by said shank strap on the gaiterette, and the strap itself as well as the lower edge of said gaiterette are drawn up tight to the surface with which they are in contact. G. W. Ludlow, of Elizabeth, N. J., is the inventor of this improvement.

ISSUED FROM THE UNITED STATES PATENT-OFFICE

FOR THE WEEK ENDING NOVEMBER 10, 1863.

Reported Officially for the Scientific American.

*** Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, 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.

40,545.—Newspaper File.—J. H. Atwater, Providence, R. I. Ante-dated Oct. 29, 1863 :

I claim making one or both of the rods largest in the middle and tapering gradually toward one or both ends, so that when they are clasped together at the ends they act as springs on the paper between them.

I also claim encircling the rods toward each end beyond the paper clamped between them with elastic bands or straps, substantially as described.

40,546.—Polishing Machine.—Albert Ball, Worcester Mass. :

I claim the adjustable table forming a guide for the surface to polished.

I also claim making the table in parts to allow projections to pass close up to the side of the wheel, substantially as set forth and described.

40,547.—Traveling Invalid Chair.—Charles L. Bander, of Cleveland, Ohio :

First, I claim the locking lever, E, for holding the chair at any inclination or extension required.

Second, The mode of propelling the chair by the arrangement of the driving wheels, K, and their cog-gearing, as herein described.

Third, I also claim the manner of guiding the movements of the chair in any direction by the guide wheels and their jointed rods, as herein described.

40,548.—Grain Separator.—J. S. Bodge, Bath, N. Y. :

I claim, first, The slides, I, having inwardly projecting arms or brackets, b, in combination with the tapering keys, j, as and for the purpose specified.

Second, The adjustable imperforate plates, H H′, in combination with the riddles, F and F′, as and for the purpose specified.

Third, The inclined screen, K, having one or more ridges, P, across it, as and for the purpose specified.

Fourth, The shoe, L, adapted to have longitudinal movement in the frame, E, in combination with the riddles, F′ and F′, and imperforate plates, H and H′, as described.

Fifth, Surrounding a portion of each of the perforations in the riddle, F and F′, at bottom, with a sloping flanch, e, as and for the purpose specified.

40,549.—Metallic Buhr.—A. T. Boon, Galesburgh, Ill.:

I claim making the grinding surface of mill buhrs of cast steel in the form of a thin circular disk, and attaching the same to the face of the iron disk or its equivalent, substantially as described.

40,550.—Gear Cutting.—A. T. Boon, Galesburg, Ill.:

First, I claim the combination of the slotted standards, B B′, screws, C C′, and nuts, K K′, K K′, or their equivalents, when attached to the index, G, for the purpose of adjusting the wheel to be cut, at the proper hight in relation to the cutter, and the arrangement of the elongated bar, D, set handle screw, E, for the purpose of regulating the depth of the cut, substantially in the manner and for the purpose herein set forth,

Second, I also claim in combination with the above the attachment of my gear-cutting apparatus to a common or engine lathe, substantially in the manner and for the purpose herein set forth.

40,551.—Apparatus for making Ice.—Jesse H. Bunnell, Massillon, Ohio

I claim, first, in combination with a box or vessel, constructed substantially as herein described, the floor, A, provided with the blocks or studs, E, and cocks or vents, F F′, for the purpose of preventing contact and adhesion between the ice and the floor, as explained.

Second, I claim the movable sides, C, constructed and secured substantially as herein described, for rendering the ice accessible to the dividing or sawing apparatus.

Third, In combination with the studded floor, A E, I claim a series of cocks or vents, F F′ G G′, arranged as and for the purposes specified.

[By means of this apparatus solid blocks of ice of any desired thickness are produced with trifling labor and cost, and by an ingenious contrivance the ice is kept from adhering to the bottom of the vessel in which it is formed.]

40,552.—Lid or Cover for Cans, &c.—Joel Bryant, Brooklyn, N. Y.:

I claim the exclusive use of lids or covers, L, for jars or cans, when provided with an opening, V, and plug or screw, S, or their equivalent, when constructed and operating substantially as herein described and for the purposes set forth.

40,553.—Revolving Fire-arm.—J. W. Cochran, New York City:

I claim the loading and unloading rammers or pistons, d and d′, connecting bar or yoke, e, with the gear lever, h, for revolving fire-arms.

40,554.—Locomotive.—P. H. Corlett, West Manchester, Pa.:

I claim making the body of the smoke box of locomotives with double plates, A B B′, with an air space between them, with perforations, C C′, for the purpose of protecting the outer plate from the destructive action of the heat, substantially as specified.

40,555.—Draft-regulator for Locomotives.—P. H. Corlett, West Manchester, Pa.:

I claim providing the escape pipe, C, with openings or holes, E, and valves, F, operating substantially as and for the purpose specified.

40,556.—Preserve Cans, Jars, &c.—Timothy Earl, Smithfield, R. I.:

I claim the method, substantially as described, of controlling the air vent to a preserve can or jar, by causing the same pressure which holds the cover upon the jar to secure the vent and the same motion which unfastens the cover to relieve the vent, as herein set forth.

40,557.—Gate.—S. G. Farnham, East Hartford, Conn.:

I claim making the upper rail of a gate longer than the gate itself, in combination with a double track rail plate, i, and rolls, d, arranged and operating substantially in the manner as described.

40,558.—Umbrella.—Derrick P. Felts, New York City:

I claim the hook-shaped ends of the umbrella ribs or braces, formed by bending the wire composing such rib or brace, in combination with the perforated crown piece or runner receiving such hooks, and with the disk at the back of such hooks for retaining them in place, as and for the purposes specified.

40,559.—Piston for Steam Engines.—F. H. Furniss and Jacob Hovey, Cleveland, Ohio:

We claim the openings, E and F, valves, I, in combination with the piston, as and for the purpose set forth.

Second, The hollow screw, K, forming an adjustable valve seat, in combination with the valve, I′, and piston, for the purpose described.

Third, The grooves, M, in combination with the openings and piston, as and for the purpose specified.

40,560.—Lubricator.—T. W. Godwin, Portsmouth, Va.:

I claim, first, The vertical shaft, C C′, substantially as described.

Second, The tube, E, in combination with the vertical shaft, C C′, substantially as shown and described.

40,561.—Machine for raising, creasing and slicking Leather.—C. W. Guest, Dexter, Mich.:

I claim the employment of the rollers, R′ and R″, in combination with the unequal-sized spur gear wheels, o′ and o″, and the forked and weighted lever, D, constructed, arranged and operated substantially as and for the purposes specified.

40,562.—Sugar Evaporator.—Samuel Hoyt, New York City:

I claim, first, Forming a flue communication between two or more evaporating pans arranged one above another, constructed with gradually diminished flues in their bottoms, substantially as herein described,

Second, Increasing the amount of heating surfaces of the flues in the several succeeding pans according to the different conditions of the sirup subjected to these pans, substantially as described.

Third, The combination of the inclined longitudinally-corrugated evaporating surfaces, with the transverse receiving troughs and discharge pipes, substantially as described

Fourth, Constructing the pan, A2, with a central corrugated flue, B4, passing through it and communicating with the common flue of the series of pans, substantially as described.

Fifth, Constructing the pan, A′, with a corrugated evaporating plate, b′, and a corrugated bottom plate, a′, both plates forming a flue of increased capacity, and constituting the bottom of said pan, substantially as described.

Sixth, A series of evaporating pans, arranged in or nearly in horizontal planes, one above another, and furnished with inclined evaporating surfaces, and a common flue, running through the whole, substantially as set forth.

Seventh, In combination with the system of evaporating pans, arranged substantially as described, I claim the system of pipes, for changing the sirup from one pan to another, substantially as set forth.

40,563.—Steam Boiler.—Samuel Hoyt, New York City:

I claim, first, Constructing the shell of a steam boiler with that portion of its surface which is exposed to the fire and heat, corrugated, and that portion which is not thus exposed plain or uncorrugated, substantially as described.

Second, Combining with a partially corrugated boiler shell, the corrugated jacket, E, so applied thereto that it forms a flue space, incloses that portion of the boiler shell which is corrugated, and communicates with the internal flues, B C C, substantially as described.

Third, The auxiliary fire chambers, J J, in combination with the main fire chamber, G, and flaring jacket, E, substantially as and for the purposes described.

Fourth, The combination of the internal curved flues, C C, with the central circular flue, B, substantially as described.

40,564.—Extension Bedstead.—Antoni Iske, Lancaster, Pa.

I claim the employment of pivoted cross-slats, L, in combination with the head and foot boards of a bedstead, A and F b, or their equivalent, the front and rear portions of a side-board, B and F, with their sides, S1, and S2, and loose top, T, made and arranged substantially as shown, with the slotted plates, K.

I also claim the ratchet, O, in combination with the affixed or hinged head-board, A, cross slats, L, and rails, R, when arranged substantially in the manner shown for the purpose specified.

40,565.—Grain Drill.—Samuel Jolly, Ripley, Ohio:

I claim the combination and arrangement of the slides, k, cross bar, j, pitmans, i i, and cranks, h h, as and for the purpose specified.

In combination with the pitmans, i i, I claim the arrangement of the U-shaped piece, s, and hand-rod, t, for disengaging the pitmans from the cross-bar, j, and temporarily suspending the delivery of seed as herein described.

40,566.—Lamp.—George A. Jones, New York City:

I claim constructing lamps, which use an impelled current of air to promote combustion, with an outer or enclosing case or shell surrounding the oil chamber, but at a little distance from it, so that the impelled current of air may pass up around the oil chamber, and in the space between it and the enclosing shell, to the wick, for the purposes set forth.

40,567.—Securing Combined Railroad Chair and Splice-piece.—Melvin W. Knox, Sheridan, N. Y.:

I claim a railroad chair and coupling combined, together with the bolts and keys secured by a spring, substantially as described and for the purposes set forth.

40,568.—Winding and Setting Watches.—Charles Eugene Laederich, St. Amier, Switzerland. Patented in France May 19, 1863:

I claim the sliding stem, d, carrying a pinion, f, that will alternately by moving it rotate the wheel, h, or the wheel, p, and thus wind up the watch, or set the hands, substantially as herein described.

I also claim in combination with the sliding stem, d, the neck, o, and sliding stop, n, for the purpose of holding said stem, and its pinion in proper position for winding the watch, its other position for moving the hands being regulated by the end of its movement, thus enabling the user to operate the parts by one hand only, substantially as described and illustrated by the annexed drawings.

40,569.—Water Elevator.—Jonathan Lilly, Castle Creek, N. Y.:

I claim the combination and arrangement of the lever, L, spring, S, brace, b, pawl, P, ratchet wheel, R, and windlass, W, as and for the purposes set forth.

40,570.—Portable Furnace.—Albert Magee, Lawrence, Mass.:

I claim the combination in a portable furnace, of the induction cold air flue, F, smoke exit flue, G, and grate, C, when constructed to be used as a utensil upon a cooking stove or range, substantially as described.

40,571.—Rotary Engine.—Adolph Millochan, New York City:

I claim the pipes, i l n and o, and valves or cocks, k k′ m and m′, in combination with the ring, c, and pistons acting in the steam spaces, y and z, substantially as specified.

40,572.—Breech-loading Fire-arm.—Wm. Morgenstern & Edward Morwitz, Philadelphia, Pa.:

We claim, first, The breech-block, C, constructed, arranged, and operating substantially as herein described and represented.

We also claim the combination of the bolt and needle or hammer, with the main spring, lever, dog, and trigger, for the purpose of cocking, and letting go, said bolt and needle or hammer, substantially as described.

40,573.—Keyed Instrument of Music.—Francis Peabody, Salem, Mass.:

I claim, first, In keyed instruments the use of concentric series of dents, I J, or their equivalents, mounted on removable plates, G, and arranged relatively to a removable series of levers, C, so as to operate therewith, in the manner substantially as herein set forth.

Second, I claim the division of the levers into two independent sets, C C′ operated on opposite or nearly opposite parts of the plate, G, substantially as and for the purpose herein set forth.

Third, I claim the speed regulator composed of the hollow shaft, L, changeable rings, N N′, and adjusting rod, P, arranged to operate in connection with each other and with the automatic works of a keyed instrument, substantially as and for the purpose herein set forth.

40,574.—Portable Fence.—H. Parker Ross, Hastings, N. Y. Ante-dated Oct. 24, 1863:

I claim providing the panels with the staples, B, and movable post, C, in combination with the dowel, A, the whole constructed and arranged in the manner and for the purpose herein set forth.

40,575.—Machine for Tanning.—Volney E. Rusco, Chicago, Ill.:

I claim the machine for tanning hides, constructed and operated in the manner set forth.

40,576.—Disintegration of Vegetable Substance for the Separation of Fibers, &c.—George Escol Sellers, Hardin County, Ill.:

I claim, first, The disintegration of vegetable substances, in the manner substantially as described and for the purposes specified.

Second, The utilizing of the non-fibrous portions of vegetable substances when separated from the fibrous portions, for the purposes specified.

40,577.—Reducing Hemp, Flax, &c., to a Fibrous Condition.—Rebecca Sherwood, Fort Edward, N. Y.:

I claim, first, The use of the solutions combined as described for the purpose of reducing hemp, flax, grass, straw, and other fibrous substances to a textile fiber for the manufacture of textile fabrics and pulp for paper, substantially as described.

Second, The use of coal oil, naptha, benzine, or other liquid hydrocarbon either alone or combined with alkaline or soapy solutions for the purpose of reducing hemp, flax, grass, straw, and other fibrous substances to a textile fiber for the manufacture of textile fabrics, or for pulp for all kinds of paper, substantially as described.

40,578.—Truss for Hernia.—Daniel C. Smith, Adrian, Mich.

I claim, first, The screw, F, and nut, G, operating in connection with the projections, D and E.

Second, I claim the joint, B B, as above described for the purposes set forth and described.

40,579.—Sugar Evaporator with Automatic Feeder.—George Stevenson, Zionsville, Ind.:

I claim, first, Regulating the flow of juice to the evaporating pan, B, by means of the float, I, when so arranged as to rise and fall by the action of the juice in the pan and by its operation control the admission of juice thereto, substantially in the manner and for the purpose herein described.

Second, I claim in combination with the division, c, of the evaporator, B, set below the level of the other part or parts as herein described, the combination and arrangement of the damper, m, plate, k, flues, l l′, air chamber, o, and side doors, n, substantially as herein shown and described.

Third, I claim in combination with the pan, B, or division thereof, c, the thin metal side chamber, p, constructed and arranged in connection therewith, substantially in the manner and for the purpose described.

40,580.—Billiard Cushion.—John Syrcher, Buffalo, N. Y.:

I claim the application and use of a strip of horn, in connection with an india-rubber pad for the purpose of making an improved billiard cushion, substantially as herein described.

40,581.—Mold for Forming Artificial Teeth.—J. Terrell, Philadelphia, Pa.:

I claim, first, The stationary projections, a, for forming recesses in the teeth, in combination with the key, E, and movable strips, D, for permitting the teeth to be withdrawn from the said projections, in the manner described.

Second, The employment of the movable pins, G, in the manner and for the purpose described.

40,582.—Horse Collar.—James H. Van Sice, Buffalo, N. Y.:

I claim a horse collar having an elastic and flexible pad, B, stuffed rim, A, and roll, C, constructed substantially as described.

40,583.—Device for Locking Screw Nuts.—Wm. F. Vernier, Philadelphia, Pa.:

I claim the plate, L L, with the lugs, N N, and the rods, G and M, constructed and applied substantially as above described and for the purposes set forth.

40,584.—Cutting Machine.—G. J. Wardwell, Coaticook Canada:

I claim the guide blocks, T and U, packing blocks, C′, bolts, a′, clamp rods or bolts, b′, arranged and combined as herein specified. I also claim the corrugations on the side of cutters or drills, S, and corresponding corrugations on the inner surfaces of head guide blocks, T, packing block, c′, bolts, a′, clamp rods or bolts, b′, as arranged and combined for effecting the objects specified.

I also claim the double-acting feed arm or plate, q′, connecting rod, U, vibrating lever, r′, combined and arranged in the manner and for the purpose herein described.

I also claim the standards, R, arranged on the outside of frame, A, in the manner and for the objects specified.

40,585.—Harvester.—S. S. Bartlett, Providence, R. I., assignor to himself and T. H. Dodge, Nashua, N. H.:

I claim the combination in a mowing machine of a tilting frame to which the finger beam is attached and a hinged tongue in such a manner as that the frame and tongue shall both have a common axis of motion, while in drawing the frame and cutting apparatus forward the draft thereof shall come directly upon the metal tongue socket pieces, or their equivalent, and not upon the main axle, whereby much friction is avoided and the machine rendered of more easy draft, substantially as described.

40,586.—Machine for Twisting Wires for Marking.—Martial Dimock, Newark, N. J., assignor to Porter Fitch, Brooklyn, N. Y.:

I claim, first, The construction and use of the shaft, a, having the aperture, i, and the double tenon, k, substantialy as shown and described.

Second, The construction and use of the sliding shaft, l, having the double tenon, h, and the notches in the shoulder, o, substantially as shown and described.

Third, The arrangement and use of the shaft, a, having aperture, i, and double tenon, K, the sliding shaft, l, with its double tenon, h, and notches in the shoulder, o, in connection and co-operation with each other and with the shaft, w, when used for twisting wires, substantially as shown and described.

40,587.—Tool for Manufacturing Knitting Burrs.—Horace Fisher, Waterford, N. Y., assignor to himself and Fuller and Safely, Cohoes, N. Y.:

I claim the combination of a spindle, E, and its button, G, screw and nut, N, with a follower, K, and collar, H′, substantially as described and for the purpose set forth.

40,588.—Screw-cutting Machine for Nicking Screw Blanks.—J. C. Rhodes (assignor to B. Hobart & Son), East Bridgewater, Mass.:

I claim the improved machine or combination constructed in manner and so as to operate substantially as above described, such machine not only having an inclined feeding trough, M, a blank receiver or carriage, F, a presser, N, a rotary saw or cutter, E, a discharger, O, and saw adjustments, substantially as herein before described, but being provided with a spring, K, applied to the blank receiver or carriage, so as not only to retract the latter, but to enable it to move in an opposite direction under derangement of a screw blank, as set forth.

40,589.—Loop-check of Sewing Machines.—J. B. Secor (assignor to himself and W. H. Butler), Chicago, Ill.:

I claim having the lower face of the bobbin ring, A, provided with a recess, a, and a loop-check, b, projecting over a portion of such recess, the whole constructed, arranged and operating together, substantially in the manner herein shown and described.

[See engraving on page 352.]

40,590.—Wrench.—G. C. Taft, Worcester, Mass., assignor to T. H. Dodge, Nashua, N. H.:

I claim the combination of the parallel grooves, d d d, in the shank, A, in the corresponding projections, e e e, on the rosette, D, the same not being spiral but running at right angles to the line of motion of the jaw, thus relieving the ferule from all strain while retaining the rosette in the same relative position as respects the handle of the wrench, substantially as and for the purposes set forth.

40,591.—Gas Heating Apparatus.—S. Lloyd Wiegand (assignor to Abraham Hart), Philadelphia, Pa. Ante-dated Nov. 2, 1863:

I claim, first, The combination of the burner, H, and adjustable cap, J, with the funnel, X, when used in the manner and for the purpose set forth.

Second, Combining the external fender or chimney, C, with the burner, H, adjustable cap, J, and a funnel, X, for the uses herein-before specified.

Third, The manner of attaching the boiler and fender to the base ring, E, by means of the lugs, T T T, and projections, Z Z, ring, G, and bolts, D D D, when in combination with the adjustable screw funnel, constructed and used in the manner set forth.

RE-ISSUES.

1,565.—Evaporator for Saccharine Liquids.—F. D. Drake, Four Corners, Ohio. Patented Jan. 6, 1863:

I claim the return flue, C, applied in combination with the furnace, A, and pan, B, substantially in the manner and for the purpose herein set forth.

[This invention consists in the employment or use of a furnace with a return flue or flues, in such a manner that the heat applied to the liquid in the pan is graduated from the highest temperature in one portion of the pan down to below the boiling point in the other portion or portions, and that thereby the scum is thrown off towards the coolest portion or portions of said pan, where it can easily be removed, and the danger of imparting an unpleasant taste to the molasses by boiling the sap in the mass is obviated, and furthermore a saving of fuel is effected.]

1,566.—Grain Separator.—James Fergusson, Dubuque, Iowa. Patented Nov. 5, 1861:

I claim, first, Dividing, screening and concentrating grain or other substances in their passage over and through one or more riddles, substantially as described.

Second, The riddle boxes, D, operating in the manner substantially as described, for the purposes set forth.

Third, The combination of the riddle, D, spring, G, and eccentric, f, or its equivalent, substantially in the manner and for the purposes described.

Fourth, The combination of the box riddles, D, pins or their equivalents, j, and bottomless hopper, E, substantially as and for the purposes described.

Fifth, The combination of the box riddles, D, and the cockle screen, I, substantially as and for the purpose described.

Sixth, The combination of the riddles or riddle boxes, D, and fan, B, substantially as and for the purposes described.

Seventh, The adjustability of the hopper, E, relatively to the upper riddle box, D, substantially in the manner and for the purposes described.

1,567.—Gaiter.—G. W. Ludlow, Elizabeth, N. J. Patented April 21, 1863:

I claim as a new article of manufacture a gaiterette, A, constructed as hereinbefore described, with flaps or projections, C, connected by a shank strap, D, of trapezoidal form.

1,568.—Grid-iron.—O. F. Morrill, Chelsea, Mass. Patented Dec. 6. 1859:

I claim an improved steak broiler, as not only made or provided with a deflector for its grid, but as having a heat passage arranged underneath such deflector, and surrounded by a gravy trough, substantially in manner as specified.

I also claim the grid, as provided with a deflector arranged with respect to the bars of the grid, as specified,

I also claim the gravy pan as made with a trough and a heat passage, arranged substantially as specified.

1,569.—Hemming Guide for Sewing Machines.—Alfred and L. D. Davis, Worcester, Mass: assignees by mesne assignments of S. E. Blake and Thomas Johnston, Louisville, Ky.:

We claim, first, The hem turner, G, combined with and attached to a spring, B, applied and arranged for adjustment to a sewing machine, substantially as described and set forth.

Second, The combination and arrangement of the hem turner, G, spring, B, and roller, f, substantially as and for the purposes set forth and specified.

Third, The yielding spring plate, B, with its hem turner, G and B′, with its presser piece, H, in combination with the adjustable gage, C, substantially as described and specified.

Fourth, The yielding presser roller, K, to smooth, flatten and present the hem or tuck to the action of the needle as the material is fed forward for stitching, substantially as described and set forth.

Fifth, The presser piece, H, attached to the spring, B′, and holding the material to the feeding surface of the sewing machine, in combination with the hem turner, G, substantially as set forth and specified.

Sixth, The combination and arrangement of the hem turner, G presser piece, H, roller, K, and adjustable gage, C, substantially as described and for the purposes specified.

DESIGNS.

1,839 to 1,847.—Nine Patents for Carpet Patterns.—E. J. Ney (assignor to the Lowell Manufacturing Company), Lowell, Mass.

1,848.—Turn-over Collar.—Chas. H. Welling, New York City.

Notes and Queries

H. W., of N. Y.—The item you criticize in relation to the small engine was published as the result of actual experiments carefully made, and the power is the result of the conditions mentioned in the items; it is not guess work; we see no ground for argument. We do not wish to revive the old discussion about working steam expansively.

D. J. P., of Wis.—Address F. Pease, Buffalo, N. Y., for a good machine oil.

A. G., of N. Y.—You will find an illustrated description of Ericsson's caloric engine on page 268, Vol. XIII. (old series) of the SCIENTIFIC AMERICAN.

E. W. H., of Wis.—An expanding shot for cannon is not new. It has frequently been shown to us since the war commenced.

A. M. V., of R. I.—George Steers.

N. & S., of N. H.—Address the Collinsville Co., Collinsville, Conn., for cast-steel castings.

Qua., of C. W.—Use a short pipe and a long shaft; but place your engine nearer the boiler, if possible. Avoid long steam pipes, for although shafting consumes power, it is not so great a source of waste as the loss of heat from the steam caused by a long pipe.

G. W. K., of Pa.—India-rubber will not destroy magnetism in steel. It is an insulator, but not a destroyer of electricity. A magnet will attract iron, although a piece of glass may be interposed between the two; and glass is a better non-conductor than india-rubber.

R. B. D., of Ky.—A mistaken idea is conveyed by the use of the term "mechanical powers" for the lever, the inclined plane, &c. There is no power in a lever, inclined plane, wheel or axle. These are merely mechanical agents for communicating power. A fulcrum is simply a point or place of rest for a lever. Your article does not make the proper distinction respecting the nature of these agents.

B. & R., of Ill.—The chloride of silver may be reduced to a metallic condition by feeding strips of zinc into a solution of the chloride acidulated with muriatic acid, when the silver will be precipitated and the chlorine will unite with the zinc. Wash the precipitated silver, then dry it thoroughly and melt in a crucible. If fused with the carbonate of soda or potash, in a crucible, the chloride of silver will also be reduced to metallic silver.

E. W. M., of Mass.—Steam cars for city railroads are quite practicable. Do not be afraid of street mud as an obstruction, for the engine can keep the rail clear by using brushes in front of the wheel. You will find a locomotive and car for city railroads illustrated on page 257, Vol. V. (new series) of the SCIENTIFIC AMERICAN.

C. G. S., of Md.—Bourne's improved catechism of the steam engine, published by D. Appleton & Co., of this city, will give you the desired information about valves. Large works on steam engines are very high in price at present.

R. B. K., of Ky.—Perhaps no person will dispute your proposition respecting the results obtained by making the fulcrum of the lever the driver; but there is no inherent power in a lever.

G. F. W., of Fairport.—We have not a single spare number of our paper which contains the engraving of Page's electro-magnetic engine. You can obtain a magnetic helice of Messrs. Chester, 104 Center street, this city.

C. S., of N. Y.—All the black chromate inks made with logwood deposit a thick sediment. A remedy for preventing the precipitate has been found in gum arabic, but we prefer the evil to the remedy, as the gum clogs up the pen and the ink does not flow so freely.

E. D. B., of N. Y.—A Board of Examiners for applicant engineers to the navy meets at different places, and the time and place of meeting are usually advertised before-hand. You will find information respecting the mode of applying for examination on page 187, Vol. VII. (new series) of the SCIENTIFIC AMERICAN.

W. S. S., of Mass.—We are not acquainted with any odorless solvent of india-rubber. Benzole is a good solvent, and is not very unpleasant to the sense of smell—some people rather like it. Naphtha—a very good solvent—has a very unpleasant odor.

A. M. D., of N. Y.—Portable saw-mills were manufactured a few years ago, by W. Montgomery, of Yonkers, N. Y., and J. Brown, of Baltimore, Md., but we know not whether these manufacturers are now engaged in the business.

Money Received.

At the Scientific American Office, on account of Patent Office business, from Wednesday, Nov. 11, to Wednesday, Nov. 18, 1863:—

A. J. M., of N. Y., $25; L. O. C., of Pa., $25; J. D. H., of N. Y., $41; W. F. R., of N. Y., $16; R. H. R., of N. Y., $20; T. J. T., of Md., $20; A. B., of Conn., $20; H. A. A., of N. Y., $20; A. T., of N. Y., $20; T. & J., of N. Y., $20; J. H. R, of N. Y., $20; C. F. T., of N. Y., $45; S. B. W., of Kansas, $20; B. & B., of Mass., $30; C. C. A., of N. Y., $48; H. M., of Ill., $25; J. A. L., of N. H. $16; R. B. C., of Mass., $46; C. & B., of Mass., $16; J. W., of Iowa, $25; T. G., of N. Y., $33; C. F. B., of Conn., $250; E. S., of N. Y., $10; D. E. C., of N. Y., $25; W. S., of N. Y., $41; S. H. M., of Ill., $20; J. W., of Iowa, $20; A. G., of N. Y., $20; G. H. R., of N. Y., $15; B. M., of N. Y., $16; E. H., of N. Y., $45; P. M. R., of Cal., $30; R. W. B., of N. Y., $16; J. A. H., of Pa., $20; W. M. of Ill., $15; R. E. & A. G., of N. Y., $25; E. L., of Vt., $16; L. W. F., of Ind., $16; D & C., of N. Y., $16; R. B., of Pa., $25; O. & F., of N. Y., $24; W. E. C., of Ill., $15; W. & H., of Cal., $50; J. H., of Ill., $25; W. W., of N. Y., $41; R. H., of Mass., $25; J. J., of Maine, $44; W. N., of N. Y., $16; C. C., of N. Y., $41; V. W. B., of Vt., $20; J. E., of N. Y., $20; J. N. B., of N. Y., $16; E. C. W., of N. Y., $20; J. P., of N. J., $20; G. F., of N. Y., $20; R. J. S, of N. Y., $20; A. C. E., of Mass., $25; F. H. C. M., of N. Y., $16; R. D. C., of England, $100; W. K., of N. Y., $16; D. P. S., of N. Y., $16; G. B. R., of Ill., $16; J. P. C., of Ill., $16; C. W. B., of Conn., $12; G. S., of N. Y., $150; D. L., of Vt., $25; J. H., of N. Y., $15; M. H. F., of N. Y., $16.

Persons having remitted money to this office will please to examine the above list to see that their initials appear in it, and if they have not received an acknowledgement by mail, and their initials are not to be found in this list, they will please notify us immediately, and inform us the amount, and how it was sent, whether by mail or express.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office, from Wednesday, Nov. 11, to Wednesday, Nov. 18, 1863:—

A. J. M., of N. Y.; D. E. C., of N. Y.; W. S., of N. Y.; R. E. & A. G., of Pa; J. H., of Ill.; H. M., of Ill.; E. S., of N. Y.; R. H., of Mass.; S. & G., of Pa.; C. W. B., of Conn.; D. L., of Vt.; W. W., of N. Y.; J. D. H., of N. Y.; A. C. E., of Mass.; H. H. H., of N. Y.; H. T. S., of Pa.; L. O. C, of Pa.; W. S., of N. Y.; B. & R., of N. Y.; J. W., of Iowa; T. G., of N. Y.

TO OUR READERS.

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.

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 are 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 arrival of the first paper a *bona-fide* acknowledgment of our reception of their funds.

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.

Binding the "Scientific American."

It is important that all works of reference should be well bound The SCIENTIFIC AMERICAN being the only publication in the country which records the doings of the United States Patent Office, it is prepared by a large class of its patrons, lawyers and others, for reference some complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, *i. e.*, heavy board sides covered with marble paper, and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we commenced on the expiration of Volume VII. to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

The price of binding in the above style is 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, No. 37 Park Row, New York.

PROPOSALS FOR HEAVY PROJECTILES.

ORDNANCE OFFICE, WAR DEPARTMENT,
WASHINGTON, Nov. 16, 1863.

Sealed proposals will be received at this office until 4 o'clock, P. M., on the 15th of December next, for Heavy Projectiles, to be delivered in the following quantities, at the undernamed arsenals, viz:—

AT THE WATERTOWN ARSENAL, MASS.
2,000 15 inch battering shot
2,000 5-inch shells
8,000 10-inch shot
5,000 10-inch shells
AT THE WATERVLIET ARSENAL, WEST TROY, N. Y.
1,000 15 inch battering shot
1,000 15-inch shells
4,000 10-inch shot
2,000 10-inch shells
AT THE U. S. ARSENAL, GOVERNOR'S ISLAND, N. Y.
3,000 15-inch battering shot
3,000 15-inch shells
10,000 10-inch shot
8,000 10-inch shells
AT THE ALLEGHANY ARSENAL, PITTSBURGH, PA.
1,000 15-inch battering shot
1,000 15-inch shells
6,000 10-inch shot
3,000 10-inch shells
AT THE ST. LOUIS ARSENAL, ST LOUIS, MO.
2,000 10-inch shot
2,000 10-inch shells
AT THE WASHINGTON ARSENAL, WASHINGTON, D. C.
1,000 15-inch battering shot
1,000 15-inch shells
2,000 10-inch shot
3,000 10-inch shells.

The Projectiles are to be made of the kind of metal, and inspected after the rules laid down in the Ordnance Manual, with the exception of the 15-inch battering shot, which are to be made of gun metal, of tensile strength, ranging between 28,000 and 30,000 pounds to the square inch, and these must be cast from a reverberatory or air furnace. The metal is to be charcoal iron, and the sample to be tested is to be taken from the projectile.

Drawings of all these projectiles can be seen at any of the arsenals where they are to be delivered. The projectiles are to be inspected at the foundry where cast, but must be delivered at the various arsenals, free of charge for transportation or handling until delivered at the arsenal. Deliveries must be made at the rate of not less than five per cent per week, of the number of projectiles contracted for; the first delivery to be made within 30 days after the date of contract, and any failure to deliver at a specified time will subject the contractor to a forfeiture of the number he may fail to deliver at that time.

Separate bids must be made for each kind of projectiles; and if any bidder proposes to deliver at different arsenals, separate bids must be made for each kind at each place.

No bid will be considered from parties other than regular founders, or proprietors of works, who are known to this Department to be capable of executing the work contracted for in their own establishments.

Each party obtaining a contract will be required to enter into bonds, with approved sureties, for its faithful execution.

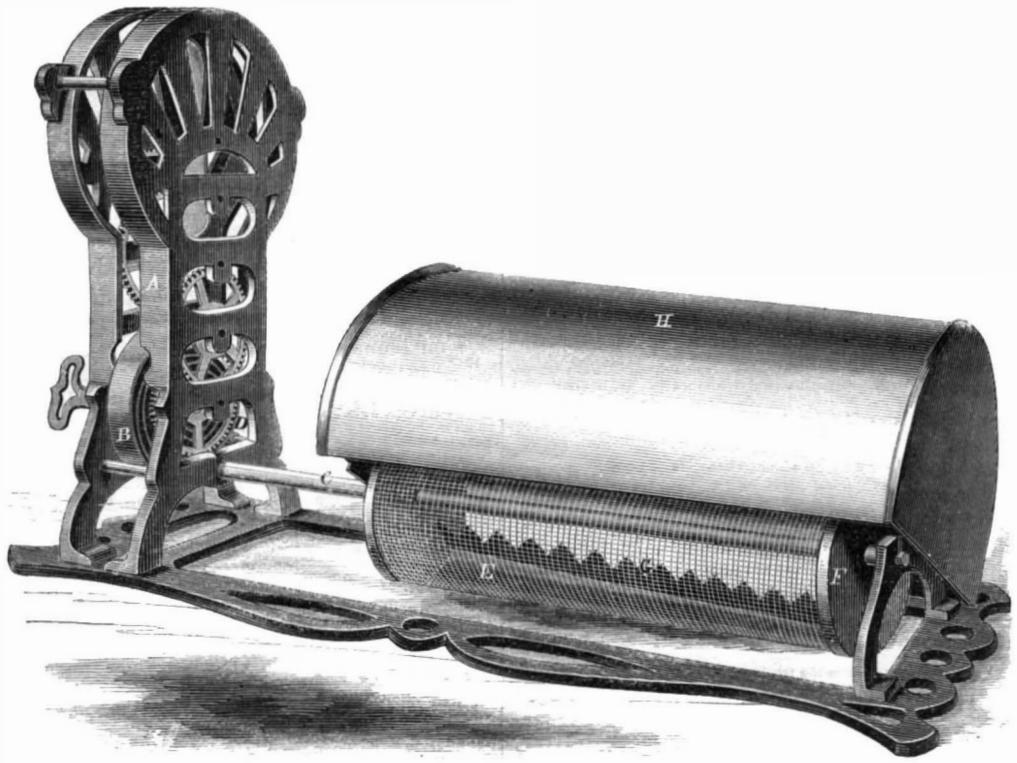
The Department reserves to itself the right to reject any or all bids, if not deemed satisfactory, for any cause.

Proposals will be addressed to "Brigadier-General George D. Ramsay, Chief of Ordnance, Washington, D. C.," and will be endorsed "Proposals for Heavy Projectiles."

GEORGE D. RAMSAY,
22 3 Brigadier-General, Chief of Ordnance.

Improved Coffee-Roaster.

The apparatus herewith illustrated is designed to facilitate, in a better manner than could be done otherwise, the roasting of coffee. It is well known to housekeepers that much difficulty is experienced in performing this duty in skillets or ordinary vessels placed over a fire, from the liability of the berries to burn by coming in contact with heated metal. Burned coffee is not only disagreeable in taste but is also unwholesome, and besides the trouble above mentioned, the necessity of personal oversight while the coffee is being roasted is a loss of time which cannot be always spared. This coffee-roaster is open to none of these objections; it is self-acting after

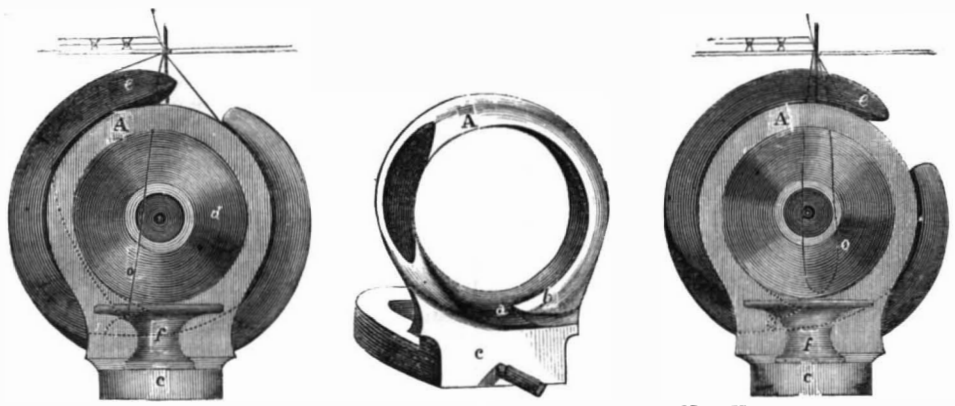


MILL'S MECHANICAL COFFEE-ROASTER.

being once wound up and the berry in roasting is subjected to the heat of the fire only; the fine netting having very little influence on the coffee. The construction of the machine is so simple that a few words will suffice to make it plain to every one. The case, A, contains a train of wheel, or clock-work driven by the spring, B, which is wound up by the key seen on the opposite side. The shaft, C, has a small pinion (not shown in the engraving), which engages with the wheel, D, and is driven by it. The cylinder, E, made of iron wire cloth so fine th t dust and small stones or grit will fall through, is fastened to the shaft and has a cover, F, at one end, which can be taken off to put the coffee inside. The serrated strip of iron, G, is fastened to the cylinder, and stirs the coffee up while roasting, so that all of it is exposed to the action of the fire equally, and the tin case, H, serves to retain the aromatic flavor evolved while roasting the coffee, and which would be dissipated and lost were the cylinder open to the air. This cover closes over the cylinder tightly and is only shown raised in our engraving to disclose the other parts below it. This is the whole of the invention and it is a very useful one to families who roast their own coffee. These machines can also be made of large size, so as to roast quantities of coffee at one time for those desiring to carry on a business of that character. It was patented by C. A. Mills; for further information address Mills & Thompson, Hazel Green, Wis. The machine is manufactured by R. J. Ives, Bristol, Conn.

Improved Loop Check.

This invention belongs to what is commonly known as the Wheeler & Wilson sewing machine. In this machine, a loop check, consisting of a pad or brush, is used to temporarily arrest the loop in its passage around the rotating hook, for the purpose of preventing the latter from getting more than one loop upon it at a time; and this loop check has been a source of much difficulty to persons operating the machine, more especially when one machine had to be used for sewing materials of different thicknesses and with thread of different sizes. Fig. 1 represents the loop, *o*, checked, and the point of the rotating hook, *e*, entering the succeeding loop. Fig. 2 represents the sliding ring with the check, *b*, attached. Fig. 3 shows the loop, *o*, liberated from the check, *b*, and the loop, *o*, being drawn up into the fabric. Several devices have been invented with a view to remedy this evil, but all have been more or less objectionable, most of them requiring essential alterations of the rotating hook, or being otherwise difficult of application to machines already made. In the application of the "Secor Improvement," to the Wheeler & Wilson machine, there is no change required, other than the removal of the brush, its holder, and the thread-guard on the underside of the cloth plate.



SECOR'S IMPROVED LOOP CHECK.

This improvement consists of a metallic tooth, *a*, Fig. 2, made of finely tempered steel, securely attached to the lower part of the circle of the bobbin ring, thus becoming a part of the ring, with the point opposite the needle, as shown in the drawings. The bobbin is grooved upon its face next to the ring, so as to allow a free passage of the loop, O, from the check. We desire to state in this connection, that this improvement has been in constant use for the last eight months in the hands of competent operators, and found to give entire satisfaction. Among the advantages to be derived from the use of this improvement, are: it saves the operator of the machine all the difficulties and annoyances attending the adjustment of friction checks, rendered necessary by wearing away of the brush, derangement of brush holder, change of thread, and the like; for this check is positive in its action, never failing to take and deliver the loop at the proper time, and is arranged for all sized threads within the range of family sewing; besides, there is much less necessity for change of tension, in passing from thin to thick goods, or over seams and other irregularities, than there is while using any other check. The great superiority of this improvement becomes apparent in the use of silk, which is not liable to be chafed or pulled apart while passing on and off the check, but remains smooth and firm, as when first unwound from the spool.

Foreign patents for this invention have been secured through the Scientific American Patent Agency, and the claim is published on page 349; further information can be obtained by addressing Secor & Butler, 147 Dearborn street, Chicago, Ill.

FROM THE STEAM PRESS OF JOHN A. GRAY & GREEN.